



CANYONS FAR SOUTH FILING NO. 2
PHASE III DRAINAGE REPORT

TOWN OF CASTLE ROCK PROJECT NO. CD24-0012

NOVEMBER 2025

For:

**Canyons Far South Owner LP
1144 15th Street, Suite 2600
Denver, CO 80202**

Prepared By:

**Cover 3 Engineering
Centennial, CO 80016**

Contact: Brian Moss, PE

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ENGINEER'S STATEMENT:

I affirm that this report and plan for the Phase III drainage design of Canyons Far South Filing No. 2 was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others.

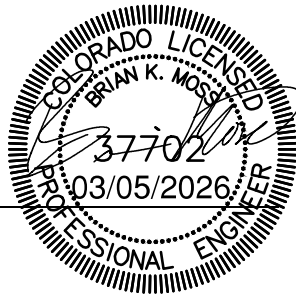
Signature: _____

Brian K. Moss

Registered Professional Engineer

State of Colorado No. 37702

For and on behalf of Cover 3 Engineering



DEVELOPMENT SERVICES
APPROVED

By jkirkpatrick
on 03/27/2026

APPROVED-CD24-0012 PhIII Drn
Rpt-GRADING ONLY.pdf
Record Document on File

**THIS APPROVAL ALLOWS GRADING ONLY ACTIVITIES,
NO OTHER CONSTRUCTION MAY OCCUR.**

DEVELOPER'S STATEMENT:

Canyons Far South Owner LP hereby certifies that the drainage facilities for Canyons Far South Filing No. 2 shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the Town of Castle Rock reviews drainage plans pursuant to the Municipal Code; but cannot, on behalf of Canyons Far South Filing No. 2, guarantee that final drainage design review will absolve Canyons Far South Owner LP and/or their successors and/or assigns of future liability for improper design.

CANYONS FAR SOUTH OWNER LP

By: Canyons Far South Owner LP, its general partner

By: HT Canyons South LP, its sole member

By: Hines Canyons South LLC, its general partner

By: Hines Canyons South Associates LP, its sole member

By: Hines Investment Management Holdings Limited
Partnership,
its general partner

By: _____

SR

re

Name: Chad Murphy

Title: Managing Director

3/19/26

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I. SCOPE

The purpose of this report is to verify that the drainage plan for Canyons Far South Filing No. 2 is in general accordance with the *Town of Castle Rock Storm Drainage Design and Technical Criteria (TOCR SDDTC)*, *Town of Castle Rock Public Works Regulations*, and Mile High Flood District (MHFD) where applicable.

II. GENERAL LOCATION AND DESCRIPTION

A. Site Location

- See the Vicinity Map in Appendix D.
- Canyons Far South Filing No. 2 is located within the Canyons Far South property. The project site is in the following areas:
 - NW Section 31, Township 7 South, Range 66 West of the 6th Principal Meridian
 - In Town of Castle Rock, Douglas County, CO.
 - The site is located south of Crowfoot Valley Road, north and west of Castle Oaks Drive, and east of Founders Parkway.
- The Castle Oaks Terrain development (zoned planned development, single family adjacent to the site) is south and southeast of the site and the Macanta (also known as Canyons South) development (zoned planned development, single family adjacent to the site) in Douglas County is north of the site.



Site Location

B. Description of Property

- Canyons Far South includes approximately 361± acres.
- Canyons Far South Filing No. 1 is to be constructed ahead of Filing No. 2. Filing No. 2 connects to infrastructure that is to be constructed with Filing No. 1.
- Canyons Far South Filing No. 2 will cover approximately 146± acres.
- The site is covered with native grasses, areas of scrub oak with a few pine trees mixed in. The topography is shallow canyons with slopes ranging from 0% to 30%.
- The Natural Resources Conservation Service (NRCS) Soils Classification Map indicates soil types present on the site are predominately classified as HSG C and D. See Appendix D for Soil Maps.
- This site outfalls to the east to McMurdo Gulch, which drains northeast to Cherry Creek. Tributary 3 of McMurdo Gulch is located within the Filing No. 2 site and has been analyzed by this project. There are no improvements directly to McMurdo Gulch anticipated for this project.
- McMurdo Gulch Tributary 3 contains flood zone within the property in Filing No. 1, at the extreme eastern edge of the site. These can be seen in the FEMA FIRM map 08035C0189G located in Appendix D. This floodplain is outside the limits of Filing No. 2 though, and there are no impacts anticipated by this project.
- The McMurdo Gulch Tributary 3 watersheds within the project site contain more than 130 acres and are considered a major drainageway. A Floodplain Modification Study is provided for Tributary 3 with Filing No. 2.
 - Tributary 3 improvements include impacts up to Pond H from Filing No. 1. Filing No. 1 provides improvements through Pond H to the property line to the east.
- There are no irrigation canals or irrigation ditches on the property.
- Canyons Far South Filing No. 2 has no significant geologic or topographic features.
- Canyons Far South Filing No. 2 has no cultural resources within the project boundary.
- Canyons Far South Filing No. 2 will tie-in to the existing infrastructure from Filing No. 1 along Edgerock Boulevard to the north.
- Canyons Far South Filing No. 2 includes 175 single-family detached lots, associated infrastructure, parks, and preserved natural open space.

III. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

- Major drainage basins in the area include McMurdo Gulch Tributary 3 which covers the entirety of the project site. The tributary drainage basins flow generally to the east to McMurdo Gulch and then northeast before it joins Cherry Creek. Within the project site, the reaches of these tributaries have fairly well defined low-flow channels and relatively flat slopes (0.4-3.0%). In the existing condition, this tributary have velocities up to 14 feet/second

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- The bulk of McMurdo Gulch Tributary 3 is undeveloped in the existing condition. A small amount of the existing Castle Oaks Terrain development to the south drains to the north into Tributary 3. A portion of Canyons Far South Filing No. 1 drains to the south into Tributary 3. Pond H from Filing No. 1, and the outfall across Edgerock Boulevard is proposed with Filing No. 1 along Tributary 3. Undeveloped land west of Founders Parkway drains to the east to Tributary 3. The existing conditions and future filings of Canyons Far South have been taken into consideration in the drainage design of Canyons Far South Filing No. 2.
- The existing Tributary 3 channel is narrow but fairly stabilized. There are existing stock ponds throughout the site in the existing condition that help to manage the runoff and control the release rates, plus recharge the aquifer. There are existing Civilian Conservation Corps (CCC) drop structures along the channel reach that are in good condition and have also helped to stabilize these channel reaches. There are some locations where erosion has occurred along the banks, but mature trees are present throughout both channel reaches.
- In the proposed condition, Canyons Far South Filing No. 2 proposes 175 single-family detached lots, associated infrastructure, parks, and preserved natural open space. Both existing and proposed conditions have been analyzed by this project.
- Referenced documents for McMurdo Gulch include:
 - *McMurdo Gulch Flood Hazard Area Delineation*, CH2MHill, Amended February 2012
 - *Canyons Far South SDP Phase II Drainage Report*, Cover 3 Engineering, Under Review
 - *Canyons Far South Filing No. 1 Phase III Drainage Report*, Cover 3 Engineering, Under Review
- Future and existing sub-regional ponds (outside of the major drainageway) have been accounted for upstream of the proposed regional ponds (Pond J). This will allow for the onsite regional ponds to not account for detention and water quality requirements of these offsite areas. This includes future ponds west of Founders Parkway and the existing Terrain pond south of Tributary 3.
- Major drainage basins have been subdivided with this project along Tributary 3 to calculate flows along the channel reaches. These drainage basins are consistent with the minor basins, to ensure the flows in the channel can be accurately accounted for along each channel reach. See the Major Basin CUHP Summary Table below and the Filing No. 2 Floodplain Modification Study for more information.

MAJOR BASIN CUHP SUMMARY TABLE				
Basin Designation	Area (ac)	% Impervious	Q ₂ (cfs)	Q ₁₀₀ (cfs)
M20 (Pond Release Rate*)	46.59	60.0%	11	129
M21 (Pond Release Rate*)	7.29	60.0%	1	15
M22 (Pond Release Rate*)	28.76	60.0%	4	47
M23	13.20	41.1%	10	42
M24	115.33	17.4%	28	204
M25	86.76	38.4%	53	261
Proposed Total	297.93	38.4%	107	699
Existing Total	297.93	5.0%	20	439
<p>*Note: Basins M1, M20, M21, and M22 were calculated in CUHP with a percent impervious of 5% because these offsite basins are anticipated to be future sub-regional ponds that will reduce developed offsite flows to near historic levels before entering the property. Canyons Far South will accept historic flows from the upstream development, but it will be the responsibility of the upstream developer to maintain historic flows from their property.</p>				

B. Minor Drainage Basins

- The existing drainage basins for Canyons Far South Filing No. 2 are divided into sub-basins to more accurately account for storm runoff along the tributary channels and are further described below.
 - Basins 3A through 3E: These basins are located along McMurdo Gulch Tributary 3. The land uses for these basins include existing single-family residential development from the Castle Oaks Terrain development to the south and existing undeveloped open space. Runoff within these basins will be conveyed through existing swales to the Tributary 3 channel. Tributary 3 outfalls to McMurdo Gulch offsite to the east.
 - Basins OS2 through OS5: These basins include Founders Parkway and existing undeveloped open space west of Founders Parkway, or Crimson Sky Drive and residential area to the south. Runoff from these basins will be conveyed to existing culverts under Founders Parkway or to storm outfalls into the site to existing swales to the Tributary 3 channel. Tributary 3 outfalls to McMurdo Gulch offsite to the east.
- See Existing Basin Summary Table below for more information on each sub-basin.
- The existing basin areas and percent impervious is consistent with the *McMurdo Gulch Flood Hazard Area Delineation*. See Report Section V.B. on page 15.

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EXISTING BASIN SUMMARY TABLE						
Basin Designation	Design Point	Area (ac)	C ₅	C ₁₀₀	Q ₅ (cfs)	Q ₁₀₀ (cfs)
3A	3A	86.77	0.08	0.50	12.84	154.95
3B	3B	51.27	0.09	0.51	9.77	102.27
3C	3C	33.64	0.08	0.50	5.90	71.17
3D	3D	15.40	0.08	0.50	2.97	35.84
3E	3E	12.88	0.09	0.51	2.75	29.45
OS2	OS2	46.59	0.20	0.57	20.89	106.55
OS3	OS3	25.29	0.08	0.50	3.52	42.49
OS4	OS4	1.46	0.49	0.71	3.18	8.43
OS5	OS5	9.13	0.08	0.50	3.37	40.62
Routed to Trib 3 Offsite		282.43			65.18	591.77

- The proposed drainage basins for Canyons Far South Filing No. 2 are divided into Basins 7 through 8 depending on which part of the development site the basins discharge to. These minor drainage basins are divided into sub-basins to more accurately account for storm runoff and are further described below.
- Basin 7
 - Basins 7A through 7C: These basins are located west and south of Edgerock Boulevard. The land uses for this basin includes undeveloped area and open space. Runoff within these basins will be conveyed through swales to the Tributary 3 channel to Pond J. Pond J outfalls through Pond H to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins 7D and 7E: These basins are from Filing No. 1 and are located along the spine infrastructure of Edgerock Boulevard. Runoff within these basins will be conveyed to curb and gutter, to Filing No. 1 inlets, to existing swales, to the Tributary 3 channel to Pond J. Pond J outfalls through Pond H to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins 7F through 7I: These basins are from Filing No. 1 and are located within the residential area of Filing No. 1. The land uses for these basins include single-family residential development, residential streets, and parks and open space. Runoff within these basins will be conveyed to curb and gutter, to Filing No. 1 inlets, to existing swales, to the Tributary 3 channel to Pond J. Pond J outfalls through Pond H to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins 7J through 7Q: These basins are located south of Edgerock Boulevard. The land uses for these basins include proposed single-family residential development, proposed residential streets, and proposed parks and open space. Runoff within these basins will be conveyed to curb and gutter, to

proposed inlets, to existing swales, to the Tributary 3 channel to Pond J. Pond J outfalls through Pond H to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.

- Basin 7R: This basin is from Filing No. 1 and includes parks and open space north of Edgerock Boulevard. Runoff within this basins will be conveyed to existing swales to Pond J. Pond J outfalls through Pond H to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins 7S through 7W: These basins are located south of Edgerock Boulevard. The land uses for these basins include proposed single-family residential development, proposed residential streets, and proposed parks and open space. Runoff within these basins will be conveyed to curb and gutter, to proposed inlets, to existing swales, to the Tributary 3 channel to Pond J. Pond J outfalls through Pond H to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins OS2 through OS5: These basins include Founders Parkway and existing undeveloped open space west of Founders Parkway, or Crimson Sky Drive and residential area to the south. Runoff from these basins will be conveyed to existing culverts under Founders Parkway or to storm outfalls into the site to existing swales to the Tributary 3 channel to Pond J. Pond J outfalls through Pond H to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
- **Basin 8**
- Basins 8A through 8G: These basins are from Filing No. 1 and are located within the residential area of Filing No. 1. The land uses for these basins include single-family residential development, residential streets, and parks and open space. Runoff within these basins will be conveyed to curb and gutter, to Filing No. 1 inlets, to existing swales, to Pond H. Pond H outfalls to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins 8H and 8I: These basins are from Filing No. 1 and are located along the spine infrastructure of Edgerock Boulevard. Runoff within these basins will be conveyed to curb and gutter, to Filing No. 1 inlets, to Pond H. Pond H outfalls to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins 8J through 8Y: These basins are located south of Edgerock Boulevard. The land uses for these basins include proposed single-family residential development, proposed residential streets, and proposed parks and open space. Runoff within these basins will be conveyed to curb and gutter, to proposed inlets, to existing swales, to Pond H. Pond H outfalls to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
- See Basin Summary Table on the next page for more information on each sub-basin.

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BASIN SUMMARY TABLE						
Basin Designation	Design Point	Area (ac)	C ₅	C ₁₀₀	Q ₅ (cfs)	Q ₁₀₀ (cfs)
7A	7A	31.25	0.22	0.57	17.13	82.64
7A2	7A2	0.66	0.19	0.56	0.46	2.48
7B	7B	13.55	0.09	0.51	2.79	28.05
7C	7C	10.33	0.08	0.50	2.04	24.65
7D	7D	1.14	0.37	0.65	1.47	4.76
7E	7E	1.27	0.37	0.65	1.77	5.71
7F	7F	4.26	0.17	0.55	2.13	12.46
7G	7G	0.53	0.57	0.75	1.24	2.98
7G2	7G2	1.96	0.56	0.75	4.43	10.75
7H	7H	1.00	0.58	0.76	2.18	5.17
7I	7I	0.76	0.55	0.74	1.58	3.86
7I2	7I2	0.92	0.59	0.76	2.12	4.99
7I3	7I3	0.08	0.56	0.75	0.21	0.50
7I4	7I4	0.54	0.58	0.76	1.28	3.02
7J	7J	2.59	0.60	0.76	6.22	14.51
7K	7K	1.49	0.62	0.78	3.65	8.33
7L	7L	12.30	0.13	0.53	5.08	37.80
7M	7M	1.07	0.39	0.66	1.43	4.46
7N	7N	0.45	0.60	0.77	1.21	2.81
7O	7O	0.60	0.62	0.78	1.67	3.80
7P	7P	1.31	0.58	0.76	2.92	6.90
7Q	7Q	5.00	0.19	0.56	3.34	17.97
7R	7R	8.26	0.23	0.58	5.95	27.61
7W	7W	12.54	0.14	0.54	5.31	37.26
OS2	OS2	46.59	0.20	0.57	20.89	106.55
OS3	OS3	25.29	0.08	0.50	3.52	42.49
OS4	OS4	1.46	0.47	0.70	3.05	8.29
OS5	OS5	9.13	0.23	0.58	10.35	46.97
Routed to Pond J		196.33			115.41	557.77
8A	8A	9.68	0.17	0.55	4.72	27.48
8B	8B	3.49	0.53	0.73	7.48	18.81
8C	8C	1.70	0.61	0.77	4.99	11.52
8D	8D	1.41	0.50	0.72	2.65	6.89
8E	8E	11.35	0.24	0.58	8.66	39.11
8F	8F	0.79	0.64	0.79	2.17	4.83
8G	8G	1.70	0.58	0.76	4.12	9.75
8G2	8G2	2.85	0.46	0.69	4.95	13.73

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8H	8H	0.45	0.63	0.78	1.00	2.26
8I	8I	1.28	0.49	0.71	2.58	6.83
8J	8J	2.39	0.21	0.57	1.79	8.79
8K	8K	1.51	0.52	0.72	3.22	8.22
8K2	8K2	0.30	0.54	0.74	0.67	1.65
8K3	8K3	0.69	0.56	0.74	1.79	4.37
8L	8L	0.99	0.60	0.76	2.43	5.67
8M	8M	2.67	0.47	0.70	4.19	11.39
8N	8N	2.56	0.24	0.59	2.00	8.97
8O	8O	1.37	0.57	0.75	3.75	8.95
8O2	8O2	0.17	0.54	0.74	0.38	0.94
8O3	8O3	0.31	0.54	0.74	0.69	1.70
8O4	8O4	0.81	0.59	0.76	2.32	5.43
8P	8P	0.66	0.59	0.76	1.71	3.99
8P2	8P2	0.23	0.59	0.76	0.58	1.37
8P3	8P3	0.32	0.59	0.76	0.81	1.90
8Q	8Q	2.96	0.24	0.59	2.61	11.45
8R	8R	1.60	0.47	0.70	2.99	8.15
8R2	8R2	0.34	0.54	0.73	0.57	1.43
8R3	8R3	1.36	0.58	0.76	3.86	9.11
8S	8S	1.46	0.60	0.77	3.70	8.60
8T	8T	6.26	0.09	0.51	2.10	20.97
8T2	8T2	10.05	0.13	0.56	2.81	21.91
8U	8U	5.14	0.18	0.66	2.22	15.12
8U2	8U2	1.43	0.62	0.66	3.56	6.89
8U3	8U3	0.19	0.78	0.69	0.72	1.15
8U4	8U4	1.04	0.59	0.63	2.67	5.17
8U5	8U5	0.15	0.73	0.58	0.55	0.79
8V	8V	1.58	0.40	0.66	2.14	6.45
8W	8W	1.28	0.38	0.69	1.56	5.21
8Y	8Y	2.24	0.46	0.63	3.64	9.14
Routed to Pond H		86.76			105.35	346.09

- There are no irrigation canals or irrigation ditches on the property.

IV. DRAINAGE DESIGN CRITERIA**A. Regulations**

- The Canyons Far South Filing No. 2 project will be designed using the *Town of Castle Rock Storm Drainage Design and Technical Criteria* and the *Town of Castle Rock Public Works Regulations* when applicable.

- The Canyons Far South Filing No. 2 project will be designed using the *Urban Storm Drainage Criteria Manual* by the Mile High Flood District (MHFD) when applicable.

B. Drainage Studies, Outfall Systems Plans, Site Constraints

- There are no improvements anticipated directly to McMurdo Gulch as part of the Canyons Far South Filing No. 2 project. Tributary 3 of McMurdo Gulch is located within the project limits and has been analyzed by this project. Full spectrum water quality and detention ponds have been graded along the tributaries to before release offsite at historic rates. Riprap has been added as necessary at outfalls throughout the site.
- The primary constraint for drainage on the Canyons Far South Filing No. 2 site is the steep grades along the McMurdo Gulch tributaries. Drainage outfall from the streets to the channels will likely require steep pipes.

C. Hydrology

- The Rational Method will be used for calculating runoff for the site. All basins are less than 160 acres. Runoff coefficients are from MHFD DCM Vol 1. This report has been updated to follow the revised criteria adopted by MHFD in March 2024. Conservative values have been assumed to ensure adequate design for existing, proposed, and future conditions.
- The Colorado Urban Hydrograph Procedure (CUHP) will be used for calculating runoff for the major drainageways. As previously described, Major Basins have been defined throughout the site and include offsite area as necessary. This will be used in conjunction with the EPA's Storm Water Management Model (SWMM) for routing runoff through the ponds to ensure ultimate release rates are less than existing.
- The 5-year storm will be used as the minor storm event and the 100-year storm will be used for the major storm event. The 2-year storm event has been included for the proposed condition to be able to preliminarily size the low-flow channel for the major drainageway.
- The design rainfall depths to be used are from 6.1.1 of the *Town of Castle Rock Storm Drainage Design and Technical Criteria*.
- The pond design accounts for the interim conditions for the Water Quality and EURV design. This is accurate as it is the local watershed that is to be treated in the facility. The 100-year design accounts for the ultimate routing of the Major Basins through CUHP and the SWMM model. This allows for the ponds in series to be accurately modeled. All release rates are per the CUHP-SWMM model routing.

D. Hydraulics

- Street and inlet capacities are included in Appendix B. Mile High Flood District's UD-Inlet spreadsheet is used for these calculations.

- Pipe hydraulics are included in Appendix B. Hydrology Studio's Stormwater Studio is used for these calculations.
- Pipe velocities have been held to a maximum of 18 feet per second in the minor storm event. Due to the steep terrain of the site, the major storm event will attempt to hold a maximum of 18 feet per second.
- Pond calculations are included in Appendix B. Mile High Flood District's UD-Detention spreadsheet is used for these calculations. Pond routing is provided via the CUHP-SWMM model routing.
- See Final Floodplain Modification Study for more information on Channel and Swale Hydraulic Calculations.
- The 2-year storm event has been calculated to be able to determine the appropriate low flow design along each channel. This has been designed to ensure that the channel reaches an appropriate equilibrium and is properly designed for the proposed condition.

E. Storage and Water Quality Enhancement

- Natural channels have been utilized for conveyance where permissible.
- Pond H and J are proposed as full spectrum water quality and detention facilities. These permanent water quality enhancement features will treat the Canyons Far South Filing No. 2 development and include offsite area as necessary.
- This project utilizes the "Applicable Development Site Draining to a Regional WQCV Facility" Standard. Prior to discharging to the Waters of the State, at least twenty percent of the upstream imperviousness is disconnected and drains through a receiving pervious area control measure comprised of the required footprint. A Disconnected Impervious Area Exhibit is provided in Appendix B to ensure that pre-discharge infiltration measures are met for regional water quality facilities. The site includes various existing and proposed swales to allow infiltration. It should be noted, though, that this requirement is made difficult by the Town's competing requirements for concrete lined channel and extensions of storm sewer pipes that do not allow for infiltration. Nonetheless, infiltration is promoted throughout the open space as feasible. The Disconnected Impervious Area Exhibit was confirmed to be satisfactory via email with David Van Dellen on July 30, 2025.
- The Canyons Far South Filing No. 2 is within the Cherry Creek Basin and is subject to the Department of Public Health and Environment Water Quality Control Commission – Cherry Creek Reservoir Control Regulation 5 CCR 1002-72. All residential lot impervious areas are treated prior to release offsite.

V. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

- Tributary 3 of McMurdo Gulch conveys runoff through the site to the east.
- The general design of the stormwater conveyance facilities will utilize existing drainage tributaries and channels where possible. Streets, inlets, pipes, and manholes will be used to convey flow from developed areas to existing swales for discharge. The outfalls

for these locations will include riprap and low tailwater basins where appropriate along Tributary 3.

- There is minimal lot-to-lot drainage as designed due to the topography of the site. Most lots drain away from other homes, or have uphill drainage captured and routed around the homes. No adverse impacts are expected due to the grading.
- For the drainage analysis of this site, assumptions were made regarding flow paths at intersections and inlet capacities. On-grade inlets are not assumed to capture 100% of runoff generated in the major and minor storm events. A portion of these flows will bypass to the next downstream basin. Street capacity calculations have been performed to determine anticipated locations for on-grade inlets. Because runoff will bypass on-grade inlets, cross-pans have been included where necessary to convey flows to the next downstream inlet.
- Additional redundant inlets were added as required by the Town, not due to being required by the hydraulic street or inlet calculations. This will minimize flows in the streets to improve street capacity. At sump inlets, minor storm depth is set at the height of curb - 4" or 6". Major storm depth is set to the back of right-of-way elevation or easement elevation - 5", 7", 8.9", or 10.9" based on curb height. Emergency overflow is provided at all sumps to safely convey runoff to existing drainage tributaries and channels.
- Slope easements have been dedicated adjacent to the right-of-way where high points are necessary to contain major drainage within the street section. Storm sewer easements have been included within the utility easement along lot frontages where storm sewer encroaches near the edge of the right-of-way.
- Storm outfalls were located to minimize impacts to existing topography and vegetation, and utilize existing drainage tributaries and channels. All runoff conveyed to the major drainageways are stabilized as necessary. Improvements are provided to stabilize the major drainageways to be able to convey all site runoff to the ponds.
- Two ponds have been located along Tributary 3 to reduce the total number of ponds, improve long term maintenance, and provide better open space for the residential lots.
- Other maintenance of swales and conveyance methods will be provided by the HOA as necessary. Swales will require periodic inspection and restoration due to sediment accumulation and/or erosion, this will be the responsibility of the Metro District as necessary.

B. Stormwater Storage Facilities

- Pond H and J are proposed by the Canyons Far South Filing No. 2 project. These have been designed as full spectrum water quality and detention facilities. These permanent water quality enhancement features will treat the Canyons Far South Filing No. 2 development and include offsite area as necessary.
- Pond H and J are along a major drainageway, and thus considered a regional detention and regional water quality pond per the SDDTC. Future and existing sub-regional ponds (outside of the major drainageway) have been accounted for upstream of the proposed regional ponds (Pond J). This will allow for the onsite regional ponds to not account for detention and water quality requirements of these offsite areas. This includes future ponds west of Founders Parkway and the existing Terrain pond south of Tributary 3.

CANYONS FAR SOUTH FILING NO. 2

PHASE III DRAINAGE REPORT

PAGE 16 OF 22

- Pond J is located along Tributary 3 of McMurdo Gulch. This allows for convenient conveyance to the pond from existing or proposed basins by following existing drainage patterns. Pond J has been sized for all runoff upstream of this location that is tributary to this pond. Pond J outfalls through Pond H to Tributary 3 to McMurdo Gulch. Due to the time required for Pond J to fill and release, it is anticipated that this would happen while Pond H is also releasing downstream. Therefore, the flow from Pond J “bypasses” Pond H due to this release timing as calculated with SWMM. The total flow is accounted for downstream of Pond H from the SWMM model, to ensure the combined release rate from the ponds is not greater than the existing condition.
- Pond H is an existing pond from Filing No. 1 located along Tributary 3 of McMurdo Gulch, downstream of Pond J. This allows for convenient conveyance to the pond from existing or proposed basins by following existing drainage patterns. The Filing No. 1 Pond H is to be modified with Filing No. 2 due to changes in watershed area and imperviousness. Pond H has been sized for all runoff upstream of this location that is tributary to this pond. Pond H outfalls to Tributary 3 to McMurdo Gulch. The total SWMM flow from Pond H and Pond J is accounted for downstream of Pond H, to ensure the combined release rate from the ponds is not greater than the existing condition.
- See summary table below. For more information see Appendix C and the construction documents.

POND SUMMARY TABLE				
Pond	Watershed Area (acres)	Watershed Imperviousness	100-yr Volume Provided (acre-feet)	Pond Volume at Spillway (acre-feet)
Pond J	187.20	16.5%	10.13	10.4 AC-FT with a WSE of 6368.0
Pond H	92.66	32.7%	7.23	7.8 AC-FT with a WSE of 6346.25

- Ponds H and J outfall to Tributary 3 of McMurdo Gulch. See the construction documents for more information about the outlet structure, emergency overflow, and downstream outfall riprap.
- Release rates for the ponds will not exceed the existing flows in the existing channel as calculated with the CUHP-SWMM model of these plans. See the channel flow summary table in Appendix A. The existing basin areas and percent impervious is consistent with the *McMurdo Gulch Flood Hazard Area Delineation*.

CANYONS FAR SOUTH FILING NO. 2**PHASE III DRAINAGE REPORT****PAGE 17 OF 22**

RELEASE RATE SUMMARY TABLE						
	McMurdo Gulch Tributary B (Filing No. 1)			McMurdo Gulch Tributary 3		
	Area (acres)	Percent Impervious	Flow (CFS)	Area (acres)	Percent Impervious	Flow (CFS)
McMurdo Gulch FHAD (2012)	485.76	10.4%	577	343.04	13.7%	423
Filing No. 2 - Existing	409.09	5.0%	529	297.93	5.0%	439
Filing No. 2 - Proposed	409.09	22.1%	407.27	297.93	36.4%	332.99
<p>- All existing release rates are per the existing CUHP of the existing condition of the Major Basins.</p> <p>- All proposed release rates are per the CUHP-SWMM model for the ultimate condition of the Major Basins.</p> <p>- McMurdo Gulch FHAD basin CC_MCG20 corresponds with flows from Tributary B to McMurdo Gulch.</p> <p>- McMurdo Gulch FHAD basin CC_MCG22 corresponds with flows from Tributary 3 to McMurdo Gulch.</p>						

- Maintenance is simplified by having two larger ponds. See the construction documents for more detail regarding access to each pond for maintenance of each pond.
- The ponds in this arrangement will also provide better open space for the residential lots. Trails can be added between lots where smaller ponds may have been located. One larger pond may also be seen as a more attractive option. Plus trees have been carefully preserved as much as possible, to allow the ponds to blend into the surrounding hills better.

C. Water Quality Enhancement Control Measures

- The Canyons Far South development meets all the standards and requirements listed in section 14.4.5 of the *Town of Castle Rock Storm Drainage Design and Technical Criteria*. In addition to the previously discussed water quality requirements, the proposed Canyons Far South development intends to reduce the amount of site runoff by employing the use of grass swales, existing drainage channels, and infiltration within open space and park areas. Once said runoff arrives at the proposed detention facilities, the use of outlet structures, orifice plates, and micropools are implemented to treat runoff and reduce the release rate of captured flows.
- Major drainageway stabilization has been provided in conjunction with the proposed development through the use of grade control structures on each channel reach. Point-source pollutants are not anticipated in the Canyons Far South development; however, these pollutants (if present) will be mitigated through pretreatment and other runoff reduction methods. Grass lined swales and runoff reduction give contaminated flows the chance to naturally filter themselves prior to reaching proposed detention facilities.
- Minor drainageway stabilization has been provided as required with the proposed development through the use of rock stabilization. After discussions with David Van Dellen on September 4, 2025, it is understood that where pipes outfall with developed flow to minor drainageways (i.e. receiving flows), the development will follow the requirements of a grass-lined channel in 12.3.2 of the SDDTC. This requires that the maximum slope is 0.6%. Due to topography constraints on this property, where most of

the existing swales exceed 2%, it is not achievable to maintain 0.6% on all major drainageways with grade control structures. Thus the only allowable stabilization is rock stabilization, which is now proposed by these plans.

- Where undeveloped flows are conveyed through a culvert, or where developed flows sheet flow to swales (i.e. backyard runoff), it is understood that we do not need rock stabilization of minor drainageways if flows are less than the undeveloped condition. Calculations have been provided proving that developed flows are less than undeveloped flows within existing and proposed minor drainageways.

D. Floodplain Modification

- No FEMA floodplain modifications will be required because of the Canyons Far South Filing No. 2 development. No permanent impacts are within the FEMA FIRM existing floodplain. Utility crossings of the FEMA FIRM existing floodplain are discussed in the Preliminary Floodplain Modification Study.
- Locally regulated floodplains within major drainageway of Tributary 3 will be minorly impacted by the proposed Canyons Far South development. No building structures are to be placed within the new limits of the locally defined 100-yr floodplain. See existing and proposed drainage maps for the limits of the effective existing and proposed 100-yr floodplain.

E. Geotechnical Investigation and Sub-surface Collection System Design

- No geotechnical concerns are anticipated for the Canyons Far South development. TOCR criteria will be followed where sub-surface underdrain systems are required. Underdrains are provided where necessary along lot frontages.

F. Operation and Maintenance

- All storm infrastructure for the Canyons Far South development is public unless otherwise noted. For infrastructure outside of Town owned right-of-way and open space, this will be the responsibility of the Metro District.
- Extended Detention Basins (EDBs) require routine inspection and maintenance to ensure proper function, long-term performance, and compliance with the Town's stormwater management requirements. The following procedures outline the recommended operations and maintenance practices for the Canyons Far South Filing 2 EDBs:
 - **Inspection**
 - Conduct inspections at least twice annually.
 - Observe sediment accumulation within the forebay.
 - Check the outlet structure for blockages or debris.
 - **Debris and Litter Removal**
 - Remove accumulated debris and litter from the detention area as necessary to minimize clogging and maintain hydraulic function.

- **Vegetation Management**

- During establishment (first three years): mow native or drought-tolerant grasses only as needed to deter weeds.
- After establishment: mowing may be discontinued or reduced, but grasses should be maintained at a minimum height of six inches.
- Manicured grasses may require mowing as frequently as weekly during the growing season, with little or no mowing required during winter months.

- **Irrigation Scheduling and Maintenance**

- Adjust irrigation rates seasonally to maintain vegetation health.
- Native and drought-tolerant species should not require irrigation following establishment except during prolonged drought.
- Inspect irrigation systems annually; repair or replace damaged components as needed.
- Drain and winterize irrigation systems prior to freezing conditions; reactivate and test in the spring.

- **Sediment Management**

- Forebay and Trickle Channel: remove accumulated sediment annually, or after significant storm events if construction activity is present within the watershed.
- Micropool: remove sediment every one to four years, or when pool depth has been reduced to approximately 18 inches. Sediment should be removed by vacuuming or pumping and properly disposed of offsite.
- Basin Bottom: remove sediment when accumulation reduces approximately 20% of the water quality design volume or results in poor drainage. This typically occurs every 15 to 25 years but may be more frequent in areas with ongoing upstream disturbance.

- **Erosion and Structural Repairs**

- Repair damaged inlets, outlets, trickle channels, and structural components to ensure proper facility function.
- Stabilize and re-vegetate eroded areas promptly following inspection.

G. Additional Permitting

- No additional or special permits are anticipated for the Canyons Far South Filing No. 2 project.
- 404 permitting and clearances is not applicable for this project – there are no wetlands or waters of the United States being impacted.
 - McMurdo Gulch Tributary B and Tributary 3 have been reviewed by the Army Corps of Engineers and determined to be Non-Jurisdictional per NWO-2021-00560-DEN.
 - Project ID NWO-2021-00560 from the EPA have confirmed that there are no wetlands or Waters of the United States onsite.

H. General

- Appendix D includes FEMA FIRM maps and the Soils Map that have been used in the calculations of this report. Excerpts from the *McMurdo Gulch Flood Hazard Area Delineation* are included to determine the existing conditions of the site. The existing area and percent impervious for each tributary basin was followed to ensure the project is not releasing flows greater than was assumed by that study.

VI. CONCLUSIONS

A. Compliance with Standards

- Canyons Far South Filing No. 2 is in general compliance with the *Town of Castle Rock Storm Drainage Design and Technical Criteria*, *Town of Castle Rock Public Works Regulations*, *Department of Public Health and Environment Water Quality Control Commission Cherry Creek Reservoir Control Regulation 5 CCR 1002-72*, and Mile High Flood District (MHFD) where applicable.

B. Variances

- No variances are anticipated at this time.

C. Drainage Concept

- The proposed drainage system for Canyons Far South Filing No. 2 will provide a sustainable drainage system for the development. Flows will be conveyed by street curb and gutter or swales, where they will be captured by inlets or culverts, and then will be treated by one of three full spectrum detention ponds and will eventually discharge into McMurdo Gulch. The development of Canyons Far South should not adversely impact downstream properties.

VII. REFERENCES

1. *Town of Castle Rock Storm Drainage Design and Technical Criteria*, Castle Rock, CO, latest version
2. *Town of Castle Rock Public Works Regulations*, Castle Rock, CO, latest version
3. *Urban Storm Drainage Criteria Manual*, Mile High Flood District, latest version
4. *McMurdo Gulch Flood Hazard Area Delineation*, CH2MHill, Amended February 2012
5. *Canyons South Filing No. 1 – Phase III Drainage Report*, Calibre Engineering Inc., August 12, 2019.
6. *Canyons South – Filing 2 Phase III Drainage Report*, Calibre Engineering Inc., July 2021
7. *Canyons Far South SDP Phase II Drainage Report*, Cover 3 Engineering, Under Review
8. *Canyons Far South Filing No. 1 Phase III Drainage Report*, Cover 3 Engineering, Under Review

VIII. APPENDICES

- A.** Hydrologic Calculations
- B.** Hydraulic Calculations
- C.** Water Quality Enhancement Control Measures
- D.** Referenced Information



APPENDIX A

HYDROLOGIC CALCULATIONS

Project: Canyons Far South - Filing No. 2

Location: Castle Rock, CO

Designer: CJG

Date: March 2025

Latest Revision: July 2025



EXISTING IMPERVIOUSNESS AND RUNOFF COEFFICIENT CALCULATIONS

				Paved	Park	Commercial	Single Family	Greenbelts/ Agricultural	Historic			
				Impervious %	95%	25%	85%	55%	5%	5%		
				C ₅	0.81	0.24	0.73	0.49	0.08	0.08		
				C ₁₀₀	0.87	0.59	0.83	0.71	0.50	0.50		
Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)	Total Area (sf)	Paved (sf)	Park (sf)	Commercial (sf)	Single Family (sf)	Greenbelts/ Agricultural (sf)	Historic (sf)	Percent Impervious	Runoff Coefficients, C	
											C ₅	C ₁₀₀
3A	C/D	86.77	3,779,806	0	0	0	0	0	3,779,806	5.0%	0.08	0.50
3B	C/D	51.27	2,233,183	0	0	0	69,608	0	2,163,575	6.6%	0.09	0.51
3C	C/D	33.64	1,465,426	0	0	0	0	0	1,465,426	5.0%	0.08	0.50
3D	C/D	15.40	670,785	0	0	0	0	0	670,785	5.0%	0.08	0.50
3E	C/D	12.88	561,136	0	0	0	14,403	0	546,733	6.3%	0.09	0.51
OS2	C/D	46.59	2,029,554	347,381	0	0	0	0	1,682,174	20.4%	0.20	0.57
OS3	C/D	25.29	1,101,420	0	0	0	0	0	1,101,420	5.0%	0.08	0.50
OS4	C/D	1.46	63,392	0	0	0	63,392	0	0	55.0%	0.49	0.71
OS5	C/D	9.13	397,731	0	0	0	0	0	397,731	5.0%	0.08	0.50
Routed to Trib 3 Offsite	C/D	282.43	12,302,434	347,381	0	0	147,404	0	11,807,650	8.1%	0.10	0.52
Total	C/D	725.95	31,622,246	512,579	0	0	889,091	0	30,220,576	7.9%	0.10	0.52

Note: Historic increased from 2% to 5% to be more consistent with assumptions and total percent impervious from McMurdo Gulch FHAD 2012 Amendment by CH2MHILL (10.4% for Trib B and 13.7% for Trib 3).

Project: Canyons Far South - Filing No. 2

Location: Castle Rock, CO

Designer: CJG

Date: March 2025

Latest Revision: July 2025

NRCS Conveyance Factors, K ²	
Type of Land Surface	K
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture/Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas	20

Minimum T_c

5

EXISTING TIME OF CONCENTRATION CALCULATIONS

			Initial/Overland Flow Time, T _i			Channelized Flow/Travel Time, T _t					Time of Concentration, T _c (Check)		
Basin Designation	Imperviousness (%)	C ₅	Length (ft)	Slope (%)	T _i (min)	Land Surface	Length (ft)	Slope (%)	Velocity (ft/sec)	T _t (min)	Computed T _c (min)	First Design Point T _c (min)	Selected T _c (min)
3A	5.0%	0.08	170	4.00	15.26	Short Pasture/Lawns	2500	6.90	1.84	22.66	37.92	N/A	37.92
3B	6.6%	0.09	70	2.00	12.15	Short Pasture/Lawns	1910	5.10	1.58	20.14	32.29	N/A	32.29
3C	5.0%	0.08	70	5.20	8.98	Short Pasture/Lawns	2120	6.60	1.80	19.65	28.63	N/A	28.63
3D	5.0%	0.08	60	2.00	11.39	Short Pasture/Lawns	1550	8.30	2.02	12.81	24.20	N/A	24.20
3E	6.3%	0.09	120	5.20	11.63	Short Pasture/Lawns	1350	5.40	1.63	13.83	25.47	N/A	25.47
OS2	20.4%	0.20	200	4.80	13.66	Tillage/Field	1390	5.80	1.20	19.24	32.90	30.64	30.64
OS3	5.0%	0.08	200	3.60	17.13	Tillage/Field	1780	5.80	1.20	24.64	41.77	N/A	41.77
OS4	55.0%	0.49	20	2.00	3.94	Paved Areas	370	1.40	2.37	2.61	6.55	19.77	6.55
OS5	5.0%	0.08	10	2.00	4.65	Paved Areas	10	2.00	2.83	0.06	4.71	N/A	5.00

Project: Canyons Far South - Filing No. 2

Location: Castle Rock, CO

Designer: CJG

Date: March 2025

Latest Revision: July 2025

Design Storm:

1-hr Design Point Rainfall (in):

5-Yr
1.43

EXISTING 5-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C _s	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
3A	3A	86.77	0.08	6.59	37.92	1.95	12.84
3B	3B	51.27	0.09	4.55	32.29	2.15	9.77
3C	3C	33.64	0.08	2.56	28.63	2.31	5.90
3D	3D	15.40	0.08	1.17	24.20	2.54	2.97
3E	3E	12.88	0.09	1.11	25.47	2.47	2.75
OS2	OS2	46.59	0.20	9.43	30.64	2.22	20.89
OS3	OS3	25.29	0.08	1.92	41.77	1.83	3.52
OS4	OS4	1.46	0.49	0.71	6.55	4.49	3.18
OS5	OS5	9.13	0.08	0.69	5.00	4.85	3.37

Project: Canyons Far South - Filing No. 2

Location: Castle Rock, CO

Designer: CJG

Date: March 2025

Latest Revision: July 2025

Design Storm:

100-Yr

1-hr Design Point Rainfall (in):

2.60

EXISTING 100-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₁₀₀	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
3A	3A	86.77	0.50	43.78	37.92	3.54	154.95
3B	3B	51.27	0.51	26.19	32.29	3.90	102.27
3C	3C	33.64	0.50	16.97	28.63	4.19	71.17
3D	3D	15.40	0.50	7.77	24.20	4.61	35.84
3E	3E	12.88	0.51	6.57	25.47	4.48	29.45
OS2	OS2	46.59	0.57	26.45	30.64	4.03	106.55
OS3	OS3	25.29	0.50	12.76	41.77	3.33	42.49
OS4	OS4	1.46	0.71	1.03	6.55	8.16	8.43
OS5	OS5	9.13	0.50	4.61	5.00	8.82	40.62

Project:	Canyons Far South - Filing No. 2
Location:	Castle Rock, CO
Designer:	CJG
Date:	March 2025
Latest Revision:	July 2025



EXISTING BASIN SUMMARY TABLE						
Basin Designation	Design Point	Area (ac)	C ₅	C ₁₀₀	Q ₅ (cfs)	Q ₁₀₀ (cfs)
3A	3A	86.77	0.08	0.50	12.84	154.95
3B	3B	51.27	0.09	0.51	9.77	102.27
3C	3C	33.64	0.08	0.50	5.90	71.17
3D	3D	15.40	0.08	0.50	2.97	35.84
3E	3E	12.88	0.09	0.51	2.75	29.45
OS2	OS2	46.59	0.20	0.57	20.89	106.55
OS3	OS3	25.29	0.08	0.50	3.52	42.49
OS4	OS4	1.46	0.49	0.71	3.18	8.43
OS5	OS5	9.13	0.08	0.50	3.37	40.62
Routed to Trib 3 Offsite		282.43			65.18	591.77



COVER
ENGINEERING

Paved	Park	Commercial	Single Family	Greenbelts/ Agricultural	Historic
95%	25%	95%	55%	5%	5%
0.78	0.18	0.78	0.42	0.03	0.03
0.81	0.24	0.81	0.49	0.08	0.08
0.87	0.59	0.87	0.71	0.50	0.50

E:_Projects\230200 - Canyons Far South - Castle Rock, CO\05 - Design\Drainage\41 - Filing 2 Drainage\Calcs\Rational\Rational Method Calculations - F2.xlsx

IMPERVIOUSNESS AND RUNOFF COEFFICIENT CALCULATIONS

				Paved	Park	Commercial	Single Family	Greenbelts/ Agricultural	Historic				
				Impervious %	95%	25%	95%	55%	5%	5%			
				C ₅	0.78	0.18	0.78	0.42	0.03	0.03			
				C ₅	0.81	0.24	0.81	0.49	0.08	0.08			
				C ₁₀₀	0.87	0.59	0.87	0.71	0.50	0.50			
Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)	Total Area (sf)	Paved (sf)	Park (sf)	Commercial (sf)	Single Family (sf)	Greenbelts/ Agricultural (sf)	Historic (sf)	Percent Impervious	Runoff Coefficients, C		
											C ₂	C ₅	C ₁₀₀
8A	C/D	9.68	421,659	0	0	0	99,508	322,151	0	16.8%	0.11	0.17	0.55
8B	C/D	3.49	152,210	24,730	0	0	123,204	4,276	0	60.1%	0.47	0.53	0.73
8C	C/D	1.70	73,931	28,237	0	0	44,700	994	0	69.6%	0.55	0.61	0.77
8D	C/D	1.41	61,610	28,059	30,443	0	1,468	1,640	0	57.1%	0.44	0.50	0.72
8E	C/D	11.35	494,226	13,093	320,019	0	40,139	120,975	0	24.4%	0.17	0.24	0.58
8F	C/D	0.79	34,432	16,913	0	0	17,236	282	0	74.2%	0.59	0.64	0.79
8G	C/D	1.70	74,085	26,363	0	0	44,023	3,698	0	66.7%	0.53	0.58	0.76
8G2	C/D	2.85	124,140	63,815	0	0	0	60,325	0	51.3%	0.39	0.46	0.69
8H	C/D	0.45	19,583	14,766	0	0	0	4,817	0	72.9%	0.58	0.63	0.78
8I	C/D	1.28	55,940	31,136	0	0	0	24,804	0	55.1%	0.43	0.49	0.71
8J	C/D	2.39	104,315	0	0	0	34,638	69,677	0	21.6%	0.15	0.21	0.57
8K	C/D	1.51	65,965	20,538	0	0	33,813	11,615	0	58.6%	0.46	0.52	0.72
8K2	C/D	0.30	13,250	2,200	0	0	11,000	50	0	61.5%	0.48	0.54	0.74
8K3	C/D	0.69	29,847	6,557	0	0	23,115	175	0	63.5%	0.50	0.56	0.74
8L	C/D	0.99	43,116	14,988	0	0	27,734	394	0	68.4%	0.54	0.60	0.76
8M	C/D	2.67	116,213	17,621	13,634	0	73,935	11,023	0	52.8%	0.41	0.47	0.70
8N	C/D	2.56	111,530	0	0	0	43,893	67,637	0	24.7%	0.17	0.24	0.59
8O	C/D	1.37	59,620	16,616	0	0	42,446	559	0	65.7%	0.52	0.57	0.75
8O2	C/D	0.17	7,305	1,255	0	0	6,023	27	0	61.7%	0.48	0.54	0.74
8O3	C/D	0.31	13,457	2,299	0	0	11,105	53	0	61.6%	0.48	0.54	0.74
8O4	C/D	0.81	35,184	12,200	0	0	22,356	628	0	68.0%	0.54	0.59	0.76
8P	C/D	0.66	28,599	9,804	0	0	18,533	262	0	68.3%	0.54	0.59	0.76
8P2	C/D	0.23	9,953	3,208	0	0	6,671	74	0	67.5%	0.53	0.59	0.76
8P3	C/D	0.32	13,911	4,655	0	0	9,168	88	0	68.1%	0.54	0.59	0.76
8Q	C/D	2.96	128,884	0	0	0	52,877	76,007	0	25.5%	0.18	0.24	0.59
8R	C/D	1.60	69,895	13,676	0	0	41,901	14,317	0	52.6%	0.40	0.47	0.70
8R2	C/D	0.34	14,605	2,354	0	0	12,167	84	0	61.2%	0.48	0.54	0.73
8R3	C/D	1.36	59,324	19,976	0	0	37,599	1,749	0	67.0%	0.53	0.58	0.76
8S	C/D	1.46	63,686	22,078	0	0	41,493	115	0	68.8%	0.55	0.60	0.77
8T	C/D	6.26	272,840	0	6,597	0	8,994	257,250	0	7.1%	0.04	0.09	0.51
8T2	C/D	10.05	437,760	0	111,643	0	12,501	313,616	0	11.5%	0.07	0.13	0.53
8U	C/D	5.14	223,736	0	0	0	55,175	168,561	0	17.3%	0.12	0.18	0.56
8U2	C/D	1.43	62,223	43,301	0	0	4,085	14,837	0	70.9%	0.56	0.62	0.77
8U3	C/D	0.19	8,219	7,622	0	0	484	113	0	91.4%	0.75	0.78	0.86
8U4	C/D	1.04	45,320	14,844	0	0	30,121	354	0	67.7%	0.54	0.59	0.76
8U5	C/D	0.15	6,738	5,647	0	0	594	498	0	84.8%	0.69	0.73	0.83
8V	C/D	1.58	68,799	8,382	0	0	38,460	21,957	0	43.9%	0.33	0.40	0.66

IMPERVIOUSNESS AND RUNOFF COEFFICIENT CALCULATIONS

				Paved	Park	Commercial	Single Family	Greenbelts/ Agricultural	Historic				
			Impervious %	95%	25%	95%	55%	5%	5%				
			C ₅	0.78	0.18	0.78	0.42	0.03	0.03				
			C ₅	0.81	0.24	0.81	0.49	0.08	0.08				
			C ₁₀₀	0.87	0.59	0.87	0.71	0.50	0.50				
Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)	Total Area (sf)	Paved (sf)	Park (sf)	Commercial (sf)	Single Family (sf)	Greenbelts/ Agricultural (sf)	Historic (sf)	Percent Impervious	Runoff Coefficients, C		
											C ₂	C ₅	C ₁₀₀
8W	C/D	1.28	55,651	16,277	0	0	11,819	27,556	0	41.9%	0.31	0.38	0.66
8Y	C/D	2.24	97,425	16,987	17,584	0	52,479	10,375	0	51.2%	0.39	0.46	0.69
Routed to Pond H	C/D	86.76	3,779,186	530,198	499,919	0	1,135,457	1,613,613	0	35.3%	0.26	0.32	0.63
Total	C/D	283.09	12,331,539	1,125,509	711,894	0	2,008,818	5,451,317	3,028,337	22.5%	0.16	0.22	0.58
M20 (Basin OS2 Ultimate)	C/D	46.59	2,029,554	-	-	-	-	-	-	60.0%	0.47	0.53	0.73
M21 (Basin OS3 Ultimate w/out M22)	C/D	7.29	317,676	-	-	-	-	-	-	60.0%	0.47	0.53	0.73
M22 (Basin L from Pine Canyon PDP25-0003)	C/D	28.76	1,252,786	-	-	-	-	-	-	60.0%	0.47	0.53	0.73
M23 (Basin O from Castle Oaks Estates F1)	C/D	13.20	574,992	-	-	-	-	-	-	41.1%	0.31	0.37	0.65
M24 (Basins OS4, 7A-7W)	C/D	115.33	5,023,647	247,931	211,974	0	720,373	3,837,704	0	17.4%	0.12	0.18	0.56
M25 (Basin 8)	C/D	86.76	3,779,186	530,198	499,919	0	1,135,457	3,935,249	0	38.4%	0.28	0.35	0.64
Major Total	C/D	297.93	12,977,842	778,129	711,894	0	1,855,830	7,772,952	0	36.4%	0.27	0.33	0.63

Project: Canyons Far South - Filing No. 2

Location: Castle Rock, CO

Designer: CJG

Date: March 2025

Latest Revision: July 2025

NRCS Conveyance Factors, K ²	
Type of Land Surface	K
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture/Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas	20

Minimum T_c

5

TIME OF CONCENTRATION CALCULATIONS

Basin Designation	Imperviousness (%)	C _s	Initial/Overland Flow Time, T _i			Channelized Flow/Travel Time, T _t					Time of Concentration, T _c (Check)		
			Length (ft)	Slope (%)	T _i (min)	Land Surface	Length (ft)	Slope (%)	Velocity (ft/sec)	T _t (min)	Computed T _c (min)	First Design Point T _c (min)	Selected T _c (min)
7A	22.1%	0.22	70	5.00	7.85	Short Pasture/Lawns	1870	7.30	1.89	16.48	24.32	31.77	24.32
7A2	18.7%	0.19	85	14.90	6.22	Short Pasture/Lawns	630	9.40	2.15	4.89	11.12	N/A	11.12
7B	7.0%	0.09	150	2.40	16.68	Short Pasture/Lawns	1355	5.40	1.63	13.88	30.57	N/A	30.57
7C	5.0%	0.08	65	4.80	8.88	Short Pasture/Lawns	1715	8.20	2.00	14.26	23.14	N/A	23.14
7D	40.3%	0.37	70	2.00	8.83	Paved Areas	400	0.90	1.90	3.51	12.34	23.95	12.34
7E	40.3%	0.37	85	2.00	9.73	Paved Areas	150	3.90	3.95	0.63	10.36	20.02	10.36
7F	16.7%	0.17	255	4.50	16.30	Short Pasture/Lawns	110	1.20	0.77	2.39	18.69	N/A	18.69
7G	64.7%	0.57	60	2.00	5.95	Paved Areas	630	4.50	4.24	2.47	8.42	17.75	8.42
7G2	63.9%	0.56	75	2.50	6.25	Paved Areas	400	1.50	2.45	2.72	8.97	18.16	8.97
7H	66.4%	0.58	55	2.00	5.54	Paved Areas	1180	3.60	3.79	5.18	10.72	20.37	10.72
7I	63.0%	0.55	55	2.00	5.84	Paved Areas	1150	3.70	3.85	4.98	10.82	20.88	10.82
7I2	67.4%	0.59	95	2.00	7.17	Paved Areas	800	7.70	5.55	2.40	9.57	17.15	9.57
7I3	63.9%	0.56	60	2.00	6.02	Paved Areas	160	6.20	4.98	0.54	6.55	15.73	6.55
7I4	66.7%	0.58	75	2.00	6.44	Paved Areas	630	5.60	4.73	2.22	8.66	17.07	8.66
7J	68.3%	0.60	115	10.20	4.54	Paved Areas	990	3.40	3.69	4.47	9.01	19.20	9.01
7K	71.1%	0.62	50	2.00	4.89	Paved Areas	980	3.40	3.69	4.43	9.32	18.58	9.32
7L	11.6%	0.13	90	7.90	8.40	Short Pasture/Lawns	735	5.80	1.69	7.27	15.67	N/A	15.67
7M	42.8%	0.39	120	2.00	11.23	Paved Areas	320	2.70	3.29	1.62	12.86	20.89	12.86
7N	69.1%	0.60	50	2.00	5.06	Paved Areas	310	2.90	3.41	1.52	6.58	15.88	6.58
7O	71.4%	0.62	50	2.00	4.87	Paved Areas	520	6.10	4.94	1.75	6.63	15.71	6.63
7P	66.8%	0.58	120	2.00	8.14	Paved Areas	640	5.60	4.73	2.25	10.39	17.10	10.39
7Q	18.8%	0.19	65	7.10	6.94	Short Pasture/Lawns	700	8.85	2.08	5.60	12.54	N/A	12.54
7R	23.5%	0.23	70	2.00	10.49	Short Pasture/Lawns	715	10.30	2.25	5.30	15.79	25.04	15.79
7W	12.7%	0.14	80	8.10	7.78	Nearly Bare Ground	1210	4.70	2.17	9.30	17.08	N/A	17.08
OS2	20.4%	0.20	200	4.80	13.66	Tillage/Field	1390	5.80	1.20	19.24	32.90	30.64	30.64
OS3	5.0%	0.08	200	3.60	17.13	Tillage/Field	1780	5.80	1.20	24.64	41.77	N/A	41.77
OS4	53.0%	0.47	20	2.00	4.05	Paved Areas	370	1.40	2.37	2.61	6.66	20.17	6.66
OS5	24.2%	0.23	10	2.00	3.93	Paved Areas	10	2.00	2.83	0.06	3.99	21.98	5.00
7N	5.0%	0.08	85	17.50	6.63	Short Pasture/Lawns	1140	9.40	2.15	8.85	15.48	N/A	15.48
7O	5.0%	0.08	120	2.90	14.25	Paved Areas	900	6.20	4.98	3.01	17.26	N/A	17.26
8A	16.8%	0.17	60	0.40	17.55	Paved Areas	290	1.10	2.10	2.30	19.85	N/A	19.85
8B	60.1%	0.53	80	11.00	4.19	Paved Areas	1060	3.60	3.79	4.66	8.84	21.13	8.84
8C	69.6%	0.61	10	2.00	2.24	Short Pasture/Lawns	10	2.00	0.99	0.17	2.41	14.23	5.00
8D	57.1%	0.50	75	5.20	5.42	Paved Areas	1825	7.60	5.51	5.52	10.94	22.79	10.94
8E	24.4%	0.24	130	5.50	10.14	Paved Areas	1355	5.40	4.65	4.86	15.00	29.68	15.00
8F	74.2%	0.64	65	4.60	4.01	Paved Areas	1250	8.10	5.69	3.66	7.67	17.15	7.67
8G	66.7%	0.58	65	4.60	4.55	Paved Areas	1250	8.10	5.69	3.66	8.21	18.65	8.21
8G2	51.3%	0.46	100	3.50	7.70	Paved Areas	910	8.20	5.73	2.65	10.35	20.56	10.35
8J	21.6%	0.21	60	16.00	4.97	Short Pasture/Lawns	500	2.50	1.11	7.53	12.50	26.71	12.50
8K	58.6%	0.52	55	2.00	6.22	Paved Areas	770	8.30	5.76	2.23	8.45	18.62	8.45
8K2	61.5%	0.54	120	2.70	8.00	Paved Areas	100	1.10	2.10	0.79	8.79	16.46	8.79
8K3	63.5%	0.56	75	8.30	4.23	Paved Areas	280	3.00	3.46	1.35	5.58	16.71	5.58
8L	68.4%	0.60	50	2.00	5.12	Paved Areas	400	1.00	2.00	3.33	8.45	17.95	8.45
8M	52.8%	0.47	150	2.00	11.12	Paved Areas	810	5.50	4.69	2.88	14.00	20.54	14.00
8N	24.7%	0.24	130	11.30	7.98	Short Pasture/Lawns	485	3.10	1.23	6.56	14.54	25.49	14.54
8O	65.7%	0.57	25	3.30	3.20	Paved Areas	640	6.40	5.06	2.11	5.31	17.15	5.31
8O2	61.7%	0.54	120	2.80	7.87	Paved Areas	60	2.00	2.83	0.35	8.23	15.91	8.23
8O3	61.6%	0.54	120	2.80	7.88	Paved Areas	100	2.00	2.83	0.59	8.47	16.19	8.47
8O4	68.0%	0.59	20	3.70	2.66	Paved Areas	500	6.10	4.94	1.69	4.35	16.27	5.00
8P	68.3%	0.59	50	2.00	5.13	Paved Areas	380	2.60	3.22	1.96	7.10	16.51	7.10
8P2	67.5%	0.59	55	1.20	6.45	Paved Areas	150	2.00	2.83	0.88	7.33	15.48	7.33
8P3	68.1%	0.59	55	1.20	6.39	Paved Areas	200	1.90	2.76	1.21	7.60	15.73	7.60
8Q	25.5%	0.24	75	11.10	6.05	Short Pasture/Lawns	530	4.80	1.53	5.76	11.81	24.87	11.81
8R	52.6%	0.47	95	3.50	7.38	Paved Areas	450	4.20	4.10	1.83	9.21	19.30	9.21
8R2	61.2%	0.54	120	0.40	15.08	Paved Areas	100	2.90	3.41	0.49	15.57	16.16	15.57
8R3	67.0%	0.58	25	3.30	3.14	Paved Areas	550	6.90	5.25	1.74	4.88	16.51	5.00
8S	68.8%	0.60	55	2.00	5.34	Paved Areas	570	3.50	3.74	2.54	7.88	17.03	7.88
8T	7.1%	0.09	80	24.10	5.69	Nearly Bare Ground	1040	7.50	2.74	6.33	12.02	N/A	12.02
8T2	11.5%	0.13	150	1.10	20.80	Nearly Bare Ground	1470	4.80	2.19	11.18	31.98	N/A	31.98
8U	17.3%	0.18	190	15.00	9.40	Nearly Bare Ground	630	0.40	0.63	16.60	26.00	N/A	26.00
8U2	70.9%	0.62	20	2.00	3.11	Paved Areas	1280	3.40	3.69	5.78	8.89	20.06	8.89
8U3	91.4%	0.78	40	2.00	2.87	Paved Areas	230	3.30	3.63	1.06	3.92	11.43	5.00
8U4	67.7%	0.59	50	2.00	5.18	Paved Areas	590	5.60	4.73	2.08	7.26	16.74	7.26
8U5	84.8%	0.73	75	5.40	3.31	Paved Areas	210	5.90	4.86	0.72	4.03	12.27	5.00
8V	43.9%	0.40	300	6.30	12.01	Paved Areas	360	5.00	4.47	1.34	13.35	20.31	13.35
8W	41.9%	0.38	255	8.10	10.42	Nearly Bare Ground	750	7.00	2.65	4.72	15.15	22.05	15.15
8Y	51.2%	0.46	160	8.70	7.21	Nearly Bare Ground	750	6.50	2.55	4.90	12.12	20.32	12.12

Project:	Canyons Far South - Filing No. 2	Design Storm:	2-Yr
Location:	Castle Rock, CO	1-hr Design Point Rainfall (in):	1.06
Designer:	CJG		
Date:	March 2025		
Latest Revision:	July 2025		

2-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₂	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
7A	7A	31.25	0.15	4.78	24.32	1.88	8.96
7A2	7A2	0.66	0.13	0.08	11.12	2.75	0.23
7B	7B	13.55	0.04	0.57	30.57	1.64	0.94
7C	7C	10.33	0.03	0.30	23.14	1.93	0.57
7D	7D	1.14	0.30	0.34	12.34	2.63	0.90
7E	7E	1.27	0.30	0.38	10.36	2.83	1.07
7F	7F	4.26	0.11	0.47	18.69	2.16	1.02
7G	7G	0.53	0.51	0.27	8.42	3.06	0.82
7G2	7G2	1.96	0.50	0.99	8.97	2.99	2.95
7H	7H	1.00	0.52	0.52	10.72	2.79	1.46
7I	7I	0.76	0.49	0.38	10.82	2.78	1.05
7I2	7I2	0.92	0.53	0.49	9.57	2.92	1.43
7I3	7I3	0.08	0.50	0.04	6.55	3.33	0.14
7I4	7I4	0.54	0.53	0.28	8.66	3.03	0.86
7J	7J	2.59	0.54	1.40	9.01	2.98	4.19
7K	7K	1.49	0.57	0.84	9.32	2.95	2.48
7L	7L	12.30	0.07	0.91	15.67	2.36	2.14
7M	7M	1.07	0.32	0.34	12.86	2.58	0.88
7N	7N	0.45	0.55	0.25	6.58	3.32	0.82
7O	7O	0.60	0.57	0.34	6.63	3.32	1.13
7P	7P	1.31	0.53	0.69	10.39	2.82	1.96
7Q	7Q	5.00	0.13	0.64	12.54	2.61	1.66
7R	7R	8.26	0.16	1.35	15.79	2.35	3.16
7W	7W	12.54	0.08	1.03	17.08	2.26	2.32
OS2	OS2	46.59	0.14	6.50	30.64	1.64	10.68
OS3	OS3	25.29	0.03	0.73	41.77	1.36	0.99
OS4	OS4	1.46	0.41	0.59	6.66	3.31	1.96
OS5	OS5	9.13	0.17	1.54	5.00	3.60	5.55
7N	7N	46.11	0.03	1.33	15.48	2.37	3.15
7O	7O	7.18	0.03	0.21	17.26	2.25	0.46
8A	8A	9.68	0.11	1.09	19.85	2.09	2.27
8B	8B	3.49	0.47	1.64	8.84	3.01	4.92
8C	8C	1.70	0.55	0.94	5.00	3.60	3.37
8D	8D	1.41	0.44	0.63	10.94	2.77	1.73
8E	8E	11.35	0.17	1.93	15.00	2.41	4.65
8F	8F	0.79	0.59	0.47	7.67	3.16	1.48
8G	8G	1.70	0.53	0.90	8.21	3.09	2.77
8G2	8G2	2.85	0.39	1.12	10.35	2.83	3.16
8H	8H	0.45	0.58	0.26	12.50	2.61	0.68
8I	8I	1.28	0.43	0.55	8.45	3.06	1.67
8J	8J	2.39	0.15	0.36	12.50	2.61	0.93
8K	8K	1.51	0.46	0.69	8.45	3.06	2.11
8K2	8K2	0.30	0.48	0.15	8.79	3.01	0.44
8K3	8K3	0.69	0.50	0.34	5.58	3.49	1.19
8L	8L	0.99	0.54	0.54	8.45	3.06	1.64
8M	8M	2.67	0.41	1.08	14.00	2.49	2.69
8N	8N	2.56	0.17	0.44	14.54	2.44	1.08
8O	8O	1.37	0.52	0.71	5.31	3.54	2.51
8O2	8O2	0.17	0.48	0.08	8.23	3.08	0.25
8O3	8O3	0.31	0.48	0.15	8.47	3.05	0.45
8O4	8O4	0.81	0.54	0.43	5.00	3.60	1.56
8P	8P	0.66	0.54	0.36	7.10	3.24	1.15
8P2	8P2	0.23	0.53	0.12	7.33	3.21	0.39
8P3	8P3	0.32	0.54	0.17	7.60	3.17	0.55
8Q	8Q	2.96	0.18	0.53	11.81	2.68	1.42
8R	8R	1.60	0.40	0.65	9.21	2.96	1.92
8R2	8R2	0.34	0.48	0.16	15.57	2.36	0.38
8R3	8R3	1.36	0.53	0.72	5.00	3.60	2.59
8S	8S	1.46	0.55	0.80	7.88	3.13	2.50
8T	8T	6.26	0.04	0.27	12.02	2.66	0.71
8T2	8T2	10.05	0.07	0.74	31.98	1.60	1.18
8U	8U	5.14	0.12	0.60	26.00	1.81	1.08
8U2	8U2	1.43	0.56	0.81	8.89	3.00	2.42
8U3	8U3	0.19	0.75	0.14	5.00	3.60	0.51
8U4	8U4	1.04	0.54	0.56	7.26	3.22	1.80
8U5	8U5	0.15	0.69	0.11	5.00	3.60	0.38
8V	8V	1.58	0.33	0.52	13.35	2.54	1.32
8W	8W	1.28	0.31	0.40	15.15	2.40	0.96
8Y	8Y	2.24	0.39	0.88	12.12	2.65	2.32

Project:	Canyons Far South - Filing No. 2	Design Storm:	5-Yr
Location:	Castle Rock, CO	1-hr Design Point Rainfall (in):	1.43
Designer:	CJG		
Date:	March 2025		
Latest Revision:	July 2025		

5-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C _s	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
7A	7A	31.25	0.22	6.77	24.32	2.53	17.13
7A2	7A2	0.66	0.19	0.12	11.12	3.71	0.46
7B	7B	13.55	0.09	1.26	30.57	2.22	2.79
7C	7C	10.33	0.08	0.79	23.14	2.60	2.04
7D	7D	1.14	0.37	0.42	12.34	3.55	1.47
7E	7E	1.27	0.37	0.46	10.36	3.81	1.77
7F	7F	4.26	0.17	0.73	18.69	2.91	2.13
7G	7G	0.53	0.57	0.30	8.42	4.13	1.24
7G2	7G2	1.96	0.56	1.10	8.97	4.03	4.43
7H	7H	1.00	0.58	0.58	10.72	3.76	2.18
7I	7I	0.76	0.55	0.42	10.82	3.75	1.58
7I2	7I2	0.92	0.59	0.54	9.57	3.93	2.12
7I3	7I3	0.08	0.56	0.05	6.55	4.49	0.21
7I4	7I4	0.54	0.58	0.31	8.66	4.09	1.28
7J	7J	2.59	0.60	1.54	9.01	4.03	6.22
7K	7K	1.49	0.62	0.92	9.32	3.98	3.65
7L	7L	12.30	0.13	1.60	15.67	3.18	5.08
7M	7M	1.07	0.39	0.41	12.86	3.48	1.43
7N	7N	0.45	0.60	0.27	6.58	4.48	1.21
7O	7O	0.60	0.62	0.37	6.63	4.47	1.67
7P	7P	1.31	0.58	0.77	10.39	3.81	2.92
7Q	7Q	5.00	0.19	0.95	12.54	3.52	3.34
7R	7R	8.26	0.23	1.88	15.79	3.17	5.95
7W	7W	12.54	0.14	1.74	17.08	3.05	5.31
OS2	OS2	46.59	0.20	9.43	30.64	2.22	20.89
OS3	OS3	25.29	0.08	1.92	41.77	1.83	3.52
OS4	OS4	1.46	0.47	0.68	6.66	4.47	3.05
OS5	OS5	9.13	0.23	2.13	5.00	4.85	10.35
7N	7N	46.11	0.08	3.50	15.48	3.20	11.21
7O	7O	7.18	0.08	0.55	17.26	3.03	1.66
8A	8A	9.68	0.17	1.67	19.85	2.82	4.72
8B	8B	3.49	0.53	1.84	8.84	4.05	7.48
8C	8C	1.70	0.61	1.03	5.00	4.85	4.99
8D	8D	1.41	0.50	0.71	10.94	3.73	2.65
8E	8E	11.35	0.24	2.67	15.00	3.25	8.66
8F	8F	0.79	0.64	0.51	7.67	4.26	2.17
8G	8G	1.70	0.58	0.99	8.21	4.16	4.12
8G2	8G2	2.85	0.46	1.30	10.35	3.82	4.95
8H	8H	0.45	0.63	0.28	12.50	3.53	1.00
8I	8I	1.28	0.49	0.63	8.45	4.12	2.58
8J	8J	2.39	0.21	0.51	12.50	3.53	1.79
8K	8K	1.51	0.52	0.78	8.45	4.12	3.22
8K2	8K2	0.30	0.54	0.16	8.79	4.06	0.67
8K3	8K3	0.69	0.56	0.38	5.58	4.71	1.79
8L	8L	0.99	0.60	0.59	8.45	4.12	2.43
8M	8M	2.67	0.47	1.25	14.00	3.35	4.19
8N	8N	2.56	0.24	0.61	14.54	3.29	2.00
8O	8O	1.37	0.57	0.79	5.31	4.77	3.75
8O2	8O2	0.17	0.54	0.09	8.23	4.16	0.38
8O3	8O3	0.31	0.54	0.17	8.47	4.12	0.69
8O4	8O4	0.81	0.59	0.48	5.00	4.85	2.32
8P	8P	0.66	0.59	0.39	7.10	4.38	1.71
8P2	8P2	0.23	0.59	0.13	7.33	4.33	0.58
8P3	8P3	0.32	0.59	0.19	7.60	4.28	0.81
8Q	8Q	2.96	0.24	0.72	11.81	3.61	2.61
8R	8R	1.60	0.47	0.75	9.21	3.99	2.99
8R2	8R2	0.34	0.54	0.18	15.57	3.19	0.57
8R3	8R3	1.36	0.58	0.80	5.00	4.85	3.86
8S	8S	1.46	0.60	0.88	7.88	4.23	3.70
8T	8T	6.26	0.09	0.59	12.02	3.59	2.10
8T2	8T2	10.05	0.13	1.30	31.98	2.16	2.81
8U	8U	5.14	0.18	0.91	26.00	2.44	2.22
8U2	8U2	1.43	0.62	0.88	8.89	4.05	3.56
8U3	8U3	0.19	0.78	0.15	5.00	4.85	0.72
8U4	8U4	1.04	0.59	0.61	7.26	4.34	2.67
8U5	8U5	0.15	0.73	0.11	5.00	4.85	0.55
8V	8V	1.58	0.40	0.62	13.35	3.43	2.14
8W	8W	1.28	0.38	0.48	15.15	3.23	1.56
8Y	8Y	2.24	0.46	1.02	12.12	3.57	3.64

Project:	Canyons Far South - Filing No. 2	Design Storm:	100-Yr
Location:	Castle Rock, CO	1-hr Design Point Rainfall (in):	2.60
Designer:	CJG		
Date:	March 2025		
Latest Revision:	July 2025		

100-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₁₀₀	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
7A	7A	31.25	0.57	17.96	24.32	4.60	82.64
7A2	7A2	0.66	0.56	0.37	11.12	6.74	2.48
7B	7B	13.55	0.51	6.95	30.57	4.03	28.05
7C	7C	10.33	0.50	5.21	23.14	4.73	24.65
7D	7D	1.14	0.65	0.74	12.34	6.45	4.76
7E	7E	1.27	0.65	0.82	10.36	6.94	5.71
7F	7F	4.26	0.55	2.35	18.69	5.30	12.46
7G	7G	0.53	0.75	0.40	8.42	7.50	2.98
7G2	7G2	1.96	0.75	1.47	8.97	7.33	10.75
7H	7H	1.00	0.76	0.76	10.72	6.84	5.17
7I	7I	0.76	0.74	0.57	10.82	6.81	3.86
7I2	7I2	0.92	0.76	0.70	9.57	7.15	4.99
7I3	7I3	0.08	0.75	0.06	6.55	8.16	0.50
7I4	7I4	0.54	0.76	0.41	8.66	7.43	3.02
7J	7J	2.59	0.76	1.98	9.01	7.32	14.51
7K	7K	1.49	0.78	1.15	9.32	7.23	8.33
7L	7L	12.30	0.53	6.54	15.67	5.78	37.80
7M	7M	1.07	0.66	0.70	12.86	6.33	4.46
7N	7N	0.45	0.77	0.34	6.58	8.15	2.81
7O	7O	0.60	0.78	0.47	6.63	8.13	3.80
7P	7P	1.31	0.76	1.00	10.39	6.93	6.90
7Q	7Q	5.00	0.56	2.81	12.54	6.40	17.97
7R	7R	8.26	0.58	4.79	15.79	5.76	27.61
7W	7W	12.54	0.54	6.72	17.08	5.54	37.26
OS2	OS2	46.59	0.57	26.45	30.64	4.03	106.55
OS3	OS3	25.29	0.50	12.76	41.77	3.33	42.49
OS4	OS4	1.46	0.70	1.02	6.66	8.12	8.29
OS5	OS5	9.13	0.58	5.33	5.00	8.82	46.97
7N	7N	46.11	0.50	23.26	15.48	5.81	135.28
7O	7O	7.18	0.50	3.62	17.26	5.51	19.98
8A	8A	9.68	0.55	5.35	19.85	5.13	27.48
8B	8B	3.49	0.73	2.55	8.84	7.37	18.81
8C	8C	1.70	0.77	1.31	5.00	8.82	11.52
8D	8D	1.41	0.72	1.02	10.94	6.79	6.89
8E	8E	11.35	0.58	6.63	15.00	5.90	39.11
8F	8F	0.79	0.79	0.62	7.67	7.75	4.83
8G	8G	1.70	0.76	1.29	8.21	7.57	9.75
8G2	8G2	2.85	0.69	1.98	10.35	6.94	13.73
8H	8H	0.45	0.78	0.35	12.50	6.41	2.26
8I	8I	1.28	0.71	0.91	8.45	7.49	6.83
8J	8J	2.39	0.57	1.37	12.50	6.41	8.79
8K	8K	1.51	0.72	1.10	8.45	7.49	8.22
8K2	8K2	0.30	0.74	0.22	8.79	7.39	1.65
8K3	8K3	0.69	0.74	0.51	5.58	8.56	4.37
8L	8L	0.99	0.76	0.76	8.45	7.49	5.67
8M	8M	2.67	0.70	1.87	14.00	6.10	11.39
8N	8N	2.56	0.59	1.50	14.54	5.99	8.97
8O	8O	1.37	0.75	1.03	5.31	8.68	8.95
8O2	8O2	0.17	0.74	0.12	8.23	7.57	0.94
8O3	8O3	0.31	0.74	0.23	8.47	7.49	1.70
8O4	8O4	0.81	0.76	0.62	5.00	8.82	5.43
8P	8P	0.66	0.76	0.50	7.10	7.96	3.99
8P2	8P2	0.23	0.76	0.17	7.33	7.87	1.37
8P3	8P3	0.32	0.76	0.24	7.60	7.78	1.90
8Q	8Q	2.96	0.59	1.74	11.81	6.57	11.45
8R	8R	1.60	0.70	1.12	9.21	7.26	8.15
8R2	8R2	0.34	0.73	0.25	15.57	5.80	1.43
8R3	8R3	1.36	0.76	1.03	5.00	8.82	9.11
8S	8S	1.46	0.77	1.12	7.88	7.68	8.60
8T	8T	6.26	0.51	3.21	12.02	6.52	20.97
8T2	8T2	10.05	0.56	5.58	31.98	3.93	21.91
8U	8U	5.14	0.66	3.41	26.00	4.43	15.12
8U2	8U2	1.43	0.66	0.94	8.89	7.36	6.89
8U3	8U3	0.19	0.69	0.13	5.00	8.82	1.15
8U4	8U4	1.04	0.63	0.65	7.26	7.90	5.17
8U5	8U5	0.15	0.58	0.09	5.00	8.82	0.79
8V	8V	1.58	0.66	1.04	13.35	6.23	6.45
8W	8W	1.28	0.69	0.89	15.15	5.88	5.21
8Y	8Y	2.24	0.63	1.41	12.12	6.50	9.14

Project:

Location:

Designer:

Date:

Latest Revision:

Canyons Far South - Filing No. 2

Castle Rock, CO

CJG

March 2025

July 2025



BASIN SUMMARY TABLE						
Basin Designation	Design Point	Area (ac)	C ₅	C ₁₀₀	Q ₅ (cfs)	Q ₁₀₀ (cfs)
7A	7A	31.25	0.22	0.57	17.13	82.64
7A2	7A2	0.66	0.19	0.56	0.46	2.48
7B	7B	13.55	0.09	0.51	2.79	28.05
7C	7C	10.33	0.08	0.50	2.04	24.65
7D	7D	1.14	0.37	0.65	1.47	4.76
7E	7E	1.27	0.37	0.65	1.77	5.71
7F	7F	4.26	0.17	0.55	2.13	12.46
7G	7G	0.53	0.57	0.75	1.24	2.98
7G2	7G2	1.96	0.56	0.75	4.43	10.75
7H	7H	1.00	0.58	0.76	2.18	5.17
7I	7I	0.76	0.55	0.74	1.58	3.86
7I2	7I2	0.92	0.59	0.76	2.12	4.99
7I3	7I3	0.08	0.56	0.75	0.21	0.50
7I4	7I4	0.54	0.58	0.76	1.28	3.02
7J	7J	2.59	0.60	0.76	6.22	14.51
7K	7K	1.49	0.62	0.78	3.65	8.33
7L	7L	12.30	0.13	0.53	5.08	37.80
7M	7M	1.07	0.39	0.66	1.43	4.46
7N	7N	0.45	0.60	0.77	1.21	2.81
7O	7O	0.60	0.62	0.78	1.67	3.80
7P	7P	1.31	0.58	0.76	2.92	6.90
7Q	7Q	5.00	0.19	0.56	3.34	17.97
7R	7R	8.26	0.23	0.58	5.95	27.61
7W	7W	12.54	0.14	0.54	5.31	37.26
OS2	OS2	46.59	0.20	0.57	20.89	106.55
OS3	OS3	25.29	0.08	0.50	3.52	42.49
OS4	OS4	1.46	0.47	0.70	3.05	8.29
OS5	OS5	9.13	0.23	0.58	10.35	46.97
Routed to Pond J		196.33			115.41	557.77
8A	8A	9.68	0.17	0.55	4.72	27.48
8B	8B	3.49	0.53	0.73	7.48	18.81
8C	8C	1.70	0.61	0.77	4.99	11.52
8D	8D	1.41	0.50	0.72	2.65	6.89
8E	8E	11.35	0.24	0.58	8.66	39.11
8F	8F	0.79	0.64	0.79	2.17	4.83
8G	8G	1.70	0.58	0.76	4.12	9.75
8G2	8G2	2.85	0.46	0.69	4.95	13.73
8H	8H	0.45	0.63	0.78	1.00	2.26
8I	8I	1.28	0.49	0.71	2.58	6.83
8J	8J	2.39	0.21	0.57	1.79	8.79
8K	8K	1.51	0.52	0.72	3.22	8.22
8K2	8K2	0.30	0.54	0.74	0.67	1.65
8K3	8K3	0.69	0.56	0.74	1.79	4.37
8L	8L	0.99	0.60	0.76	2.43	5.67
8M	8M	2.67	0.47	0.70	4.19	11.39
8N	8N	2.56	0.24	0.59	2.00	8.97
8O	8O	1.37	0.57	0.75	3.75	8.95
8O2	8O2	0.17	0.54	0.74	0.38	0.94
8O3	8O3	0.31	0.54	0.74	0.69	1.70
8O4	8O4	0.81	0.59	0.76	2.32	5.43
8P	8P	0.66	0.59	0.76	1.71	3.99
8P2	8P2	0.23	0.59	0.76	0.58	1.37
8P3	8P3	0.32	0.59	0.76	0.81	1.90
8Q	8Q	2.96	0.24	0.59	2.61	11.45
8R	8R	1.60	0.47	0.70	2.99	8.15
8R2	8R2	0.34	0.54	0.73	0.57	1.43
8R3	8R3	1.36	0.58	0.76	3.86	9.11
8S	8S	1.46	0.60	0.77	3.70	8.60
8T	8T	6.26	0.09	0.51	2.10	20.97
8T2	8T2	10.05	0.13	0.56	2.81	21.91
8U	8U	5.14	0.18	0.66	2.22	15.12
8U2	8U2	1.43	0.62	0.66	3.56	6.89
8U3	8U3	0.19	0.78	0.69	0.72	1.15
8U4	8U4	1.04	0.59	0.63	2.67	5.17
8U5	8U5	0.15	0.73	0.58	0.55	0.79
8V	8V	1.58	0.40	0.66	2.14	6.45
8W	8W	1.28	0.38	0.69	1.56	5.21
8Y	8Y	2.24	0.46	0.63	3.64	9.14
Routed to Pond H		86.76			105.35	346.09

Project:

Location:

Designer:

Date:

Latest Revision:

Canyons Far South - Filing No. 2

Castle Rock, CO

CJG

March 2025

July 2025



MAJOR BASIN CUHP SUMMARY TABLE				
Basin Designation	Area (ac)	% Impervious	Q ₂ (cfs)	Q ₁₀₀ (cfs)
M20 (Pond Release Rate*)	46.59	60.0%	11	129
M21 (Pond Release Rate*)	7.29	60.0%	1	15
M22 (Pond Release Rate*)	28.76	60.0%	4	47
M23	13.20	41.1%	10	42
M24	115.33	17.4%	28	204
M25	86.76	38.4%	53	261
Proposed Total	297.93	38.4%	107	699
Existing Total	297.93	5.0%	20	439
<p>*Note: Basins M1, M20, M21, and M22 were calculated in CUHP with a percent impervious of 5% because these offsite basins are anticipated to be future sub-regional ponds that will reduce developed offsite flows to near historic levels before entering the property. Canyons Far South will accept historic flows from the upstream development, but it will be the responsibility of the upstream developer to maintain historic flows from their property.</p>				

Project:

Canyons Far South - Filing No. 2

Location:

Castle Rock, CO

Designer:

CJG

Date:

March 2025

Latest Revision:

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MAJOR DRAINAGEWAY SUMMARY TABLE					
Location	Proposed			Jurisdiction	Improvements Proposed
	SWMM Node	Q ₂ (cfs)	Q ₁₀₀ (cfs)		
Channel Reach 3B	Conduit 3B (From Filing No. 2)	42.92	392.36	Castle Rock	Culvert Pipe
	Storage Unit PondJ (From Filing No. 2)	43.01	392.52	Castle Rock	Forebay to Pond J trickle channel to pond outfall pipe
	Storage Unit PondH (From Filing No. 2)	52.31	429.49	Castle Rock	Forebay to Pond H trickle channel to pond outfall pipe
Channel Reach 3A	Outfall PondHOut (From Filing No. 2)	7.64	332.99	Castle Rock	Reinforced plunge pool at Pond H outfall, to grade control structures of riffle drops, boulder drops, and scour pools with riprap and coir mats

Project:

Location:

Designer:

Date:

Latest Revision:

Canyons Far South - Filing No. 2

Castle Rock, CO

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POND SUMMARY TABLE				
Pond	Watershed Area (acres)	Watershed Imperviousness	100-yr Volume Provided (acre-feet)	Pond Volume at Spillway (acre-feet)
Pond J	187.20	16.5%	10.13	10.4 AC-FT with a WSE of 6368.0
Pond H	86.76	35.3%	7.23	7.8 AC-FT with a WSE of 6346.25

Project:	Canyons Far South - Filing No. 2
Location:	Castle Rock, CO
Designer:	CJG
Date:	March 2025
Latest Revision:	July 2025



RELEASE RATE SUMMARY TABLE						
	McMurdo Gulch Tributary B (Filing No. 1)			McMurdo Gulch Tributary 3		
	Area (acres)	Percent Impervious	Flow (CFS)	Area (acres)	Percent Impervious	Flow (CFS)
McMurdo Gulch FHAD (2012)	485.76	10.4%	577	343.04	13.7%	423
Filing No. 2 - Existing	409.09	5.0%	529	297.93	5.0%	439
Filing No. 2 - Proposed	409.09	22.1%	407.27	297.93	36.4%	332.99
<div>- All existing release rates are per the existing CUHP of the existing condition of the Major Basins.</div> <div>- All proposed release rates are per the CUHP-SWMM model for the ultimate condition of the Major Basins.</div> <div>- McMurdo Gulch FHAD basin CC_MCG20 corresponds with flows from Tributary B to McMurdo Gulch.</div> <div>- McMurdo Gulch FHAD basin CC_MCG22 corresponds with flows from Tributary 3 to McMurdo Gulch.</div>						

Project: CFS F1 - Minor Drainageway Analysis
Location: Castle Rock, CO
Designer: BCB
Date: 9/9/2025
Latest Revision: 9/9/2025

UNDEVELOPED BASIN SUMMARY TABLE		
Basin Designation	Area (ac)	Q ₁₀₀ (cfs)
5C	6.27	11.58
5D	4.69	12.88
6J	35.72	56.51

DEVELOPED BASIN SUMMARY TABLE		
Basin Designation	Area (ac)	Q ₁₀₀ (cfs)
5C	2.54	7.85
5D	3.55	12.46
6J	15.74	52.11

Basin Designation		Q ₁₀₀
5C	Is Developed Flow less than Undeveloped Flow?	YES
5D	Is Developed Flow less than Undeveloped Flow?	YES
6J	Is Developed Flow less than Undeveloped Flow?	YES

Project: CFS F1 - Minor Drainageway Analysis

Location: Castle Rock, CO

Designer: BCB

Date: 9/9/2025

Latest Revision: 9/9/2025

UNDEVELOPED IMPERVIOUSNESS AND RUNOFF COEFFICIENT CALCULATIONS

				Paved	Park	Commercial	Single Family	Duplex Lots	Greenbelts/ Agricultural	Historic			
				Impervious % ¹	95%	25%	85%	55%	65%	5%	5%		
				C ₁₀₀	0.87	0.59	0.83	0.71	0.75	0.50	0.50		
Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)	Total Area (sf)	Roofs (sf)	Lawn (sf)	Pavement (sf)	Sidewalk (sf)	Pond HWL (sf)	Greenbelts/ Agricultural (sf)	Historic (sf)	Percent Impervious	Runoff Coefficients, C	
												C ₁₀₀	
5C	C/D	6.27	273,025	0	0	0	0	0	0	273,025	5.0%	0.50	
5D	C/D	4.69	204,166	0	0	0	0	0	0	204,166	5.0%	0.50	
6J	C/D	35.72	1,555,809	0	0	0	0	0	0	1,555,809	5.0%	0.50	
Overall		46.67	2,033,000	0	0	0	0	0	0	2,033,000	5.0%	0.50	

DEVELOPED IMPERVIOUSNESS AND RUNOFF COEFFICIENT CALCULATIONS

				Paved	Park	Commercial	Single Family	Duplex Lots	Greenbelts/ Agricultural	Historic			
				Impervious % ¹	95%	25%	85%	55%	65%	5%	5%		
				C ₁₀₀	0.87	0.59	0.83	0.71	0.75	0.50	0.50		
Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)	Total Area (sf)	Roofs (sf)	Lawn (sf)	Pavement (sf)	Sidewalk (sf)	Pond HWL (sf)	Greenbelts/ Agricultural (sf)	Historic (sf)	Percent Impervious	Runoff Coefficients, C	
												C ₁₀₀	
5C	C/D	2.54	110,767	0	0	0	23,389	0	87,378	0	15.6%	0.55	
5D	C/D	3.55	154,768	0	0	0	27,967	0	126,802	0	14.0%	0.54	
6J	C/D	15.74	685,819	10,440	541,363	0	133,893	0	122	0	31.9%	0.61	
Overall		21.84	951,354	10,440	541,363	0	185,249	0	214,302	0	27.1%	0.60	

Project: CFS F1 - Minor Drainageway Analysis

Location: Castle Rock, CO

Designer: BCB

Date: 9/9/2025

Latest Revision: 9/9/2025

NRCS Conveyance Factors, K ²	
Type of Land Surface	K
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture/Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas	20

¹Max 300 ft in Urban areas and 500 ft in rural areas

²From Table 6-2 in UDFCD Volume 1

Minimum T_c 5

UNDEVELOPED TIME OF CONCENTRATION CALCULATIONS

Basin Designation	Imperviousness (%)	C _s	Initial/Overland Flow Time, T _i			Channelized Flow/Travel Time, T _t				Time of Concentration, T _c (Check)			
			Length (ft) ¹	Slope (%)	T _i (min)	Land Surface	Length (ft)	Slope (%)	Velocity (ft/sec)	T _t (min)	Computed T _c (min)	First Design Point T _c (min)	Selected T _c (min)
5C	5.00%	0.08	1135	6.80	33.09	Short Pasture/Lawns	340	8.50	2.04	2.78	35.86	N/A	35.86
5D	5.00%	0.08	270	10.60	13.94	Short Pasture/Lawns	520	10.90	2.31	3.75	17.69	N/A	17.69
6J	5.00%	0.08	1930	6.30	44.25	Short Pasture/Lawns	180	6.80	1.83	1.64	45.89	N/A	45.89

DEVELOPED TIME OF CONCENTRATION CALCULATIONS

Basin Designation	Imperviousness (%)	C _s	Initial/Overland Flow Time, T _i			Channelized Flow/Travel Time, T _t				Time of Concentration, T _c (Check)			
			Length (ft) ¹	Slope (%)	T _i (min)	Land Surface	Length (ft)	Slope (%)	Velocity (ft/sec)	T _t (min)	Computed T _c (min)	First Design Point T _c (min)	Selected T _c (min)
5C	15.56%	0.16	80	2.00	12.04	Short Pasture/Lawns	600	10.20	2.24	4.47	16.52	N/A	16.52
5D	14.04%	0.15	135	5.90	11.09	Paved Areas	480	12.50	7.07	1.13	12.22	N/A	12.22
6J	31.92%	0.30	95	2.00	11.25	Short Pasture/Lawns	800	7.70	1.94	6.86	18.11	24.14	18.11

2.4.1 Initial or Overland Flow Time

The initial or overland flow time, t_i , may be calculated using Equation 6-3:

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

Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
 C_s = 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).

2.4.2 Channelized Flow Time

The channelized flow time (travel time) is calculated using the hydraulic properties of the conveyance element. The channelized flow time, t_t , is estimated by dividing the length of conveyance by the velocity. The following equation, Equation 6-4 (Guo 2013), can be used to determine the flow velocity in conjunction with Table 6-2 for the conveyance factor.

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

Equation 6-4

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).

$$t_c = t_i + t_t$$

Equation 6

Where:

t_c = computed time of concentration (minutes)
 t_i = overland (initial) flow time (minutes)
 t_t = channelized flow time (minutes).

2.4.3 First Design Point Time of Concentration in Urban Catchments

Equation 6-4 was solely determined by the waterway characteristics and using a set of empirical formulas. A calibration study between the Rational Method and the Colorado Urban Hydrograph Procedure (CUHP) suggests that the time of concentration shall be the lesser of the values calculated by Equation 6-2 and Equation 6-5 (Guo and Urbanas 2013).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_o}}$$

Equation 6-5

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_o = slope of the channelized flow path (ft/ft).

2.4.4 Minimum Time of Concentration

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.



FOR REFERENCE ONLY

Project: CFS F1 - Minor Drainageway Analysis
Location: Castle Rock, CO
Designer: BCB
Date: 9/9/2025
Latest Revision: 9/9/2025

Design Storm:	100-Yr
1-hr Design Point Rainfall (in):	2.60

UNDEVELOPED 100-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₁₀₀	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
5C	1	6.27	0.50	3.16	35.86	3.66	11.58
5D	2	4.69	0.50	2.36	17.69	5.45	12.88
6J	3	35.72	0.50	18.02	45.89	3.14	56.51

DEVELOPED 100-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₁₀₀	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
5C	1	2.54	0.55	1.39	16.52	5.64	7.85
5D	2	3.55	0.54	1.92	12.22	6.47	12.46
6J	3	15.74	0.61	9.68	18.11	5.38	52.11



APPENDIX B

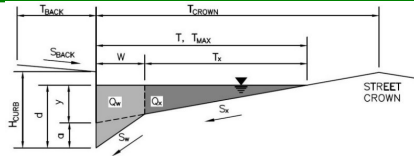
HYDRAULIC CALCULATIONS

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 0.50%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.005	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

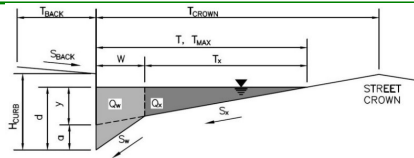
MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	3.2	49.9	cfs

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 5.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

Inlet ID: Local - 0.60%



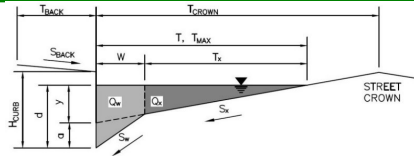
WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 5.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity **GOOD** - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 0.70%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_o =$	0.083	ft/ft
$S_o =$	0.007	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	3.8	59.1	cfs

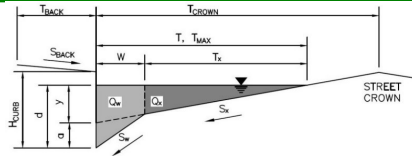
WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 5.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local 0.80%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.008	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	4.0	63.2	cfs

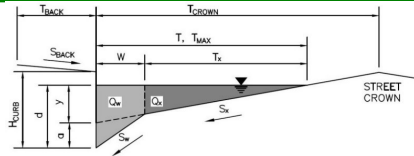
WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 5.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 0.90%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.009	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

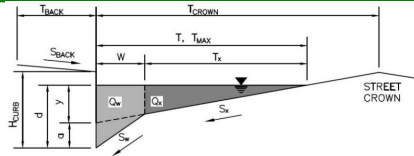
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	4.3	67.0	cfs

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 5.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 1 - STREET CAPACITY**Inlet ID: **Local - 1.0%****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.010	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

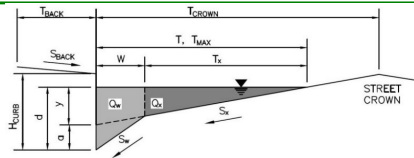
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	4.5	70.6	cfs

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 5.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 1 - STREET CAPACITY**Inlet ID: **Local - 1.25%****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.013	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	5.0	78.9	cfs

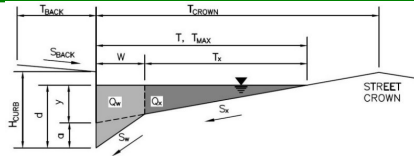
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 1.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.015	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

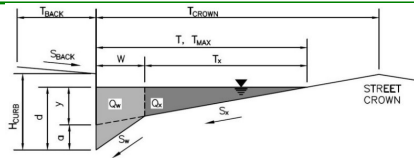
MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	5.5	86.5	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

Inlet ID: Local - 1.75%



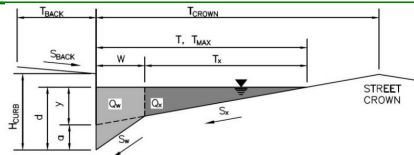
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 2.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_0 =$	0.020	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

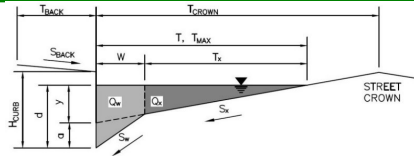
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	6.4	83.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 1 - STREET CAPACITY**Inlet ID: **Local - 2.5%****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.025	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	7.1	77.9	cfs

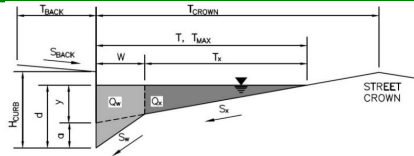
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 2.75%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.028	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	7.5	75.7	cfs

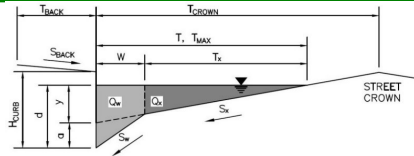
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 3.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.030	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	7.8	73.8	cfs

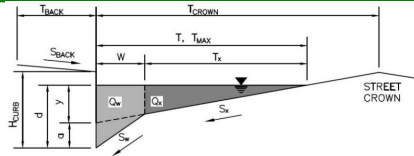
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 3.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.035	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

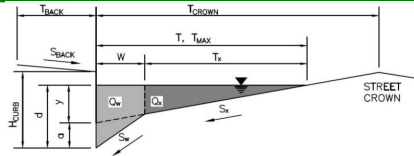
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	8.4	70.4	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 1 - STREET CAPACITY**Inlet ID: **Local - 3.75%****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_W =$	0.083	ft/ft
$S_o =$	0.038	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	8.7	69.0	cfs

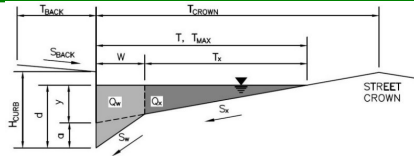
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 4.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.040	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	9.0	67.7	cfs

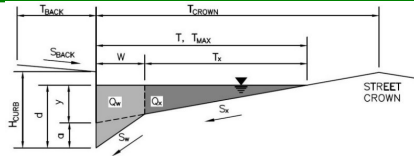
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 4.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.045	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

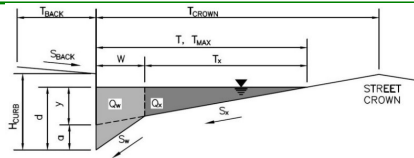
MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	9.6	65.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

Inlet ID: Local - 5.0%



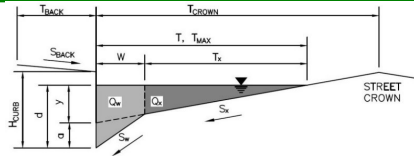
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 5.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.055	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	10.6	61.5	cfs

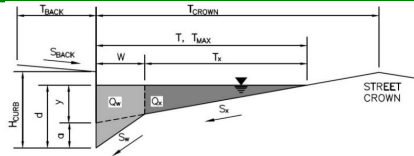
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Local - 6.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.060	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☒	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	11.0	59.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'

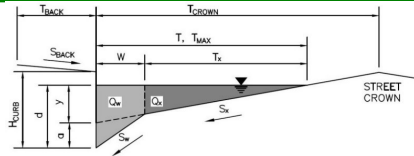
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 1.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.010	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	6.3	98.0	cfs

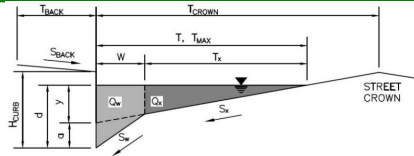
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 1.25%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.013	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	7.0	109.5	cfs

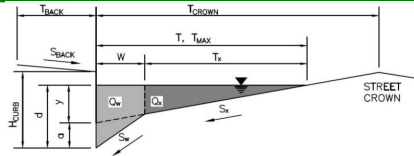
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 1.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	19.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.017	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.015	ft/ft
n_{STREET}	=	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm		
T_{MAX}	=	12.0	17.0	ft
d_{MAX}	=	6.0	10.4	inches
		☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm		
Q_{allow}	=	7.7	120.0	cfs

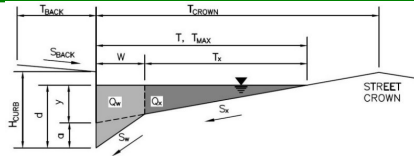
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 1.75%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	19.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.017	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_y	=	0.083	ft/ft
S_o	=	0.018	ft/ft
n_{STREET}	=	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm		
T_{MAX}	=	12.0	17.0	ft
d_{MAX}	=	6.0	10.4	inches
		☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm		
Q_{allow}	=	8.3	120.3	cfs

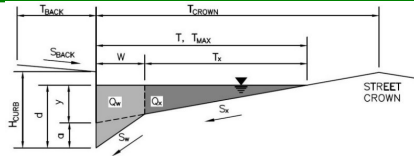
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 2.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	19.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.017	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.020	ft/ft
n_{STREET}	=	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm		
T_{MAX}	=	12.0	17.0	ft
d_{MAX}	=	6.0	10.4	inches
		☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm		
Q_{allow}	=	8.9	115.6	cfs

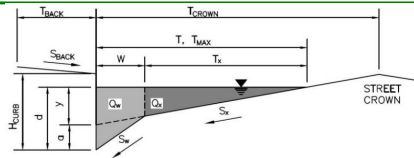
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 2.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.025	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	9.9	108.1	cfs

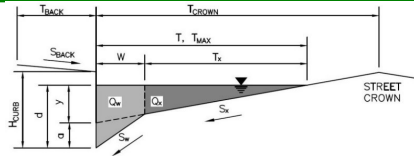
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 3.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	19.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.017	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.030	ft/ft
n_{STREET}	=	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm		
T_{MAX}	=	12.0	17.0	ft
d_{MAX}	=	6.0	10.4	inches
		☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm		
Q_{allow}	=	10.9	102.3	cfs

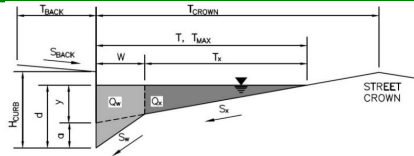
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 3.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.035	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	11.7	97.7	cfs

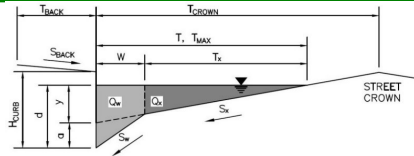
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 4.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.040	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	12.6	93.9	cfs

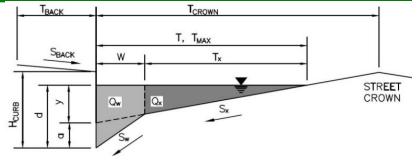
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 4.5%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.045	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	13.3	90.6	cfs

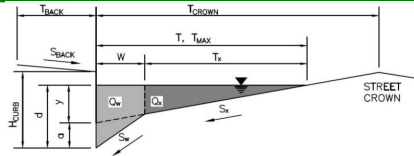
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 5.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	19.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.017	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.050	ft/ft
n_{STREET}	=	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm		
T_{MAX}	=	12.0	17.0	ft
d_{MAX}	=	6.0	10.4	inches
		☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm		
Q_{allow}	=	14.0	87.8	cfs

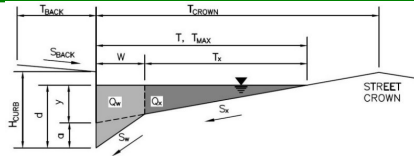
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 6.0%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.060	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	15.4	83.1	cfs

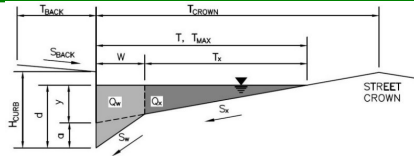
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 1 - STREET CAPACITY

Inlet ID: Collector - 10.7%

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.017	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.107	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	10.4	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	16.1	69.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.00 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.00 cfs on sheet 'Inlet Management'**

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 7E	Basin 7D	Basin 7C
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	AREA
Hydraulic Condition	On Grade	On Grade	Swale
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	User-Defined

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	1.8	1.5	2.0
Major Q_{Known} (cfs)	5.7	4.8	24.6

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	User-Defined
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	20.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	56.3

Includes captured flow from upstream inlets**Watershed Characteristics**

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.8	1.5	22.0
Major Total Design Peak Flow, Q (cfs)	5.7	4.8	81.0
Minor Flow Bypassed Downstream, Q_b (cfs)	0.2	-0.4	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	1.1	-0.6	0.0

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 7M	Basin 7J	Basin 7N
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	In Sump	On Grade
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	1.4	6.2	1.2
Major Q_{Known} (cfs)	4.5	14.5	2.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	1.8	0.0

Includes Basins 7D and 7M**Watershed Characteristics**

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.4	6.2	1.2
Major Total Design Peak Flow, Q (cfs)	4.5	16.3	2.8
Minor Flow Bypassed Downstream, Q_b (cfs)	0.4	N/A	0.6
Major Flow Bypassed Downstream, Q_b (cfs)	2.4	N/A	1.4

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 7K	Basin 7O	Basin 8K3
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	On Grade
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{known} (cfs)	3.7	1.7	1.8
Major Q_{known} (cfs)	8.3	3.8	4.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Basin 7N	No Bypass Flow Received	Basin 7O
Minor Bypass Flow Received, Q_b (cfs)	0.6	0.0	0.7
Major Bypass Flow Received, Q_b (cfs)	1.4	0.0	2.3

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	4.2	1.7	2.5
Major Total Design Peak Flow, Q (cfs)	9.7	3.8	6.6
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.7	1.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	2.3	4.0

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8K2	Basin 8J	Basin 8K
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	AREA	STREET
Hydraulic Condition	On Grade	Swale	In Sump
Inlet Type	Denver No. 16 Combination	CDOT Type C	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	0.7	1.8	3.2
Major Q_{Known} (cfs)	1.7	8.8	8.2

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Basin 8K3	No Bypass Flow Received	Basin 8K2
Minor Bypass Flow Received, Q_b (cfs)	1.0	0.0	0.4
Major Bypass Flow Received, Q_b (cfs)	4.0	0.0	3.2

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.6	1.8	3.7
Major Total Design Peak Flow, Q (cfs)	5.7	8.8	11.5
Minor Flow Bypassed Downstream, Q_b (cfs)	0.4	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	3.2	0.0	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 7R	Basin 7P	Basin 8U4
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	AREA	STREET	STREET
Hydraulic Condition	Swale	On Grade	On Grade
Inlet Type	CDOT Type D (In Series)	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	6.0	2.9	2.7
Major Q_{Known} (cfs)	27.6	6.9	5.1

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	Basin 7P
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	1.6
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	5.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	6.0	2.9	4.3
Major Total Design Peak Flow, Q (cfs)	27.6	6.9	10.0
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	1.6	2.7
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	5.0	7.9

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8U3	Basin 8U2	Basin 8L
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	0.7	3.6	2.4
Major Q_{Known} (cfs)	1.2	6.9	5.7

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	Basin 8U4	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	2.7	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	7.9	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.7	6.2	2.4
Major Total Design Peak Flow, Q (cfs)	1.2	14.8	5.7
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8M	Basin 8N	Basin 8O4
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	AREA	STREET
Hydraulic Condition	On Grade	Swale	On Grade
Inlet Type	Denver No. 16 Combination	CDOT TYPE D (Parallel)	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	4.2	2.0	2.3
Major Q_{Known} (cfs)	11.4	9.0	5.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	4.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	8.9	0.0

Receives captured flow from
Basin 8M

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	4.2	6.0	2.3
Major Total Design Peak Flow, Q (cfs)	11.4	17.9	5.4
Minor Flow Bypassed Downstream, Q_b (cfs)	0.2	0.0	0.9
Major Flow Bypassed Downstream, Q_b (cfs)	2.5	0.0	3.1

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 803	Basin 802	Basin 80
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{known} (cfs)	0.7	0.4	3.7
Major Q_{known} (cfs)	1.7	0.9	8.9

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Basin 804	Basin 803	Basin 802
Minor Bypass Flow Received, Q_b (cfs)	0.9	0.4	0.2
Major Bypass Flow Received, Q_b (cfs)	3.1	2.7	1.7

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.6	0.8	3.9
Major Total Design Peak Flow, Q (cfs)	4.8	3.6	10.7
Minor Flow Bypassed Downstream, Q_b (cfs)	0.4	0.2	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	2.7	1.7	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8P3	Basin 8P2	Basin 8P
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{known} (cfs)	0.8	0.6	1.7
Major Q_{known} (cfs)	1.9	1.4	4.0

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	Basin 8P3	Basin 8P2
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.2	0.1
Major Bypass Flow Received, Q_b (cfs)	0.0	0.6	0.7

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.8	0.8	1.8
Major Total Design Peak Flow, Q (cfs)	1.9	2.0	4.7
Minor Flow Bypassed Downstream, Q_b (cfs)	0.2	0.1	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.6	0.7	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8V	Basin 8Q	Basin 8U5
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	AREA	STREET
Hydraulic Condition	On Grade	Swale	On Grade
Inlet Type	Denver No. 16 Combination	CDOT TYPE D (Parallel)	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	2.1	2.6	0.5
Major Q_{Known} (cfs)	6.5	11.4	0.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Basin 8M	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.2	1.7	0.0
Major Bypass Flow Received, Q_b (cfs)	2.5	3.9	0.0

Receives captured flow from
Basin 8V**Watershed Characteristics**

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.4	4.3	0.5
Major Total Design Peak Flow, Q (cfs)	9.0	15.3	0.8
Minor Flow Bypassed Downstream, Q_b (cfs)	0.7	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	5.1	0.0	0.1

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8R3	Basin 8R2	Basin 8R
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	3.9	0.6	3.0
Major Q_{Known} (cfs)	9.1	1.4	8.2

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Basin 8V	Basin 8R3	User-Defined
Minor Bypass Flow Received, Q_b (cfs)	0.7	2.9	2.1
Major Bypass Flow Received, Q_b (cfs)	5.1	12.0	11.3

Bypass from Basin 8U5 and 8R2

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	4.6	3.5	5.1
Major Total Design Peak Flow, Q (cfs)	14.2	13.4	19.5
Minor Flow Bypassed Downstream, Q_b (cfs)	2.9	2.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	12.0	11.2	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8S	Basin 8T	Basin 8W
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	AREA	STREET
Hydraulic Condition	In Sump	Swale	In Sump
Inlet Type	Denver No. 16 Combination	CDOT TYPE D (Parallel)	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	3.7	2.1	1.6
Major Q_{Known} (cfs)	8.6	21.0	5.2

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	8.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	36.1	0.0

Includes captured flow from
upstream inlets**Watershed Characteristics**

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	3.7	10.1	1.6
Major Total Design Peak Flow, Q (cfs)	8.6	57.1	5.2
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin 8Y
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	3.6
Major Q_{Known} (cfs)	9.0

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0

Watershed Characteristics

Subcatchment Area (acres)	
Percent Impervious	
NRCS Soil Type	

Watershed Profile

Overland Slope (ft/ft)	
Overland Length (ft)	
Channel Slope (ft/ft)	
Channel Length (ft)	

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

CALCULATED OUTPUT

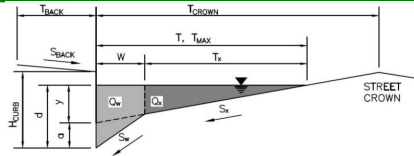
Minor Total Design Peak Flow, Q (cfs)	3.6
Major Total Design Peak Flow, Q (cfs)	9.0
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 7E

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.020	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_y =$	0.083	ft/ft
$S_0 =$	0.059	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

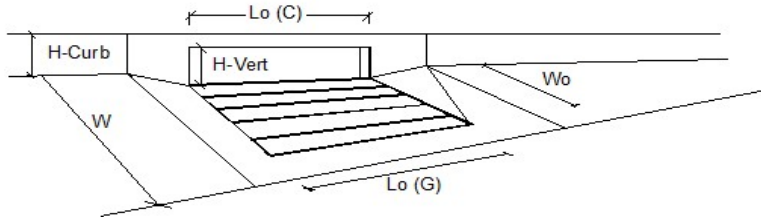
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	15.2	122.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.59 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.13 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



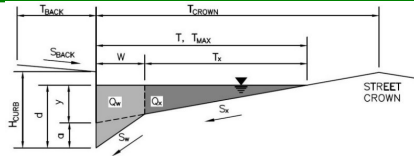
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q =	1.6	4.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.2	1.1	cfs
Capture Percentage = Q_i/Q_o		$C\%$ =	90	80	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 7D

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	19.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.020	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	17.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_y =$	0.083	ft/ft
$S_0 =$	0.059	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	12.0	17.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

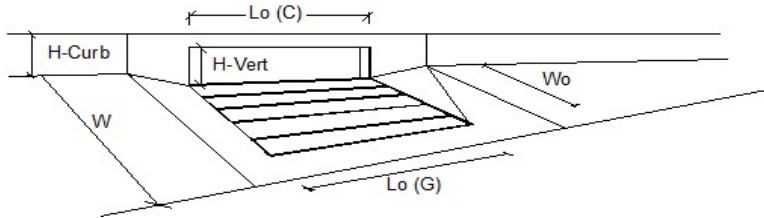
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	15.2	122.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.55 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 28.46 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

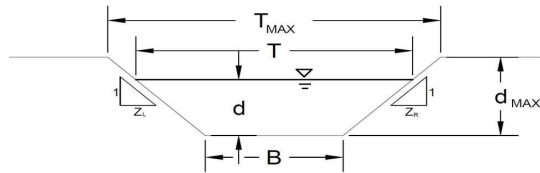


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_o =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q =	1.9	5.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	-0.4	-0.6	cfs
Capture Percentage = Q_i/Q_o		$C\%$ =	128	113	%

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2

Basin 7C



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

n =	0.200
S_0 =	0.0001 ft/ft
B =	3.00 ft
Z1 =	4.00 ft/ft
Z2 =	4.00 ft/ft

Choose One:

- ☒ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	60.00	60.00	ft
d_{MAX} =	15.00	15.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Top Width Criterion

MAJOR STORM Allowable Capacity is based on Top Width Criterion

	Minor Storm	Major Storm	
Q_{allow} =	39.5	39.5	cfs
d_{allow} =	7.13	7.13	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

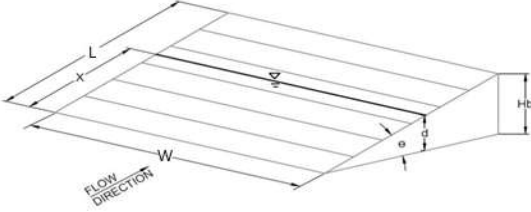
Q_o =	22.0	81.0	cfs
d =	5.65	9.43	ft

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2
Basin 7C

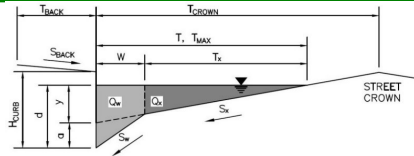
Inlet Design Information (Input)																					
Type of Inlet	User-Defined																				
Inlet Type = User-Defined																					
Angle of Inclined Grate (must be ≤ 30 degrees)	$\theta = 0.00$ degrees																				
Width of Grate	$W = 3.00$ ft																				
Length of Grate	$L = 6.00$ ft																				
Open Area Ratio	$A_{\text{RATIO}} = 0.70$																				
Height of Inclined Grate	$H_B = 0.00$ ft																				
Clogging Factor	$C_f = 0.50$																				
Grate Discharge Coefficient	$C_d = \text{N/A}$																				
Orifice Coefficient	$C_o = 0.64$																				
Weir Coefficient	$C_w = 2.05$																				
																					
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)																					
Total Inlet Interception Capacity (assumes clogged condition)																					
Bypassed Flow																					
Capture Percentage = Q_a/Q_o																					
	<table border="1"> <thead> <tr> <th></th> <th>MINOR</th> <th>MAJOR</th> <th></th> </tr> </thead> <tbody> <tr> <td>$d =$</td> <td>5.65</td> <td>9.43</td> <td></td> </tr> <tr> <td>$Q_a =$</td> <td>76.9</td> <td>99.4</td> <td>cfs</td> </tr> <tr> <td>$Q_b =$</td> <td>0.0</td> <td>0.0</td> <td>cfs</td> </tr> <tr> <td>$C\% =$</td> <td>100</td> <td>100</td> <td>%</td> </tr> </tbody> </table>		MINOR	MAJOR		$d =$	5.65	9.43		$Q_a =$	76.9	99.4	cfs	$Q_b =$	0.0	0.0	cfs	$C\% =$	100	100	%
	MINOR	MAJOR																			
$d =$	5.65	9.43																			
$Q_a =$	76.9	99.4	cfs																		
$Q_b =$	0.0	0.0	cfs																		
$C\% =$	100	100	%																		

Warning 02: Depth (d) exceeds USDCM Volume I recommendation.

Warning 06: Top Width (T) exceeds max allowable top width (Tmax).

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 2**Inlet ID: **Basin 7M****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_X =$	0.020	ft/ft
$S_W =$	0.083	ft/ft
$S_O =$	0.024	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.6	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

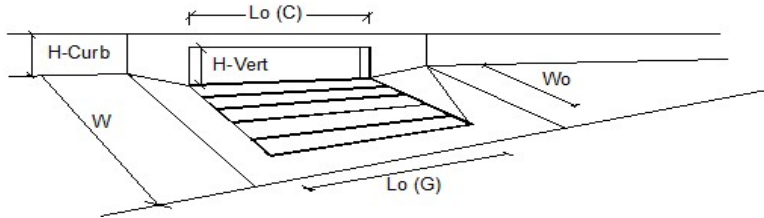
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	7.0	71.6	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.43 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.46 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



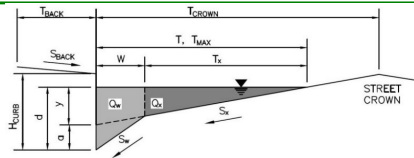
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')		2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$				
Total Inlet Interception Capacity		1.0	2.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		0.4	2.4	cfs
Capture Percentage = Q_i/Q_o		71	45	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 7J

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	5.5	9.4	inches
	☐	☐	

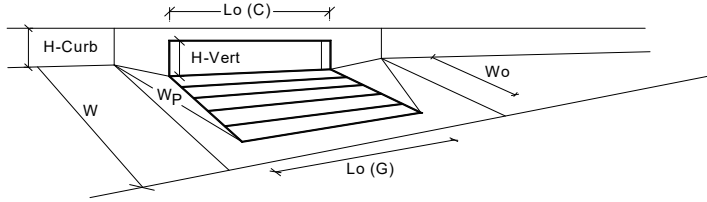
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

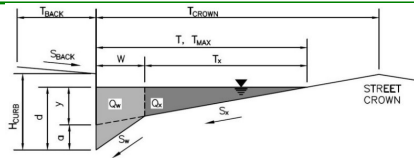
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	9.4	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	3.00	3.00	feet
Width of a Unit Grate		W _o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	5.25	5.25	inches
Angle of Throat		Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	0.48	0.81	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.29	0.62	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	0.52	0.89	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.52	0.89	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	6.8	26.6	cfs
		Q _{PEAK REQUIRED} =	6.2	16.3	cfs

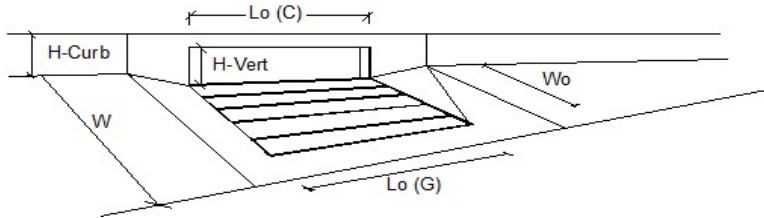
Inlet ID: Basin 7N



Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.21 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.81 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



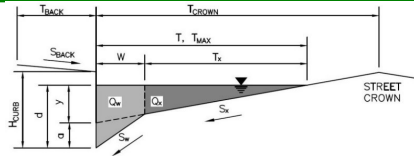
Design Information (Input)		MINOR		MAJOR
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL} =$	2.0	2.0 inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o =$	1	1
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o =$	3.00	3.00 ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o =$	1.73	1.73 ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G) =$	0.50	0.50
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C) =$	0.10	0.10
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		MINOR		MAJOR
Total Inlet Interception Capacity		$Q =$	0.7	1.4 cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_o =$	0.6	1.4 cfs
Capture Percentage = Q_i/Q_o		$C\% =$	54	51 %

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 7K

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	5.5	9.4	inches
	☐	☐	

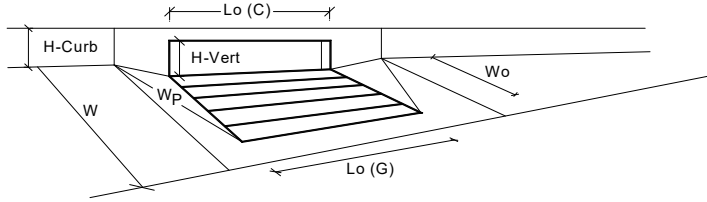
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



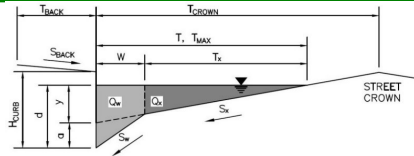
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} =$	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		$N_o =$	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	9.4	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) =$	3.00	3.00	feet
Width of a Unit Grate		$W_o =$	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} =$	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G) =$	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) =$	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) =$	0.60	0.60	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) =$	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert} =$	6.50	6.50	inches
Height of Curb Orifice Throat in Inches		$H_{throat} =$	5.25	5.25	inches
Angle of Throat		$\Theta =$	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p =$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) =$	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) =$	0.66	0.66	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} =$	0.48	0.81	ft
Depth for Curb Opening Weir Equation		$d_{Curb} =$	0.29	0.62	ft
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} =$	0.65	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} =$	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} =$	0.65	1.00	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_s =$	6.0	18.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED} =$	4.2	9.7	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 70

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_y =$	0.083	ft/ft
$S_o =$	0.049	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

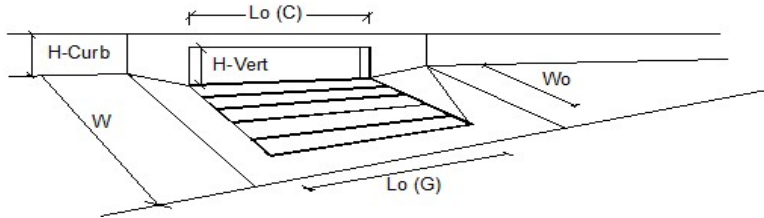
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	10.0	63.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.67 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.80 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

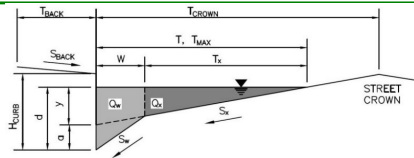
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a_{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L_o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (G)$ =	0.50	0.50	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		$C_f (C)$ =	0.10	0.10	
Total Inlet Interception Capacity		MINOR		MAJOR	
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q =	0.9	1.5	cfs
Capture Percentage = Q_i/Q_o		Q_o =	0.7	2.3	cfs
		$C\%$ =	55	40	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 2**Inlet ID: **Basin 8K3****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_y =$	0.083	ft/ft
$S_o =$	0.011	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

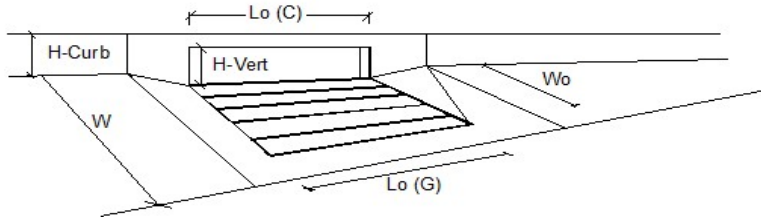
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	4.7	74.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.54 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.63 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

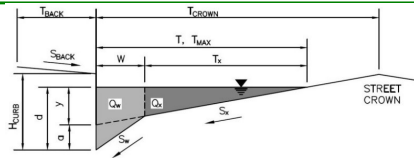
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Type =		Denver No. 16 Combination	
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_o =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$ =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q =	1.6	2.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_o =	1.0	4.0	cfs
Capture Percentage = Q_i/Q_o		$C\%$ =	62	39	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 2**Inlet ID: **Basin 8K2****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_o =$	0.083	ft/ft
$S_o =$	0.011	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

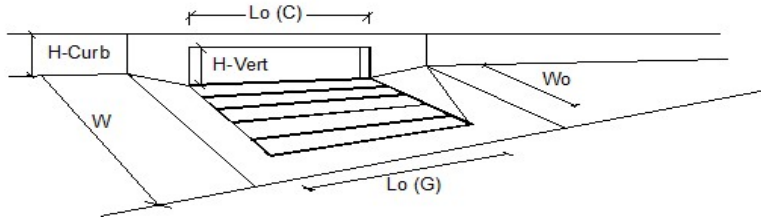
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	4.7	74.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.64 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.67 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

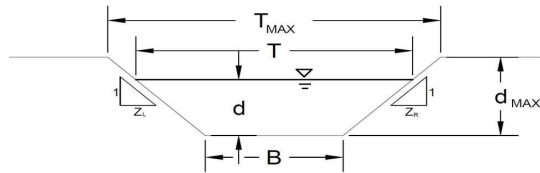


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL}	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q	1.2	2.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b	0.4	3.2	cfs
Capture Percentage = Q_i/Q_o		$C\%$	73	43	%

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2

Basin 8J



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

n =	0.200
S_0 =	0.0200 ft/ft
B =	2.00 ft
Z1 =	4.00 ft/ft
Z2 =	4.00 ft/ft

Choose One:

- ☐ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	18.00	18.00	ft
d_{MAX} =	2.00	2.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	22.2	22.2	cfs
d_{allow} =	2.00	2.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

Q_o =	1.8	8.8	cfs
d =	0.66	1.35	ft

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2
Basin 8J

Inlet Design Information (Input)

Type of Inlet

CDOT Type C

Inlet Type =

CDOT Type C

Angle of Inclined Gate (must be ≤ 30 degrees)

Width of Gate

Length of Gate

Open Area Ratio

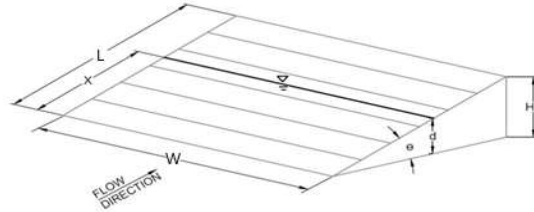
Height of Inclined Gate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient

 $\theta = 0.00$ degrees $W = 3.00$ ft $L = 3.00$ ft $A_{RATIO} = 0.70$ $H_g = 0.00$ ft $C_f = 0.50$ $C_d = 0.96$ $C_o = 0.64$ $C_w = 2.05$

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

Capture Percentage = Q_a/Q_o

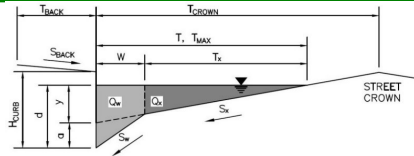
	MINOR	MAJOR	
$d =$	0.66	1.35	
$Q_a =$	9.9	18.8	cfs
$Q_b =$	0.0	0.0	cfs
$C\% =$	100	100	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8K

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.6	inches
	☐	☐	

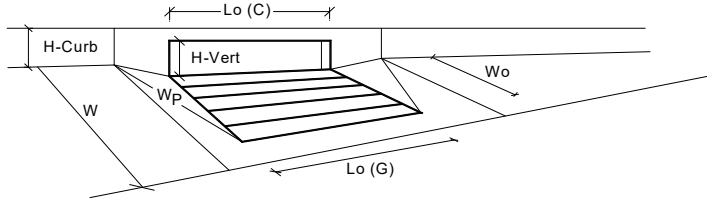
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

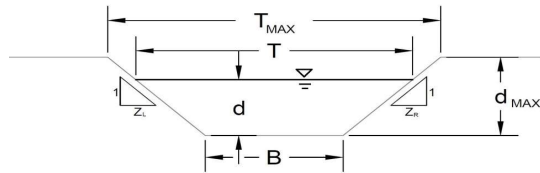


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		N_o =	5	5	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	8.6	inches
<u>Grate Information</u>			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		$L_o (G)$ =	3.00	3.00	feet
Width of a Unit Grate		W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G)$ =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	0.60	0.60	
<u>Curb Opening Information</u>			MINOR	MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	4.50	4.50	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	5.25	5.25	inches
Angle of Throat		Θ =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_o =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$ =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$ =	0.66	0.66	
<u>Low Head Performance Reduction (Calculated)</u>			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.36	0.74	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.17	0.55	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	0.38	0.81	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.38	0.81	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q_s =	4.4	37.6	cfs
		$Q_{PEAK REQUIRED}$ =	3.7	11.5	cfs

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2

Basin 7R



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

n =	0.200
S_o =	0.0400 ft/ft
B =	2.00 ft
Z1 =	4.00 ft/ft
Z2 =	4.00 ft/ft

Choose One:

- ☐ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	20.00	20.00	ft
d_{MAX} =	2.00	2.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	31.4	31.4	cfs
d_{allow} =	2.00	2.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

Q_o =	6.0	27.6	cfs
d =	0.98	1.90	ft

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2
Basin 7R

Inlet Design Information (Input)

Type of Inlet

CDOT Type D (In Series)

Inlet Type =

CDOT Type D (In Series)

Angle of Inclined Grate (must be ≤ 30 degrees)

Width of Grate

Length of Grate

Open Area Ratio

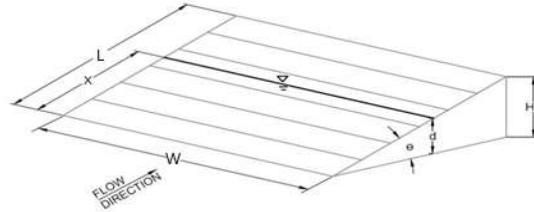
Height of Inclined Grate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient

 $\theta =$ 0.00 degrees $W =$ 3.00 ft $L =$ 6.00 ft $A_{\text{RATIO}} =$ 0.70 $H_B =$ 0.00 ft $C_f =$ 0.38 $C_d =$ 0.78 $C_o =$ 0.52 $C_w =$ 1.67

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

Capture Percentage = Q_a/Q_o

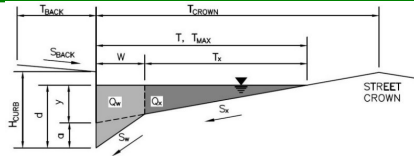
MINOR

MAJOR

 $d =$ 0.98 1.90 $Q_a =$ 28.8 45.3 cfs $Q_b =$ 0.0 0.0 cfs $C\% =$ 100 100 %

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Canyons Far South - Filing No. 2**Inlet ID: **Basin 7P****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.050	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

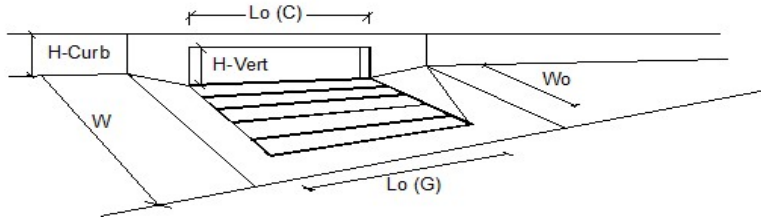
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	10.1	63.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.92 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.90 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



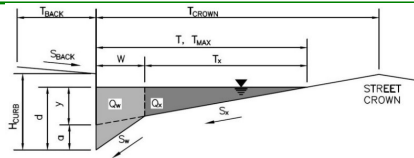
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a _{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L _o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W _o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (G) =	0.50	0.50	
		C _f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	1.3	1.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	1.6	5.0	cfs
Capture Percentage = Q _i /Q _a		C% =	45	28	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8U4

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_y =$	0.083	ft/ft
$S_o =$	0.050	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

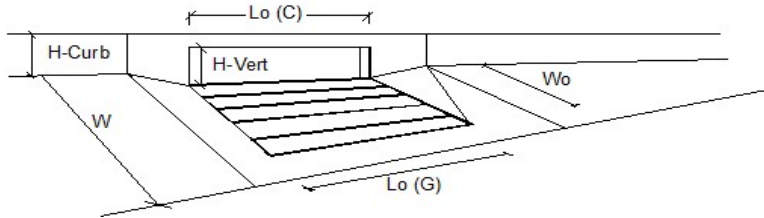
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	10.1	63.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.27 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.05 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



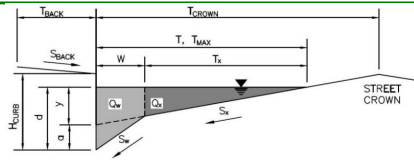
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a_{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L_o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (G)$ =	0.50	0.50	
		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	1.6	2.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	2.7	7.9	cfs
Capture Percentage = Q_i/Q_o		$C\%$ =	38	21	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8U3

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	5.5	9.4	inches
	☐	☐	

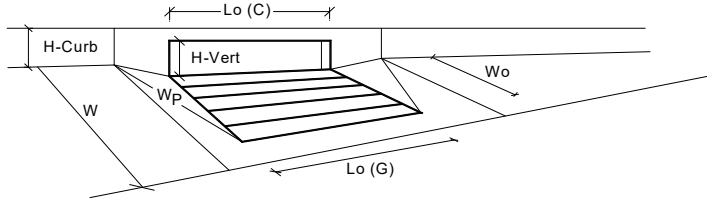
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



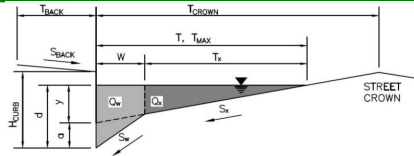
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} =$	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		$N_o =$	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	9.4	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) =$	3.00	3.00	feet
Width of a Unit Grate		$W_o =$	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} =$	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G) =$	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) =$	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) =$	0.60	0.60	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) =$	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert} =$	6.50	6.50	inches
Height of Curb Orifice Throat in Inches		$H_{throat} =$	5.25	5.25	inches
Angle of Throat		$\Theta =$	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p =$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) =$	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) =$	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} =$	0.48	0.81	ft
Depth for Curb Opening Weir Equation		$d_{Curb} =$	0.29	0.62	ft
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} =$	0.86	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} =$	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} =$	0.86	1.00	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_s =$	4.5	8.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED} =$	0.7	1.2	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8U2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	5.5	9.4	inches
	☐	☐	

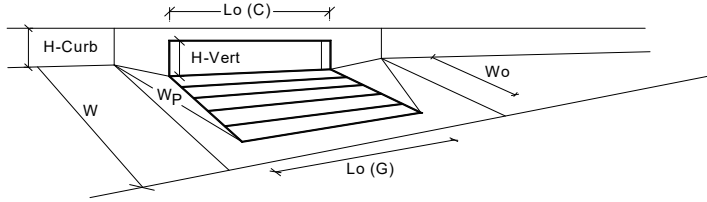
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



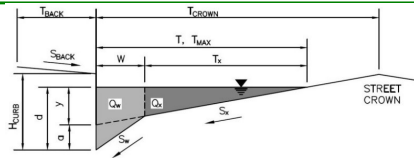
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} =$	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		$N_o =$	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	9.4	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) =$	3.00	3.00	feet
Width of a Unit Grate		$W_o =$	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} =$	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G) =$	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) =$	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) =$	0.60	0.60	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) =$	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert} =$	6.50	6.50	inches
Height of Curb Orifice Throat in Inches		$H_{throat} =$	5.25	5.25	inches
Angle of Throat		$\Theta =$	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p =$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) =$	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) =$	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} =$	0.47	0.81	ft
Depth for Curb Opening Weir Equation		$d_{Curb} =$	0.28	0.62	ft
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} =$	0.50	0.89	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} =$	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} =$	0.50	0.89	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_s =$	6.3	26.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED} =$	6.2	14.8	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8L

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.6	inches
	☐	☐	

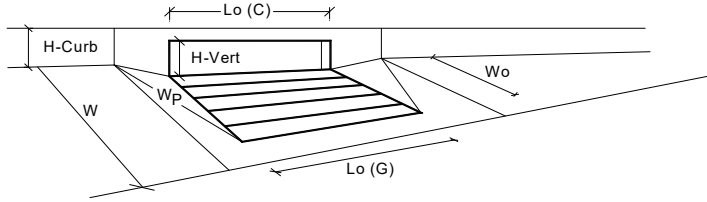
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



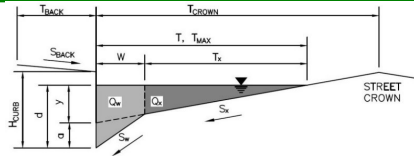
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} =$	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		$N_o =$	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	8.6	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) =$	3.00	3.00	feet
Width of a Unit Grate		$W_o =$	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} =$	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G) =$	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) =$	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) =$	0.60	0.60	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) =$	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert} =$	4.50	4.50	inches
Height of Curb Orifice Throat in Inches		$H_{throat} =$	5.25	5.25	inches
Angle of Throat		$\Theta =$	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_o =$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) =$	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) =$	0.66	0.66	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} =$	0.36	0.74	ft
Depth for Curb Opening Weir Equation		$d_{Curb} =$	0.17	0.55	ft
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} =$	0.38	0.81	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} =$	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} =$	0.38	0.81	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_s =$	2.7	23.1	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED} =$	2.4	5.7	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8M

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_y =$	0.083	ft/ft
$S_o =$	0.050	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

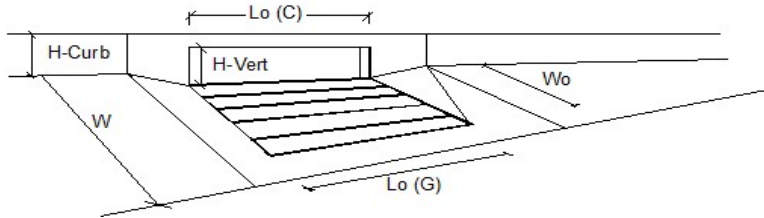
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	10.1	63.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.19 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 11.39 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

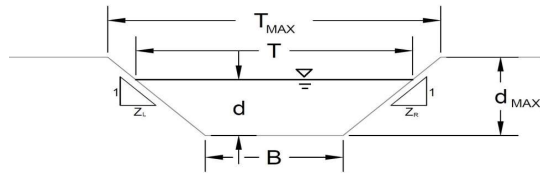


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	6	6	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity					
Total Inlet Interception Capacity		Q =	4.0	8.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	0.2	2.5	cfs
Capture Percentage = Q _i /Q _a		C% =	95	78	%

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2

Basin 8N



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

n =	0.200
S_o =	0.0200 ft/ft
B =	2.00 ft
Z1 =	4.00 ft/ft
Z2 =	4.00 ft/ft

Choose One:

- ☐ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	18.00	18.00	ft
d_{MAX} =	2.00	2.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	22.2	22.2	cfs
d_{allow} =	2.00	2.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

Q_o =	6.0	17.9	cfs
d =	1.14	1.83	ft

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2
Basin 8N

Inlet Design Information (Input)

Type of Inlet

CDOT TYPE D (Parallel)

Inlet Type =

CDOT TYPE D (Parallel)

Angle of Inclined Grate (must be ≤ 30 degrees)

Width of Grate

Length of Grate

Open Area Ratio

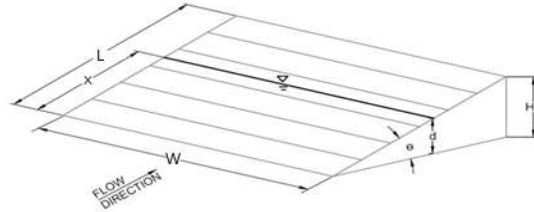
Height of Inclined Grate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient

 $\theta =$ 0.00 degrees

W = 6.00 ft

L = 3.00 ft

 $A_{\text{RATIO}} =$ 0.70 $H_B =$ 0.00 ft $C_f =$ 0.38 $C_d =$ 0.76 $C_o =$ 0.50 $C_w =$ 1.62

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

Capture Percentage = Q_a/Q_o

MINOR

MAJOR

d = 1.14 1.83

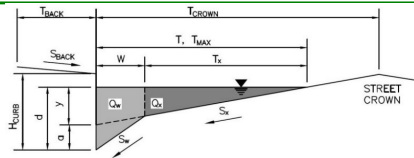
 $Q_a =$ 31.4 43.0 cfs $Q_b =$ 0.0 0.0 cfs $C\% =$ 100 100 %

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 804

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	6.5	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.012	

H_{CURB}	=	4.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_y	=	0.083	ft/ft
S_0	=	0.019	ft/ft
n_{STREET}	=	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

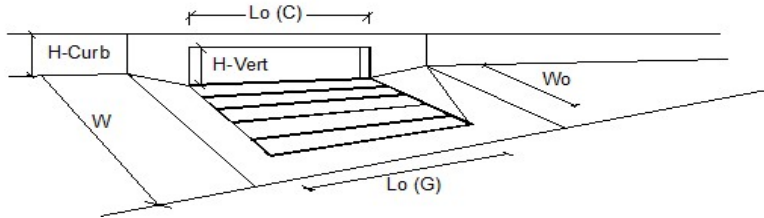
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow}	6.2	84.6	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.32 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.43 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



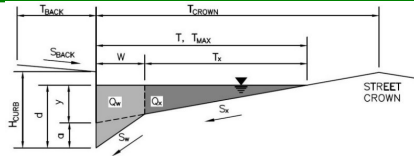
Design Information (Input)		MINOR		MAJOR		
Type of Inlet	Denver No. 16 Combination	Type =	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	2.0	2.0	inches	
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1		
Length of a Single Unit Inlet (Grate or Curb Opening)		L _o =	3.00	3.00	ft	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _o =	1.73	1.73	ft	
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	0.50	0.50		
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10		
Street Hydraulics: OK - Q < Allowable Street Capacity						
			MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	1.5	2.3	cfs	
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	0.9	3.1	cfs	
Capture Percentage = Q _i /Q _a		C% =	63	42	%	

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 803

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.019	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

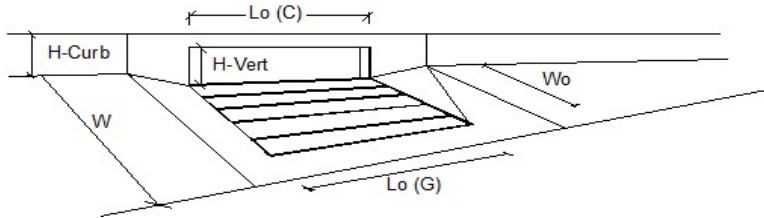
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	6.2	84.6	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.56 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.84 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



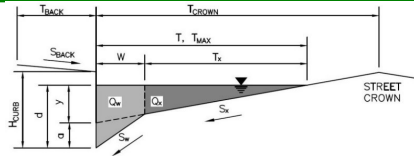
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL}	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q	1.1	2.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b	0.4	2.7	cfs
Capture Percentage = Q_i/Q_o		$C\%$	72	45	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 802

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.019	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

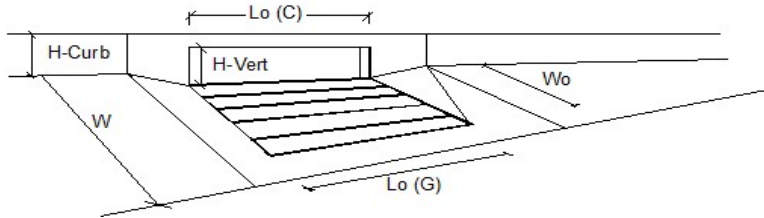
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	6.2	84.6	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.81 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.61 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



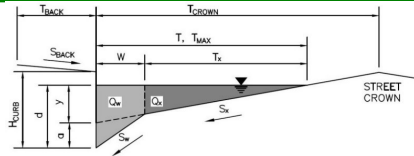
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a_{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L_o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (G)$ =	0.50	0.50	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		$C_f (C)$ =	0.10	0.10	
Total Inlet Interception Capacity		MINOR		MAJOR	
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q =	0.6	1.9	cfs
Capture Percentage = Q_i/Q_o		Q_o =	0.2	1.7	cfs
		$C\%$ =	78	52	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 80

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.6	inches
	☐	☐	

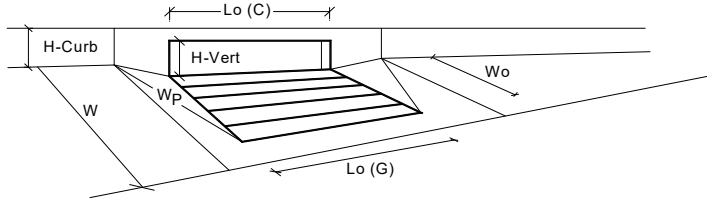
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



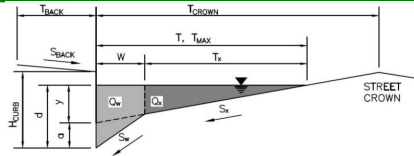
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination				
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		N _o =	5	5	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	8.6	inches
Grate Information		☒ Override Depths			
Length of a Unit Grate		L _o (G) =	3.00	3.00	feet
Width of a Unit Grate		W _o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	0.60	0.60	
Curb Opening Information					
Length of a Unit Curb Opening		L _o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	4.50	4.50	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	5.25	5.25	inches
Angle of Throat		Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)					
Depth for Grate Midwidth		d _{Grate} =	0.36	0.74	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.17	0.55	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	0.38	0.81	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.38	0.81	
Total Inlet Interception Capacity (assumes clogged condition)					
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)					
		MINOR		MAJOR	
		Q _s =	4.4	37.6	cfs
		Q _{PEAK REQUIRED} =	3.9	10.7	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8P3

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_o =$	0.083	ft/ft
$S_y =$	0.019	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

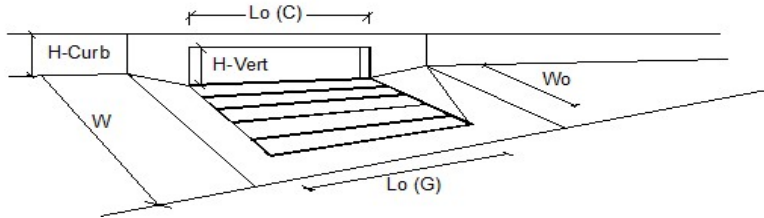
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	6.2	84.6	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.81 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.90 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



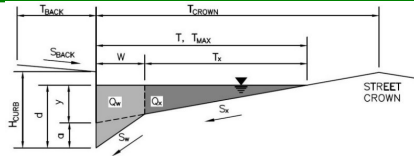
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a_{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L_o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (G)$ =	0.50	0.50	
		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	0.6	1.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.2	0.6	cfs
Capture Percentage = Q_i/Q_o		$C\%$ =	78	67	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Baisn 8P2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_y =$	0.083	ft/ft
$S_o =$	0.019	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

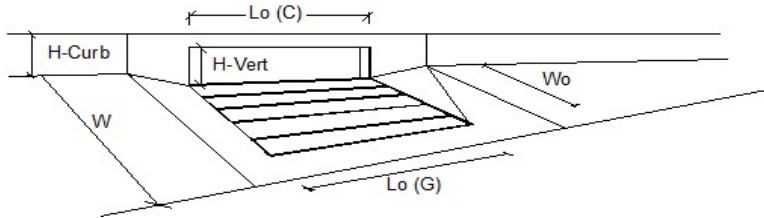
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	6.2	84.6	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.76 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.98 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



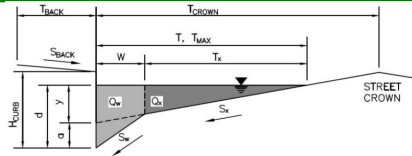
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a _{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L _o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W _o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (G) =	0.50	0.50	
		C _f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	0.6	1.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	0.1	0.7	cfs
Capture Percentage = Q _i /Q _a		C% =	85	66	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8P

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.6	inches
	☐	☐	

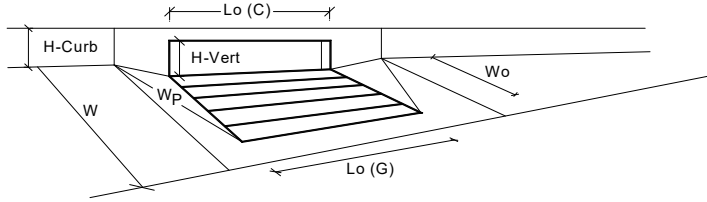
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



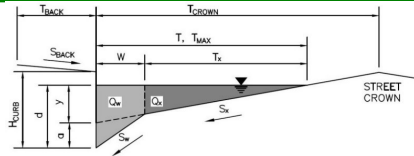
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} =$	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		$N_o =$	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	8.6	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) =$	3.00	3.00	feet
Width of a Unit Grate		$W_o =$	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} =$	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G) =$	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) =$	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) =$	0.60	0.60	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) =$	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert} =$	4.50	4.50	inches
Height of Curb Orifice Throat in Inches		$H_{throat} =$	5.25	5.25	inches
Angle of Throat		$\Theta =$	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p =$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) =$	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) =$	0.66	0.66	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} =$	0.36	0.74	ft
Depth for Curb Opening Weir Equation		$d_{Curb} =$	0.17	0.55	ft
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} =$	0.47	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} =$	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} =$	0.47	1.00	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_s =$	2.3	17.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED} =$	1.8	4.7	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8V

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	6.5	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.012	

H_{CURB}	=	4.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_y	=	0.083	ft/ft
S_o	=	0.050	ft/ft
n_{STREET}	=	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

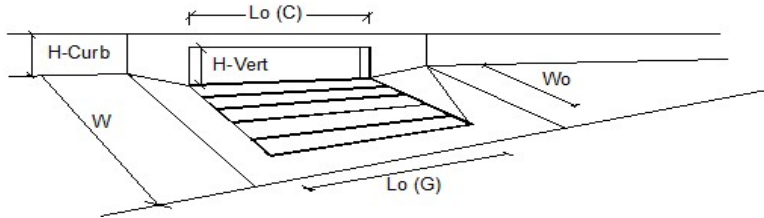
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow}	10.1	63.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.36 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.95 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

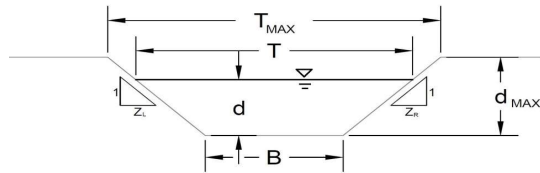


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a_{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	3	3	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L_o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (G)$ =	0.50	0.50	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		$C_f (C)$ =	0.10	0.10	
Total Inlet Interception Capacity		MINOR		MAJOR	
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q =	1.7	3.9	cfs
Capture Percentage = Q_i/Q_o		Q_o =	0.7	5.1	cfs
		$C\%$ =	70	43	%

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2

Basin 8Q



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

n =	0.200
S_0 =	0.0200 ft/ft
B =	2.00 ft
Z1 =	4.00 ft/ft
Z2 =	4.00 ft/ft

Choose One:

- ☐ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	18.00	18.00	ft
d_{MAX} =	2.00	2.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	22.2	22.2	cfs
d_{allow} =	2.00	2.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

Q_o =	4.3	15.3	cfs
d =	0.98	1.71	ft

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2
Basin 8Q

Inlet Design Information (Input)

Type of Inlet

CDOT TYPE D (Parallel)

Inlet Type =

CDOT TYPE D (Parallel)

Angle of Inclined Grate (must be ≤ 30 degrees)

Width of Grate

Length of Grate

Open Area Ratio

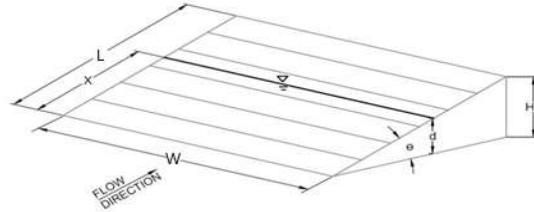
Height of Inclined Grate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient

 $\theta =$ 0.00 degrees

W = 6.00 ft

L = 3.00 ft

 $A_{RATIO} =$ 0.70 $H_B =$ 0.00 ft $C_f =$ 0.38 $C_d =$ 0.76 $C_o =$ 0.50 $C_w =$ 1.62

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

Capture Percentage = Q_a/Q_o

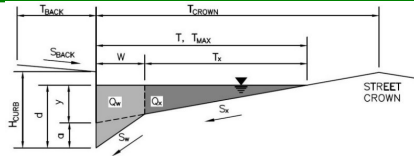
	MINOR	MAJOR	
d =	0.98	1.71	
$Q_a =$	25.2	41.7	cfs
$Q_b =$	0.0	0.0	cfs
C% =	100	100	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8U5

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.050	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

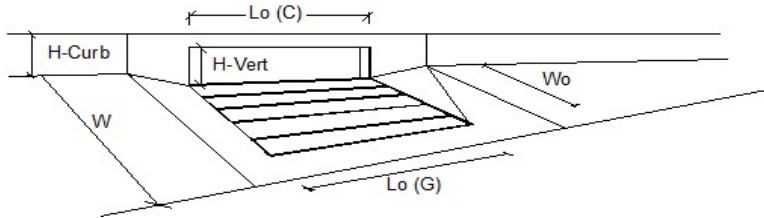
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	10.1	63.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.55 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.78 cfs on sheet 'Inlet Management'**

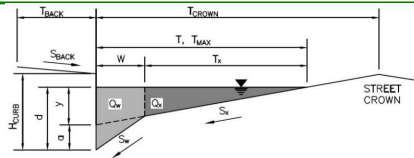
INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a _{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	3	3	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L _o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W _o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (G) =	0.50	0.50	
		C _f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	0.5	0.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	0.0	0.1	cfs
Capture Percentage = Q _i /Q _a		C% =	92	86	%

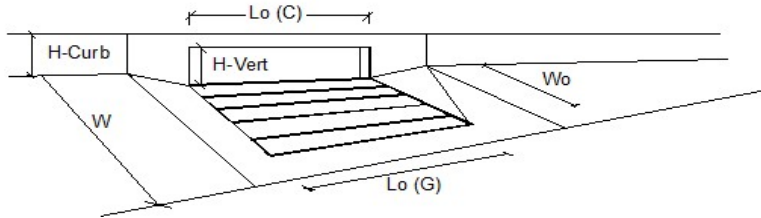
Inlet ID: Basin 8R3



Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.57 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.19 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



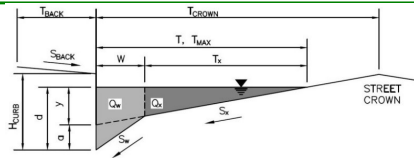
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL}	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q	1.7	2.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b	2.9	12.0	cfs
Capture Percentage = Q_i/Q_o		$C\%$	36	15	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8R2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.050	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Depth Criterion

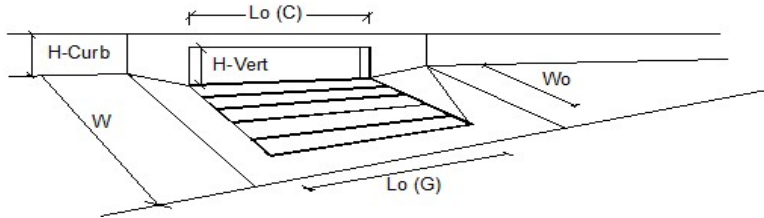
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	10.1	63.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.48 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 13.43 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



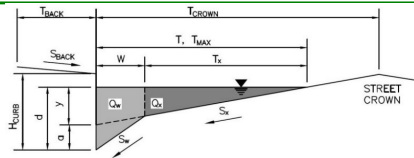
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a')		Type =			
Total Number of Units in the Inlet (Grate or Curb Opening)		a_{LOCAL} =	2.0	2.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)		No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		L_o =	3.00	3.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (G)$ =	0.50	0.50	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		$C_f (C)$ =	0.10	0.10	
Total Inlet Interception Capacity		MINOR		MAJOR	
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q =	1.5	2.2	cfs
Capture Percentage = Q_i/Q_o		Q_o =	2.0	11.2	cfs
		$C\%$ =	42	16	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8R

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.6	inches
	☐	☐	

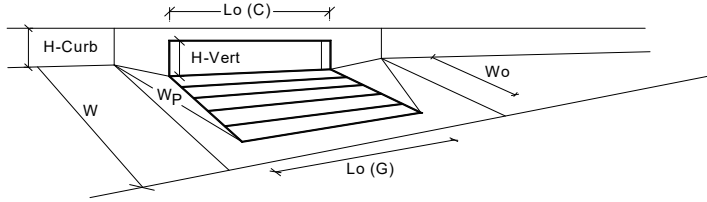
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



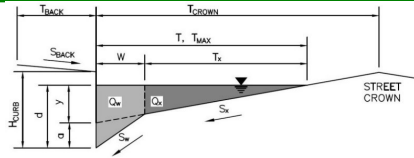
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		N _o =	6	6	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	8.6	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	3.00	3.00	feet
Width of a Unit Grate		W _o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	4.50	4.50	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	5.25	5.25	inches
Angle of Throat		Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	0.36	0.74	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.17	0.55	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	0.38	0.81	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.38	0.81	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	5.2	44.6	cfs
		Q _{PEAK REQUIRED} =	5.1	19.5	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8S

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	4.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	4.0	8.6	inches
	☐	☐	

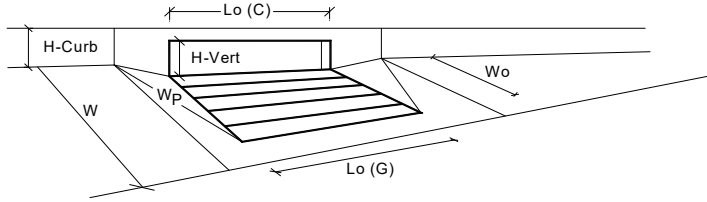
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

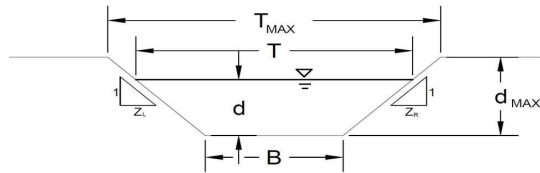


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} =$	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		$N_o =$	5	5	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	8.6	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) =$	3.00	3.00	feet
Width of a Unit Grate		$W_o =$	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} =$	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G) =$	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) =$	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) =$	0.60	0.60	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) =$	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert} =$	4.50	4.50	inches
Height of Curb Orifice Throat in Inches		$H_{throat} =$	5.25	5.25	inches
Angle of Throat		$\Theta =$	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_o =$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) =$	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) =$	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} =$	0.36	0.74	ft
Depth for Curb Opening Weir Equation		$d_{Curb} =$	0.17	0.55	ft
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} =$	0.38	0.81	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} =$	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} =$	0.38	0.81	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_s =$	4.4	37.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED} =$	3.7	8.6	cfs

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2

Basin 8T



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

n =	0.200
S_0 =	0.0010 ft/ft
B =	3.00 ft
Z1 =	5.00 ft/ft
Z2 =	12.00 ft/ft

Choose One:

- ☐ Non-Cohesive
☒ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	22.00	22.00	ft
d_{MAX} =	2.00	2.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Top Width Criterion

MAJOR STORM Allowable Capacity is based on Top Width Criterion

	Minor Storm	Major Storm	
Q_{allow} =	2.4	2.4	cfs
d_{allow} =	1.12	1.12	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

Q_o =	10.1	57.1	cfs
d =	2.02	4.01	ft

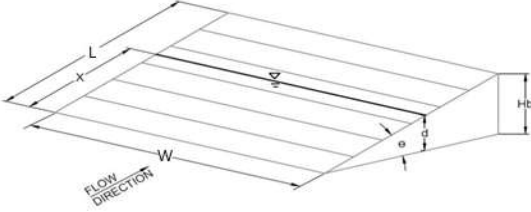
Warning 05

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Canyons Far South - Filing No. 2
Basin 8T

Inlet Design Information (Input)																
Type of Inlet	CDOT TYPE D (Parallel)															
Inlet Type = CDOT TYPE D (Parallel)																
Angle of Inclined Grate (must be ≤ 30 degrees)	$\theta = 0.00$ degrees															
Width of Grate	$W = 6.00$ ft															
Length of Grate	$L = 3.00$ ft															
Open Area Ratio	$A_{\text{RATIO}} = 0.70$															
Height of Inclined Grate	$H_B = 0.00$ ft															
Clogging Factor	$C_f = 0.38$															
Grate Discharge Coefficient	$C_d = 0.76$															
Orifice Coefficient	$C_o = 0.50$															
Weir Coefficient	$C_w = 1.62$															
																
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	<table border="1"> <thead> <tr> <th></th> <th>MINOR</th> <th>MAJOR</th> </tr> </thead> <tbody> <tr> <td>$d =$</td> <td>2.02</td> <td>4.01</td> </tr> <tr> <td>$Q_a =$</td> <td>45.3</td> <td>63.8</td> </tr> <tr> <td>$Q_b =$</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <td>$C\% =$</td> <td>100</td> <td>100</td> </tr> </tbody> </table>		MINOR	MAJOR	$d =$	2.02	4.01	$Q_a =$	45.3	63.8	$Q_b =$	0.0	0.0	$C\% =$	100	100
	MINOR	MAJOR														
$d =$	2.02	4.01														
$Q_a =$	45.3	63.8														
$Q_b =$	0.0	0.0														
$C\% =$	100	100														
Total Inlet Interception Capacity (assumes clogged condition)																
Bypassed Flow																
Capture Percentage = Q_a/Q_o																

Warning 05: Depth (d) exceeds max allowable depth (dmax).

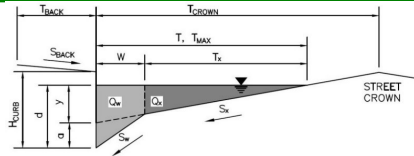
Warning 06: Top Width (T) exceeds max allowable top width (Tmax).

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8W

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	5.5	9.4	inches
	☐	☐	

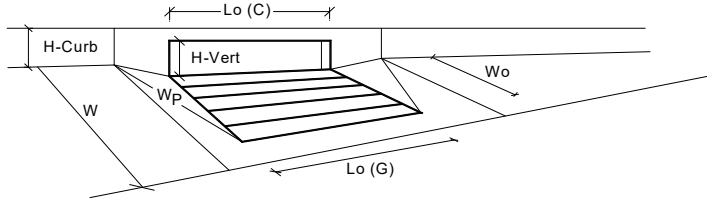
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



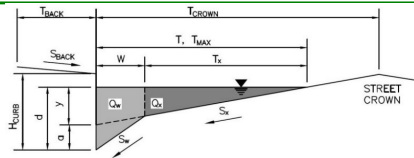
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Denver No. 16 Combination			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} =$	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		$N_o =$	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	9.4	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) =$	3.00	3.00	feet
Width of a Unit Grate		$W_o =$	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} =$	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G) =$	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) =$	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) =$	0.60	0.60	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) =$	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert} =$	6.50	6.50	inches
Height of Curb Orifice Throat in Inches		$H_{throat} =$	5.25	5.25	inches
Angle of Throat		$\Theta =$	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p =$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) =$	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) =$	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} =$	0.48	0.81	ft
Depth for Curb Opening Weir Equation		$d_{Curb} =$	0.29	0.62	ft
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} =$	0.86	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} =$	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} =$	0.86	1.00	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_s =$	4.5	8.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED} =$	1.6	5.2	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Canyons Far South - Filing No. 2

Inlet ID: Basin 8Y

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	6.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.012	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	16.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.012	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	16.0	16.0	ft
$d_{MAX} =$	5.5	9.4	inches
	☐	☐	

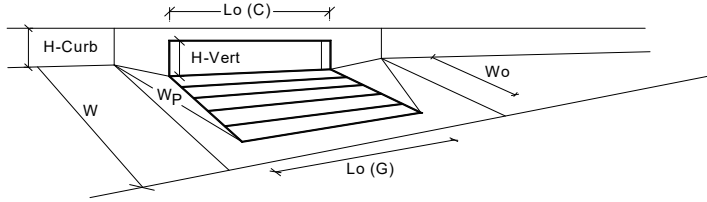
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		N_o =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	9.4	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		$L_o (G)$ =	3.00	3.00	feet
Width of a Unit Grate		W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G)$ =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	5.25	5.25	inches
Angle of Throat		Θ =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_o =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$ =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$ =	0.66	0.66	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.48	0.81	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.29	0.62	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	0.65	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.65	1.00	
Total Inlet Interception Capacity (assumes clogged condition)		Q_s =	6.0	18.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED}$ =	3.6	9.0	cfs

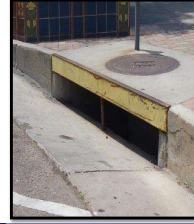
INLET PICTURES



CDOT Type R Curb Opening



Denver No. 14 Curb Opening



Colorado Springs D-10-R



CDOT/Denver 13 Valley Grate



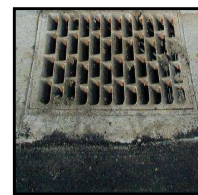
CDOT/Denver 13 Combination



Denver No. 16 Combination



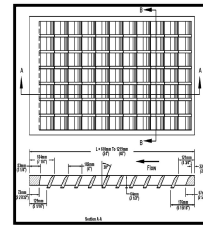
Wheat Ridge Combination Inlet



Denver No. 16 Valley Grate



Directional Cast Vane Grate



Directional 30-Degree Bar Grate (courtesy H&C-22)



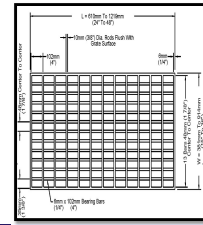
Directional 45-Degree Bar Grate



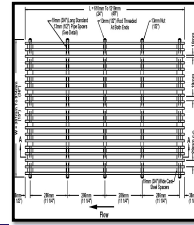
Reticulate Riveted Grate



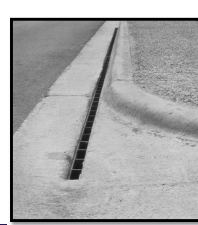
1-7/8" Bar Grate, Crossbars @ 8"



1-7/8" Bar Grate, Crossbars @ 4" (courtesy H&C-22)



1-1/8 in. Bar Grate, Crossbars @ 8 in. (courtesy H&C-22)



Slotted Inlet Parallel to Flow



CDOT Type C Orifice (Close Mesh)



CDOT Type C Orifice



CUUJ1 Type C Inlet



CUUJ1 Type C Inlet in Depression



CDOT Type D Inlet in Series (Flat & Depressed)



CDOT Type D Inlet in Series (10° Incline & Depressed)



CDOT Type D Inlet in Series (20° Incline & Depressed)



CDOT Type D Inlet in Series (30° Incline & Depressed)



CDOT Type D Inlet Parallel (Flat & Depressed)



CDOT Type D Inlet Parallel (10° Incline & Depressed)



CDOT Type D Inlet Parallel (20° Incline & Depressed)



CDOT Type D Inlet Parallel (30° Incline & Depressed)

Stormwater Studio Report
Storm Sewer Junction Losses: 3rd Edition of HEC-22
Canyons Far South Filing No. 2
Minor Storm Event - 5-yr

Line No.	Area ID	InletID	Inlet ID DownStr	Known Q (from Runoff Calculations Spreadsheet or Inlet Calculations Spreadsheet)	Flow Rate (Combined Flow)	Capac. Full	Line Size	Line Slope	Line Length	Line Type	Vel Ave	Invert Up	Invert Dn	Energy Loss	HGL Up	HGL Dn	EGL Up	EGL Dn	Grnd/Rim Elev Up	Grnd/Rim Elev Dn
				(cfs)	(cfs)	(cfs)	(in)	(ft/ft)	(ft)		(ft/s)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
1	0	MH-72		0	6.78	81.69	30	3.97	44.66	Cir	2.92	6419.77	6418	0.422	6420.64	6420.5	6420.95	6420.53	6425.2	6420.96
2	Basin 7N	IN-73	MH-72	0.7	6.78	87.45	30	4.55	125.18	Cir	4.46	6425.66	6419.97	5.692	6426.53	6420.84	6426.84	6421.15	6436.44	6425.2
3	Basin 7M	IN-72	IN-73	1	6.08	81.71	30	3.97	33.84	Cir	4.15	6427.21	6425.86	1.337	6428.03	6426.74	6428.32	6426.98	6436.44	6436.44
4	Basin 7L	FES-50	IN-72	5.08	5.08	76.85	30	3.51	158.78	Cir	3.85	6432.98	6427.41	5.562	6433.74	6428.23	6433.99	6428.43	6435.94	6436.44
5	0	MH-75		0	2.2	28.76	18	7.5	176.33	Cir	3.6	6395.5	6382.28	13.225	6396.07	6382.84	6396.27	6383.05	6411.23	6384.57
6	0	IN-79	MH-75	0	2.2	28.12	18	7.17	110.75	Cir	3.6	6403.9	6395.95	7.943	6404.46	6396.52	6404.66	6396.72	6413.84	6411.23
7	Basin 7P	MH-314	IN-79	1.3	2.2	21.86	18	4.33	61.22	Cir	3.6	6407.29	6404.64	2.651	6407.85	6405.2	6408.06	6405.4	6417.04	6413.84
8	Basin 7O	IN-78	MH-314	0.9	0.9	7.43	18	0.5	31.35	Cir	2.72	6408.2	6408.04	0.157	6408.56	6408.4	6408.67	6408.52	6417.04	6417.04
9	0	MH-80		0	43.1	162.11	48	1.27	74.6	Cir	7.12	6339.5	6338.55	0.95	6341.44	6340.49	6342.23	6341.28	6352.45	6342.73
10	Basin 8S	IN-88	MH-80	3.7	43.1	370.53	48	6.65	88	Cir	7.12	6350.21	6344.36	5.855	6352.15	6346.3	6352.94	6347.09	6362.38	6352.45
11	Basin 8R	IN-87	IN-88	5.1	39.4	159.85	48	1.24	33.83	Cir	6.9	6350.92	6350.5	0.419	6352.78	6352.36	6353.52	6353.1	6362.38	6362.38
12	Basin 8Q	IN-86	IN-87	4.31	31.1	147.34	48	1.05	33.37	Cir	5.83	6351.77	6351.42	0.298	6353.32	6353.42	6354.05	6353.76	6359.93	6362.38
13	0	MH-79	IN-86	0	26.79	186.82	42	3.45	126.3	Cir	6.33	6356.63	6352.27	4.355	6358.21	6353.86	6358.84	6354.48	6366.26	6359.93
14	0	MH-78	MH-79	0	26.79	275.53	42	7.5	80	Cir	6.33	6364.63	6358.63	6	6366.21	6360.21	6366.84	6360.84	6376.85	6366.26
15	Basin 8P	IN-85	MH-78	1.8	26.79	275.51	42	7.5	77.63	Cir	6.33	6372.65	6366.83	5.822	6374.24	6368.41	6374.86	6369.04	6384.53	6376.85
16	Basin 8O	IN-84	IN-85	3.9	24.99	100.53	42	1	33.84	Cir	6.18	6373.51	6373.17	0.338	6375.04	6374.7	6375.63	6375.29	6384.53	6384.53
17	Basin 8N	IN-83	IN-84	6	16.69	96.41	42	0.92	36.48	Cir	4.42	6374.09	6373.76	0.107	6375.35	6375.5	6375.8	6375.69	6381.8	6384.53
18	0	MH-77	IN-83	0	10.69	19.3	24	0.73	83.19	Cir	5.67	6376.2	6375.59	0.606	6377.35	6376.75	6377.85	6377.25	6381.89	6381.8
19	0	MH-76	MH-77	0	10.69	61.94	24	7.5	104.17	Cir	5.35	6384.21	6376.4	7.795	6385.37	6377.68	6385.87	6378.07	6398.25	6381.89
20	Basin 8L	IN-82	MH-76	2.4	10.69	62.2	24	7.56	76.09	Cir	5.67	6397.31	6391.56	5.754	6398.47	6392.72	6398.97	6393.22	6407.57	6398.25
21	Basin 8K	IN-81	IN-82	3.7	8.29	42.33	24	3.5	33.84	Cir	5.09	6398.8	6397.61	1.185	6399.82	6398.65	6400.23	6399.05	6407.58	6407.57
22	0	MH-307	IN-81	0	2.8	7.42	18	0.5	6.26	Cir	2.68	6399.31	6399.28	0.011	6400.15	6400.15	6400.27	6400.26	6407.63	6407.58
23	Basin 8K2	MH-309	MH-307	1.2	2.8	8.13	18	0.6	98.91	Cir	3.9	6400.16	6399.56	0.593	6400.8	6400.2	6401.03	6400.44	6408.73	6407.63
24	Basin 8K3	MH-308	MH-309	1.6	1.6	10.5	18	1	96.67	Cir	3.2	6401.38	6400.42	0.965	6401.86	6400.91	6402.03	6401.06	6409.83	6408.73
25	Basin 8J	IN-80	IN-81	1.79	1.79	19.69	18	3.52	29.3	Cir	2.47	6400.31	6399.28	0.752	6400.82	6400.2	6401	6400.24	6405.86	6407.58
26	0	IN-90		0	2	20.75	18	3.9	76.56	Cir	2.31	6397.98	6394.99	2.199	6398.52	6396.49	6398.71	6396.51	6402.44	6396.82
27	Basin 8M	IN-95	IN-90	2	2	10.45	18	0.99	7.99	Cir	3.48	6398.56	6398.48	0.08	6399.1	6399.02	6399.29	6399.21	6403.57	6402.44
28	0	MH-71		0	10.4	23.65	18	5.07	173.9	Cir	6.7	6375.6	6366.78	8.823	6376.83	6368.01	6377.53	6368.71	6382.95	6368.63
29	0	MH-70	MH-71	0	10.4	25.96	18	6.11	107.75	Cir	6.7	6384.19	6377.6	6.587	6385.42	6378.83	6386.12	6379.53	6398.5	6382.95
30	Basin 7K	IN-71	MH-70	4.2	10.4	15.1	18	2.07	46.24	Cir	6.7	6391.14	6390.19	0.956	6392.37	6391.42	6393.07	6392.12	6404.38	6398.5
31	Basin 7J	IN-70	IN-71	6.2	6.2	7.51	18	0.51	33	Cir	4.02	6391.81	6391.64	0.117	6393	6392.91	6393.26	6393.15	6404.38	6404.38
32	0	MH-83		0	54.36	388.92	60	2.23	126.63	Cir	7.14	6369.6	6366.78	2.823	6371.66	6368.84	6372.45	6369.63	6381.85	6372.67
33	Basin 7C	IN-94	MH-83	23.22	54.36	531.55	60	4.16	255.52	Cir	7.14	6382.58	6371.94	10.641	6384.64	6374	6385.43	6374.79	6391.7	6381.85
34	Basin 7A2	HW-3	IN-94	31.14	31.14	541.26	60	4.32	64.95	Cir	4.57	6385.63	6382.83	2.263	6387.19	6385.33	6387.75	6385.48	6391.53	6391.7
35	0	MH-300	IN-84	0	4.4	7.43	18	0.5	5.17	Cir	4.38	6375.5	6375.47	0.026	6376.33	6376.3	6376.63	6376.6	6384.59	6384.53
36	Basin 8O2	MH-303	MH-300	0.6	4.4	7.43	18	0.5	45.41	Cir	4.38	6375.98	6375.75	0.227	6376.81	6376.58	6377.11	6376.88	6385.35	6384.59
37	Basin 8O3	MH-302	MH-303	1.1	3.2	13.05	18	1.55	53.4	Cir	3.44	6377.05	6376.23	0.72	6377.74	6377.16	6378	6377.28	6386.5	6385.35
38	0	MH-305	MH-302	0	2.1	13.57	18	1.67	84.7	Cir	3.55	6378.85	6377.44	1.414	6379.4	6377.99	6379.6	6378.19	6387.91	6386.5
39	Basin 8P3	MH-304	MH-305	0.6	0.6	7.41	18	0.5	32.71	Cir	1.64	6379.26	6379.1	0.056	6379.6	6379.58	6379.66	6379.61	6388.22	6387.91
40	Basin 8O4	MH-301	MH-305	1.5	1.5	22.5	18	4.59	16.65	Cir	3.19	6379.87	6379.1	0.764	6380.33	6379.57	6380.49	6379.73	6388.59	6387.91
41	Basin 8V	IN-93		1.77	1.77	13.62	18	1.68	77.01	Cir	2.18	6378	6376.7	0.464	6378.51	6378.2	6378.68	6378.22	6382.77	6378.54
42	Basin 8P2	MH-306	MH-303	0.6	0.6	7.44	18	0.5	33.84	Cir	0.53	6376.4	6376.23	0.001	6377.24	6377.24	6377.24	6377.24	6385.35	6385.35
43	Basin 8Y	IN-92		3.64	8.01	23.66	24	1.09	75.41	Cir	3.39	6370.58	6369.75	0.164	6371.74	6371.75	6372.02	6371.86	6381.58	6372.13
44	Basin 8W	IN-91	IN-92	1.56	4.37	33.37	24	2.18	33	Cir	3.1	6371.6	6370.88	0.387	6372.34	6372.15	6372.6	6372.22	6381.58	6381.58
45	Basin 8T2	FES-54	IN-91	2.81	2.81	59.58	24	6.94	43.23	Cir	3.6	6376.6	6373.6	3	6377.2	6374.2	6377.4	6374.4	6378.98	6381.58
46	0	MH-298		0	71.1	338.34	48	5.55	186.98	Cir	8.63	6350.05	6339.68	10.373	6352.54	6342.17	6353.7	6343.33	6369.97	6344.43
47	0	MH-74	MH-298	0	2.1	26.94	18	6.58	76.33	Cir	3.55	6362.05	6357.02	5.025	6362.6	6357.57	6362.79	6357.77	6372.58	6369.97
48	0	MH-73	MH-74	0	2.1	21.57	18	4.22	127	Cir	3.55	6367.66	6362.3	5.359	6368.21	6362.85	6368.41	6363.05	6376.49	6372.58
49	Basin 8U4	IN-77	MH-73	1.6	2.1	19.42	18	3.42	75.66	Cir	3.55	6371	6368.41	2.587	6371.55	6368.97	6371.75	6369.16	6380.42	6376.49
50	Basin 8U5	IN-76	IN-77	0.5	0.5	7.38	18	0.49	33.84	Cir	1.36	6371.42	6371.25	0.041	6371.75	6371.74	6371.79	6371.75	6380.42	6380.42
51	0	MH-313	IN-88	0	0	16.77	18	2.55	1.34	Cir	0	6361.66	6361.63	0.034	6361.66	6361.63	6361.66	6361.63	6363.41	6362.38
52	0	MH-299	MH-298	0	6.9	45.88	24	4.11	60.28	Cir	4.82	6359	6356.52	2.48	6359.93	6357.45	6360.29	6357.81	6369.06	6369.97
53	Basin 8U2	IN-75	MH-299	6.2	6.2	21.25	18	4.1	8.5	Cir	5.25	6359.85	6359.5	0.348	6360.8	6360.45	6361.23	6360.88	6369.39	6369.06
54	Basin 8U3	IN-74	MH-299	0.7	0.7	14.86	18	2	25.53	Cir	1.65	6360.01	6359.5	0.138	6360.33	6360.29	6360.43	6360.29	6369.1	6369.06
55	Basin 8R2	IN-96	IN-87	1.5	3.2	14.51	18	1.91	120.81	Cir	4.09	6355.73	6353.42	2.306	6356.41	6354.1	6356.67	6354.36	6364.52	6362.38
56	Basin 8R3	MH-310	IN-96	1.7	1.7	15.3	18	2.12	96.67	Cir	2.86	6358.02	6355.97	1.997	6358.52	6356.6	6358.69	6356.69	6367.41	6364.52
57	0	MH-311	IN-87	0	0	14.87	18	2.01	8.84	Cir	0	6353.6	6353.42	0.177	6353.6	6353.42	6353.6	6353.42	6362.48	6362.38
58	Pond J	OS-1	MH-298	62.1	62.1	302.91	48	4.45	93.35	Cir	6.76	6354.5	6							

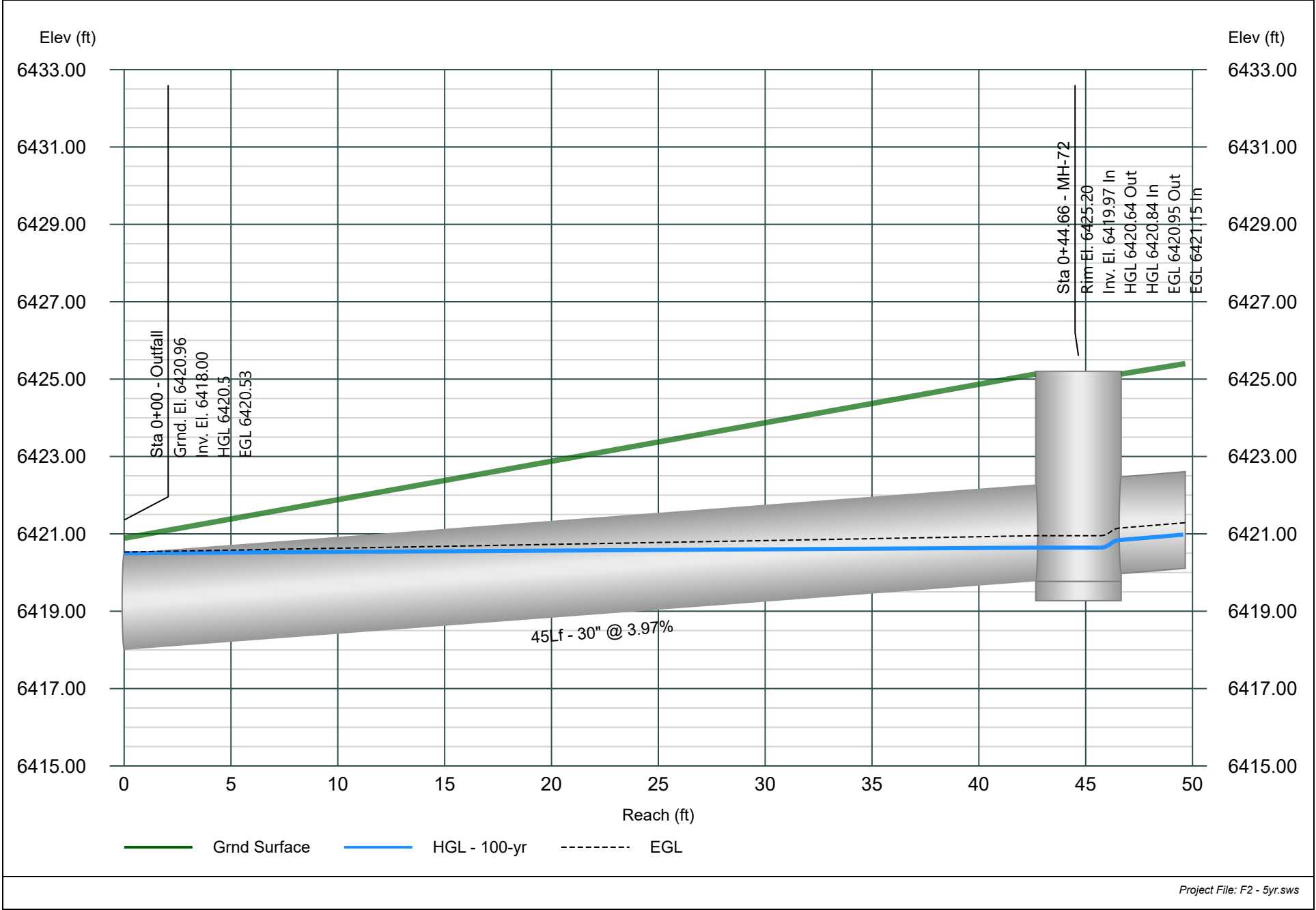
Line 1 - PIPE-48

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



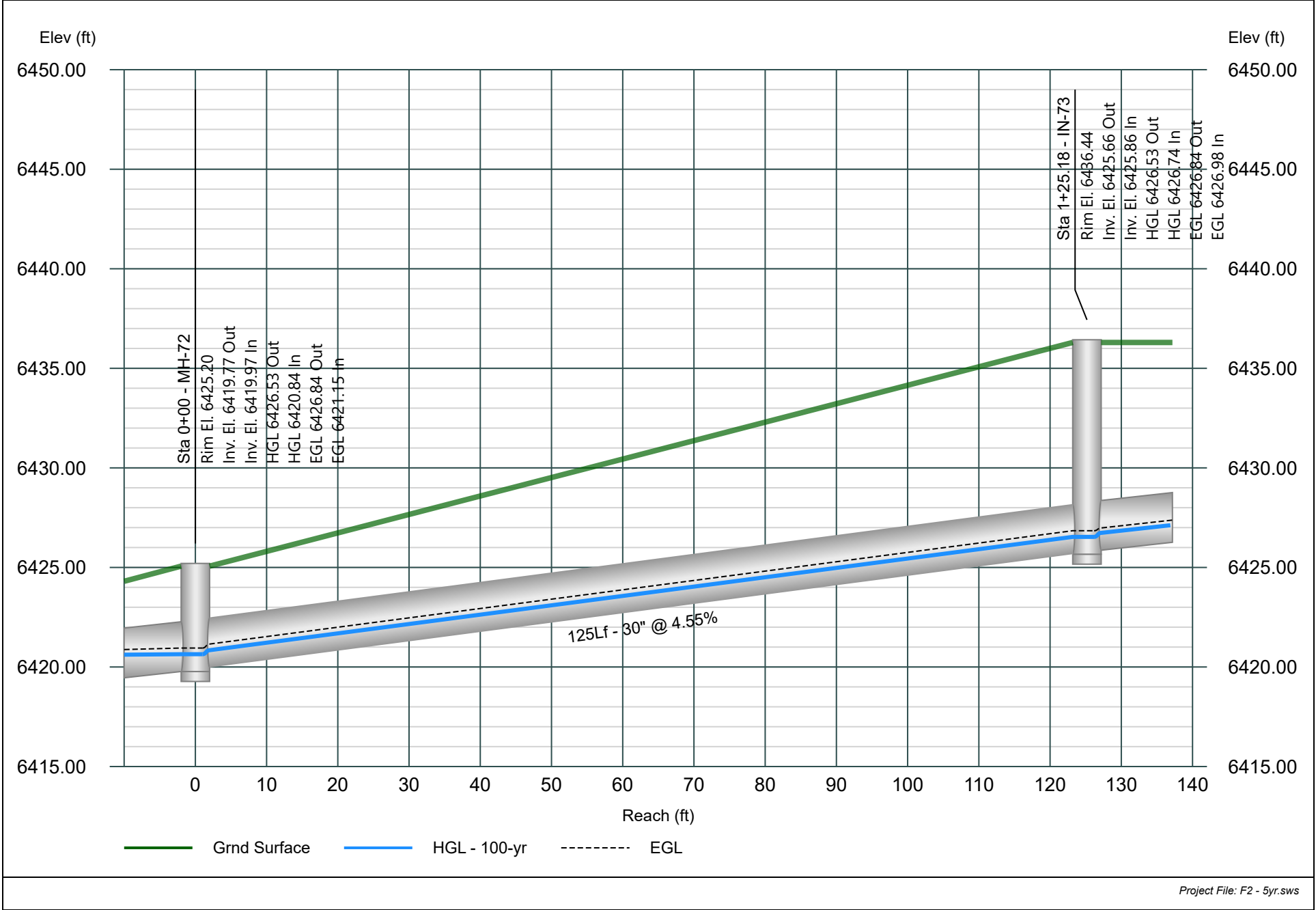
Line 2 - PIPE-47

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



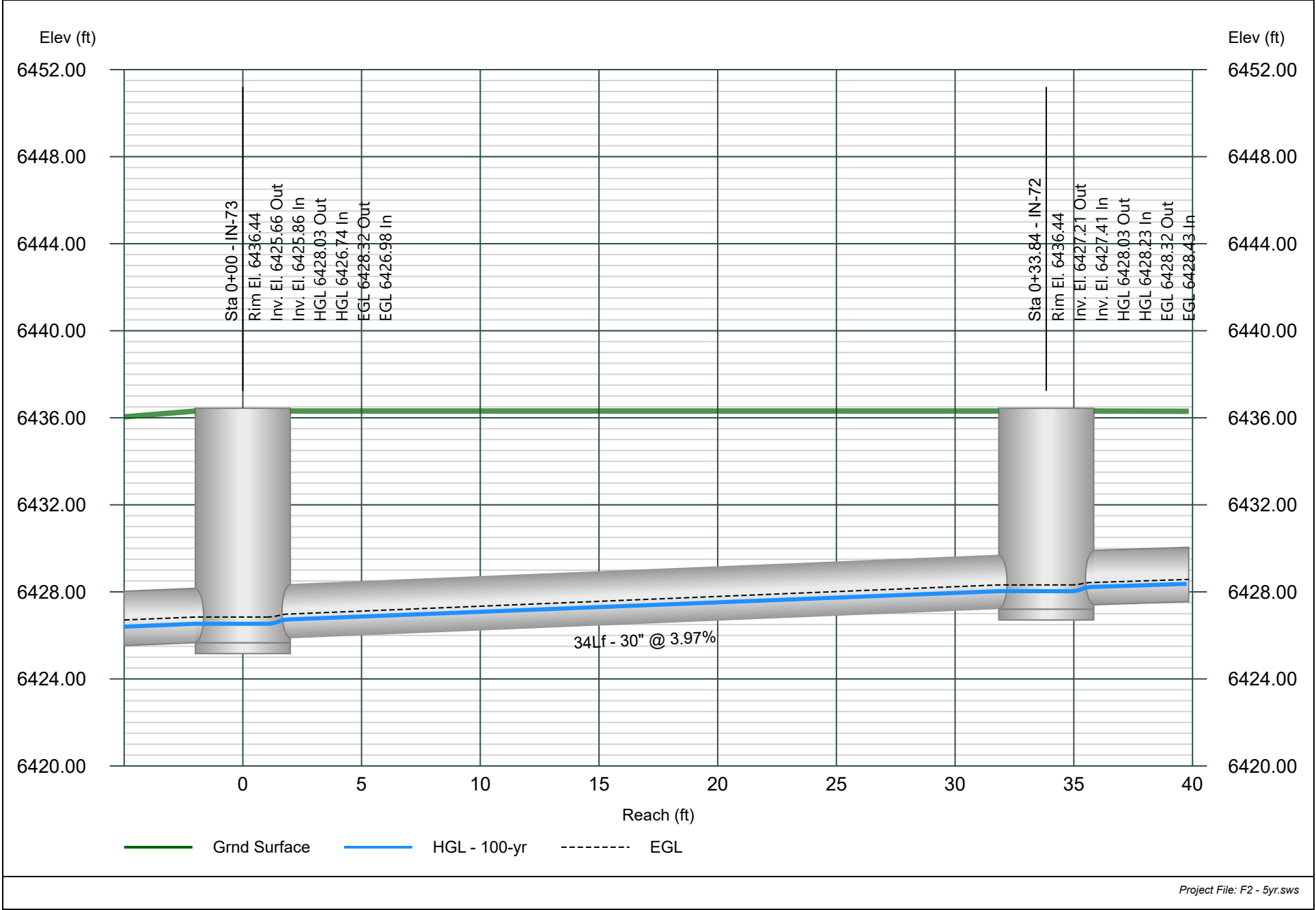
Line 3 - PIPE-45

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



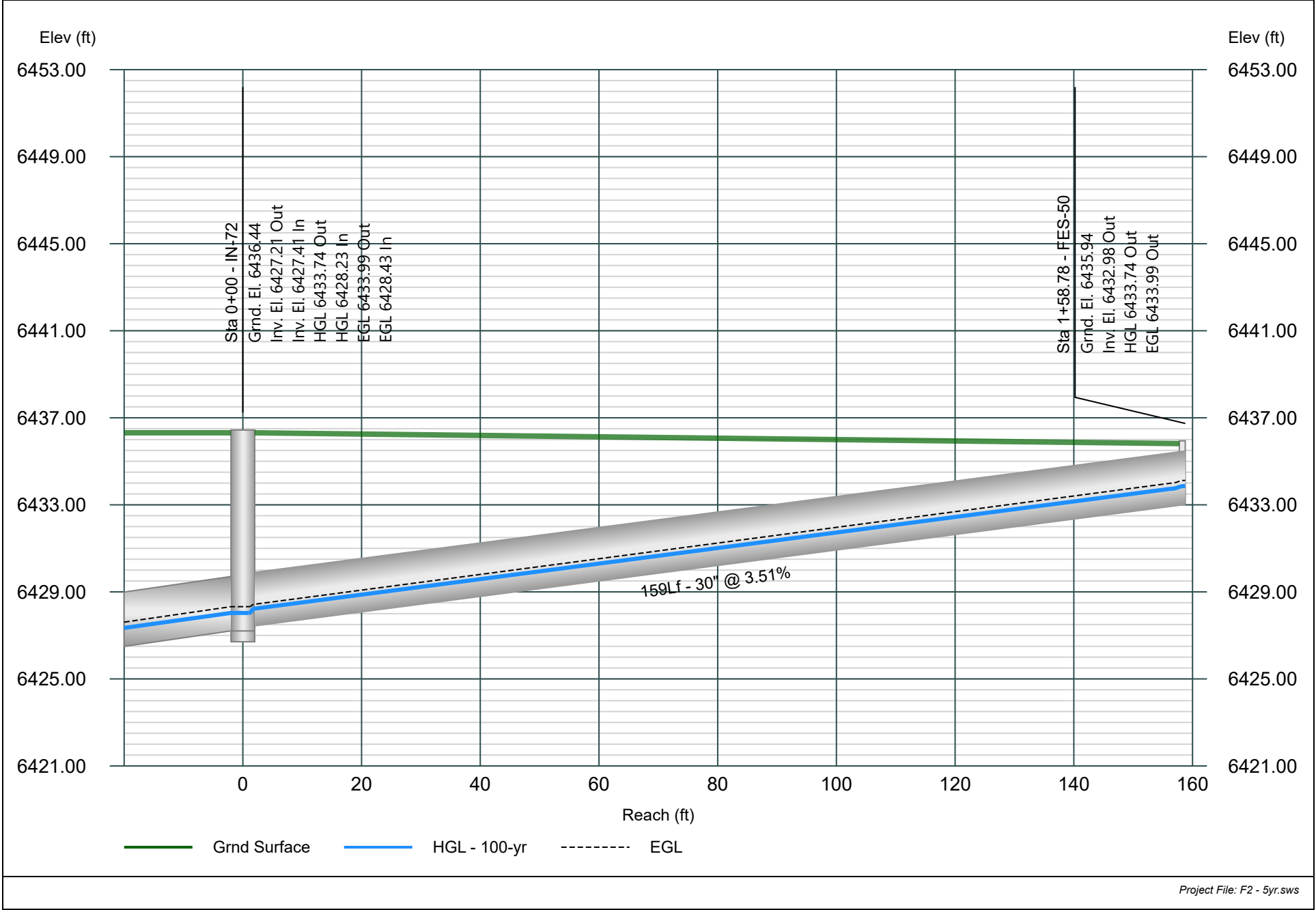
Line 4 - PIPE-46

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



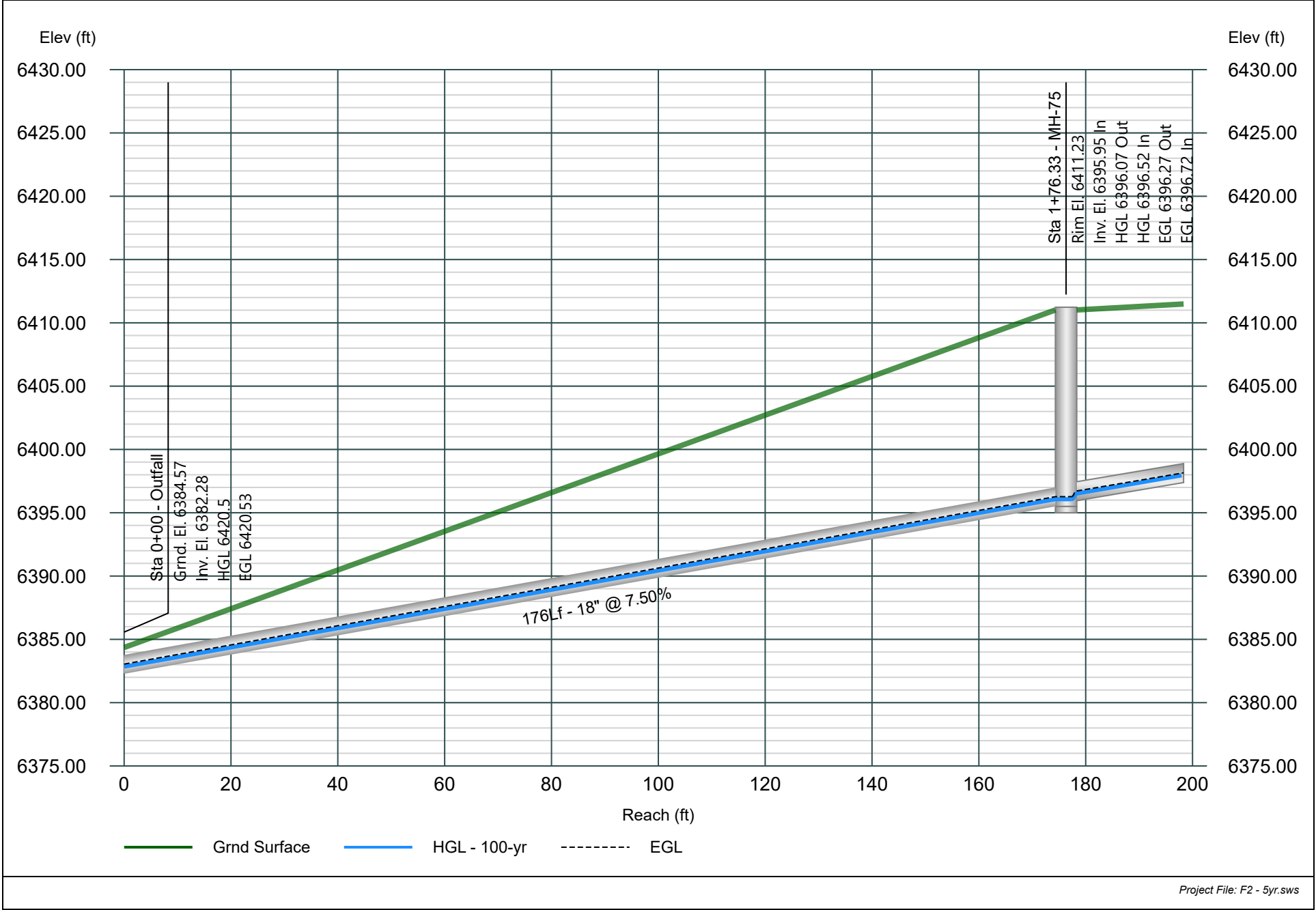
Line 5 - PIPE-63

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



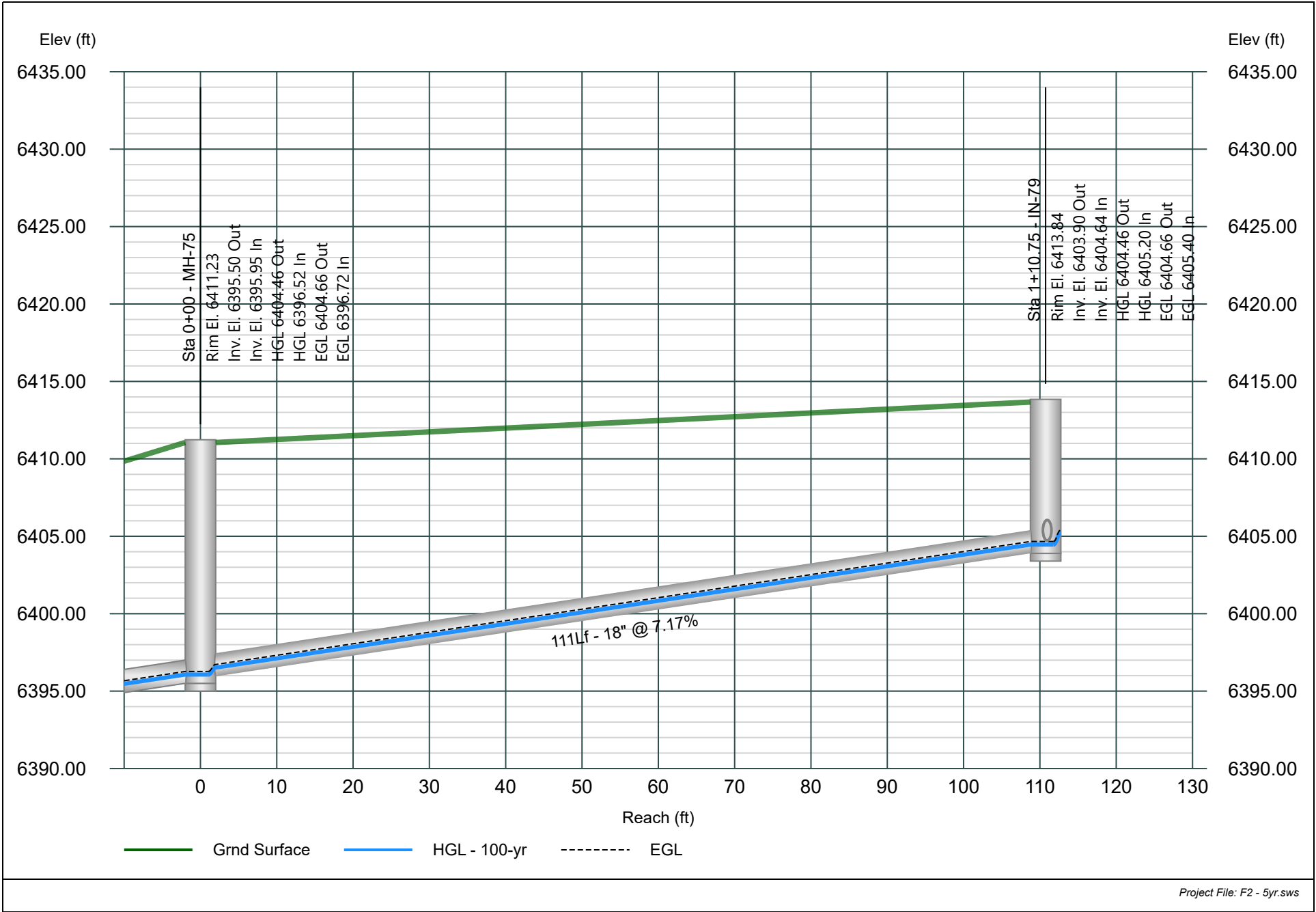
Line 6 - PIPE-62

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



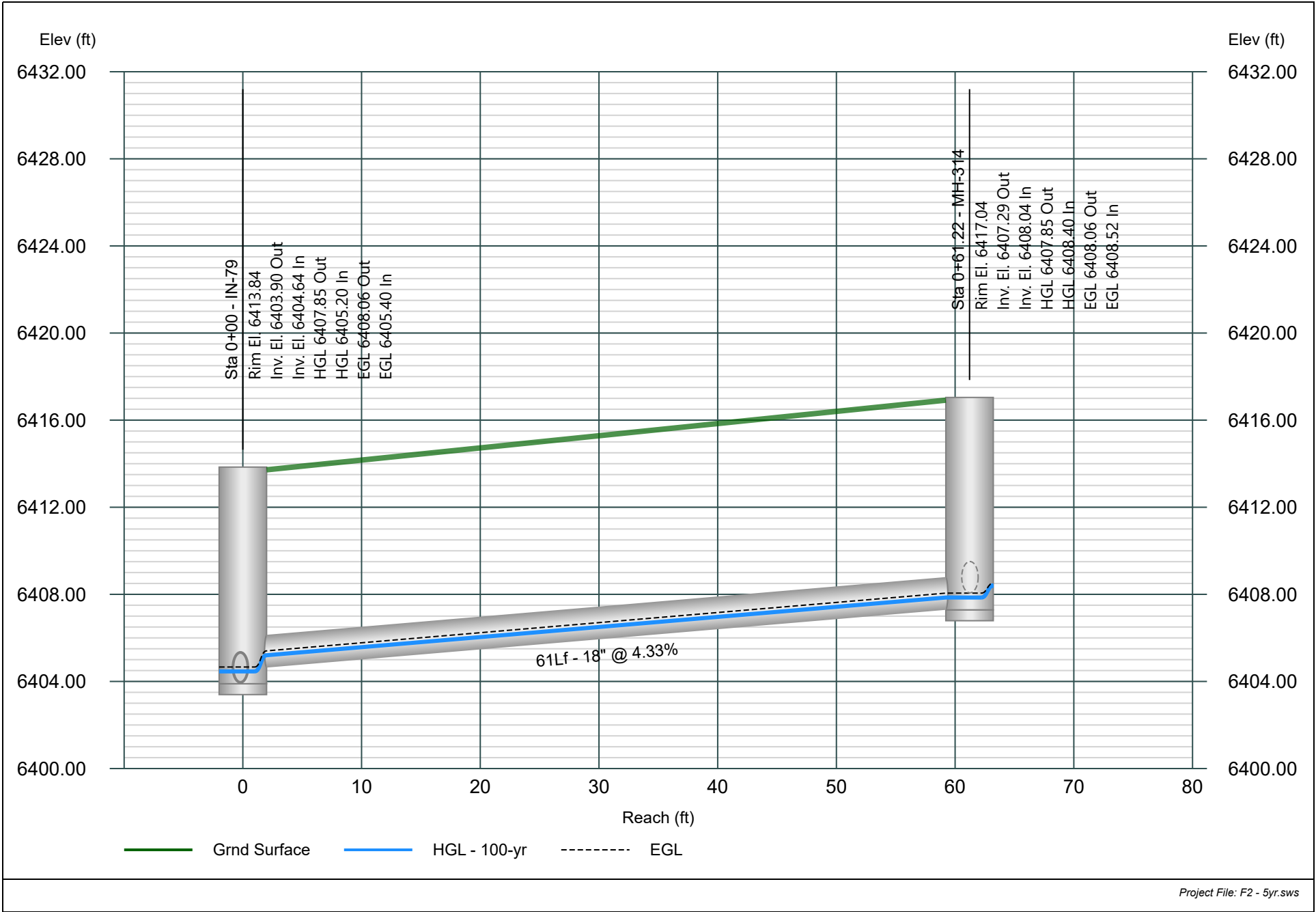
Line 7 - PIPE-250

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



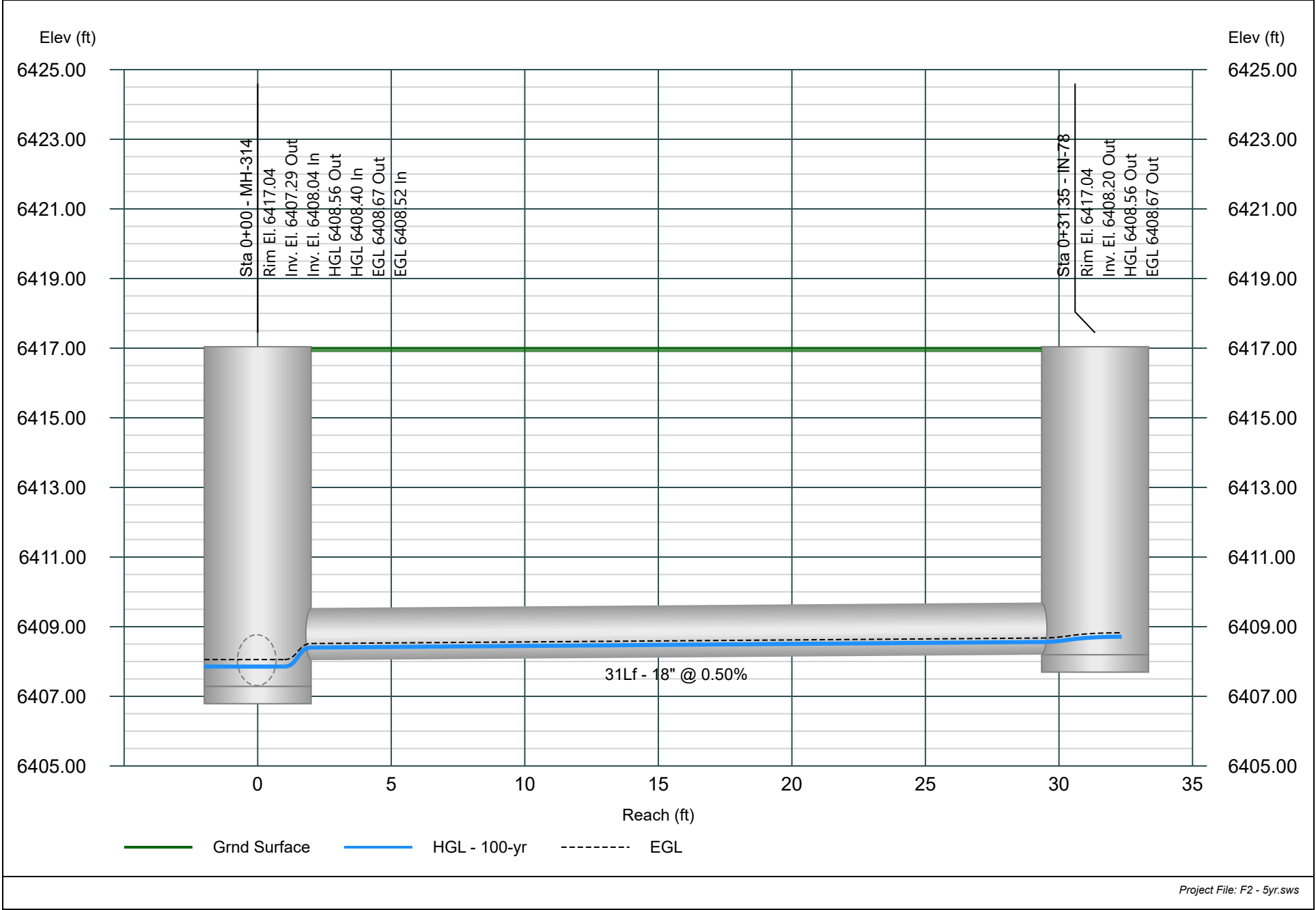
Line 8 - PIPE-61

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



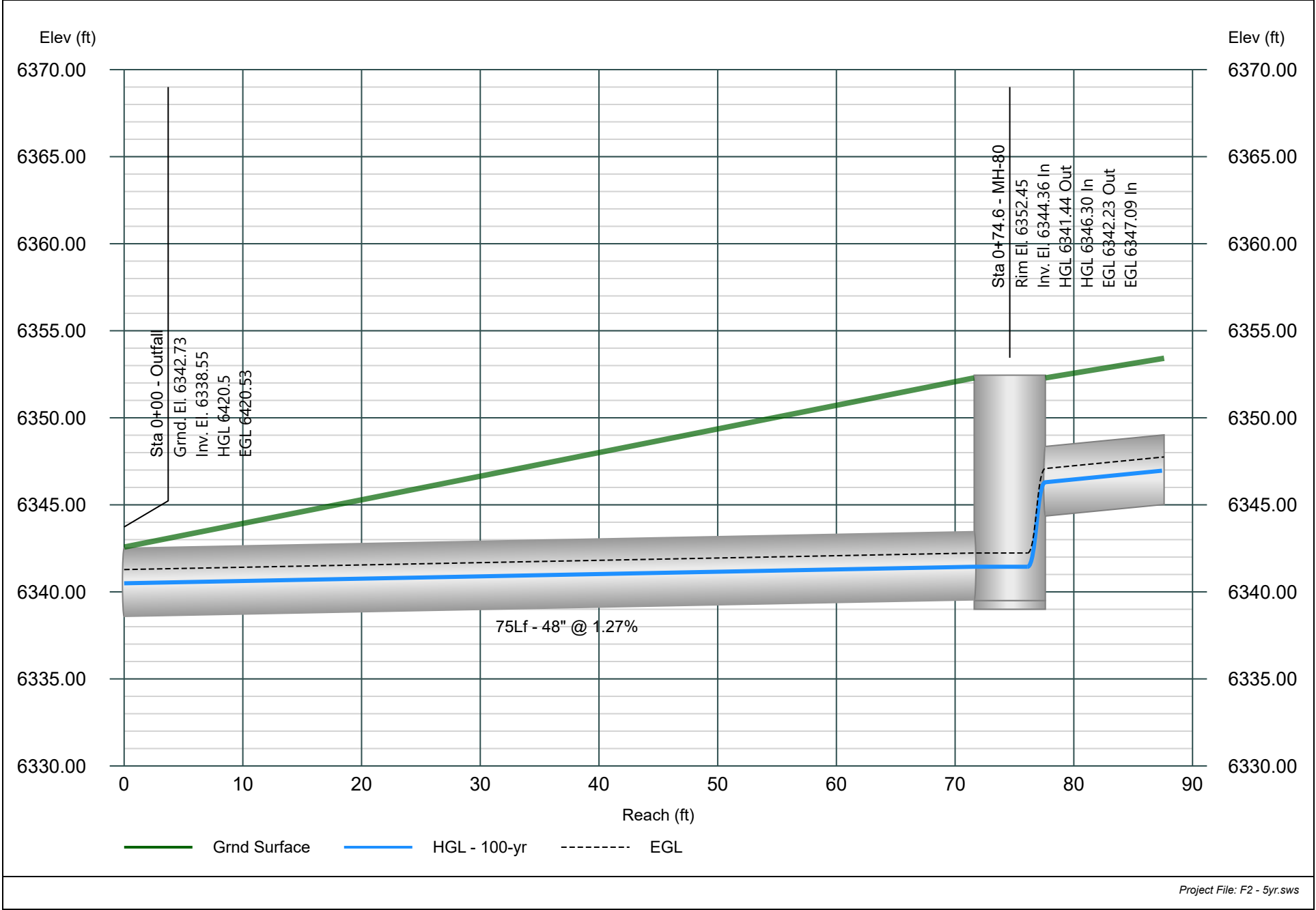
Line 9 - PIPE-25 (1)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



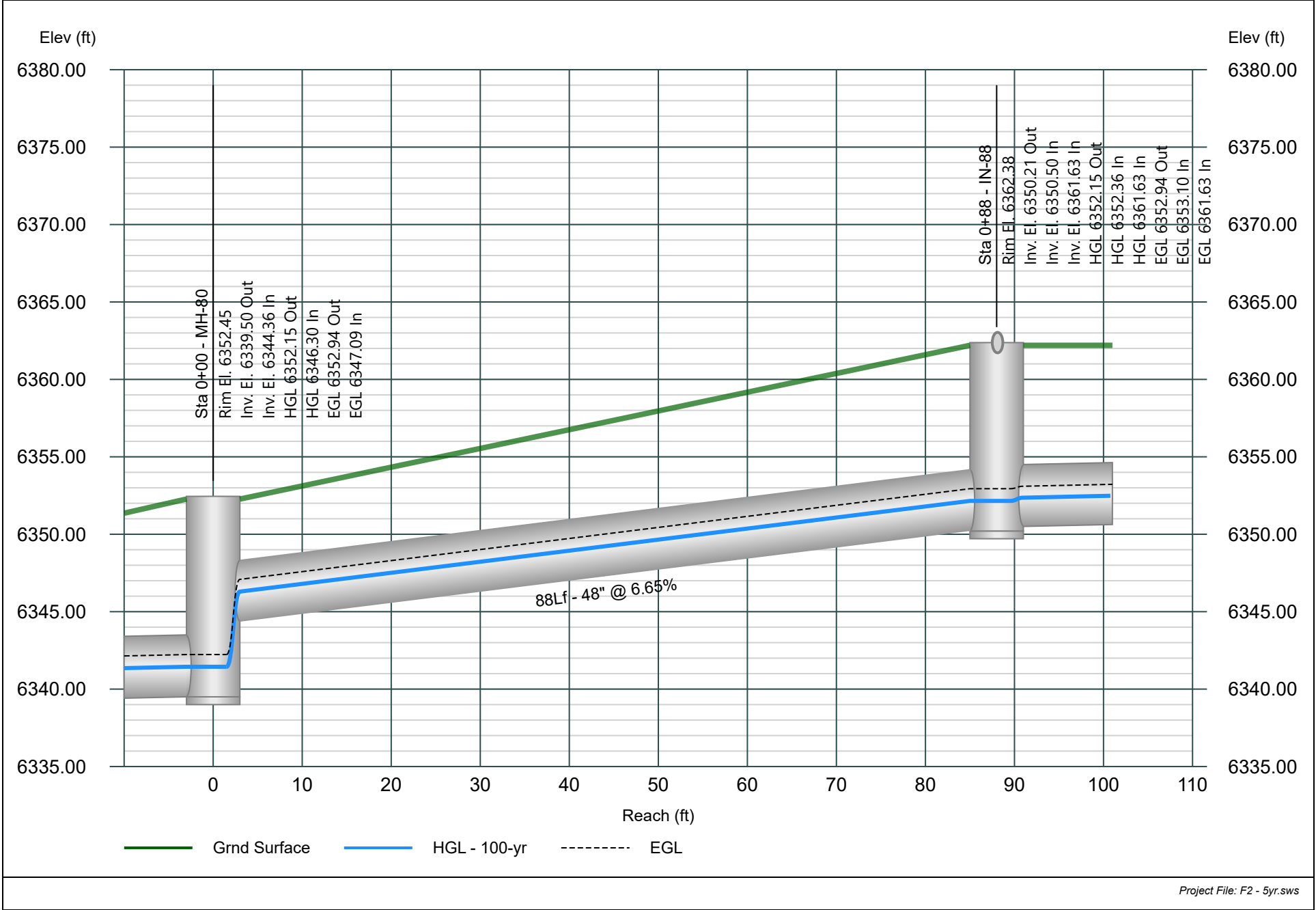
Line 10 - PIPE-25

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



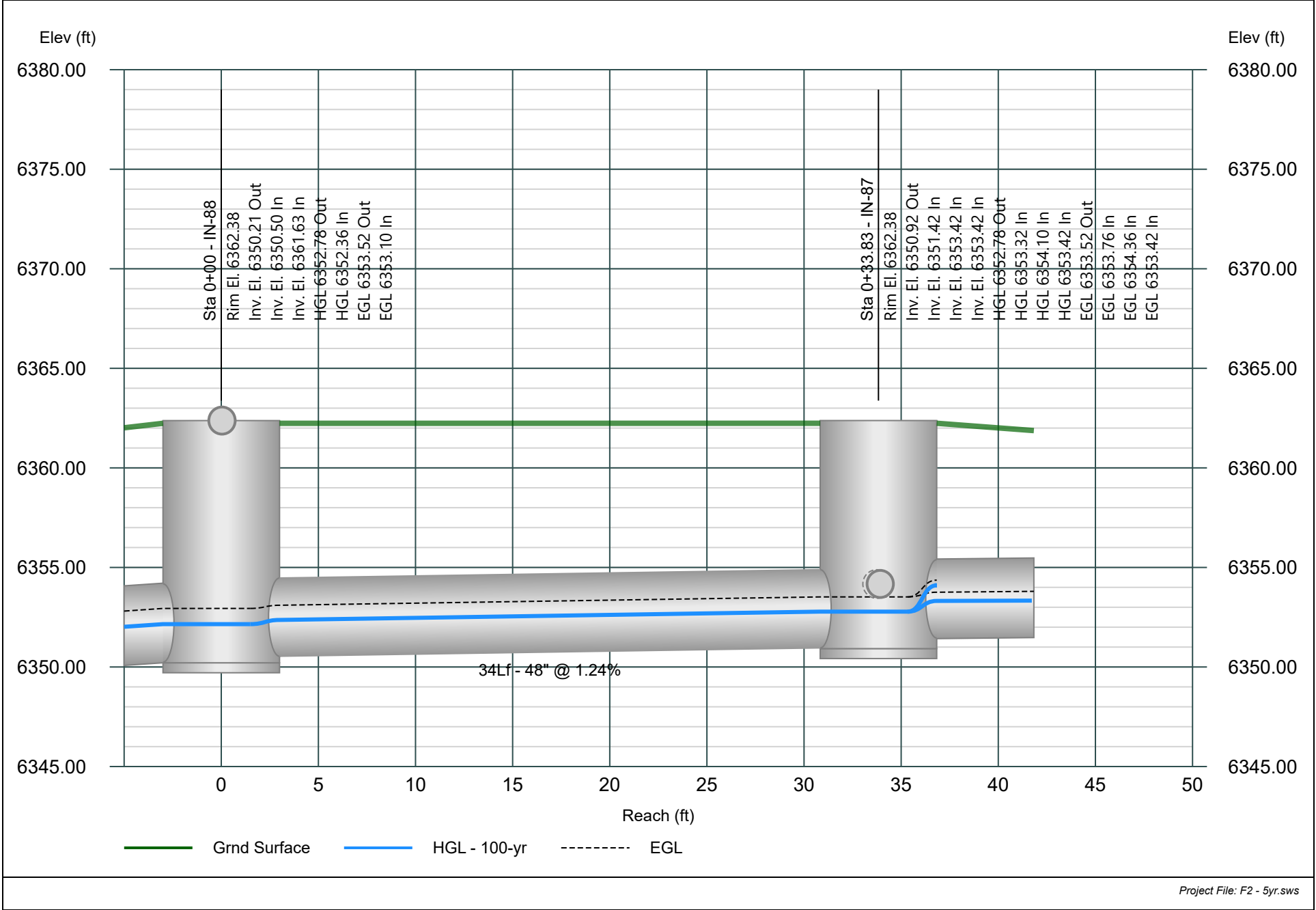
Line 11 - PIPE-40

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



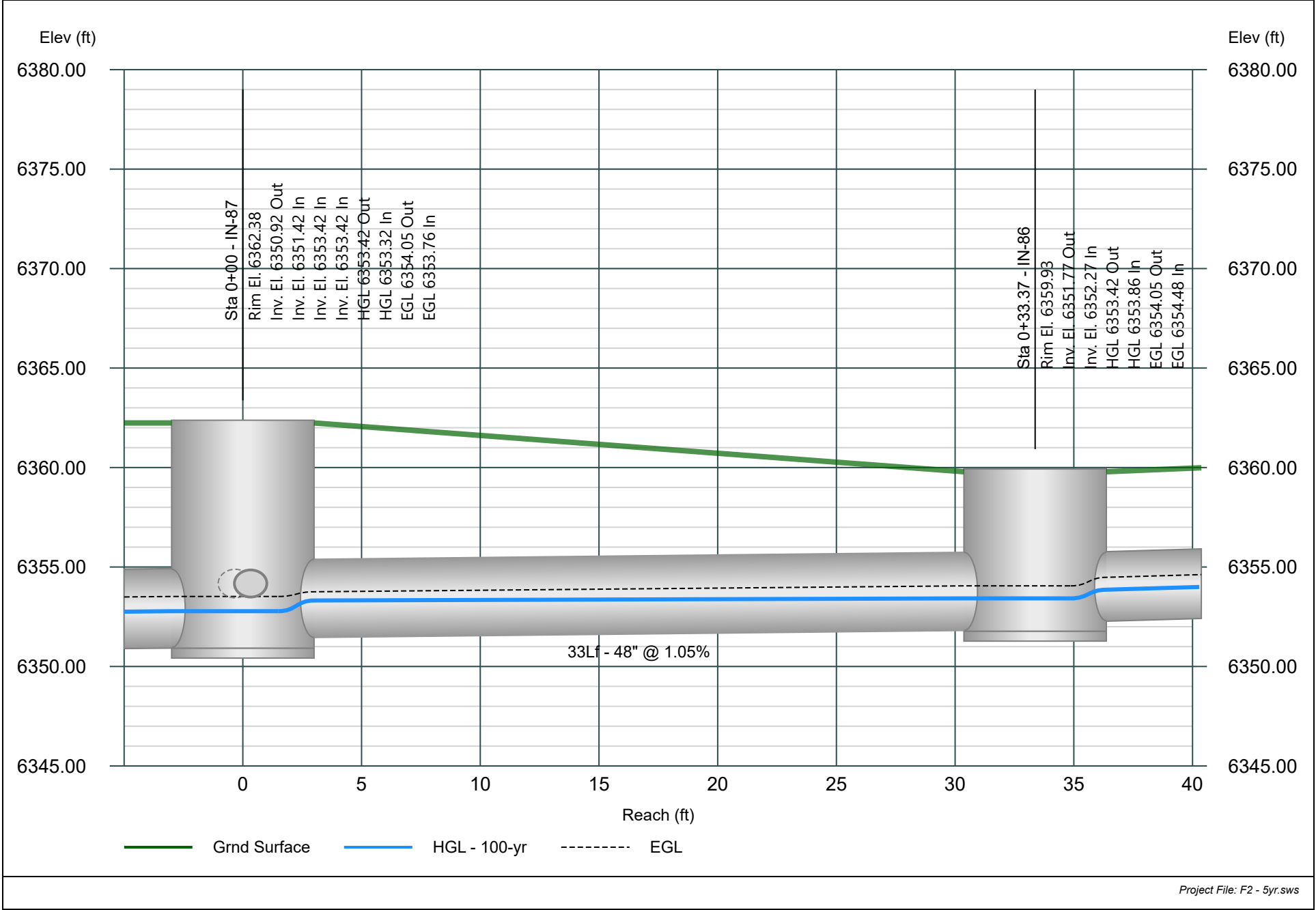
Line 12 - PIPE-38

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



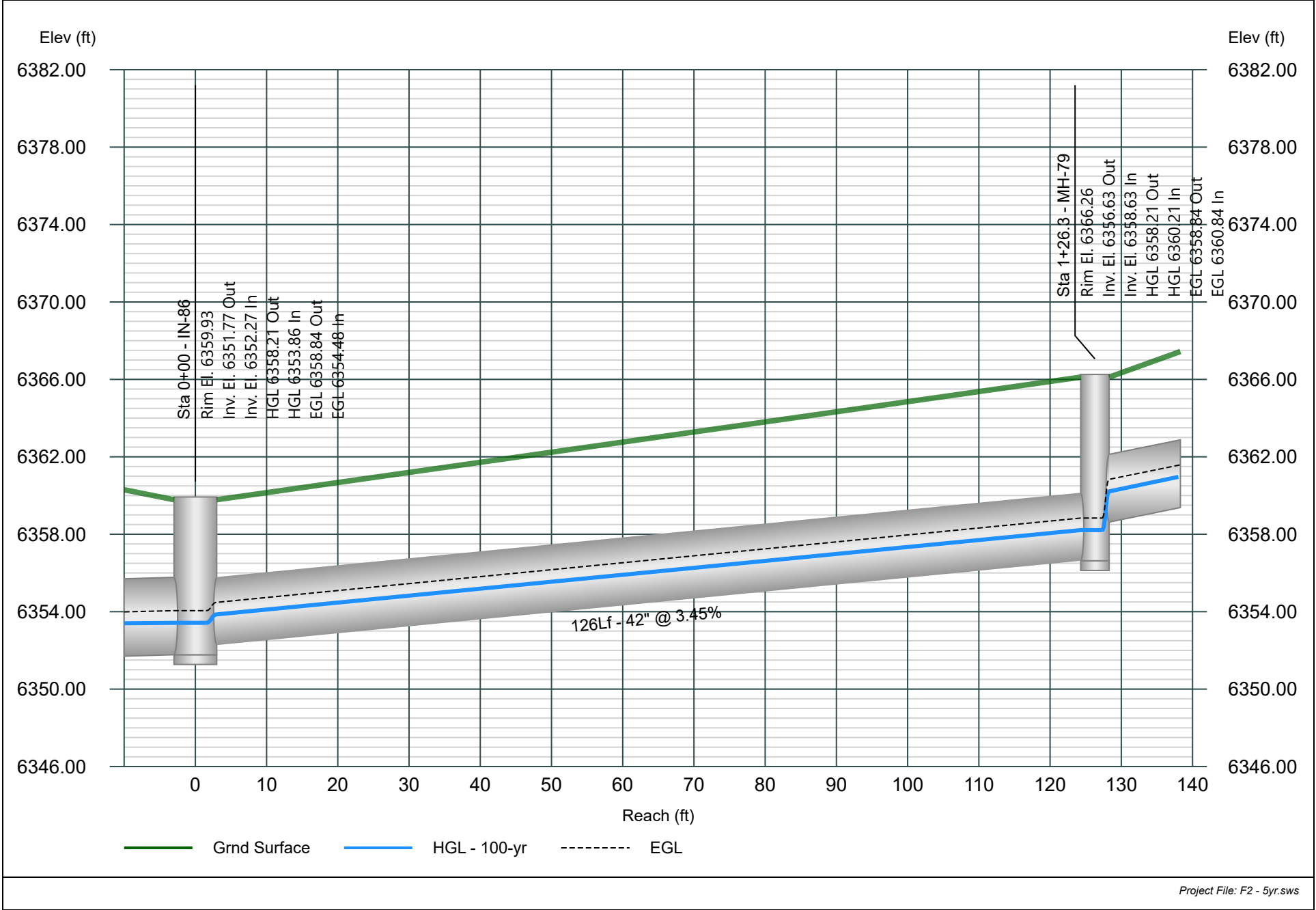
Line 13 - PIPE-24

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



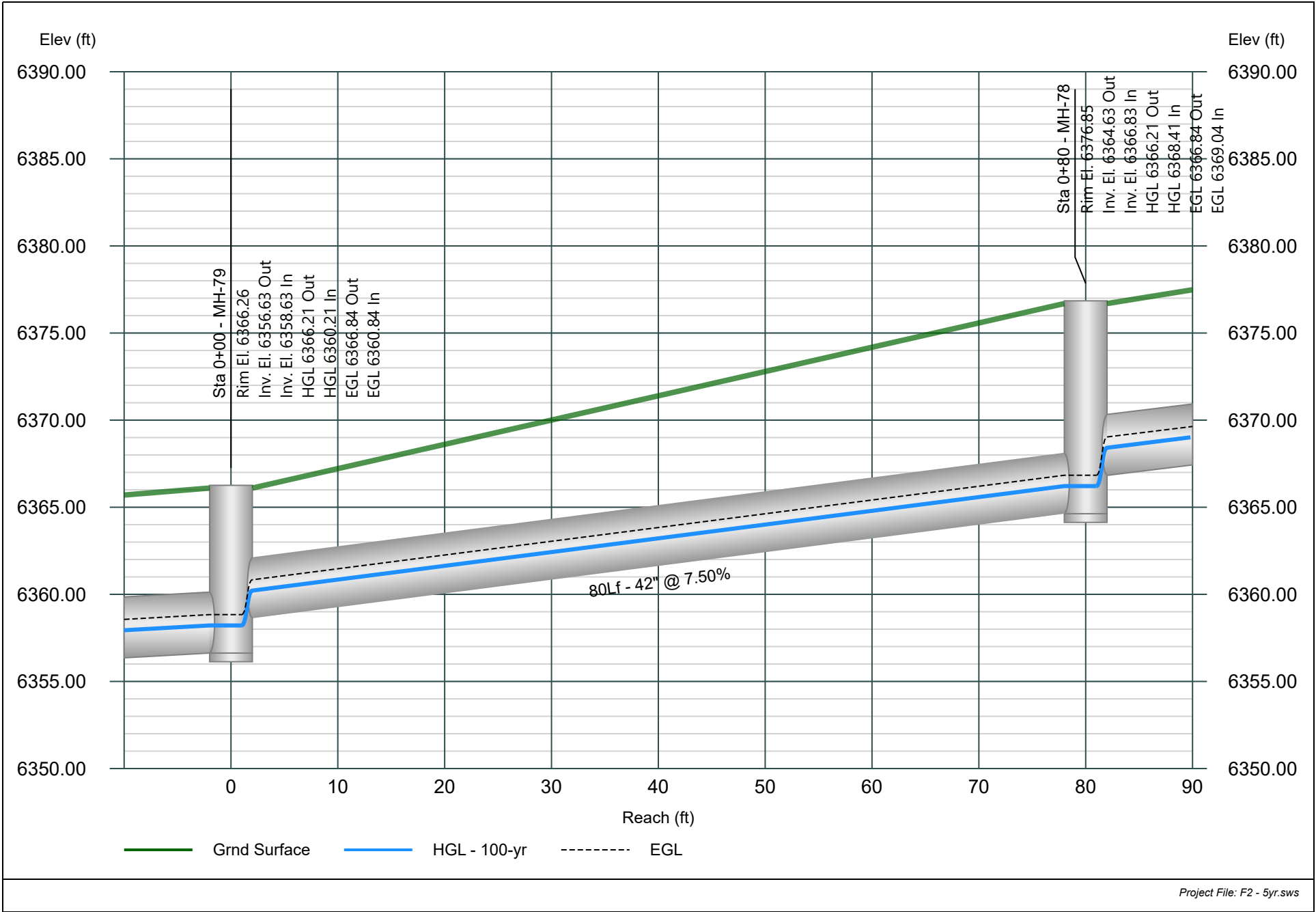
Line 14 - PIPE-36

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



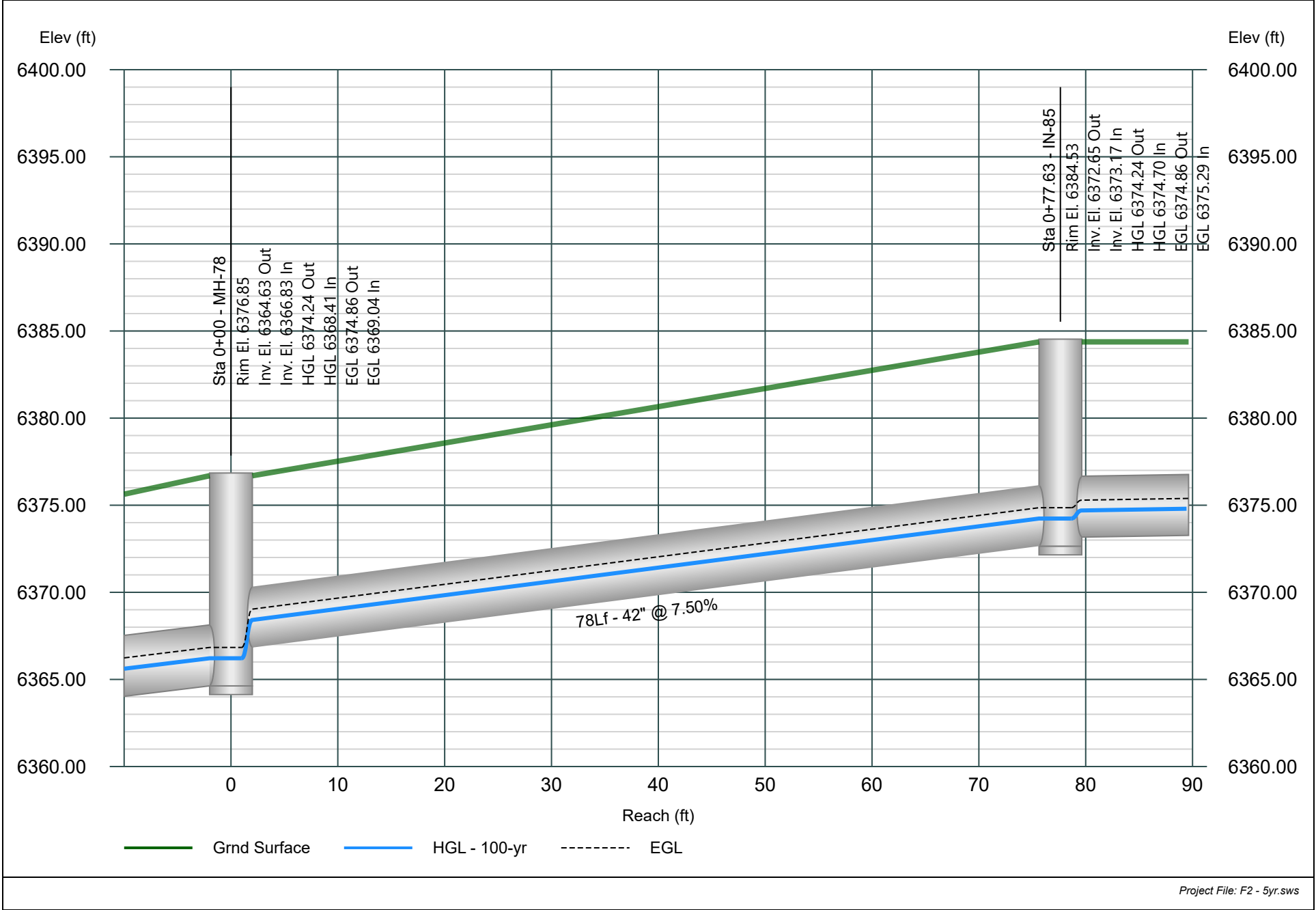
Line 15 - PIPE-35

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



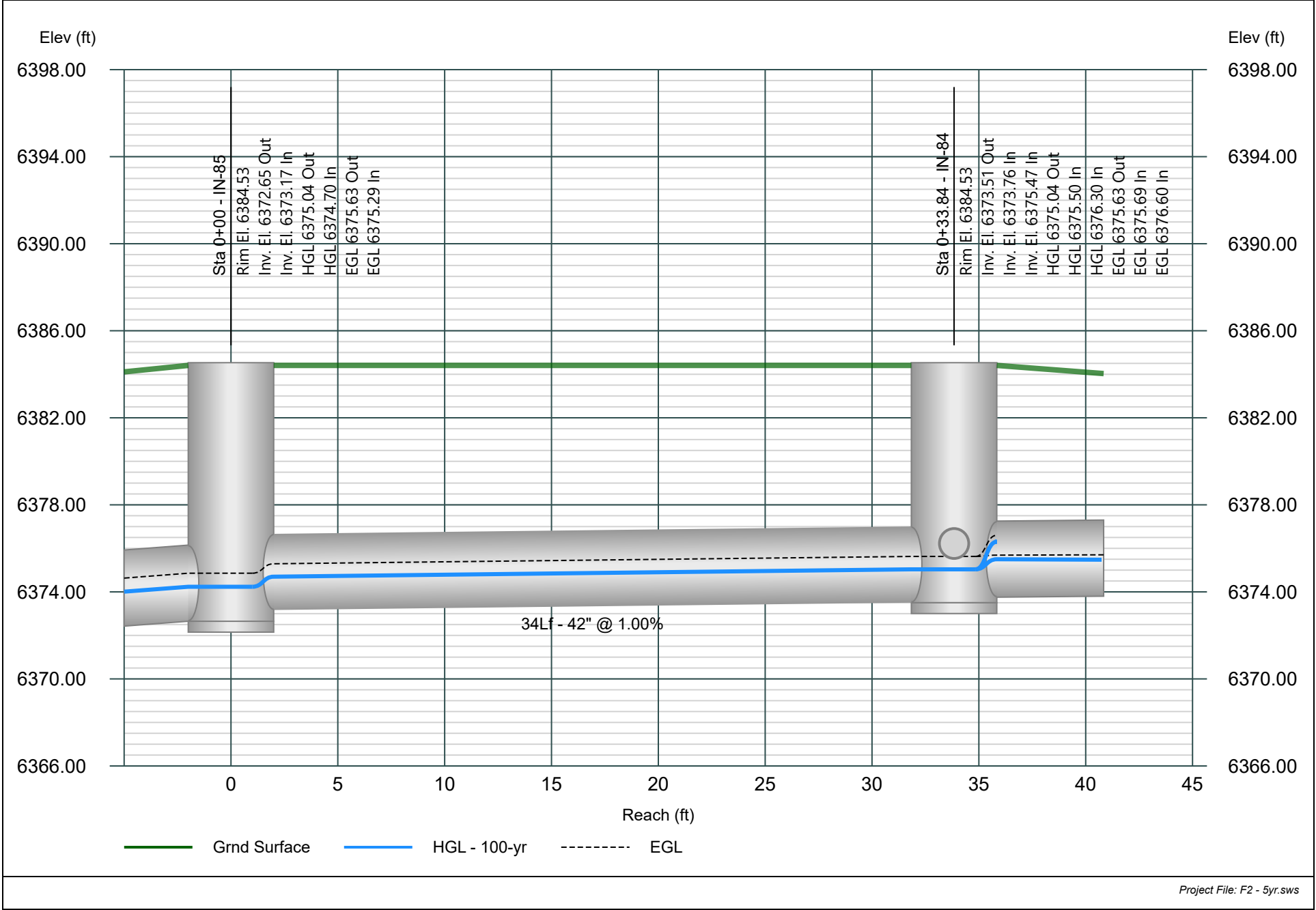
Line 16 - PIPE-42

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



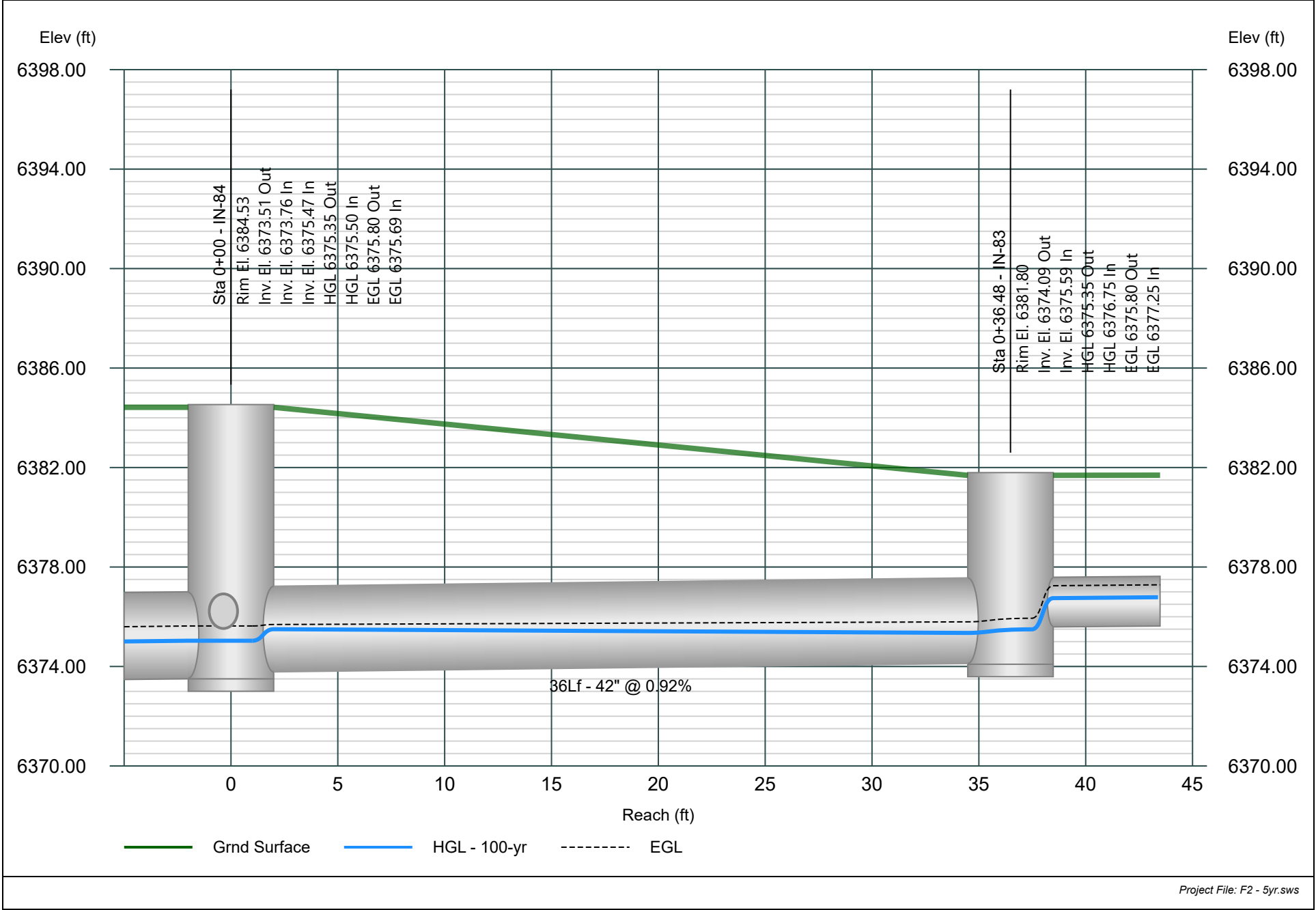
Line 17 - PIPE-43

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



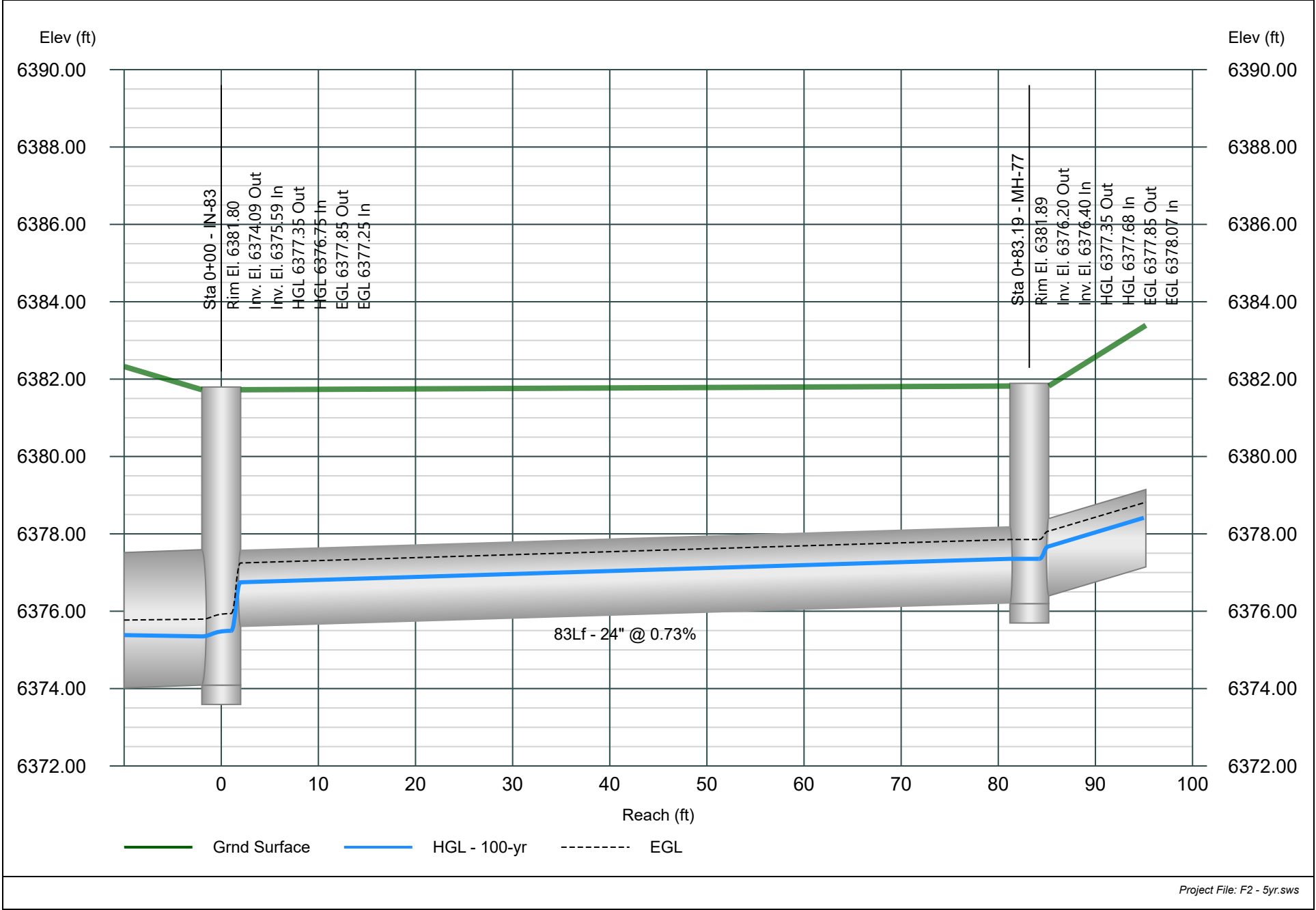
Line 18 - PIPE-29

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



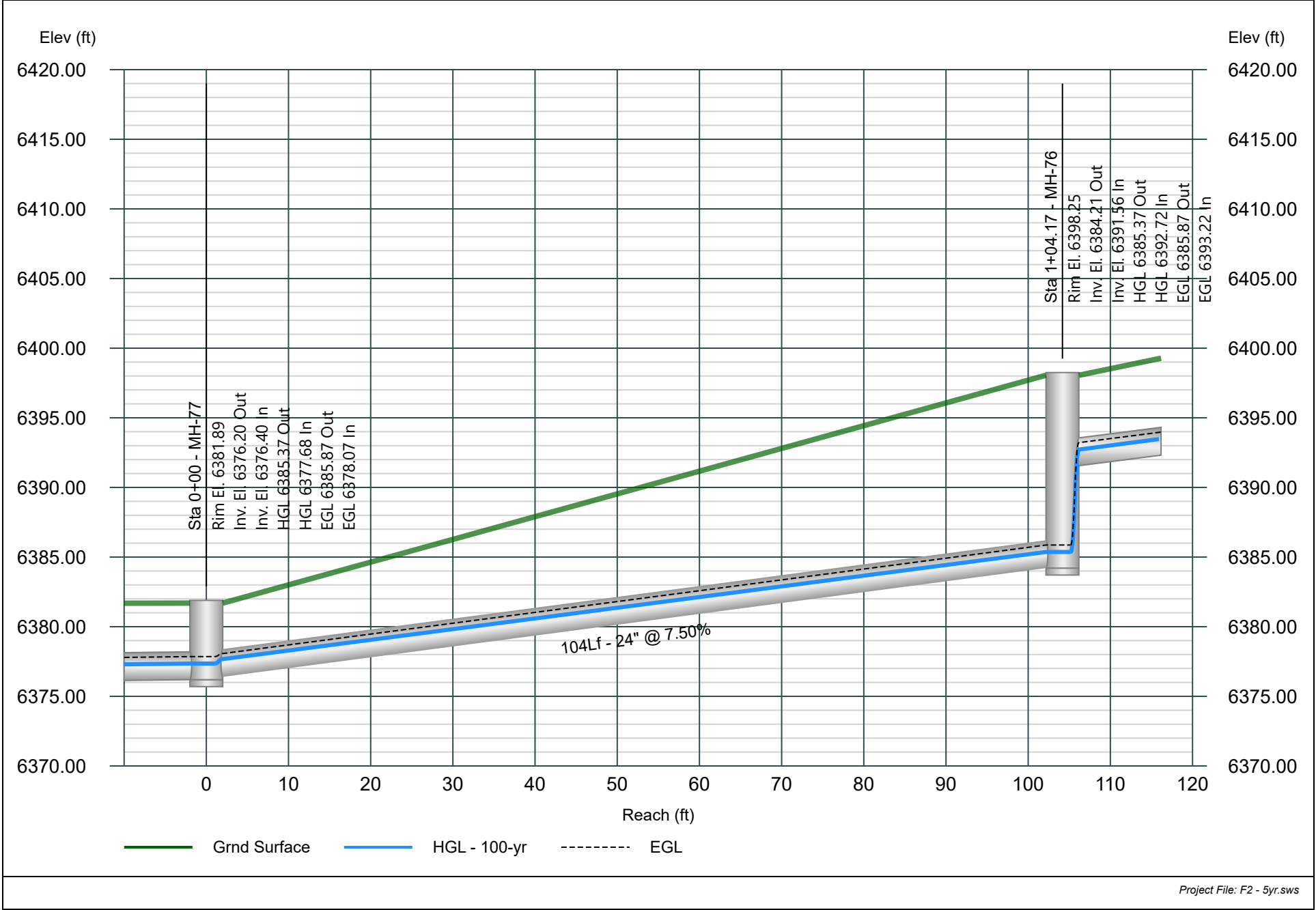
Line 19 - PIPE-83

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



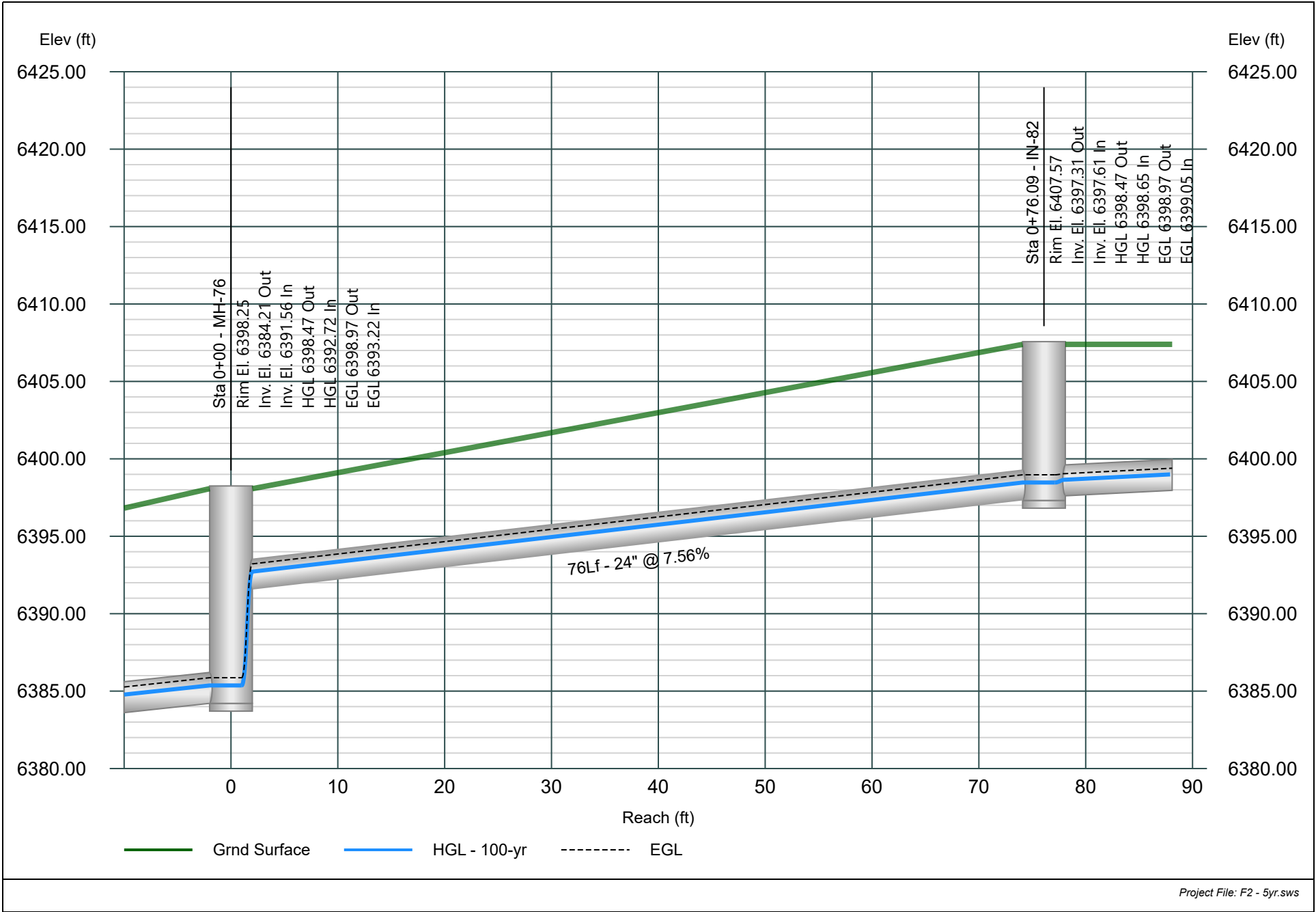
Line 20 - PIPE-33

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



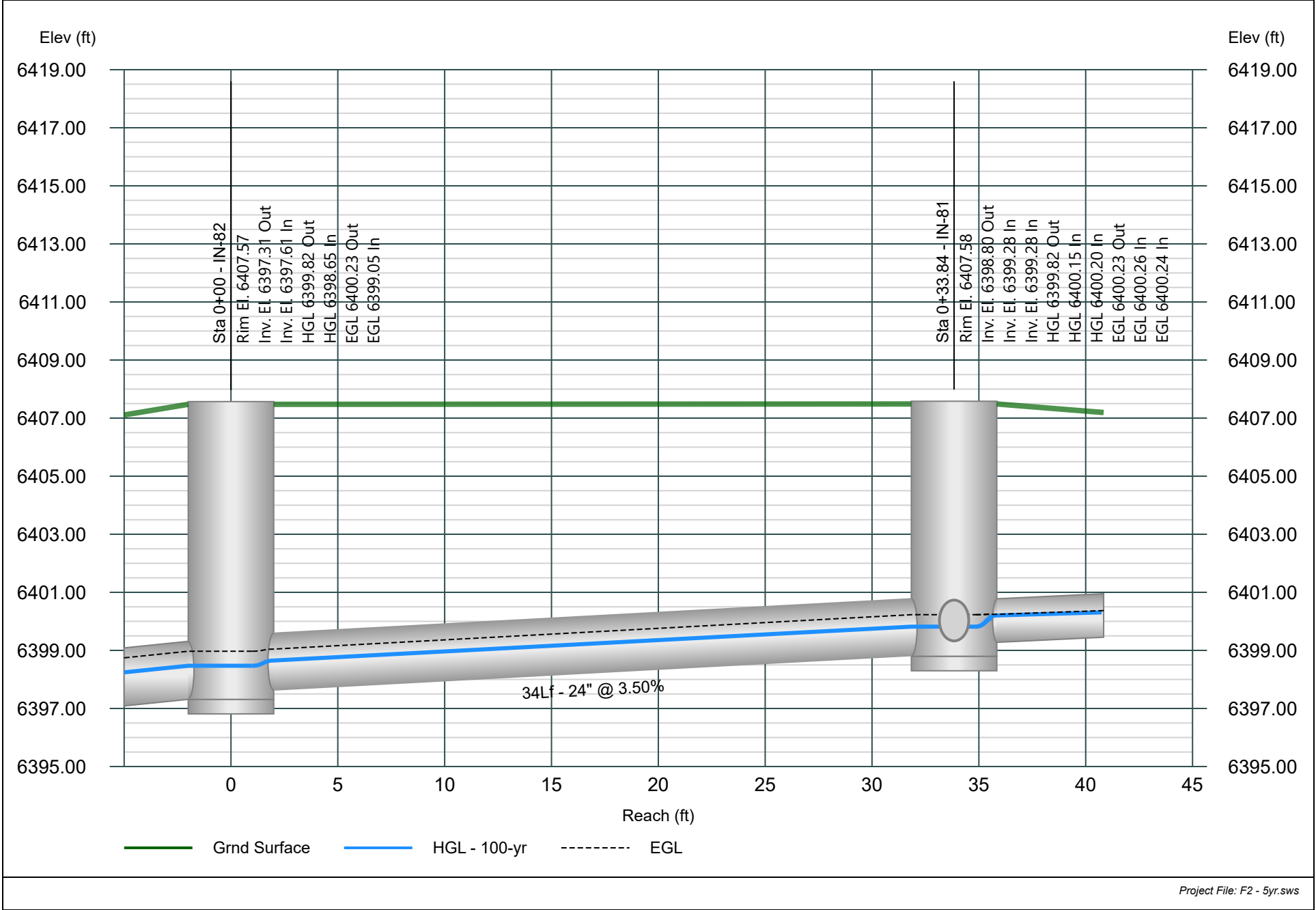
Line 21 - PIPE-44

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



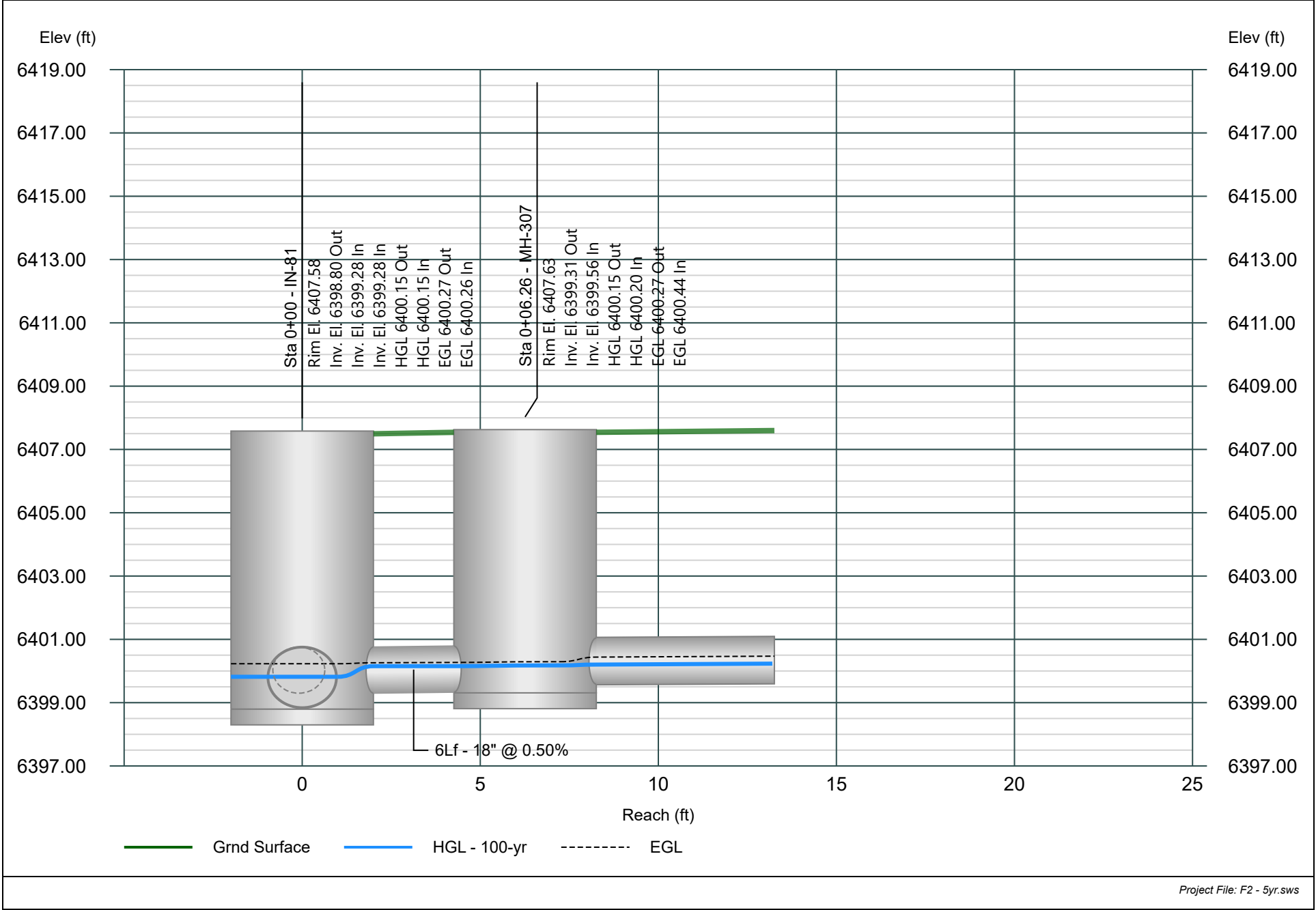
Line 22 - PIPE-244

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



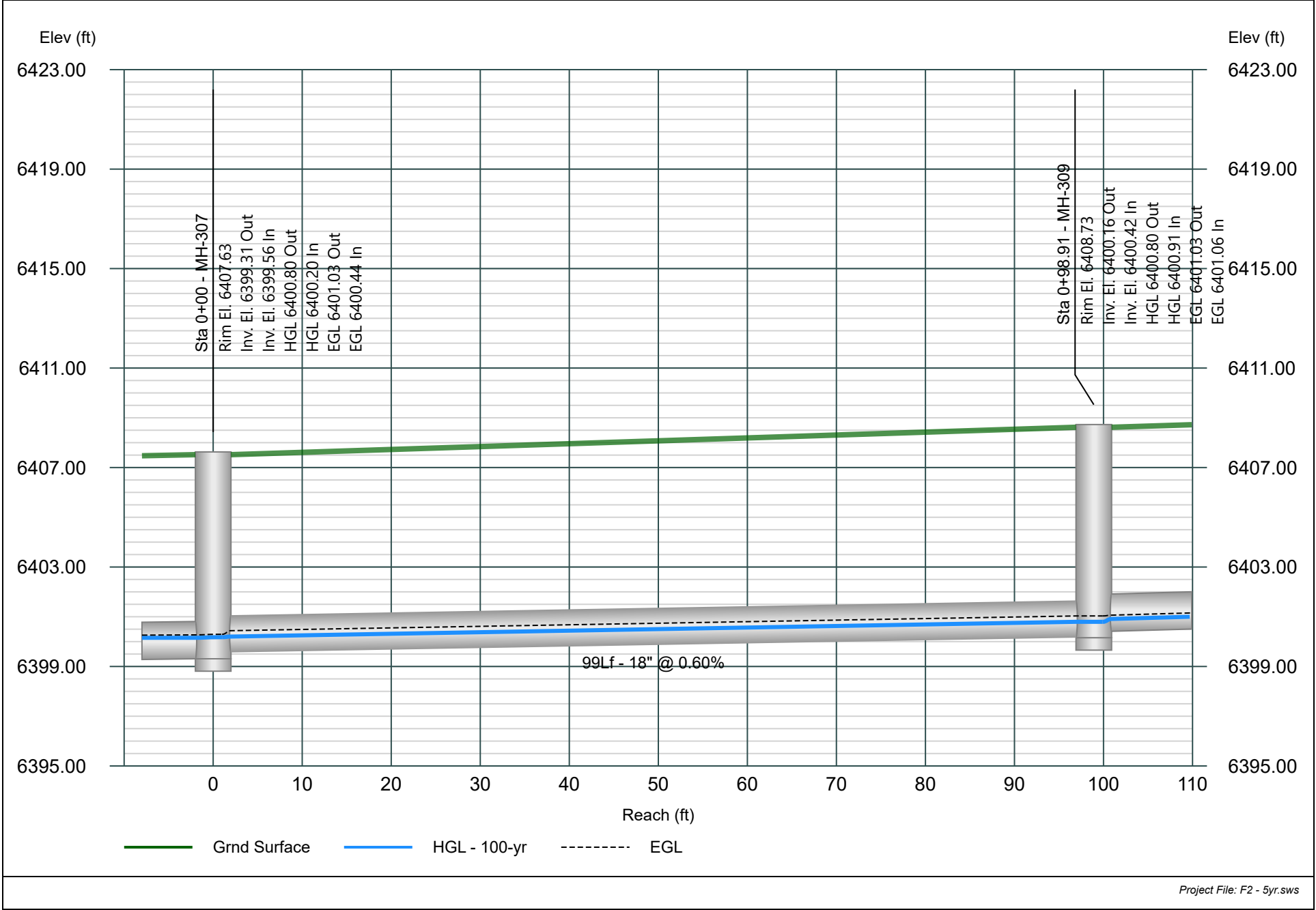
Line 23 - PIPE-246

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



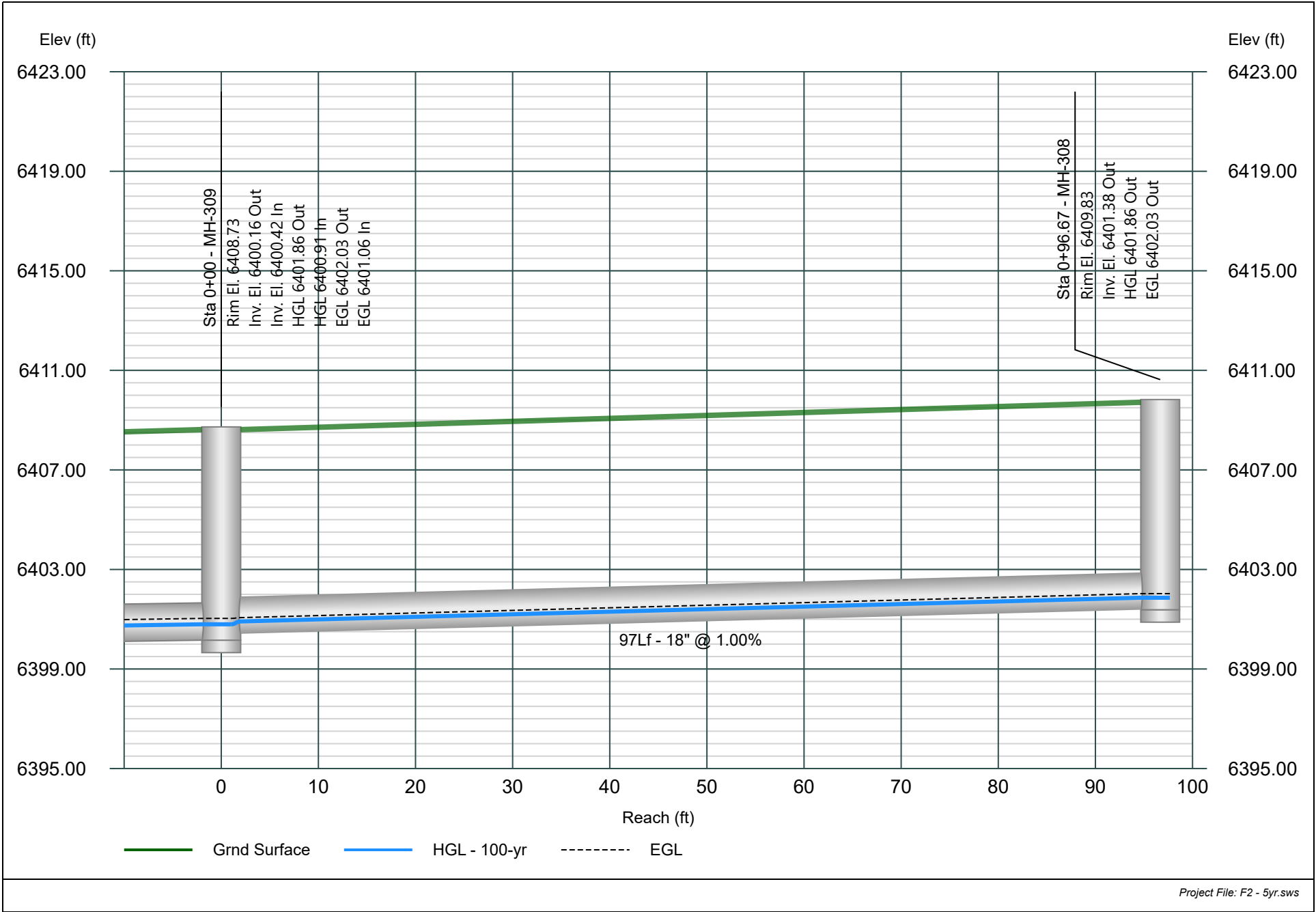
Line 24 - PIPE-245

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



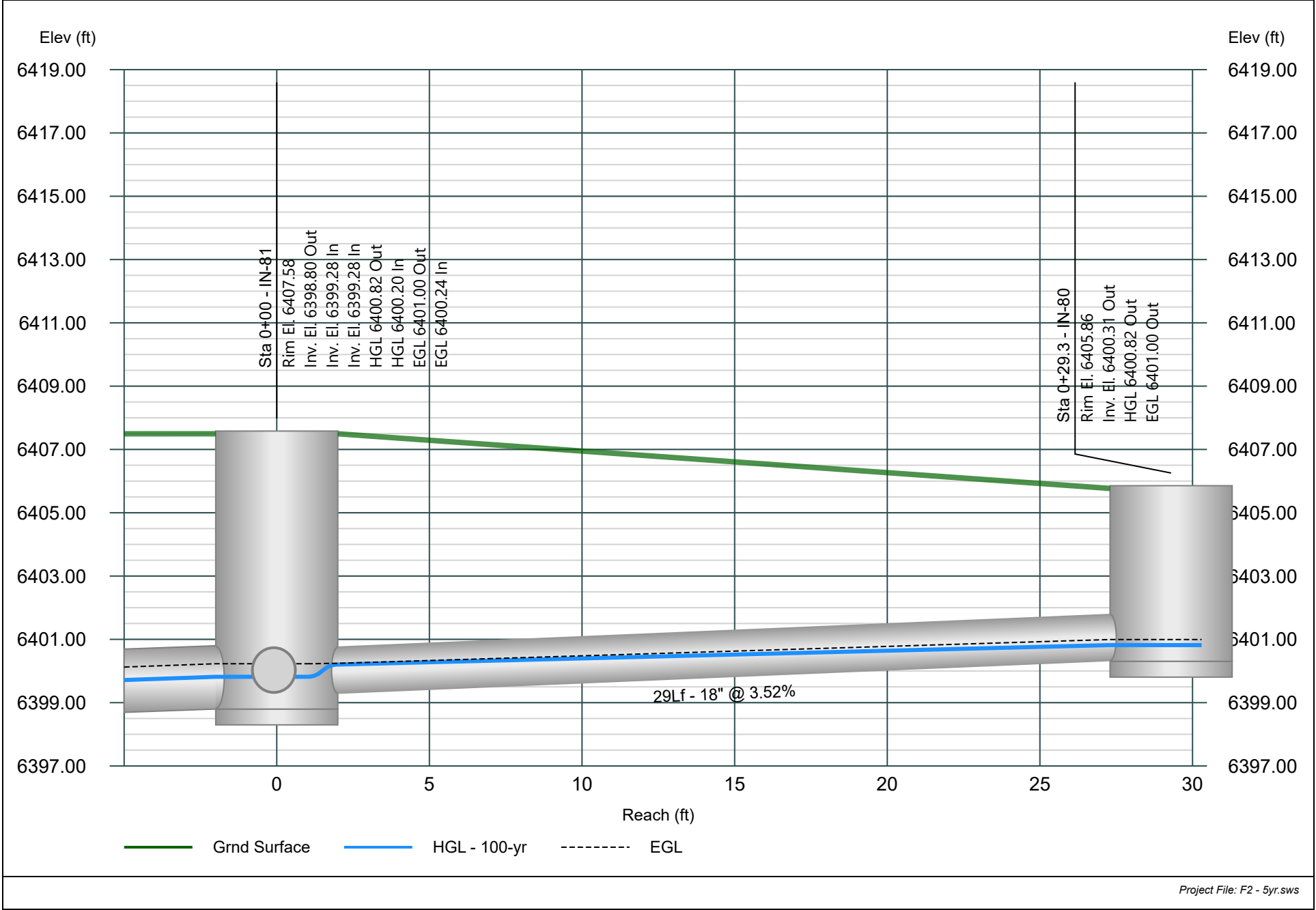
Line 25 - PIPE-84

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



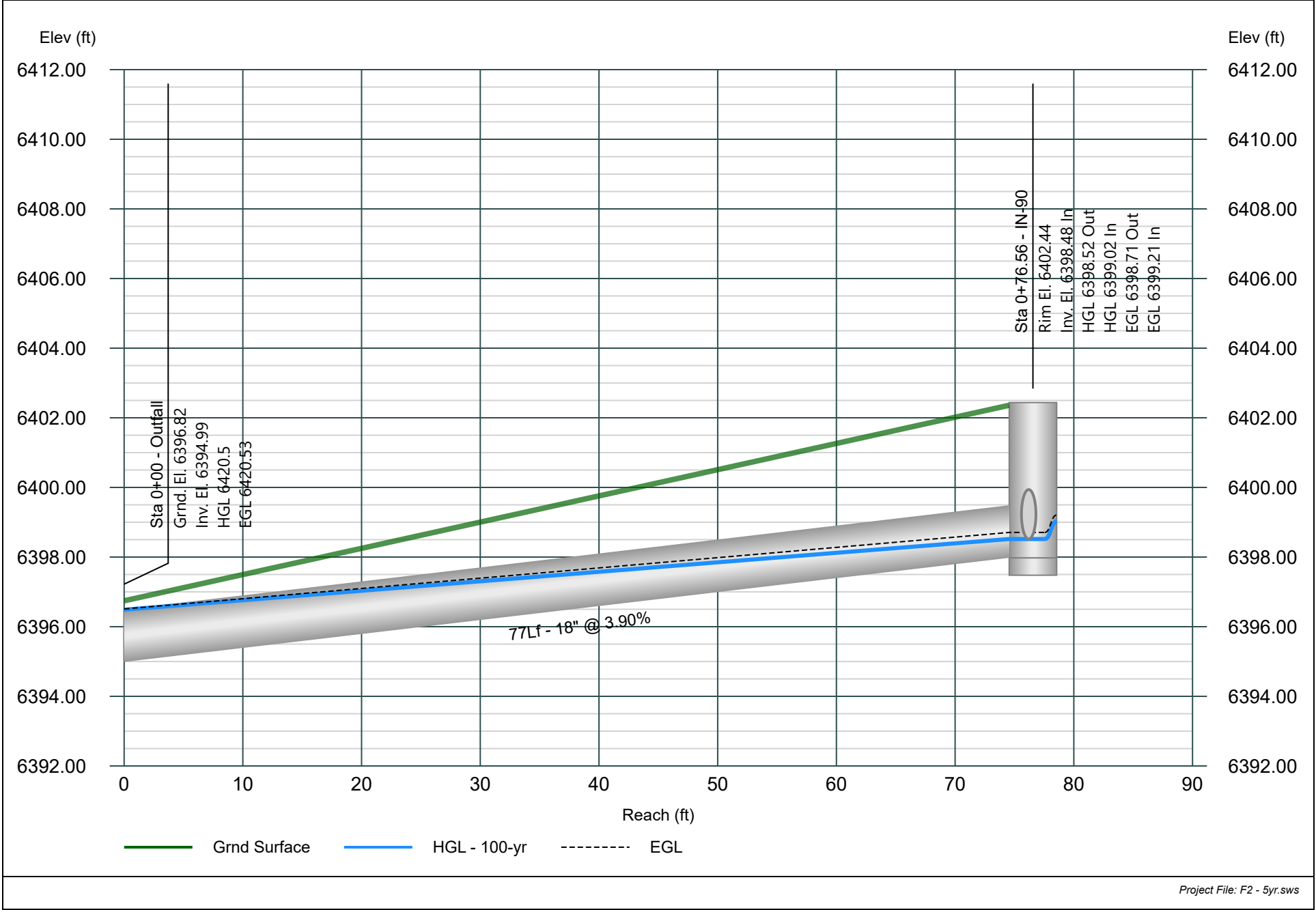
Line 26 - PIPE-213

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



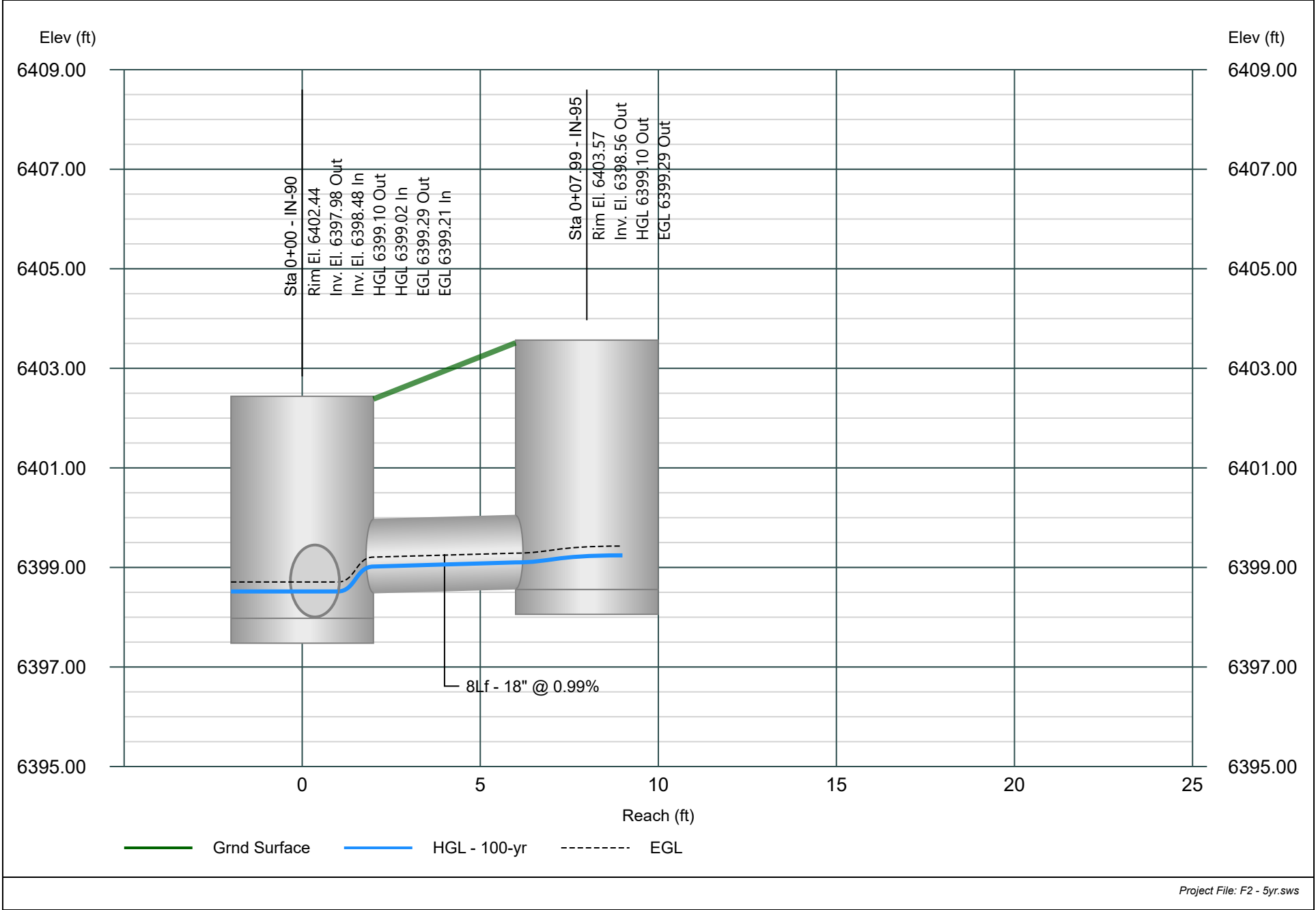
Line 27 - PIPE-221

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



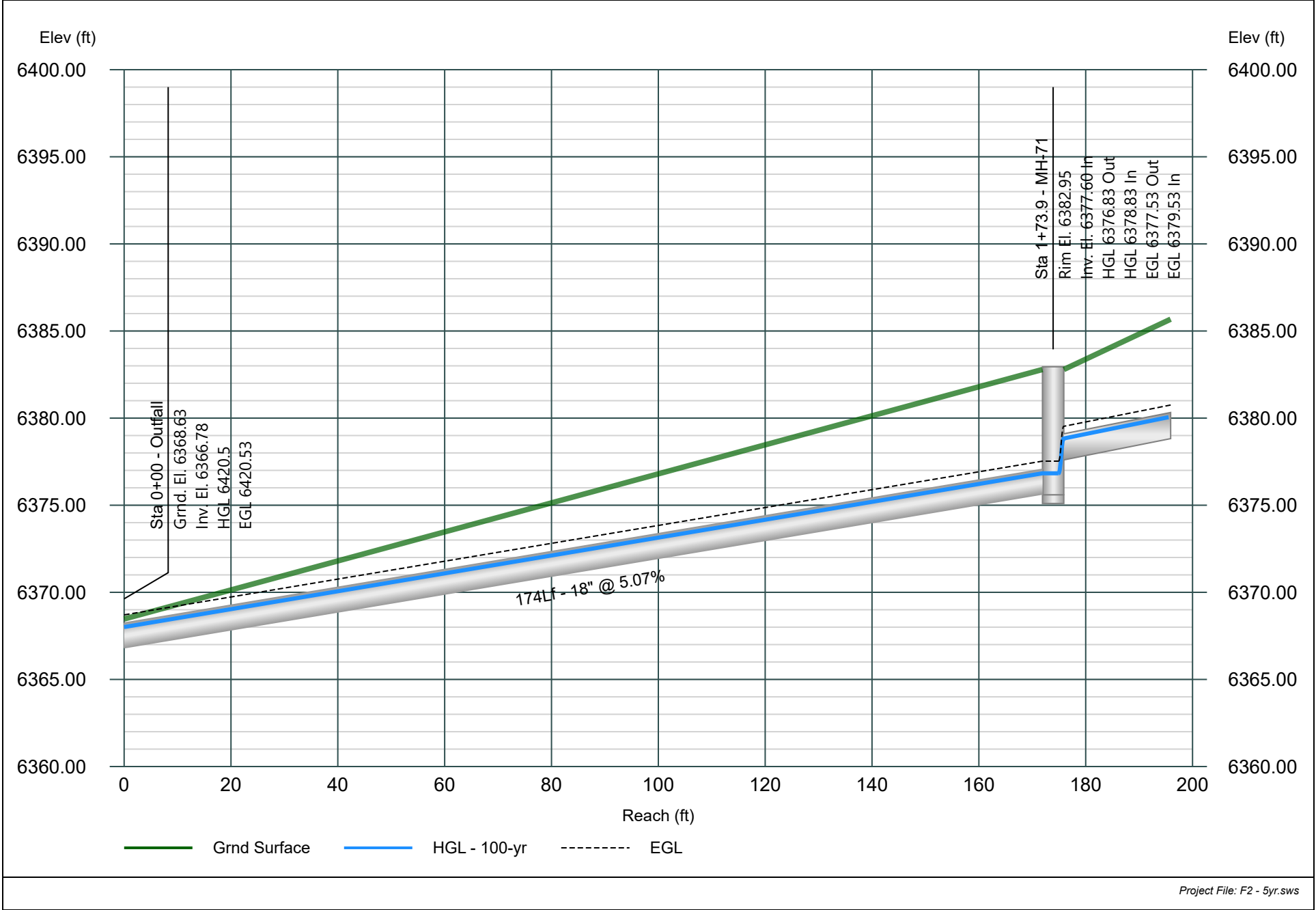
Line 28 - PIPE-64 (1)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



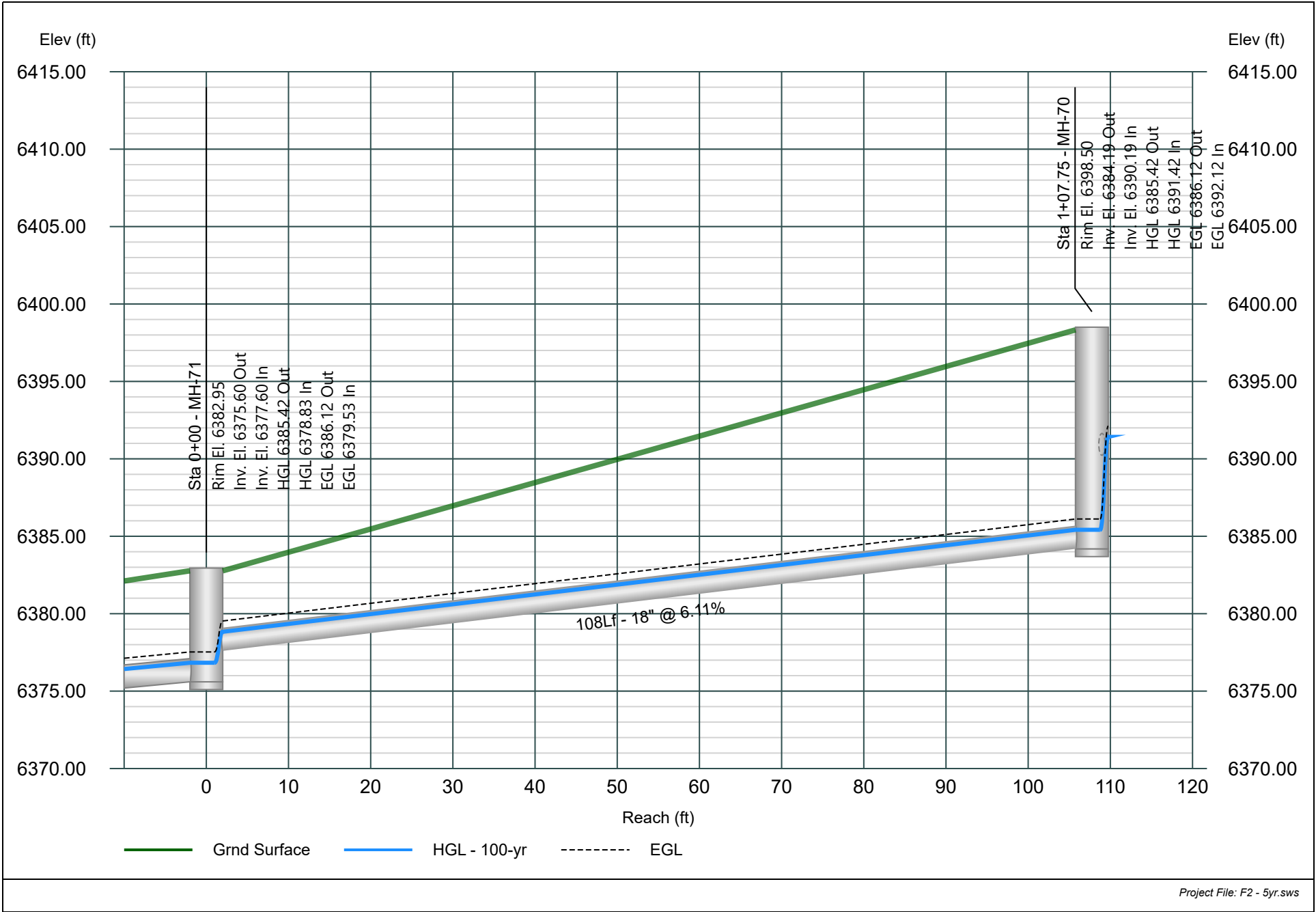
Line 29 - PIPE-64 (2)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



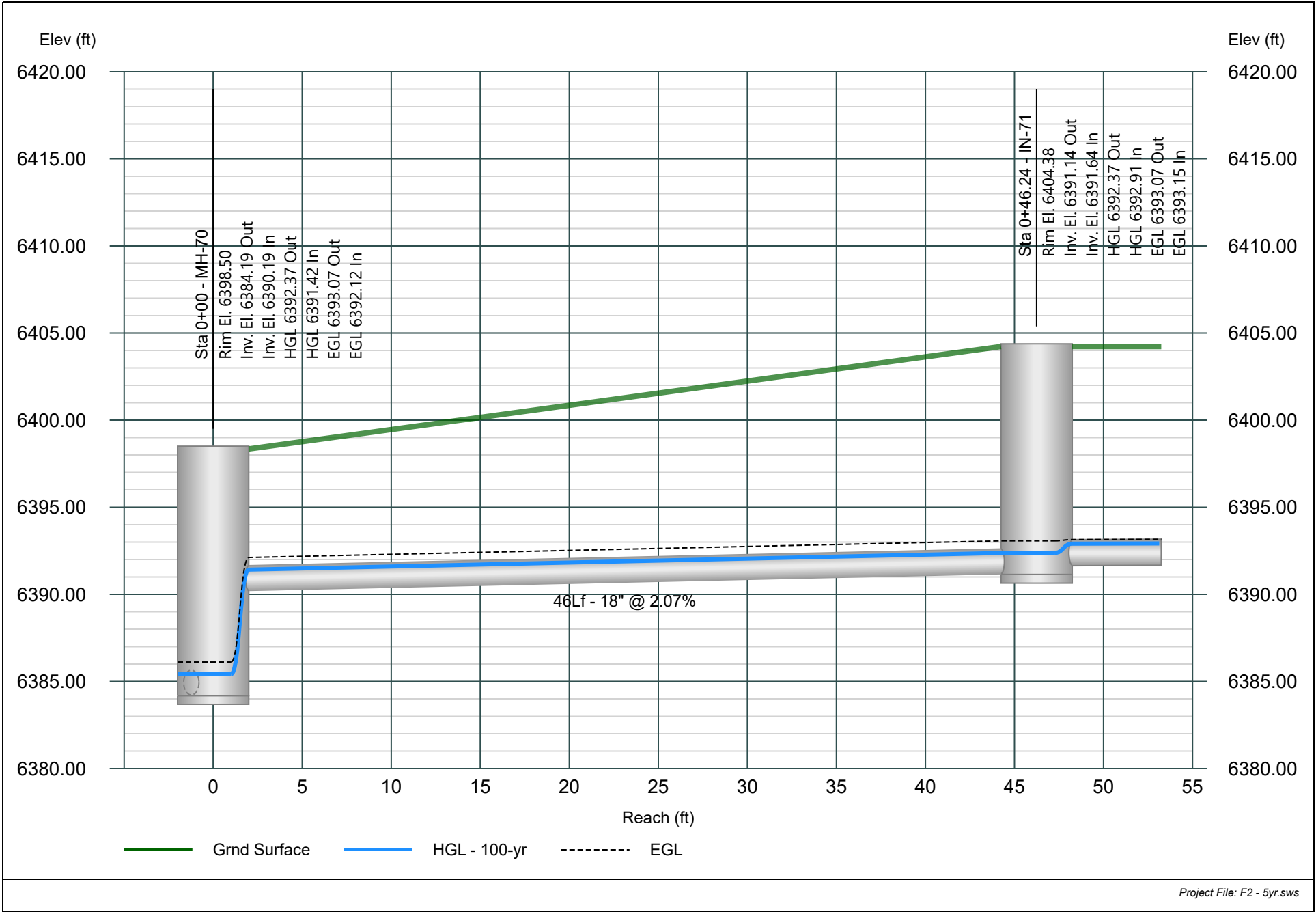
Line 30 - PIPE-64

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



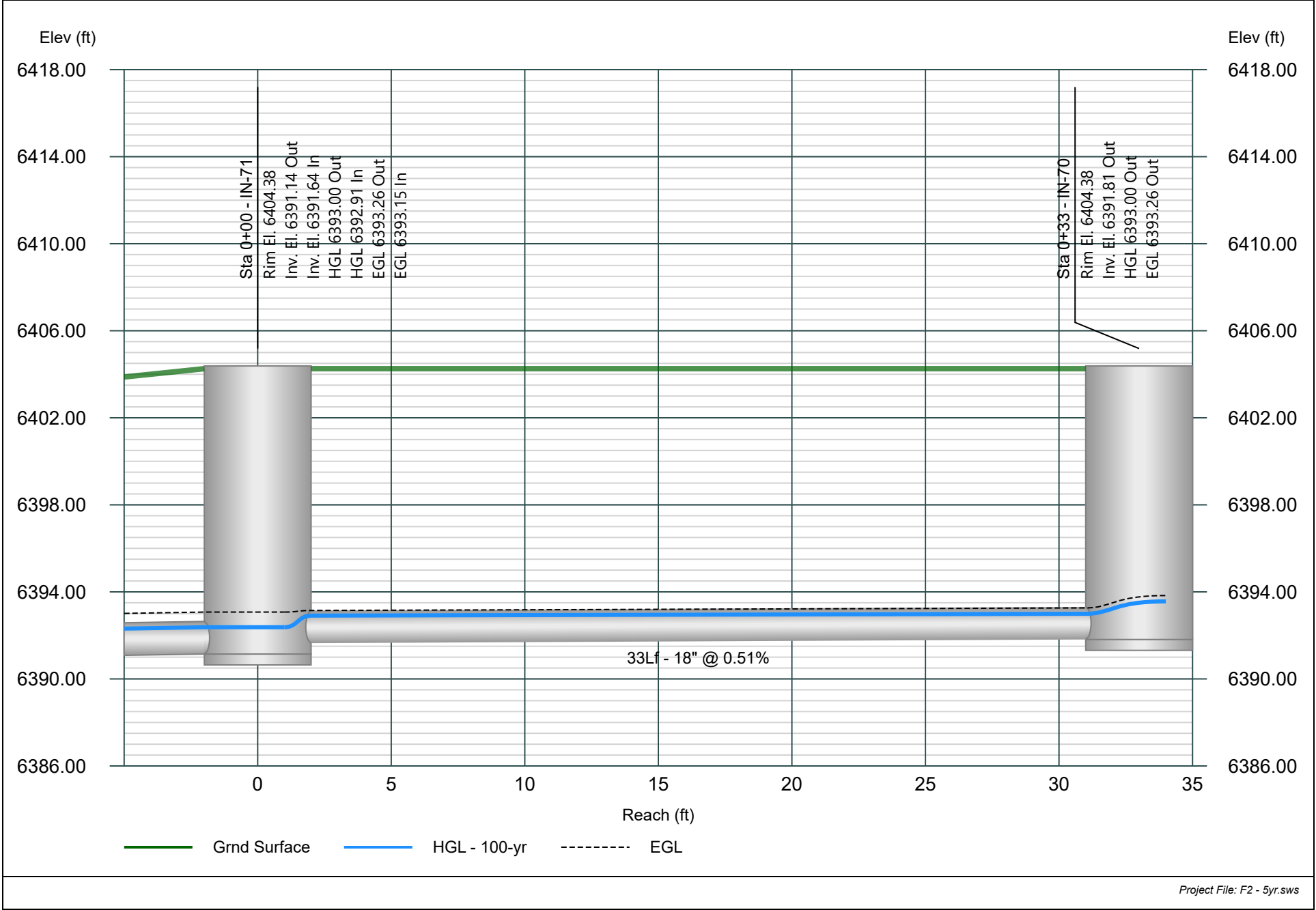
Line 31 - PIPE-90

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



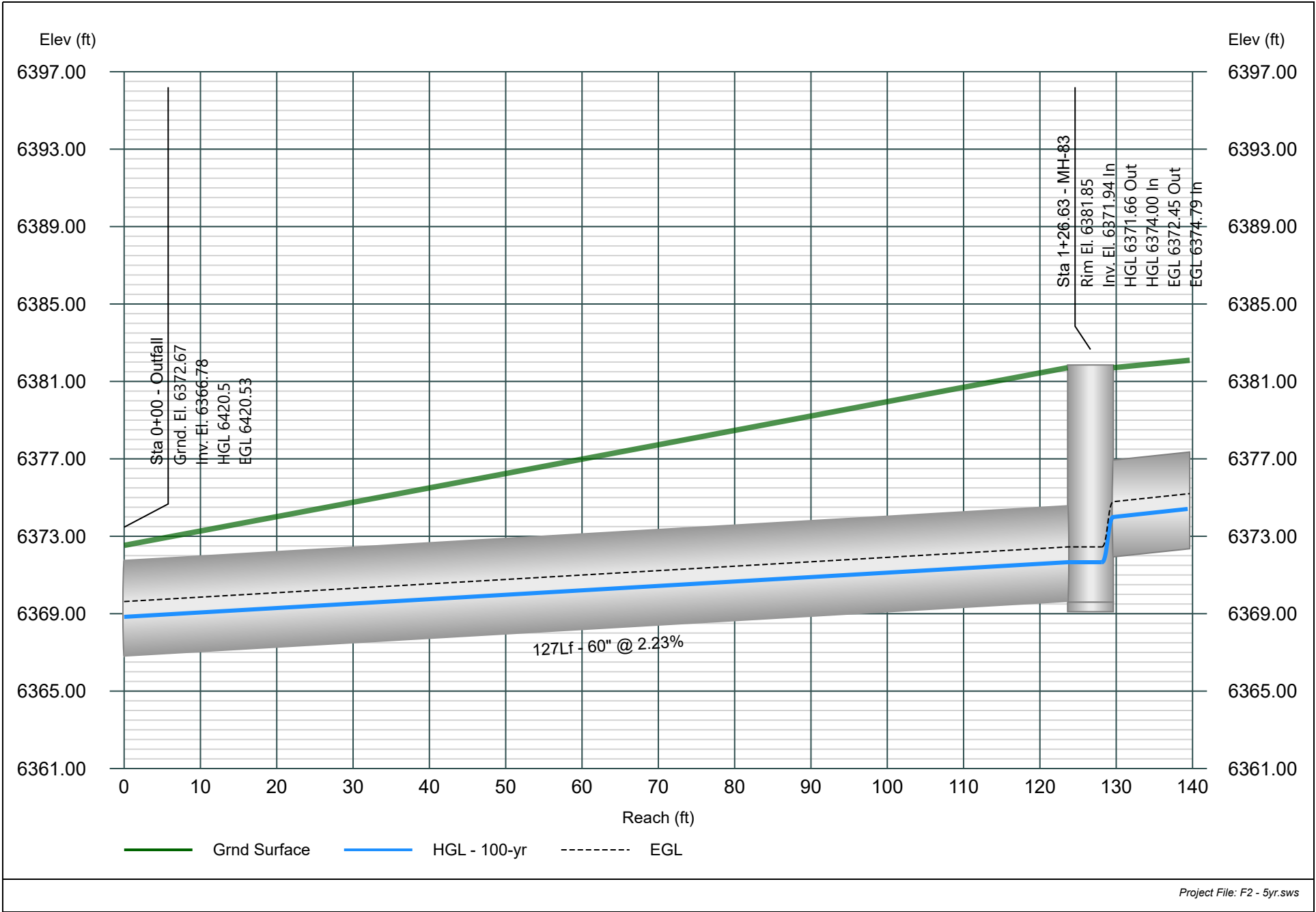
Line 32 - PIPE-89 (1)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



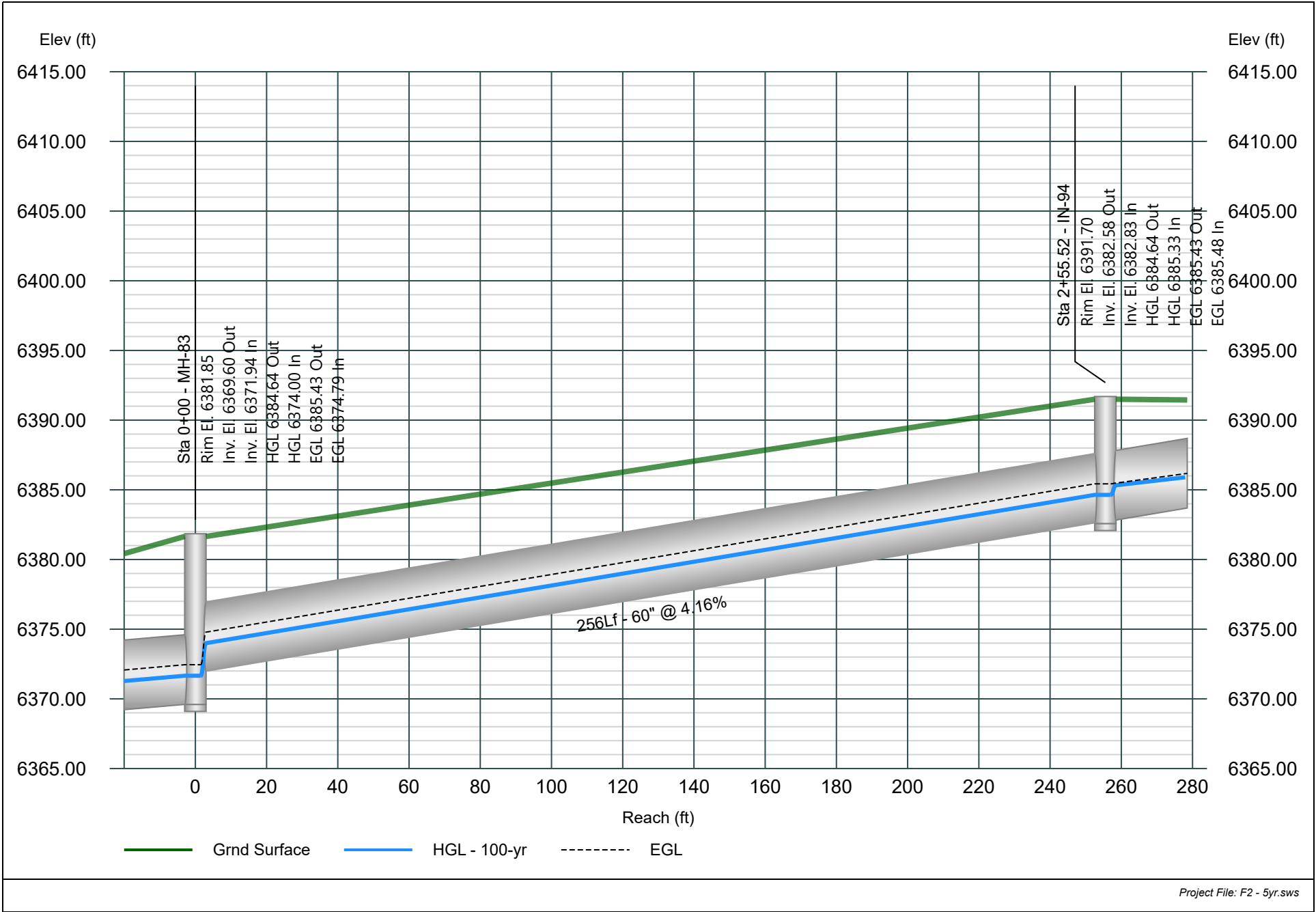
Line 33 - PIPE-89 (2)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



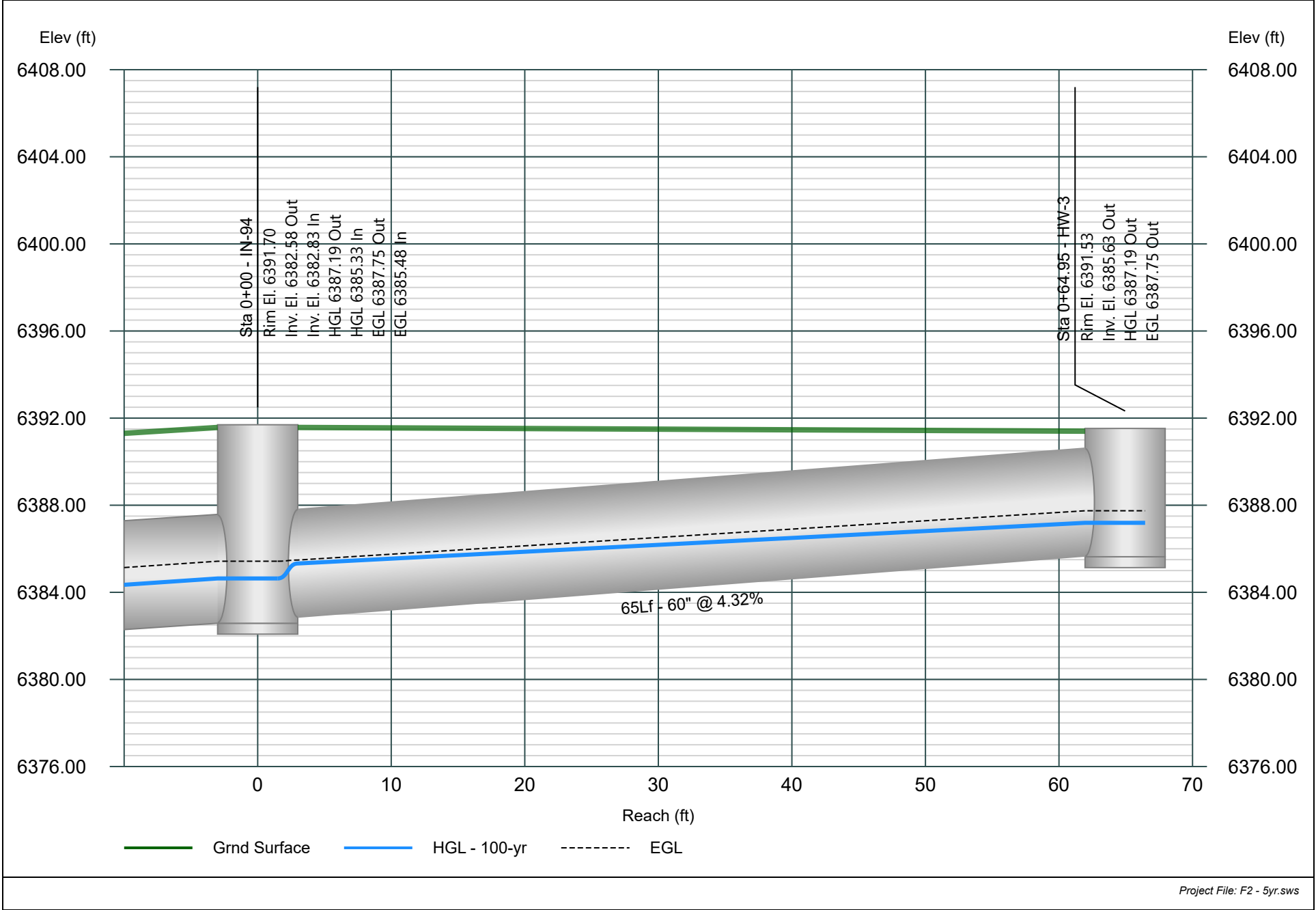
Line 34 - PIPE-89

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



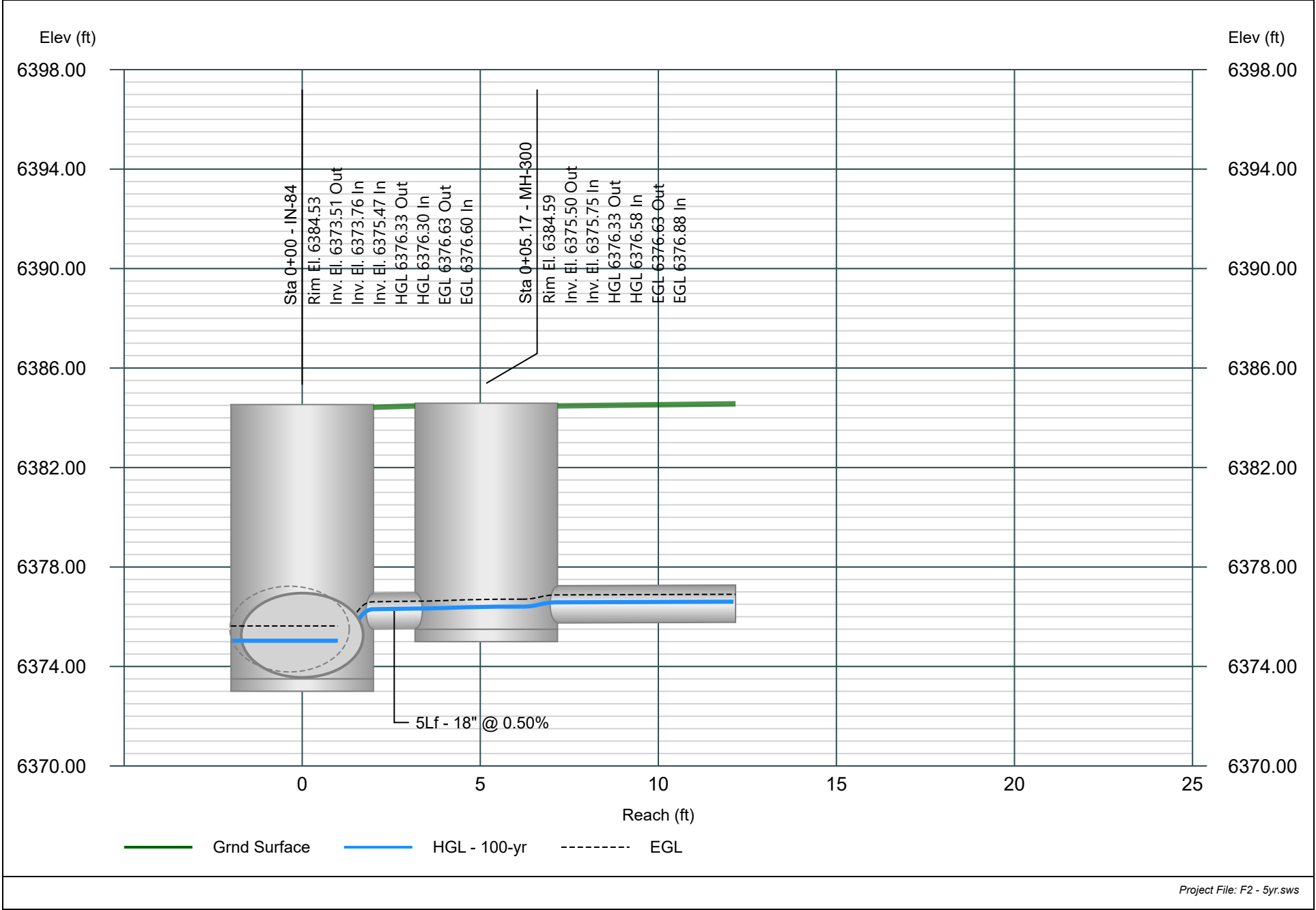
Line 35 - PIPE-237

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



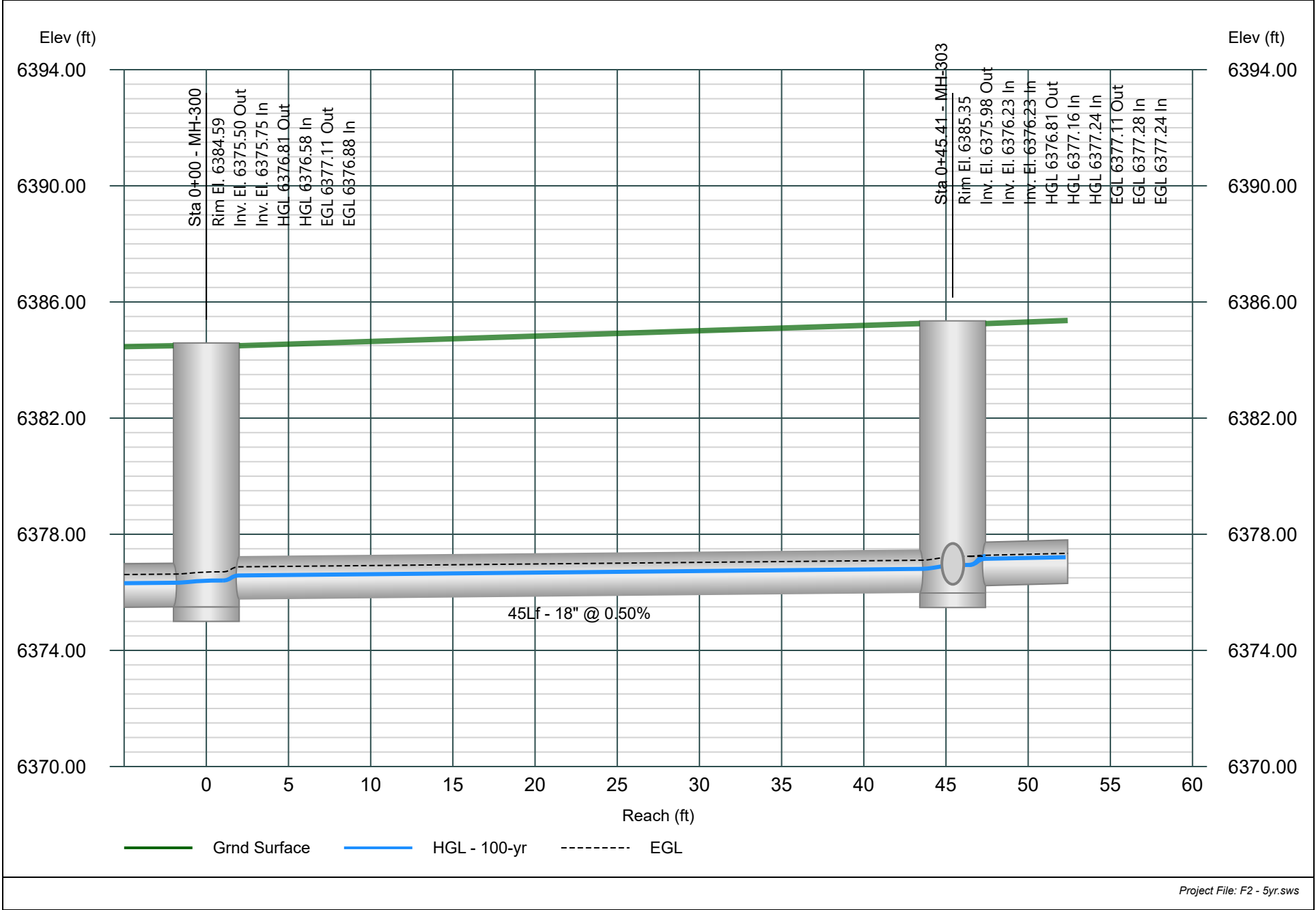
Line 36 - PIPE-236

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



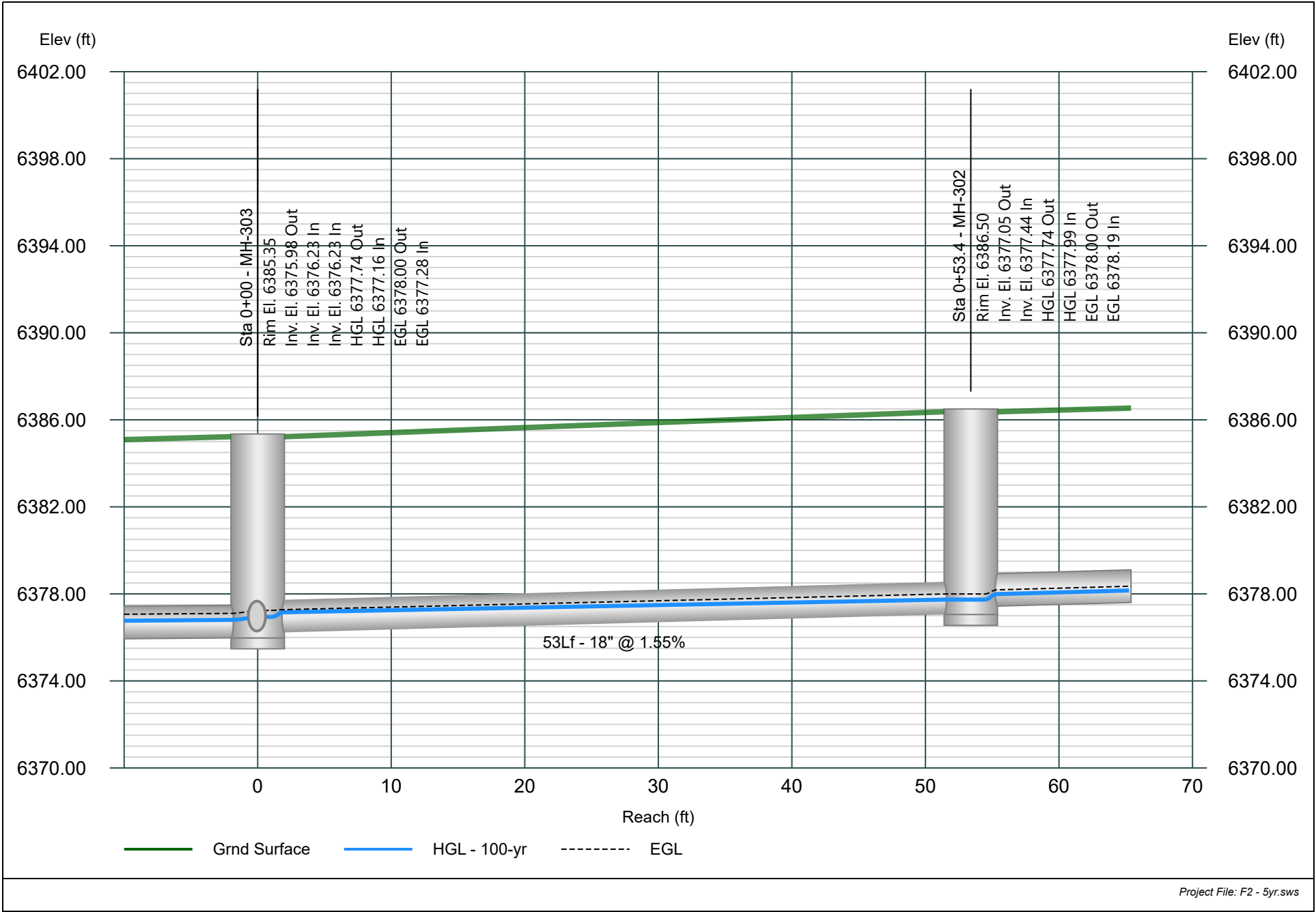
Line 37 - PIPE-229

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



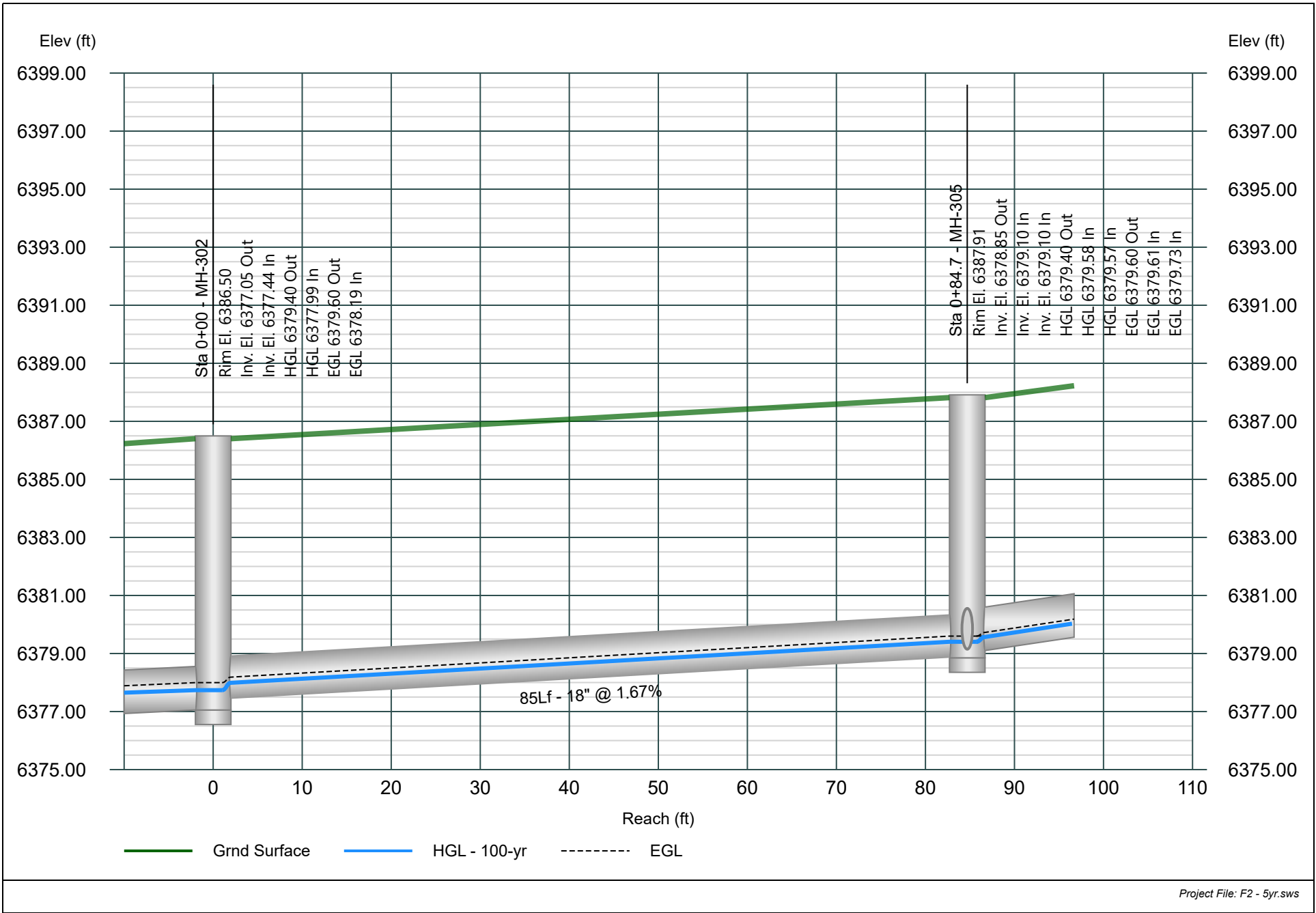
Line 38 - PIPE-228 (1)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



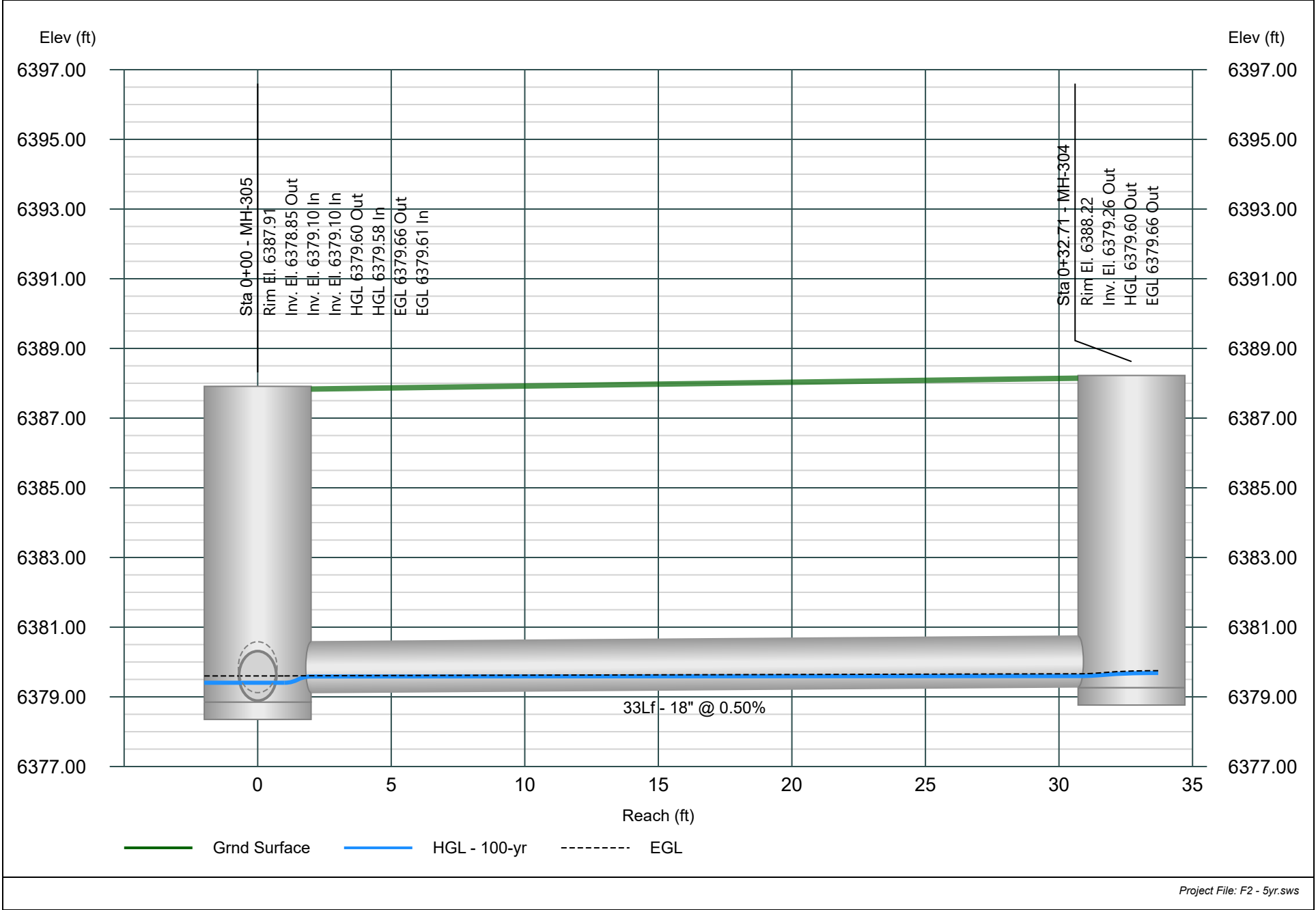
Line 39 - PIPE-238

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



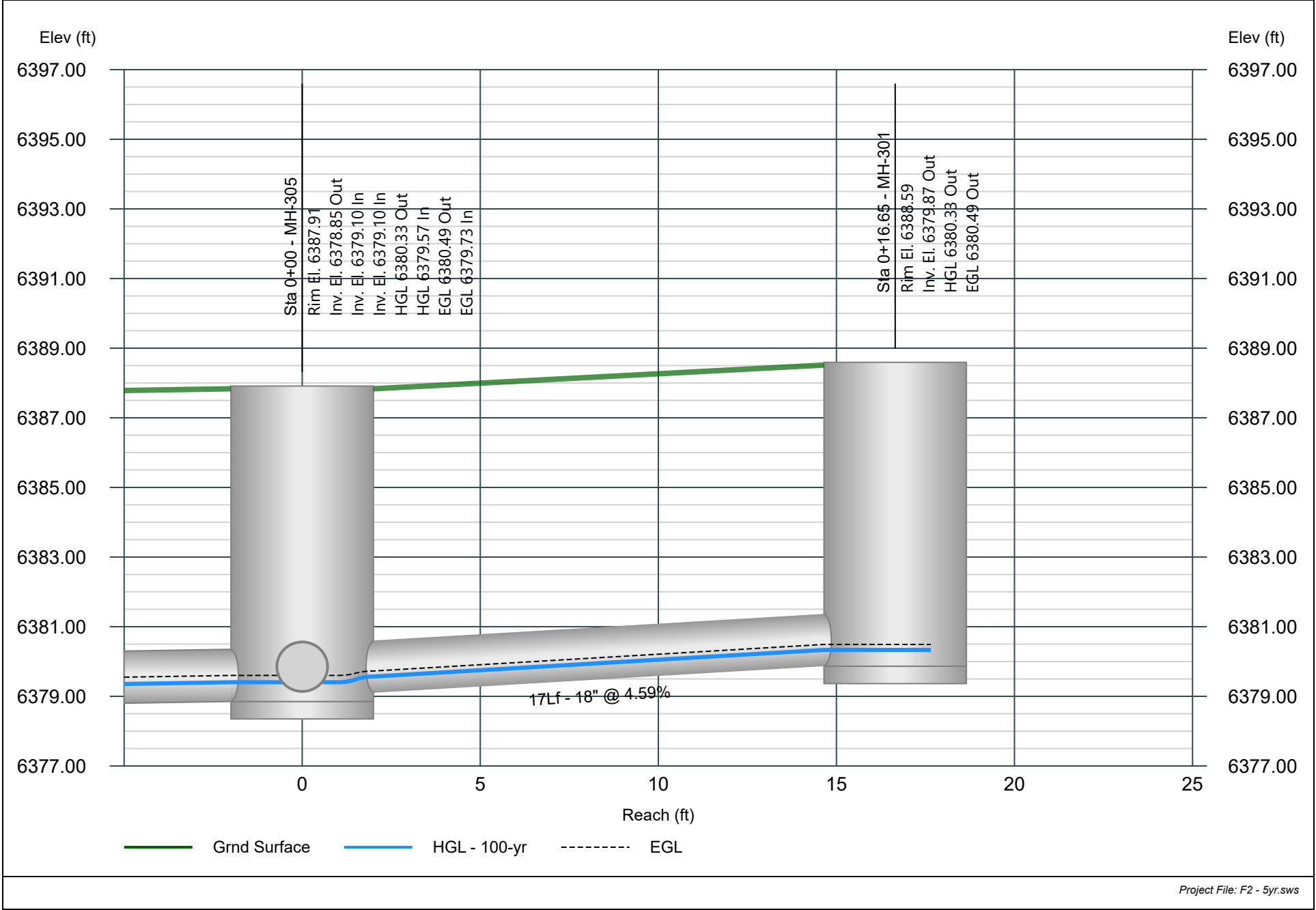
Line 40 - PIPE-228

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



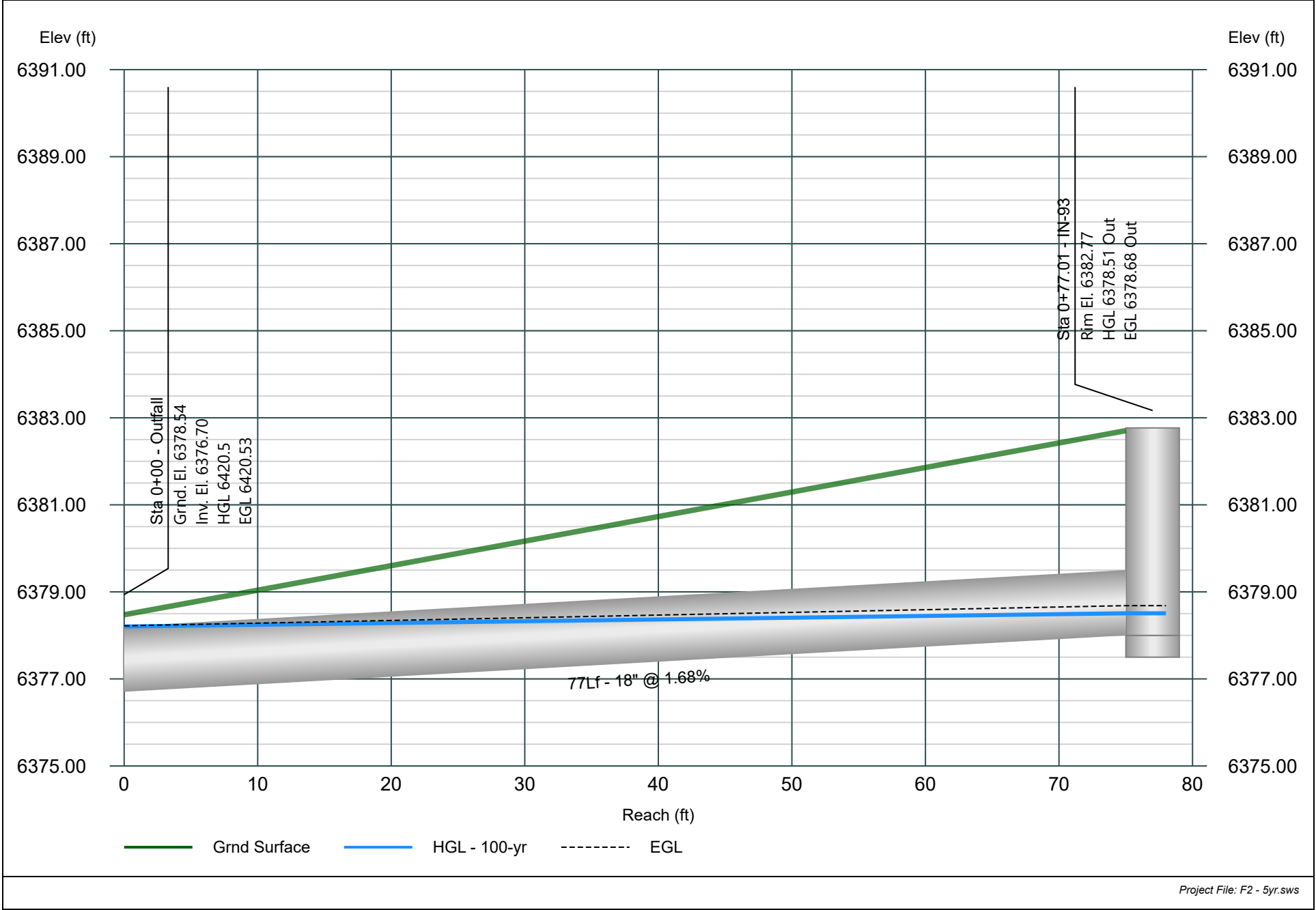
Line 41 - PIPE-220

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025

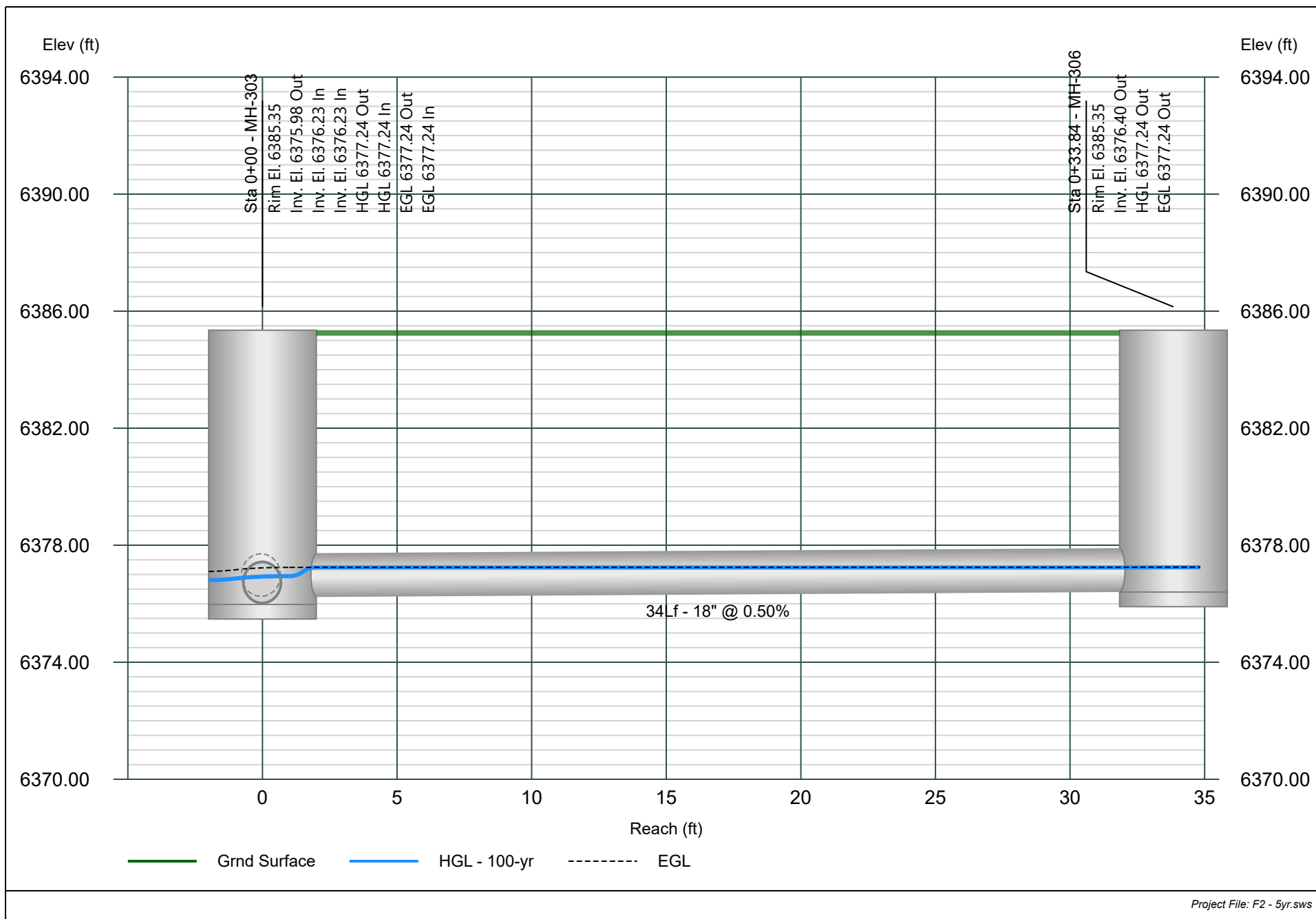


Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



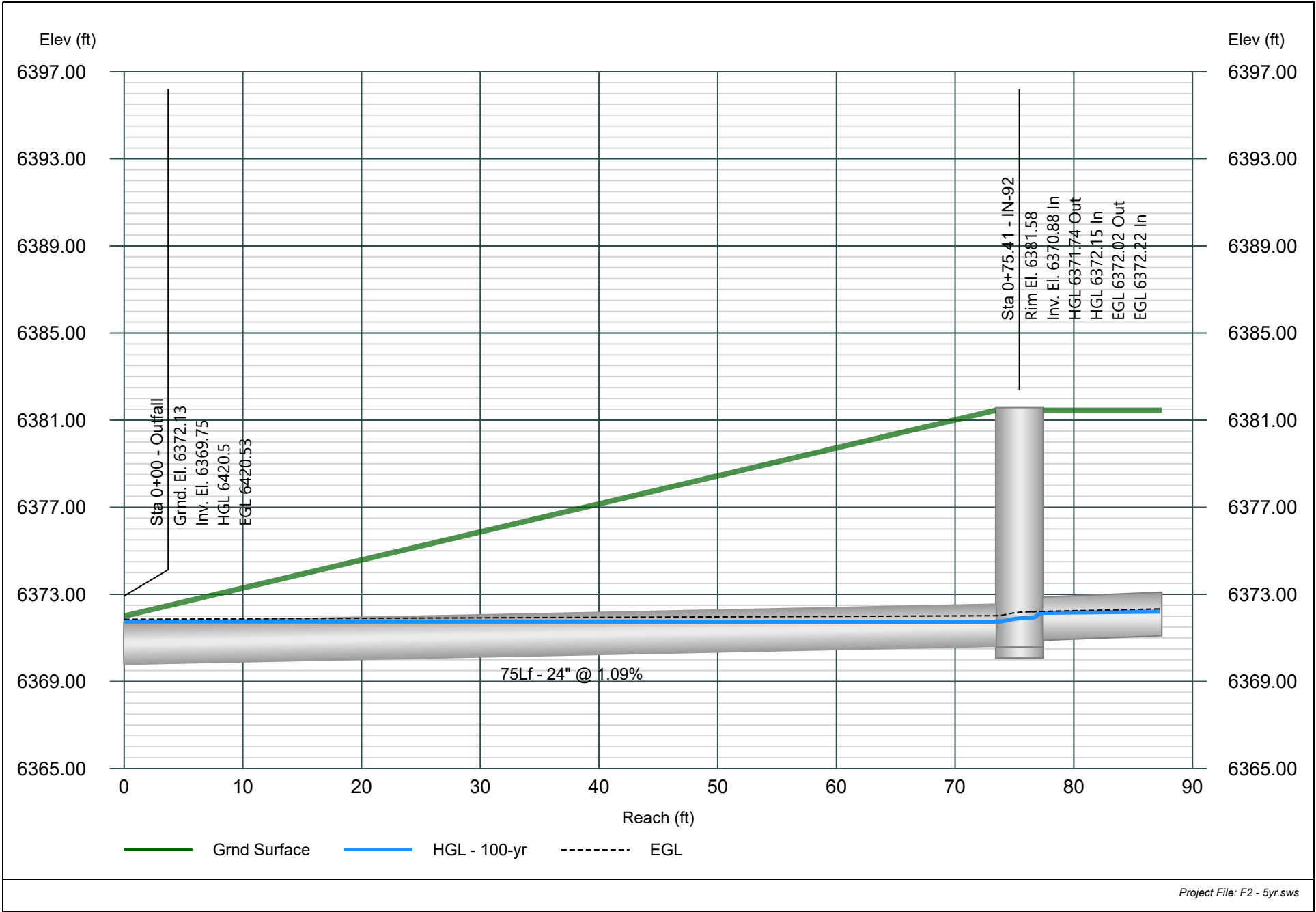
Line 43 - PIPE-219

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



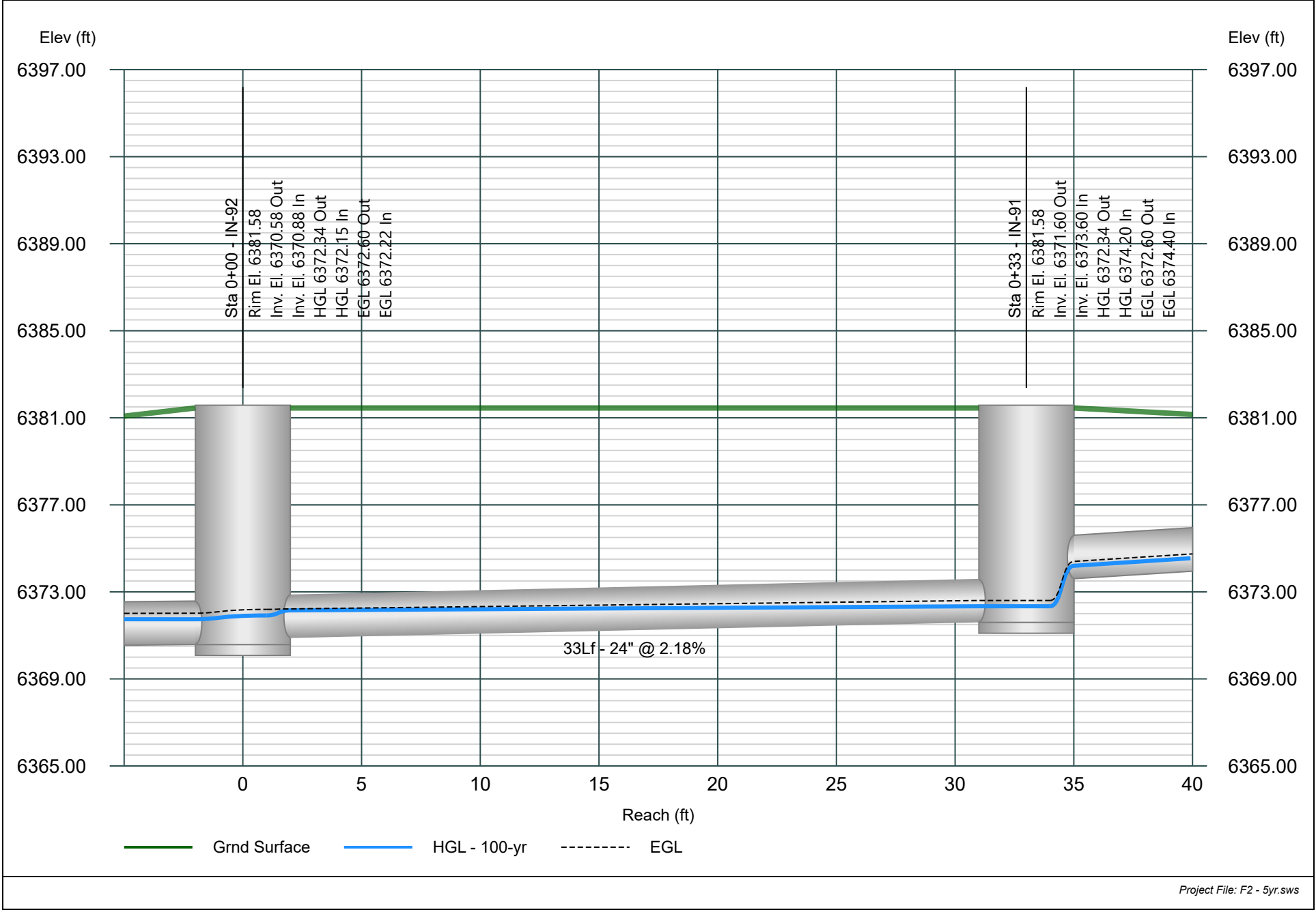
Line 44 - PIPE-218

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



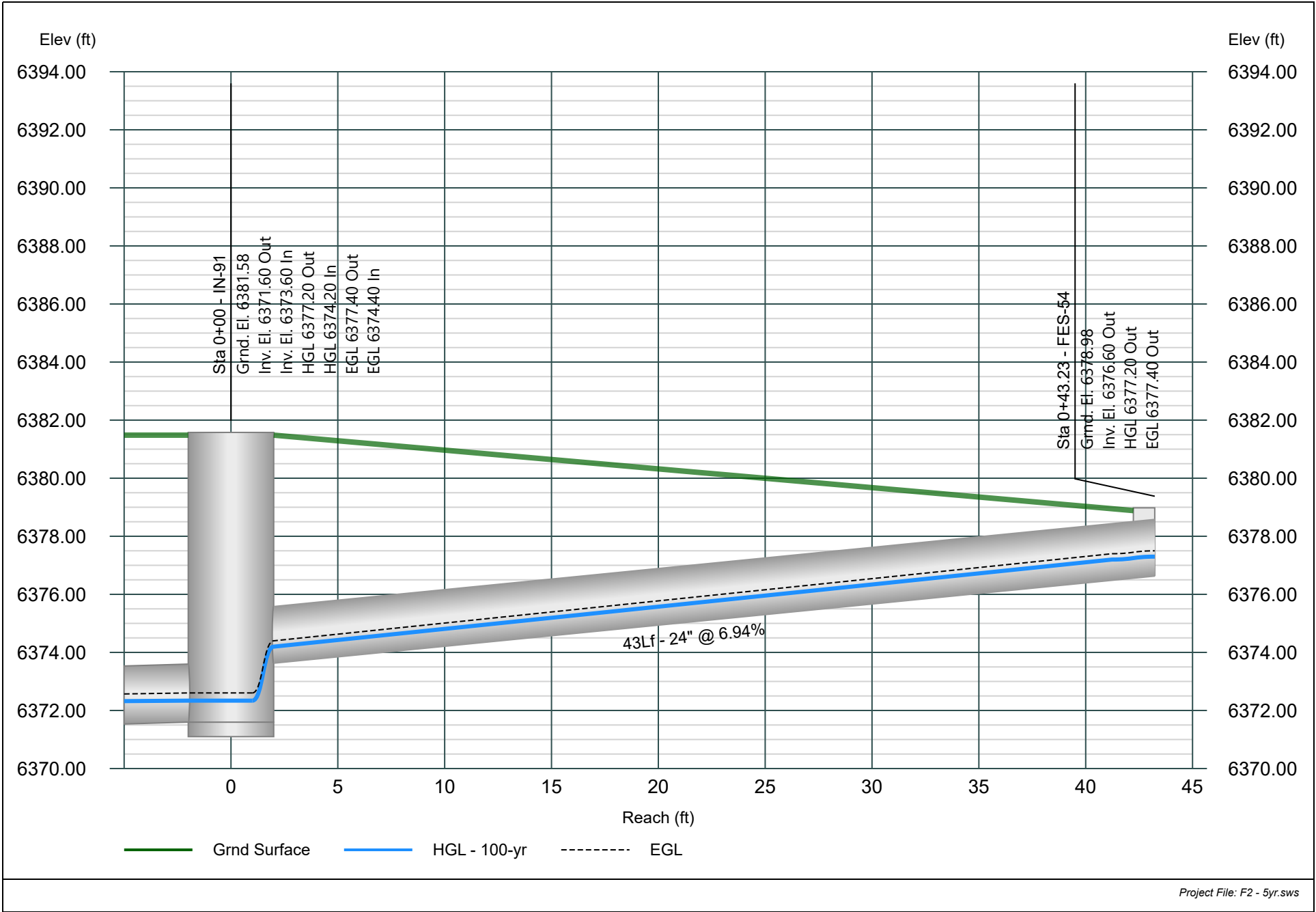
Line 45 - PIPE-217

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



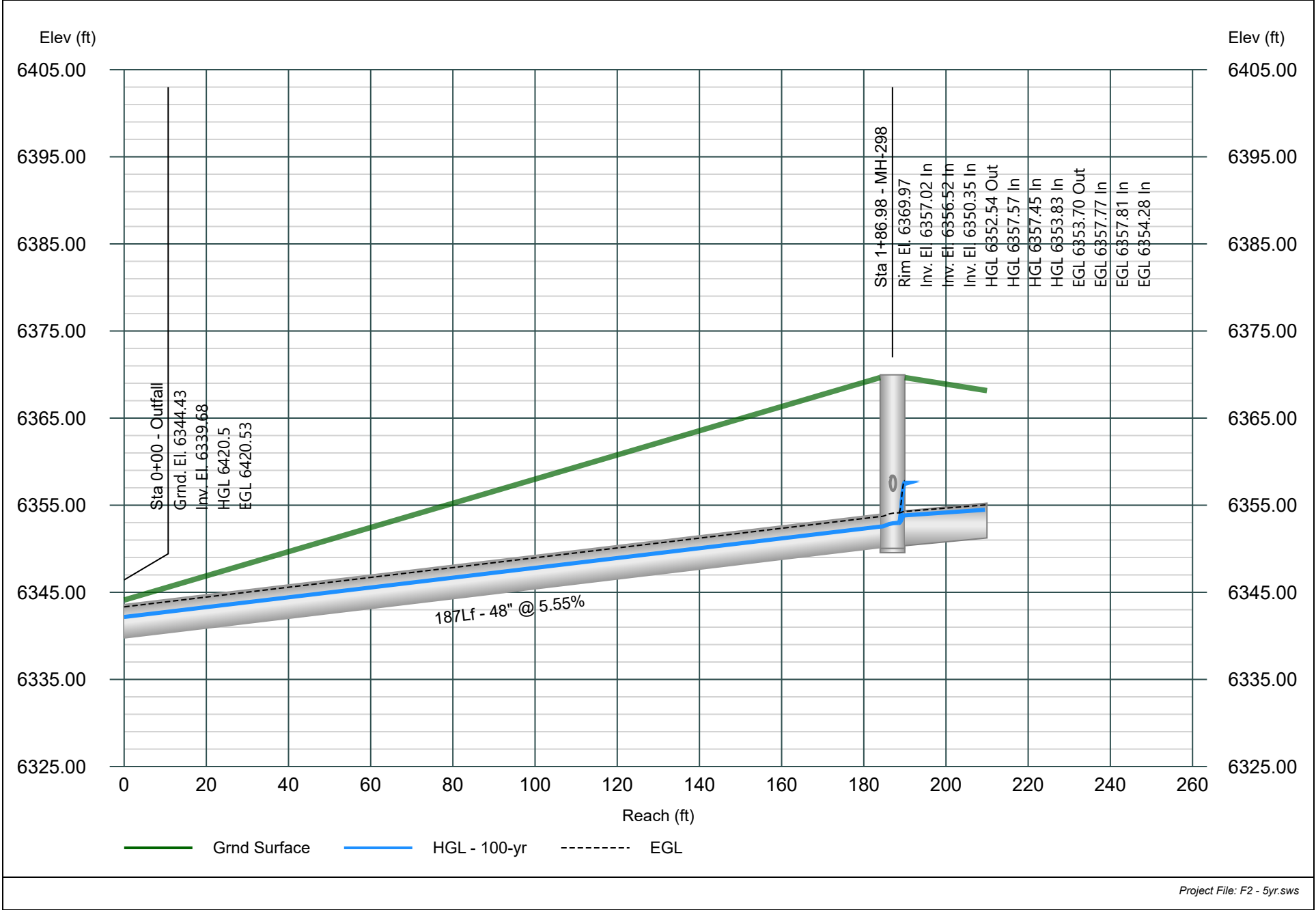
Line 46 - PIPE-81 (1)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



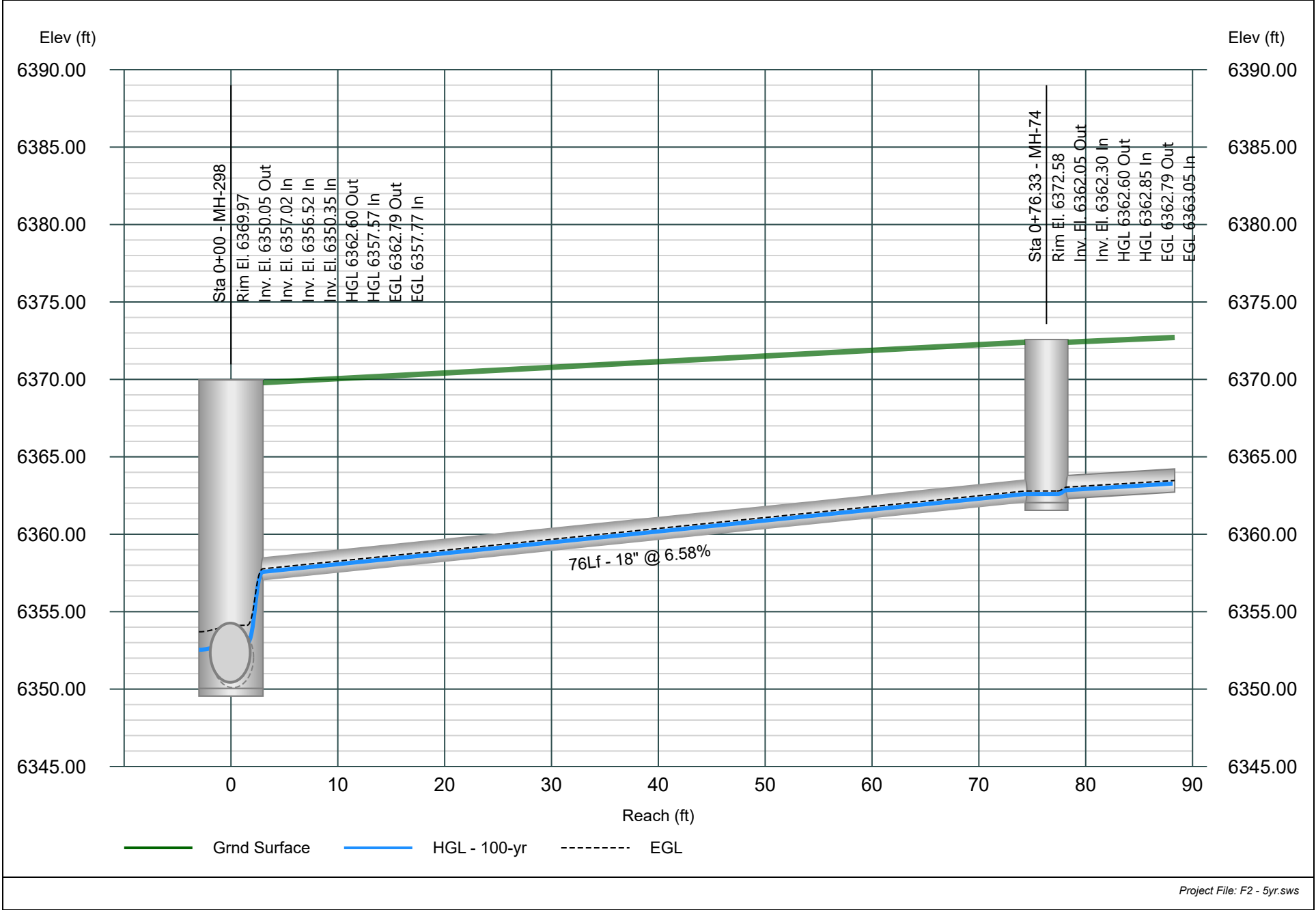
Line 47 - PIPE-54

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



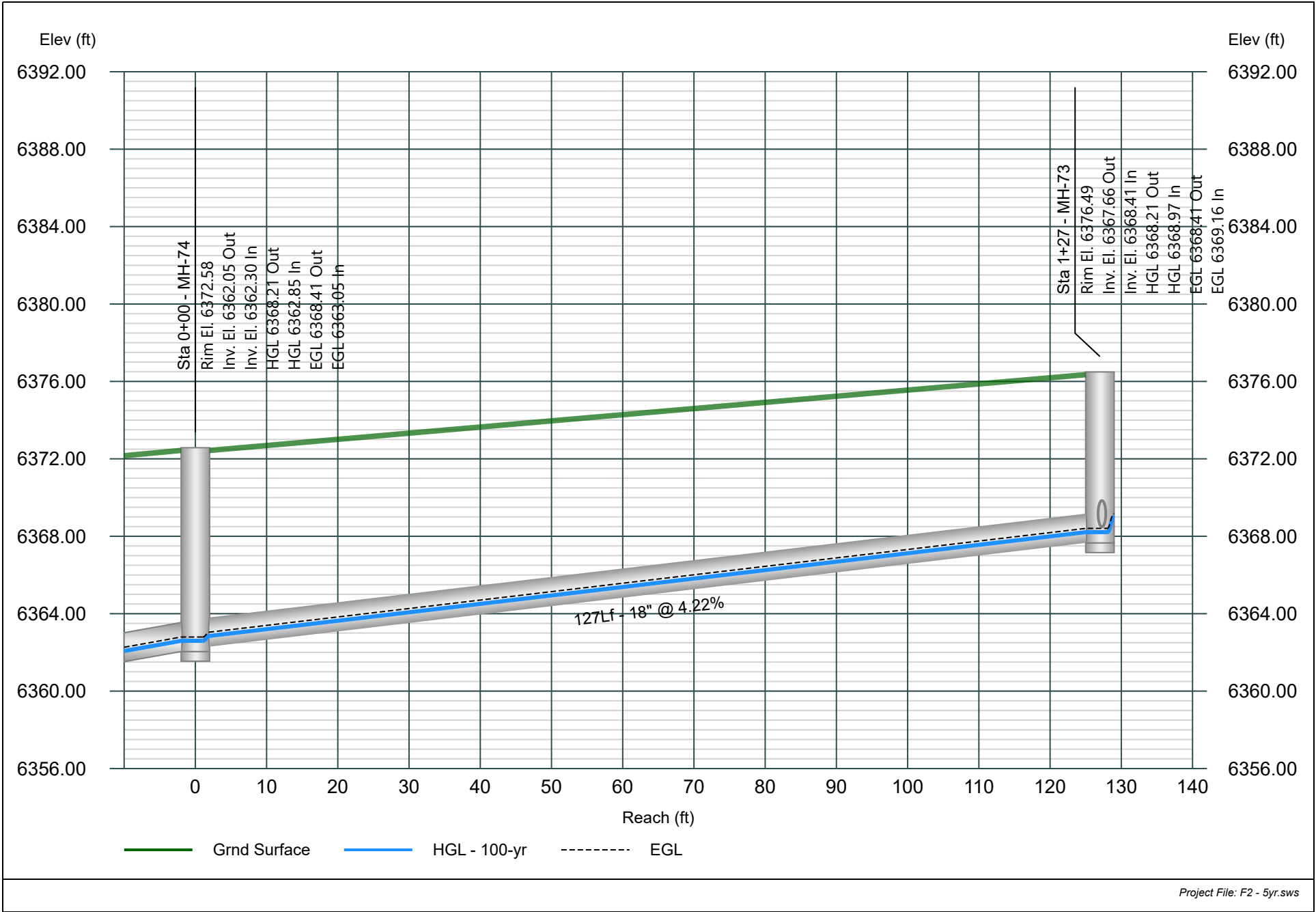
Line 48 - PIPE-53

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



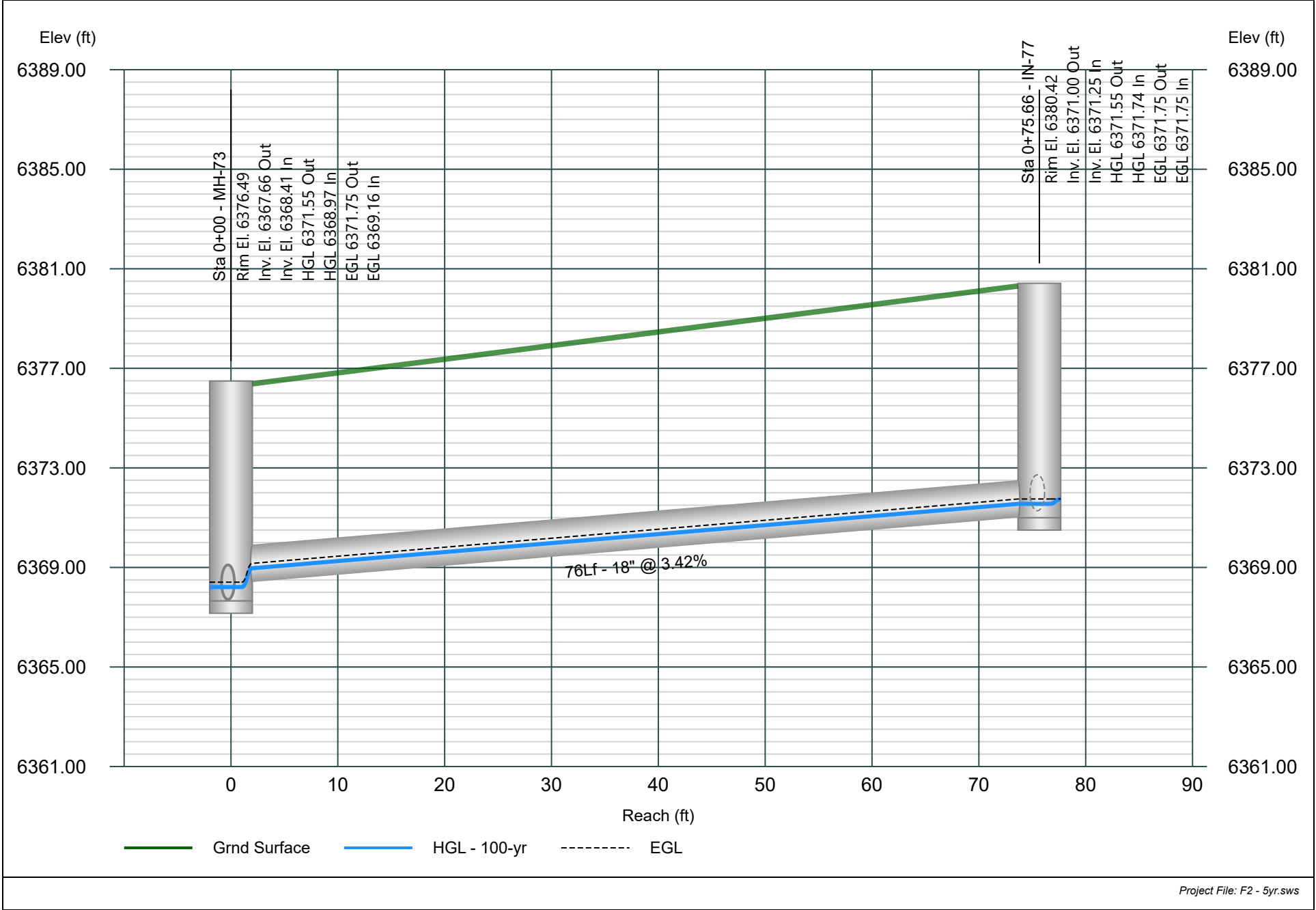
Line 49 - PIPE-52

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



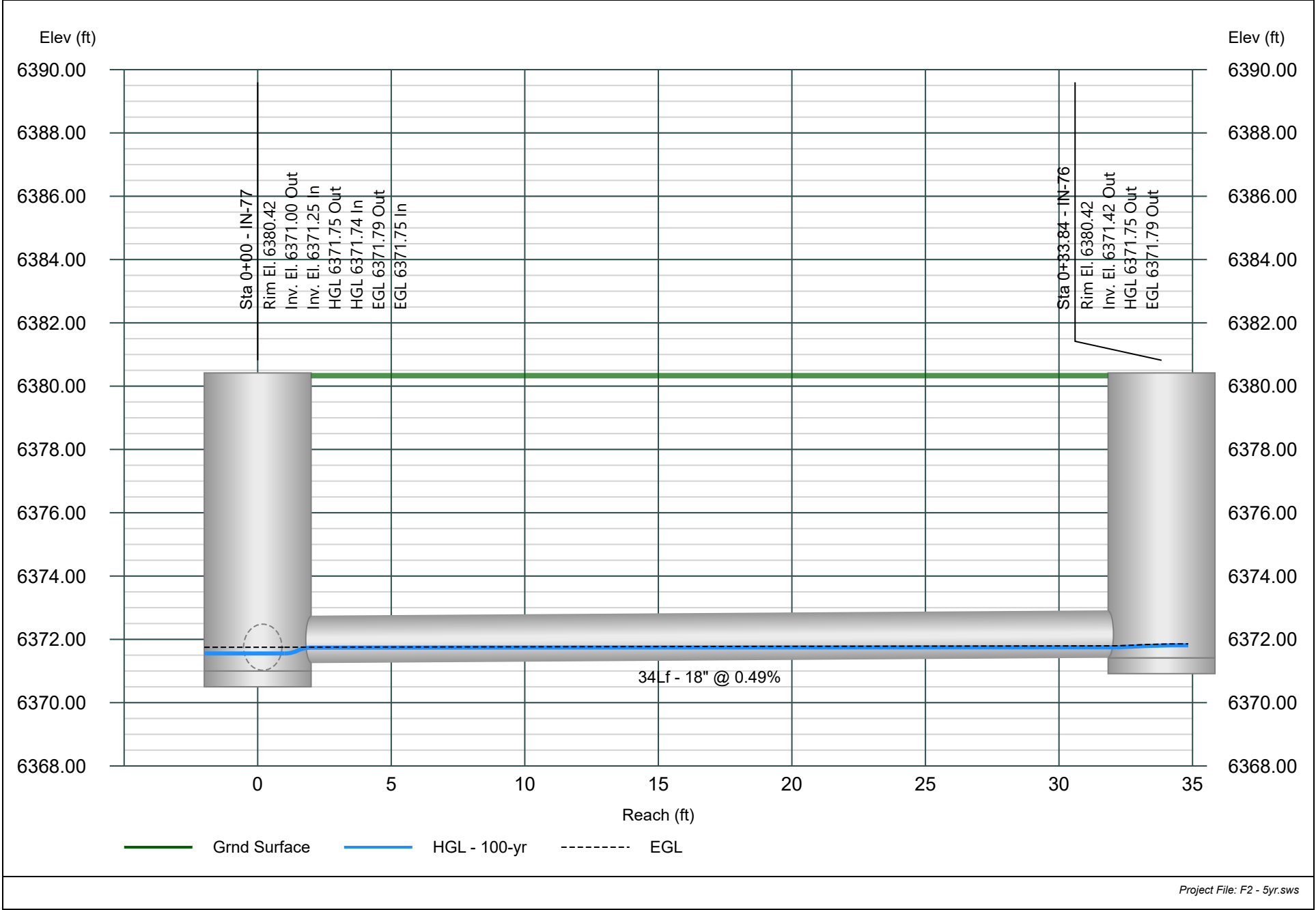
Line 50 - PIPE-51

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



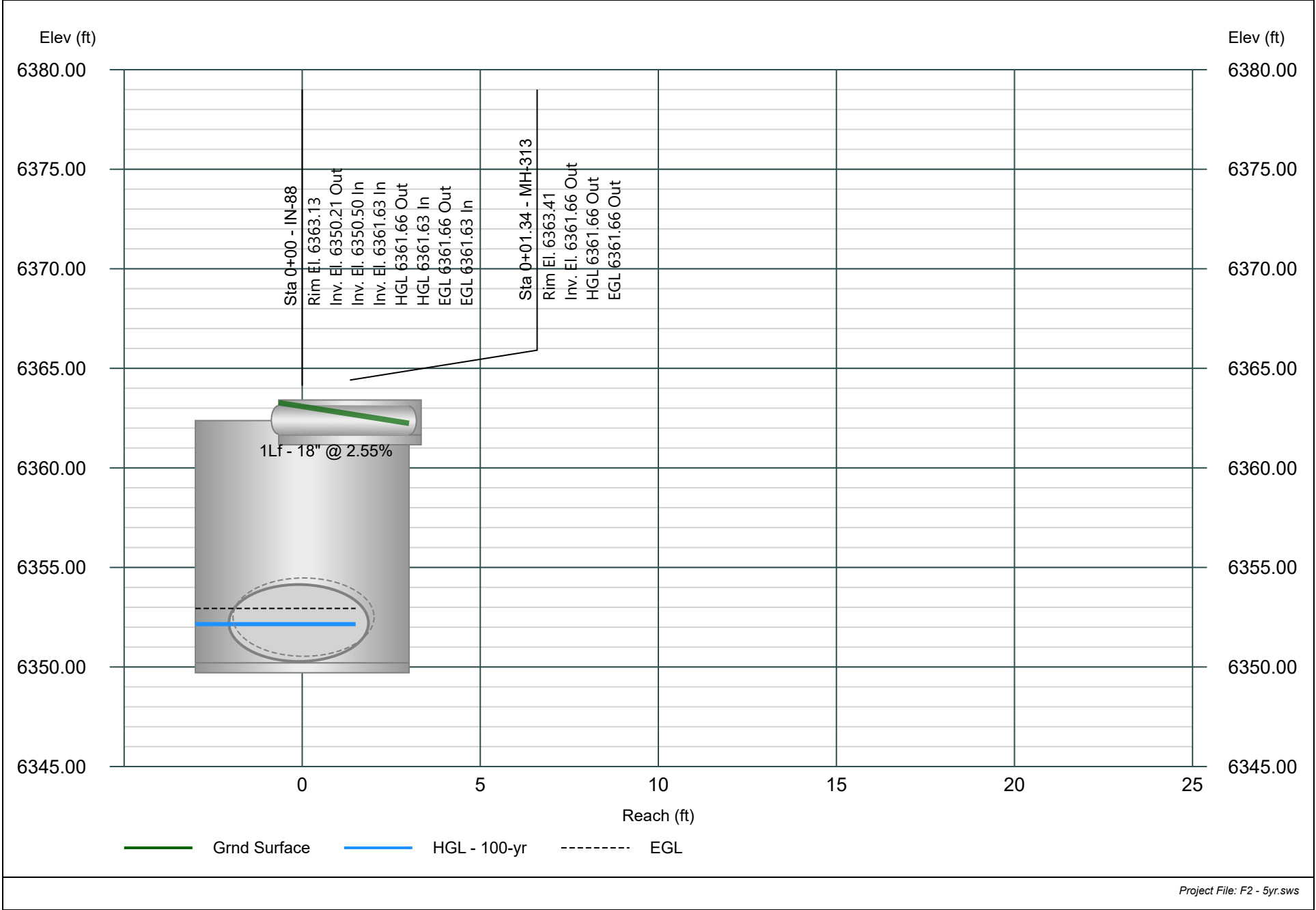
Line 51 - PIPE-249

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



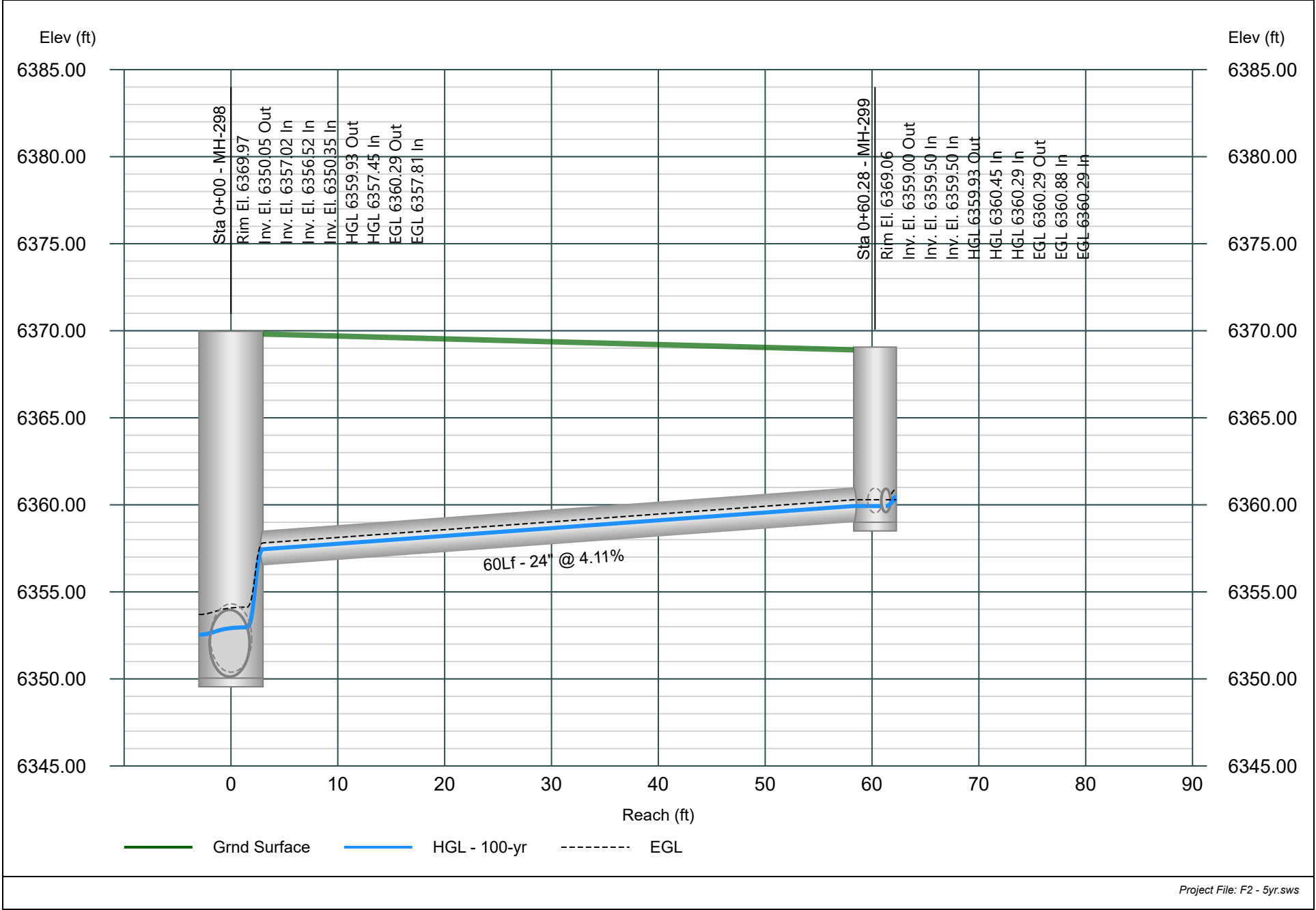
Line 52 - PIPE-56

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



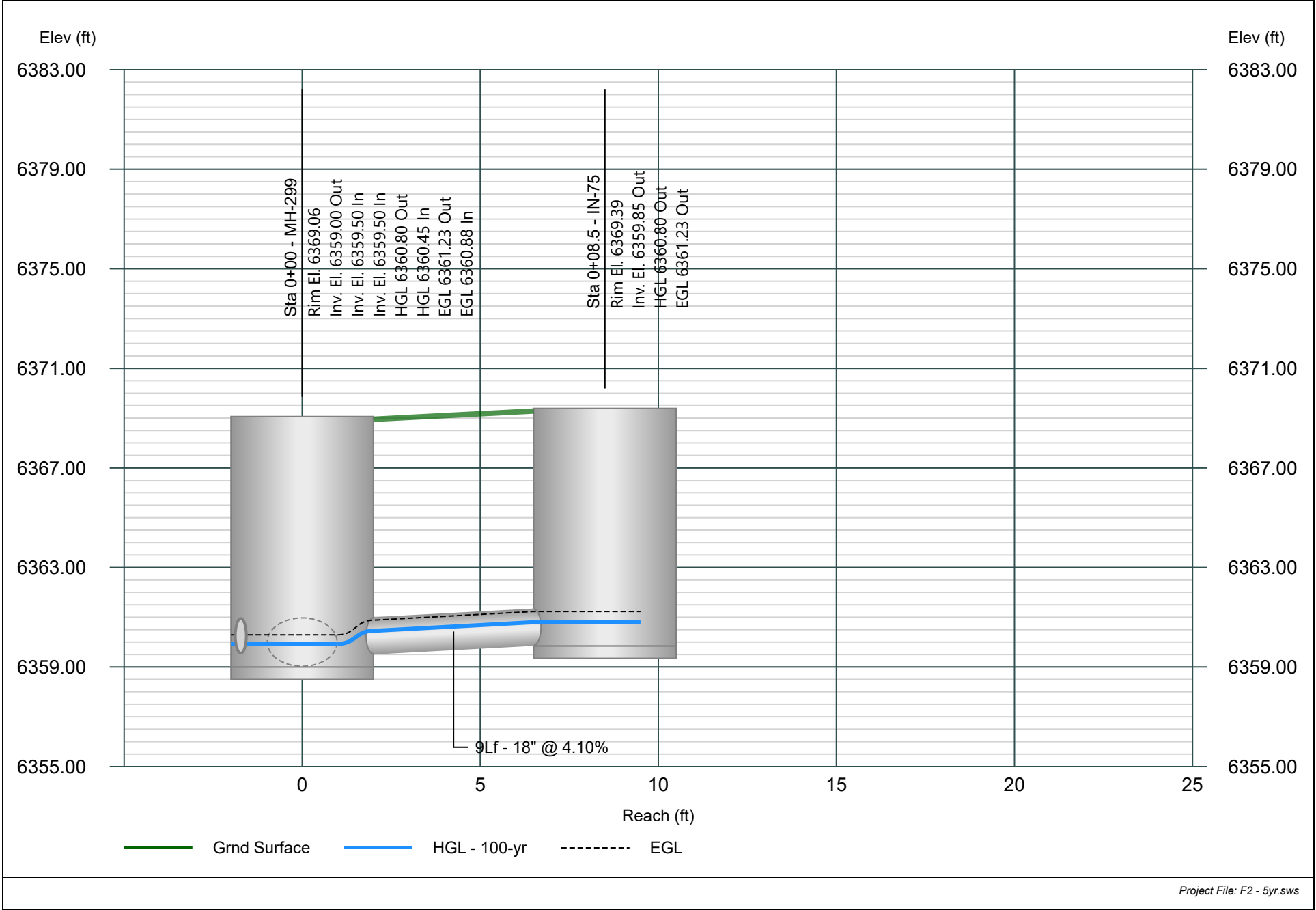
Line 53 - PIPE-59 (1)

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



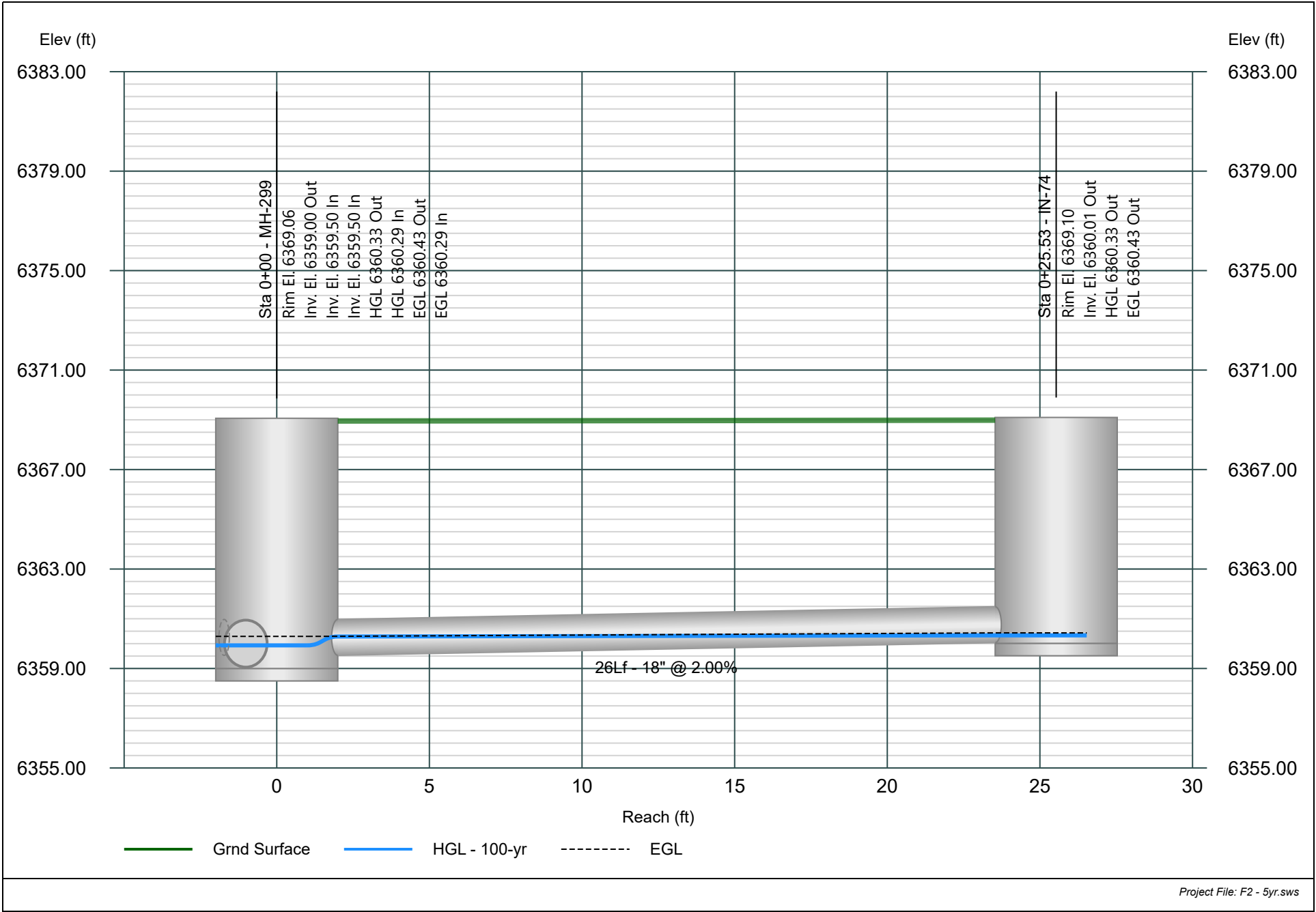
Line 54 - PIPE-59

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



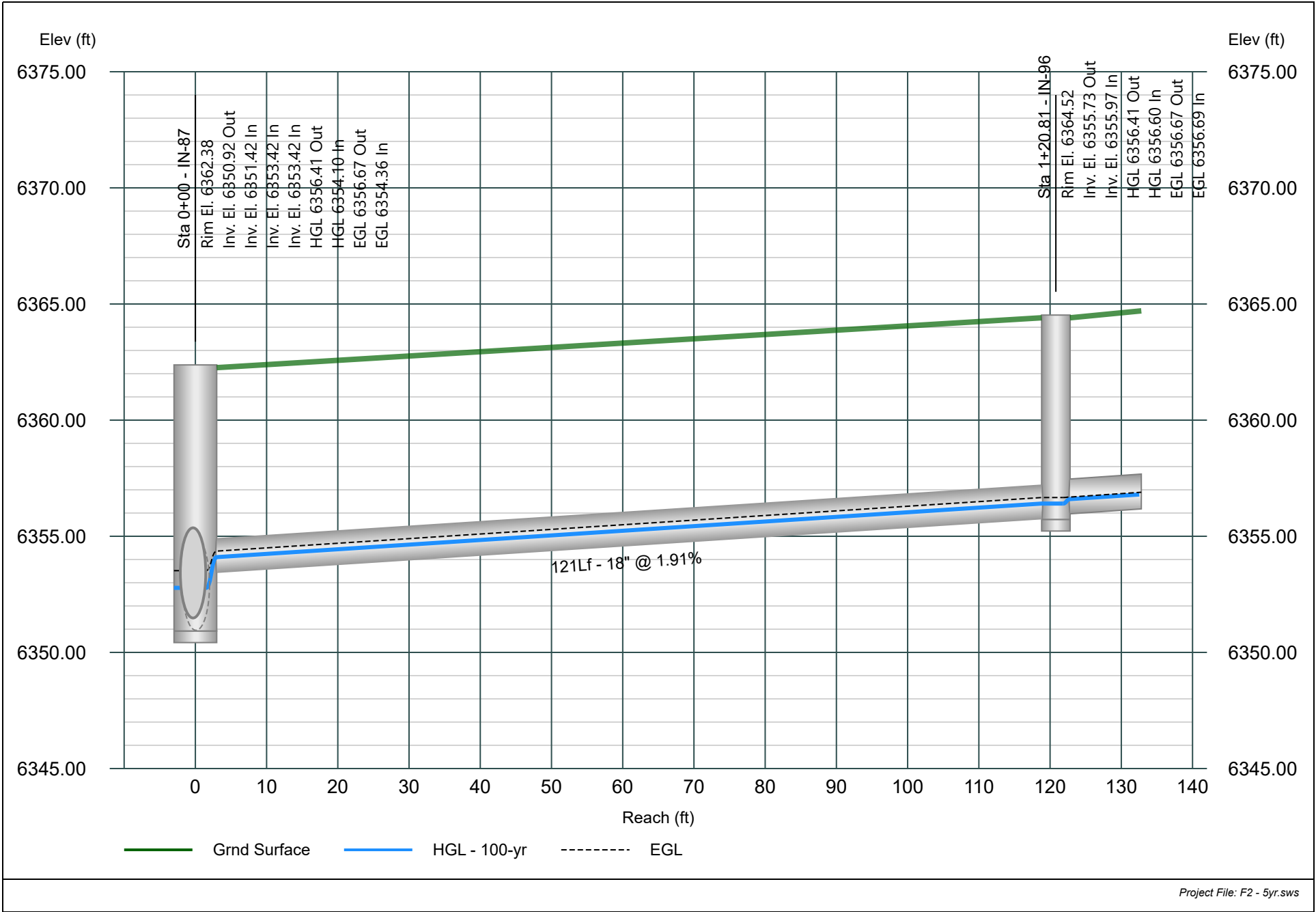
Line 55 - PIPE-227

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



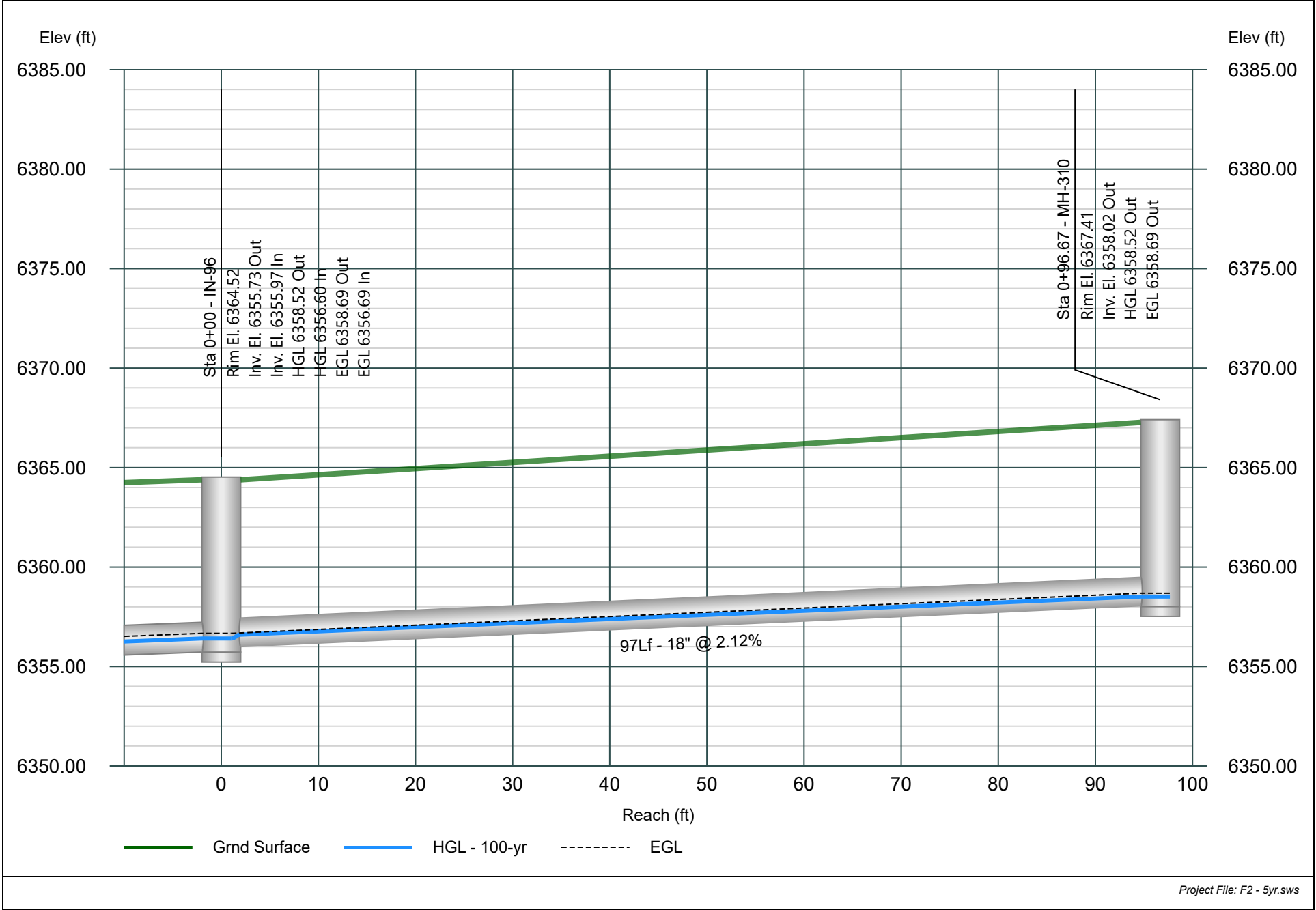
Line 56 - PIPE-247

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



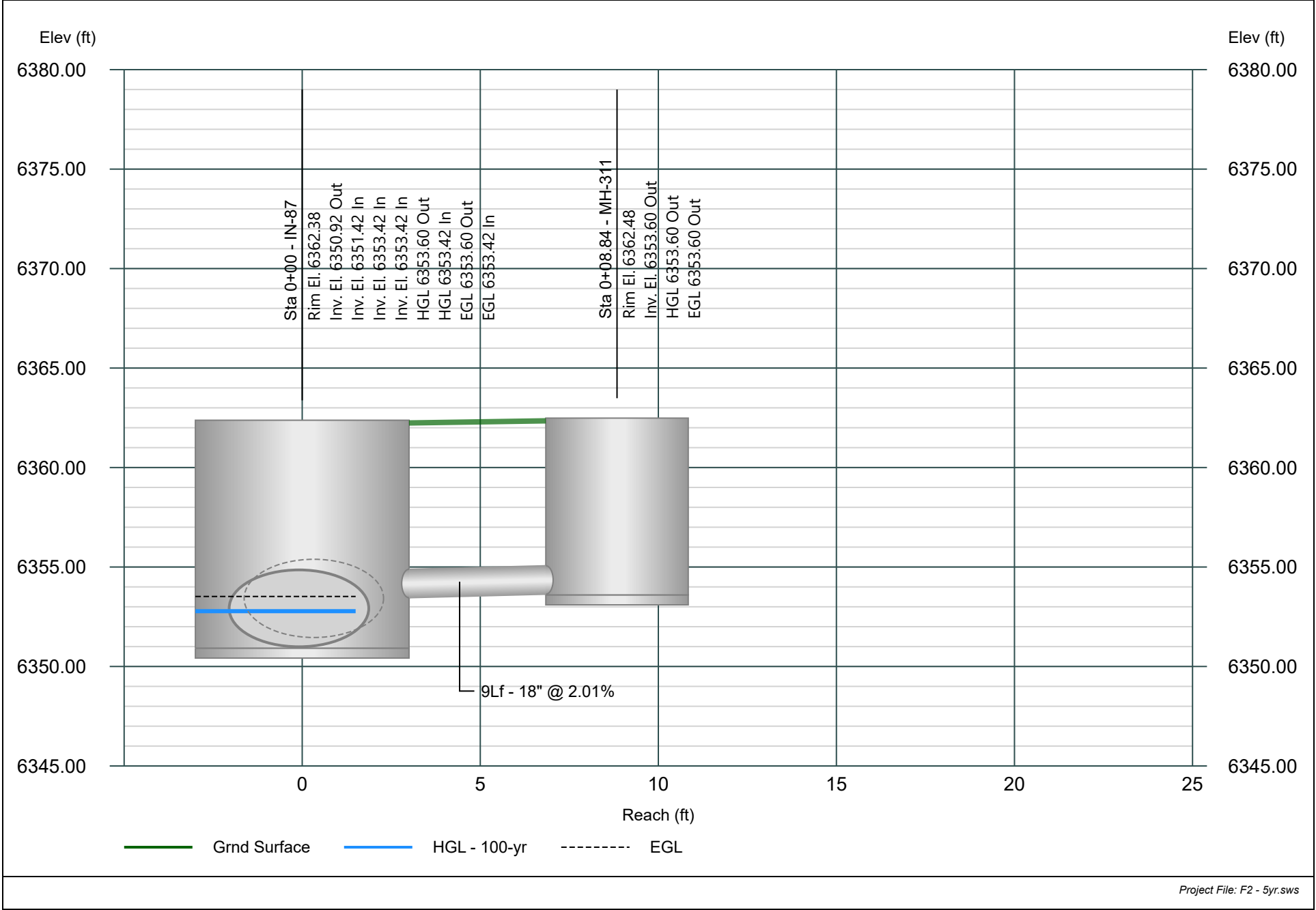
Line 57 - PIPE-248

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



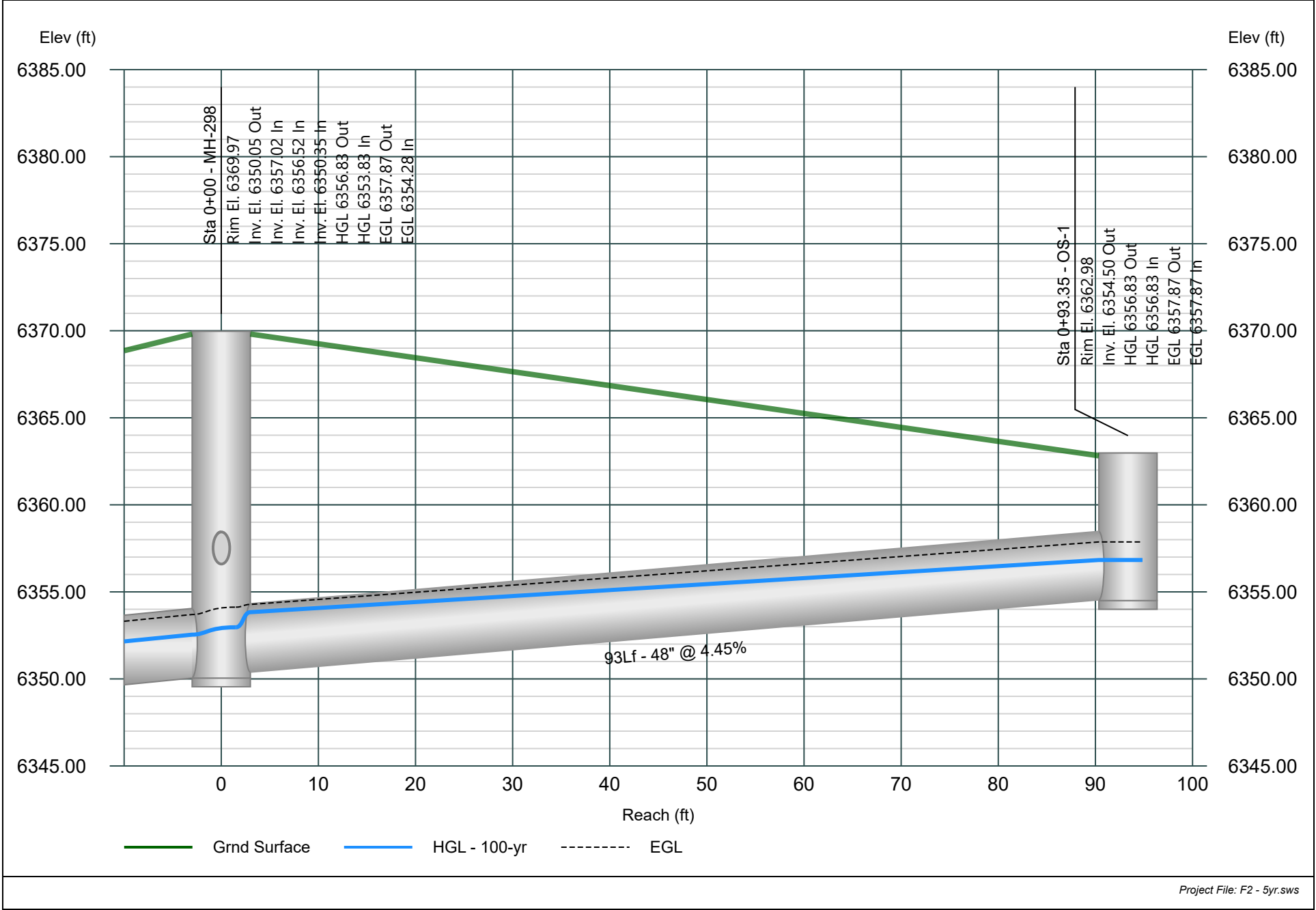
Line 58 - PIPE-81

Minor Storm - 5yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



Stormwater Studio Report
Storm Sewer Junction Losses: 3rd Edition of HEC-22
Canyons Far South Filing No. 2
Major Storm Event - 100-yr

Line No.	Area ID	InletID	Inlet ID DownStr	Known Q (from Runoff Calculations Spreadsheet or Inlet Calculations Spreadsheet)	Flow Rate (Combined Flow)	Capac. Full	Line Size	Line Slope	Line Length	Line Type	Vel Ave	Invert Up	Invert Dn	Energy Loss	HGL Up	HGL Dn	EGL Up	EGL Dn	Grnd/Rim Elev Up	Grnd/Rim Elev Dn
				(cfs)	(cfs)	(cfs)	(in)	(ft/ft)	(ft)		(ft/s)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
1	0	MH-72	FES-51	0	41.2	81.69	30	3.97	44.66	Cir	9.14	6419.77	6418	1.772	6421.93	6420.16	6423.23	6421.46	6425.2	6420.96
2	Basin 7N	IN-73	MH-72	1.4	41.2	87.45	30	4.55	125.18	Cir	8.77	6425.66	6419.97	4.993	6427.82	6423.03	6429.12	6424.13	6436.44	6425.2
3	Basin 7M	IN-72	IN-73	2	39.8	81.71	30	3.97	33.84	Cir	8.56	6427.21	6425.86	0.643	6429.32	6428.91	6430.58	6429.94	6436.44	6436.44
4	Basin 7L	FES-50	IN-72	37.8	37.8	76.85	30	3.51	158.78	Cir	8.23	6432.98	6427.41	5.282	6435.04	6430.02	6436.23	6430.95	6435.94	6436.44
5	0	MH-75	FES-52	0	3.4	28.76	18	7.5	176.33	Cir	4.18	6395.5	6382.28	13.225	6396.21	6382.98	6396.48	6383.25	6411.23	6384.57
6	0	IN-79	MH-75	0	3.4	28.12	18	7.17	110.75	Cir	4.18	6403.9	6395.95	7.944	6404.6	6396.66	6404.87	6396.93	6413.84	6411.23
7	Basin 7P	MH-314	IN-79	1.9	3.4	21.86	18	4.33	61.22	Cir	4.18	6407.29	6404.64	2.652	6407.99	6405.34	6408.26	6405.61	6417.04	6413.84
8	Basin 7O	IN-78	MH-314	1.5	1.5	7.43	18	0.5	31.35	Cir	3.18	6408.2	6408.04	0.157	6408.67	6408.51	6408.82	6408.66	6417.04	6417.04
9	0	MH-80	FB-6	0	121.29	162.11	48	1.27	74.6	Cir	11.07	6339.5	6338.55	0.95	6342.76	6341.81	6344.66	6343.71	6352.45	6342.73
10	Basin 8S	IN-88	MH-80	8.6	121.29	370.53	48	6.65	88	Cir	11.07	6350.21	6344.36	5.855	6353.47	6347.61	6355.37	6349.52	6362.38	6352.45
11	Basin 8R	IN-87	IN-88	19.5	112.69	159.85	48	1.24	33.83	Cir	9.01	6350.92	6350.5	0.195	6354.79	6354.62	6356.07	6355.87	6362.38	6362.38
12	Basin 8Q	IN-86	IN-87	15.3	88.79	147.34	48	1.05	33.37	Cir	7.07	6351.77	6351.42	0.128	6356.14	6356.01	6356.91	6356.79	6359.93	6362.38
13	0	MH-79	IN-86	0	73.49	186.82	42	3.45	126.3	Cir	8.57	6356.63	6352.27	3.205	6359.25	6356.54	6360.66	6357.45	6366.26	6359.93
14	0	MH-78	MH-79	0	73.49	275.53	42	7.5	80	Cir	9.49	6364.63	6358.63	6	6367.25	6361.25	6368.66	6362.66	6376.85	6366.26
15	Basin 8P	IN-85	MH-78	4.7	73.49	275.51	42	7.5	77.63	Cir	9.49	6372.65	6366.83	5.822	6375.28	6369.45	6376.68	6370.85	6384.53	6376.85
16	Basin 8O	IN-84	IN-85	10.7	68.79	100.53	42	1	33.84	Cir	8.47	6373.51	6373.17	0.222	6376.05	6376.2	6377.36	6377.14	6384.53	6384.53
17	Basin 8N	IN-83	IN-84	17.9	49.09	96.41	42	0.92	36.48	Cir	5.1	6374.09	6373.76	0.087	6377.78	6377.69	6378.19	6378.1	6381.8	6384.53
18	0	MH-77	IN-83	0	31.19	19.3	24	0.73	83.19	Cir	10.23	6376.2	6375.59	1.491	6379.06	6377.38	6380.59	6379.1	6381.89	6381.8
19	0	MH-76	MH-77	0	31.19	61.94	24	7.5	104.17	Cir	10.05	6384.21	6376.4	6.167	6386.09	6380	6387.7	6381.53	6398.25	6381.89
20	Basin 8L	IN-82	MH-76	5.7	31.19	62.2	24	7.56	76.09	Cir	10.17	6397.31	6391.56	5.754	6399.19	6393.44	6400.8	6395.05	6407.57	6398.25
21	Basin 8K	IN-81	IN-82	11.5	25.49	42.33	24	3.5	33.84	Cir	8.38	6398.8	6397.61	0.522	6400.57	6400.19	6401.74	6401.21	6407.58	6407.57
22	0	MH-307	IN-81	0	5.2	7.42	18	0.5	6.26	Cir	2.94	6399.31	6399.28	0.016	6401.67	6401.65	6401.81	6401.79	6407.63	6407.58
23	Basin 8K2	MH-309	MH-307	2.6	5.2	8.13	18	0.6	98.91	Cir	2.94	6400.16	6399.56	0.243	6401.99	6401.75	6402.13	6401.89	6408.73	6407.63
24	Basin 8K3	MH-308	MH-309	2.6	2.6	10.5	18	1	96.67	Cir	1.98	6401.38	6400.42	0.107	6402.24	6402.19	6402.34	6402.23	6409.83	6408.73
25	Basin 8J	IN-80	IN-81	8.79	8.79	19.69	18	3.52	29.3	Cir	5.12	6400.31	6399.28	0.194	6401.65	6401.5	6402.08	6401.89	6405.86	6407.58
26	0	IN-90	FES-53	0	8.9	20.75	18	3.9	76.56	Cir	5.61	6397.98	6394.99	2.828	6399.12	6396.49	6399.71	6396.88	6402.44	6396.82
27	Basin 8M	IN-95	IN-90	8.9	8.9	10.45	18	0.99	7.99	Cir	6.17	6398.56	6398.48	0.08	6399.7	6399.62	6400.29	6400.21	6403.57	6402.44
28	0	MH-71	FB-1A	0	26	23.65	18	5.07	173.9	Cir	14.72	6375.6	6366.78	10.291	6378.56	6368.27	6381.93	6371.64	6382.95	6368.63
29	0	MH-70	MH-71	0	26	25.96	18	6.11	107.75	Cir	14.71	6384.19	6377.6	6.607	6387.2	6380.59	6390.56	6383.96	6398.5	6382.95
30	Basin 7K	IN-71	MH-70	9.7	26	15.1	18	2.07	46.24	Cir	14.71	6391.14	6390.19	2.836	6394.52	6391.69	6397.89	6395.05	6404.38	6398.5
31	Basin 7J	IN-70	IN-71	16.3	16.3	7.51	18	0.51	33	Cir	9.22	6391.81	6391.64	0.795	6399.54	6398.74	6400.86	6400.07	6404.38	6404.38
32	0	MH-83	FB-1A	0	344.59	388.92	60	2.23	126.63	Cir	17.79	6369.6	6366.78	2.823	6374.4	6371.58	6379.32	6376.5	6381.85	6372.67
33	Basin 7C	IN-94	MH-83	24.65	344.59	531.55	60	4.16	255.52	Cir	17.79	6382.58	6371.94	10.641	6387.38	6376.74	6392.3	6381.66	6391.7	6381.85
34	Basin 7A2	HW-3	IN-94	319.94	319.94	541.26	60	4.32	64.95	Cir	16.3	6385.63	6382.83	0.98	6390.8	6389.82	6394.93	6393.95	6391.53	6391.7
35	0	MH-300	IN-84	0	9	7.43	18	0.5	5.17	Cir	5.09	6375.5	6375.47	0.038	6377.73	6377.69	6378.14	6378.1	6384.59	6384.53
36	Basin 8O2	MH-303	MH-300	1.9	9	7.43	18	0.5	45.41	Cir	5.09	6375.98	6375.75	0.334	6378.31	6377.97	6378.71	6378.38	6385.35	6384.59
37	Basin 8O3	MH-302	MH-303	2.2	5.8	13.05	18	1.55	53.4	Cir	3.28	6377.05	6376.23	0.163	6378.93	6378.77	6379.1	6378.93	6386.5	6385.35
38	0	MH-305	MH-302	0	3.6	13.57	18	1.67	84.7	Cir	3.15	6378.85	6377.44	0.639	6379.58	6379.15	6379.86	6379.22	6387.91	6386.5
39	Basin 8P3	MH-304	MH-305	1.3	1.3	7.41	18	0.5	32.71	Cir	1.81	6379.26	6379.1	0.038	6379.84	6379.83	6379.91	6379.87	6388.22	6387.91
40	Basin 8O4	MH-301	MH-305	2.3	2.3	22.5	18	4.59	16.65	Cir	3.57	6379.87	6379.1	0.763	6380.44	6379.7	6380.65	6379.89	6388.59	6387.91
41	Basin 8V	IN-93	FES-56	3.9	3.9	13.62	18	1.68	77.01	Cir	3.3	6378	6376.7	0.773	6378.75	6378.2	6379.05	6378.28	6382.77	6378.54
42	Basin 8P2	MH-306	MH-303	1.3	1.3	7.44	18	0.5	33.84	Cir	0.74	6376.4	6376.23	0.005	6378.87	6378.86	6378.88	6378.87	6385.35	6385.35
43	Basin 8Y	IN-92	FES-55	9	36.11	23.66	24	1.09	75.41	Cir	11.5	6370.58	6369.75	1.923	6373.68	6371.75	6375.73	6373.81	6381.58	6372.13
44	Basin 8W	IN-91	IN-92	5.2	27.11	33.37	24	2.18	33	Cir	8.63	6371.6	6370.88	0.474	6376.2	6375.73	6377.36	6376.88	6381.58	6381.58
45	Basin 8T2	FES-54	IN-91	21.91	21.91	59.58	24	6.94	43.23	Cir	7.42	6376.6	6373.6	1.245	6378.26	6377.22	6379.23	6377.98	6378.98	6381.58
46	0	MH-298	FB-5	0	240.1	338.34	48	5.55	186.98	Cir	19.19	6350.05	6339.68	10.373	6353.98	6343.6	6359.7	6349.33	6369.97	6344.43
47	0	MH-74	MH-298	0	2.8	26.94	18	6.58	76.33	Cir	2.74	6362.05	6357.02	3.206	6362.68	6359.68	6362.92	6359.72	6372.58	6369.97
48	0	MH-73	MH-74	0	2.8	21.57	18	4.22	127	Cir	3.9	6367.66	6362.3	5.359	6368.3	6362.94	6368.53	6363.17	6376.49	6372.58
49	Basin 8U4	IN-77	MH-73	2.1	2.8	19.42	18	3.42	75.66	Cir	3.9	6371	6368.41	2.587	6371.64	6369.05	6371.88	6369.29	6380.42	6376.49
50	Basin 8U5	IN-76	IN-77	0.7	0.7	7.38	18	0.49	33.84	Cir	1.29	6371.42	6371.25	0.025	6371.87	6371.87	6371.91	6371.88	6380.42	6380.42
51	0	MH-313	IN-88	0	0	16.77	18	2.55	1.34	Cir	0	6361.66	6361.63	0.034	6361.66	6361.63	6361.66	6361.63	6363.41	6362.38
52	0	MH-299	MH-298	0	16	45.88	24	4.11	60.28	Cir	5.91	6359	6356.52	1.259	6360.42	6359.46	6361.12	6359.86	6369.06	6369.97
53	Basin 8U2	IN-75	MH-299	14.8	14.8	21.25	18	4.1	8.5	Cir	8.61	6359.85	6359.5	0.348	6361.25	6360.91	6362.41	6362.06	6369.39	6369.06
54	Basin 8U3	IN-74	MH-299	1.2	1.2	14.86	18	2	25.53	Cir	0.77	6360.01	6359.5	0.005	6361.12	6361.12	6361.13	6361.12	6369.1	6369.06
55	Basin 8R2	IN-96	IN-87	2.2	4.4	14.51	18	1.91	120.81	Cir	3.27	6355.73	6353.42	0.353	6356.61	6356.42	6356.87	6356.51	6364.52	6362.38
56	Basin 8R3	MH-310	IN-96	2.2	2.2	15.3	18	2.12	96.67	Cir	2.59	6358.02	6355.97	1.671	6358.58	6357.08	6358.79	6357.11	6367.41	6364.52
57	0	MH-311	IN-87	0	0	14.87	18	2.01	8.84	Cir	0	6353.6	6353.42	0.177	6353.6	6353.42	6353.6	6353.42	6362.48	6362.38
58	Pond J	OS-1	MH-298																	

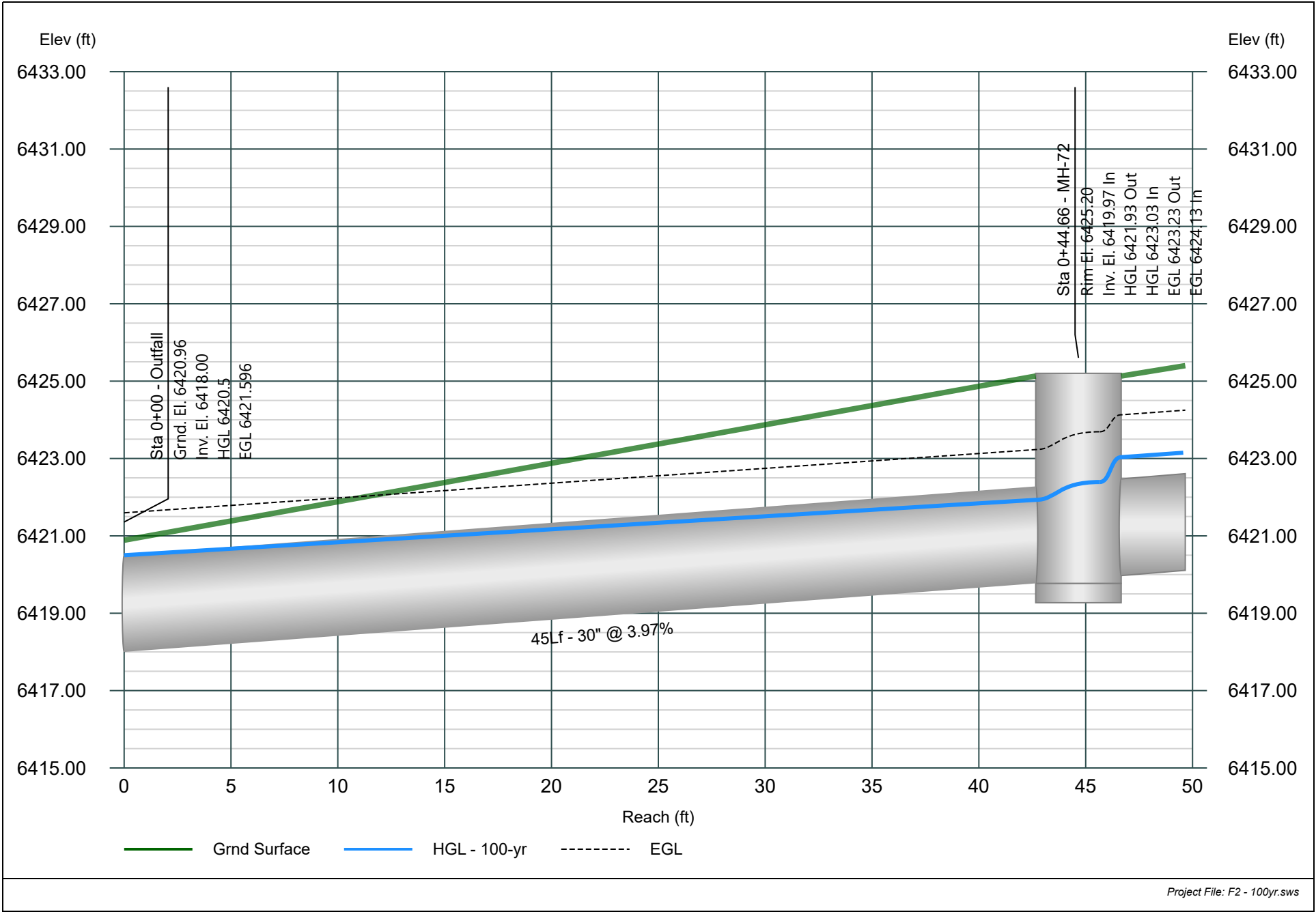
Line 1 - PIPE-48

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



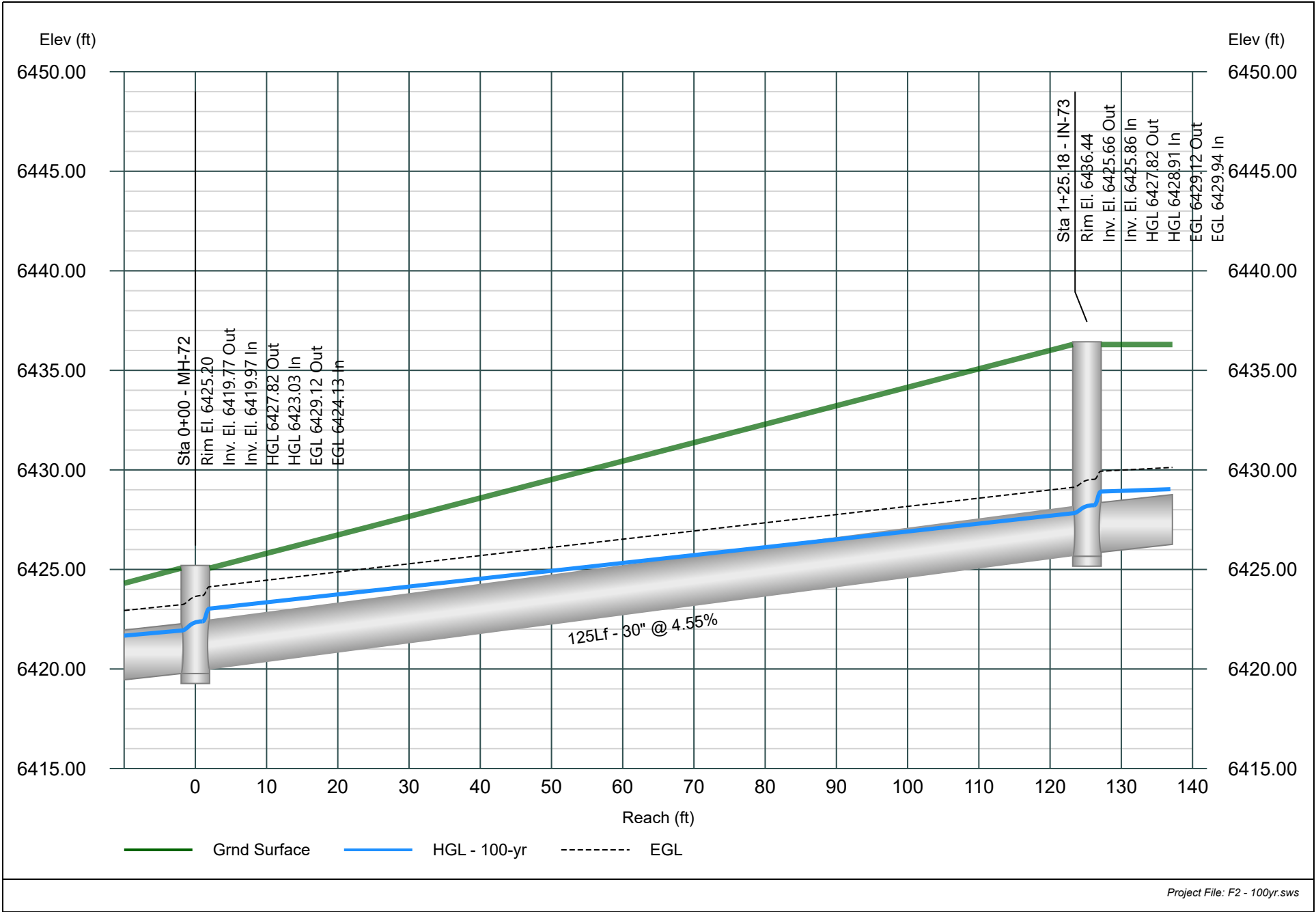
Line 2 - PIPE-47

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



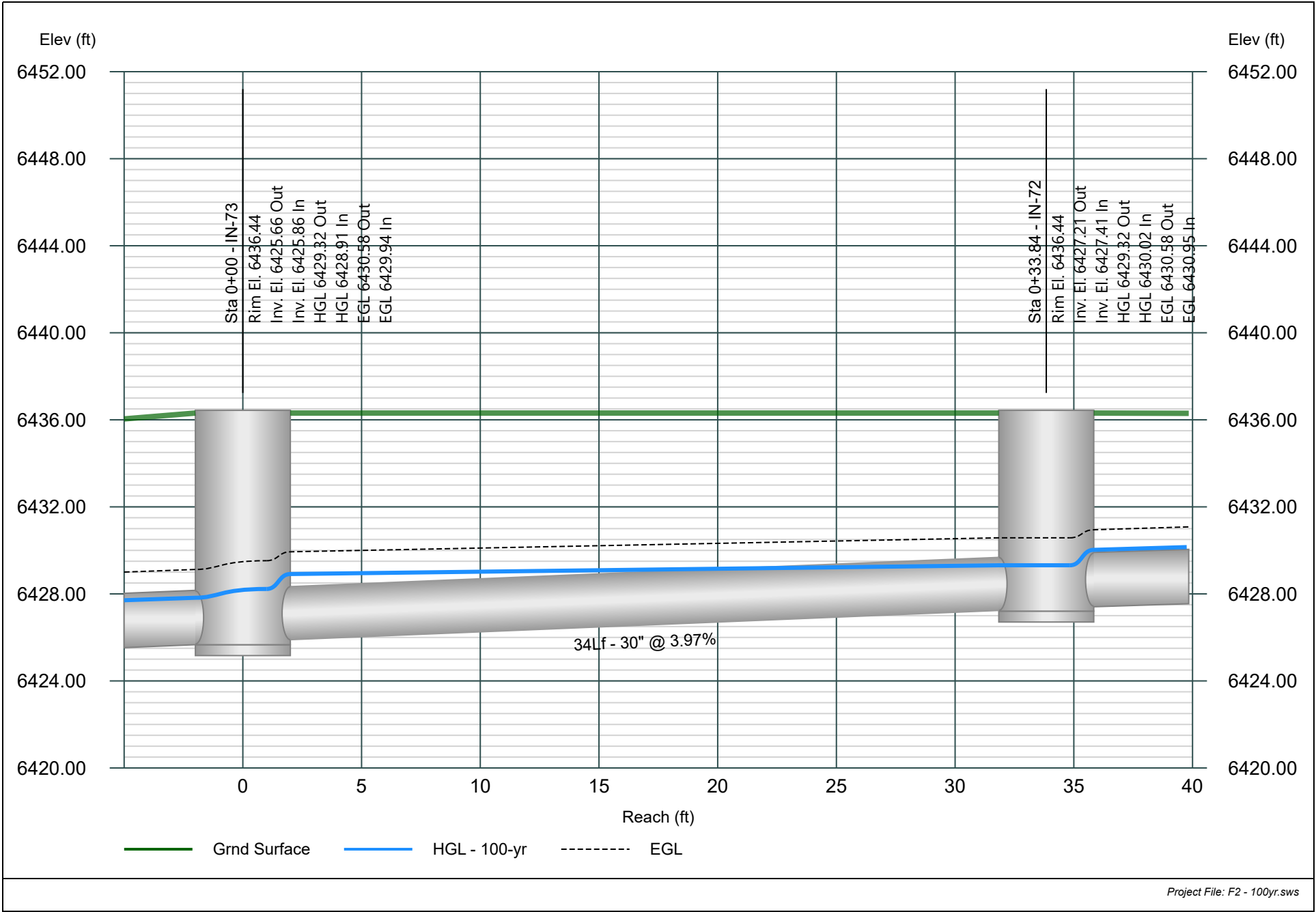
Line 3 - PIPE-45

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



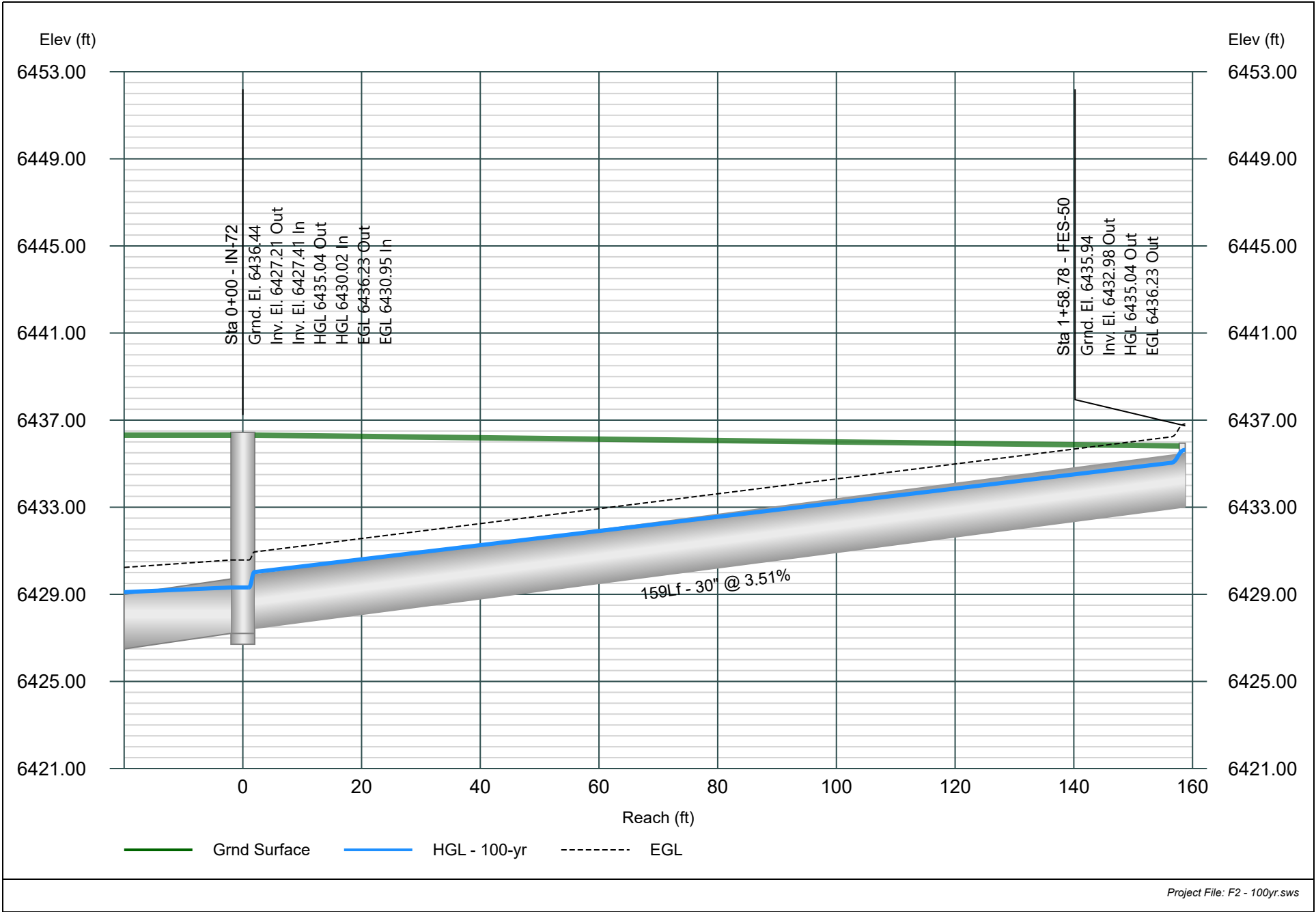
Line 4 - PIPE-46

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



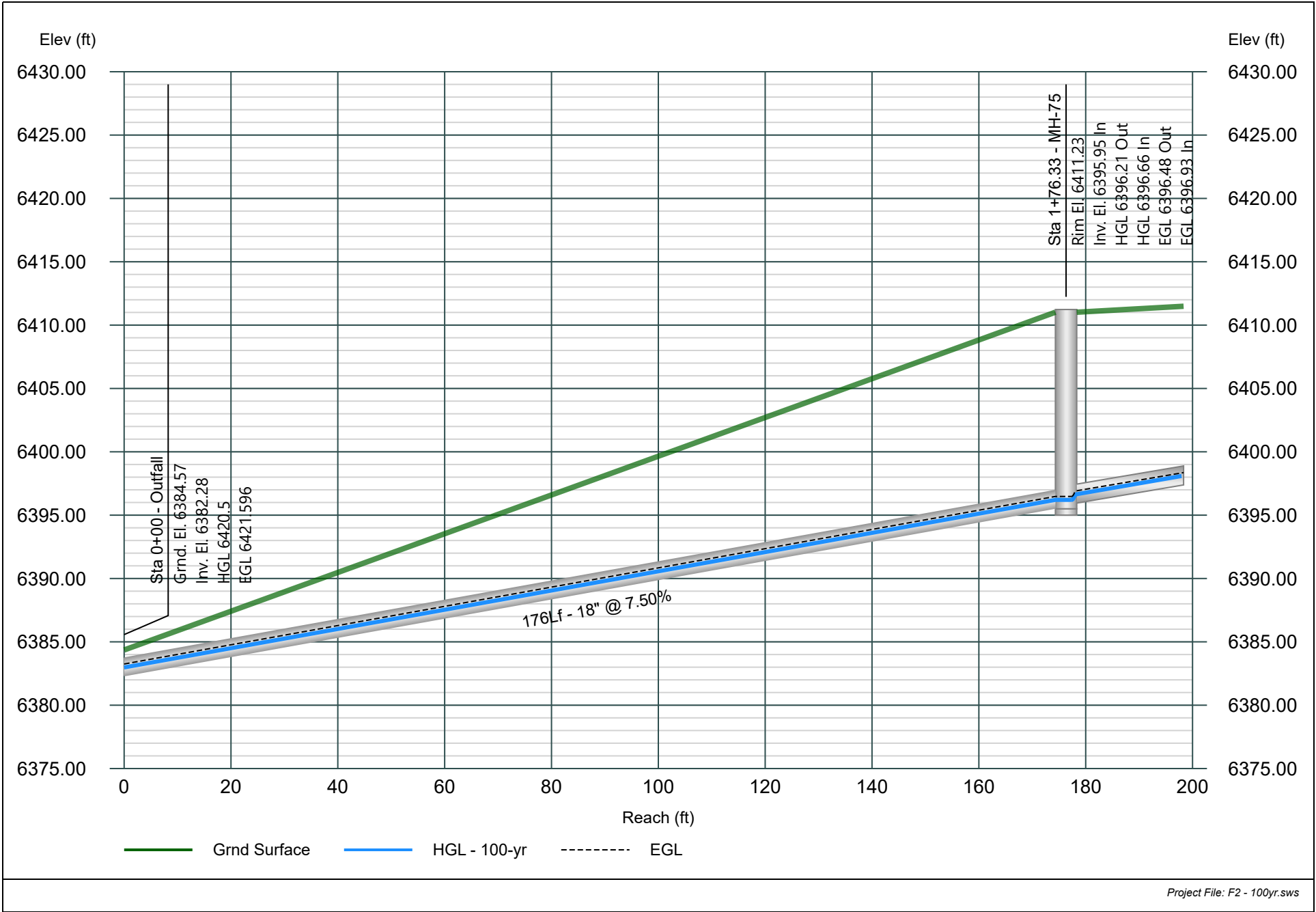
Line 5 - PIPE-63

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



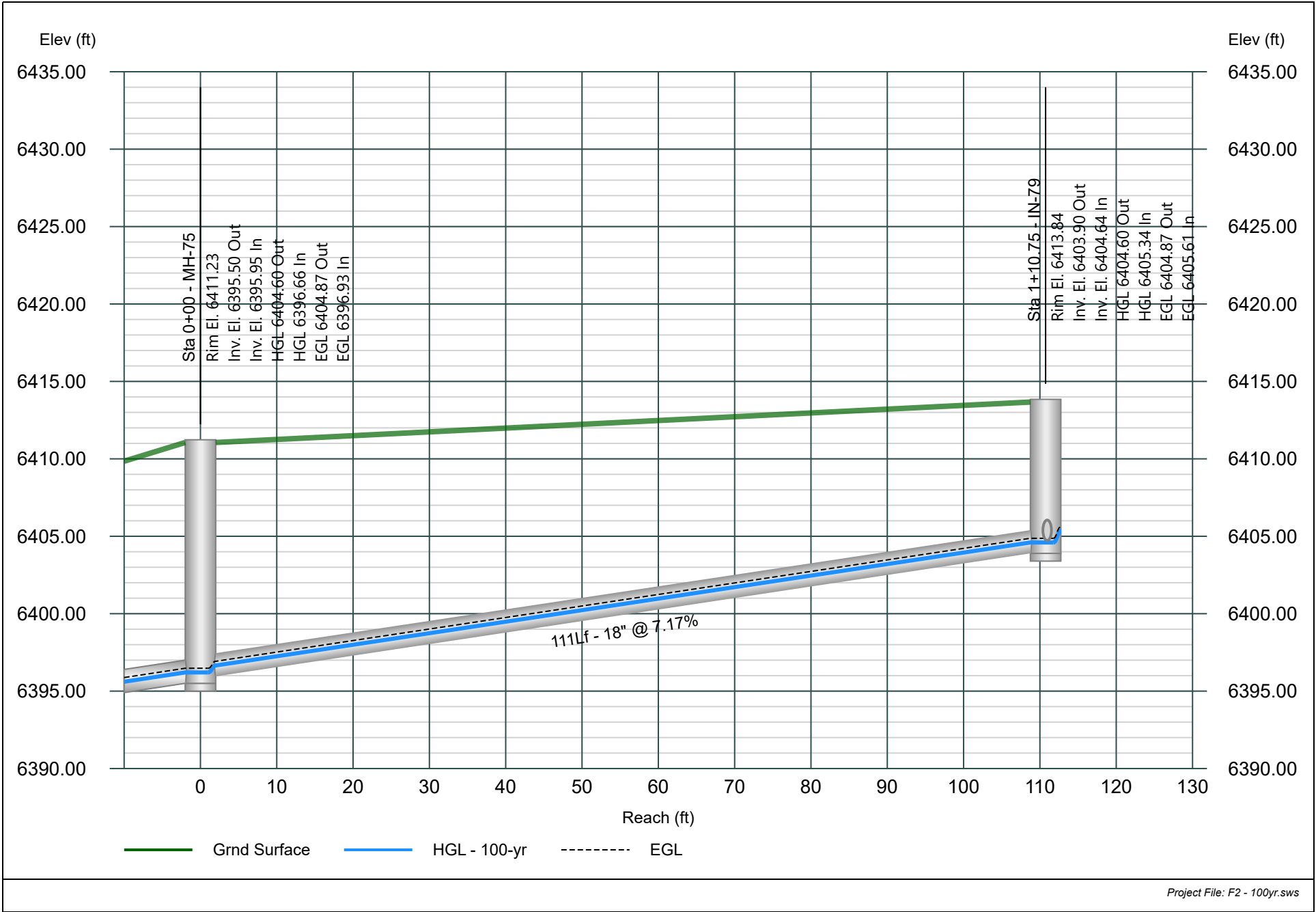
Line 6 - PIPE-62

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



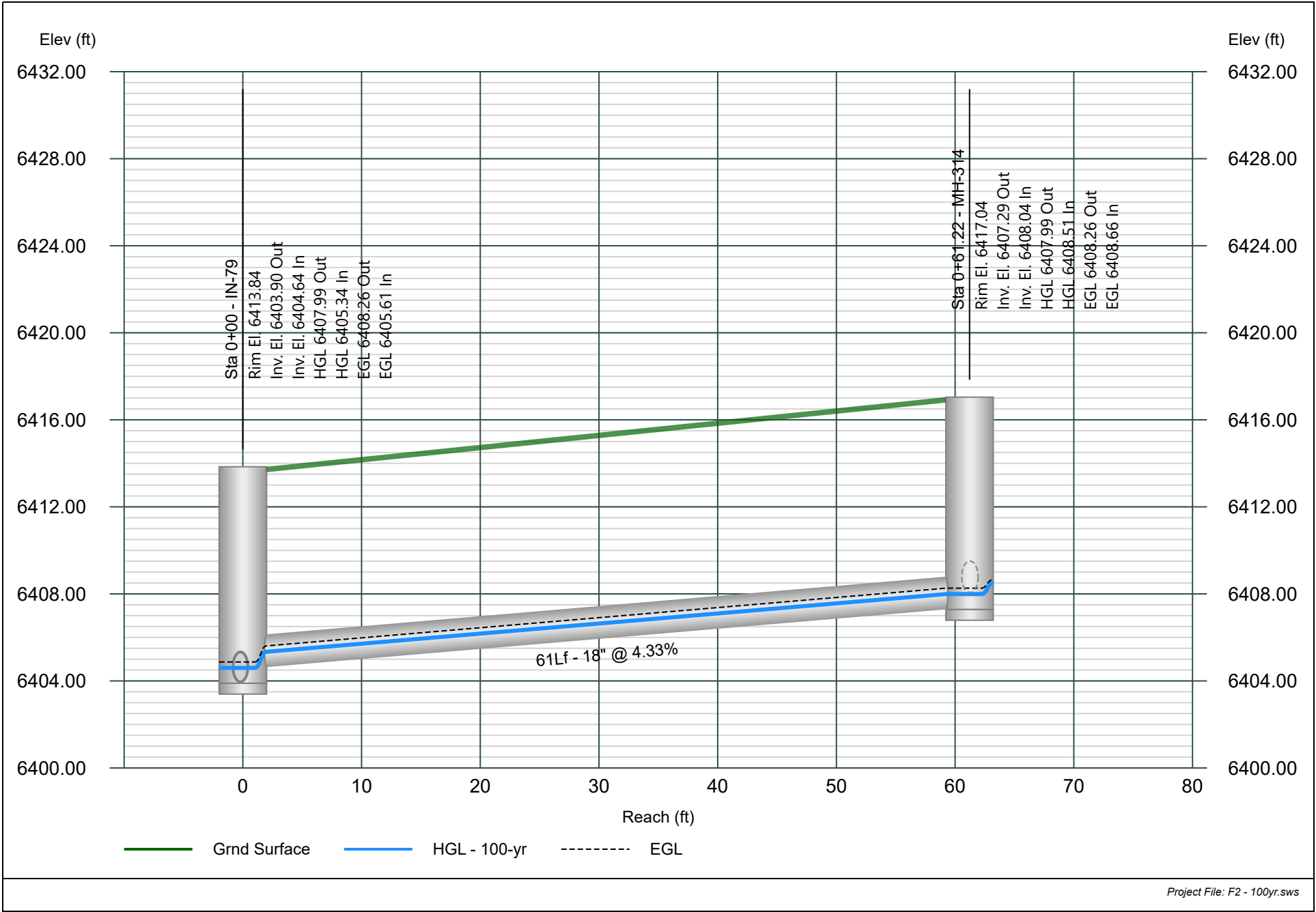
Line 7 - PIPE-250

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



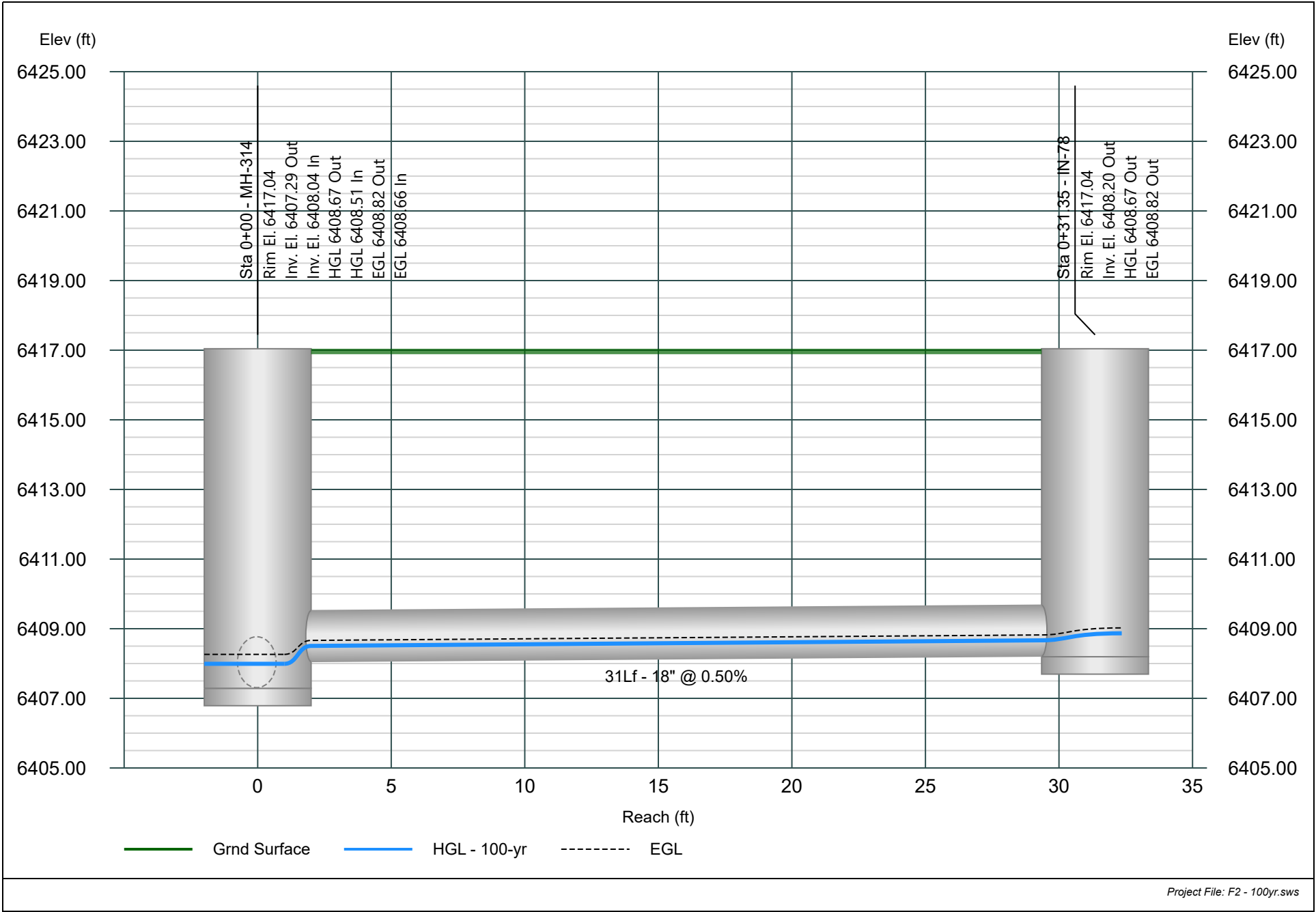
Line 8 - PIPE-61

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



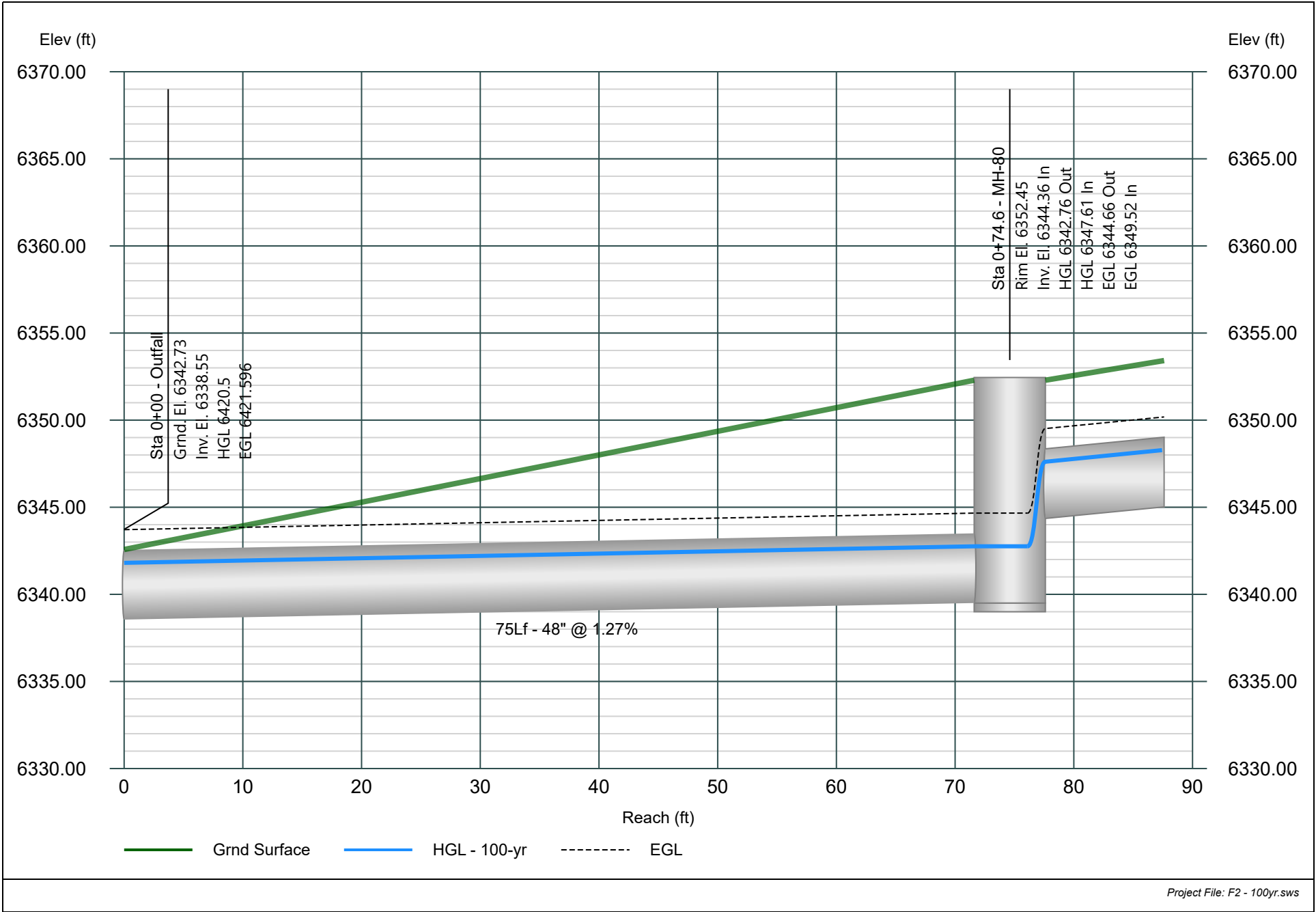
Line 9 - PIPE-25 (1)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



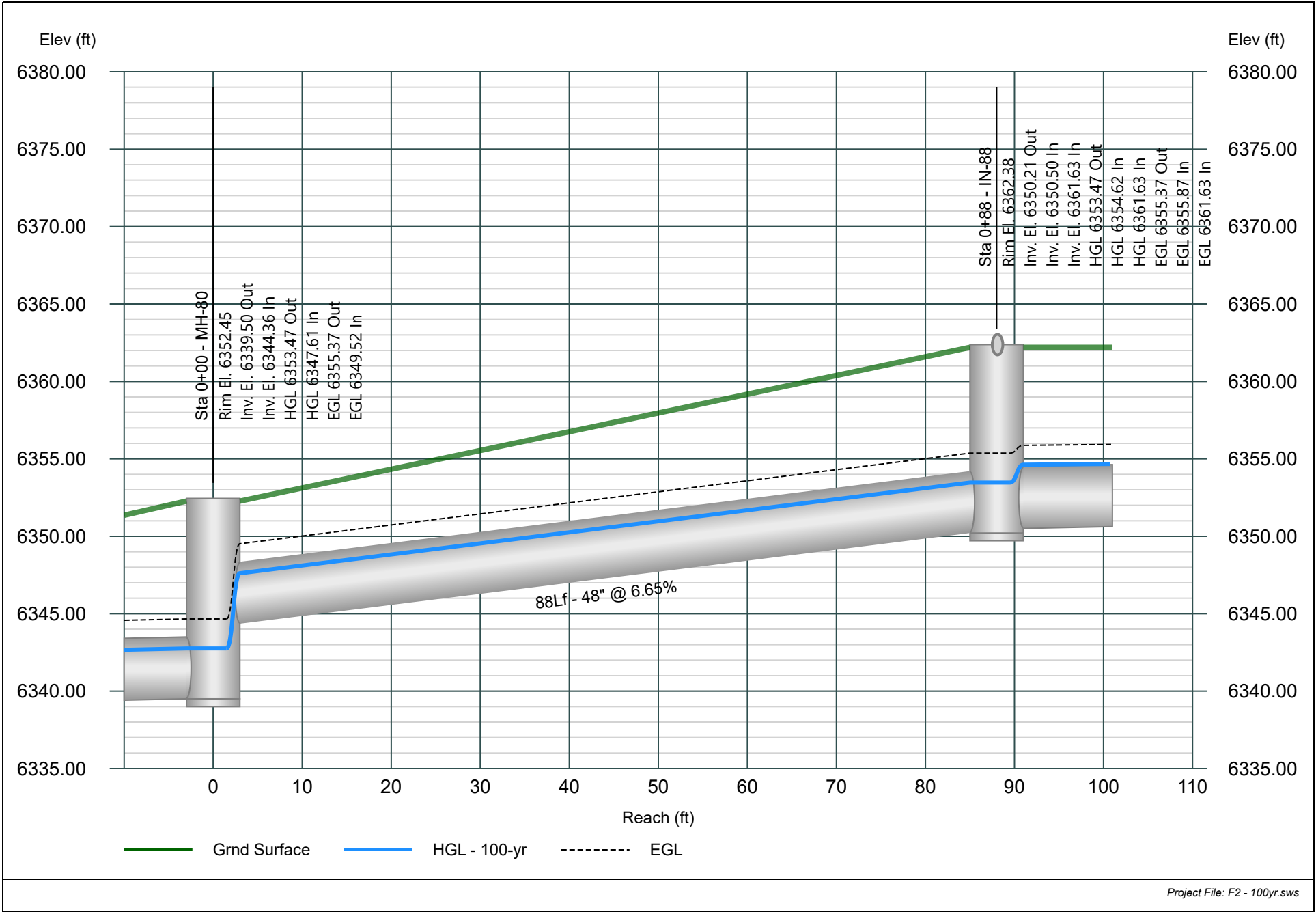
Line 10 - PIPE-25

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



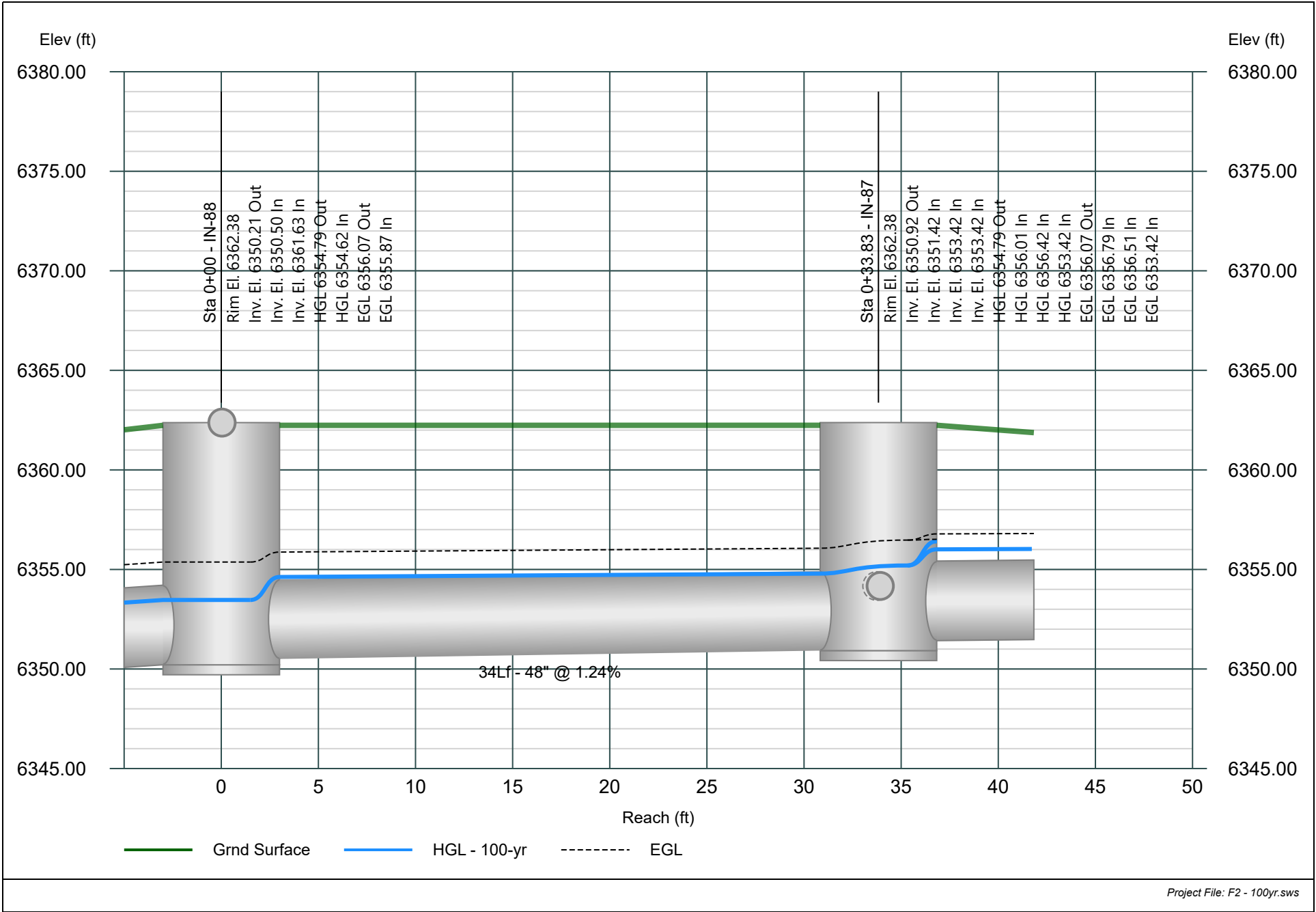
Line 11 - PIPE-40

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



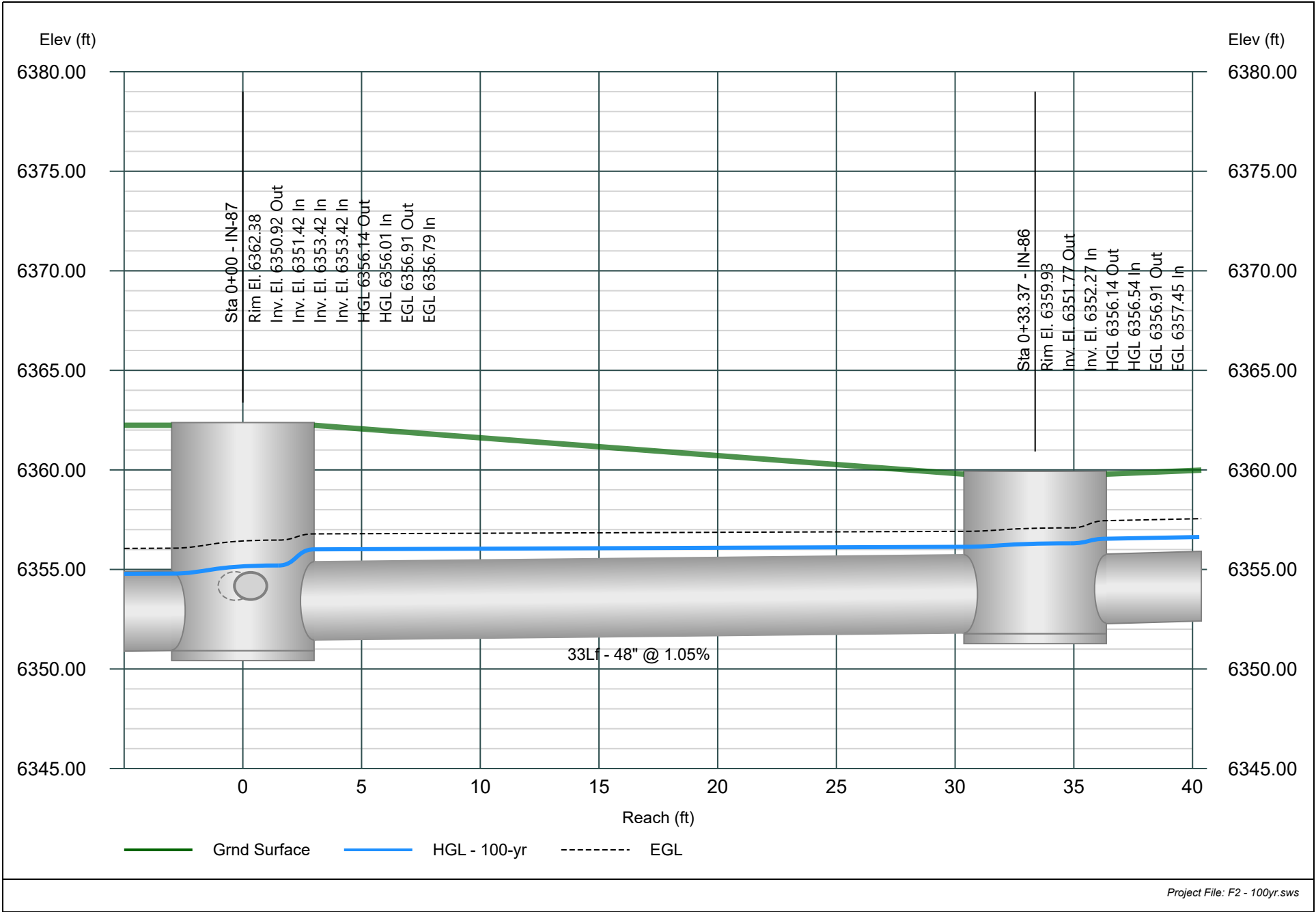
Line 12 - PIPE-38

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



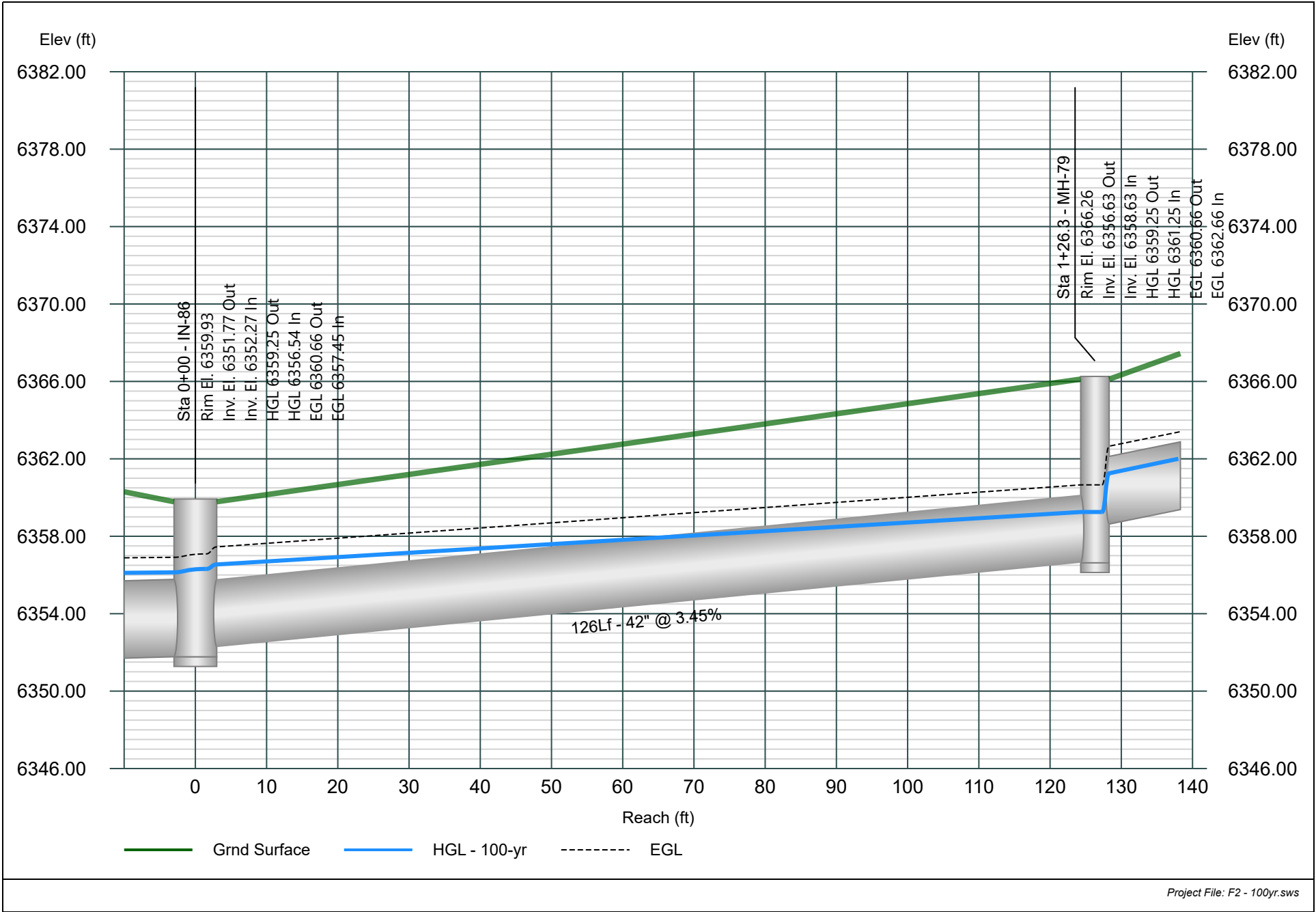
Line 13 - PIPE-24

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



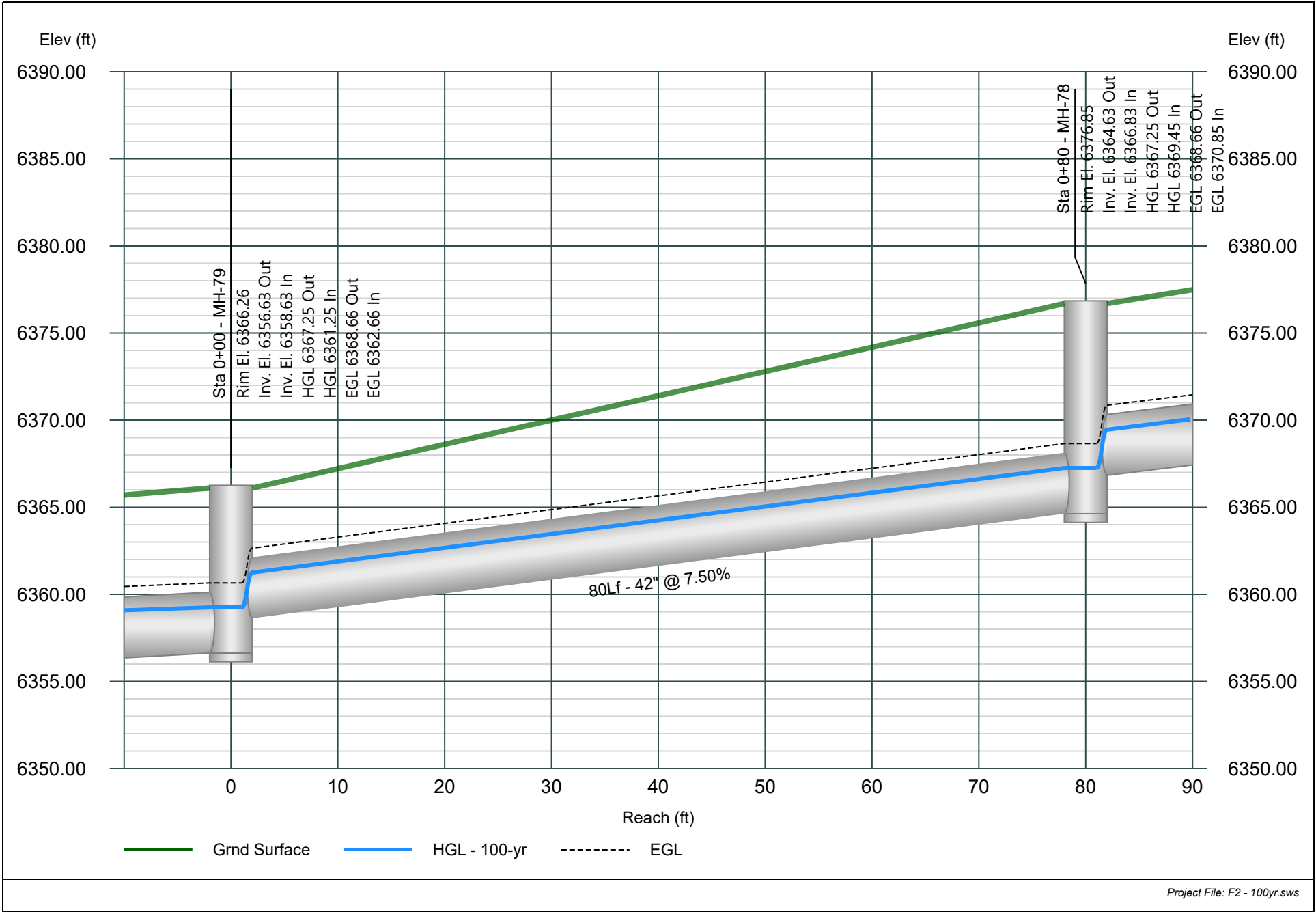
Line 14 - PIPE-36

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



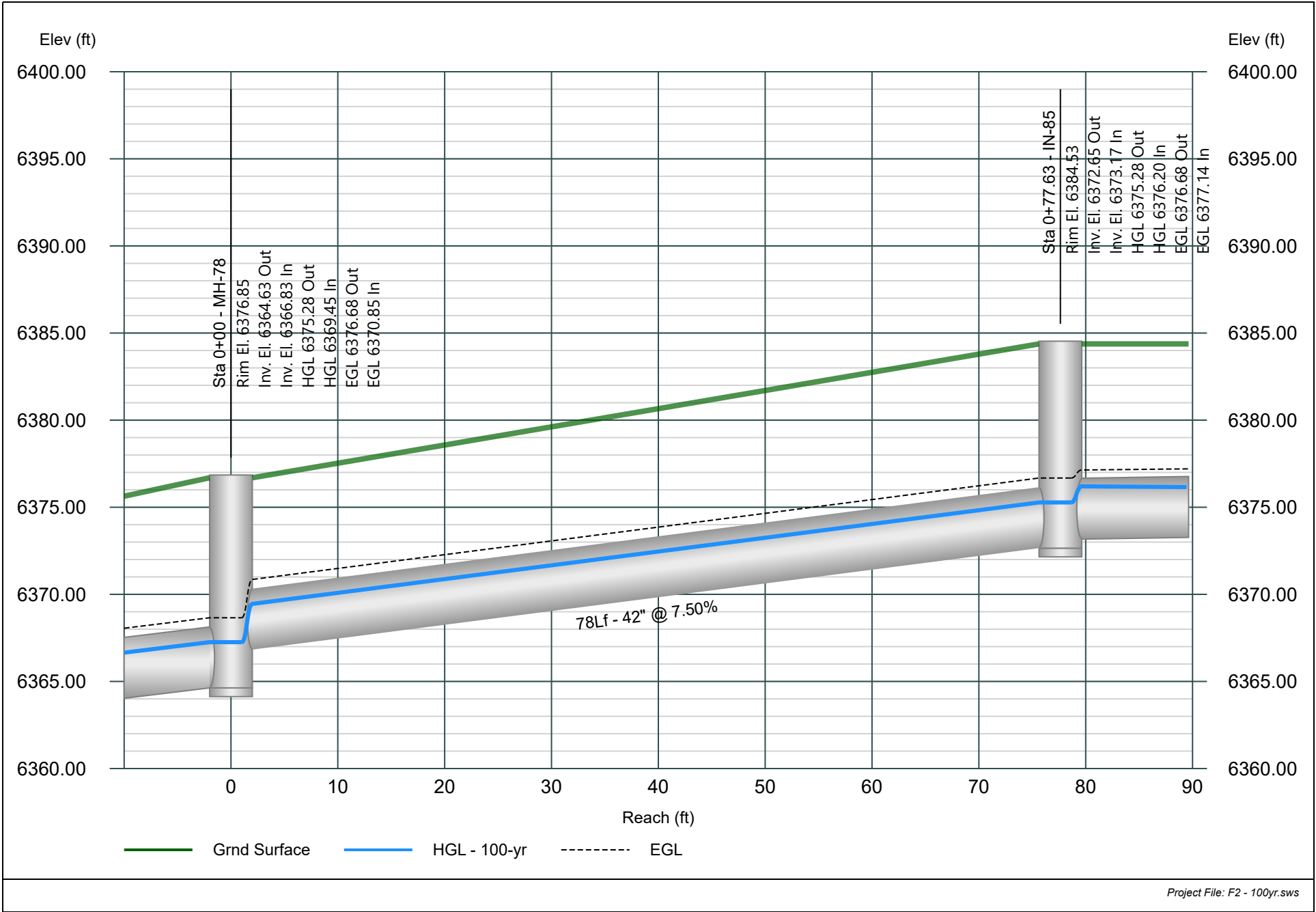
Line 15 - PIPE-35

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



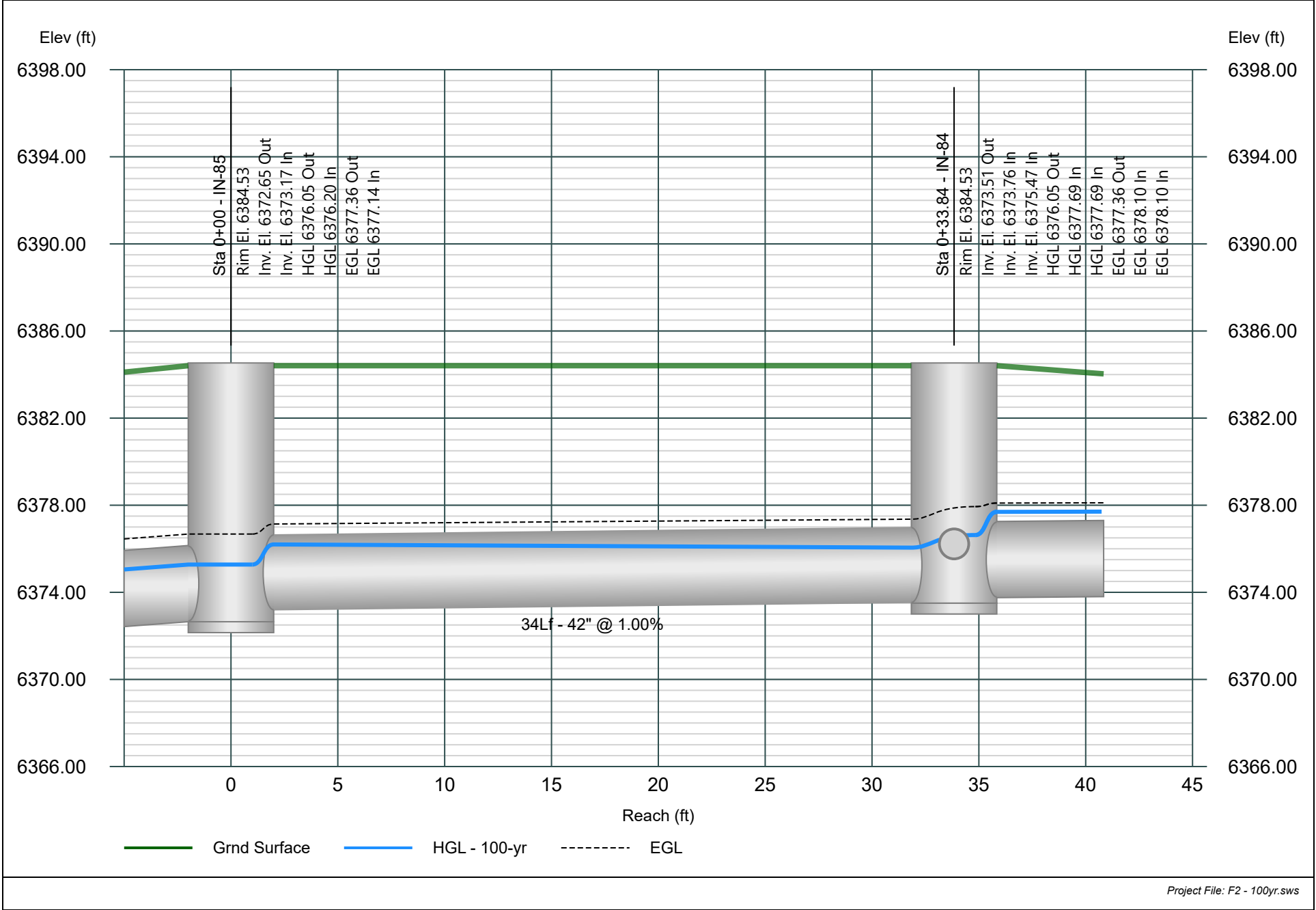
Line 16 - PIPE-42

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



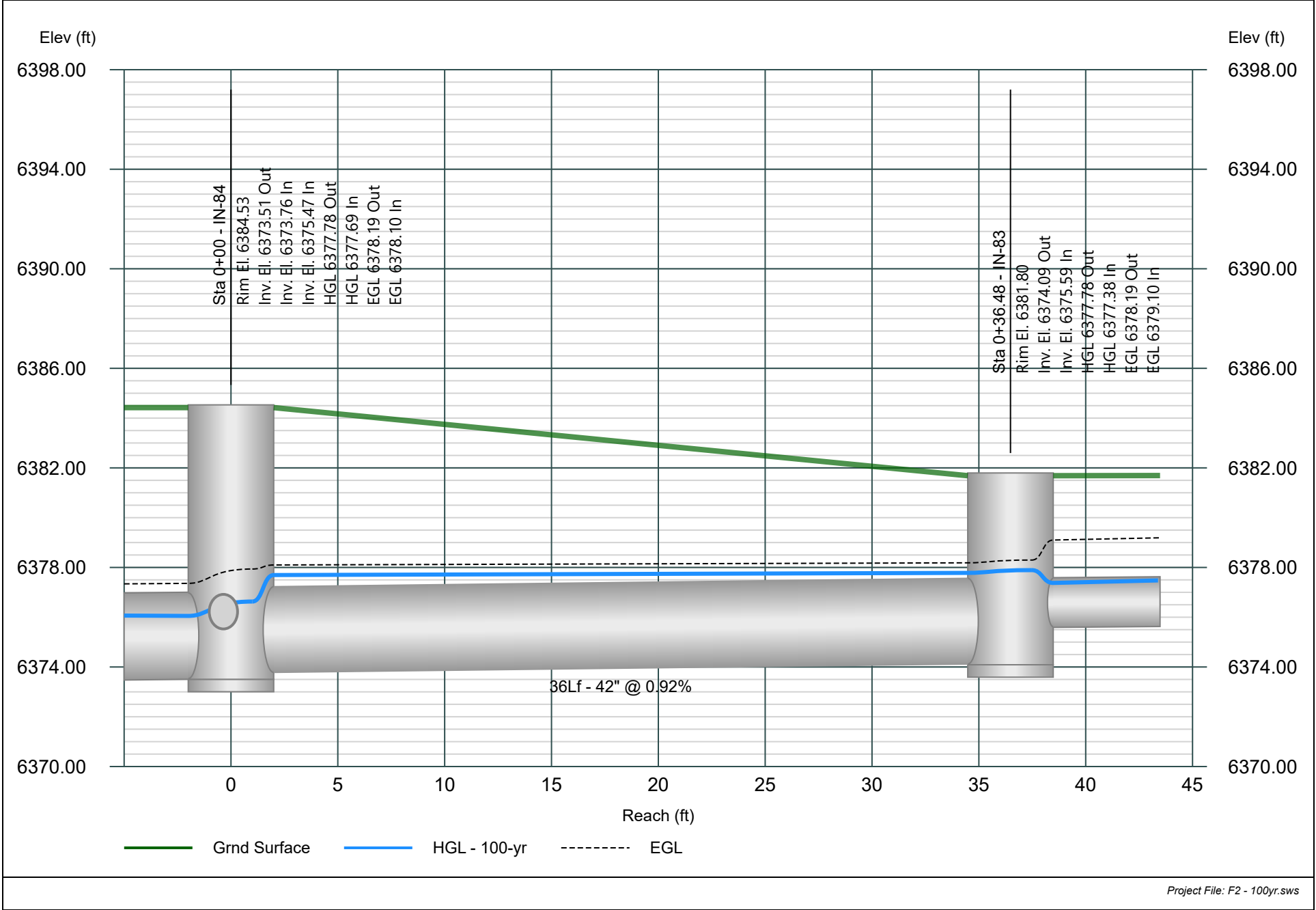
Line 17 - PIPE-43

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



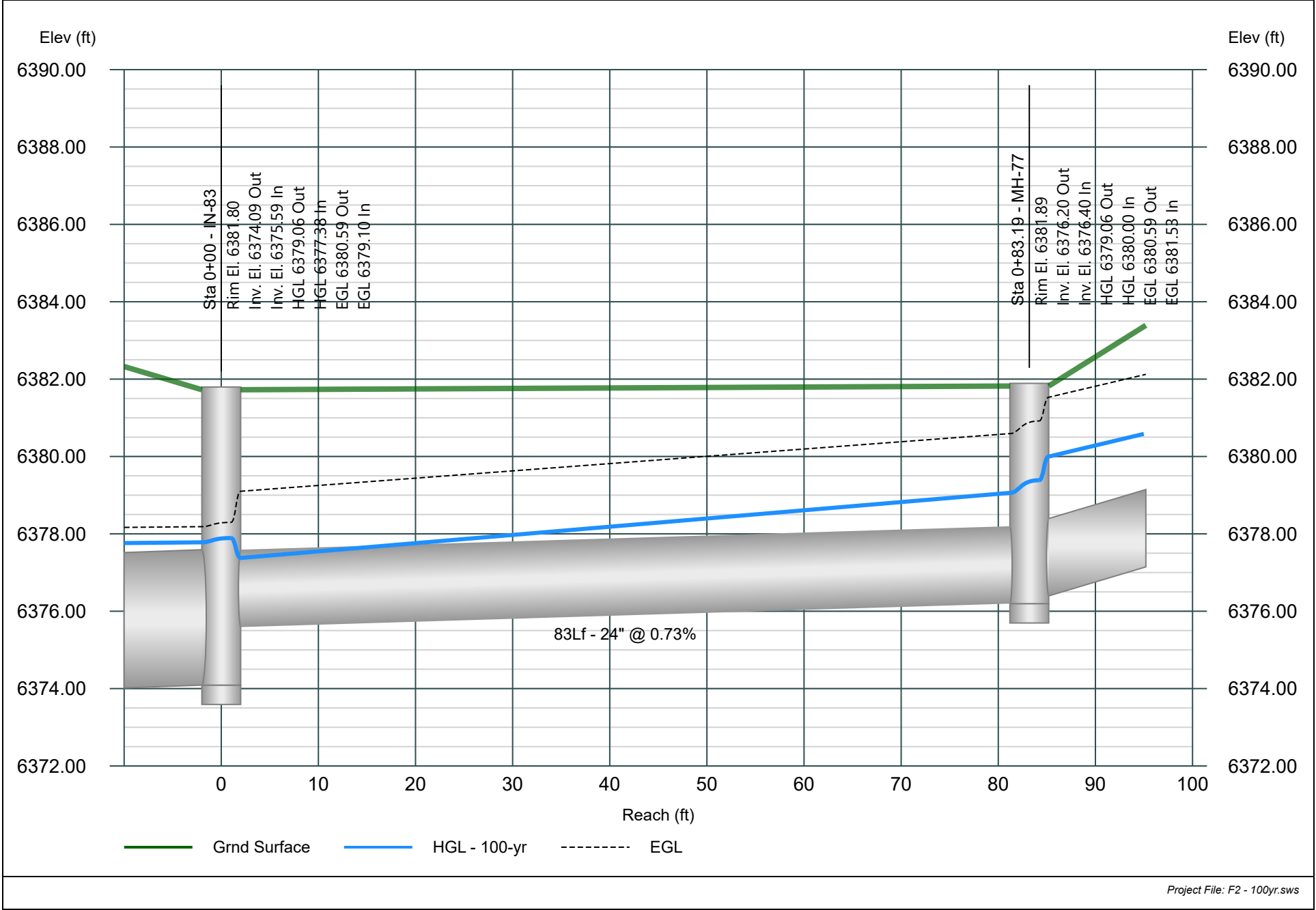
Line 18 - PIPE-29

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



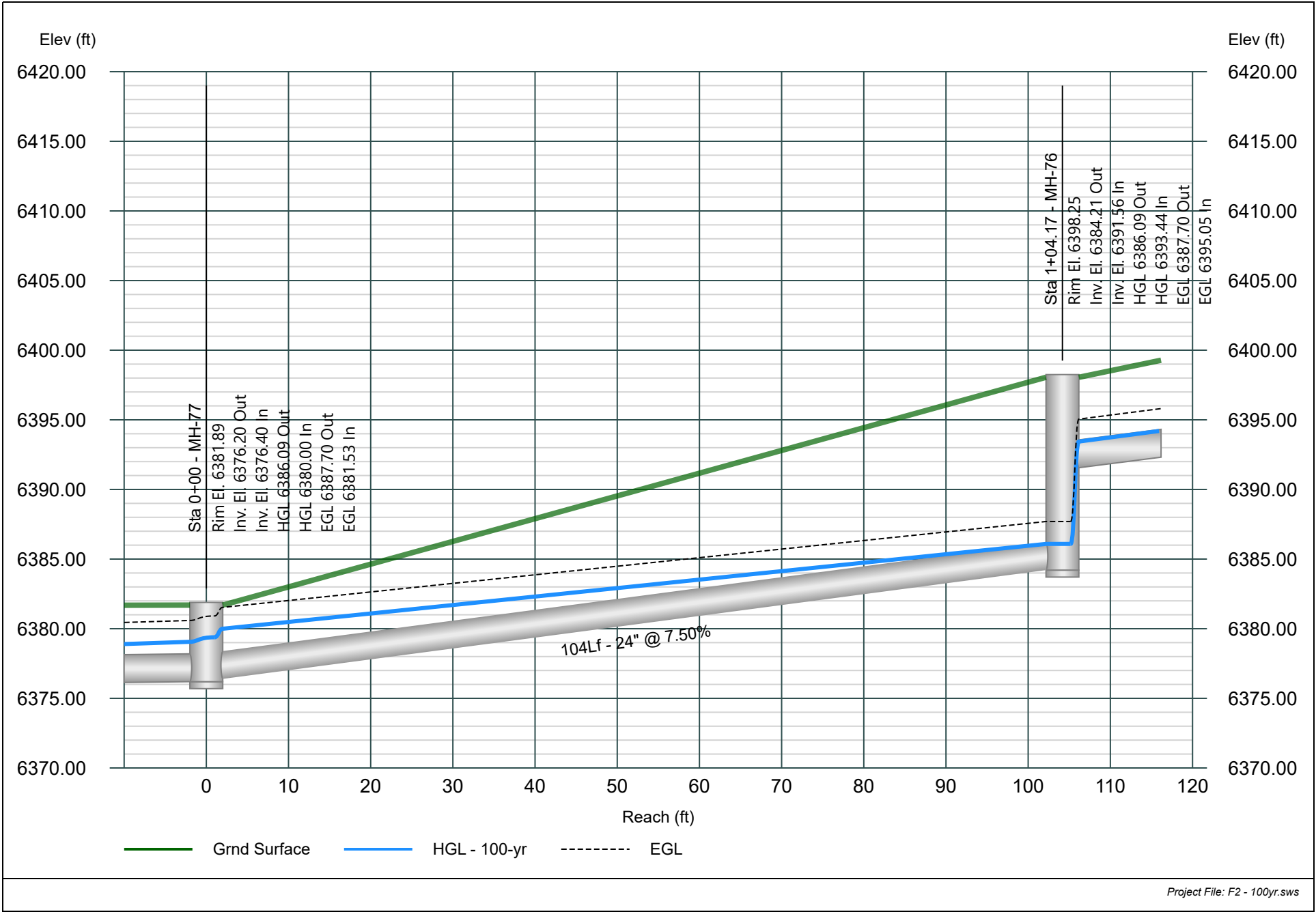
Line 19 - PIPE-83

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



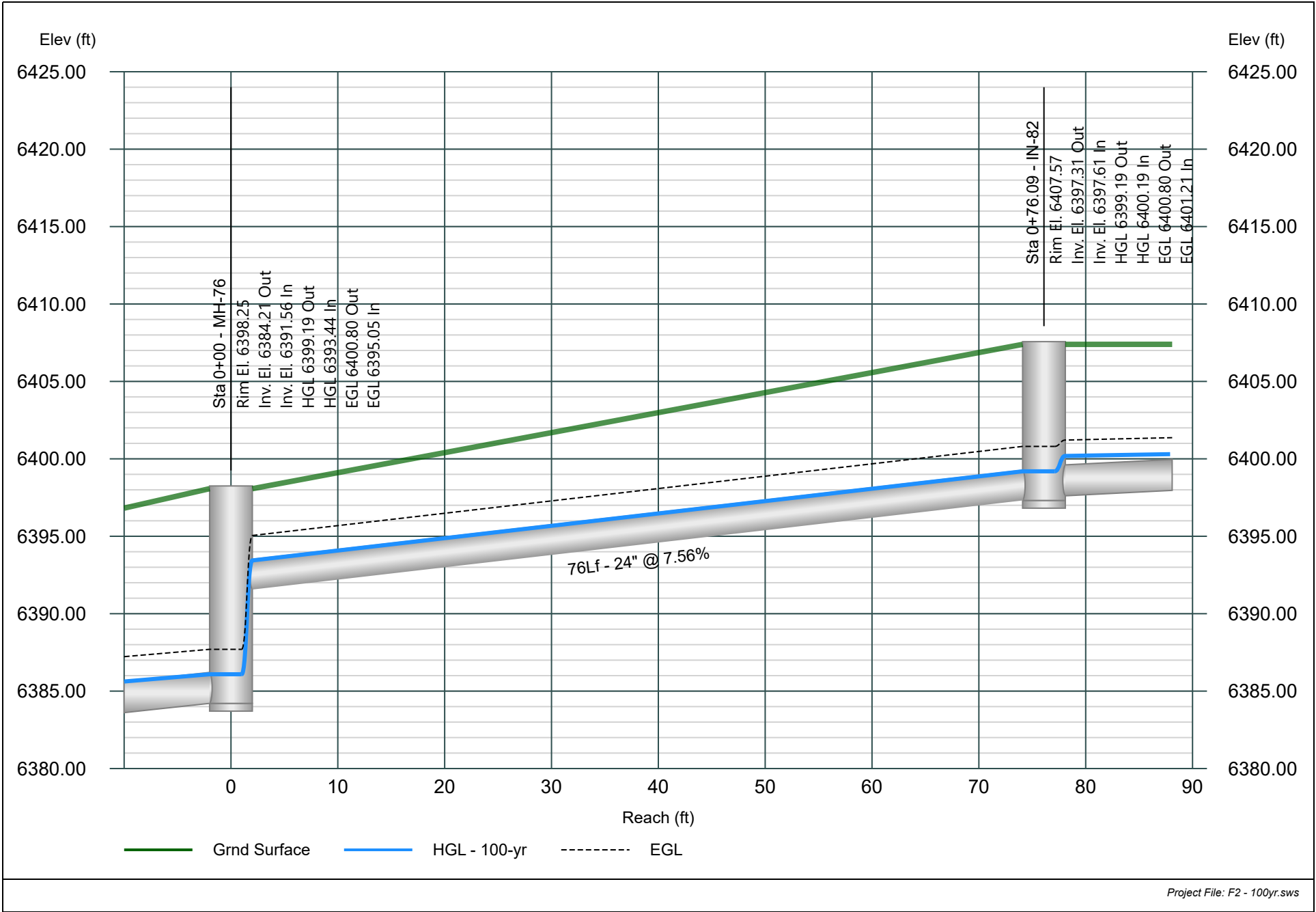
Line 20 - PIPE-33

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



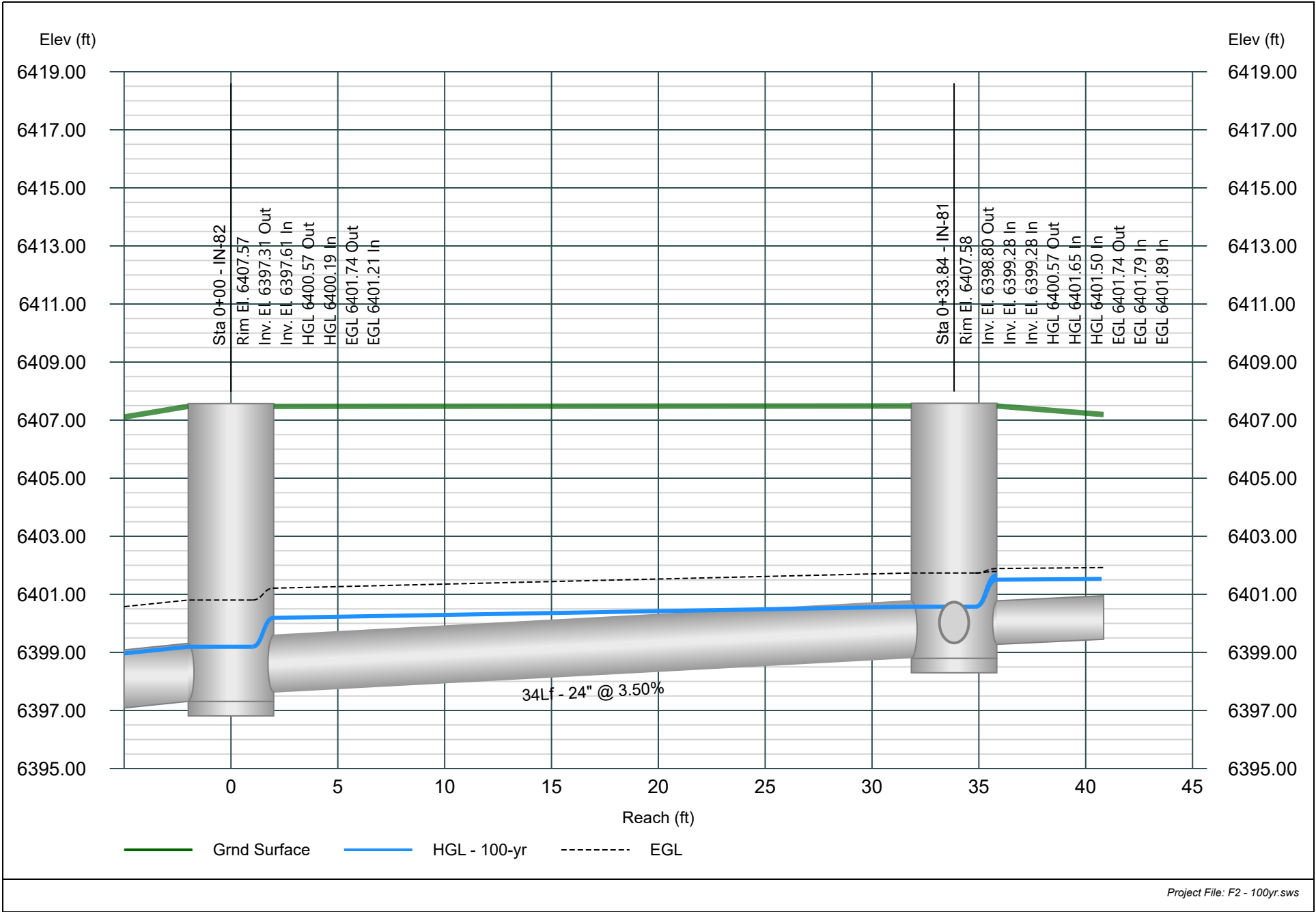
Line 21 - PIPE-44

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



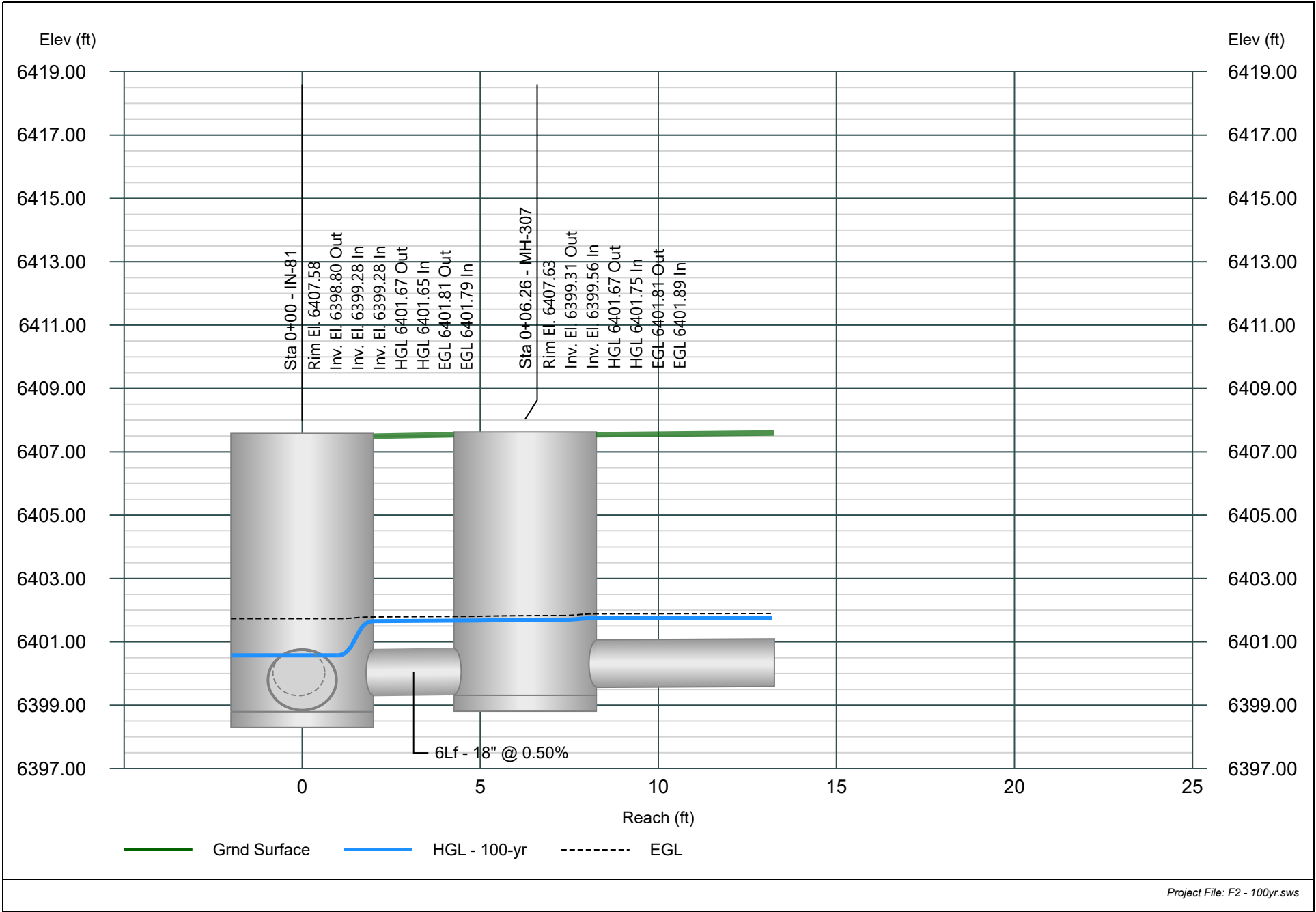
Line 22 - PIPE-244

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



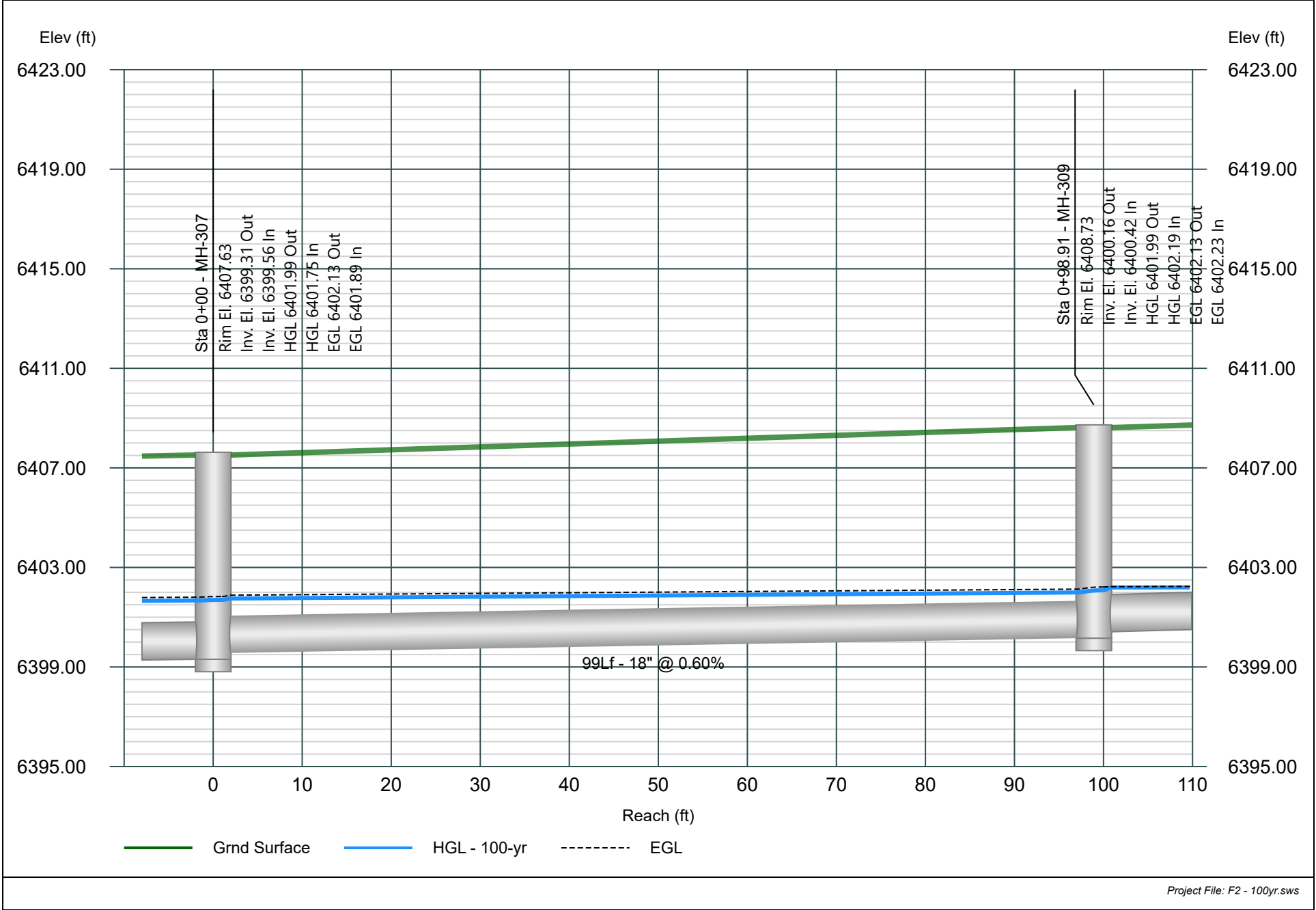
Line 23 - PIPE-246

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



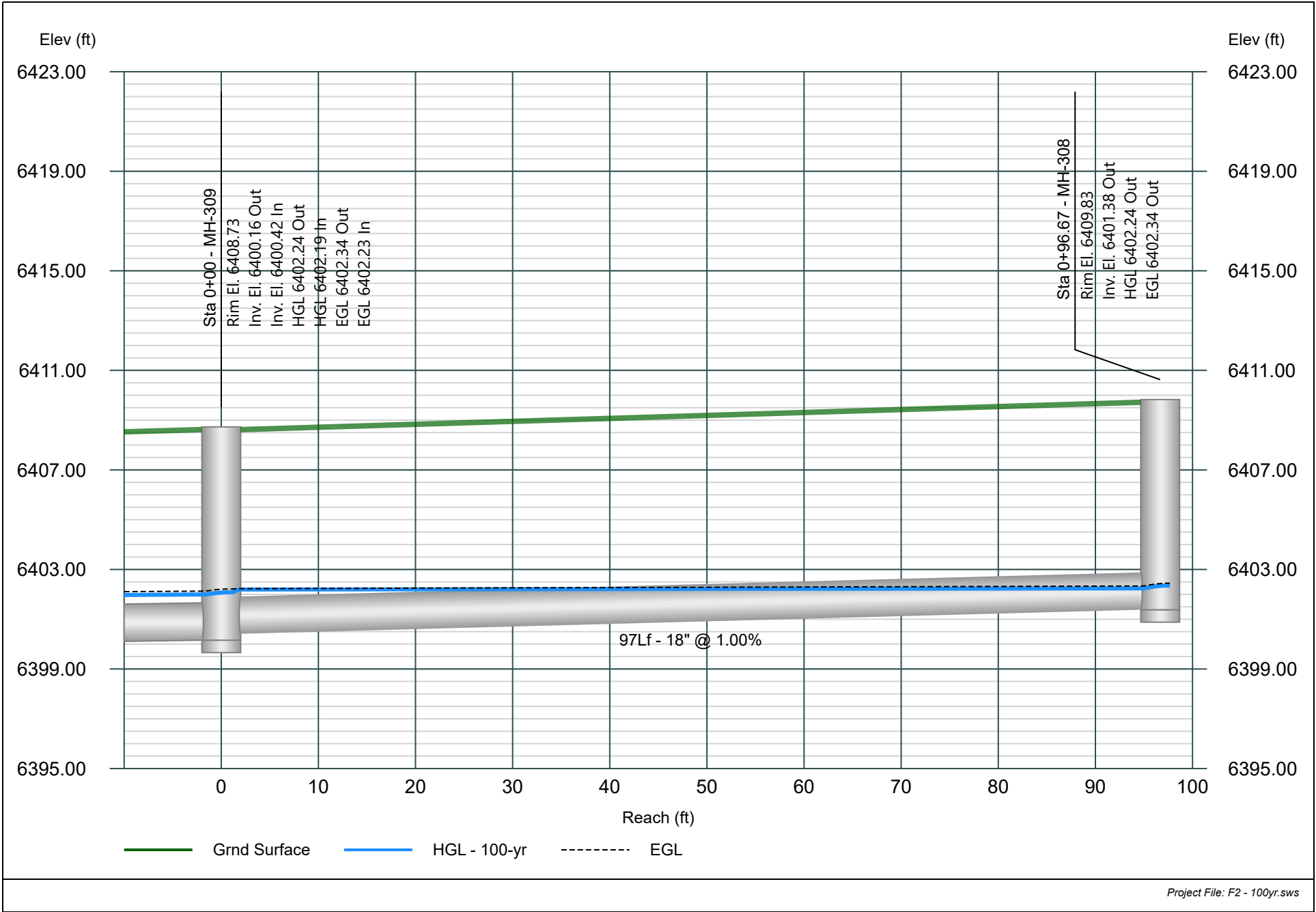
Line 24 - PIPE-245

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



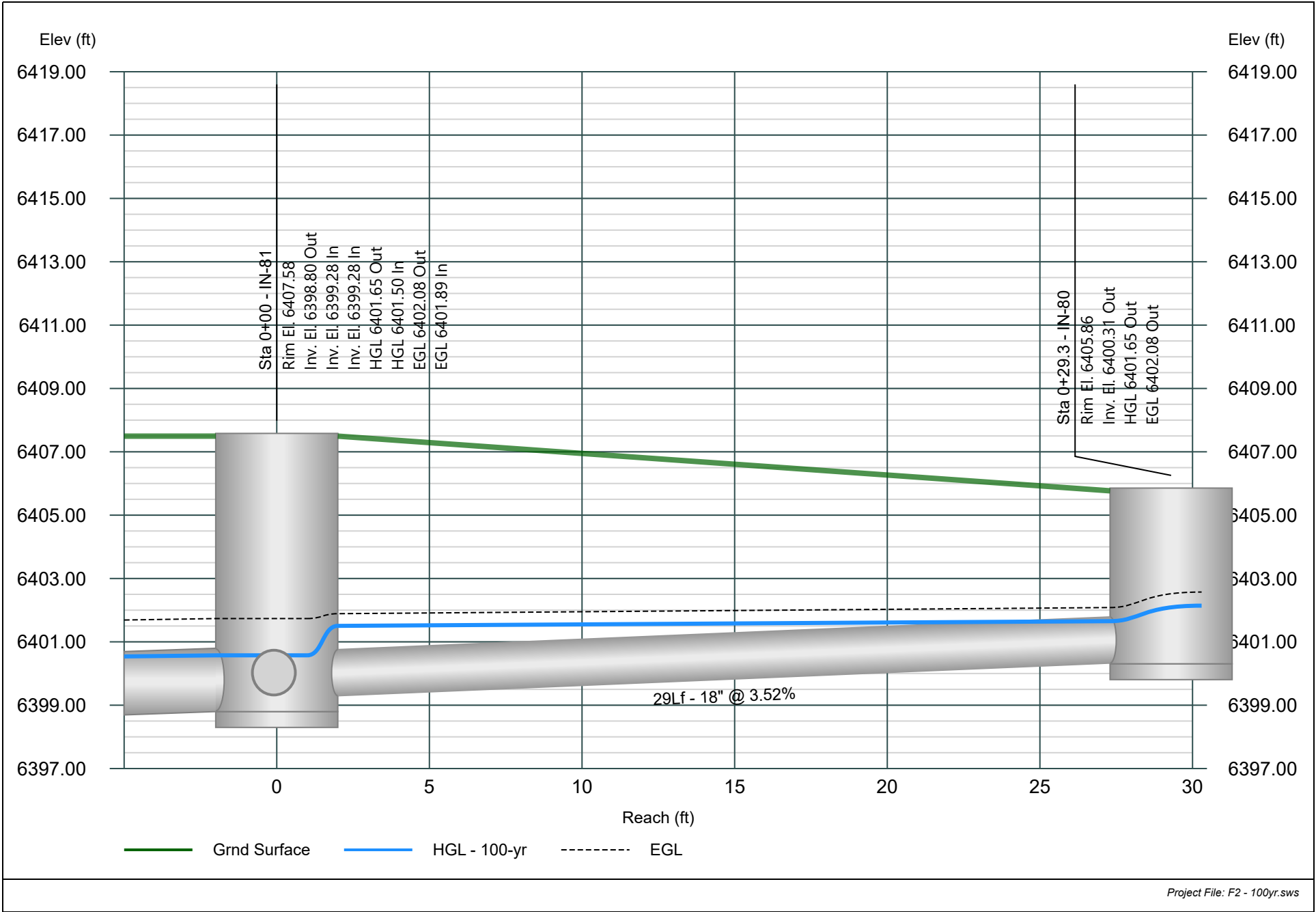
Line 25 - PIPE-84

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



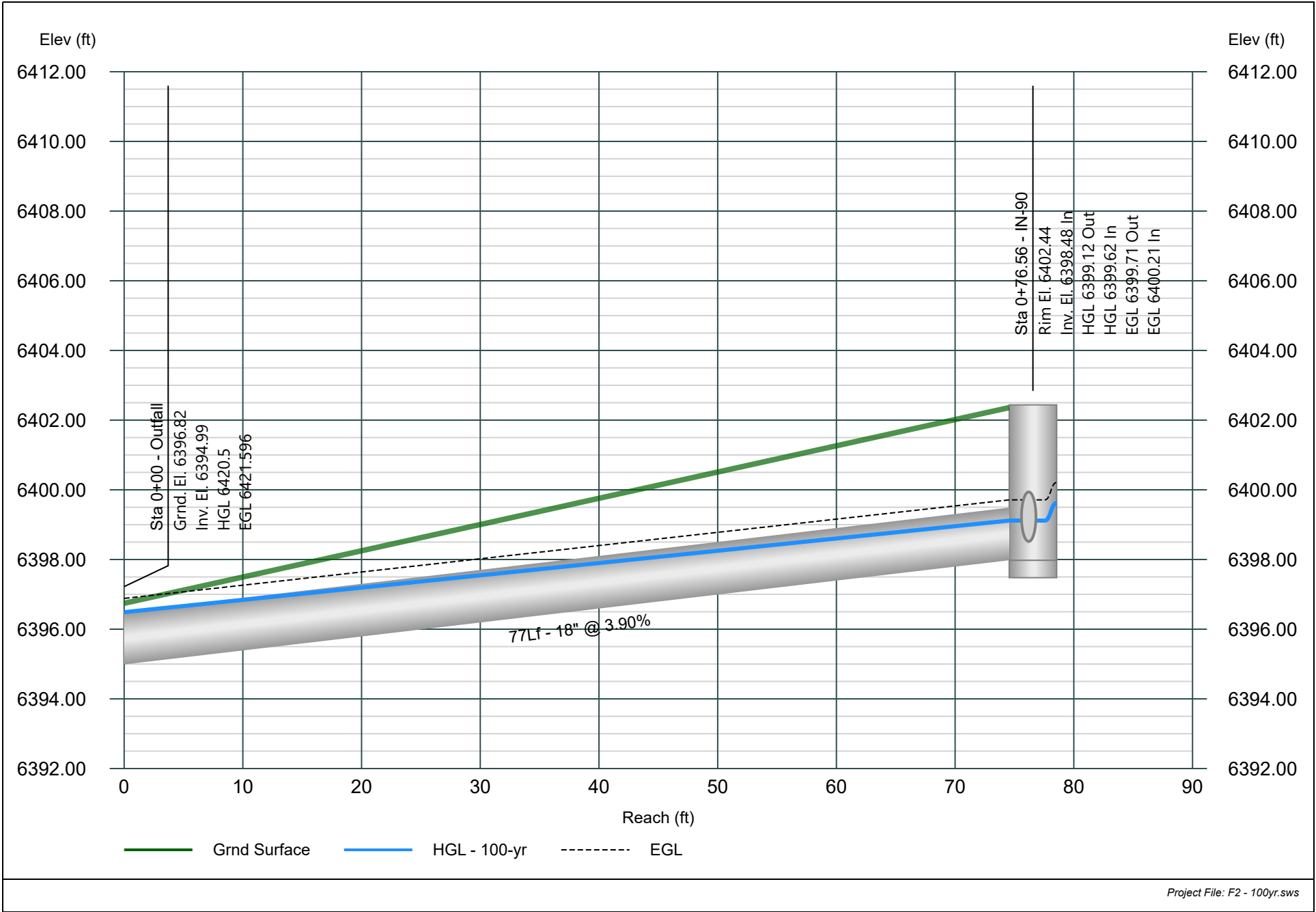
Line 26 - PIPE-213

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



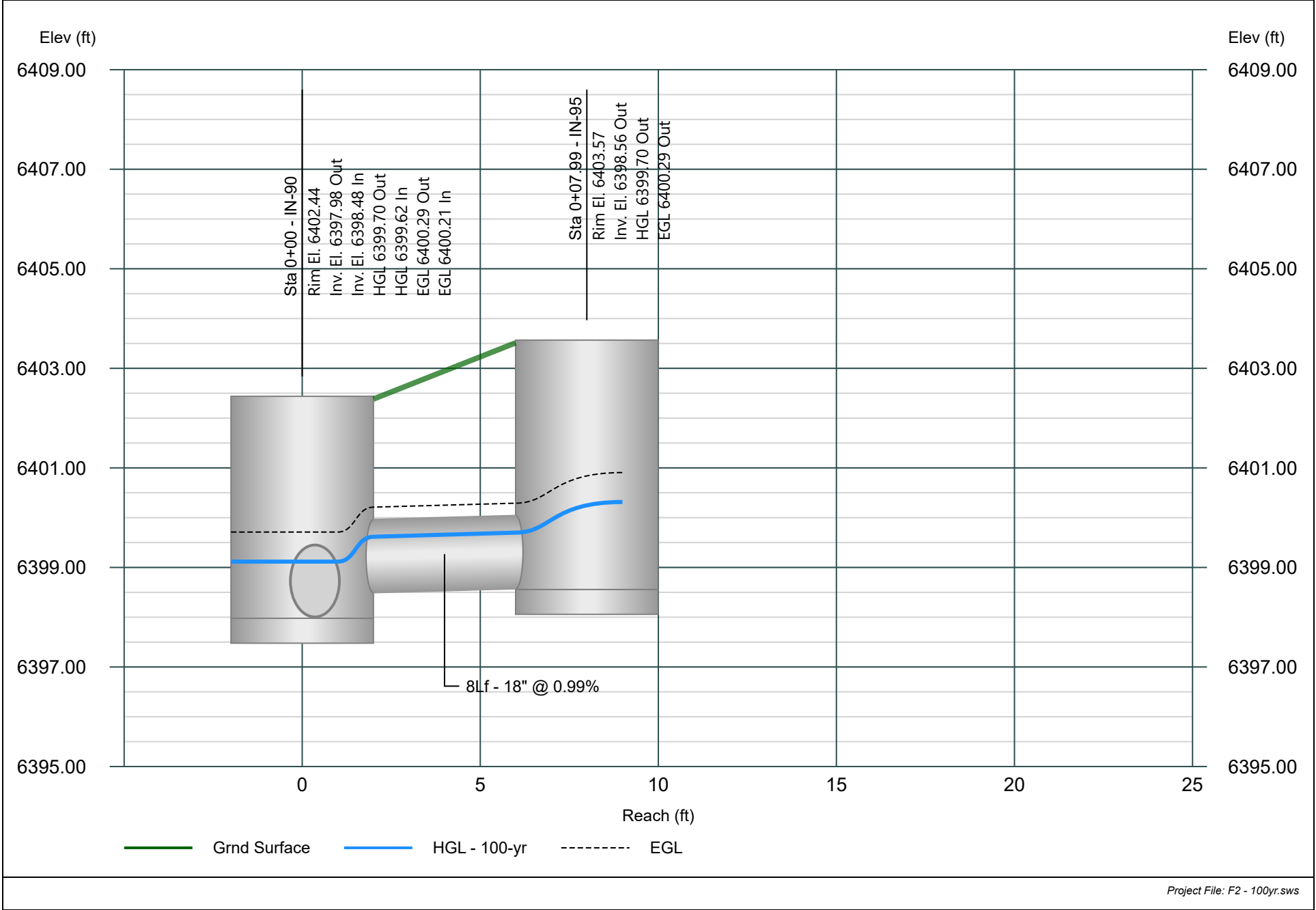
Line 27 - PIPE-221

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



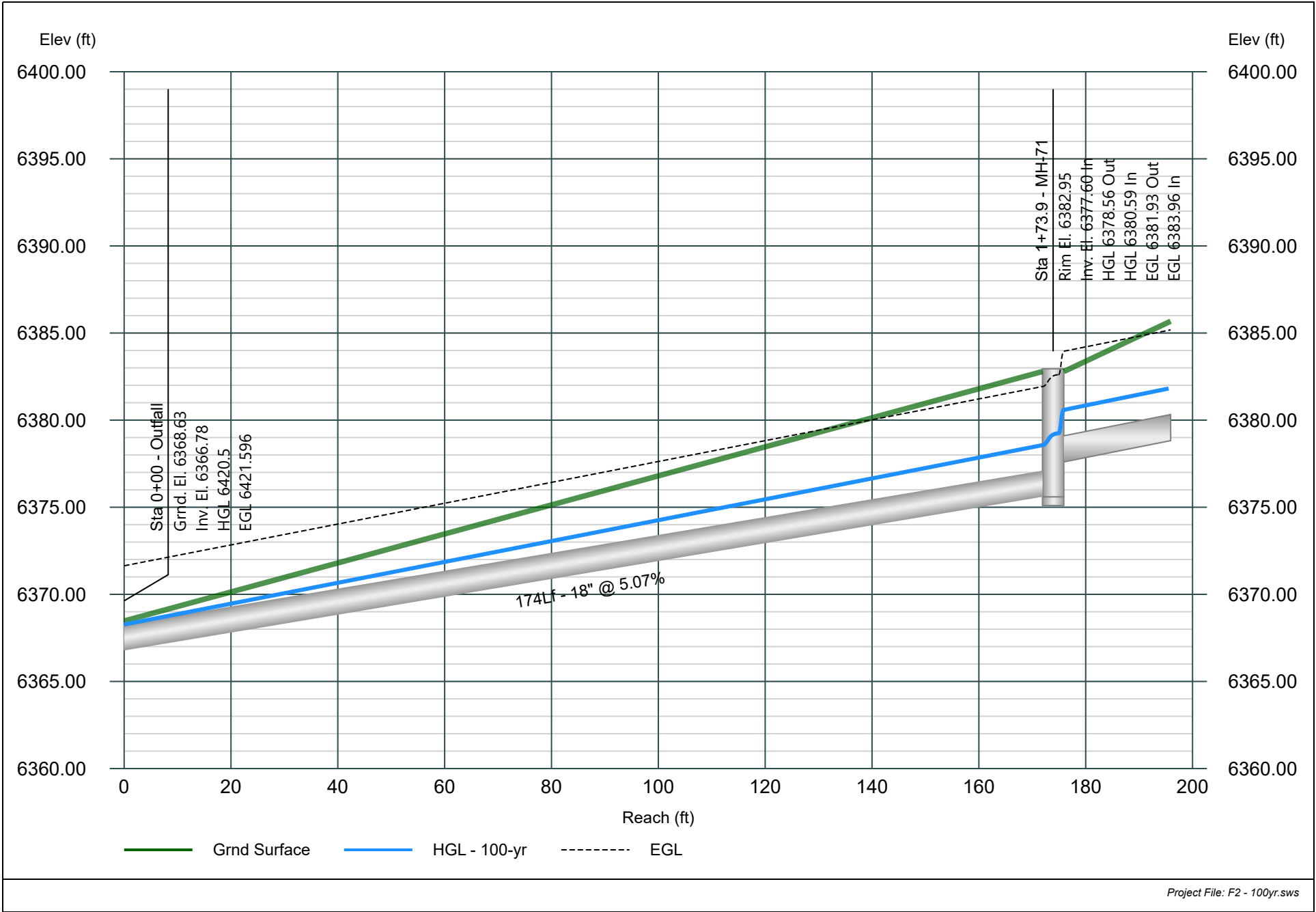
Line 28 - PIPE-64 (1)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



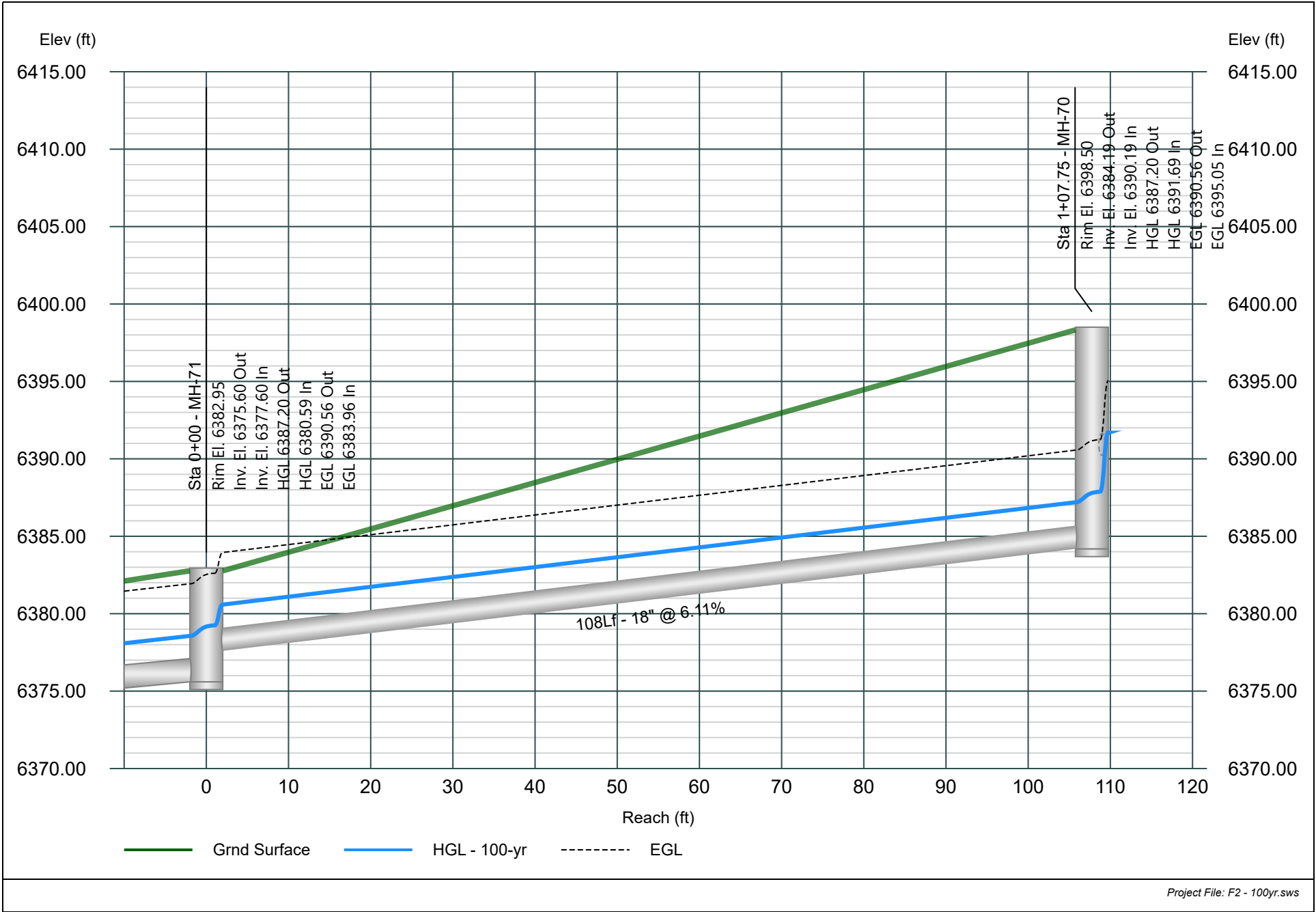
Line 29 - PIPE-64 (2)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



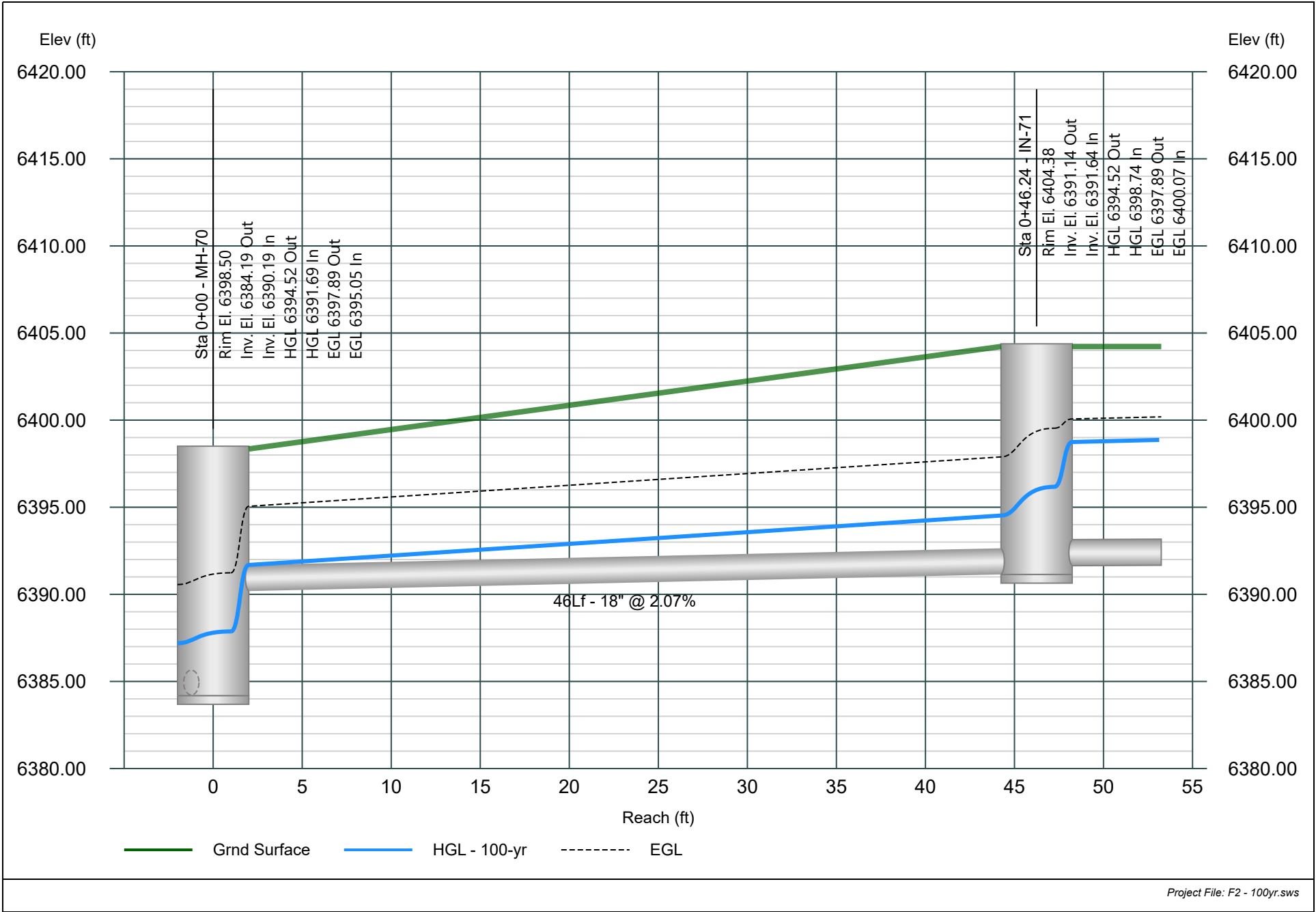
Line 30 - PIPE-64

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



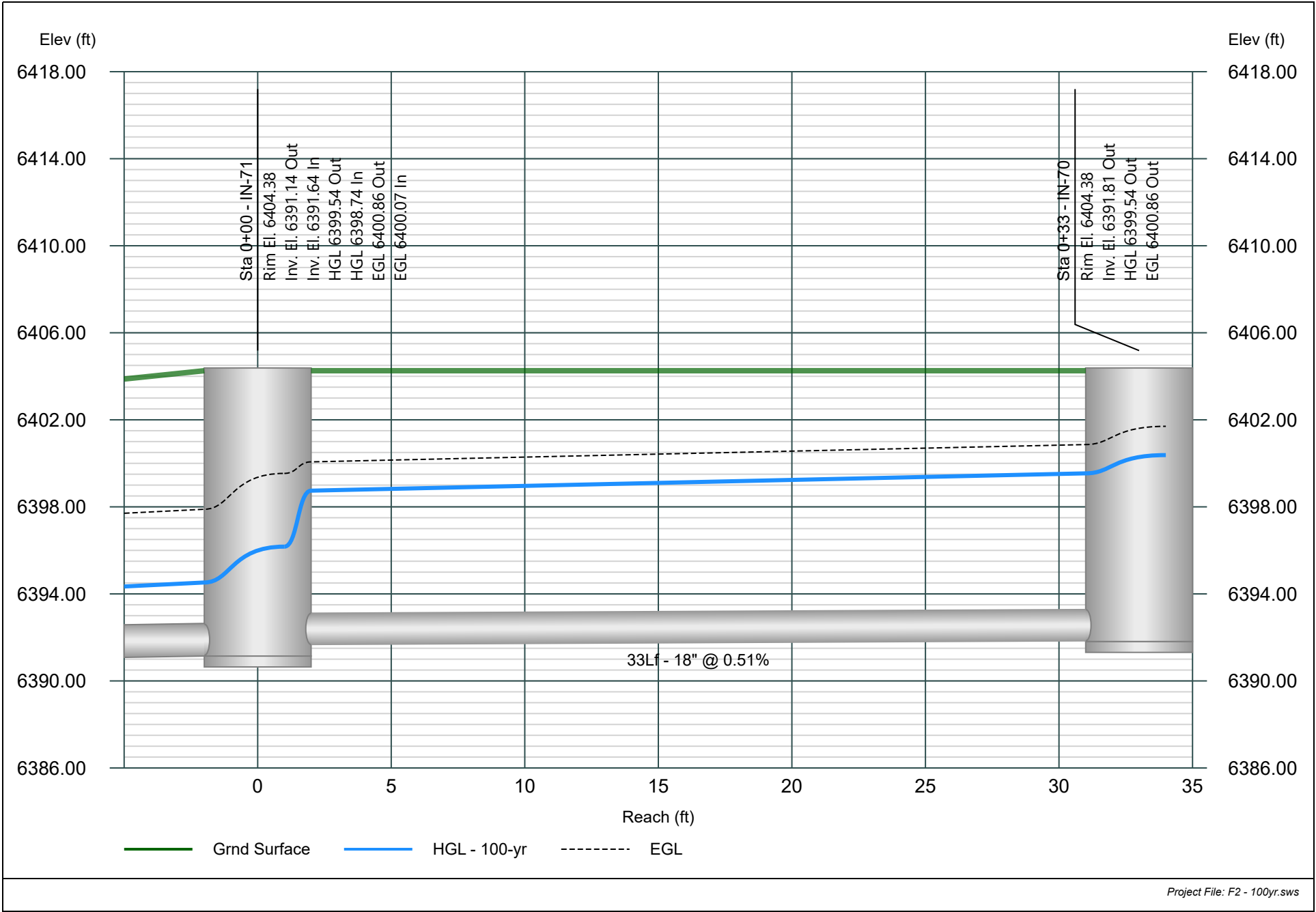
Line 31 - PIPE-90

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



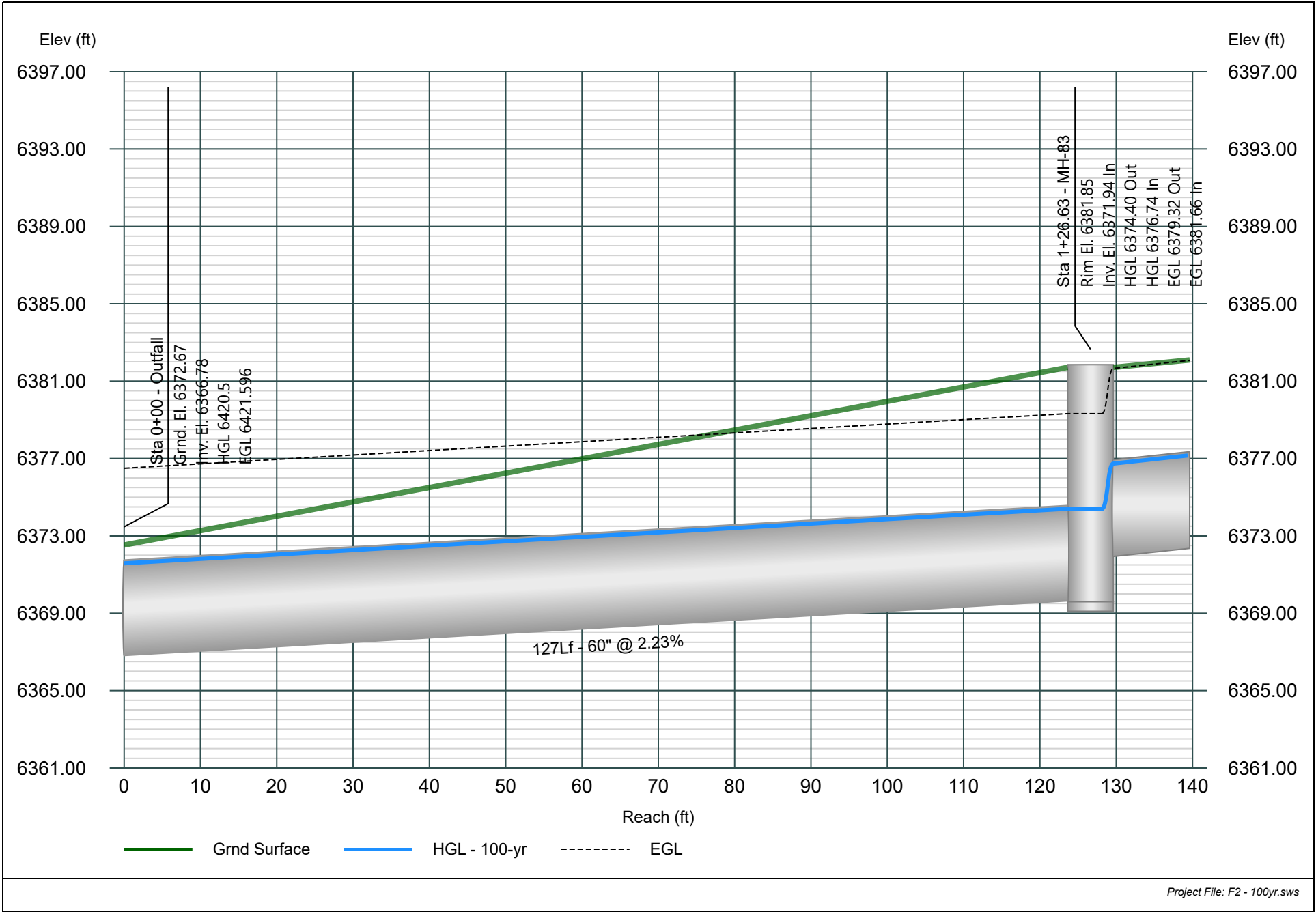
Line 32 - PIPE-89 (1)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



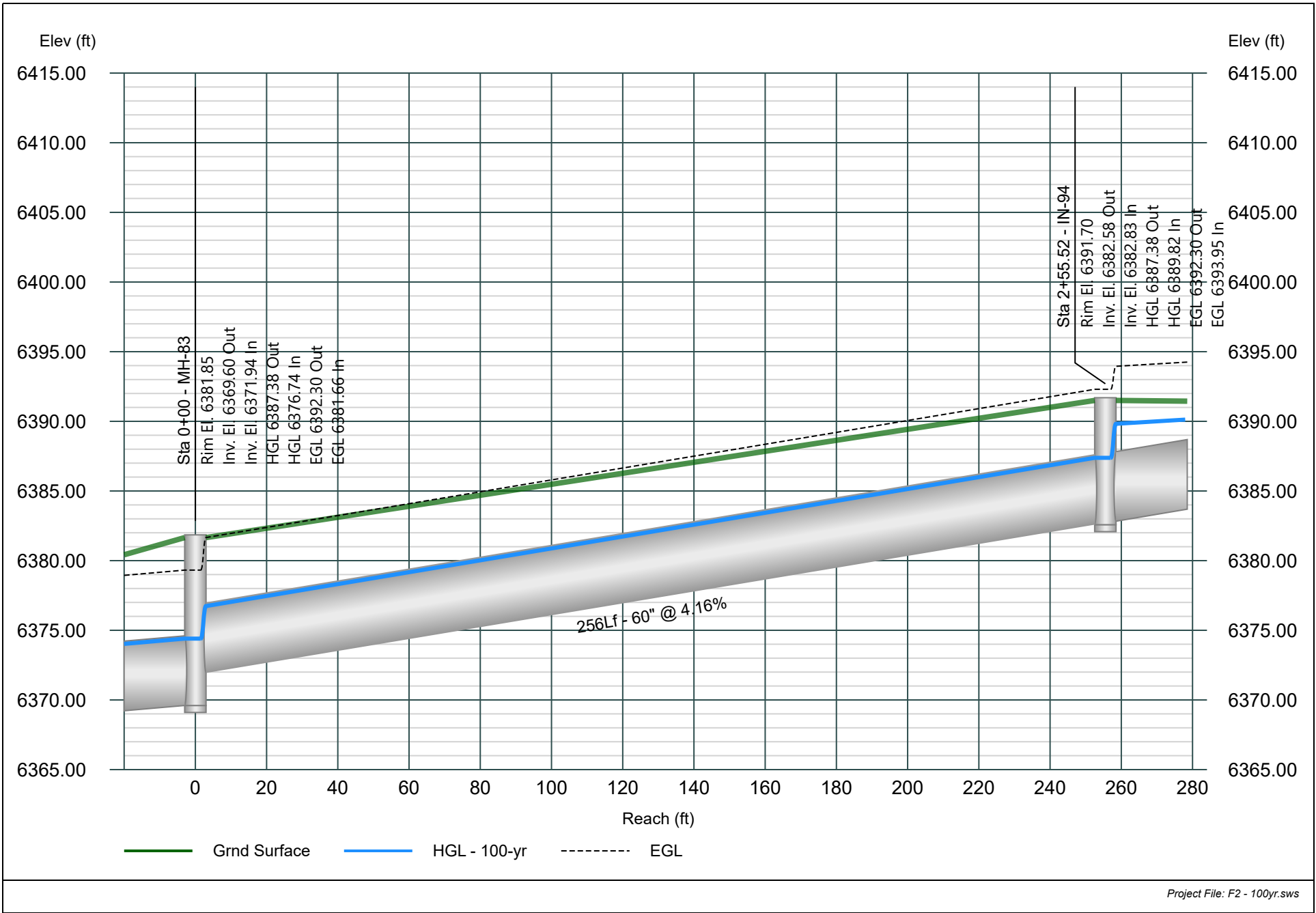
Line 33 - PIPE-89 (2)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



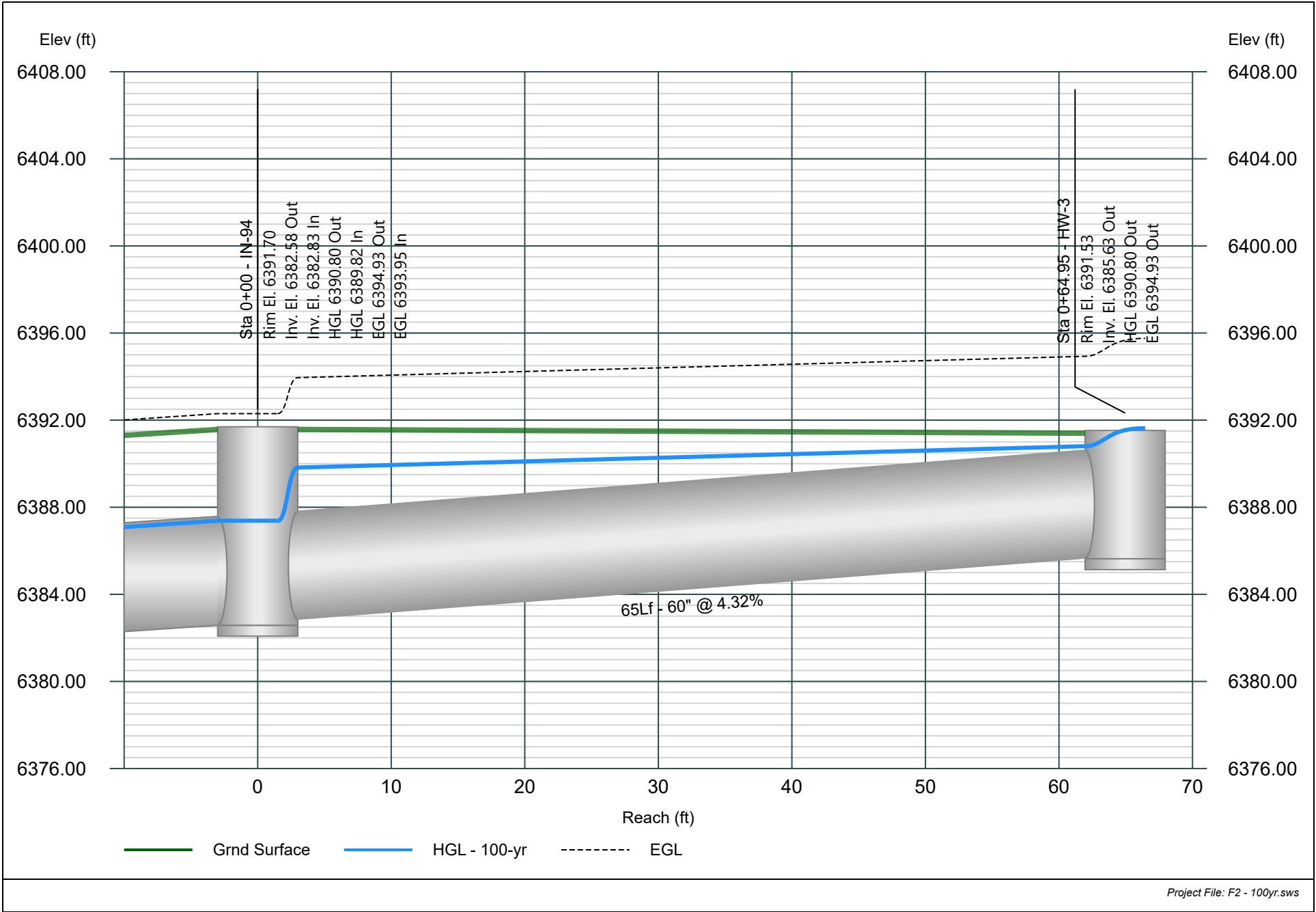
Line 34 - PIPE-89

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



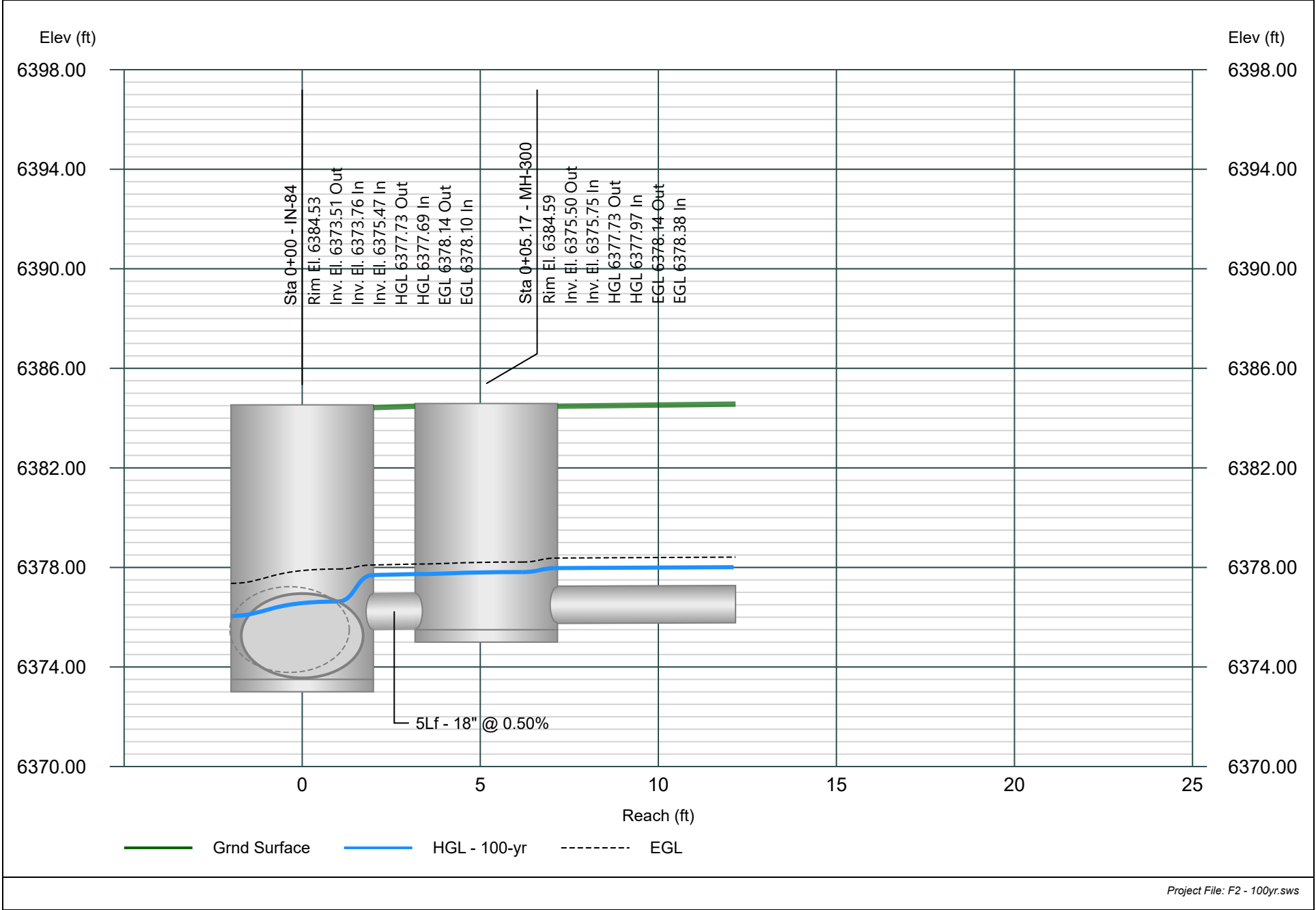
Line 35 - PIPE-237

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



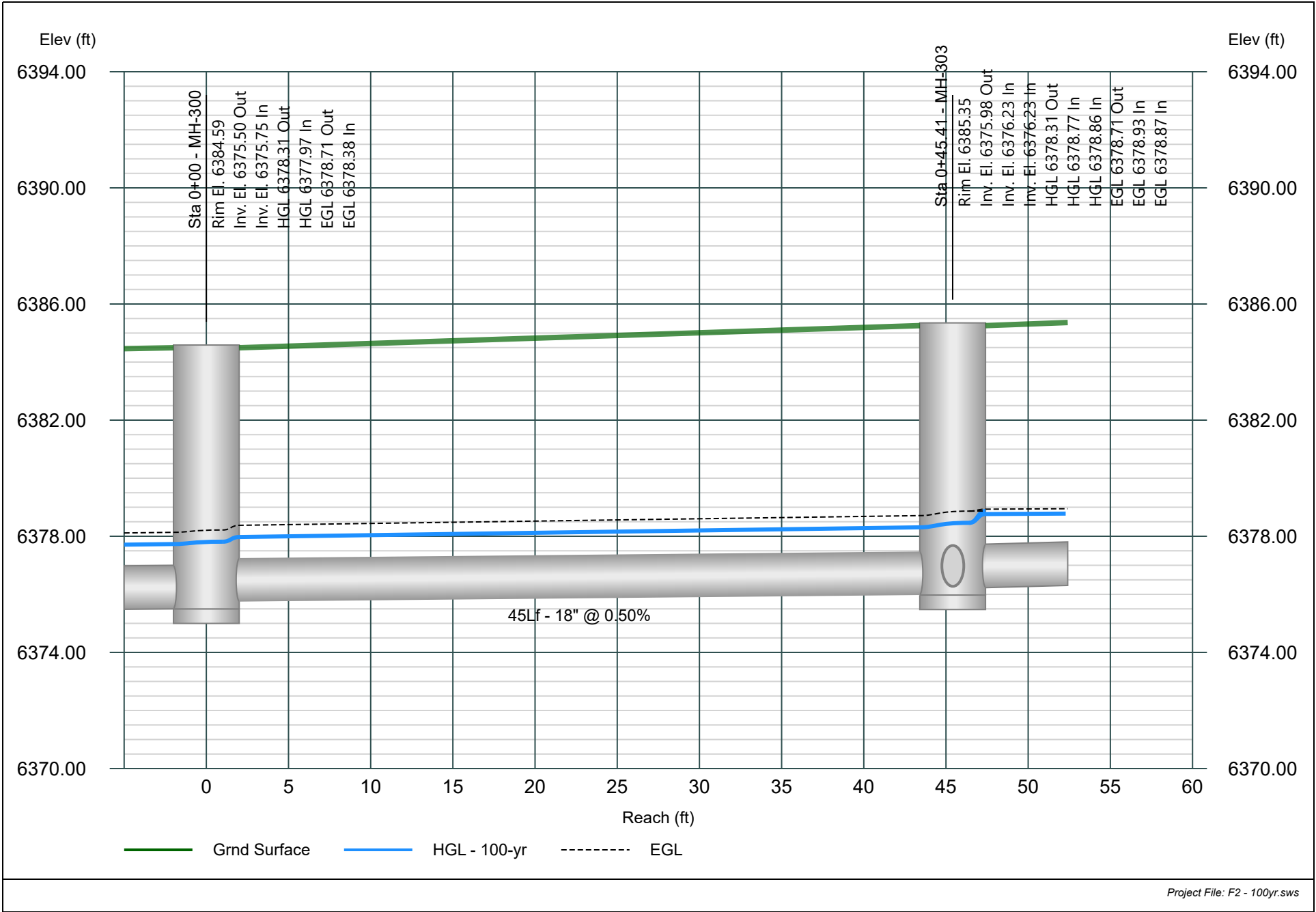
Line 36 - PIPE-236

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



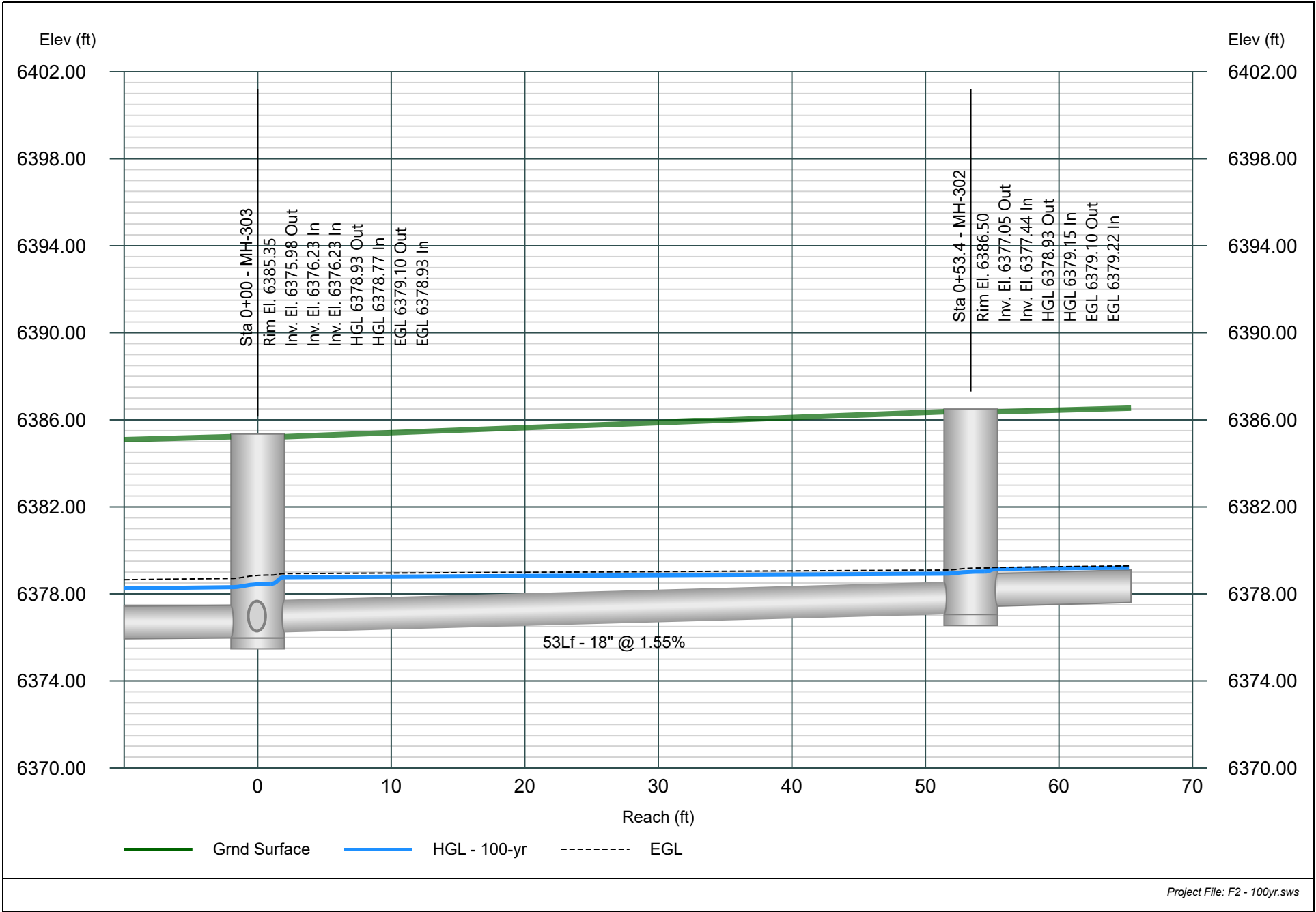
Line 37 - PIPE-229

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



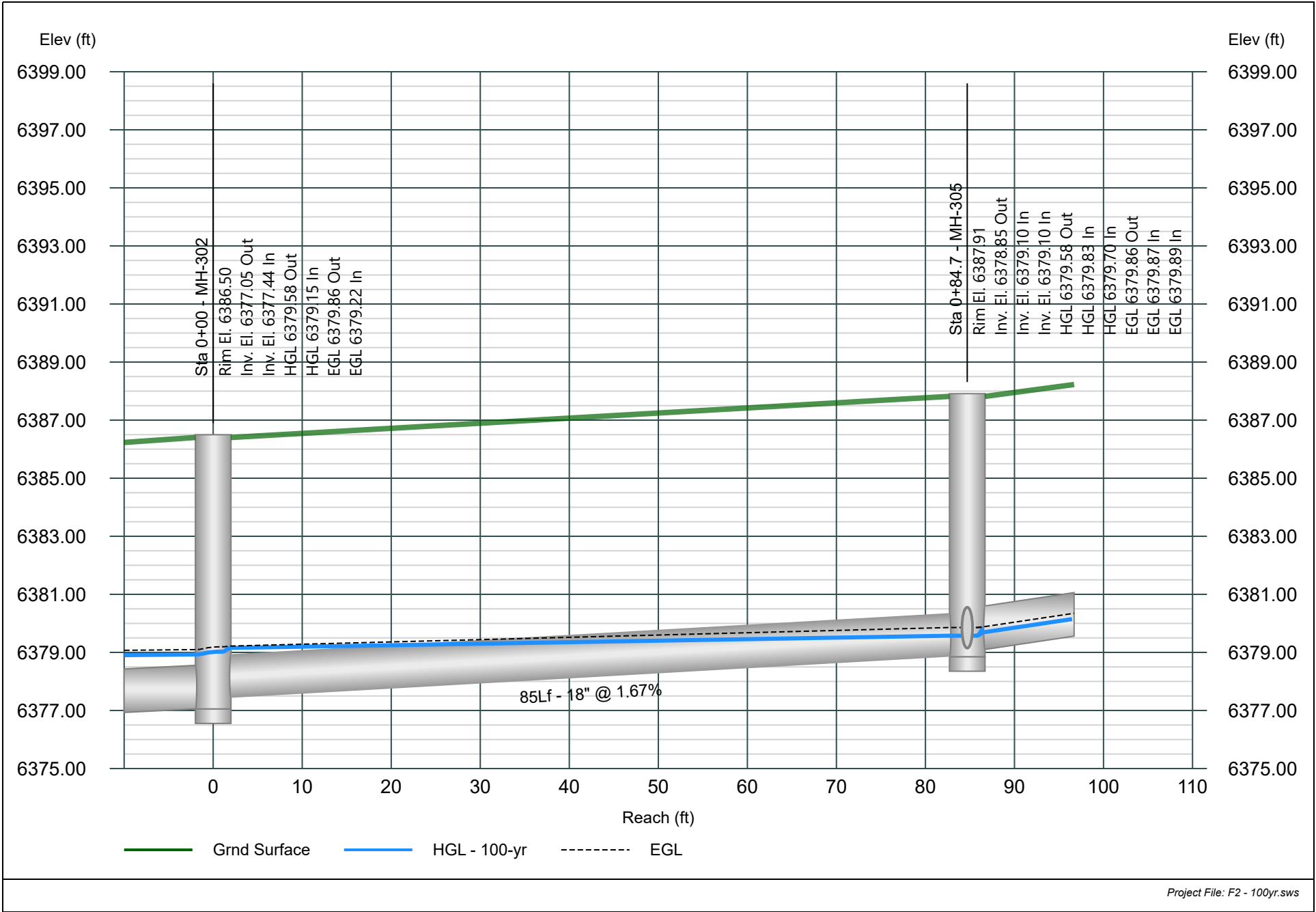
Line 38 - PIPE-228 (1)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



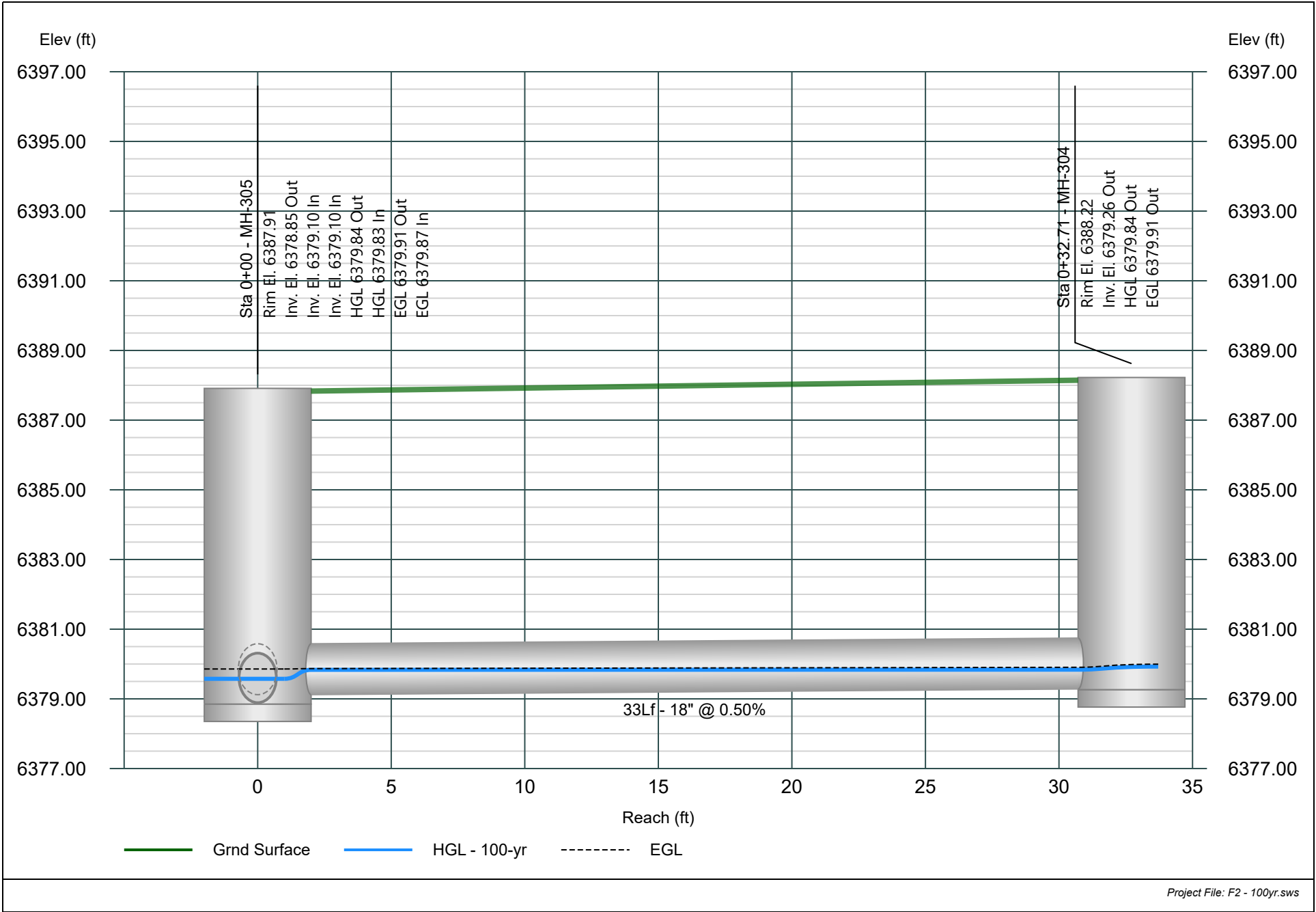
Line 39 - PIPE-238

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



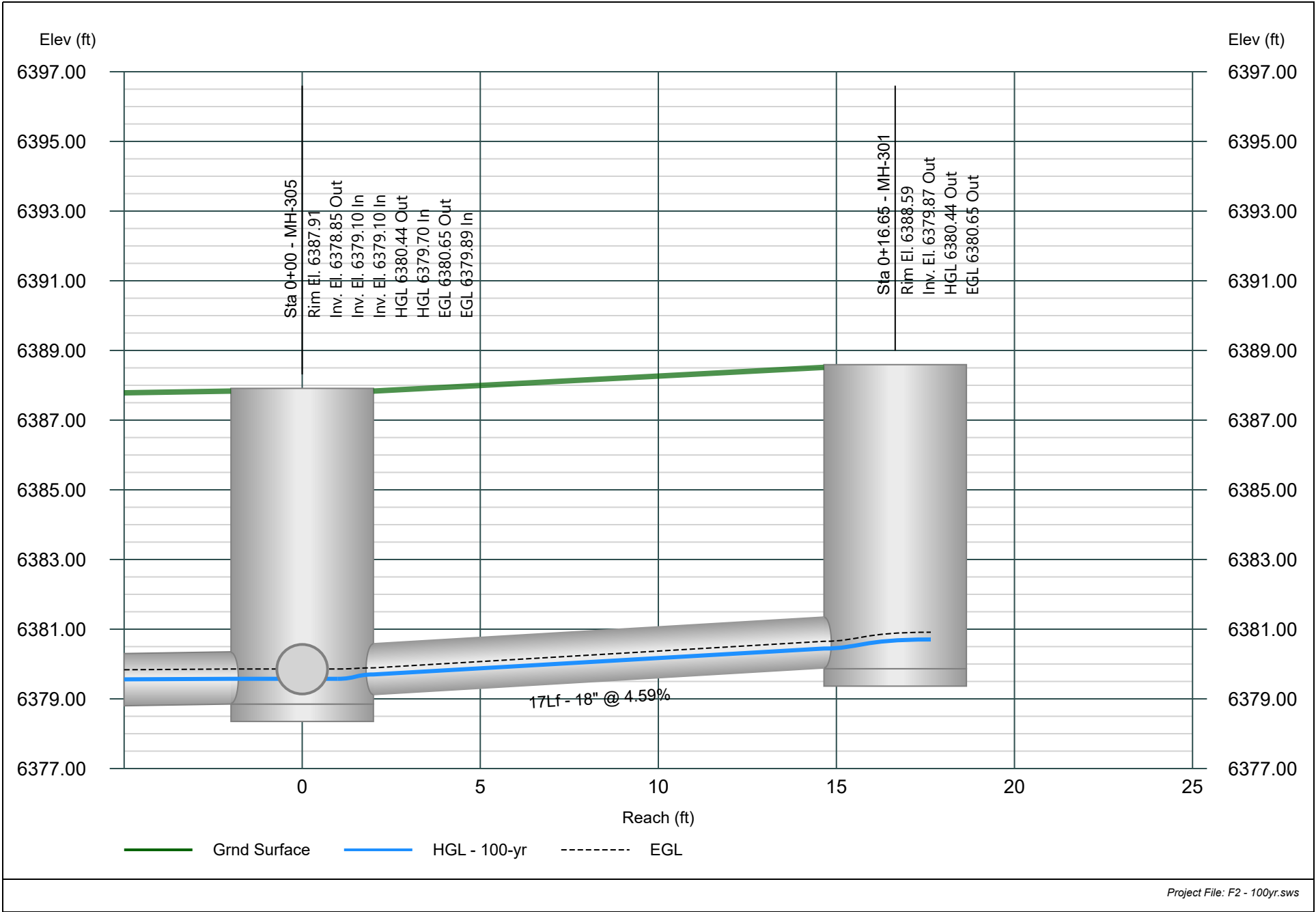
Line 40 - PIPE-228

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



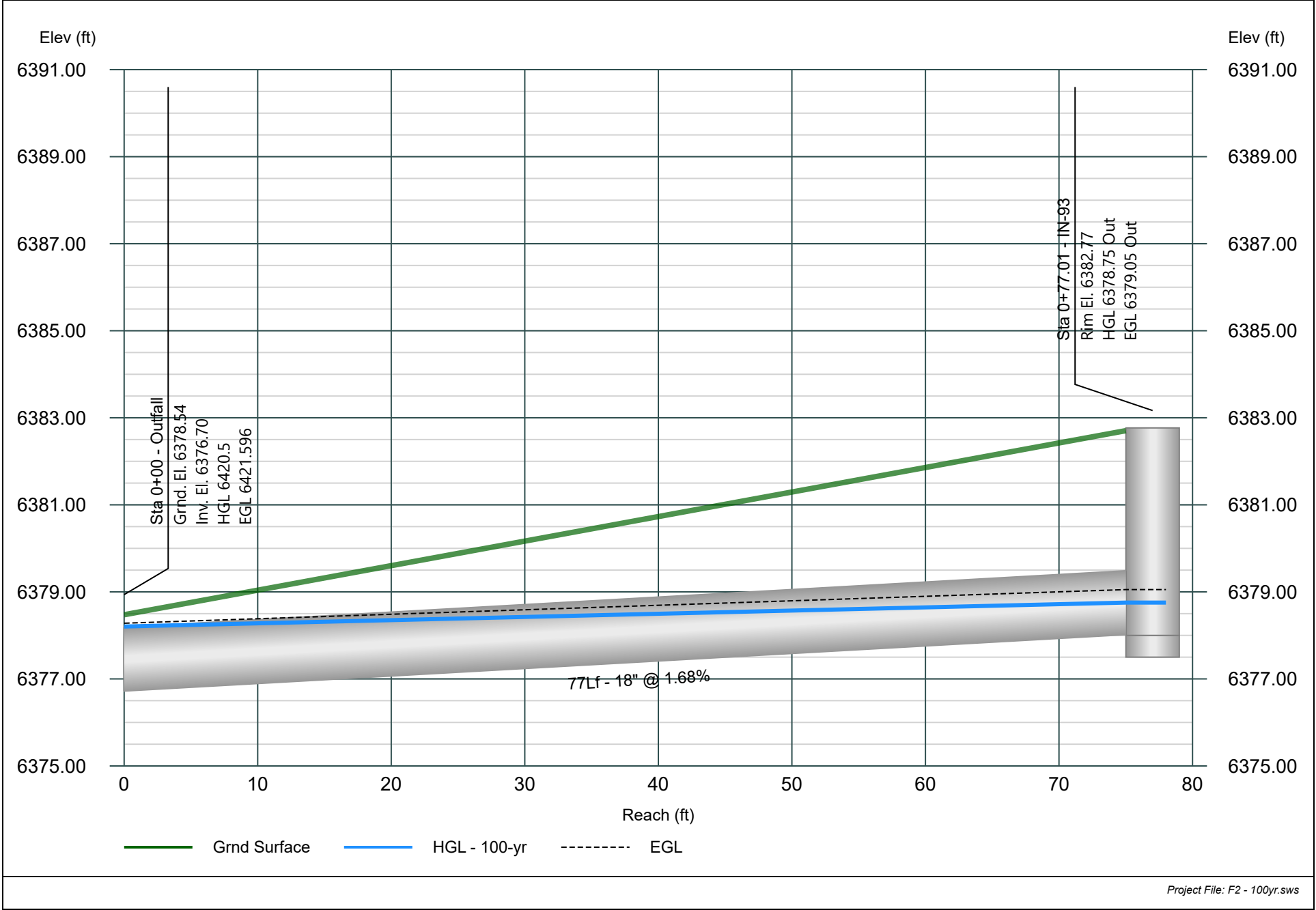
Line 41 - PIPE-220

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



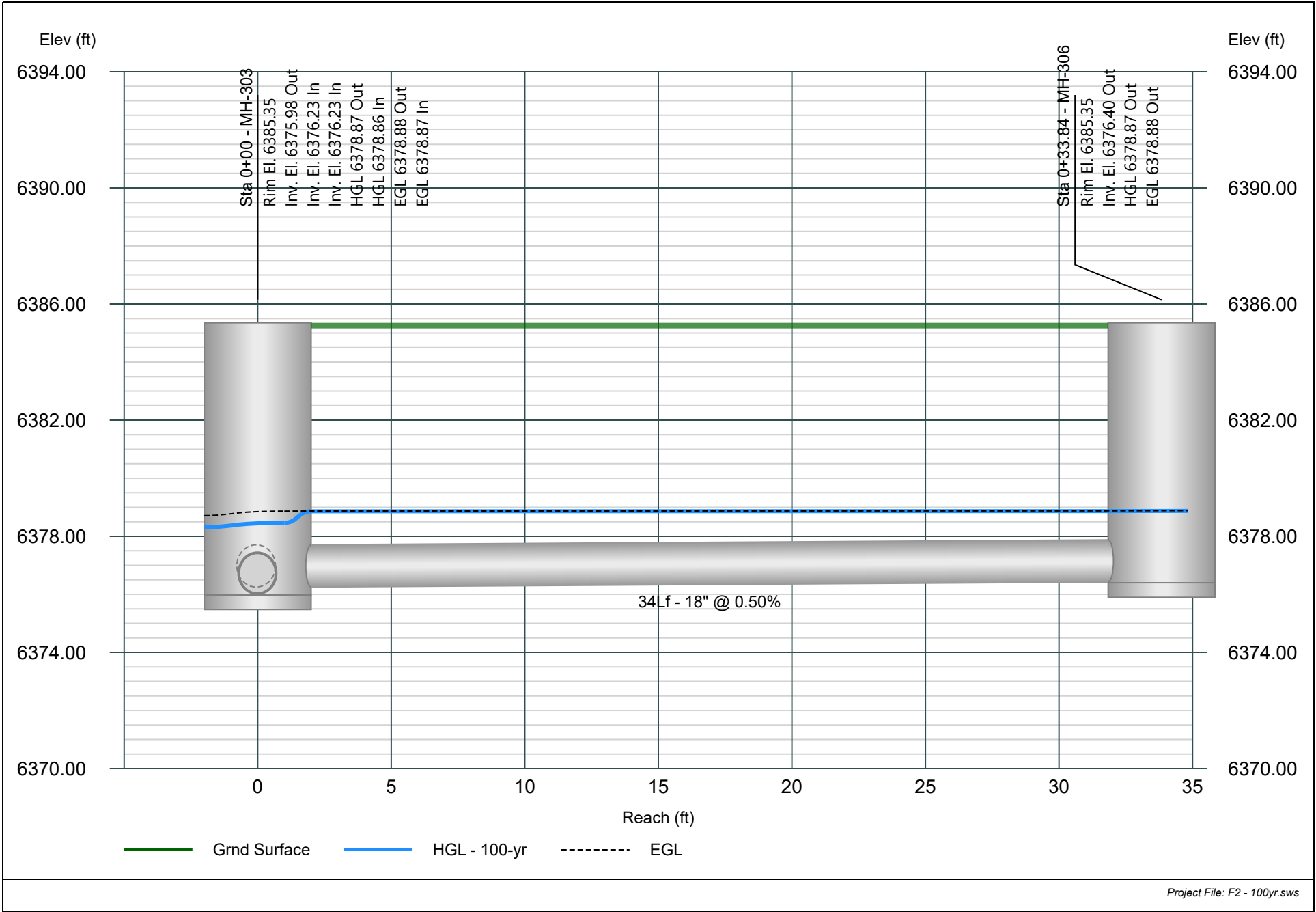
Line 42 - PIPE-240

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



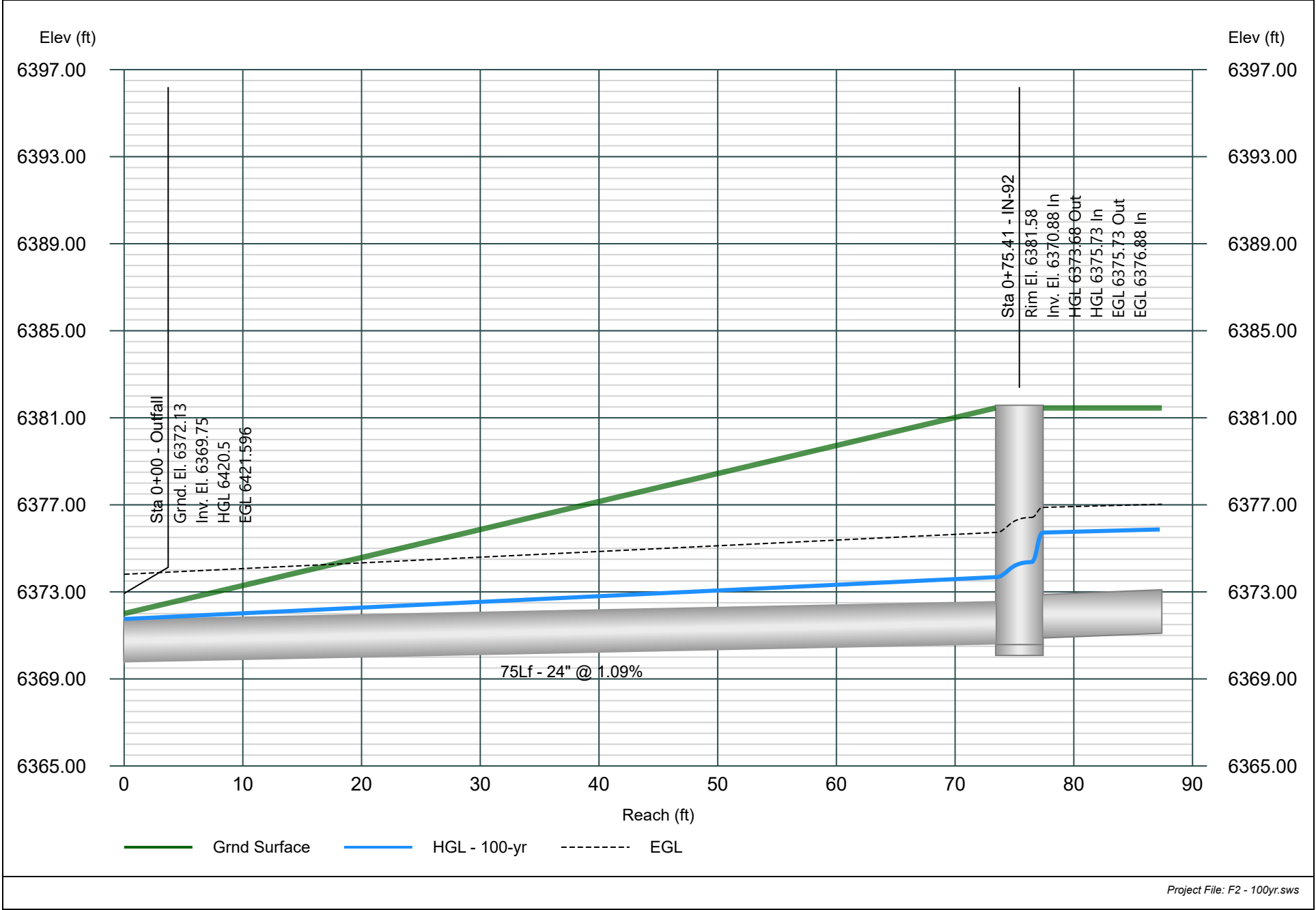
Line 43 - PIPE-219

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



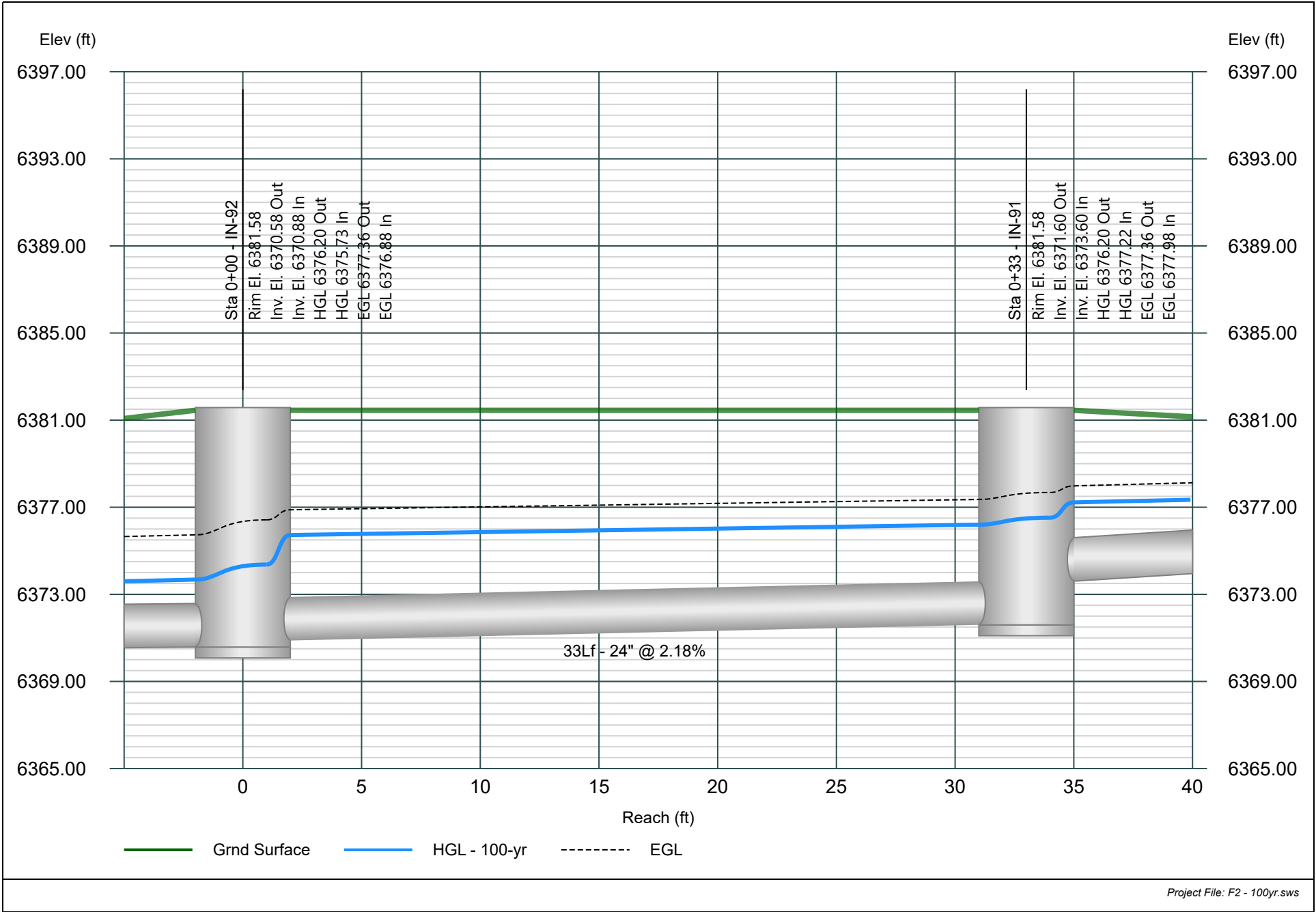
Line 44 - PIPE-218

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



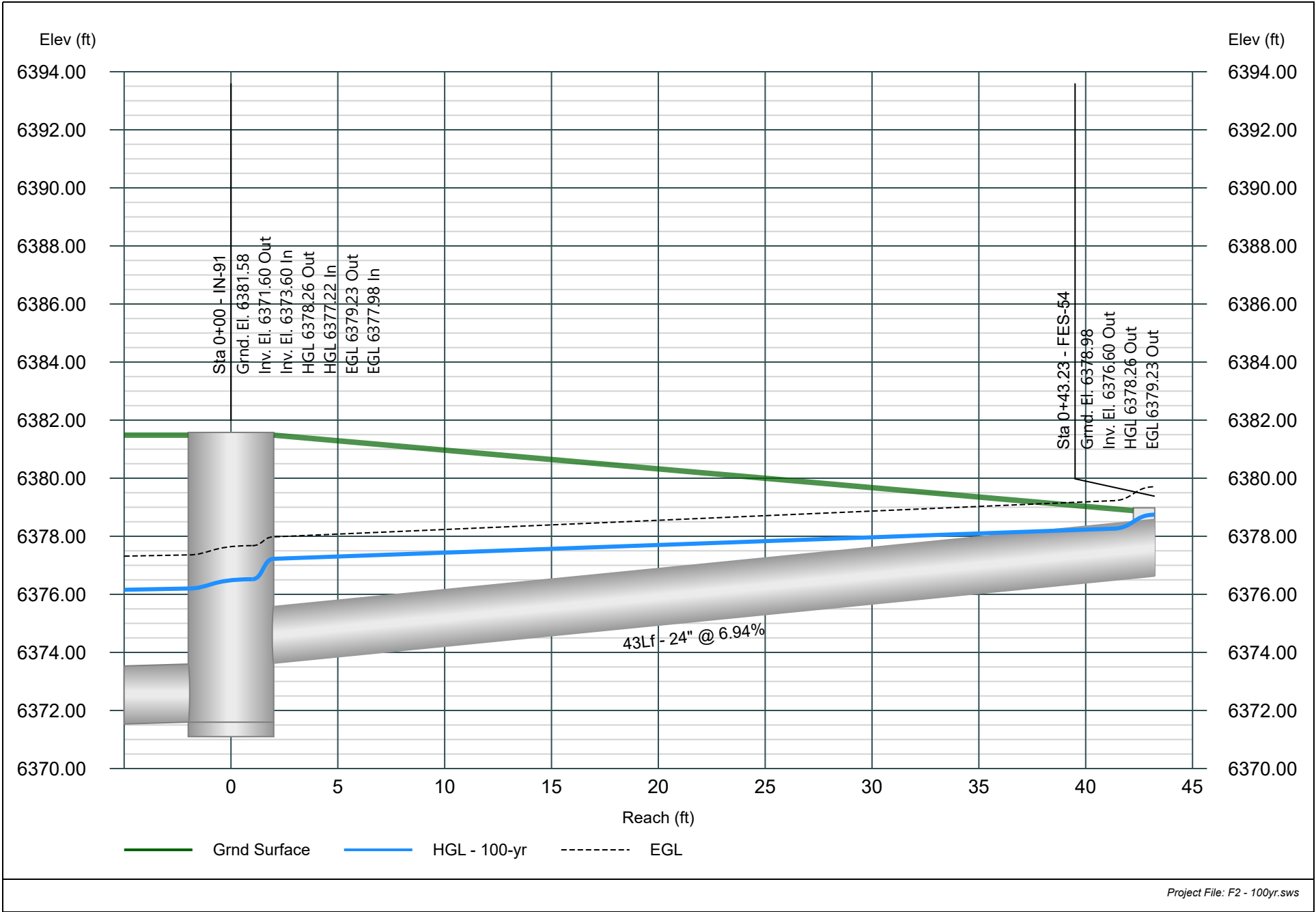
Line 45 - PIPE-217

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



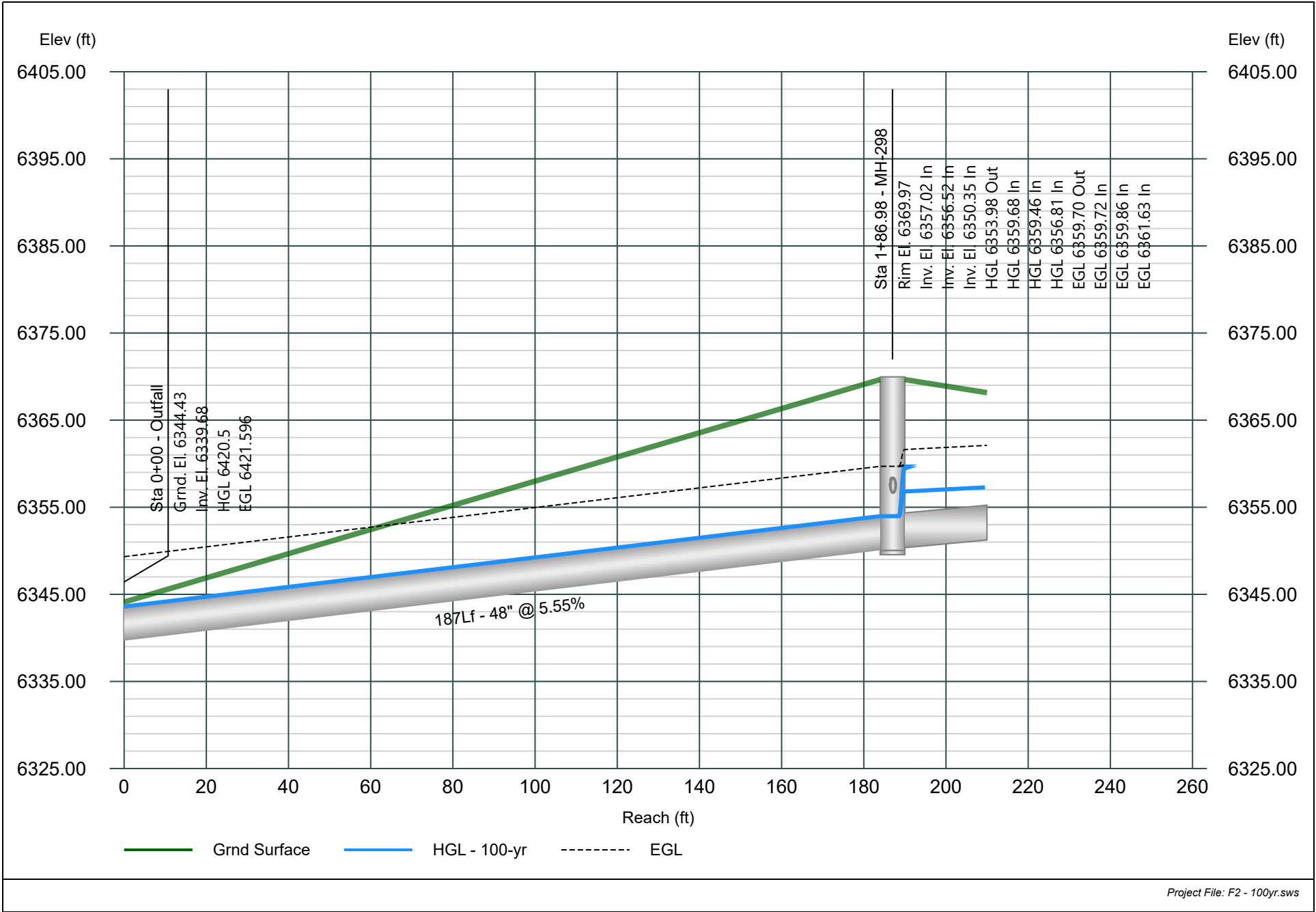
Line 46 - PIPE-81 (1)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



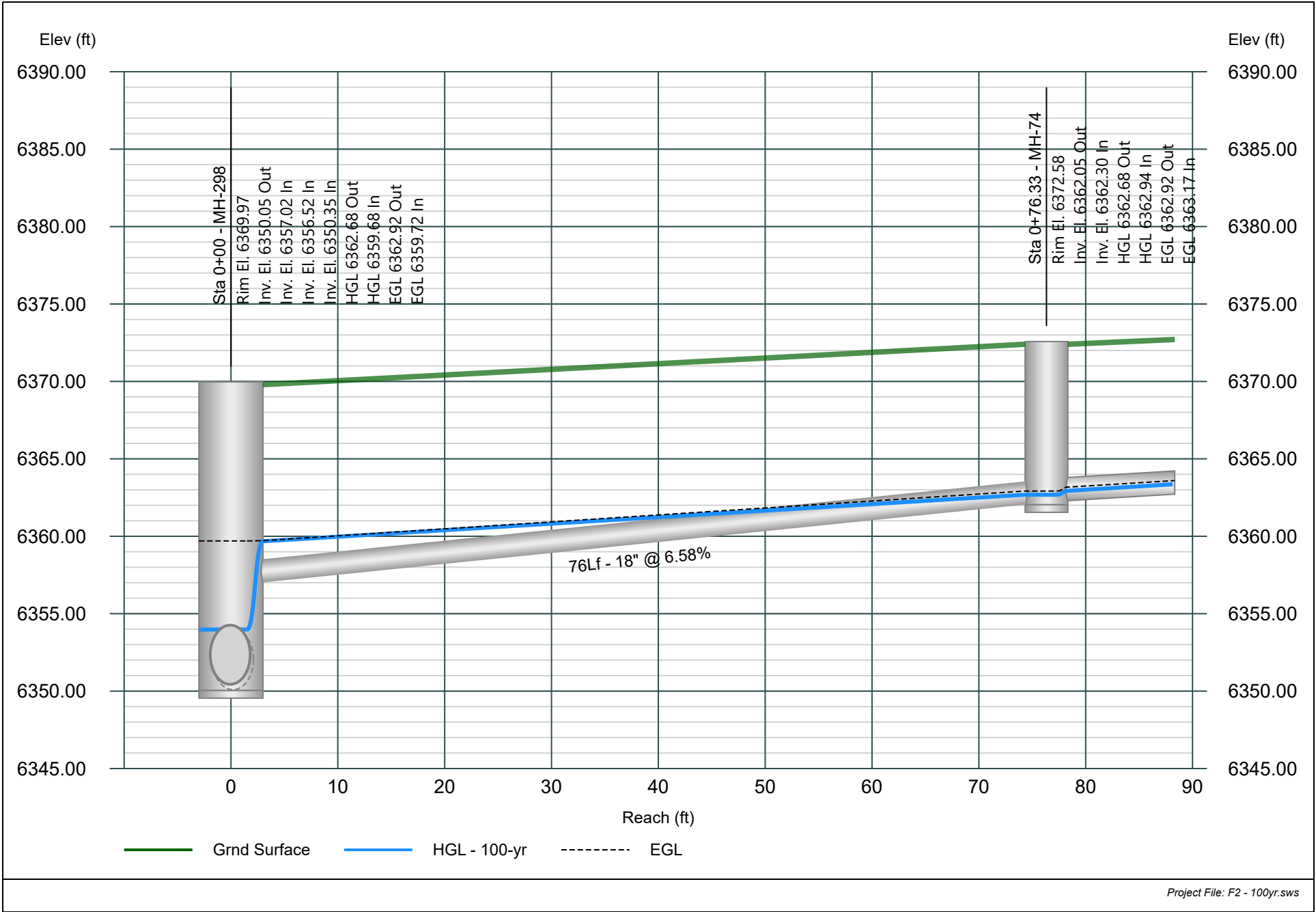
Line 47 - PIPE-54

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



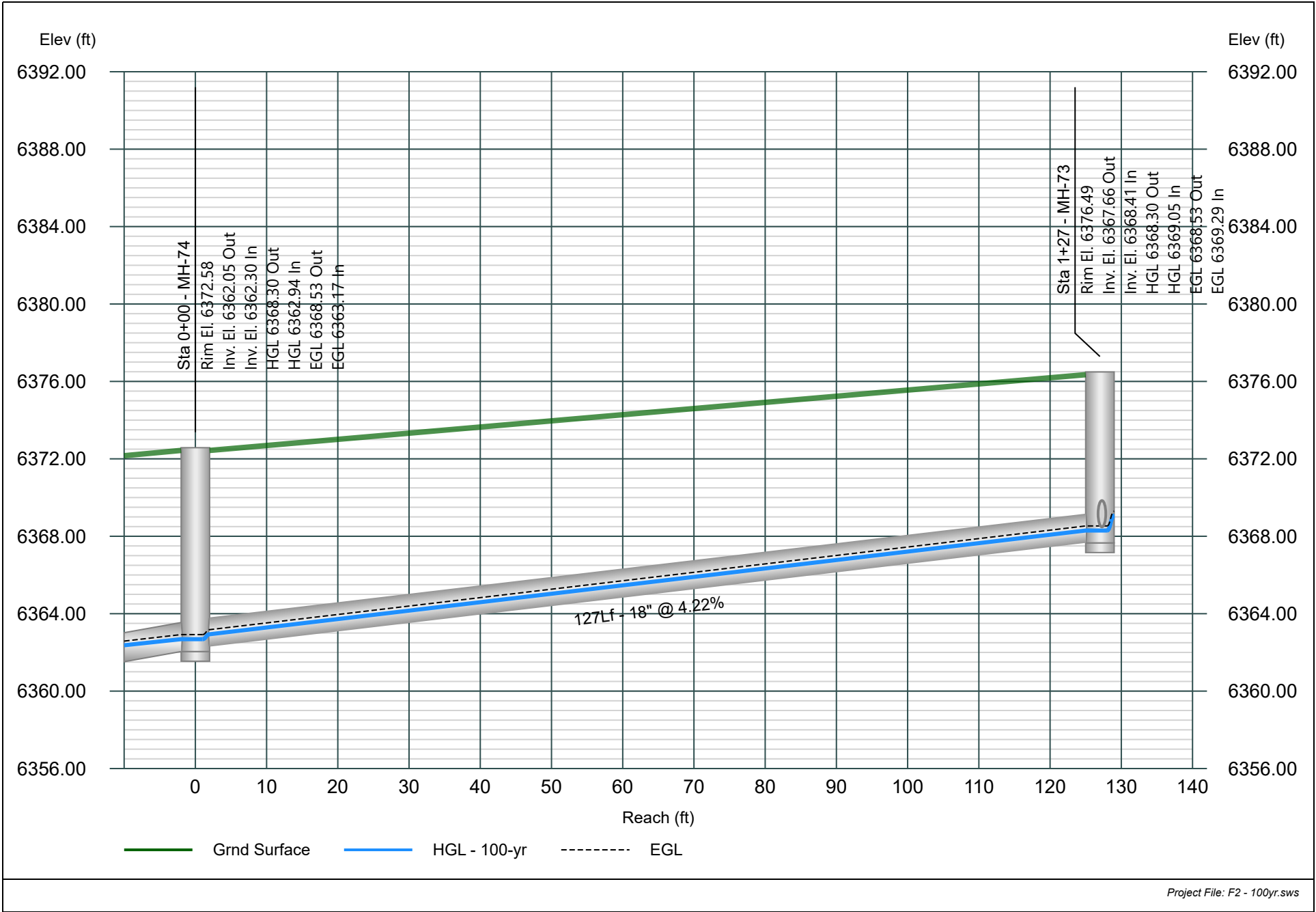
Line 48 - PIPE-53

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



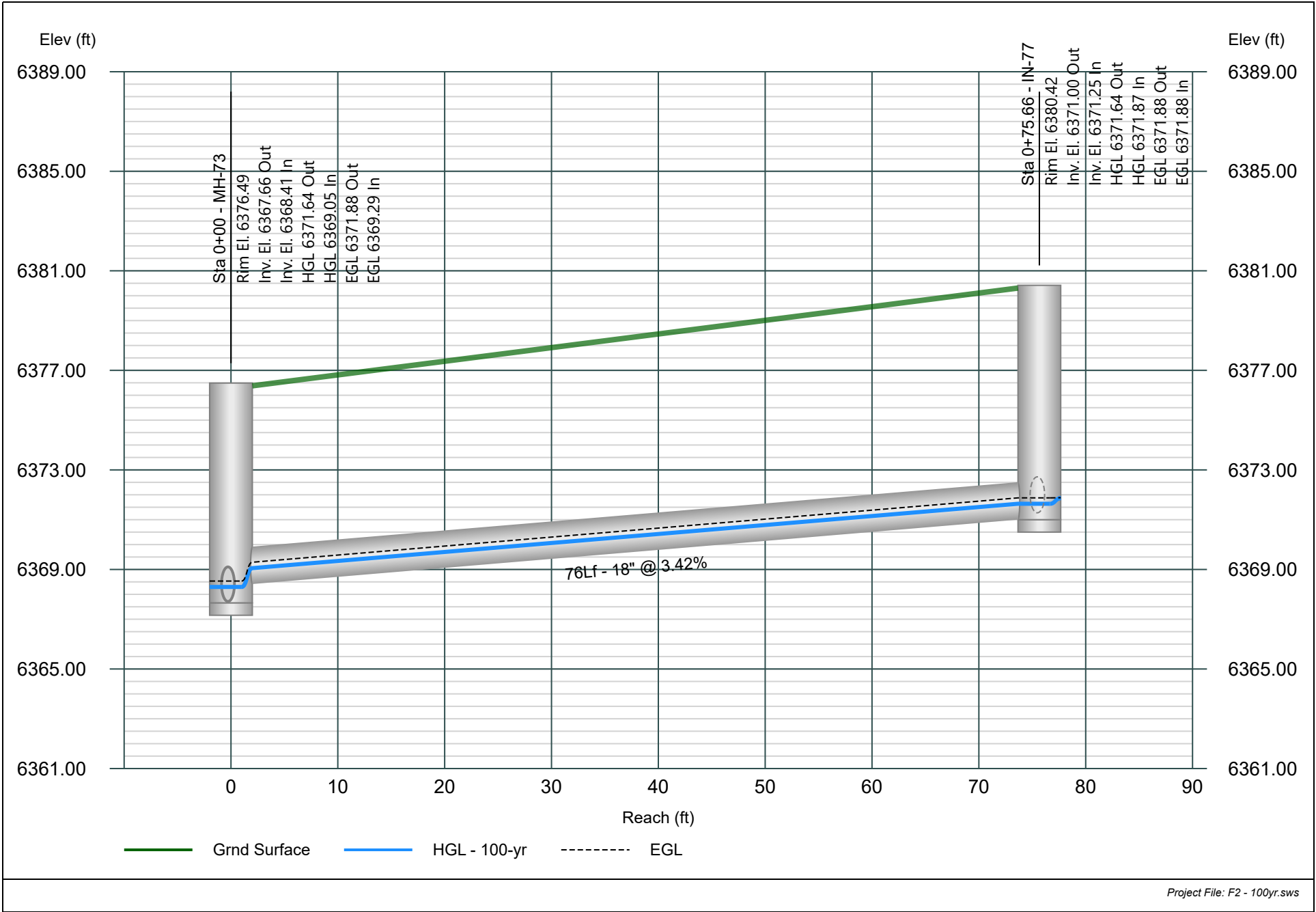
Line 49 - PIPE-52

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



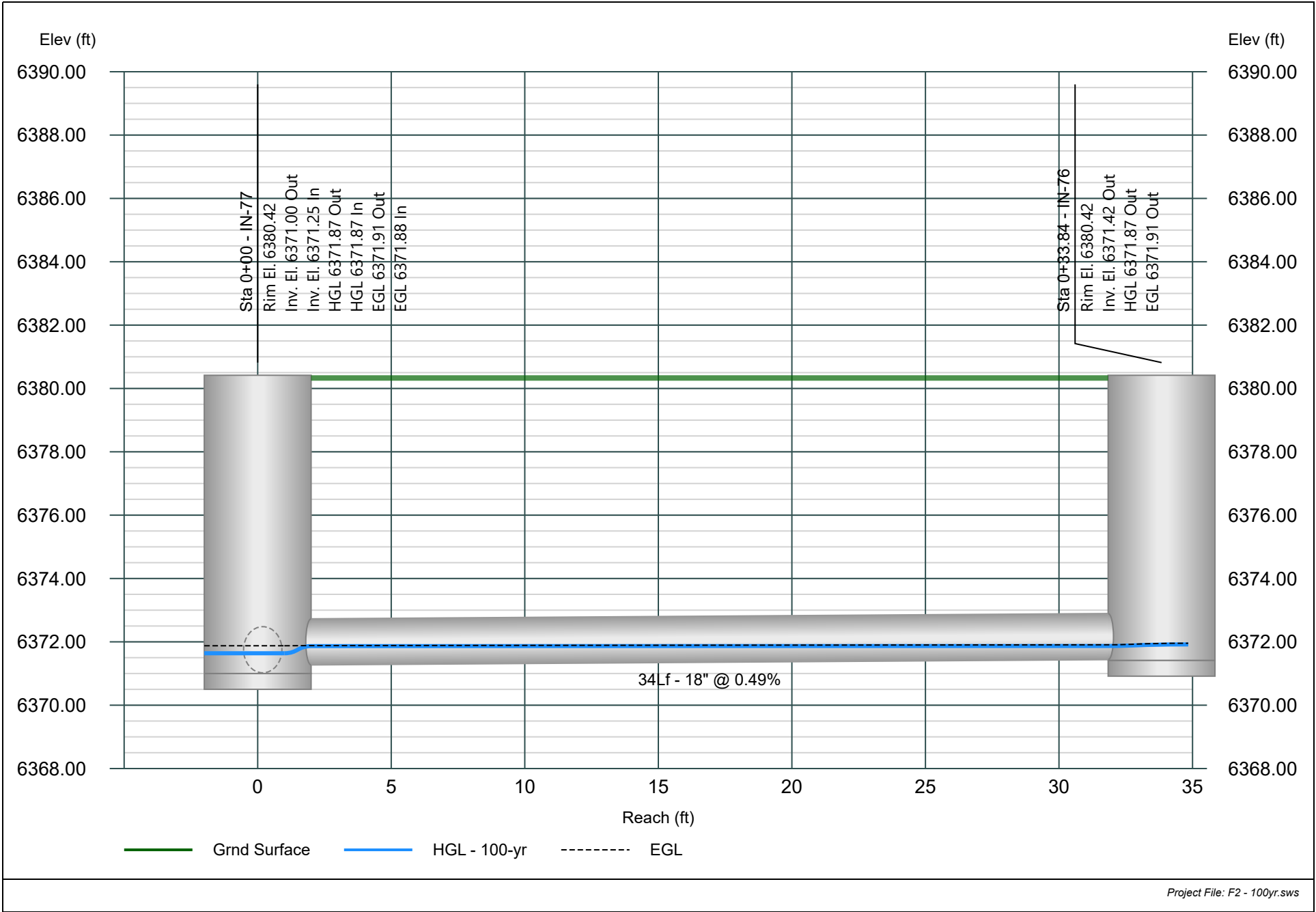
Line 50 - PIPE-51

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



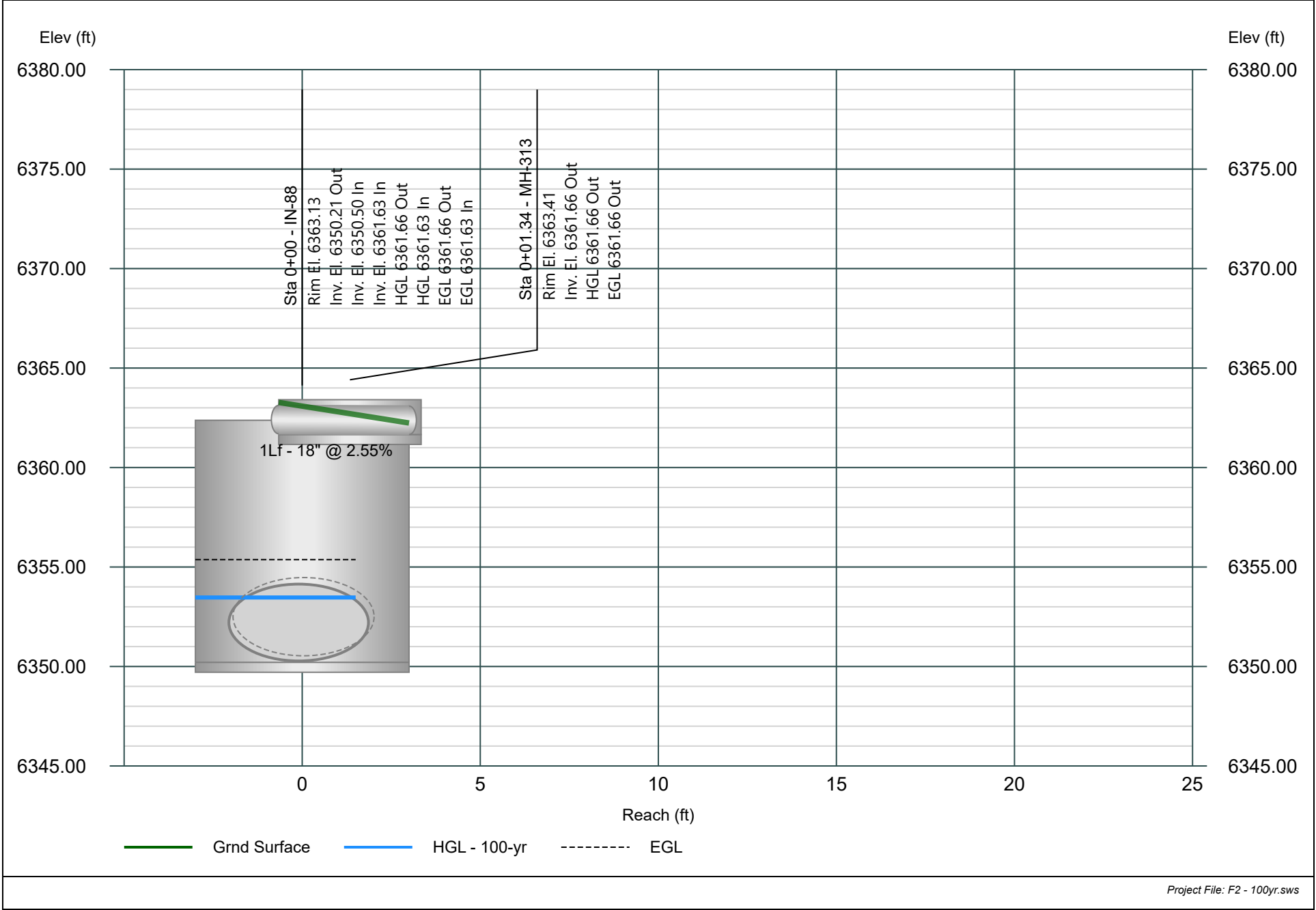
Line 51 - PIPE-249

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



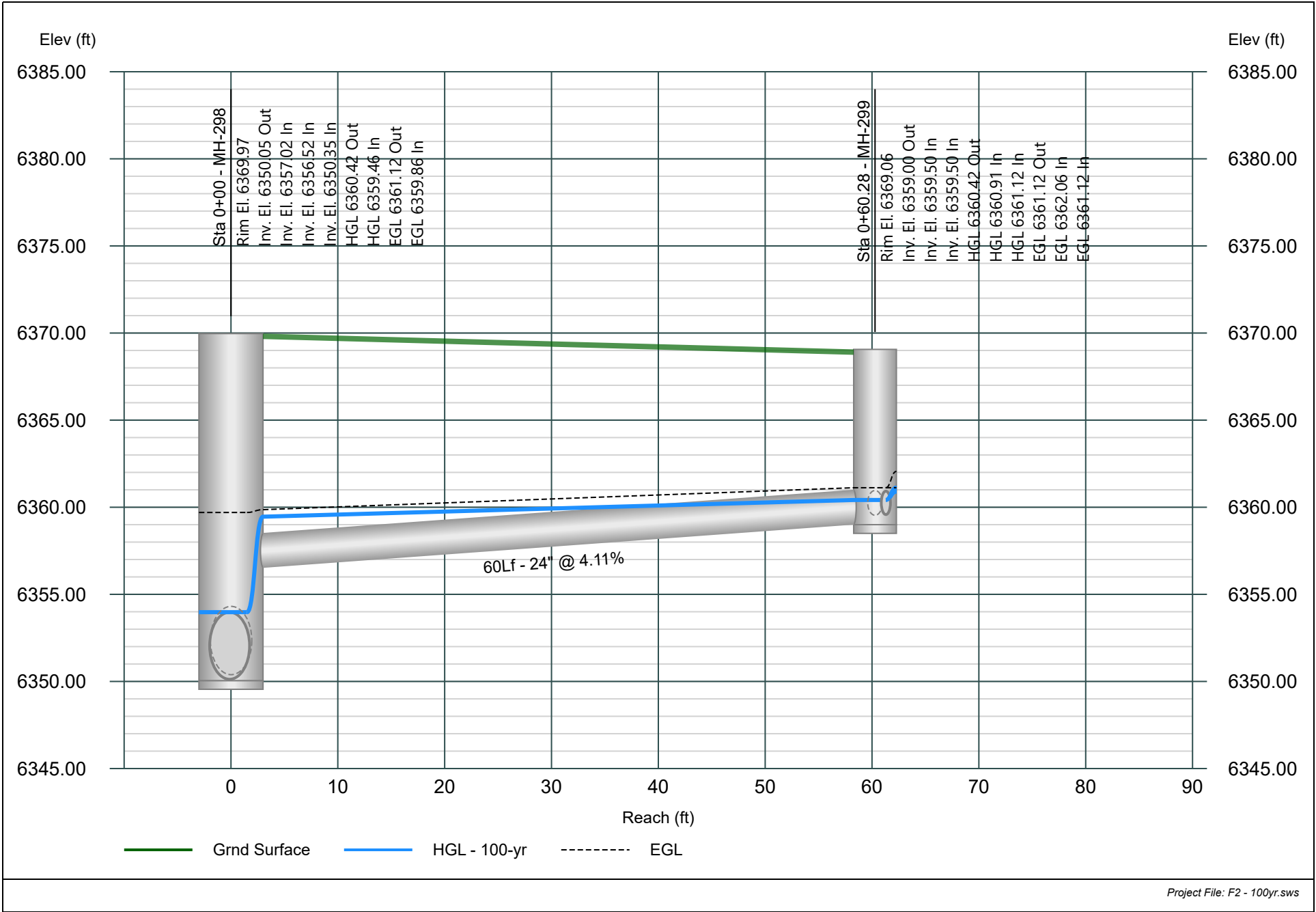
Line 52 - PIPE-56

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



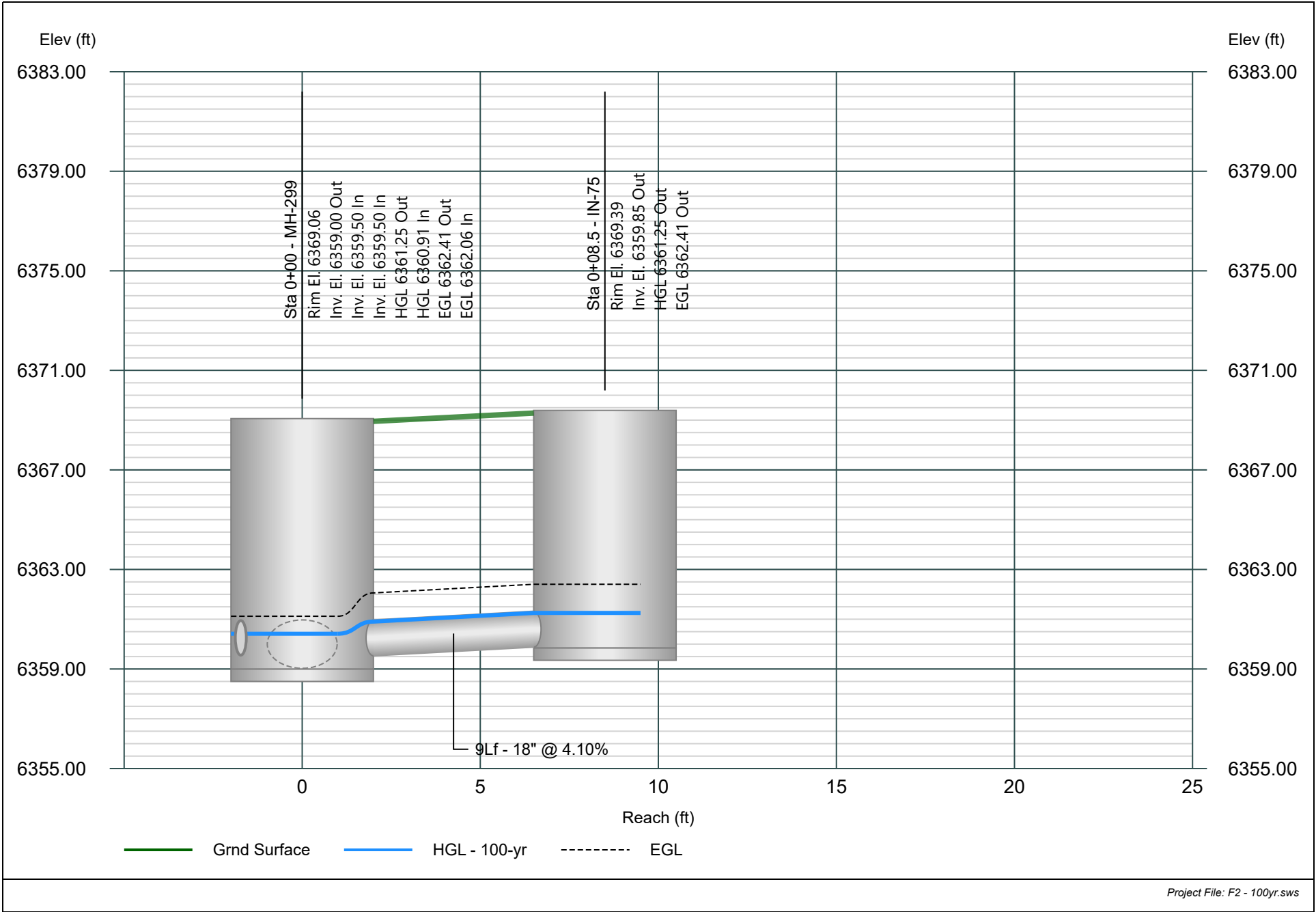
Line 53 - PIPE-59 (1)

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



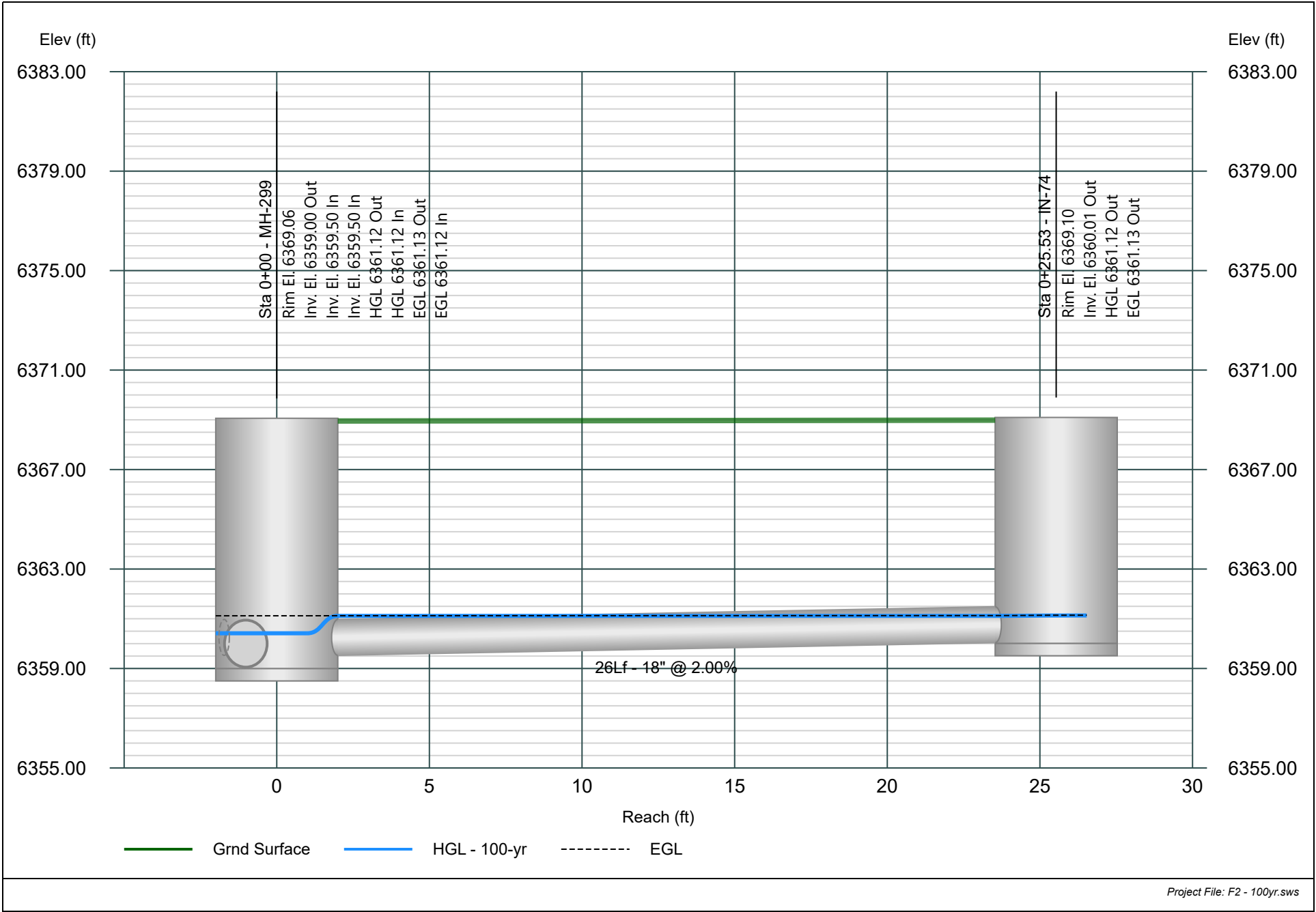
Line 54 - PIPE-59

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



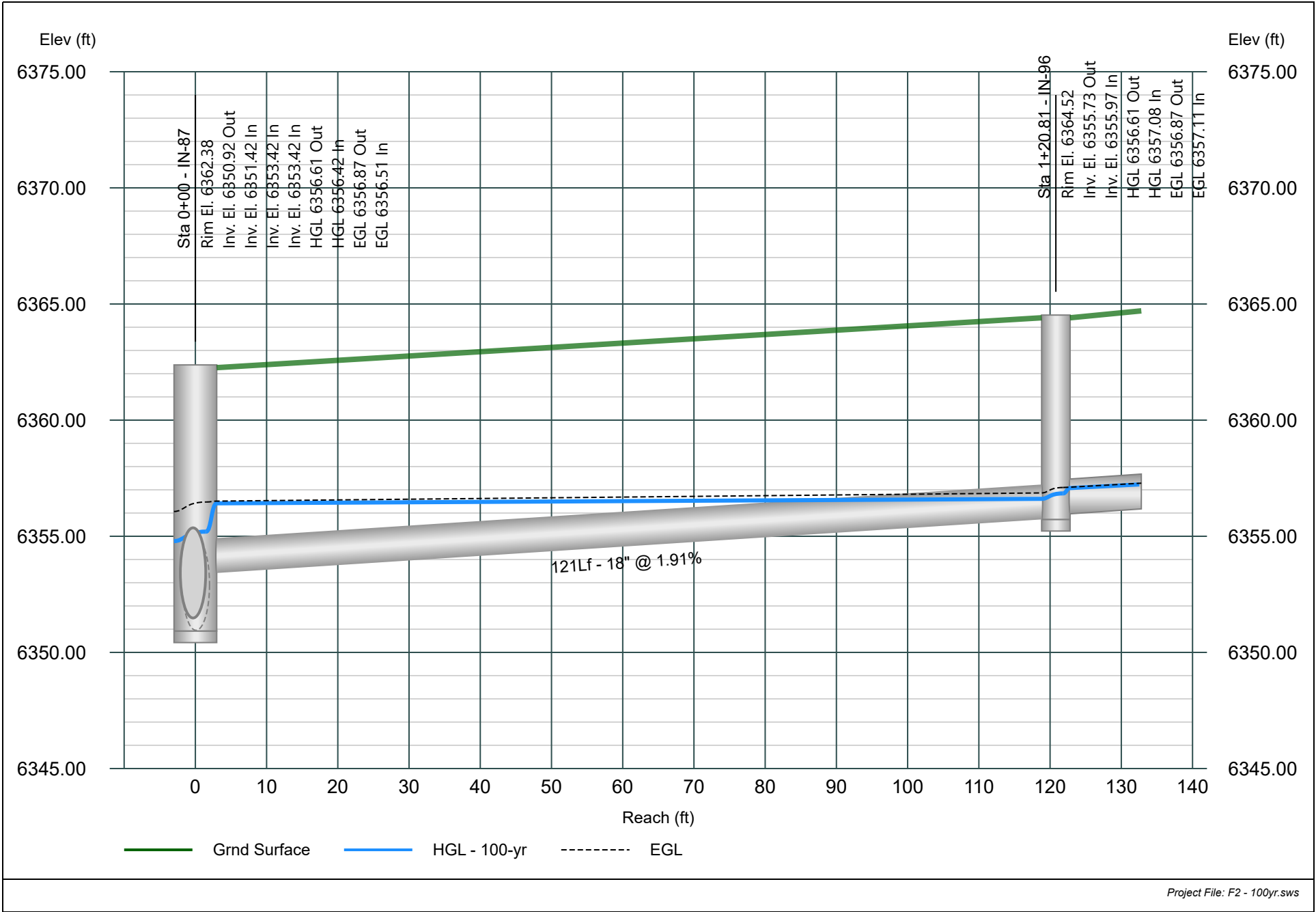
Line 55 - PIPE-227

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



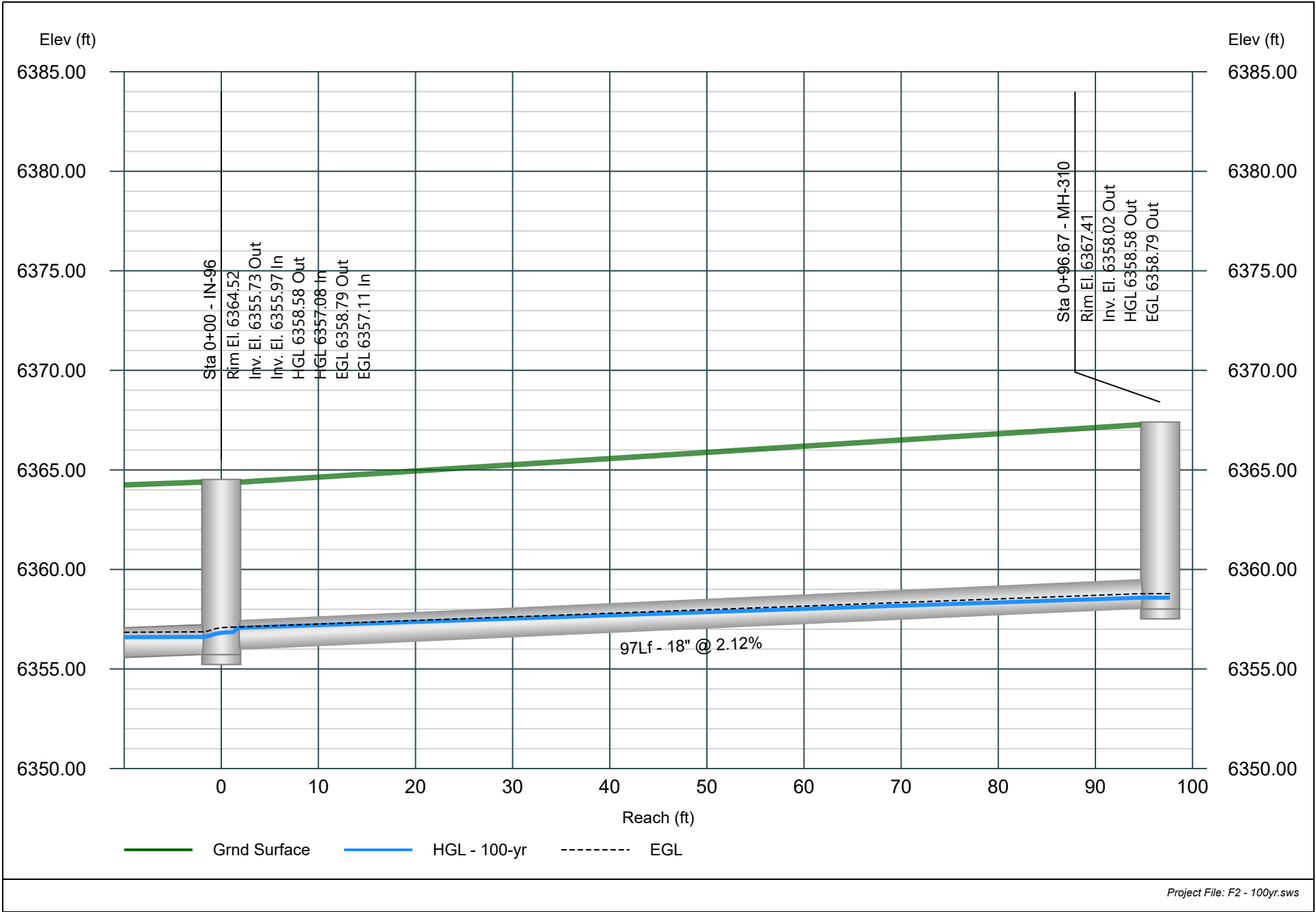
Line 56 - PIPE-247

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



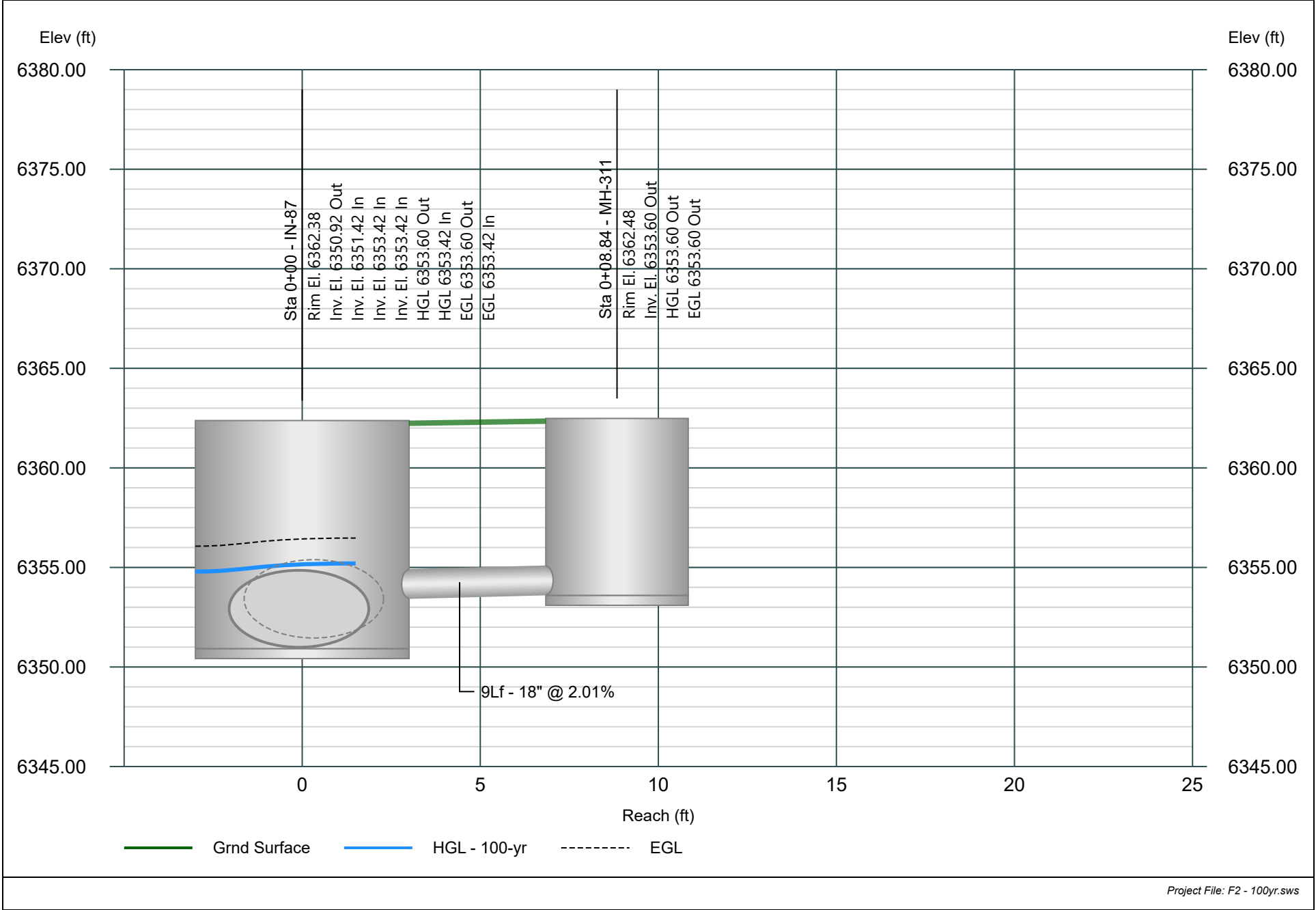
Line 57 - PIPE-248

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



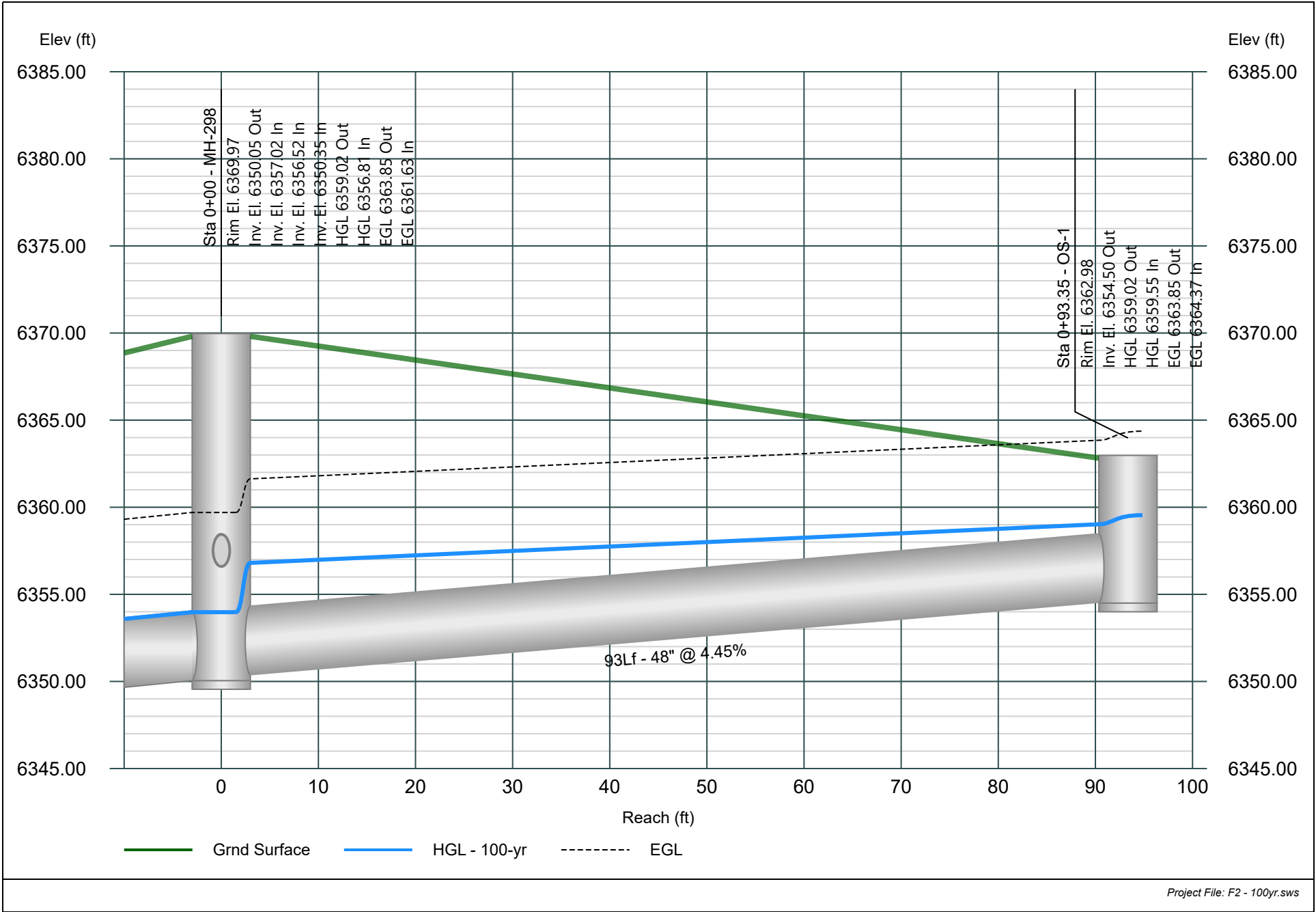
Line 58 - PIPE-81

Major Storm - 100yr Event

Project Name: STORM.

Stormwater Studio 2025 v 3.0.0.38

07-11-2025



Stormwater Studio Report

Storm Sewer Junction Losses: 3rd Edition of HEC-22

Canyons Far South Filing No. 2

Velocity Exhibit

Line No.	Area ID	InletID	Inlet ID DownStr	Pipe Size	Pipe Slope	100yr Velocity	5yr Velocity	Is 100yr greater than 2 fps?	Is 5yr greater than 2 fps?	Velocity at 25% depth from Studio Express	Is 25% depth greater than 2 fps?
				(in)	(%)	(ft/s)	(ft/s)				
1	-	MH-103	FES-51	30	3.97	9.14	2.92	YES	YES	-	N/A
2	Basin 7N	IN-117	MH-103	30	4.55	8.77	4.46	YES	YES	-	N/A
3	Basin 7M	IN-116	IN-117	30	3.97	8.56	4.15	YES	YES	-	N/A
4	Basin 7L	FES-101	IN-116	30	3.51	8.23	3.85	YES	YES	-	N/A
5	-	MH-106	FES-52	18	7.50	4.18	2.42	YES	YES	-	N/A
6	-	MH-113	MH-106	18	7.17	4.18	3.6	YES	YES	-	N/A
7	Basin 7P	IN-138	MH-113	18	4.33	4.18	3.6	YES	YES	-	N/A
8	Basin 7O	IN-122	IN-138	18	0.50	3.18	2.72	YES	YES	-	N/A
9	-	MH-111	FB-6	48	1.39	11.07	3.83	YES	YES	-	N/A
10	Basin 8S	IN-106	MH-111	48	6.65	11.07	7.12	YES	YES	-	N/A
11	Basin 8R	IN-105	IN-106	48	1.24	9.01	6.9	YES	YES	-	N/A
12	Basin 8Q	IN-104	IN-105	48	0.85	7.07	5.83	YES	YES	-	N/A
13	-	MH-110	IN-104	42	3.68	8.57	6.33	YES	YES	-	N/A
14	-	MH-109	MH-110	42	7.50	9.49	6.33	YES	YES	-	N/A
15	Basin 8P	IN-103	MH-109	42	7.50	9.49	6.33	YES	YES	-	N/A
16	Basin 8O	IN-102	IN-103	42	1.00	7.71	5.61	YES	YES	-	N/A
17	Basin 8N	IN-101	IN-102	42	0.72	5.1	4.42	YES	YES	-	N/A
18	-	MH-108	IN-101	24	1.21	10.24	5.67	YES	YES	-	N/A
19	-	MH-107	MH-108	24	7.50	10.05	5.35	YES	YES	-	N/A
20	Basin 8L	IN-125	MH-107	24	7.56	10.17	5.67	YES	YES	-	N/A
21	Basin 8K	IN-124	IN-125	24	1.98	8.11	5.09	YES	YES	-	N/A
22	-	IN-132	IN-124	18	0.50	2.94	3.89	YES	YES	-	N/A
23	Basin 8K2	IN-134	IN-132	18	0.60	2.94	3.9	YES	YES	-	N/A
24	Basin 8K3	IN-133	IN-134	18	1.00	1.57	3.2	NO	YES	4.16	YES
25	Basin 8J	IN-123	IN-124	18	2.89	4.97	3.37	YES	YES	-	N/A
26	-	IN-107	FES-53	18	3.90	5.61	2.31	YES	YES	-	N/A
27	Basin 8M	IN-112	IN-107	18	1.00	6.17	3.48	YES	YES	-	N/A
28	-	MH-102	FB-1A	24	7.34	8.77	4.46	YES	YES	-	N/A
29	-	MH-101	MH-102	24	5.28	8.77	5.61	YES	YES	-	N/A
30	Basin 7K	IN-115	MH-101	18	2.04	14.71	6.7	YES	YES	-	N/A
31	Basin 7J	IN-114	IN-115	18	0.53	9.22	4.03	YES	YES	-	N/A
32	-	MH-112	FB-1A	78	2.33	13.01	2.23	YES	YES	-	N/A
33	Basin 7C	IN-111	MH-112	78	4.16	13.01	6.62	YES	YES	-	N/A
34	Basin 7A2	HW-3	IN-111	78	4.32	11.13	4.33	YES	YES	-	N/A
35	-	IN-126	IN-102	18	0.50	5.09	4.38	YES	YES	-	N/A
36	Basin 802	IN-129	IN-126	18	0.50	5.09	4.38	YES	YES	-	N/A
37	Basin 803	IN-128	IN-129	18	1.55	3.28	4.09	YES	YES	-	N/A
38	-	MH-116	IN-128	18	1.08	3.17	3.55	YES	YES	-	N/A
39	Basin 8P3	IN-130	MH-116	18	0.50	3.04	2.42	YES	YES	-	N/A
40	Basin 8O4	IN-127	MH-116	18	4.59	3.65	3.19	YES	YES	-	N/A
41	Basin 8V	IN-110	FES-56	18	1.68	3.3	2.18	YES	YES	-	N/A
42	Basin 8P2	IN-131	IN-129	18	0.50	0.74	1.57	NO	NO	2.19	YES
43	Basin 8Y	IN-109	FES-55	24	1.09	11.5	3.39	YES	YES	-	N/A
44	Basin 8W	IN-108	IN-109	24	2.18	8.63	3.1	YES	YES	-	N/A
45	Basin 8T2	FES-105	IN-108	24	7.11	7.42	3.6	YES	YES	-	N/A
46	-	MH-114	FB-5	60	5.72	13.19	5.72	YES	YES	-	N/A
47	-	MH-105	MH-114	18	6.58	3.9	3.55	YES	YES	-	N/A
48	-	MH-104	MH-105	18	4.22	3.9	3.55	YES	YES	-	N/A
49	Basin 8U4	IN-121	MH-104	18	2.75	3.9	3.55	YES	YES	-	N/A
50	Basin 8U5	IN-120	IN-121	18	1.50	2.54	2.31	YES	YES	-	N/A
51	-	MH-115	MH-114	24	3.28	6.72	4.82	YES	YES	-	N/A
52	Basin 8U2	IN-119	MH-115	18	4.09	8.61	5.25	YES	YES	-	N/A
53	Basin 8U3	IN-118	MH-115	18	2.00	1.39	2.54	NO	YES	3.39	YES
54	Basin 8R2	IN-113	IN-105	18	1.91	3.37	4.09	YES	YES	-	N/A
55	Basin 8R3	IN-135	IN-113	18	2.12	2.57	2.86	YES	YES	-	N/A
56	-	OF-1	MH-114	60	4.14	11.99	6.78	YES	YES	-	N/A
57	Pond J	OS-1	OF-1	54	5.58	14.16	7.27	YES	YES	-	N/A
58	-	IN-136	IN-105	18	2.00	5.52	3.78	YES	YES	-	N/A

Channel Report

IN-133 to IN-134

Channel 1

CIRCULAR PIPE

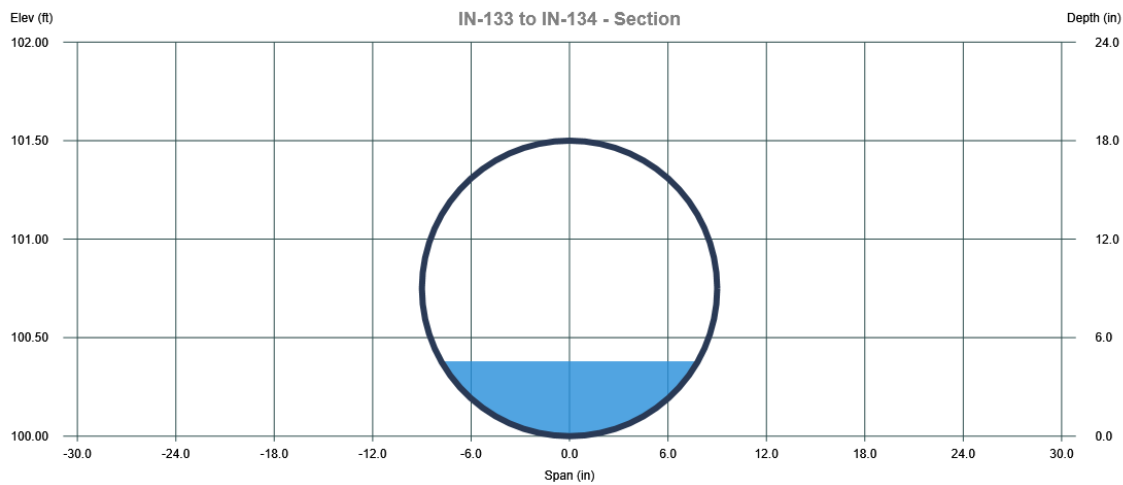
Diameter = 18.0 in
Invert Elevation = 100.00 ft
Pipe Slope = 1.000 %
Manning's n = 0.013

DISCHARGE

Method = Known Depth
known Depth = 0.38 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
1.44	4.5	0.35	4.16	1.57	0.013	5.4	100.4	100.64	0.23	1.30



Channel Report

IN-131 to IN-129

Channel 2

CIRCULAR PIPE

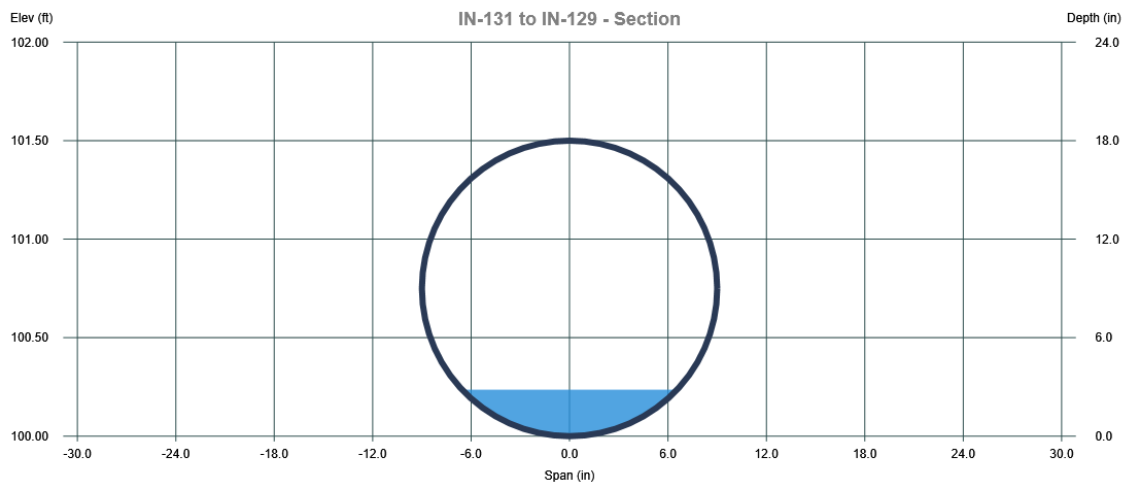
Diameter = 18.0 in
Invert Elevation = 100.00 ft
Pipe Slope = 0.500 %
Manning's n = 0.013

DISCHARGE

Method = Known Q
Known Q = 0.38 cfs

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
0.38	2.8	0.17	2.19	1.21	0.013	2.8	100.2	100.30	0.07	1.08



Channel Report

IN-118 to MH-115

Channel 3

CIRCULAR PIPE

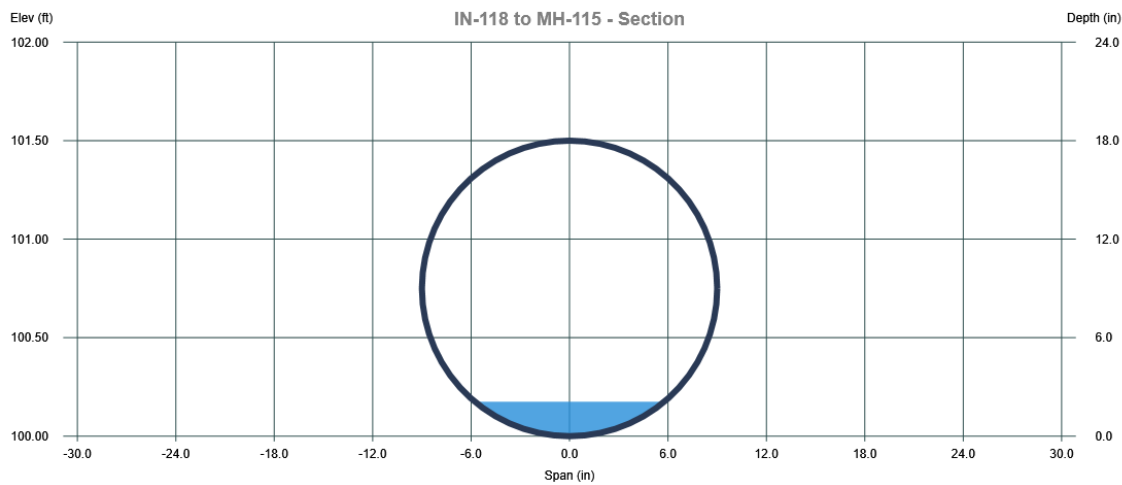
Diameter = 18.0 in
Invert Elevation = 100.00 ft
Pipe Slope = 2.000 %
Manning's n = 0.013

DISCHARGE

Method = Known Q
Known Q = 0.38 cfs

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
0.38	2.0	0.11	3.39	1.03	0.013	2.8	100.2	100.35	0.21	0.95



Culvert Report

Project filename: Filing 2 Culvert Calcs.cst

Culvert Studio v 2.0.0.32

09-19-2025

HW-3 to FB-1

Culvert 1

CULVERT

Shape = Circular
Inlet Edge = Projecting
Material = Concrete
Manning's n = 0.013
Rise = 78 in
Span = 78 in
Invert Elev. Down = 6366.25 ft
Length = 425 ft
Slope = 0.046 ft/ft
Invert Elev. Up = 6385.63 ft
No. Barrels = 1
Plan Skew Angle = 0 degrees

EMBANKMENT

Top Width = 45.00 ft
Top Elevation = 6405.40 ft
Crest Length = 206.10 ft

DISCHARGE

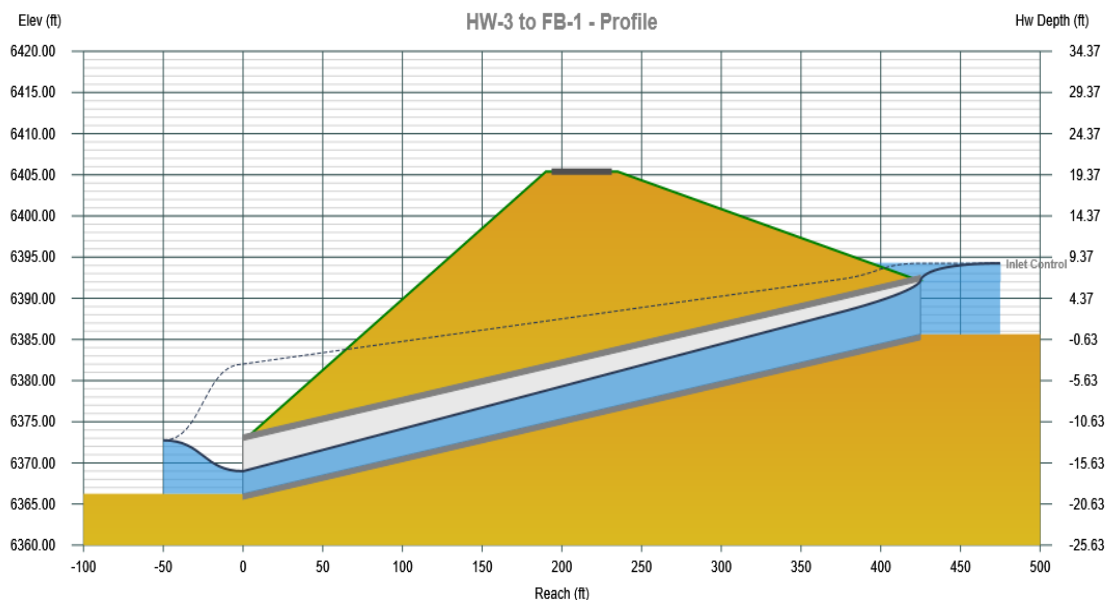
Method = Qmin to Qmax
Q Min = 385.68 cfs
Q Max = 385.68 cfs
Q Increment = 1.00 cfs

TAILWATER

Tailwater Elevation = Crown

CALCULATION SAMPLE

Discharge			Velocity		Depth		HGL @ Hw/D = 1.33		
Total	Culvert	Over Top	Down	Up	Down	Up	Down	Up	Hw
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)
385.68	385.68	0.00	28.94	13.39	32.9	63.2	6368.99	6390.90	6394.25

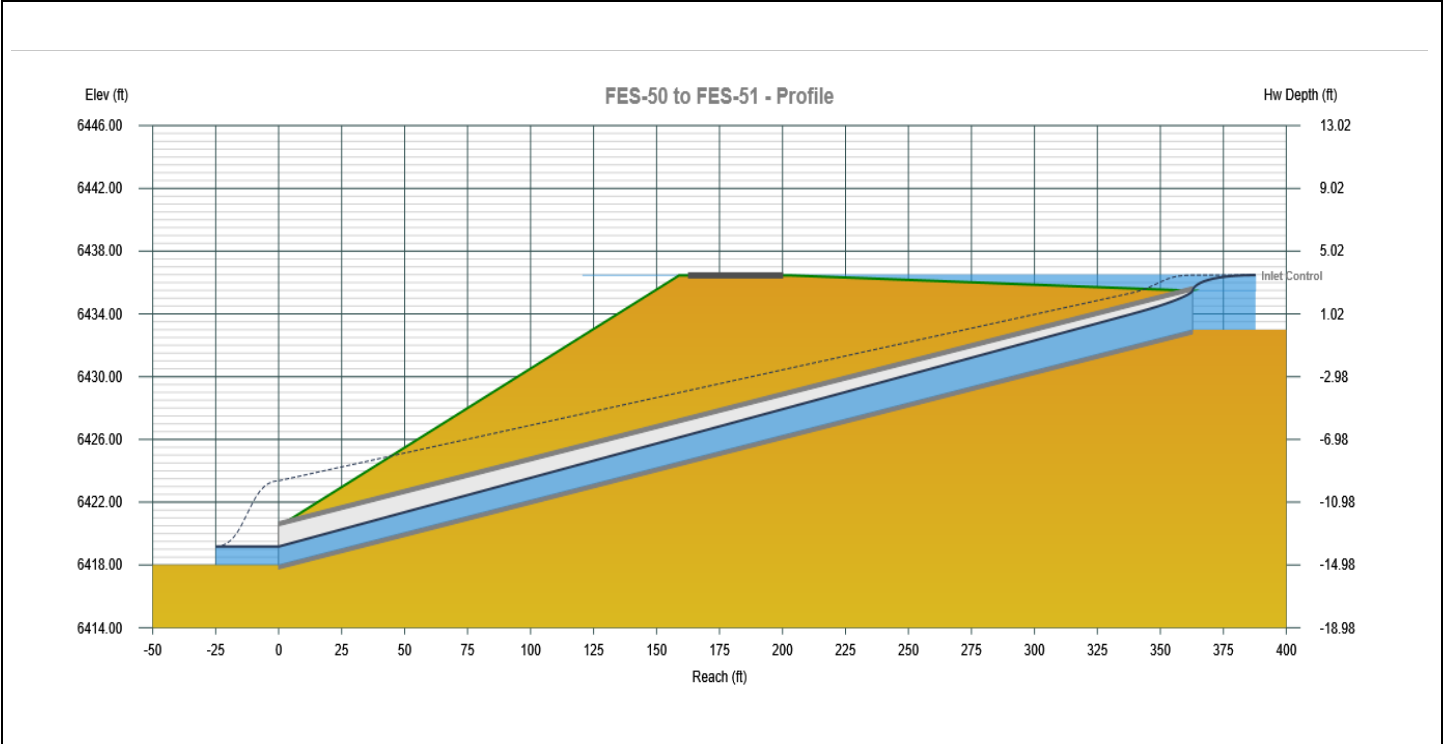


FES-50 to FES-51

Culvert 2

CULVERT		EMBANKMENT	
Shape	= Circular	Top Width	= 45.00 ft
Inlet Edge	= Projecting	Top Elevation	= 6436.45 ft
Material	= Concrete	Crest Length	= 100.00 ft
Manning's n	= 0.013		
Rise	= 30 in		
Span	= 30 in		
Invert Elev. Down	= 6418.00 ft		
Length	= 363 ft		
Slope	= 0.041 ft/ft		
Invert Elev. Up	= 6432.98 ft		
No. Barrels	= 1		
Plan Skew Angle	= 0 degrees		
		DISCHARGE	
		Method	= Qmin to Qmax
		Q Min	= 37.80 cfs
		Q Max	= 37.80 cfs
		Q Increment	= 1.00 cfs
		TAILWATER	
		Tailwater Elevation	= Normal Depth

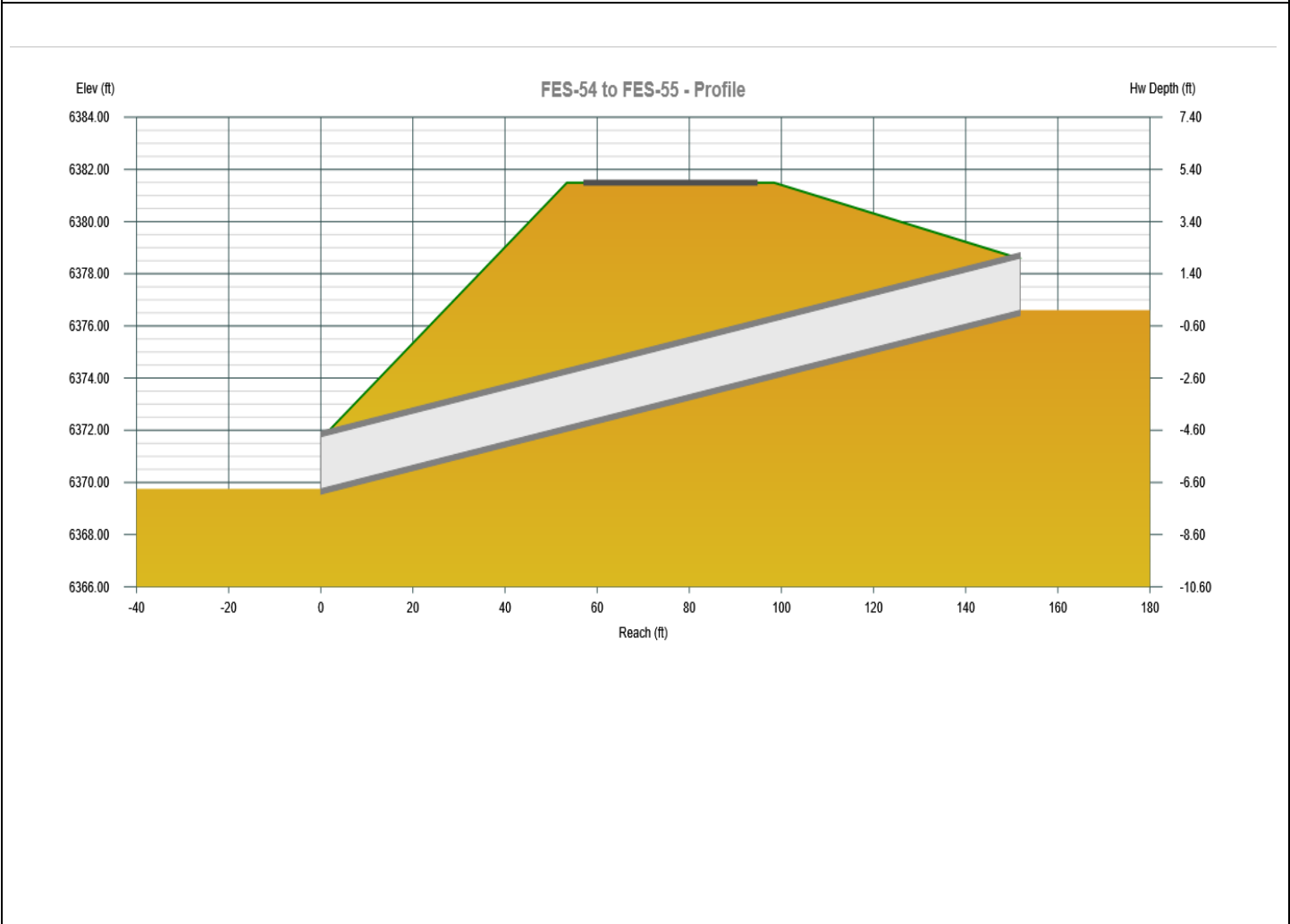
CALCULATION SAMPLE									
Discharge			Velocity		Depth		HGL @ Hw/D = 1.40		
Total	Culvert	Over Top	Down	Up	Down	Up	Down	Up	Hw
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)
37.80	37.20	0.60	16.43	8.56	14.1	24.8	6419.17	6435.05	6436.48



FES-54 to FES-55

Culvert 3

CULVERT		EMBANKMENT	
Shape	= Circular	Top Width	= 45.00 ft
Inlet Edge	= Projecting	Top Elevation	= 6381.49 ft
Material	= Concrete	Crest Length	= 103.00 ft
Manning's n	= 0.013	DISCHARGE	
Rise	= 24 in		
Span	= 24 in		Method = Qmin to Qmax
Invert Elev. Down	= 6369.75 ft		Q Min = 22.29 cfs
Length	= 152 ft	Q Max	= 22.29 cfs
Slope	= 0.045 ft/ft	Q Increment	= 1.00 cfs
Invert Elev. Up	= 6376.60 ft	TAILWATER	
No. Barrels	= 1		Tailwater Elevation = Normal Depth
Plan Skew Angle	= 0 degrees		



Typical Yard Swale

Channel 1

TRAPEZOIDAL

Bottom Width = 2.00 ft

Side Slope Left, z:1 = 4.00

Side Slope Right, z:1 = 4.00

Total Depth = 2.00 ft

Invert Elevation = 100.00 ft

Channel Slope = 2.000 %

Manning's n = 0.200

DISCHARGE

Method = Known Depth

known Depth = 2.00 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(ft)	(sqft)	(ft/s)	(ft)		(ft)	(ft)	(ft)	(lb/sqft)	(ft)
22.14	2.00	20.00	1.11	18.49	0.200	0.93	102.00	102.02	2.50	18.00

Elev (ft)

102.50

102.00

101.50

101.00

100.50

100.00

Typical Yard Swale - Section

Depth (ft)

2.50

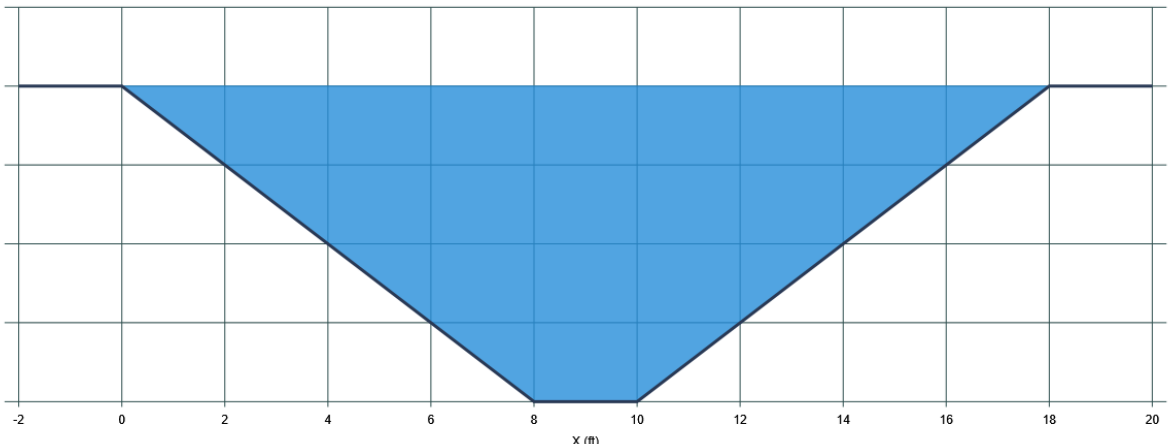
2.00

1.50

1.00

0.50

0.00



Channel Report

Project filename: Swale Calcs.stx

Studio Express by Hydrology Studio v 1.0.0.15

05-14-2024

Basin 8T

Channel 1

TRIANGULAR

Bottom Width = 0.00 ft

Side Slope Left, z:1 = 4.00

Side Slope Right, z:1 = 4.00

Total Depth = 2.00 ft

Invert Elevation = 10.00 ft

Channel Slope = 5.000 %

Manning's n = 0.030

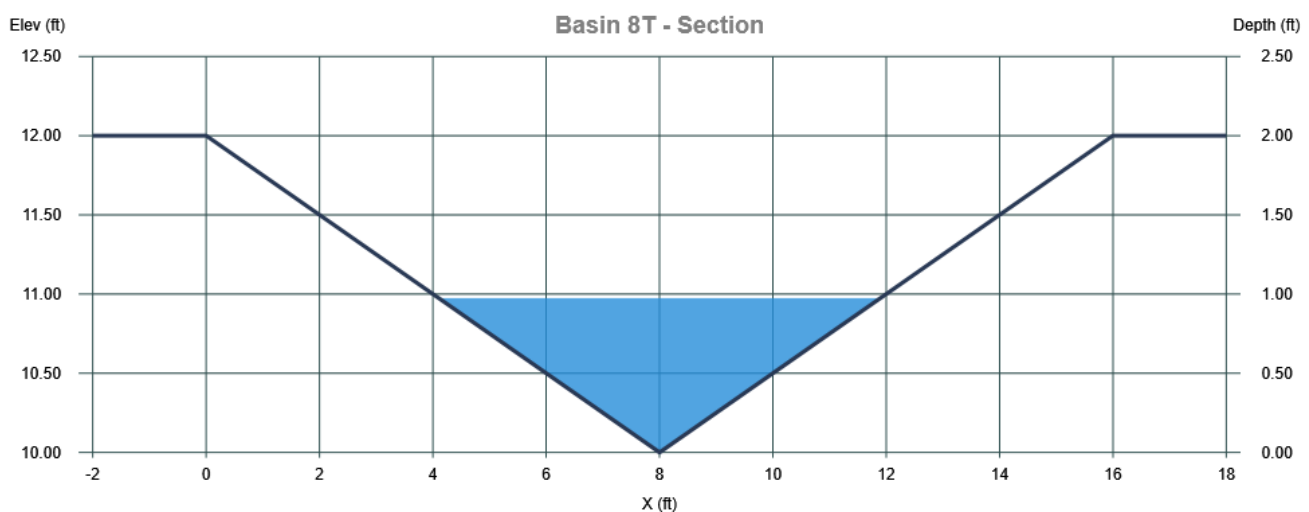
DISCHARGE

Method = Known Q

Known Q = 25.00 cfs

CALCULATION SAMPLE

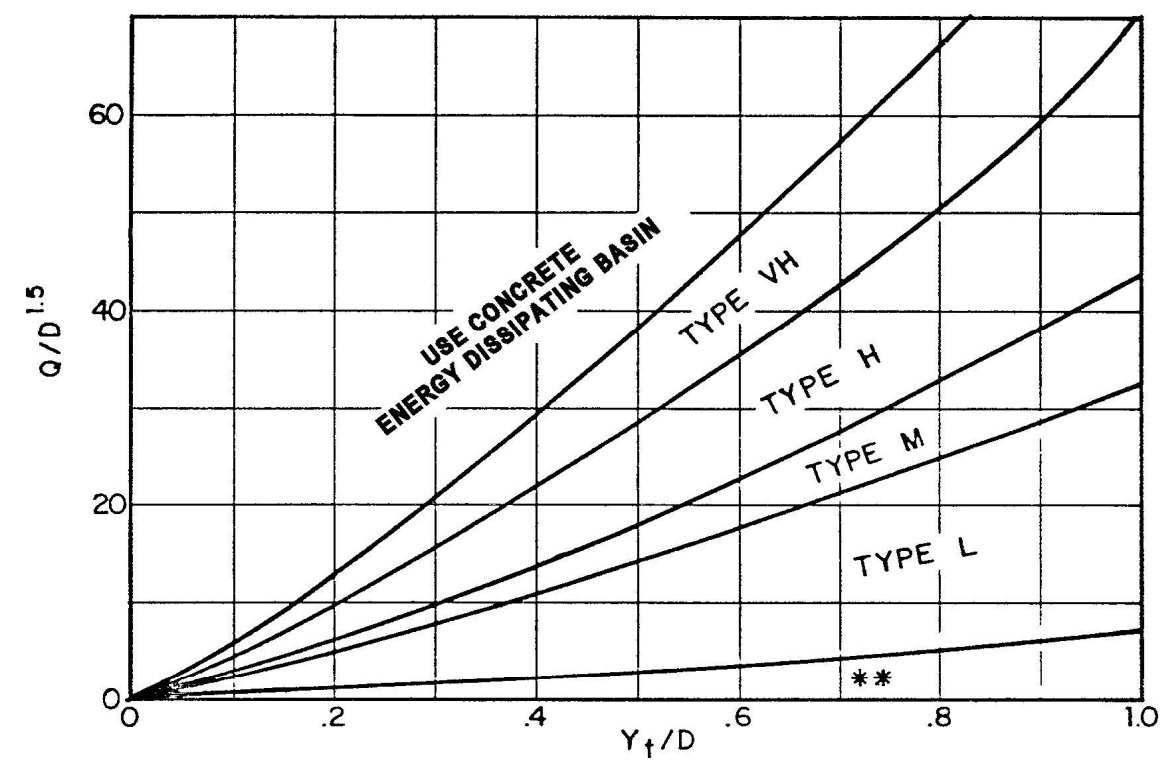
Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(ft)	(sqft)	(ft/s)	(ft)		(ft)	(ft)	(ft)	(lb/sqft)	(ft)
25.00	0.97	3.76	6.64	8.00	0.030	1.20	10.97	11.66	3.03	7.76



RIPRAP SIZING

Description/ Location	Pipe Diameter, D	Pipe Slope, S	Velocity, V	Discharge, Q ₁₀₀	Normal Depth of supercritical flow, Y _n	HGL	Invert	Tailwater Depth, Y _t	Froude Number, Fr	Da= (D+Y _n)/2	Use D=	Q/D ^{1.5}	Y _t /D	Riprap Type, From Figure MD-21	D ₅₀	Q/D ^{2.5}	Expansion Factor, 1/(2tanθ), From Figure MD-23	Allowable Non- eroding Velocity	Required area of flow at allowable velocity, At	Lp= (1/(2 tanθ))(A _t /Y _t -W)	Minimum Length, 3(D)	Maximum Length, 10(D)	Adjustment Factor if Q/D ^{2.5} < 6	Required Length (min.)	Required Width, 3(D) (min.)	Required Depth, 2(D ₅₀)
	(in)	(%)	(ft/sec)	(cfs)	(ft)			(ft)	-	(ft)	(ft)	-	-	-	(in)	-	-	(ft/sec)	(ft ²)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
FES-52	18	7.5	4.2	3.4	1.5	6383.0	6382.3	0.7	0.88	1.5	1.5	1.85	0.5	M	12	1.23	6.5	7	0.49	-5.2	4.5	15.0	N/A	4.5	4.5	2.0
FES-53	18	3.9	5.6	8.9	1.5	6396.5	6395.0	1.5	0.81	1.5	1.5	4.84	1.0	M	12	3.23	6.5	7	1.27	-4.2	4.5	15.0	N/A	4.5	4.5	2.0
FES-56	18	1.7	3.3	3.9	1.5	6378.2	6376.7	1.5	0.47	1.5	1.5	2.12	1.0	M	12	1.42	6.5	7	0.56	-7.3	4.5	15.0	N/A	4.5	4.5	2.0

Notes:
If flow is supercritical (if Fr is greater then 1.0) use Da=(D+Y_n)/2, otherwise use D
Allowable Non-eroding velocity =5.5 ft/sec for very erosive soils, 7.7 for erosion resistant soils



Use D_a instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

Figure MD-21—Riprap Erosion Protection at Circular Conduit Outlet Valid for $Q/D^{2.5} \leq 6.0$

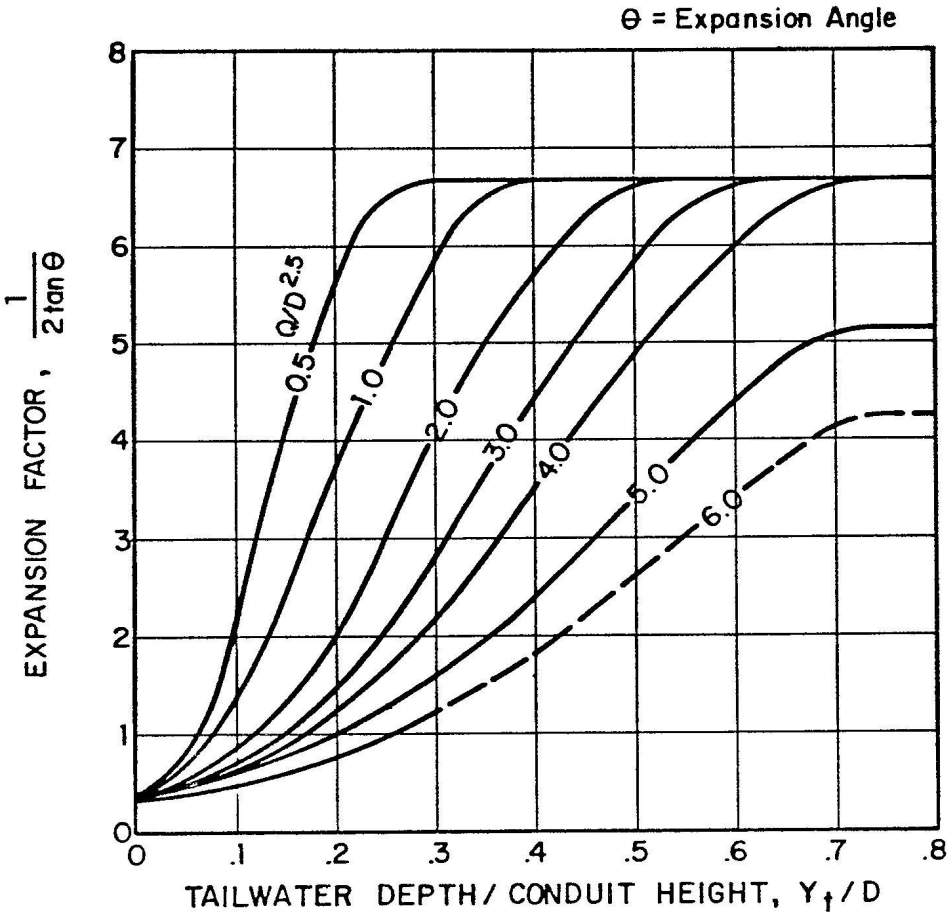


Figure MD-23—Expansion Factor for Circular Conduits

RIPRAP APRON AND LOW TAILWATER BASIN SIZING FOR CIRCULAR CONDUITS

			GEOMETRY								RIPRAP SIZING						DIMENSIONS					
Design Point	Basins	Structure Name	Discharge, Q ₁₀₀	Pipe Diameter, D _c **		Supercritical ?	Y _t , Known Tailwater	Y _n , Normal Depth	Min. Tailwater (0.4D _c)	Use Y _t	Da	Use D	Y _t /D	Q/D ^{1.5}	Min d ₅₀ = 0.23Q/(Y _t ^{1.2} D ^{0.3})	Min. Nominal d ₅₀	Length (L)	Width (W)	Riprap Type Used*	(T) Required Thickness, 2(D ₅₀)	Basin Depth (D)	Total Width (W + 2*(3(D))))
			(cfs)	(in)	(ft)	-		(ft)	(ft)		(ft)	(ft)	-		(in)	(in)	(ft)	(ft)		(ft)	(ft)	(ft)
1	2	3	4	5	6	7	12	13	14	15	8	9	10	11	12	13	14	15	16	17	18	19
		FES-51	41.2	30	2.5	Yes	2.16	2.50	1.00	2.16	2.5	2.5	0.9	10.4	3.4	6	20	6	M	2.0	1.5	15.0
		FES-55	36.1	24	2.0	Yes	2.00	2.00	0.80	2.00	2.0	2.0	1.0	12.8	3.5	6	15	4	M	2.0	1.0	10.0

Notes:

* Where minimum required $D_{50} < 12$ inches, use Type-M

** Equivalent circular diameter for HERCP

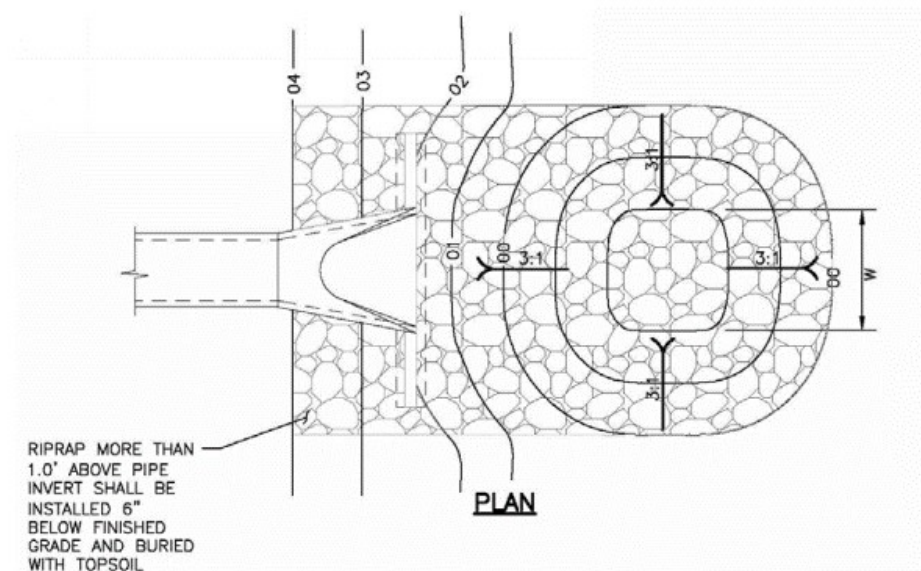
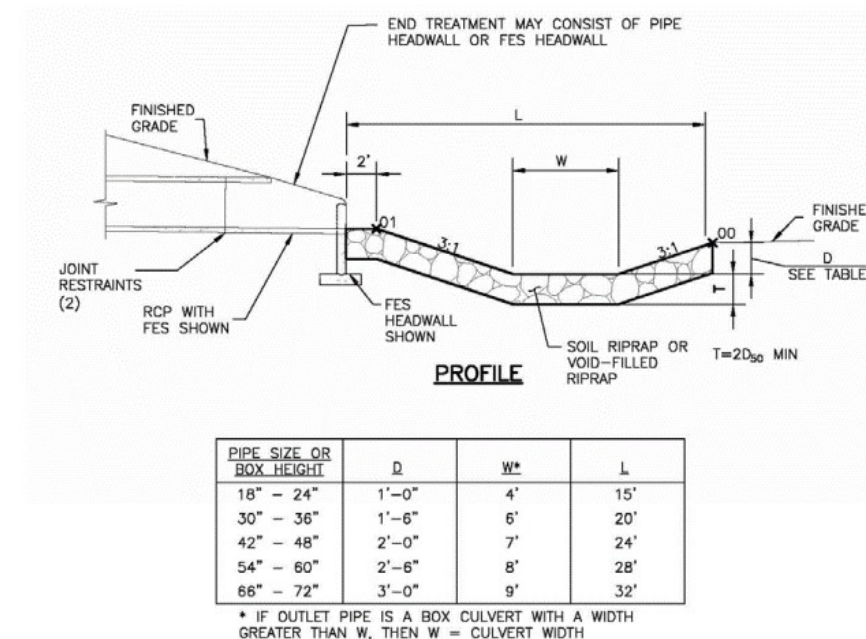
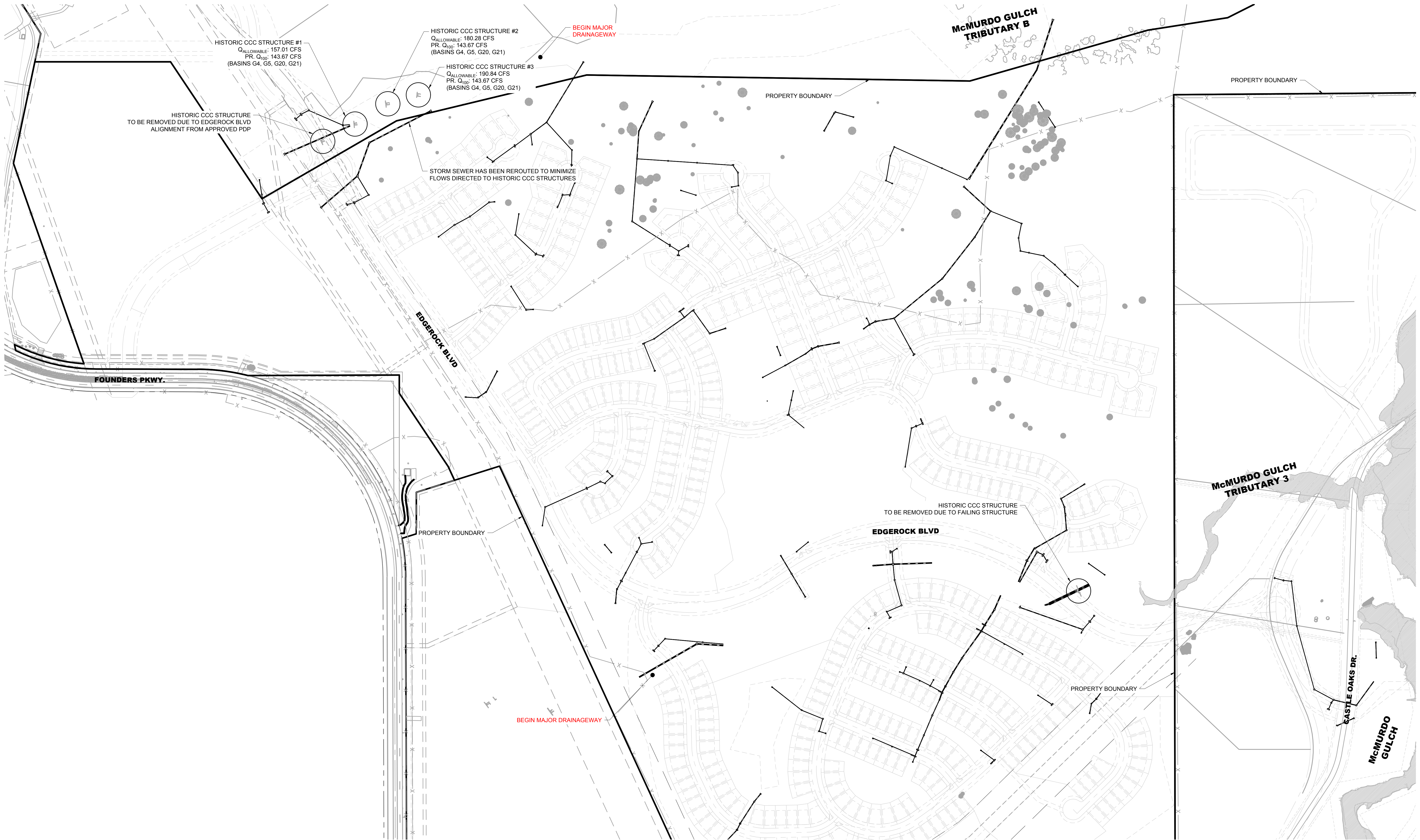


Figure 9-37. Low tailwater riprap basin



Weir Report

Project filename: Historic CCC Structures.stx

Studio Express by Hydrology Studio v 1.0.0.18

08-12-2025

CCC #1

Weir 1

RECTANGULAR - Broad

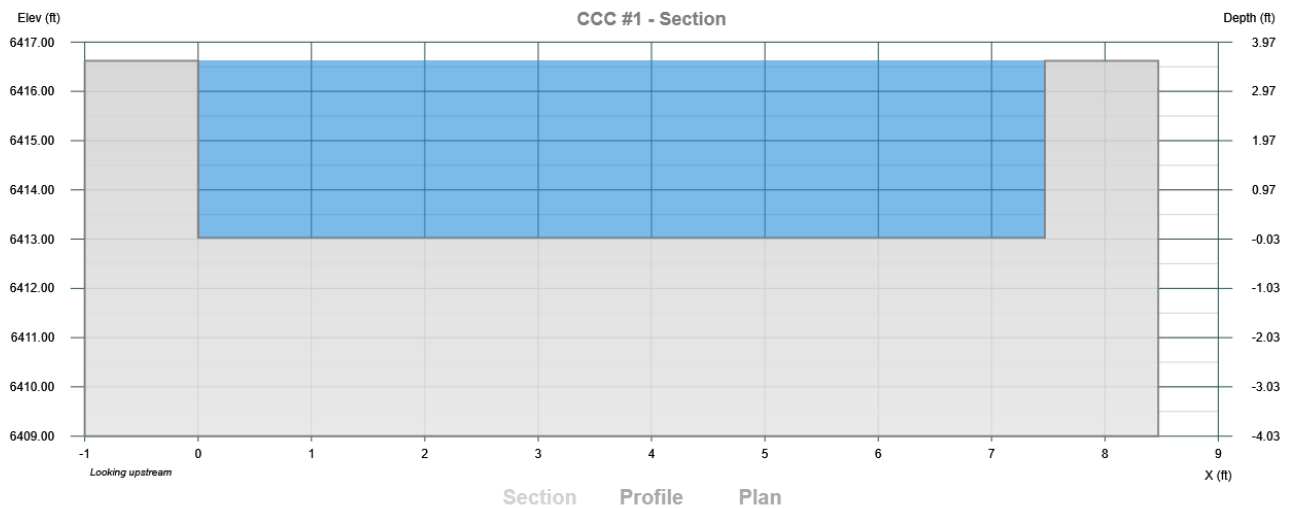
Crest Length = 7.47 ft
Total Depth = 3.59 ft
Crest Elevation = 6413.03 ft
Weir Coefficient, C_w = 3.09

DISCHARGE

Method = Known Depth
known Depth = 3.59 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	Top Width	HGL	EGL	Crit Depth		
(cfs)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)		
157.01	3.59	26.82	5.85	7.47	6416.62	6417.15	2.39		



Weir Report

Project filename: Historic CCC Structures.stx

Studio Express by Hydrology Studio v 1.0.0.18

08-12-2025

CCC #2

Weir 2

RECTANGULAR - Broad

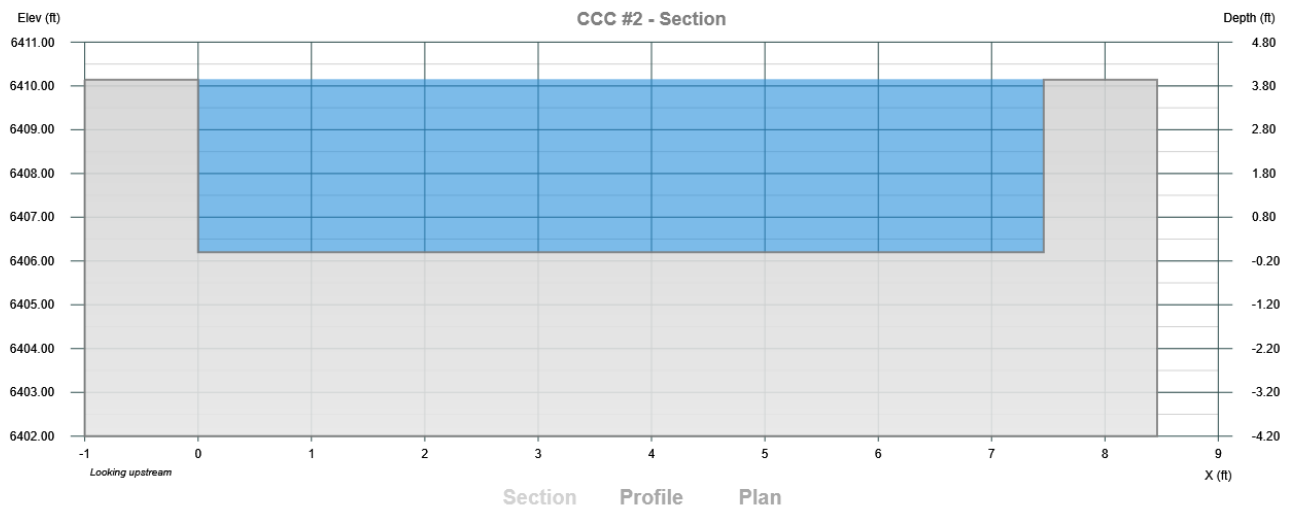
Crest Length = 7.46 ft
Total Depth = 3.94 ft
Crest Elevation = 6406.20 ft
Weir Coefficient, C_w = 3.09

DISCHARGE

Method = Known Depth
known Depth = 3.94 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	Top Width	HGL	EGL	Crit Depth		
(cfs)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)		
180.28	3.94	29.39	6.13	7.46	6410.14	6410.73	2.63		



Weir Report

Project filename: Historic CCC Structures.stx

Studio Express by Hydrology Studio v 1.0.0.18

08-12-2025

CCC #3

Weir 3

RECTANGULAR - Broad

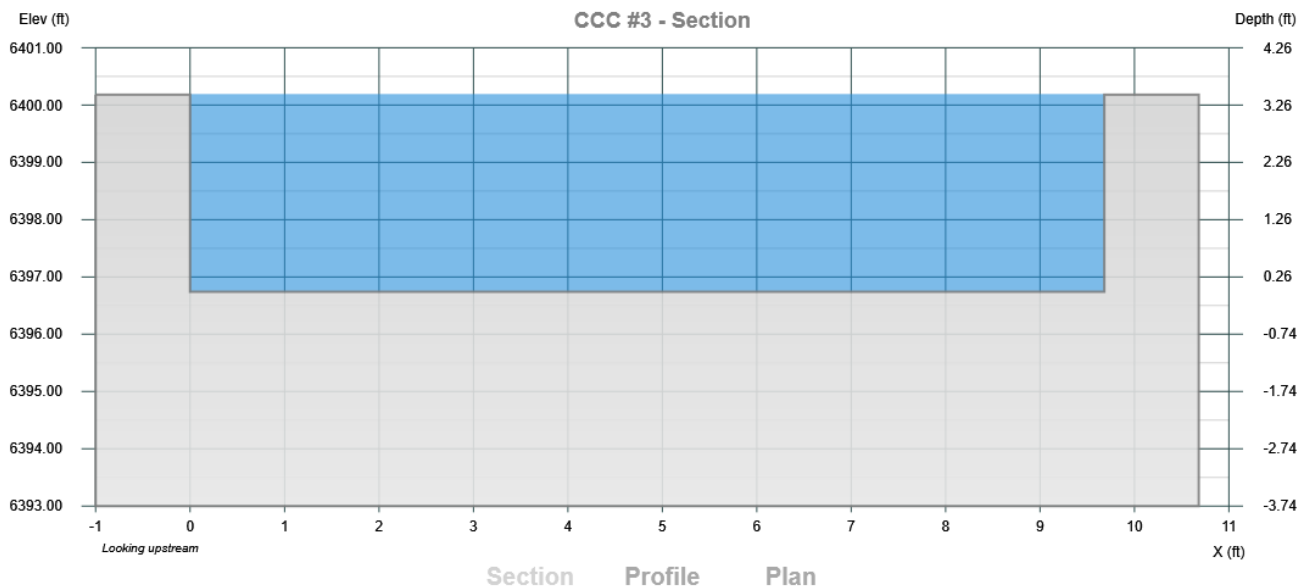
Crest Length = 9.68 ft
Total Depth = 3.44 ft
Crest Elevation = 6396.74 ft
Weir Coefficient, C_w = 3.09

DISCHARGE

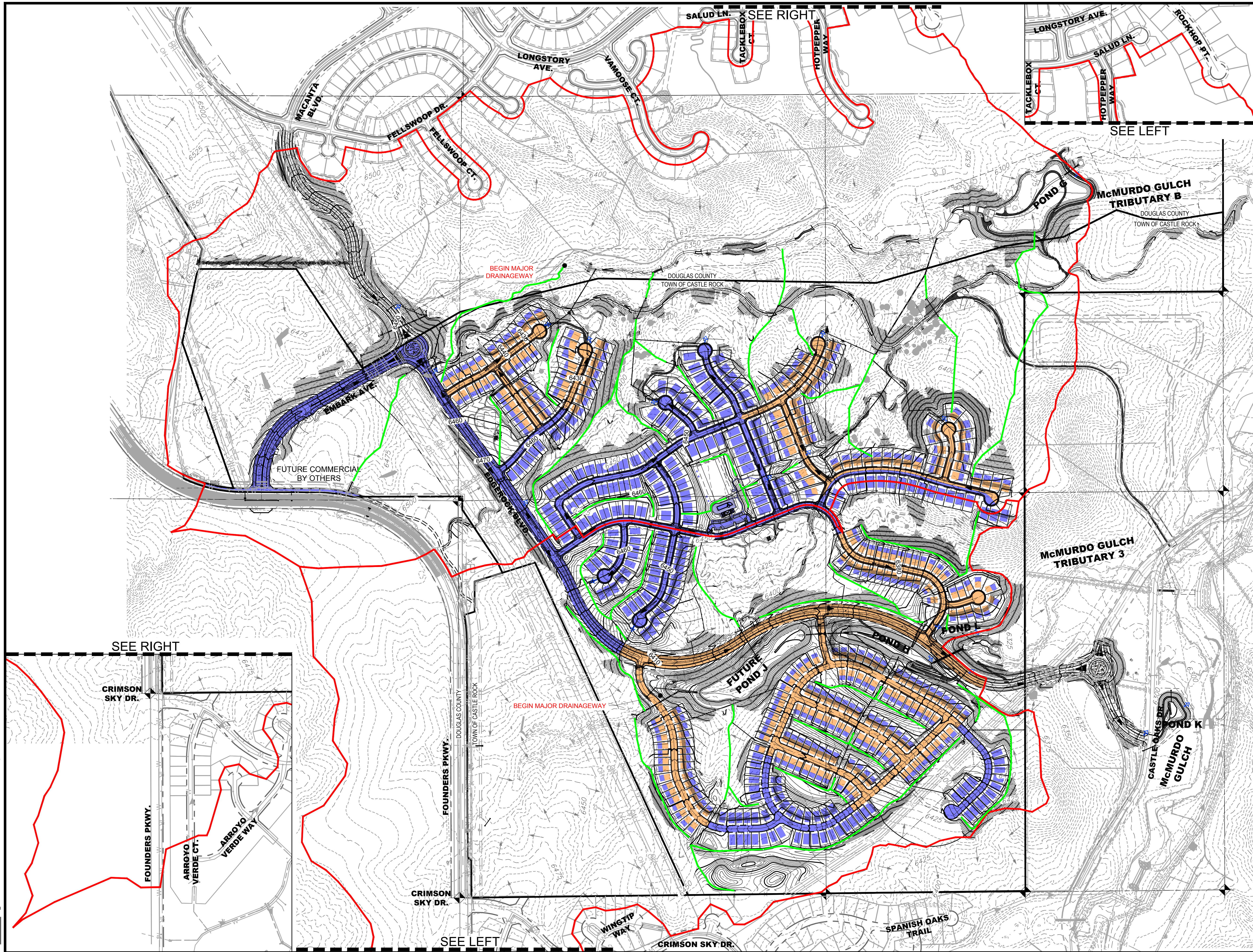
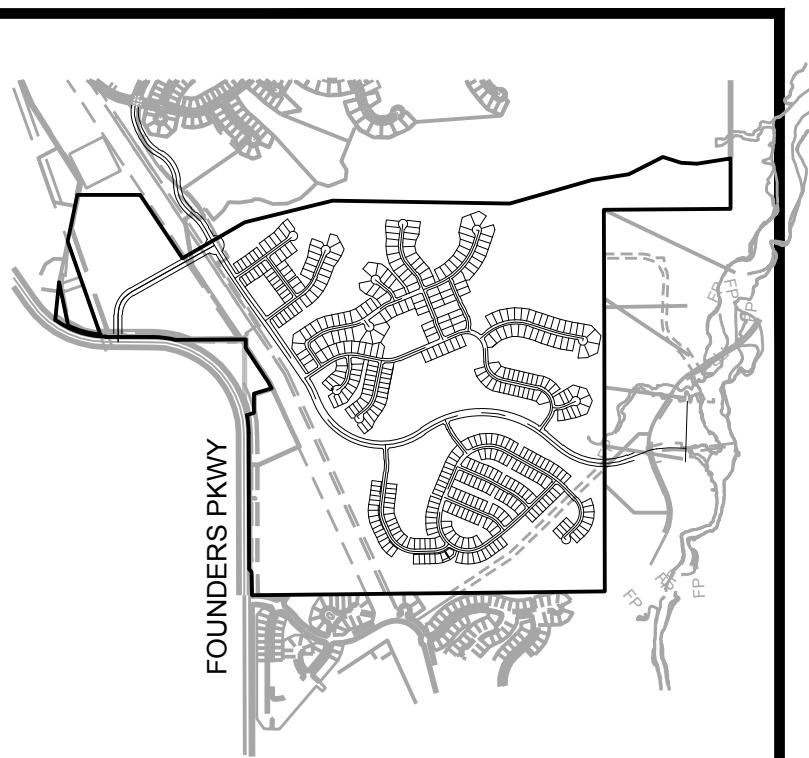
Method = Known Depth
known Depth = 3.44 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	Top Width	HGL	EGL	Crit Depth		
(cfs)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)		
190.84	3.44	33.30	5.73	9.68	6400.18	6400.69	2.29		



PLOT DATE: 7/30/25 AT 12:22 PM
FILE PATH: E:\PROJECTS\230200 - CANYONS FAR SOUTH - CASTLE ROCK, CO\3 - DRAWINGS\EXHIBITS\1 DISCONNECTED IMPERVIOUS AREA



KEYMAP
LEGEND

- DISCONNECTED LENGTH/
RECEIVING PERVIOUS AREA (RPA) —
- IMPERVIOUS AREA TO RPA —
- IMPERVIOUS AREA NOT TO RPA —
- WATERSHED —

811
UNCC
CALL BEFORE
YOU DIG
811
OR
1-800-922-1987
Utility Notification
Center of Colorado



0 300' 600'
1" = 300' (HORIZONTAL)

COVER
ENGINEERING
CANYONS FAR SOUTH
FILING NO. 1
DISCONNECTED IMPERVIOUS AREA
EXHIBIT

Project: Canyons Far South
 Location: Castle Rock, CO
 Designer: CJG
 Date: February 2025
 Latest Revision: July 2025



DISCONNECTED IMPERVIOUS AREA EXHIBIT																	
North Total Watershed Area (Red)		North Impervious Total Area (Orange & Blue)		20% of Impervious Area		10% for Disconnected Area Required		Disconnected Length (Green)		Wetted Perimeter Average Width		Disconnected Area Provided		Impervious Area to RPA Provided (Blue)		Impervious Area to RPA Percentage Provided (20% Required)	
16,732,141.63	(sf)	1,555,921.08	(sf)	311,184.22	(sf)	31,118.42	(sf)	13,428.14	(ft)	3.00	(ft)	40,284.43	(sf)	1,123,404.48	(sf)	72%	
384.12	(ac)	35.72	(ac)	7.14	(ac)	0.71	(ac)	-		-		0.92	(ac)	25.79	(ac)	72%	
South Total Watershed Area (Red)		South Impervious Total Area (Orange & Blue)		20% of Impervious Area		10% for Disconnected Area Required		Disconnected Length (Green)		Wetted Perimeter Average Width		Disconnected Area Provided		Impervious Area to RPA Provided (Blue)		Impervious Area to RPA Percentage Provided (20% Required)	
12,354,590.99	(sf)	1,613,693.25	(sf)	322,738.65	(sf)	32,273.87	(sf)	14,266.13	(ft)	3.00	(ft)	42,798.40	(sf)	805,975.81	(sf)	50%	
283.62	(ac)	37.05	(ac)	7.41	(ac)	0.74	(ac)	-		-		0.98	(ac)	18.50	(ac)	50%	



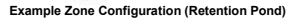
APPENDIX C

WATER QUALITY ENHANCEMENT

CONTROL MEASURES

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: Pond H (Micropool WSEL= 6335.25)



Steep Slope > 0.06 ft/f

Optional User Overrides

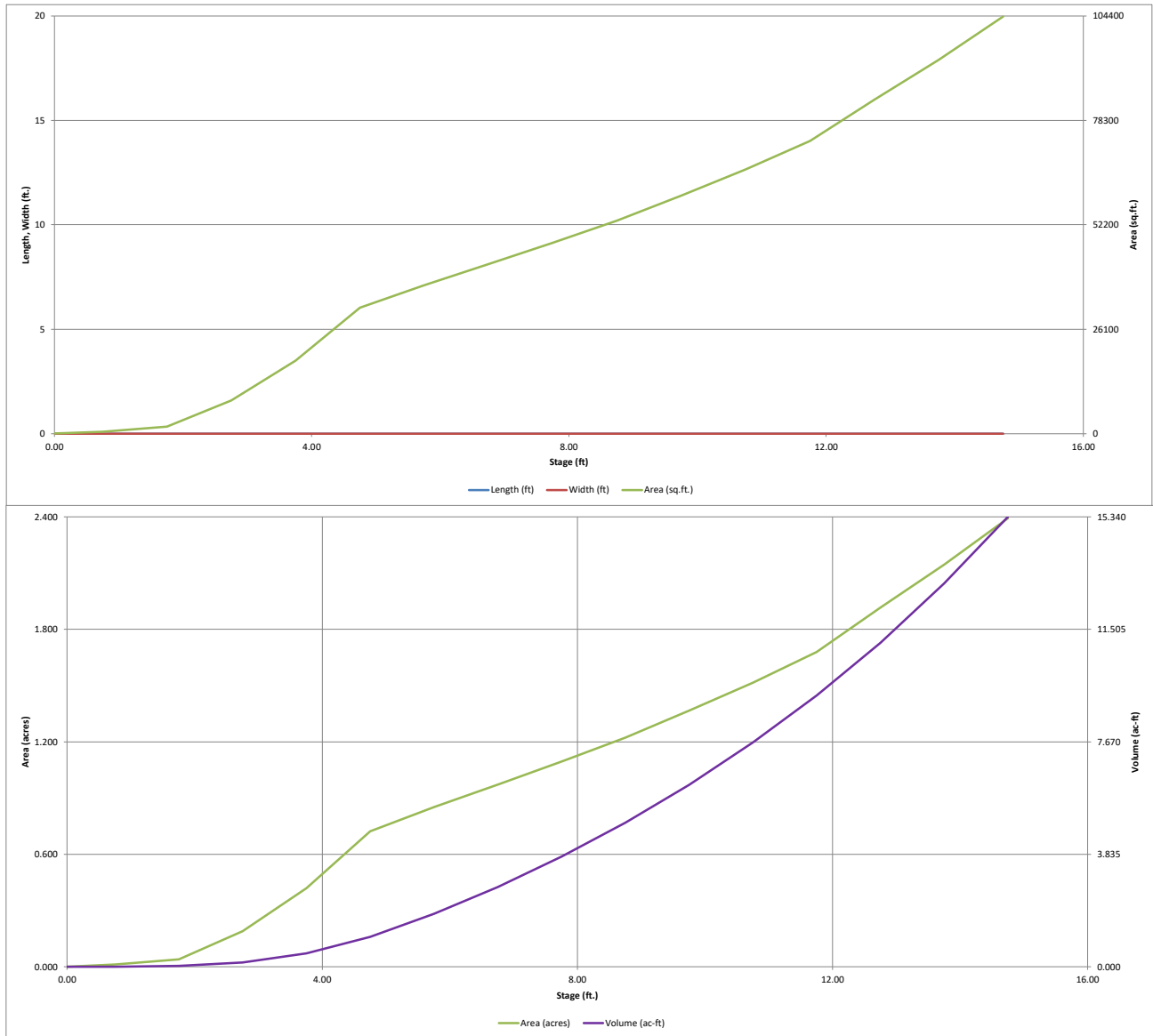
	acre-feet
	acre-feet
1.06	inches
1.43	inches
1.66	inches
	inches
2.26	inches
2.60	inches
	inches

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

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

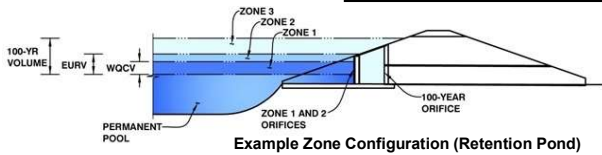


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Canyons Far South - Filing No. 2**

Basin ID: **Pond H (Micropool WSEL= 6335.25)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.04	1.233	Orifice Plate
Zone 2 (EURV)	6.81	1.538	Weir&Pipe (Restrict)
Zone 3 (100-year)	10.02	3.804	Weir&Pipe (Restrict)
Total (all zones)		6.575	

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

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

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

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	5.00					
Orifice Area (sq. inches)	2.00	3.00	15.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

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

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

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

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

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

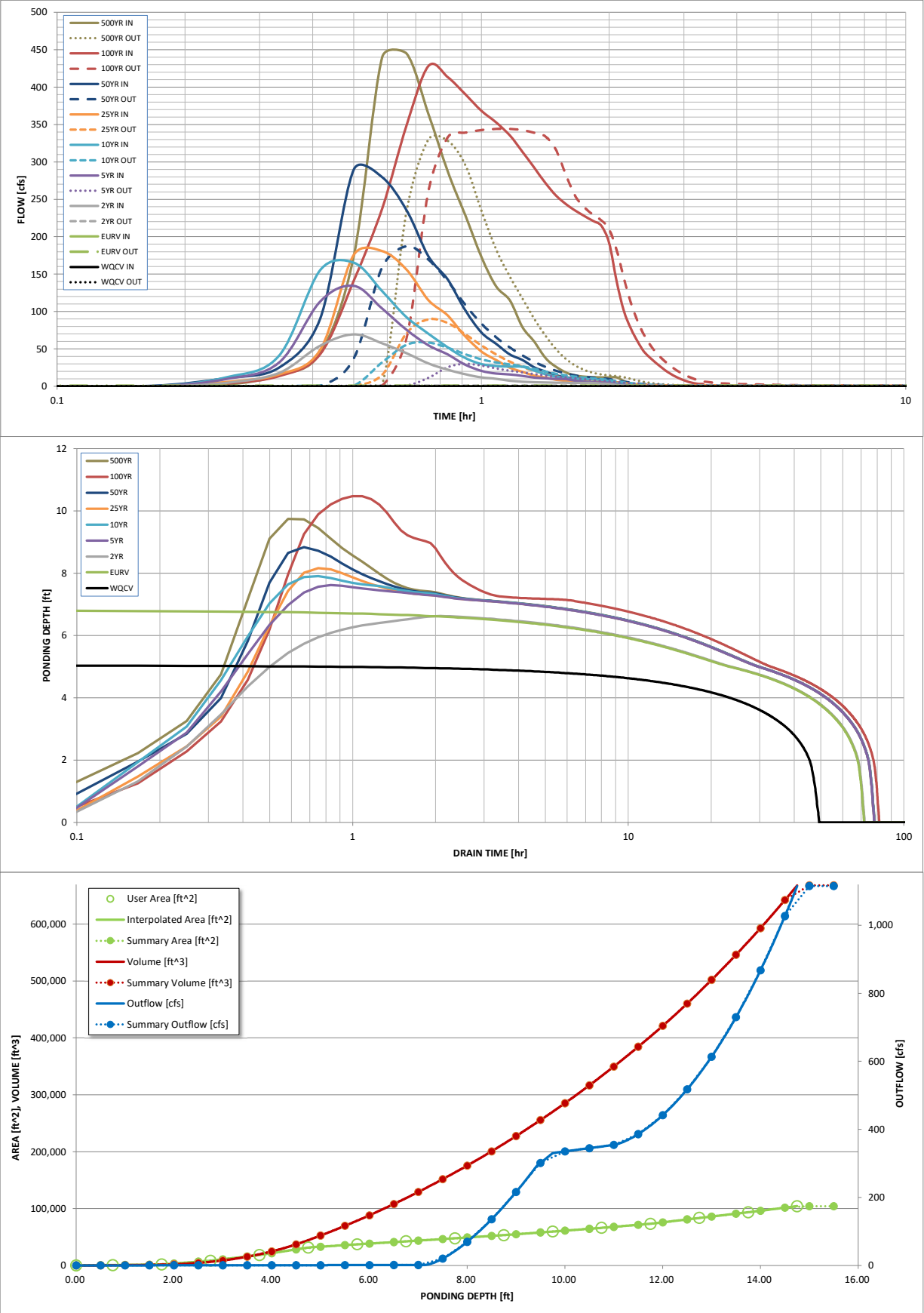
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
One-Hour Rainfall Depth (in) =	1.233	2.771	2.742	5.086	6.729	7.325	11.628	14.623	18.826
CUHP Runoff Volume (acre-ft) =	1.233	2.771	2.742	5.086	6.729	7.325	11.628	14.623	18.826
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.742	5.086	6.729	7.325	11.628	14.623	18.826
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	19.8	74.1	103.5	120.2	210.8	271.3	354.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.21	0.80	1.12	1.30	2.28	2.93	3.82
Peak Inflow Q (cfs) =	N/A	N/A	69.6	134.3	165.4	180.9	289.6	427.9	444.7
Peak Outflow Q (cfs) =	0.5	1.1	1.1	30.0	58.5	89.6	187.4	344.2	329.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	0.7	0.9	1.3	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.3	0.7	1.1	2.2	4.1	3.9
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) =	46	66	66	69	67	66	61	31	52
Time to Drain 99% of Inflow Volume (hours) =	48	69	69	74	73	73	71	61	68
Maximum Ponding Depth (ft) =	5.04	6.81	6.63	7.62	7.91	8.17	8.83	10.47	9.75
Area at Maximum Ponding Depth (acres) =	0.76	0.98	0.96	1.08	1.11	1.15	1.23	1.47	1.36
Maximum Volume Stored (acre-ft) =	1.234	2.776	2.593	3.610	3.917	4.210	5.008	7.226	6.190

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.17	2.38
	0:15:00	0.00	0.00	4.67	9.56	11.89	5.97	10.87	3.90	14.83
	0:20:00	0.00	0.00	17.93	31.54	40.73	15.90	25.04	13.52	44.68
	0:25:00	0.00	0.00	54.39	113.43	155.24	48.72	90.45	42.80	173.76
	0:30:00	0.00	0.00	69.57	134.27	165.44	175.72	289.63	141.06	440.01
	0:35:00	0.00	0.00	57.44	103.87	127.17	180.92	279.63	237.57	444.72
	0:40:00	0.00	0.00	44.20	75.40	92.30	155.94	235.40	349.04	364.59
	0:45:00	0.00	0.00	30.58	54.89	70.52	115.40	174.08	427.92	287.03
	0:50:00	0.00	0.00	22.25	42.51	52.08	94.50	142.64	413.33	228.26
	0:55:00	0.00	0.00	16.02	28.76	37.71	66.43	101.24	390.16	173.09
	1:00:00	0.00	0.00	12.01	20.57	29.83	46.64	72.08	368.30	133.72
	1:05:00	0.00	0.00	10.15	17.13	27.20	35.20	56.87	352.70	114.85
	1:10:00	0.00	0.00	7.62	16.01	26.35	24.80	42.68	335.39	79.24
	1:15:00	0.00	0.00	6.29	13.85	26.06	19.25	35.14	313.60	59.38
	1:20:00	0.00	0.00	5.56	11.79	21.00	14.17	25.10	291.97	37.68
	1:25:00	0.00	0.00	5.16	10.62	16.07	11.65	19.87	271.42	26.03
	1:30:00	0.00	0.00	4.89	9.99	13.03	8.84	14.89	254.99	18.55
	1:35:00	0.00	0.00	4.72	9.60	11.30	7.23	12.11	243.44	14.57
	1:40:00	0.00	0.00	4.66	7.49	10.22	6.37	10.57	234.77	12.95
	1:45:00	0.00	0.00	4.66	6.26	9.56	5.95	9.80	227.54	12.23
	1:50:00	0.00	0.00	4.66	5.54	9.31	5.74	9.48	221.00	12.13
	1:55:00	0.00	0.00	3.72	5.16	8.64	5.63	9.35	214.67	12.13
	2:00:00	0.00	0.00	3.14	4.64	7.01	5.61	9.32	191.69	12.13
	2:05:00	0.00	0.00	1.84	2.66	4.06	3.29	5.42	140.82	7.00
	2:10:00	0.00	0.00	1.06	1.50	2.29	1.89	3.09	101.07	3.96
	2:15:00	0.00	0.00	0.56	0.81	1.21	1.01	1.64	77.47	2.09
	2:20:00	0.00	0.00	0.27	0.44	0.60	0.55	0.87	59.97	1.09
	2:25:00	0.00	0.00	0.11	0.18	0.21	0.23	0.34	46.52	0.41
	2:30:00	0.00	0.00	0.03	0.04	0.04	0.04	0.05	37.98	0.05
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.93	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.57	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.18	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.71	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.09	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.16	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.97	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.35	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.35	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.26	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.18	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.09	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.81	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.72	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.63	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.55	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.46	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.38	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.22	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.93	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.86	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.55	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.07	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

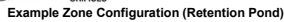
The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

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

[illegible]

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: Pond J (Micropool WSEL= 6357.00)



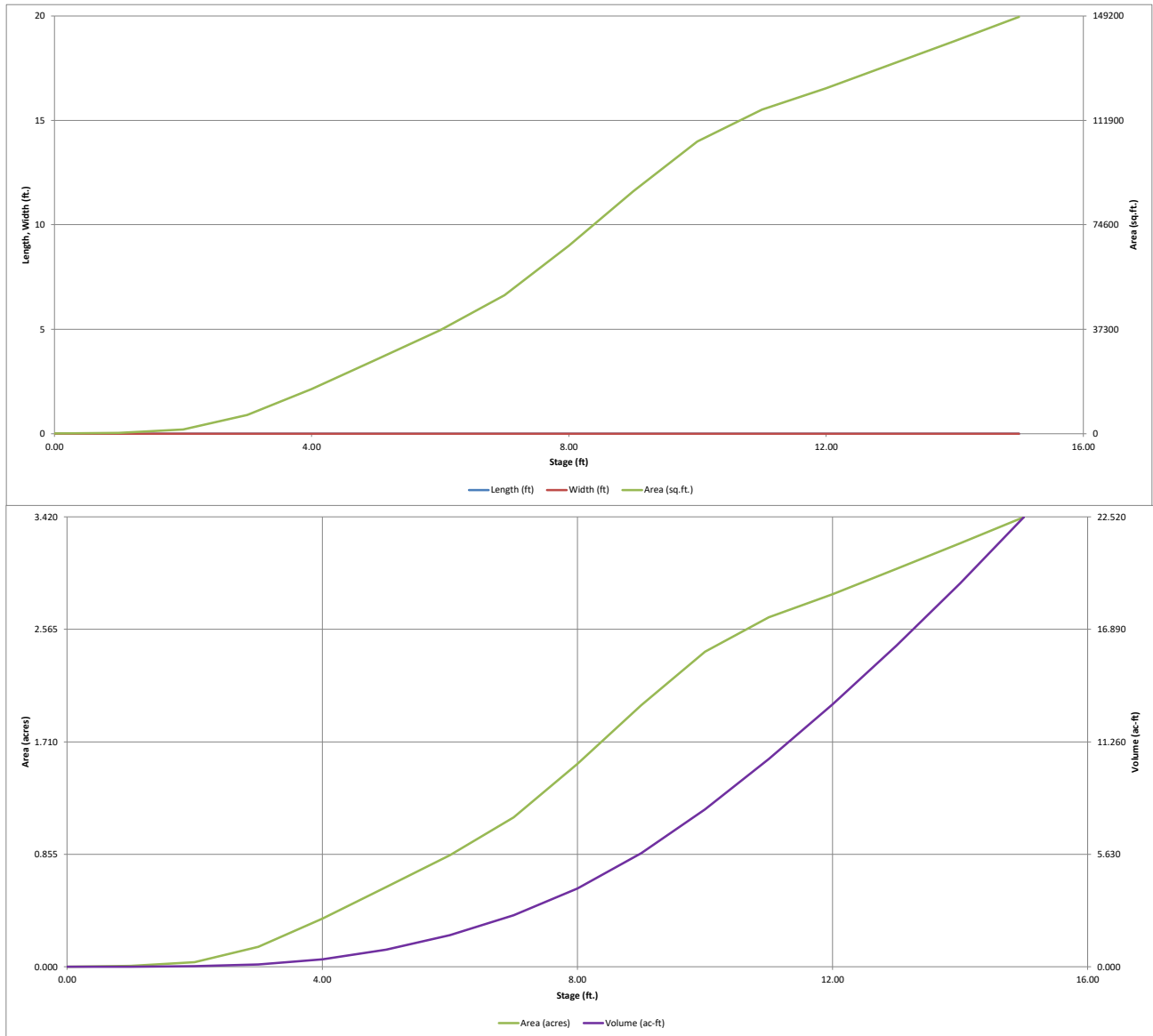
	acre-feet
	acre-feet
1.06	inches
1.43	inches
1.66	inches
	inches
2.26	inches
2.60	inches
	inches

Initial Surchage Area (A_{ISV})	=	user	ft ²
Surchage Volume Length (L_{ISV})	=	user	ft
Surchage 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_{OBS})	=	user	acre-feet

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

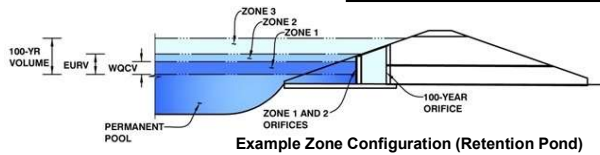


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Canyons Far South - Filing No. 2**

Basin ID: **Pond J (Micropool WSEL= 6357.00)**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.98	1.566	Orifice Plate
Zone 2 (EURV)	7.09	1.108	Weir&Pipe (Restrict)
Zone 3 (100+1/2WQCV)	10.80	7.193	Weir&Pipe (Restrict)
Total (all zones)		9.868	

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

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

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

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50						
Orifice Area (sq. inches)	3.00	3.00						

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

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

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

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

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

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

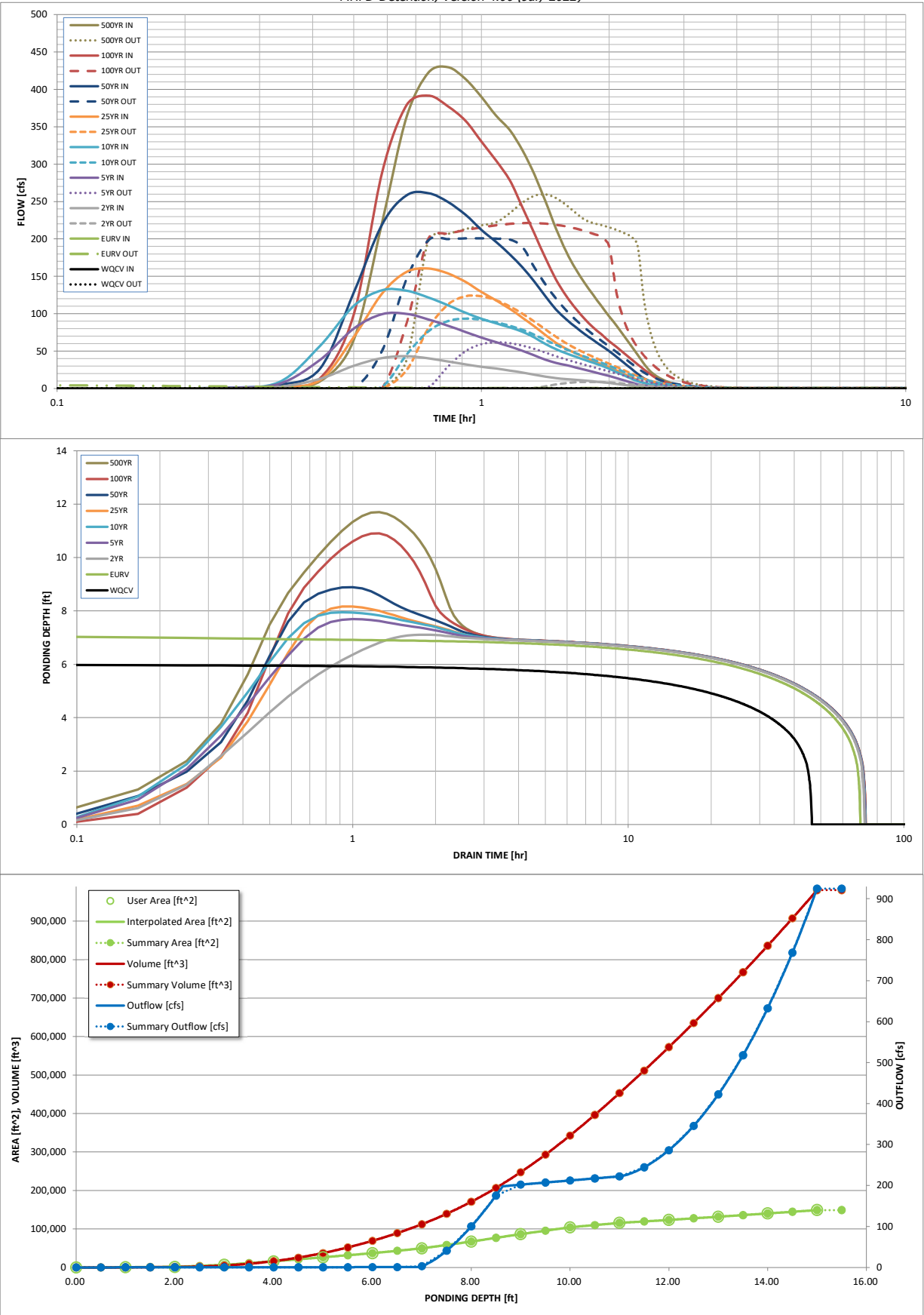
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
One-Hour Rainfall Depth (in) =	1.566	2.674	3.267	7.782	11.077	12.564	21.336	27.738	36.414
CUHP Runoff Volume (acre-ft) =	N/A	N/A	3.267	7.782	11.077	12.564	21.336	30.344	36.414
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	20.4	76.6	107.4	135.5	235.0	303.6	398.4
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.41	0.57	0.72	1.26	1.62	2.13
Peak Inflow Q (cfs) =	N/A	N/A	43.2	99.9	131.4	160.3	261.3	391.7	429.8
Peak Outflow Q (cfs) =	0.5	6.3	8.9	61.8	93.5	123.4	200.8	221.3	259.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.9	0.9	0.9	0.7	0.7
Structure Controlling Flow =	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.08	0.09	0.6	1.0	1.3	2.1	2.3	2.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	44	66	68	63	60	59	51	44	39
Time to Drain 99% of Inflow Volume (hours) =	45	68	70	69	68	67	64	61	59
Maximum Ponding Depth (ft) =	5.98	7.09	7.11	7.69	7.95	8.16	8.89	10.91	11.71
Area at Maximum Ponding Depth (acres) =	0.84	1.17	1.18	1.42	1.52	1.61	1.94	2.63	2.78
Maximum Volume Stored (acre-ft) =	1.569	2.682	2.705	3.458	3.825	4.169	5.464	10.132	12.299

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.23
	0:15:00	0.00	0.00	0.46	0.94	1.16	0.58	1.13	0.22	1.67
	0:20:00	0.00	0.00	2.23	6.22	8.58	2.14	4.75	2.05	9.74
	0:25:00	0.00	0.00	13.10	38.51	57.26	11.41	26.87	13.79	64.90
	0:30:00	0.00	0.00	30.32	80.14	110.26	68.66	128.06	98.70	222.48
	0:35:00	0.00	0.00	40.83	99.46	131.43	127.30	219.56	289.16	363.22
	0:40:00	0.00	0.00	43.19	99.92	130.76	155.97	258.34	378.88	422.29
	0:45:00	0.00	0.00	40.41	92.35	121.71	160.31	261.28	391.72	429.76
	0:50:00	0.00	0.00	36.13	84.11	111.42	153.85	249.54	377.50	413.82
	0:55:00	0.00	0.00	32.27	75.71	101.29	142.73	232.43	358.06	389.89
	1:00:00	0.00	0.00	29.09	68.04	93.42	128.99	212.01	330.20	364.74
	1:05:00	0.00	0.00	26.66	61.85	87.24	117.84	195.95	304.78	345.39
	1:10:00	0.00	0.00	24.07	56.22	81.54	106.39	179.23	278.26	318.55
	1:15:00	0.00	0.00	21.27	50.38	75.80	94.75	161.96	242.20	285.96
	1:20:00	0.00	0.00	18.50	44.16	68.10	82.94	142.74	206.93	249.82
	1:25:00	0.00	0.00	15.92	38.37	59.39	71.49	123.14	174.12	213.75
	1:30:00	0.00	0.00	13.97	34.21	52.57	61.07	105.66	145.50	183.23
	1:35:00	0.00	0.00	12.62	31.26	47.19	53.30	92.69	124.06	160.10
	1:40:00	0.00	0.00	11.52	28.25	42.54	47.14	82.18	107.31	141.52
	1:45:00	0.00	0.00	10.53	25.18	38.33	41.88	73.08	93.26	125.14
	1:50:00	0.00	0.00	9.57	22.23	34.45	37.14	64.86	81.81	110.39
	1:55:00	0.00	0.00	8.50	19.45	30.59	32.79	57.29	72.55	96.69
	2:00:00	0.00	0.00	7.37	16.71	26.46	28.62	50.04	63.38	83.81
	2:05:00	0.00	0.00	6.17	13.86	22.04	24.28	42.42	55.41	70.78
	2:10:00	0.00	0.00	4.96	10.98	17.64	19.87	34.65	47.61	57.81
	2:15:00	0.00	0.00	3.78	8.21	13.49	15.52	27.08	39.71	45.16
	2:20:00	0.00	0.00	2.68	5.65	9.77	11.30	19.87	32.45	33.21
	2:25:00	0.00	0.00	1.86	3.98	7.45	7.43	13.57	25.52	23.25
	2:30:00	0.00	0.00	1.39	3.06	5.97	5.11	9.82	19.27	16.83
	2:35:00	0.00	0.00	1.08	2.41	4.79	3.62	7.26	13.79	12.36
	2:40:00	0.00	0.00	0.87	1.92	3.83	2.63	5.42	10.06	8.98
	2:45:00	0.00	0.00	0.69	1.52	3.02	1.88	3.99	7.53	6.40
	2:50:00	0.00	0.00	0.55	1.20	2.34	1.40	2.96	5.44	4.45
	2:55:00	0.00	0.00	0.44	0.93	1.79	1.02	2.16	3.90	3.01
	3:00:00	0.00	0.00	0.35	0.72	1.34	0.75	1.57	2.76	2.07
	3:05:00	0.00	0.00	0.28	0.55	1.00	0.58	1.19	1.98	1.57
	3:10:00	0.00	0.00	0.23	0.41	0.74	0.45	0.90	1.47	1.20
	3:15:00	0.00	0.00	0.18	0.30	0.57	0.35	0.71	1.11	0.96
	3:20:00	0.00	0.00	0.13	0.21	0.43	0.26	0.54	0.85	0.74
	3:25:00	0.00	0.00	0.10	0.14	0.31	0.20	0.40	0.65	0.55
	3:30:00	0.00	0.00	0.07	0.09	0.21	0.14	0.29	0.50	0.39
	3:35:00	0.00	0.00	0.04	0.06	0.13	0.09	0.19	0.38	0.26
	3:40:00	0.00	0.00	0.02	0.03	0.07	0.06	0.11	0.28	0.15
	3:45:00	0.00	0.00	0.01	0.02	0.03	0.03	0.06	0.20	0.07
	3:50:00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.15	0.02
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

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Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]

Project: Canyons Far South Filing 2
Location: Castle Rock, CO
Designer: CJG
Date: March 2025
Latest Revision: 9/23/2025

FOREBAY

	¹ Contributing Area (ac)	¹ Percent Impervious	² WQCV (in)	³ WQCV (cf)	⁴ Min. Forebay Volume Required (cf)	⁵ Forebay Depth (ft)	⁶ Forebay Area Required (sf)	⁷ Forebay Area Provided (sf)	⁸ Volume Provided (cf)	⁹ Is provided greater then required?	¹⁰ 100-year Peak Discharge	¹¹ Forebay Release (cfs)	¹² Required Forebay Notch Width (in)
Pond J - Forebay 3	178.94	16.5%	0.09	58,698	1761	2.0	880	1,125	2,249	yes	392.4	7.85	10.00
Pond J - Forebay 4	8.26	23.5%	0.12	3,488	105	1.3	84	138	172	yes	26.2	0.52	1.35
Pond H - Forebay 5	12.54	12.7%	0.07	3,345	100	1.3	80	550	688	yes	221.3	4.43	11.41
Pond H - Forebay 6	83.2	22.5%	0.11	34,176	1025	3.0	342	352	1,056	yes	121.3	2.43	1.68

- ¹From rational calculations
- ²Water Quality Capture Volume (watershed inches) per equation 3-1
- ³Translate to cubic feet
- ⁴3% of the WQCV per Table EDB-4
- ⁵Per the plans
- ⁶Required volume divided by forebay depth
- ⁷Per the plans
- ⁸Provided volume multiplied by forebay depth
- ⁹Back check the previous calculations
- ¹⁰From rational calcs for pipe outfall
- ¹¹2% of the 100-year peak discharge per Table EDB-4
- ¹²Rectangular weir calculation to solve for the notch: $L = Q / (CH^{3/2})$ Where C = 3.33 for sharp crest weir

$$WQCV = a(0.91I^3 - 1.19I^2 + 0.78I)$$

Equation 3-1

Where:

WQCV = Water Quality Capture Volume (watershed inches)

a = Coefficient corresponding to WQCV drain time (Table 3-2)

I = Imperviousness (%/100) (see Figures 3-3 through 3-5 [single family land use] and /or the *Runoff* chapter of Volume 1[other typical land uses])

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hrs)	Coefficient, a
12 hours	0.8
24 hours	0.9
40 hours	1.0

T-5 Extended Detention Basin (EDB)

Table EDB-4. EDB component criteria

	On-Site EDBs for Watersheds up to 1 Impervious Acre ¹	EDBs with Watersheds between 1 and 2 Impervious Acres ¹	EDBs with Watersheds up to 5 Impervious Acres	EDBs with Watersheds over 5 Impervious Acres	EDBs with Watersheds over 20 Impervious Acres
Forebay Release and Configuration	EDBs should not be used for watersheds with less than 1 impervious acre.	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch or berm/pipe ² configuration
Minimum Forebay Volume		1% of the WQCV	2% of the WQCV	3% of the WQCV	3% of the WQCV
Maximum Forebay Depth		12 inches	18 inches	18 inches	30 inches
Trickle Channel Capacity		≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity
Micropool		Area ≥ 10 ft²	Area ≥ 10 ft²	Area ≥ 10 ft²	Area ≥ 10 ft²
Initial Surcharge Volume		Depth ≥ 4 inches	Depth ≥ 4 inches	Depth ≥ 4 in. Volume ≥ 0.3% WQCV	Depth ≥ 4 in. Volume ≥ 0.3% WQCV

¹ EDBs are not recommended for sites with less than 2 impervious acres. Consider a sand filter or rain garden.

² Round up to the first standard pipe size (minimum 8 inches).



Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to document conformance with the Town of Castle Rock's MS4 permit with regard to permanent water quality on land disturbance projects.

Project Name Canyons Far South Filing 2

Project Owner HT Canyons South Development LP

Project Location East of Founders Parkway, North of Castle Oaks Drive

ToCR Project Number CD24-0012

Total Site Area 65.4 acres

Total Size of Common Plan of Development 361 acres

Check all that apply:

☐ **Project within Plum Creek Basin**

☒ **Project within Cherry Creek Basin**

Estimated construction completion date Summer 2027

1. The water quality control measure(s) for applicable development sites shall meet one of the following base design standards as per the SDDTCM Section 14.4. Please select all design standards that were applied to meet conformance with the MS4 on this site.

- ☒ WQCV standard
- ☐ Pollutant removal standard
- ☒ Runoff reduction standard
- ☒ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)
- ☒ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)
- ☐ Constrained redevelopment sites standard
 - Imperviousness of existing site _____/_____ (Imp. Ac/Site Ac) = ____%
 - Variance required TCV No. _____
- ☐ Existing control measure with WQCV per previous criteria standards
 - Reference Construction Permit No. _____
- ☒ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☒ Tier 3
- ☐ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

2. Was an exclusion to water quality applied as per SDDTCM Section 13.1.5? ☐ Yes ☒ No

i. If yes, please select all that apply, provide total excluded impervious area(s) and submit variance, as applicable: TCV No. _____

☐ Pavement management site

Excluded impervious area: _____ acres

☐ Excluded roadway redevelopment

Excluded impervious area: _____ acres

☐ Excluded existing roadway areas

Excluded impervious area: _____ acres

☐ Above ground and below ground utilities

☐ Large lot single family home

☐ Non-residential and non-commercial infiltration

Excluded impervious area: _____ acres

☐ Land disturbance for land to remain undeveloped

Excluded impervious area: _____ acres

☐ Stream Stabilization Sites

Excluded impervious area: _____ acres

☐ Trails

Excluded impervious area: _____ acres

☐ Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre? ☐ Yes ☒ No

If yes, complete the following:

Excluded area: _____ acres

Total Site area: _____ acres, _____ % site excluded

4. For Constrained sites, was any portion of the site excluded up to 50% of the site and not to exceed 50% of the impervious area? ☐ Yes ☒ No

If yes, complete the following:

Excluded area: _____ acres

Excluded impervious area: _____ acres

Total Site area: _____ acres, _____ % site excluded

Total Impervious area: _____ acres, _____ % impervious excluded

Permanent Water Quality Determination Worksheet (Taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5)

Project:		Project#		Applicant:
Section	Questions	Response	Check those that apply	Instructions
1	Non-applicable Sites			
1.1	Will the project result in a temporary disturbance of greater than one acre?	No Yes	☐ ☒	Proceed to section 1.2. Proceed to section 2.
1.2	Is the project part of a larger common plan of development or sale where multiple separate and distinct construction activities may be taking place at different times on different schedules, but remain related and are within 1/4 mile of each other? (A common plan of development will generally be documented on a site development plan, master plan, or equivalent, for the property/project)	No Yes	☐ ☐	Proceed to section 1.3. Proceed to section 2.
1.3	Is the project within the Cherry Creek Watershed?	Yes No	☐ ☐	Permanent water quality control measures may be required. Refer to Water Quality Control Regulation 72.7 for details and allowable exclusions. Permanent water quality control measures are not required.
2	Applicable Site Types and Exclusions by Variance			
2.1	Does the project have more than 35% impervious area on the existing site?	No Yes	☒ ☐	Project is an applicable Development Site. Proceed to section 3. Proceed to 2.2.
2.2	Does the project have greater than 75% impervious area on the existing site?	No Yes	☐ ☐	Project is an applicable Redevelopment Site. Proceed to section 3. Project is an applicable Constrained Redevelopment Site. Proceed to 2.3.
2.3	Will 100% of the runoff from the existing and proposed site be captured and treated using one or more of the allowable design standards for permanent water quality?	Yes No	☐ ☐	No further action required. Proceed to 2.4.
2.4	Do any other water quality exclusions apply to the site?	No Yes	☐ ☐	Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> . Proceed to section 3. Following approval of other exclusions, design remaining site in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> .
3	Applicable Sites with Other Exclusions by Variance			
3.1	Category 1: Roadways, bridges and trails only			
3.1.1	Is the project a bike or pedestrian trail?	Yes No	☐ ☐	Proceed to next line. Proceed to 3.1.2.
	Is the trail for a roadway?	Yes No	☐ ☐	Proceed to 3.1.2. Project is excluded. Submit variance for <u>Trails Excluded from Permanent Water Quality Requirements</u> .
3.1.2	Is the project primarily used for parking or access to parking?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to 3.1.3.
3.1.3	Does the project add impervious area?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Pavement Management Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.1.4.

Section	Questions	Response	Check those that apply	Instructions
3.1.4	Does the project add more than 8.25 feet of paved width at any location to the existing roadway?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Does the project add more than one acre of paved area per mile to an existing roadway?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Does the project increase the width by two times or more, on average, of the original roadway area?	No Yes	☐ ☐	Existing areas of site are excluded only. Submit variance for <u>Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.
3.2	Category 2: Non-residential and non-commercial projects only			
3.2.1	Is the project associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities, including activities necessary to prepare a site for drilling and the movement and placement of drilling equipment?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.2.
3.2.2	Is the project for stream stabilization?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Stream Stabilization Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.3.
3.2.3	Is the project for installation or maintenance of aboveground or underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity including activities to install, replace or maintain utilities under roadways or other paved areas that return the surface to the same condition?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.4.
3.2.4	Is the project on undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the project?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.5.
3.2.5	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No Yes	☐ ☐	Project is excluded. Submit study along with variance for <u>Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.
3.3	Category 3: Residential, Agricultural and Commercial projects			
3.3.1	Is the project a single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling unit?	Yes No	☐ ☒	Proceed to next line. Proceed to 3.3.2.
	Is the project site greater than 10% impervious?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Is the project site greater than 20% impervious?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No Yes	☐ ☐	Project is excluded. Submit study along with variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.

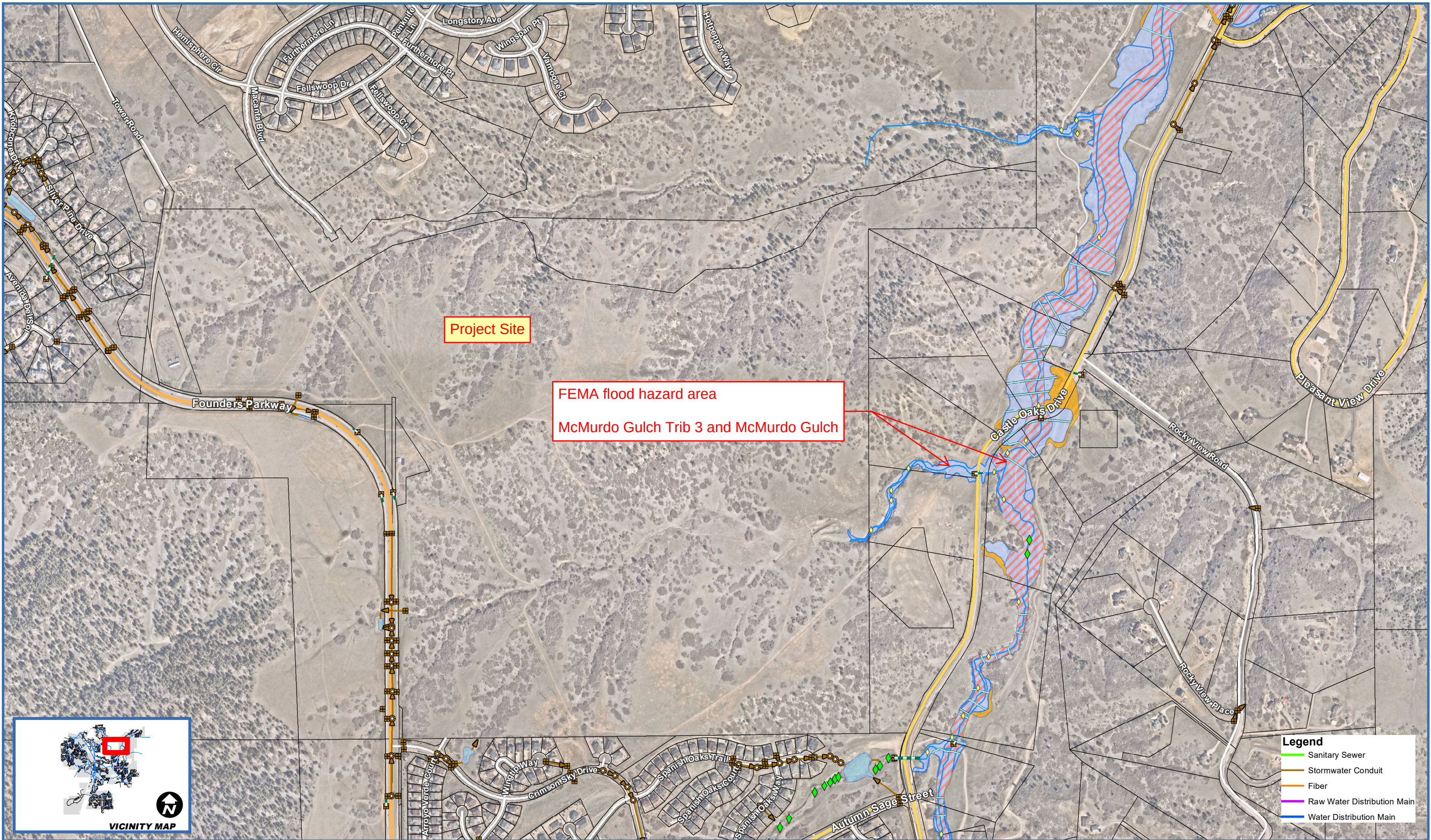
Section	Questions	Response	Check those that apply	Instructions
3.3.2	Will 100% of the runoff from the residential or commercial site be captured?	Yes No	☒ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	Yes No	☐ ☐	This portion of the project is excluded. Submit variance for <u>Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . Proceed to next line. Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	No Yes	☐ ☐	Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the drainage report . No further action is needed. This exclusion does not apply. Permanent water quality is required.



APPENDIX D

REFERENCED INFORMATION





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.

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 Floodway Data table shown on this EIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. 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:

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>.

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 **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline as shown outside the CEHA.

Based on updated topographic information, 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. As a result, the Flood Insurance Study (FIS) and Floodway Data tables for multiple streams in the Flood Insurance Study Region (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unreviewed streams may differ from what is shown on previous maps.

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.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.



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 Areas are the areas 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.

 FLOODWAY AREAS IN ZONE AE

encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

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.

 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.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Roadway boundary

 Zone D boundary
 CBRS and OPA boundary

 Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

 Cross section line

45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

4890000 N	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 X	Bench mark (see explanation in Notes to Users section of this FIRM page)

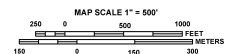
MAP REPOSITORIES

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

1. To update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

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.



NFIP PROGRAM	PANEL 0187G
	FIRM FLOOD INSURANCE RATE MAP DOUGLAS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 187 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

<u>CONTAINS:</u>			
<u>COMMUNITY</u>	<u>NUMBER</u>	<u>PANEL</u>	<u>SUFFIX</u>
CASTLE ROCK, TOWN OF	080050	0187	G
DOUGLAS COUNTY	080049	0187	G
CASTLE PINES, CITY OF	080231	0187	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
08035C0187G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

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 shown on 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 Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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 Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 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. 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, NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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 by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

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 **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

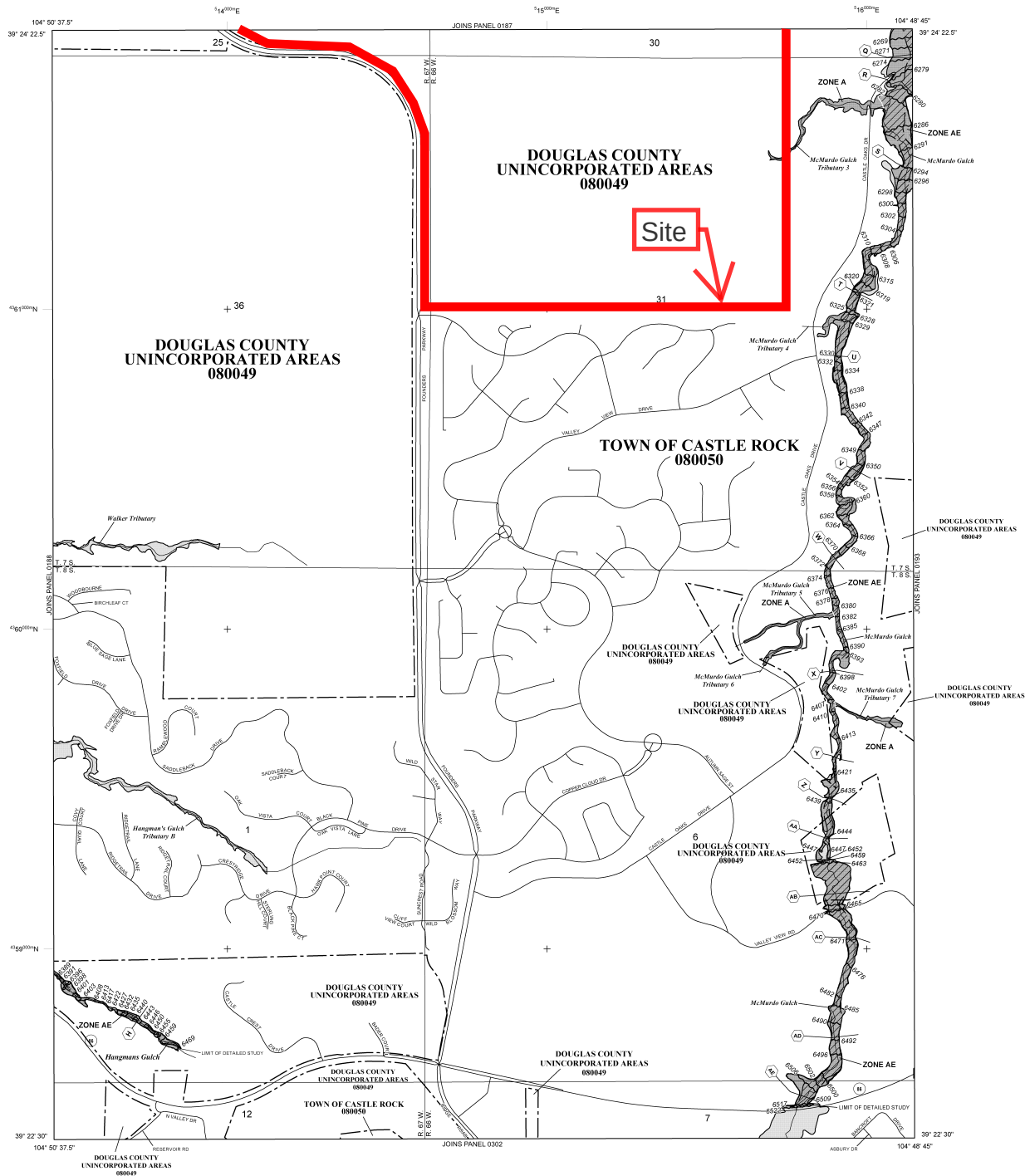
Based on updated topographic information this map reflects more detailed and up-to-date **stream channel configurations** and **floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unreviewed streams may differ from what is shown on previous maps.

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.

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LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO FLOODING 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 area subject to flooding by the 1% annual chance flood is the **area subject to flooding by the 1% annual chance flood**. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, AV, 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 shear flow on sloping terrain); average depths determined; for areas of flow in flooding, velocities also determined.
- ZONE AO**
Flood depths of 1 to 3 feet (usually shear flow on sloping terrain); average depths determined; for areas of flow in flooding, velocities also determined.
- ZONE AR**
Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently derelict. Zone AR indicates that the former flood control system is being retained to provide protection from the 1% annual chance or greater flood.
- ZONE AV**
Areas to be protected from the 1% annual chance flood by a Federal flood protection system under construction in 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); no 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 encroachments 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 discharge areas less than 1 square mile; and areas protected by levees from the 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 heights are determined, 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.

- 1% Annual Chance Floodplain Boundary**
- Floodway boundary**
- Zone D boundary**
- CBRS and OPA boundary**
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.**
- Base Flood Elevation line and value; elevation in feet***
- Base Flood Elevation value where uniform within zone; elevation in feet***

*Referenced to the North American Vertical Datum of 1988

- Cross section line**
- Transect line**
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere**
- 1000-meter Universal Transverse Mercator grid values, zone 13**
- 89°00'N**
- DMS10 X**
- Bench mark (see explanation in Notes to Users section of this FIRM)**
- 1M1.5**
- River Mile**

MAP REPOSITORIES

Refer to Map Repository List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

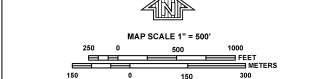
SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to community 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 1-800-435-6620.



NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0189G
FIRM
FLOOD INSURANCE RATE MAP
DOUGLAS COUNTY,
COLORADO
AND INCORPORATED AREAS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

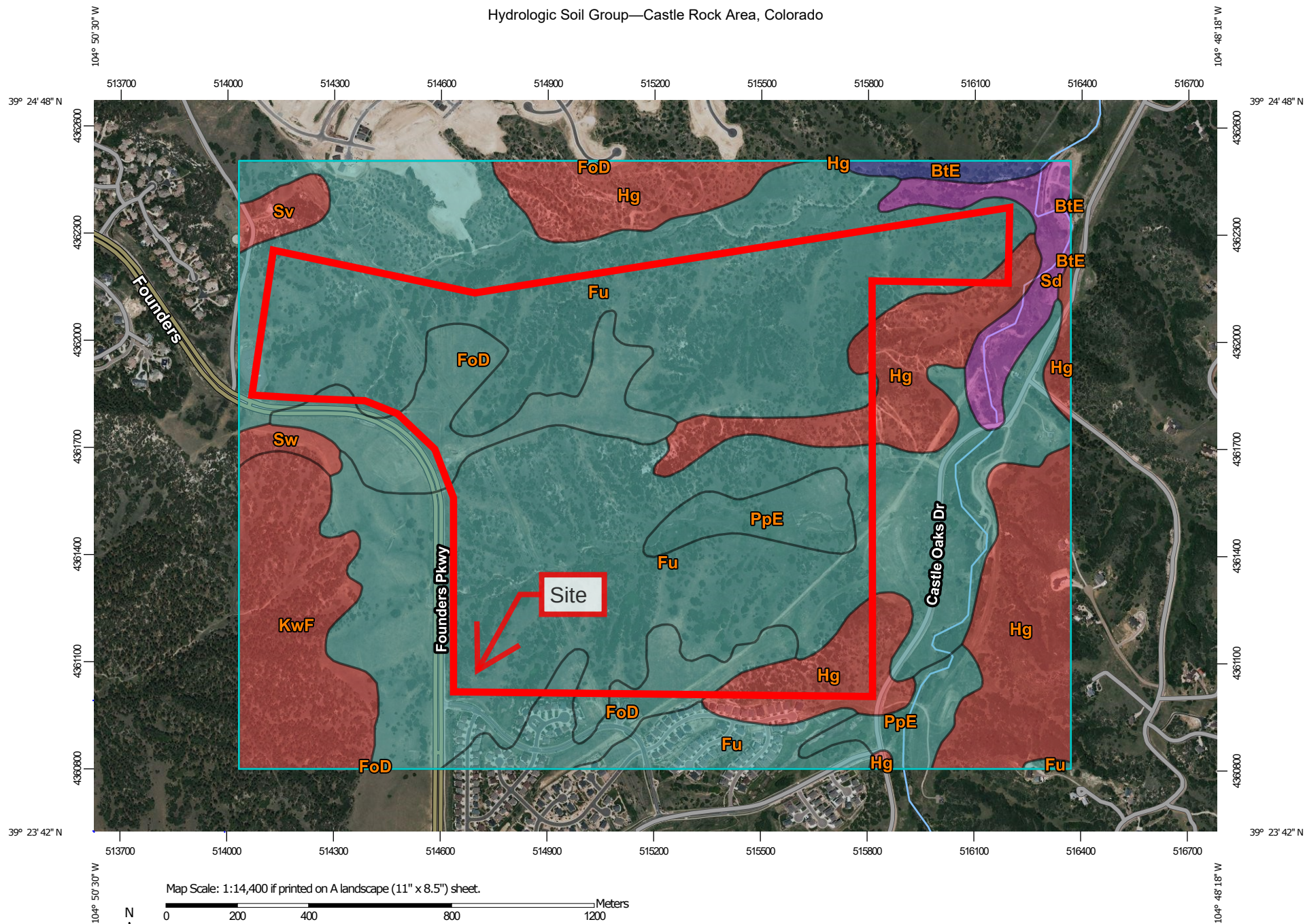
PANEL 189 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:	COMMUNITY	NUMBER	PANEL	SUFFIX
	CASCADE, TOWN OF	080052	0189	G
	DOUGLAS COUNTY	080049	0189	G

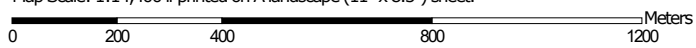
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0189G
MAP REVISED
MARCH 16, 2016
Federal Emergency Management Agency

Hydrologic Soil Group—Castle Rock Area, Colorado



Map Scale: 1:14,400 if printed on A landscape (11" x 8.5") sheet.



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



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

7/5/2023
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Castle Rock Area, Colorado
 Survey Area Data: Version 15, Sep 1, 2022

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

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

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BtE	Bresser-Truckton sandy loams, 5 to 25 percent slopes	B	7.0	0.7%
FoD	Fondis clay loam, 3 to 9 percent slopes	C	83.6	8.5%
Fu	Fondis-Kutch association	C	583.0	59.0%
Hg	Hilly gravelly land	D	168.2	17.0%
KwF	Kutch-Newlin-Stapleton complex, 8 to 40 percent slopes	D	67.9	6.9%
PpE	Peyton-Pring-Crowfoot sandy loams, 5 to 25 percent slopes	C	37.3	3.8%
Sd	Sandy alluvial land	A	26.6	2.7%
Sv	Stony steep land	D	8.4	0.8%
Sw	Stony steep land, cold	D	5.8	0.6%
Totals for Area of Interest			987.8	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



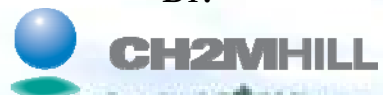
MCMURDO GULCH FLOOD HAZARD AREA DELINEATION

McMURDO GULCH FLOOD HAZARD AREA DELINEATION

NOVEMBER 2007

AMENDED FEBRUARY 2012

By:



PREPARED FOR:



TOWN OF CASTLE ROCK
UTILITIES DEPARTMENT
175 KELLOGG COURT
CASTLE ROCK, CO 80109

PREPARED BY:



4601 DTC BOULEVARD
SUITE 700
DENVER, CO 80237



TETRA TECH RMC



Table 3-2: Hydrologic Soil Groups

Soil Group	ID	Hydrologic Soil Group
Bresser sandy loam, 3 to 9 percent slopes	BrD	B
Bresser-Truckton sandy loams, 5 to 25 percent slopes	BtE	B
Bresser and Truckton soils, 3 to 12 percent slopes, eroded	BuD2	B
Coni rocky loam, 3 to 100 percent slopes	CoG	D
Fondis clay loam, 3 to 9 percent slopes	FoD	C
Fondis-Kutch association	Fu	C
Hilly gravelly land	Hg	D
Loamy alluvial land	Lo	C
Newlin gravelly sandy loam, 8 to 30 percent slopes	NeE	B
Peyton-Pring-Crowfoot sandy loams, 5 to 25 percent slopes	PpE	B
Sampson loam	Sa	B
Sandy alluvial land	Sd	A
Sandy wet alluvial land	Se	D
Stony steep land	Sv	D

Land use and estimated percent imperviousness used in the model are included in **Table 3-3** (based on values in the USDCM, UDFCD, 2001).

Table 3-3: Land Use Percent Imperviousness

Land Use Type	Percent Impervious
Undeveloped	10%
Golf Course	5%
Open Space	5%
Open Water	100%
Roads	95%
Rural	10%
Semi-rural	15%
Urban	65%

The imperviousness of the watershed was analyzed to be consistent with the Town of Castle Rock SWMP as well as with the drainage studies for the various developments along McMurdo Gulch. The existing conditions watersheds have an average imperviousness value of 19.3% with a low of 2% and a high of 75%. The average of the future conditions imperviousness rose to 29.1% with the same low and high impervious values. Some of the undeveloped basins within the watershed are expected to become more urbanized while others are built out with residential development.

3.3.3 Routing

The program EPA-SWMM was used to route the CUHP generated runoff hydrographs. The version of the model used is EPA-SWMM version 5.0. The routing element parameters required for EPA-SWMM are: element number, type (e.g. direct flow, channel, pipe, etc.), length, slope, side slopes and resistance coefficient value. EPA-SWMM parameters utilized in the model for the 100-year storm were obtained from the various models as well as the topographic information provided by the Town of Castle Rock to determine reach lengths and approximate widths of the drainage channels.

A summary of SWMM routing parameters including the lengths of channels and storm sewer, sizes, roughness coefficients, detention volumes, detention release rates, and invert elevations is included in **Appendix A**. The locations of the SWMM design points are shown on **Figure 3-2**. The output information from the EPA-SWMM analysis is also contained in **Appendix A**.

3.3.4 Detention

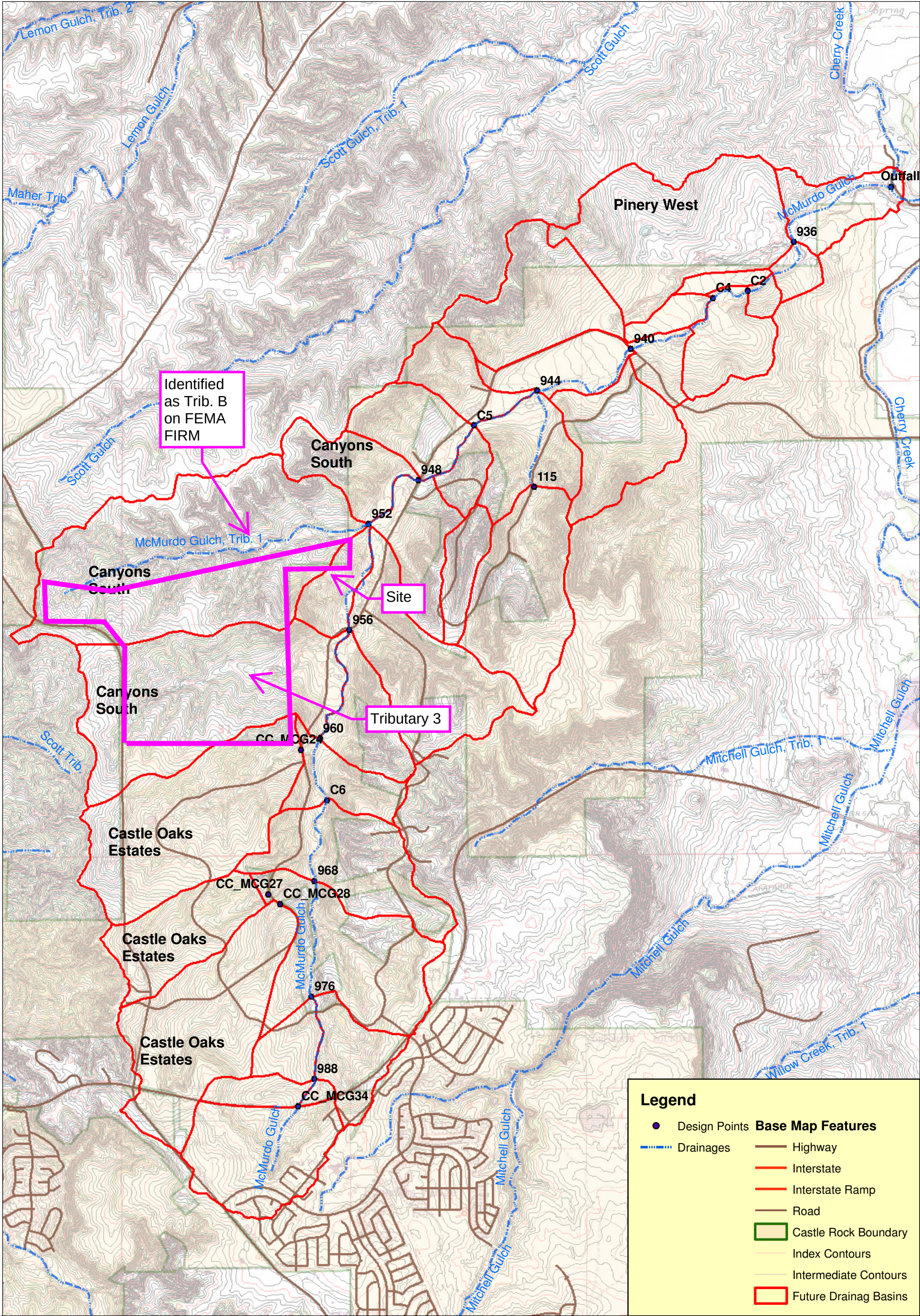
There are fifty-one (51) detention ponds in the future condition. The storage information for these detention ponds is included in **Appendix C** of the separate Baseline Hydrology Report (PBS&J, 2006).

3.4 Model Calibration

Existing conditions model yields flowrates consistent with the Town of Castle Rock SWMP. The Town of Castle Rock SWMP yields an existing 100-year peak flow rate of 5,025 cfs while this study yields a 100-year peak flow rate of 5,020 cfs for the existing conditions.

The previous model shows the peak flow occurring in the reach of channel upstream of the last reach before reaching the confluence with Cherry Creek. In this model, the peak flow rate occurs in the reach immediately upstream of the confluence with Cherry Creek.

The future conditions model for McMurdo Gulch shows that future flow conditions increase even with the proposed detention by the developments. The 100-year flow rate rises to 5,970 cfs in the reach immediately upstream of the confluence with Cherry Creek. There are no previous studies to calibrate this model to. The drainage reports associated with Liberty Village included a future conditions hydrologic model; however, there were discrepancies within the model including acreages for the physical and modeled watershed that did not match. Therefore, it was not deemed a reliable source to compare or calibrate results.



Legend

Design Points

Drainages

Highway

Interstate

Interstate Ramp

Road

Castle Rock Boundary

Index Contours

Intermediate Contours

Future Drainag Basins

06001,2002,4003,6004,800

Feet

TOWN OF
CASTLE ROCK
COLORADO

PBSJ

McMurdo Gulch Drainageway Masterplan
FIGURE 3-1: Sub-Basin Areas

DESIGNED BY: ADT	CHECKED BY: SWR	DRAWN BY: ADT	
DATE: 09-29-2006	SCALE: 1:2000	PROJECT #: 246217.07	
		CADD FILE: FIGURE3-1.MXD	
DRAWING NUMBER:			
FIGURE 3-1			
REVISIONS			

3.5 Summary of Results

A summary of peak runoff rates at primary design points is presented in **Table 3-4**.

The input and output from the CUHP models are included in **Appendix A**. These models are broken into existing and future conditions and include the 2-, 5-, 10-, 25-, 50-, 100- and 500-year storm events (results for the 100-year event only included in the Appendix). The input and output from the EPA-SWMM models are also included in **Appendix A**.

Table 3-4: Summary of Hydrologic Results

Design Point	2-year Flowrate (cfs)	5-year Flowrate (cfs)	10-year Flowrate (cfs)	25-year Flowrate (cfs)	50-year Flowrate (cfs)	100-year Flowrate (cfs)	500-year Flowrate (cfs)
EXISTING CONDITIONS							
936	360	1,050	1,510	3,010	3,640	5,020	7,080
940	330	950	1,350	2,660	3,240	4,440	6,250
944	310	870	1,220	2,410	2,920	3,980	5,580
948	260	730	1,010	2,002	2,430	3,290	4,620
960	110	300	450	970	1200	1,680	2,400
968	70	200	280	540	660	1,000	1,460
976	30	76	100	180	210	300	450
988	80	170	220	350	410	510	680
PROPOSED CONDITIONS							
936	570	1,380	1,880	3,640	4,450	5,970	8,200
940	550	1,310	1,920	3,530	4,290	5,480	7,550
944	540	1,190	1,920	3,360	3,960	4,990	6,830
948	570	1,120	1,420	2,670	3,210	4,300	5,870
960	430	730	900	1,390	1,600	2,040	2,890
968	280	470	570	860	990	1,230	1,640
976	110	170	200	300	360	480	640
988	250	380	450	630	710	850	1,080



Summary of CUHP Input Parameters (Version 1.1)

Catchment Name/ID	Raingage Name/ID	Area in (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Pecent Imperv.	Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions		
							Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in./hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imerv. Fraction	Receiv. Perv. Fraction
CC MCG1	CASTLE ROCK	0.122	0.273	0.621	0.031	10.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.20	0.09
CC MCG2	CASTLE ROCK	0.434	0.534	0.997	0.032	22.0	0.36	0.10	4.50	0.60	0.0018	0.00	0.44	0.13
CC MCG3	CASTLE ROCK	0.036	0.148	0.292	0.042	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG4	CASTLE ROCK	0.026	0.220	0.431	0.018	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG5	CASTLE ROCK	0.020	0.128	0.231	0.062	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG6	CASTLE ROCK	0.128	0.384	0.636	0.040	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG7	CASTLE ROCK	0.039	0.220	0.431	0.020	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG8	CASTLE ROCK	0.057	0.188	0.361	0.058	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG9	CASTLE ROCK	0.257	0.314	0.629	0.059	12.7	0.36	0.10	4.50	0.58	0.0018	0.00	0.25	0.09
CC MCG10	CASTLE ROCK	0.113	0.324	0.761	0.040	14.7	0.36	0.10	4.50	0.55	0.0018	0.00	0.29	0.10
CC MCG11	CASTLE ROCK	0.208	0.213	0.649	0.082	14.7	0.36	0.10	3.75	0.55	0.0018	0.00	0.29	0.10
CC MCG12	CASTLE ROCK	0.104	0.431	0.712	0.068	18.8	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG13	CASTLE ROCK	0.151	0.309	0.606	0.036	18.8	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG14	CASTLE ROCK	0.131	0.420	0.671	0.069	18.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG15	CASTLE ROCK	0.050	0.315	0.612	0.076	18.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG16	CASTLE ROCK	0.075	0.296	0.624	0.056	18.8	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG17	CASTLE ROCK	0.299	0.484	1.100	0.048	16.2	0.36	0.10	4.50	0.60	0.0018	0.00	0.32	0.11
CC MCG18	CASTLE ROCK	0.129	0.360	0.665	0.068	29.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.60	0.15
CC MCG19	CASTLE ROCK	0.140	0.493	0.876	0.055	29.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.60	0.15
CC MCG20	CASTLE ROCK	0.759	0.817	1.704	0.040	10.4	0.36	0.10	3.00	0.50	0.0018	0.00	0.21	0.09
CC MCG21	CASTLE ROCK	0.381	0.733	1.363	0.038	17.5	0.36	0.10	4.50	0.60	0.0018	0.00	0.35	0.11
CC MCG22	CASTLE ROCK	0.536	0.797	1.574	0.035	13.7	0.36	0.10	3.00	0.50	0.0018	0.00	0.27	0.10
CC MCG23	CASTLE ROCK	0.128	0.575	0.893	0.052	15.7	0.36	0.10	3.00	0.50	0.0018	0.00	0.31	0.10
CC MCG25	CASTLE ROCK	0.105	0.279	0.583	0.060	17.7	0.36	0.10	3.00	0.50	0.0018	0.00	0.35	0.11
CC MCG26	CASTLE ROCK	0.252	0.316	0.924	0.048	17.5	0.36	0.10	4.50	0.60	0.0018	0.00	0.35	0.11
CC MCG29	CASTLE ROCK	0.321	0.413	0.859	0.045	17.2	0.36	0.10	4.50	0.60	0.0018	0.00	0.34	0.11
CC MCG30	CASTLE ROCK	0.070	0.251	0.462	0.043	17.2	0.36	0.10	4.50	0.60	0.0018	0.00	0.34	0.11
CC MCG31	CASTLE ROCK	0.119	0.320	0.614	0.042	20.0	0.36	0.10	3.00	0.50	0.0018	0.00	0.40	0.12
CC MCG32	CASTLE ROCK	0.051	0.294	0.521	0.042	20.0	0.36	0.10	3.00	0.50	0.0018	0.00	0.40	0.12
CC MCG33	CASTLE ROCK	0.010	0.064	0.152	0.062	20.0	0.36	0.10	3.00	0.50	0.0018	0.00	0.40	0.12
CC MCG34	CASTLE ROCK	0.249	0.278	0.661	0.042	23.5	0.36	0.10	3.00	0.50	0.0018	0.00	0.47	0.13
198	CASTLE ROCK	0.015	0.057	0.115	0.102	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
196	CASTLE ROCK	0.036	0.194	0.479	0.038	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
194	CASTLE ROCK	0.047	0.178	0.368	0.056	33.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.68	0.17
192	CASTLE ROCK	0.028	0.095	0.189	0.048	25.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.52	0.14
190	CASTLE ROCK	0.012	0.056	0.123	0.077	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
188	CASTLE ROCK	0.021	0.122	0.241	0.068	29.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.60	0.15
186	CASTLE ROCK	0.017	0.095	0.189	0.052	16.5	0.40	0.05	3.00	0.50	0.0018	0.00	0.33	0.11
184	CASTLE ROCK	0.019	0.129	0.258	0.050	47.7	0.40	0.05	3.00	0.50	0.0018	0.00	0.84	0.22
182	CASTLE ROCK	0.011	0.069	0.138	0.060	28.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.58	0.15
180	CASTLE ROCK	0.026	0.185	0.369	0.034	35.1	0.40	0.05	3.00	0.50	0.0018	0.00	0.70	0.17
178	CASTLE ROCK	0.075	0.211	0.422	0.035	31.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.62	0.16
176	CASTLE ROCK	0.036	0.123	0.246	0.045	47.3	0.40	0.05	3.00	0.50	0.0018	0.00	0.84	0.22
175	CASTLE ROCK	0.031	0.193	0.381	0.036	31.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.64	0.16
174	CASTLE ROCK	0.008	0.099	0.199	0.053	9.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.18	0.08
172	CASTLE ROCK	0.019	0.200	0.400	0.048	39.7	0.40	0.05	3.00	0.50	0.0018	0.00	0.79	0.19
170	CASTLE ROCK	0.011	0.038	0.076	0.088	32.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.64	0.16
169	CASTLE ROCK	0.010	0.043	0.085	0.053	32.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.64	0.16
168	CASTLE ROCK	0.033	0.085	0.170	0.073	12.7	0.40	0.05	3.00	0.50	0.0018	0.00	0.25	0.09
166	CASTLE ROCK	0.011	0.095	0.189	0.061	48.4	0.40	0.05	3.00	0.50	0.0018	0.00	0.84	0.22
160	CASTLE ROCK	0.015	0.137	0.275	0.031	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
158	CASTLE ROCK	0.015	0.050	0.169	0.045	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
156	CASTLE ROCK	0.018	0.116	0.233	0.062	26.6	0.40	0.05	3.00	0.50	0.0018	0.00	0.53	0.14
154	CASTLE ROCK	0.095	0.211	0.422	0.043	43.1	0.40	0.05	3.00	0.50	0.0018	0.00	0.82	0.20
152	CASTLE ROCK	0.008	0.091	0.182	0.040	11.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.22	0.09
150	CASTLE ROCK	0.011	0.052	0.104	0.058	19.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.38	0.12
148	CASTLE ROCK	0.028	0.099	0.199	0.063	19.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.38	0.12
146	CASTLE ROCK	0.008	0.034	0.067	0.046	2.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.04	0.06
140	CASTLE ROCK	0.017	0.101	0.203	0.064	30.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.62	0.16
138	CASTLE ROCK	0.058	0.191	0.428	0.035	70.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.95	0.30
136	CASTLE ROCK	0.088	0.227	0.454	0.054	11.3	0.40	0.05	3.00	0.50	0.0018	0.00	0.23	0.09
134	CASTLE ROCK	0.048	0.145	0.289	0.077	35.5	0.40	0.05	3.00	0.50	0.0018	0.00	0.71	0.17
132	CASTLE ROCK	0.026	0.118	0.237	0.045	39.4	0.40	0.05	3.00	0.50	0.0018	0.00	0.79	0.19
130	CASTLE ROCK	0.007	0.046	0.092	0.012	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
128	CASTLE ROCK	0.008	0.062	0.123	0.034	10.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.20	0.09
124	CASTLE ROCK	0.031	0.134	0.267	0.041	27.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.54	0.14
122	CASTLE ROCK	0.014	0.103	0.206	0.035	75.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.98	0.31
120	CASTLE ROCK	0.010	0.062	0.123	0.077	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
118	CASTLE ROCK	0.026	0.111	0.222	0.032	24.2	0.40	0.05	3.00	0.50	0.0018	0.00	0.48	0.13
116	CASTLE ROCK	0.010	0.066	0.133	0.066	2.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.04	0.06
199	CASTLE ROCK	0.021	0.120	0.230	0.036	41.1	0.40	0.05	3.00	0.50	0.0018	0.00	0.81	0.19

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.1)''

100-Year Storm Event		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph	
Catchment Name/ID	User Comment for Catchment	Ct	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f.)	Excess (inches)	Excess (c.f.)	Peak Flow (cfs)	Total Volume (c.f.)
CC_MCG1		0.137	0.210	30.1	6.36	15.7	4.49	10.6	121	283,430	1.54	437,696	130	437,780
CC_MCG2		0.108	0.293	29.0	8.04	15.1	5.68	13.4	449	1,009,198	1.70	1,714,694	514	1,712,767
CC_MCG3		0.179	0.176	22.5	4.55	11.7	3.22	7.6	48	83,635	1.57	131,331	47	130,699
CC_MCG4		0.144	0.167	34.4	5.93	17.9	4.19	9.9	22	59,474	1.57	93,391	25	93,347
CC_MCG5		0.232	0.161	24.2	4.50	12.6	3.18	7.5	25	46,464	1.57	72,962	25	72,778
CC_MCG6		0.116	0.213	28.2	6.11	14.7	4.32	10.2	136	297,370	1.57	466,954	143	466,706
CC_MCG7		0.145	0.179	31.4	5.81	16.3	4.11	9.7	38	91,685	1.57	143,971	41	143,881
CC_MCG8		0.160	0.189	21.6	4.63	11.2	3.27	7.7	79	132,422	1.57	207,940	76	206,850
CC_MCG9		0.121	0.238	21.7	5.46	11.3	3.86	9.1	355	596,365	1.61	958,130	355	955,976
CC_MCG10		0.129	0.214	31.2	6.63	16.2	4.69	11.1	109	262,522	1.67	439,291	124	439,524
CC_MCG11		0.118	0.234	16.6	4.50	8.7	3.18	7.5	375	483,226	1.67	808,606	347	804,690
CC_MCG12		0.120	0.223	27.2	6.16	14.1	4.35	10.3	115	241,613	1.66	400,285	124	399,380
CC_MCG13		0.112	0.236	22.1	5.51	11.5	3.90	9.2	205	350,803	1.66	581,183	209	580,012
CC_MCG14		0.120	0.231	25.1	5.96	13.1	4.21	9.9	157	304,339	1.66	504,562	166	503,881
CC_MCG15		0.136	0.200	26.8	5.63	14.0	3.98	9.4	56	116,625	1.66	193,351	60	192,836
CC_MCG16		0.137	0.213	26.8	5.87	13.9	4.15	9.8	84	174,240	1.66	288,667	90	287,982
CC_MCG17		0.116	0.252	33.0	7.88	17.1	5.57	13.1	272	694,637	1.62	1,127,471	311	1,125,456
CC_MCG18		0.166	0.292	25.6	7.24	13.3	5.11	12.1	151	299,693	1.80	540,133	170	538,740
CC_MCG19		0.150	0.296	32.0	8.75	16.6	6.18	14.6	131	324,551	1.80	584,935	160	583,404
CC_MCG20		0.125	0.276	53.9	12.94	28.0	9.14	21.6	422	1,763,309	1.70	3,004,351	577	3,003,138
CC_MCG21		0.114	0.266	43.9	10.47	22.8	7.40	17.5	260	885,139	1.64	1,452,003	325	1,451,436
CC_MCG22		0.120	0.267	52.3	12.25	27.2	8.66	20.4	307	1,245,468	1.74	2,169,094	423	2,168,656
CC_MCG23		0.104	0.220	32.7	7.04	17.0	4.97	11.7	117	297,370	1.76	524,703	142	524,641
CC_MCG25		0.139	0.220	24.3	5.59	12.6	3.95	9.3	130	243,936	1.79	436,013	144	435,622
CC_MCG26		0.114	0.250	24.5	6.20	12.7	4.38	10.3	309	584,982	1.64	959,770	325	959,119
CC_MCG29		0.114	0.258	26.5	6.76	13.8	4.78	11.3	364	746,676	1.64	1,222,045	387	1,219,600
CC_MCG30		0.138	0.205	23.8	5.26	12.4	3.72	8.8	88	162,624	1.64	266,158	91	265,717
CC_MCG31		0.130	0.232	25.8	6.10	13.4	4.31	10.2	138	276,461	1.81	501,452	158	500,729
CC_MCG32		0.133	0.205	26.5	5.66	13.8	4.00	9.4	58	118,483	1.81	214,908	66	214,333
CC_MCG33		0.396	0.160	24.4	4.50	12.7	3.18	7.5	12	23,232	1.81	42,139	14	42,031
CC_MCG34		0.106	0.278	17.0	5.13	8.8	3.63	8.6	439	578,477	1.86	1,073,130	435	1,065,541
198		0.538	0.307	12.7	4.45	6.6	2.98	7.5	35	34,848	2.10	73,220	34	72,595
196		0.258	0.350	24.2	8.00	12.6	5.66	13.3	45	83,635	2.10	175,727	54	175,063
194		0.223	0.278	20.3	5.84	10.6	4.13	9.7	69	109,190	1.96	213,892	77	213,729
192		0.277	0.211	18.5	4.50	9.6	3.18	7.5	45	65,050	1.86	120,907	45	120,247
190		0.491	0.297	13.2	4.50	6.8	3.18	7.5	27	27,878	2.10	58,576	27	58,292
188		0.239	0.222	17.7	4.51	9.2	3.19	7.5	36	48,787	1.91	93,104	36	92,616
186		0.282	0.165	23.7	4.50	12.3	3.18	7.5	21	39,494	1.74	68,871	23	68,667
184		0.294	0.332	16.6	5.74	8.6	4.05	9.6	34	44,141	2.14	94,251	36	93,719
182		0.396	0.197	19.9	4.50	10.3	3.18	7.5	17	25,555	1.90	48,451	17	48,084
180		0.220	0.263	24.3	6.42	12.6	4.53	10.7	32	60,403	1.98	119,322	38	119,246
178		0.192	0.277	22.8	6.35	11.9	4.49	10.6	99	174,240	1.92	335,139	113	335,521
176		0.298	0.364	15.1	5.29	7.9	3.53	9.5	72	83,635	2.13	178,157	73	177,400
175		0.203	0.248	24.4	6.13	12.7	4.33	10.2	38	72,019	1.93	139,252	44	139,194
174		0.271	0.141	27.6	4.50	14.4	3.18	7.5	9	18,586	1.65	30,708	9	30,587
172		0.233	0.286	23.6	6.68	12.3	4.72	11.1	24	44,141	2.03	89,796	29	89,791
170		0.770	0.213	18.3	4.50	9.5	3.18	7.5	18	25,555	1.94	49,477	18	49,225
169		0.609	0.210	18.6	4.50	9.7	3.18	7.5	16	23,232	1.94	44,979	17	44,737
168		0.340	0.175	22.4	4.50	11.6	3.18	7.5	44	76,666	1.70	130,113	45	129,384
166		0.331	0.310	14.2	4.89	7.4	3.45	8.1	23	25,555	2.14	54,793	24	54,727
160		0.281	0.307	20.5	6.32	10.6	4.47	10.5	22	34,848	2.10	73,220	26	73,265
158		0.449	0.307	14.6	4.94	7.6	3.49	8.2	31	34,848	2.10	73,220	31	73,040
156		0.242	0.201	19.4	4.50	10.1	3.18	7.5	28	41,818	1.87	78,141	28	77,632
154		0.239	0.391	19.1	6.67	9.9	4.46	12.0	149	220,704	2.08	458,436	171	458,208
152		0.276	0.140	27.9	4.50	14.5	3.18	7.5	9	18,586	1.68	31,156	9	31,047
150		0.515	0.160	24.4	4.50	12.7	3.18	7.5	14	25,555	1.77	45,351	15	45,233
148		0.283	0.184	21.2	4.50	11.0	3.18	7.5	40	65,050	1.77	115,438	41	114,733
146		0.738	0.162	24.1	4.50	12.6	3.18	7.5	10	18,586	1.57	29,158	10	29,084
140		0.278	0.221	17.7	4.50	9.2	3.18	7.5	29	39,494	1.92	75,865	29	75,474
138		0.249	0.493	15.9	5.58	8.3	3.73	12.6	109	134,746	2.42	326,121	128	327,109
136		0.148	0.201	23.5	5.12	12.2	3.62	8.5	113	204,442	1.68	343,462	118	342,873
134		0.250	0.292	16.2	5.13	8.4	3.62	8.5	89	111,514	1.98	220,855	90	219,971
132		0.283	0.297	16.9	5.35	8.8	3.78	8.9	46	60,403	2.03	122,645	48	121,890
130		0.578	0.274	20.8	5.86	10.8	4.14	9.8	10	16,262	2.10	34,169	12	34,147
128		0.384	0.139	28.0	4.50	14.6	3.18	7.5	9	18,586	1.66	30,932	9	30,827
124		0.215	0.220	19.9	4.87	10.4	3.44	8.1	47	72,019	1.87	134,934	48	133,867
122		0.261	0.410	10.5	3.67	5.4	2.45	8.0	40	32,525	2.49	80,901	38	79,745
120		0.468	0.289	13.5	4.50	7.0	3.18	7.5	22	23,232	2.10	48,813	22	48,662
118		0.225	0.201	20.3	4.63	10.5	3.27	7.7	38	60,403	1.84	111,073	40	110,273
116		0.421	0.167	23.3	4.50	12.1	3.18	7.5	13	23,232	1.57	36,448	13	36,342
199		0.286	0.299	17.7	5.58	9.2	3.94	9.3	35	48,555	2.05	99,634	37	99,233

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.006a)

McMurdo Gulch Master Plan Existing Conditions
100-Year Storm

Analysis Options

Flow Units CFS
Flow Routing Method KINWAVE
Starting Date JAN-01-2005 00:00:00
Ending Date JAN-02-2005 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	601.510	196.011
External Outflow	591.217	192.657
Surface Flooding	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	10.930	3.562
Continuity Error (%)	-0.106	

Node Depth Summary

Node	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Total Flooding acre-in	Total Minutes Flooded
6	0.10	1.60	6459.00	0 01:10	0	0
16	0.10	1.87	6471.37	0 00:54	0	0
19	0.10	1.60	6440.80	0 01:10	0	0
20	0.09	1.73	6481.12	0 00:55	0	0
38	0.07	1.12	6428.12	0 00:57	0	0
44	0.08	1.53	6462.53	0 00:35	0	0
49	0.04	0.58	6497.78	0 00:56	0	0
51	0.03	0.46	6529.96	0 01:02	0	0
63	0.14	2.24	6349.24	0 00:53	0	0
67	0.12	1.85	6362.85	0 00:56	0	0
70	0.10	1.56	6368.56	0 00:59	0	0
76	0.08	1.09	6386.29	0 01:11	0	0
84	0.09	1.28	6471.18	0 01:01	0	0
86	0.07	1.11	6486.01	0 00:35	0	0
94	0.13	1.79	6481.79	0 01:01	0	0
116	0.00	0.00	6418.00	0 00:00	0	0
118	0.00	0.00	6440.00	0 00:00	0	0
120	0.03	0.91	6426.91	0 00:30	0	0
122	0.03	1.19	6457.29	0 00:30	0	0
124	0.00	0.00	6480.00	0 00:00	0	0
128	0.00	0.00	6460.00	0 00:00	0	0
130	0.00	0.00	6459.00	0 00:00	0	0
132	0.00	0.00	6470.00	0 00:00	0	0
134	0.00	0.00	6507.00	0 00:00	0	0
136	0.00	0.00	6526.00	0 00:00	0	0
138	0.00	0.00	6480.00	0 00:00	0	0
140	0.01	0.46	6512.36	0 00:30	0	0
146	0.00	0.00	6500.00	0 00:00	0	0
148	0.00	0.00	6500.00	0 00:00	0	0
150	0.00	0.00	6500.00	0 00:00	0	0
152	0.00	0.00	6500.00	0 00:00	0	0
154	0.00	0.00	6500.00	0 00:00	0	0
156	0.00	0.00	6500.00	0 00:00	0	0
158	0.00	0.00	6531.00	0 00:00	0	0
160	0.00	0.00	6531.00	0 00:00	0	0
166	0.00	0.00	6338.00	0 00:00	0	0
168	0.00	0.00	6348.00	0 00:00	0	0
169	0.00	0.00	6387.00	0 00:00	0	0
170	0.00	0.00	6339.00	0 00:00	0	0
172	0.03	0.81	6373.80	0 00:35	0	0
174	0.00	0.00	6362.00	0 00:00	0	0
175	0.00	0.00	6402.00	0 00:00	0	0
176	0.00	0.00	6362.00	0 00:00	0	0
178	0.03	1.06	6432.06	0 00:35	0	0
180	0.04	1.10	6444.10	0 00:35	0	0
182	0.00	0.00	6387.00	0 00:00	0	0

EXISTING CONDITIONS

184	0.04	1.17	6452.87	0	00:30	0	0
186	0.00	0.00	6445.00	0	00:00	0	0
188	0.00	0.00	6485.00	0	00:00	0	0
190	0.00	0.16	6526.16	0	00:30	0	0
192	0.00	0.00	6472.00	0	00:00	0	0
194	0.02	0.70	6474.70	0	00:35	0	0
196	0.00	0.00	6485.00	0	00:00	0	0
198	0.00	0.00	6485.00	0	00:00	0	0
CC_MCG1	0.00	0.12	6005.12	0	00:40	0	0
CC_MCG10	0.01	0.13	6130.13	0	00:40	0	0
CC_MCG11	0.01	0.25	6130.25	0	00:30	0	0
CC_MCG12	0.00	0.12	6165.12	0	00:35	0	0
CC_MCG13	0.00	0.16	6165.16	0	00:35	0	0
CC_MCG14	0.00	0.14	6190.14	0	00:35	0	0
CC_MCG15	0.00	0.07	6190.07	0	00:35	0	0
CC_MCG16	0.02	0.74	6275.74	0	00:35	0	0
CC_MCG17	0.03	0.78	6225.78	0	00:40	0	0
CC_MCG18	0.00	0.14	6215.14	0	00:35	0	0
CC_MCG19	0.01	0.13	6215.13	0	00:40	0	0
CC_MCG2	0.01	0.35	6040.35	0	00:40	0	0
CC_MCG20	0.02	0.29	6240.29	0	00:55	0	0
CC_MCG21	0.01	0.20	6240.20	0	00:45	0	0
CC_MCG22	0.01	0.24	6275.24	0	00:50	0	0
CC_MCG23	0.00	0.12	6275.12	0	00:40	0	0
CC_MCG24	0.13	1.86	6337.86	0	00:58	0	0
CC_MCG25	0.00	0.11	6330.11	0	00:35	0	0
CC_MCG26	0.01	0.20	6350.20	0	00:35	0	0
CC_MCG27	0.07	1.17	6416.17	0	00:57	0	0
CC_MCG28	0.10	1.60	6418.70	0	01:11	0	0
CC_MCG29	0.01	0.23	6385.23	0	00:35	0	0
CC_MCG3	0.00	0.09	6040.09	0	00:35	0	0
CC_MCG30	0.00	0.10	6455.10	0	00:35	0	0
CC_MCG31	0.00	0.13	6455.13	0	00:35	0	0
CC_MCG32	0.01	0.16	6493.16	0	00:35	0	0
CC_MCG33	0.00	0.06	6493.06	0	00:35	0	0
CC_MCG34	0.06	2.11	6512.11	0	00:30	0	0
CC_MCG4	0.00	0.04	6060.04	0	00:40	0	0
CC_MCG5	0.00	0.04	6060.04	0	00:35	0	0
CC_MCG6	0.00	0.12	6070.12	0	00:35	0	0
CC_MCG7	0.00	0.07	6080.07	0	00:40	0	0
CC_MCG8	0.00	0.09	6100.09	0	00:35	0	0
CC_MCG9	0.01	0.25	6130.25	0	00:35	0	0
DN1	0.04	1.01	6525.31	0	00:48	0	0
DN2	0.04	0.69	6506.59	0	00:53	0	0
DN3	0.08	1.00	6478.61	0	01:03	0	0
DN4	0.07	1.10	6452.10	0	00:58	0	0
DN5	0.04	0.52	6473.52	0	01:11	0	0
DN6	0.07	0.95	6408.25	0	01:12	0	0
DN7	0.06	0.65	6525.45	0	00:58	0	0
DN8	0.08	0.23	6385.23	0	01:30	0	0
988	0.07	2.36	6494.86	0	00:35	0	0
J10	0.07	1.96	6211.96	0	00:40	0	0
944	0.64	20.00	6180.00	0	00:44	0.00	10
940	0.63	20.00	6147.00	0	00:49	0.00	5
J13	0.59	20.00	6115.00	0	00:48	0.00	5
J14	0.66	20.00	6097.00	0	00:46	0.00	12
C2	0.68	20.00	6084.00	0	00:46	0.00	10
C1	0.68	20.00	6075.00	0	00:47	0.00	11
936	0.69	20.00	6058.00	0	00:44	0.00	9
976	0.18	1.69	6451.69	0	01:03	0	0
968	0.30	3.53	6383.53	0	01:05	0	0
J4	0.32	3.93	6348.93	0	01:03	0	0
960	0.38	20.00	6342.00	0	01:01	0.00	2
956	0.45	5.50	6275.50	0	00:58	0	0
952	0.54	20.00	6255.00	0	00:51	0.00	5
948	0.59	20.00	6230.00	0	00:40	0.00	10
J9	0.59	20.00	6205.00	0	00:39	0.00	9
199	0.00	0.00	6320.00	0	00:00	0	0
996	0.03	0.65	6312.65	0	00:57	0	0
OUTFALL	19.90	20.00	6020.00	0	00:11	0	0
325	2.03	3.33	6443.33	0	00:47	0	0
326	1.15	3.32	6421.32	0	00:56	0	0
330	0.09	1.31	6479.31	0	01:02	0	0
335	6.05	9.24	6466.74	0	01:11	0	0
340	0.08	1.37	6507.37	0	00:53	0	0
345	0.06	1.77	6526.77	0	00:48	0	0
350	0.07	1.47	6480.97	0	00:56	0	0
355	6.01	8.15	6463.15	0	00:58	0	0
360	0.69	7.18	6481.18	0	01:10	0	0
363	0.09	1.34	6531.34	0	00:57	0	0
365	0.09	1.33	6531.33	0	01:05	0	0
375	10.97	13.08	6350.08	0	00:57	0	0
377	0.23	1.14	6339.14	0	01:26	0	0
379	0.24	1.08	6387.08	0	01:30	0	0
380	0.34	5.93	6418.93	0	00:54	0	0
381	0.24	5.68	6406.68	0	00:46	0	0
390	0.47	5.73	6449.73	0	01:12	0	0
393	0.10	1.38	6526.38	0	00:58	0	0
395	0.21	3.85	6473.85	0	01:05	0	0
397	0.08	1.30	6483.30	0	01:03	0	0

399	0.09	1.44	6483.44	0	00:54	0	0
799	0.15	1.37	6451.47	0	01:18	0	0
301	1.14	4.36	6317.36	0	00:57	0	0

Storage Volume Summary

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
325	13.543	8	33.601	19	0 00:47	20.53
326	3.530	0	24.979	2	0 00:56	10.10
330	3.855	1	64.714	11	0 01:02	26.90
335	137.553	38	337.320	94	0 01:11	231.49
340	4.648	0	93.125	7	0 00:53	53.79
345	1.465	0	56.530	5	0 00:48	99.07
350	9.195	1	185.575	14	0 00:56	223.87
355	111.836	39	202.037	70	0 00:58	138.65
360	6.233	6	81.508	82	0 01:10	44.83
363	2.278	0	36.815	3	0 00:57	15.10
365	2.501	1	36.551	13	0 01:05	13.39
375	209.831	55	308.055	80	0 00:57	409.84
377	7.499	0	39.740	2	0 01:26	3.09
379	7.648	2	37.197	10	0 01:30	2.21
380	3.189	3	71.011	57	0 00:54	52.33
381	2.994	3	88.949	90	0 00:46	139.06
390	15.605	4	233.538	60	0 01:12	137.56
393	2.091	1	31.896	13	0 00:58	11.39
395	3.001	3	65.623	68	0 01:05	71.92
397	3.788	1	68.326	10	0 01:03	36.23
399	2.358	1	37.483	14	0 00:54	15.54
799	95.447	4	872.494	37	0 01:18	164.81
301	10.109	17	44.818	74	0 00:57	22.24

Conduit Flow Summary

Max release to McMurdo
Gulch through CUHP

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
1	433.46	0 00:33	8.80	1.00	0.01	0
2	66.10	0 00:35	26.90	1.00	0.00	0
3	13.62	0 00:35	14.59	1.00	0.00	0
988	510.10	0 00:37	8.94	1.00	0.01	0
5	91.10	0 00:35	>50.00	1.00	0.00	0
6	157.90	0 00:35	>50.00	1.00	0.00	0
7	387.02	0 00:35	>50.00	1.00	0.00	0
976	295.93	0 01:07	8.09	1.00	0.00	0
9	305.31	0 01:11	9.34	1.00	0.00	0
10	172.30	0 00:59	7.50	1.00	0.00	0
968	996.22	0 01:07	9.73	1.00	0.02	0
12	1189.29	0 01:05	9.89	1.00	0.02	0
13	325.20	0 00:35	>50.00	1.00	0.00	0
14	144.35	0 00:35	>50.00	1.00	0.00	0
15	409.81	0 00:58	9.79	1.00	0.01	0
960	1677.77	0 01:06	11.37	1.00	0.03	0
17	423.13	0 00:50	>50.00	1.00	0.00	0
18	141.88	0 00:40	>50.00	1.00	0.00	0
956	2185.93	0 01:06	10.80	1.00	0.05	0
20	577.27	0 00:55	>50.00	1.00	0.00	0
21	324.68	0 00:45	>50.00	1.00	0.00	0
952	3039.00	0 01:01	11.91	1.00	0.07	0
23	169.70	0 00:35	>50.00	1.00	0.00	0
24	159.80	0 00:40	>50.00	1.00	0.00	0
948	3287.77	0 01:01	12.05	1.00	0.07	0
26	60.23	0 00:35	>50.00	1.00	0.00	0
27	166.44	0 00:35	>50.00	1.00	0.00	0
28	3442.65	0 01:02	12.88	1.00	0.07	0
29	209.49	0 00:35	>50.00	1.00	0.00	0
30	123.67	0 00:35	>50.00	1.00	0.00	0
31	89.26	0 00:39	6.76	1.00	0.00	0
32	396.83	0 00:43	8.92	1.00	0.01	0
33	124.19	0 00:40	>50.00	1.00	0.00	0
34	347.13	0 00:30	>50.00	1.00	0.00	0
944	3978.96	0 01:03	12.22	1.00	0.09	0
940	4438.63	0 01:02	15.87	1.00	0.08	0
37	76.36	0 00:35	>50.00	1.00	0.00	0
38	354.73	0 00:35	>50.00	1.00	0.00	0
39	40.93	0 00:40	38.71	1.00	0.00	0
40	4481.70	0 01:03	14.74	1.00	0.09	0
41	4511.18	0 01:04	13.54	1.00	0.10	0
42	4610.54	0 01:04	13.03	1.00	0.11	0

Tributary 3

Tributary B

EXISTING CONDITIONS

43	4642.88	0	01:05	13.96	1.00	0.10	0
936	5018.30	0	01:07	13.42	1.00	0.11	0
45	24.91	0	00:40	39.27	1.00	0.00	0
46	142.84	0	00:35	>50.00	1.00	0.00	0
47	24.85	0	00:35	41.21	1.00	0.00	0
48	46.92	0	00:35	35.99	1.00	0.00	0
49	514.00	0	00:40	>50.00	1.00	0.00	0
50	129.90	0	00:40	>50.00	1.00	0.00	0
51	310.79	0	00:40	22.18	1.00	0.00	0
52	89.63	0	00:30				
53	117.56	0	00:35				
54	128.47	0	00:35				
58	28.97	0	00:35	5.38	1.00	0.01	0
220	242.28	0	00:56	8.31	1.00	0.07	0
218	270.15	0	00:55	8.28	1.00	0.08	0
61	11.73	0	00:35				
62	47.55	0	00:30				
63	9.24	0	00:35				
65	48.33	0	00:35				
214	262.29	0	01:11	8.29	1.00	0.08	0
212	38.14	0	00:30	14.76	1.00	0.33	0
70	39.50	0	00:35				
71	21.81	0	00:30	12.01	1.00	0.20	0
210	291.00	0	01:11	9.16	1.00	0.08	0
74	12.74	0	00:35				
75	25.61	0	00:35				
77	31.46	0	00:30				
250	28.14	0	01:04	5.20	1.00	0.01	0
80	44.93	0	00:57	6.28	1.00	0.01	0
238	176.75	0	00:36	5.92	1.00	0.07	0
230	165.24	0	00:58	8.08	1.00	0.04	0
85	170.88	0	00:35				
86	28.37	0	00:35				
87	9.30	0	00:35				
88	14.64	0	00:35				
89	40.61	0	00:35				
90	9.96	0	00:35				
91	54.42	0	00:35				
93	33.92	0	00:30				
298	51.11	0	01:01	11.60	1.00	0.67	0
286	100.84	0	01:02	5.24	1.00	0.04	0
274	144.45	0	01:12	7.25	1.00	0.04	0
262	298.81	0	00:59	9.76	1.00	0.07	0
258	343.33	0	00:57	9.00	1.00	0.10	0
256	398.03	0	00:54	8.20	1.00	0.14	0
104	45.39	0	00:35				
105	26.68	0	00:30	>50.00	1.00	0.00	0
107	35.97	0	00:30				
288	38.42	0	00:35	16.26	1.00	0.29	0
294	76.09	0	00:36	6.38	1.00	0.02	0
110	22.82	0	00:35				
111	17.23	0	00:35				
278	36.20	0	00:32	14.19	1.00	0.32	0
270	37.81	0	00:35	16.19	1.00	0.28	0
266	111.76	0	00:37	7.44	1.00	0.03	0
117	44.41	0	00:35				
119	73.04	0	00:30				
120	9.30	0	00:35				
254	28.81	0	00:35	18.83	1.00	0.16	0
122	45.27	0	00:35				
123	23.74	0	00:30				
124	16.58	0	00:30				
125	18.45	0	00:30				
224	98.88	0	00:51	7.00	1.00	0.03	0
128	53.75	0	00:55	6.12	1.00	0.01	0
216	26.90	0	01:03	13.05	1.00	0.24	0
234	138.59	0	00:59	6.93	1.00	0.04	0
242	44.82	0	01:11	5.16	1.00	0.01	0
282	137.55	0	01:12	8.14	1.00	0.03	0
290	11.39	0	00:59	10.13	1.00	0.10	0
260	2.21	0	01:30	8.94	1.00	0.01	0
129	37.24	0	00:35				
130	17.60	0	01:23	2.85	1.00	0.01	0

Routing Time Step Summary

Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00

Analysis begun on: Tue Apr 25 17:41:22 2006
Total elapsed time: 00:00:02

Offsite, Not Included

1121

CASTLE OAKS ESTATES FILING NO. 1

REGIONAL DRAINAGEWAYS PHASE III DRAINAGE REPORT

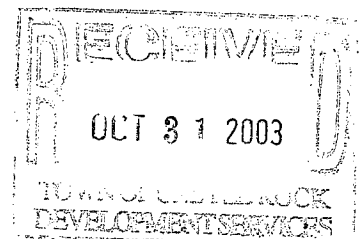
September 17, 2003

Prepared By:

Water & Waste
ENGINEERING, INC.

621 17th Street, Suite 1020
Denver, Colorado 80293

Project #: 02-020.000



Detention Pond 301

Design Calculations

621 Seventeenth Street, Suite 1020
 Denver, Colorado 80293
 Tel. (303) 292-3503 Fax. (303) 292-3547
 Subject _____

DATE 7/18/03 Sheet 1 of 2
 Proj. No. _____
 Proj. Name _____
 Des. By ESP Ckd. By _____

POND 301 OUTLET

10 FR $Q = 9 \text{ cfs @ } 0.74 \text{ AF } H = 77.0 - 71.5 - .5 = 5.0$

USE 1.0' Ø ORIFICE PLATE

$$Q = .67 \times \pi/4 \times \sqrt{64.4 \times 5} = 9 \text{ cfs OK}$$

100 FR

$100 \text{ FR WS} = 78.4 \quad H = 78.4 - 71.5 - .5 = 6.4'$

$$Q = .67 \times \pi/4 \times \sqrt{64.4 \times 6.4} = 10.6 \text{ cfs}$$

$Q_{100 \text{ sp}} = 27 - 10.6 = 16.5 \text{ cfs}$

LET $L = 10'$ SOLVE FOR H

$$Q = 16.5 = 3.1 \times 10 \times H^{1.5} + 2.45 \times 4 \times H^{2.5}$$

$H = 0.5 \quad Q = 12.7$

$H = 0.6 \quad Q = 22$

USE $H = 0.6$

T.O. SPILLWAY = $64.78.4 - 0.6 = \underline{\underline{6477.8}}$

CHECK EMERGENCY SPILLWAY

T.O. DAM = 6480.0

$H = 2.2'$

$Q = 2.2^{1.5} \times 3.1 \times 10 = 101 \text{ cfs} > 70 \text{ cfs OK}$

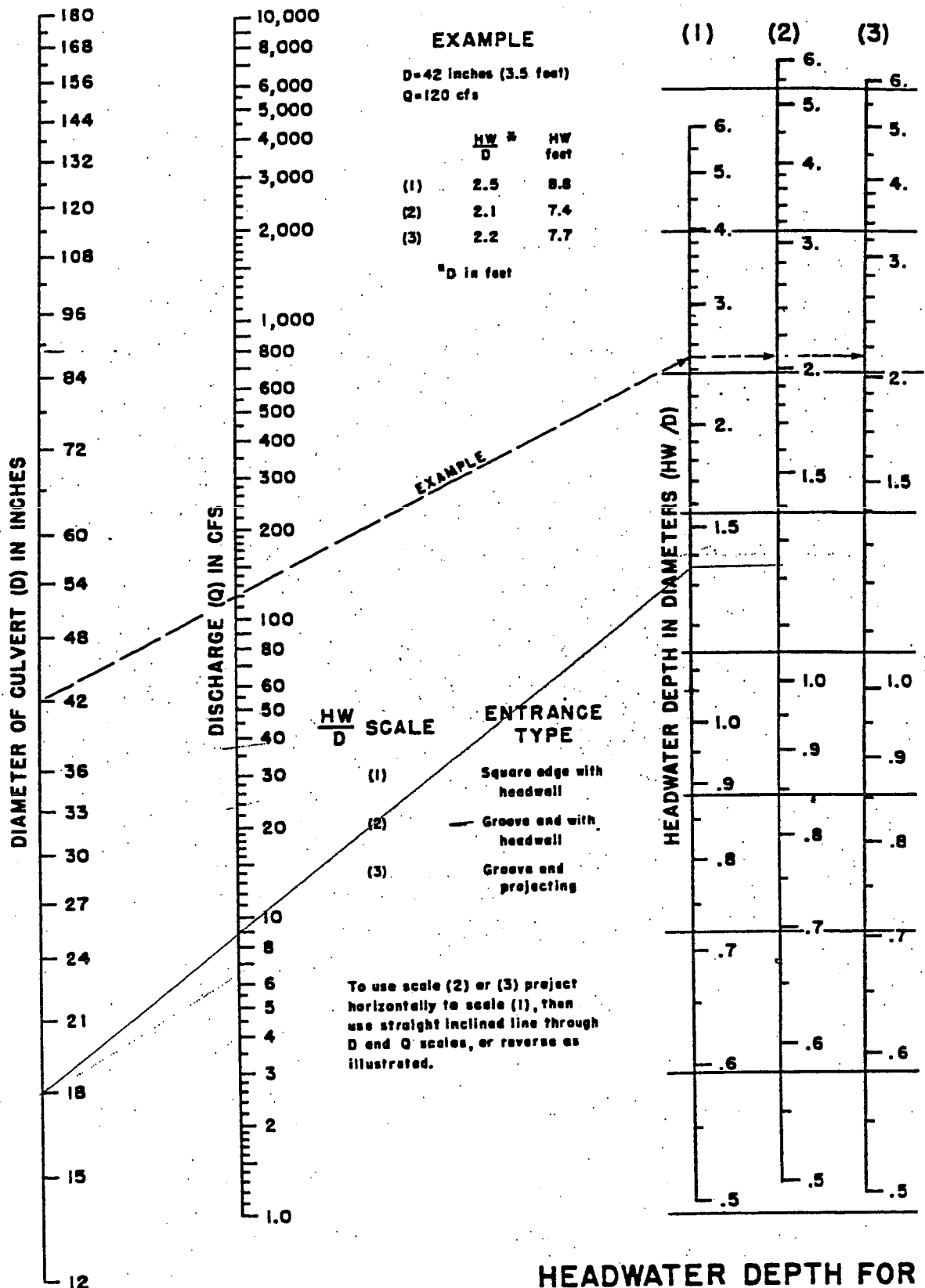
STATION:

For $D \leq 36''$, $Hw \leq 5'$
 For $D > 36''$, $Hw \leq 1.5 * D$
 $n_{gcp} = 0.013$
 $n_{cmp} = 0.024$

Date _____
Calc. By _____

Revision	Date

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2 & 3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

CHART 5

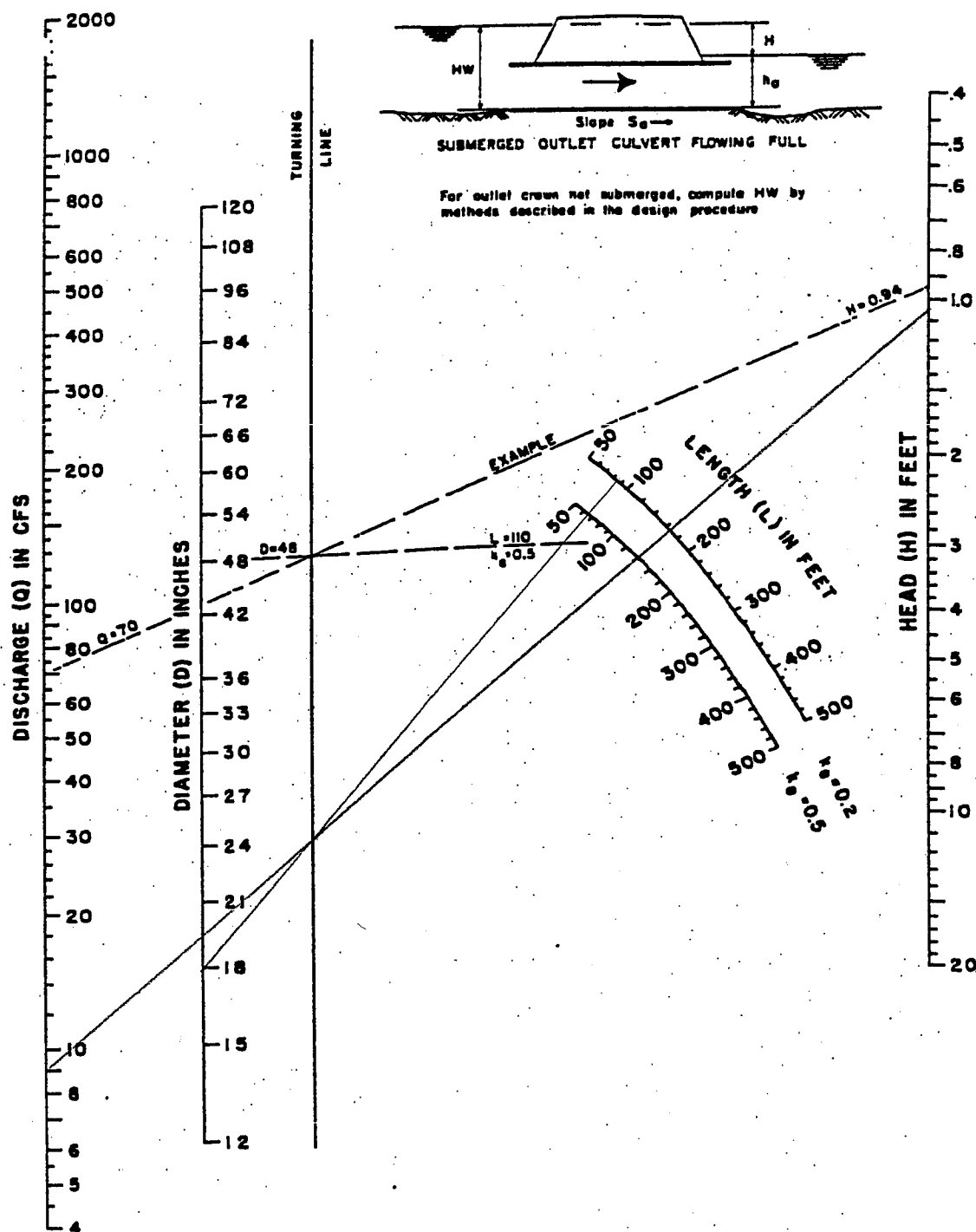
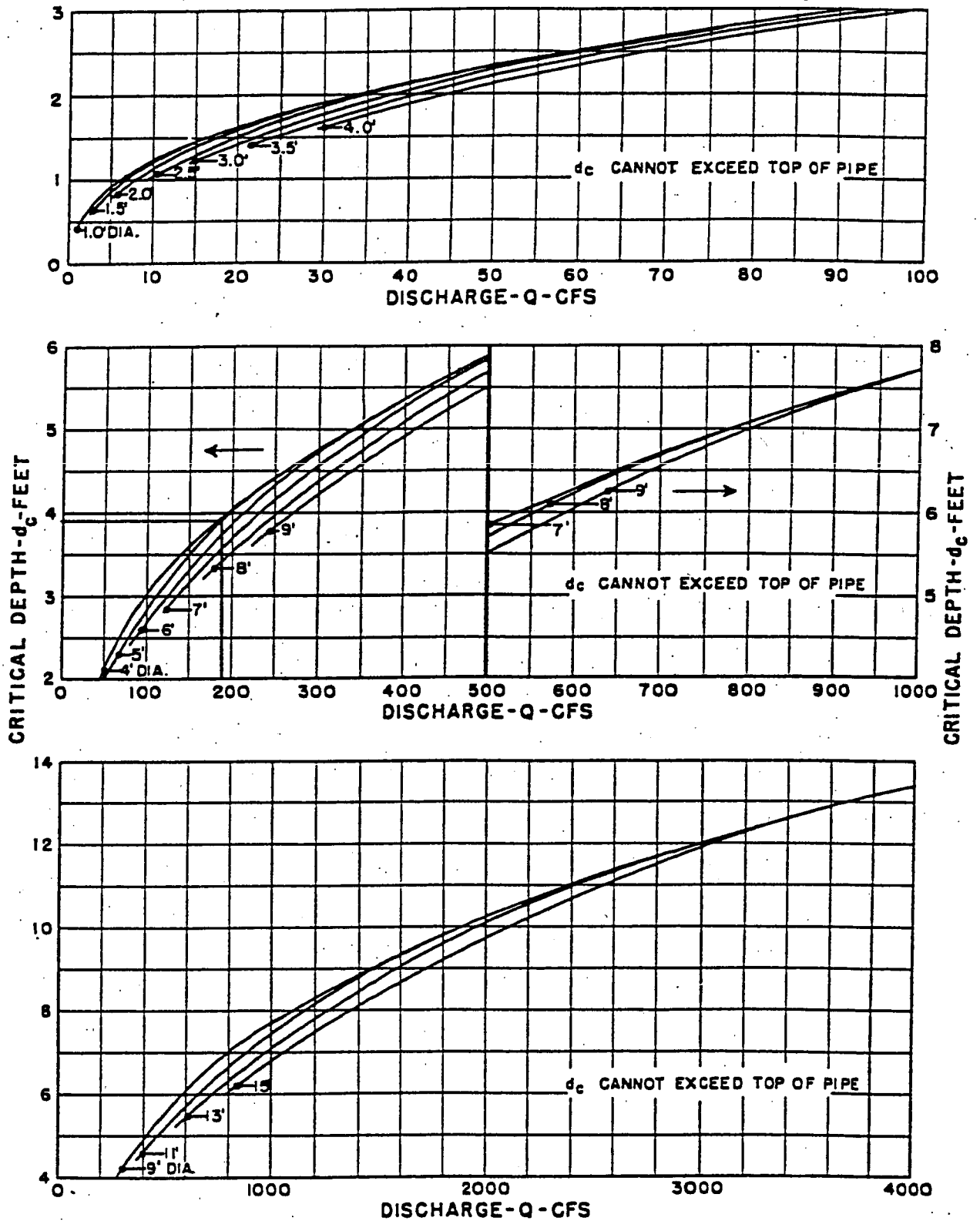


CHART 4



BUREAU OF PUBLIC ROADS
JAN. 1964

CRITICAL DEPTH
CIRCULAR PIPE

Water & Waste ENGINEERING, INC.

621 Seventeenth Street, Suite 1020
Denver, Colorado 80293
Tel. (303) 292-3503 Fax. (303) 292-3547
Subject DB 301 water Quality Outlet Box

DATE 8/3/03 Sheet of
Proj. No.
Proj. Name Castle Oaks Estates
Des. By BAC Ckd. By

10-Yr Weir Flow

$$\text{Front Length} = 6'$$

$$\text{Side Length} = 6'$$

$$Z = \text{Side slope of Box} = 3:1$$

$$\text{Elevation}_{\text{Top of WQ outlet}} = 6474.2$$

$$\text{Elevation}_{10\text{yr}} = 6477.0$$

Assume End contraction losses into box

Assume Flow into box with sloped sides is similar to flow over spillway w/ sloped side.

$$Q_{\text{weir}} = (3.1)(L - .2H)(H)^{1.5} + (2.45)(Z)(H)^{2.5}$$

$$H = 6477.0 - 6474.2 = 2.8'$$

$$\begin{aligned} Q_{\text{weir}} &= (3.1)(5.44)(2.8)^{1.5} + (2.45)(3)(2.8)^{2.5} \\ &= 175 \text{ cfs} >> Q_{10} (9 \text{ cfs}) \quad \text{OK} \end{aligned}$$

10 Yr Orifice Flow

$$\text{Outlet Box Area} = 6' \times 6' = 36 \text{ sqft}$$

Assume worst case grate occupies 40% of Orifice Area

$$\text{Open Area} = (.6)(36) = 21.6 \text{ sqft}$$

$$\text{Required Open Area} = 2 \times \text{Orifice Area} = 2 \times \pi \left(\frac{1.0}{2}\right)^2 = 1.6 \text{ sqft} < 21.6$$

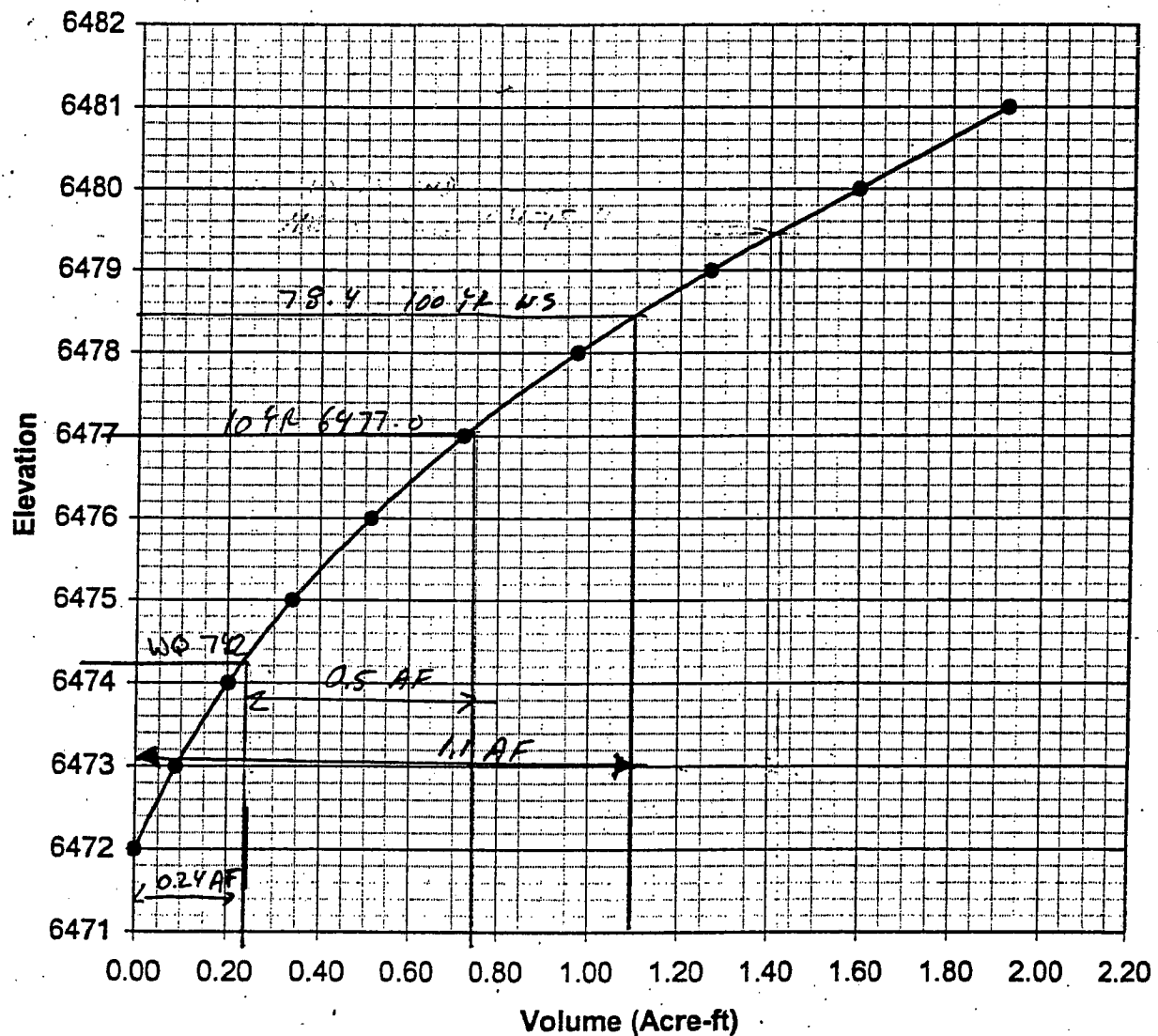
OK

Castle Oaks Drainage Plan

Pond 301
Elevation-Volume Curve

Elevation	Area (ft ²)	Area (AC)	ΔH (ft)	ΔV (ft ³)	ΣV (ft ³)	ΣV (AF)
6472	3,386	0.1	0	0	0	0.00
6473	4,435	0.1	1	3,899	3,899	0.09
6474	5,363	0.1	1	4,892	8,790	0.20
6475	6,783	0.2	1	6,059	14,849	0.34
6476	8,259	0.2	1	7,509	22,358	0.51
6477	9,863	0.2	1	9,049	31,408	0.72
6478	12,102	0.3	1	10,963	42,371	0.97
6479	13,513	0.3	1	12,801	55,172	1.27
6480	15,070	0.3	1	14,284	69,456	1.59
6481	13,270	0.3	1	14,160	83,617	1.92

Pond 301 Elevation-Volume Curve



Castle Oaks Drainage Plan

Pond 301 Outlet Works

Bottom elevation = 6471.5

Crest elevation = 6480.5

100-yr WS = 6478.4

10-yr WS = 6477

WQ WS = 6474.2

H₁₀₀ = 7.1 ft

H₁₀ = 5.6 ft

H_{WQ} = 2.7 ft

100-yr Q = 27 cfs

10-yr Q = 9 cfs

A₁₀₀ = 2.5 ft²

A₁₀ = 0.8 ft²

φ₁₀₀ = 1.8 ft

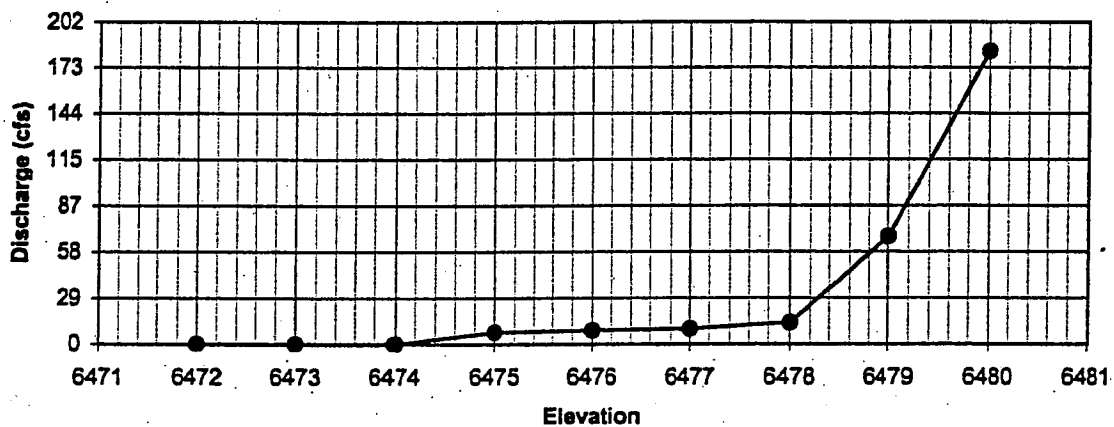
φ₁₀ = 1.0 ft

φ₀ = 2

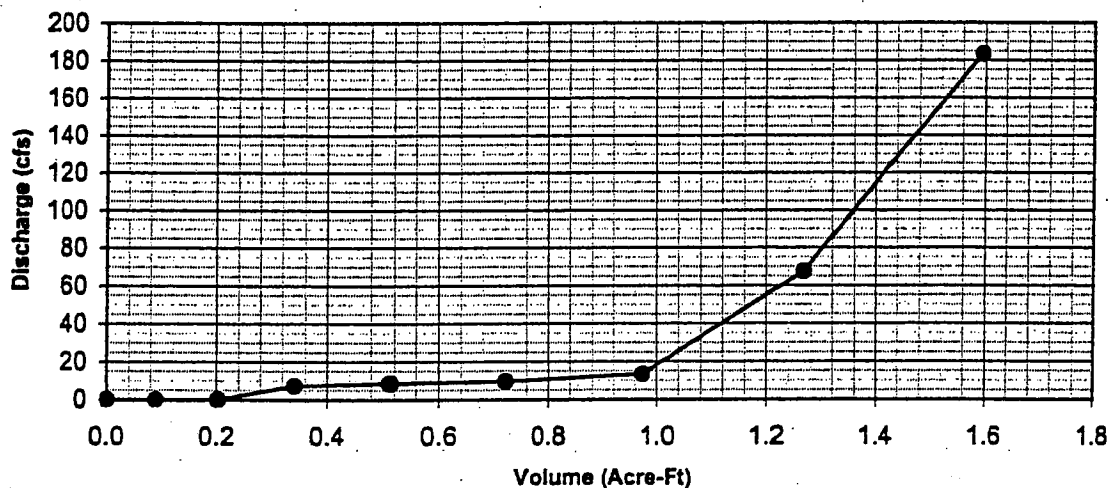
Q₀ = 1

Elevation	H (ft)	V (AF)	Q outlet	Q spillway	Q total
6472	0.5	0.0	0	0	0
6473	1.5	0.1	0	0	0
6474	2.5	0.2	0	0	0
6475	3.5	0.3	7	0	7
6476	4.5	0.5	8	0	8
6477	5.5	0.7	9	0	9
6478	6.5	1.0	10	2.9	13
6479	7.5	1.3	11	56.2	67
6480	8.5	1.6	12	171.5	183

Elevation-Discharge Curve



Storage-Discharge Curve



621 Seventeenth Street, Suite 1020
 Denver, Colorado 80293
 Tel. (303) 292-3503 Fax. (303) 292-3547
 Subject _____

DATE 1/25/03 Sheet 1 of 2
 Proj. No. 02-070-000
 Proj. Name CASTLE OAKS RETENTION BASIN 30
 Des. By EKL Ckd. By BAC

I. ESTIMATE WATER QUALITY CAPTURE VOLUME

- Watershed IMPERVIOUSNESS = $I = 41.1\%$
- WATERSHED AREA = $A = 13.2$
- WQCU = $(0.91I^3 - 1.19I^2 + 7.98I) \frac{A}{12} = 0.20$
- DESIGN VOL = $WQCU \cdot 1.2 = 0.24$

II DESIGN WATER QUALITY OUTLET

A. $H_2 = 1.8 \text{ ft.} = DWQ$

B. ORIFICE PLATE

1. $A_{\text{hole}} = \frac{WQCU}{K_{d0}} = \frac{WQCU}{0.013D_{h0}^2 + 0.22D_{h0} - 0.10} = \frac{0.20}{0.013(1.8)^2 + 0.22(1.8) - 0.10}$

$A_{\text{hole}} = 0.592$

(FROM WDFCD FIG. EAB-3)

2. TYPE OF HOLE

a. CIRCULAR

1. Diameter = $.813 = \frac{13}{16}$ FROM WDFCD FIG. 5
 2. $N_c = 1$

b. RECTANGULAR

1. WIDTH = $\frac{A_{\text{hole}}}{2} = \frac{.592}{2} = .296$ WIDE
 2. $N_c = 1$

C. WE CIRCULAR BECAUSE $.813 > .296$

3. VERTICAL HOLE SPACING

a. Vertical Hole spacing = $4''$

b. number of rows = $\frac{H_2}{4} = \frac{1.8}{0.333} = 5.4 \approx 5 \text{ Rows}$

C. TRASH RACK

1. USE BAR GRATE

2. ESTIMATE TRASH RACK OPEN AREA

$\frac{A_{\text{tr}}}{A_{\text{ot}}} = 77(e^{-0.124D})$ where $D = .813$

$\frac{A_{\text{tr}}}{A_{\text{ot}}} = 77(e^{-0.124(.813)})$

$\frac{A_{\text{tr}}}{A_{\text{ot}}} = 69.62$ FROM FIG. 7 WDFCD

$A_{\text{ot}} = 0.52 \cdot 5.4 = 2.808 \text{ m}^2$

Actual hole size
 Fig. 7 WDFCD

$A_{\text{open rack}} = A_{\text{tr}} = 0.5 \cdot \frac{A_{\text{tr}}}{A_{\text{ot}}} \cdot A_{\text{ot}} = 0.5 \cdot 69.62 \cdot 2.808 = 97.75 \approx 98$

621 Seventeenth Street, Suite 1020
 Denver, Colorado 80293
 Tel. (303) 292-3503 Fax. (303) 292-3547
 Subject

DATE 6/25/03 Sheet 2 of 2
 Proj. No. CASTLE OAKS 02-020.000
 Proj. Name BASIN 301
 Des. By EKL Ckd. By BAC

3. GROSS TRASH RACK AREA

- SET CROSS ROD SPACING OF BAR GRATE AT $\frac{13}{16}$ "
- $R = 0.71$
- $A_{gross rack} = \frac{A_{open rack}}{0.71} = 97.75 \text{ in}^2 / 0.71 = 137.68 \text{ in}^2$

4. TRASH RACK DIMENSIONS

b. BAR GRATE TRASH RACK W/ CIRCULAR OPENINGS

1. Width of Concrete opening = $W_H = 20'$ from UDFCD 6B-1

$$\begin{aligned} 2. \text{ TRASH RACK HEIGHT} &= H_2 + 2'4" - 4" + 2" \\ &= 1.8' + 2' + 2" \\ &= 3.967' \approx 4' \end{aligned}$$

CHECK AGAINST TOTAL GROSS AREA

$$\text{WIDTH} = \frac{A_{gross rack}}{\text{HEIGHT}} = \frac{137.68 \text{ in}^2}{3.967' (12")} = 2.89" \approx 3"$$

$$2' = 24" > 3"$$

USE 24" WIDTH

D. STEEL FLOW CONTROL PLATE

1. CIRCULAR OPENINGS

a. PLATE WIDTH

$$1. W_{column} = 6" \quad \text{UDFCD FIG 6A-1}$$

$$2. W_{row} = W_{column} \cdot N_{column} = 6" \cdot 1 = 6"$$

$$3. W_{plate} = W_{row} + 6" = 6" + 6" = 12" = 1 \text{ ft.}$$

b. PLATE HEIGHT

$$1. H_2 = 1.8'$$

$$2. \text{ PLATE Depth Below lowest perforation} = 2'$$

$$3. \text{ Add } 2" \text{ for Attachment to concrete}$$

$$4. \text{ PLATE HEIGHT} = 1.8' + 2' + 2" = 3.967' \approx 4'$$

$$c. \text{ PLATE THICKNESS} = 1/4" \quad (\text{From UDFC \& Fig 5})$$

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Sheet 1 of 3

Designer: EKL
 Company: WATER & WASTE ENGINEERING
 Date: June 30, 2003
 Project: 02-020-000
 Location: CASTLE OAKS, DETENTION BASIN 301

1. Basin Storage Volume

- A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
 B) Contributing Watershed Area (Area)
 C) Water Quality Capture Volume (WQCV)
 ($WQCV = 1.0 * (0.91 * I^2 - 1.19 * I + 0.78 * I)$)
 D) Design Volume: $Vol = (WQCV / 12) * Area * 1.2$

$I_a =$ 41.10 %
 $i =$ 0.41

Area = 13.20 acres

WQCV = 0.18 watershed inches

Vol = 0.241 acre-feet

2. Outlet Works

- A) Outlet Type (Check One)

☒ Orifice Plate
☐ Perforated Riser Pipe
☐ Other: _____

- B) Depth at Outlet Above Lowest Perforation (H)

H = 1.80 feet

- C) Required Maximum Outlet Area per Row, (A_o)

$A_o =$ 0.59 square inches

- D) Perforation Dimensions (enter one only):

- i) Circular Perforation Diameter OR
 ii) 2" Height Rectangular Perforation Width

$D =$ 0.813 inches, OR
 $W =$ _____ inches

- E) Number of Columns (nc, See Table 6a-1 For Maximum)

nc = 1 number

- F) Actual Design Outlet Area per Row (A_o)

$A_o =$ 0.52 square inches

- G) Number of Rows (nr)

nr = 5 number

- H) Total Outlet Area (A_{ot})

$A_{ot} =$ 2.80 square inches

3. Trash Rack

- A) Needed Open Area: $A_t = 0.5 * (\text{Figure 7 Value}) * A_{ot}$

$A_t =$ 98 square inches

- B) Type of Outlet Opening (Check One)

☒ ≤ 2 " Diameter Round
☐ 2" High Rectangular
☐ Other: _____

- C) For 2", or Smaller, Round Opening (Ref.: Figure 6a):

- i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1

$W_{conc} =$ 6 inches

- ii) Height of Trash Rack Screen (H_{TR})

$H_{TR} =$ 52 inches



PHASE I DRAINAGE REPORT FOR

PINE CANYON CASTLE ROCK, COLORADO

Located in parts of Section 34, 35 & 36, Township 7 South,
Range 67 West of the 6th Principal Meridian, and part of Section 1,
Township 8 South, Range 67 West of the 6th Principal Meridian

Prepared for:

JWR Family Limited Partnership, LLLP
5975 E. Jamison Pl
Centennial, CO 80112
Contact: Kurt Walker
Phone: 303.587.0102

Prepared by:

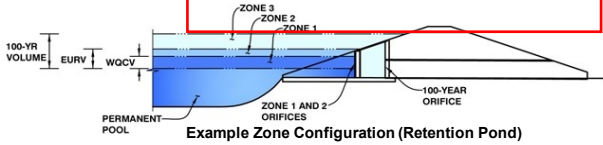
CORE Consultants, Inc.
1950 W. Littleton Blvd., Suite 109
Littleton, CO 80120
Contact: Michael Goodhue, PE
Phone: 303-703-4444
CORE Project Number: 25-004

April 2025

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: Pine Canyon - Phase 1 Drainage Report
Basin ID: Basin L



Watershed Information

Selected BMP Type =	EDB	Note: L / W Ratio < 1
Watershed Area =	28.76 acres	L / W Ratio = 0.34
Watershed Length =	650 ft	
Watershed Length to Centroid =	300 ft	
Watershed Slope =	0.050 ft/ft	
Watershed Imperviousness =	54.40% percent	
Percentage Hydrologic Soil Group A =	0.0% percent	
Percentage Hydrologic Soil Group B =	0.0% percent	
Percentage Hydrologic Soil Groups C/D =	100.0% 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.

Water Quality Capture Volume (WQCV) =	0.524 acre-feet	
Excess Urban Runoff Volume (EURV) =	1.490 acre-feet	
2-yr Runoff Volume (P1 = 1.06 in.) =	1.226 acre-feet	1.06 inches
5-yr Runoff Volume (P1 = 1.43 in.) =	1.934 acre-feet	1.43 inches
10-yr Runoff Volume (P1 = 1.66 in.) =	2.405 acre-feet	1.66 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	2.538 acre-feet	
50-yr Runoff Volume (P1 = 2.26 in.) =	3.754 acre-feet	2.26 inches
100-yr Runoff Volume (P1 = 2.6 in.) =	4.558 acre-feet	2.60 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	5.737 acre-feet	
Approximate 2-yr Detention Volume =	1.177 acre-feet	
Approximate 5-yr Detention Volume =	1.845 acre-feet	
Approximate 10-yr Detention Volume =	2.093 acre-feet	
Approximate 25-yr Detention Volume =	2.007 acre-feet	
Approximate 50-yr Detention Volume =	2.467 acre-feet	
Approximate 100-yr Detention Volume =	2.846 acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.524 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.966 acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	1.618 acre-feet
Total Detention Basin Volume =	3.108 acre-feet
Initial Surge Volume (ISV) =	68 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{L/W}) =	2
Initial Surge Area (A _{ISV}) =	208 ft ²
Surge Volume Length (L _{ISV}) =	14.4 ft
Surge Volume Width (W _{ISV}) =	14.4 ft
Depth of Basin Floor (H _{FLOOR}) =	0.99 ft
Length of Basin Floor (L _{FLOOR}) =	216.4 ft
Width of Basin Floor (W _{FLOOR}) =	113.4 ft
Area of Basin Floor (A _{FLOOR}) =	24,537 ft ²
Volume of Basin Floor (V _{FLOOR}) =	8,910 ft ³
Depth of Main Basin (H _{MAIN}) =	4.18 ft
Length of Main Basin (L _{MAIN}) =	249.8 ft
Width of Main Basin (W _{MAIN}) =	146.8 ft
Area of Main Basin (A _{MAIN}) =	36,683 ft ²
Volume of Main Basin (V _{MAIN}) =	127,102 ft ³
Calculated Total Basin Volume (V _{total}) =	3.126 acre-feet

Depth Increment =	0.50	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)
Top of Micropool	0.00		14.4	14.4	208		0.005		
ISV	0.33		14.4	14.4	208		0.005	68	0.002
	0.50		14.4	14.4	208		0.005	104	0.002
	1.00		49.1	31.4	1,542		0.035	304	0.007
	1.50		151.1	81.4	12,299		0.282	3,339	0.077
Floor	1.82		216.4	113.4	24,537		0.563	9,122	0.209
	2.00		217.8	114.8	25,014		0.574	13,581	0.312
Zone 1 (WQCV)	2.37		220.8	117.8	26,007		0.597	23,020	0.528
	2.50		221.8	118.8	26,361		0.605	26,424	0.607
	3.00		225.8	122.8	27,739		0.637	39,947	0.917
	3.50		229.8	126.8	29,150		0.669	54,168	1.244
Zone 2 (EURV)	3.87		232.8	129.8	30,214		0.694	65,150	1.496
	4.00		233.8	130.8	30,592		0.702	69,102	1.586
	4.50		237.8	134.8	32,067		0.736	84,766	1.946
	5.00		241.8	138.8	33,574		0.771	101,175	2.323
	5.50		245.8	142.8	35,112		0.806	118,345	2.717
Z3 (100+1/2WQCV)	5.98		249.6	146.7	36,619		0.841	135,559	3.112
	6.00		249.8	146.8	36,683		0.842	136,292	3.129
	6.50		253.8	150.8	38,285		0.879	155,033	3.559
	7.00		257.8	154.8	39,920		0.916	174,583	4.008
	7.50		261.8	158.8	41,587		0.955	194,959	4.476
	8.00		265.8	162.8	43,285		0.994	216,175	4.963
	8.50		269.8	166.8	45,016		1.033	238,249	5.469
	9.00		273.8	170.8	46,778		1.074	261,197	5.996
	9.50		277.8	174.8	48,573		1.115	285,033	6.543
	10.00		281.8	178.8	50,400		1.157	309,775	7.111
	10.50		285.8	182.8	52,258		1.200	335,438	7.701
	11.00		289.8	186.8	54,149		1.243	362,039	8.311
	11.50		293.8	190.8	56,072		1.287	389,592	8.944
	12.00		297.8	194.8	58,026		1.332	418,115	9.599
	12.50		301.8	198.8	60,013		1.378	447,624	10.276
	13.00		305.8	202.8	62,031		1.424	478,134	10.976
	13.50		309.8	206.8	64,082		1.471	509,661	11.700
	14.00		313.8	210.8	66,165		1.519	542,221	12.448
	14.50		317.8	214.8	68,279		1.567	575,830	13.219
	15.00		321.8	218.8	70,426		1.617	610,505	14.015
	15.50		325.8	222.8	72,604		1.667	646,261	14.836
	16.00		329.8	226.8	74,815		1.718	683,115	15.682
	16.50		333.8	230.8	77,058		1.769	721,082	16.554
	17.00		337.8	234.8	79,332		1.821	760,178	17.451
	17.50		341.8	238.8	81,639		1.874	800,419	18.375
	18.00		345.8	242.8	83,977		1.928	841,822	19.326
	18.50		349.8	246.8	86,348		1.982	884,402	20.303
	19.00		353.8	250.8	88,751		2.037	928,175	21.308
	19.50		357.8	254.8	91,185		2.093	973,158	22.341
	20.00		361.8	258.8	93,652		2.150	1,019,366	23.401
	20.50		365.8	262.8	96,150		2.207	1,066,815	24.491
	21.00		369.8	266.8	98,681		2.265	1,115,522	25.609
	21.50		373.8	270.8	101,244		2.324	1,165,501	26.756
	22.00		377.8	274.8	103,838		2.384	1,216,771	27.933
	22.50		381.8	278.8	106,465		2.444	1,269,345	29.140
	23.00		385.8	282.8	109,123		2.505	1,323,241	30.377
	23.50		389.8	286.8	111,814		2.567	1,378,474	31.645
	24.00		393.8	290.8	114,537		2.629	1,435,060	32.944
	24.50		397.8	294.8	117,291		2.693	1,493,016	34.275
	25.00		401.8	298.8	120,078		2.757	1,552,357	35.637
	25.50		405.8	302.8	122,896		2.821	1,613,099	37.032
	26.00		409.8	306.8	125,747		2.887	1,675,259	38.459



**JURISDICTIONAL DETERMINATION
FOR THE CANYONS SOUTH DEVELOPMENT SITE**

December 22, 2017

Mr. Aaron Eilers
Denver Regulatory Office
U.S. Army Corps of Engineers
9307 S. Wadsworth Blvd.
Littleton, CO 80128-6901

RE: Request for Approved Jurisdictional Determination for The Canyons South
Development Site, Douglas County, Colorado

Dear Mr. Eilers:

On behalf of Lowe Enterprises (Lowe), ERO Resources Corporation (ERO) is requesting an approved Jurisdictional Determination (JD) for the wetlands and other waters associated with two drainages on the Canyons South property (property) located east of the intersection at Founders Parkway and Crowfoot Valley Road in Castle Rock, Douglas County, Colorado (project area; Figure 1). In 2005, the Corps issued a JD for multiple drainages on the property and found them to be nonjurisdictional and not regulated under Section 404 of the Clean Water Act (File No. 200580638). On November 30, December 1, and December 8, 2017, ERO assessed the project area for potential wetlands and waters of the U.S. (2017 site visits).

The property is a roughly 1,600-acre parcel within an undeveloped portion of Castle Rock. The legal description of the project area is Sections 17 through 20, 30, and 31, Township 7 South, Range 66 West and Sections 14 and 15, Township 7 South, Range 67 West of the 6th Principal Meridian in Douglas County, Colorado (Figure 1). The UTM coordinates of the approximate center of the project area are NAD 83; 515558mE, 4363401mN, Zone 13N. The latitude/longitude of the project area is 39.419996°N/104.819251°W. The elevation of the project area is approximately 6,400 feet above sea level. Photos of the project area are attached.

The project area consists primarily of upland grasslands and Gambel oak (*Quercus gambelii*) woodlands (Figures 2a through 2c). During the 2017 site visits, the dominant vegetation in the upland understory consisted of smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), blue grama (*Bouteloua gracilis*), purple threeawn (*Aristida purpurea*), and western wheatgrass (*Pascopyrum smithii*). The property is actively grazed by livestock.

The property is bounded by residential development and undeveloped lands on the north and west, the Pradera Golf Course and residential community on the northeast, and undeveloped lands and limited residential development on the south and southeast (Figures 2a through 2d).

Several drainages (Scott Gulch, Drainage 1, Drainage 2, and Drainage 3) traverse the property, generally trending from southwest to northeast toward Cherry Creek. Lowe retained ERO to

Denver
1842 Clarkson St.
Denver, CO 80218
303.830.1188

Durango
1015 ½ Main Avenue
Durango, CO 81301
970.422.2136

Hotchkiss
P.O. Box 932
161 South 2nd St.
Hotchkiss, CO 81419
970.872.3020

Idaho
4001 East Main Street
Emmett, ID 83617
208.365.7684

www.eroresources.com

Consultants in
Natural Resources
and the Environment

document the conditions of three of the drainages – Scott Gulch, Drainage 1, and Drainage 3 – with the intention of determining their jurisdictional status as potential waters of the U.S. Drainage 2, which is located on the southern portion of the property was excluded from the field survey and the property owner is not seeking a jurisdictional determination of this feature. A discussion of the drainages of interest is provided below.

Scott Gulch

Scott Gulch (Gulch) traverses the center of the project area and is shown as an intermittent stream on the U.S. Geological Survey (USGS) Castle Rock North quadrangle. The headwaters of the Gulch originate in the west corner of the project area (Figure 2b). During the 2017 site visits, sporadic wetlands were identified along and within the Gulch channel, as well as short sections of upland inclusions/swales that lacked characteristics of a defined bed and bank. Review of historic imagery on Google Earth (years 1937, 1956, and 1999) (Google Earth Pro 2017) appear to indicate that historically the Gulch was a continuous feature that reached Cherry Creek. Subsequently, development activities in the vicinity of the Gulch contributed to notable alterations of the drainage channel within the project area and downstream. In 2003, construction of the Pradera community was in the initial phases, which directly and indirectly affected downstream flows within the Gulch. In 2004, an irrigation pond was constructed on the Gulch channel (see 2005 Google Earth image). During 2013, flooding contributed to excessive bank erosion and instability and incision along the Gulch, which was evident during the 2017 site visits (Photo 1).

The wetlands associated with the Gulch occur intermittently within and along the margin of the channel and consist predominantly of foxtail barley (*Hordeum jubatum*), meadow foxtail (*Alopecurus pratensis*), redtop (*Agrostis gigantea*), Baltic rush (*Juncus balticus*), and Nebraska sedge (*Carex nebrascensis*) (Photos 2 and 3; Figure 2b). The upstream section of the Gulch is a narrow and shallow channel, ranging in width from 2 to 4 feet with a rough depth of 0.5 to 1 foot. Short sections of upland swales/inclusions occur in the upper portion of the Gulch, which were defined by the loss of channel characteristics (bed and bank) and dominance of upland vegetation species (Photos 4, 5, and 6).

A large stock pond is situated approximately halfway down the Gulch in the project area. The stock pond exhibits evidence of recent ponding, including surface cracks and limited vegetation cover (Photo 7; Figure 2b). An upland berm separates the stock pond from the downstream Gulch channel, at which point the Gulch channel is headcut and incised (Photo 8). The width of the Gulch channel increases to approximately 25 to 30 feet with an approximate depth of 10 to 15 feet. According to the current landowner, following the 2013 flooding events, this section of the Gulch degraded. Along this reach, wetlands occur within the Gulch channel bed and ponded water was noted in areas (Photo 9). Sections of the channel are also devoid of vegetation and several segments support upland vegetation species. A datapoint (DP1) conducted on the downstream end of the Gulch channel

documented nonwetland conditions, including dominance by upland species and a lack of hydric soils and hydrology indicators (Photo 10; Figure 2b).

The Gulch continues from the property onto adjacent open space lands before entering the Pradera Golf Course property (Figure 2c). This section of the Gulch is a sandy bottom channel that mostly lacks vegetation within the Gulch channel (Photo 11). The drainage meets a culvert that passes under Raintree Drive and continues downstream before connecting with an irrigation pond on the Pradera Golf Course. This section of the Gulch channel supports cattail wetlands and may be augmented by stormwater runoff from Raintree Drive (Photo 12). According to the acting maintenance superintendent of the Pradera Golf Course, the irrigation pond, which was constructed on the Gulch in 2004, is primarily filled using potable water sourced by Pinery Water. Outflow from the irrigation pond occurs only during peak storm events, such as the 2013 event (Boyd, pers. comm. 2017). Two overflow weirs are located downgradient of the irrigation pond and across the golf course greens (Figure 2a); the downstream weir was constructed above an outlet culvert that diverts stormwater runoff and overflow waters from the irrigation pond. A cattail and willow scrub-shrub wetland occurs directly downstream of the weir (Photo 13; Figure 2a, DP2]). The scrub-shrub wetland transitions into an upland swale that is dominated by upland grasses (blue gramma [*Bouteloua gracilis*], cheatgrass [*Bromus tectorum*], smooth brome [*Bromus intermis*]) and upland forbs (Photo 14; DP3 and DP4). The upland swale continues for roughly 1,000 feet (Photo 15) before reaching a rock weir and culvert that continues under Pradera Parkway. A detention pond located southeast of the Gulch and Pradera Parkway also feeds into the weir/culvert associated with Pradera Parkway (Photo 16). The drainage continues downstream and north of Pradera Parkway before meeting Cherry Creek, a jurisdictional water of the U.S., roughly 1-mile northeast of the Pradera residential community. This section of the Gulch is likely fed primarily by stormwater runoff and from the detention pond south of Pradera Parkway; the Gulch channel within this section supports a dense cattail wetland (Photo 17).

Drainage 1

The unnamed Drainage 1 occurs on the southern section of the project area (Figure 2c). Drainage 1 is shown as an intermittent stream on the USGS quadrangle and is a tributary to McMurdo Gulch. Review of historic imagery indicates that the drainage was historically present with a continuous channel along its current alignment (Google Earth 1937, 1955). A large upland inclusion on the downstream end of the drainage is visible on the 1993 imagery, which was consistent with field observations during the 2017 site visits.

The very downstream portion of the drainage before the confluence with McMurdo Gulch is a sandy swale that lacks defined banks (Photo 18). Sporadic pine tree saplings occur within the drainage (Photo 19). The upland inclusion visible on Google Earth (2017) lacks a defined bed and bank and supports a dominance of mature ponderosa pine (*Pinus ponderosa*) trees (Photo 20). No wetlands were observed within the downstream portion of the drainage.

Drainage 3

The unnamed Drainage 3 occurs on the north end of the property (Figure 2d). Drainage 3 is shown as an intermittent stream on the USGS quadrangle. The upstream end of the drainage begins on the northern portion of the property. The upstream end of the drainage is an upland swale with no characteristics of a channel bed and bank. The drainage continues as an upland swale northeast across the property and onto the adjacent property (Photos 21 and 22). The drainage remains an upland feature for the remainder of its length; the drainage terminates on the southeast corner of the Pradera Golf Course where it meets the golf greens and a small irrigation pond. Review of historic imagery in Google Earth shows a drainage feature present in the location of Drainage 3 during 1937 and 1999. In 2004, the Pradera Golf Course was constructed and a small irrigation pond was created on the downstream end of Drainage 3 (Google Earth image 2004).

Summary

Based on the 2017 site visits and review of historic Google Earth aerial imagery, Scott Gulch, Drainage 1, and Drainage 3 do not appear to have continuous hydrologic connections to any other potential or known waters of the U.S. Scott Gulch is a sandy channel with intermittent sections of upland swales/breaks upstream of the large stock pond. Below the stock pond, wetlands are contained within the channel and may be primarily supported by groundwater, a result of the degraded channel invert, and intermittent storm flows. The wetlands transition into a channel with a sandy bed for most of the reach to Raintree Drive. Construction of the Pradera Golf Course irrigation pond on the drainage created a barrier that prevents conveyance of downstream flows except during major storm events. The upland swale downstream of the lower overflow weir suggests that flows from the irrigation pond overflow rarely reach the culvert below Pradera Parkway. Based on these observations, ERO believes that flows within Scott Gulch south of Pradera Parkway do not reach Cherry Creek and that flows below the irrigation pond occur only during major storm events.

Drainage 1 contains a significant upland swale on the downstream end of the drainage and does not show evidence of intermittent flows. ERO believes that Drainage 1 does not have a surface connection with McMurdo Gulch or other waters of the U.S.

Drainage 3 is an upland swale and does not show evidence of intermittent flows. ERO believes that Drainage 3 does not have a surface connection with a downstream water of the U.S.

On behalf of Lowe, ERO requests an approved JD of Scott Gulch and Drainage 1 as described above. Please let us know if you need additional information to make this determination.

Please contact me with any questions at ecrumb@eroresources.com.

Sincerely,



Esa Crumb
Biologist

cc: Erik Clore, Lowe Enterprises

Attachments: Photo log; Google Earth Image log; Figures 1, 2a, 2b, 2c, 2d; datasheets

References

Google Earth Pro. 2017. Historical imagery from 1937 to 2017. Last accessed December 12, 2017.

Boyd, M. 2017. Personal communication with Pradera Golf Course Superintendent. December 15.

REQUEST FOR CORPS JURISDICTIONAL DETERMINATION (JD)

U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT

The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced below. **Note:** Submission of requested information is voluntary; however, if information is not provided, the request for an AJD cannot be evaluated nor can an AJD be issued.

CORPS USE ONLY:
DATE RECEIVED:

PROJECT NO.:

1. PROPERTY LOCATION:

Street Address:

City/Township/Parish: Castle Rock

County: Douglas State: CO

Acreage of Parcel/Review Area for JD: 1600 acres

Section: 17-20,30,31 Township: 7S Range: 66W

Latitude: 39.419996°N Longitude: 104.819251°W

(For linear projects, please include the center point of the proposed alignment.)

2. REQUESTOR CONTACT INFORMATION:

Typed or printed name: Erik Lowe

Company name: Lowe Enterprises

Street Address: 7979 East Tufts Avenue

City: Denver State: CO Zip: 80237

Daytime phone no.: 303-850-2406

Email address: eclore@lowe-re.com

3. MAP: Please attach a survey/plat map and vicinity map identifying location and review area for the JD.**4. REASON FOR REQUEST (check as many as applicable):**

- ☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps, and the JD would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.
- ☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps; this request is accompanied by my permit application and the JD is to be used in the permitting process.
- ☐ I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is included on the district Section 10 list and/or is subject to the ebb and flow of the tide.
- ☐ A Corps JD is required in order to obtain my local/state authorization.
- ☐ I intend to contest jurisdiction over a particular aquatic resource and request the Corps confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.
- ☐ I believe that the site may be comprised entirely of dry land/upland.
- ☒ Other: the property may be sold and the potential buyer wishes to know the jurisdictional status of the aquatic resources

5. TYPE OF DETERMINATION BEING REQUESTED:

- ☒ I am requesting an approved JD
- ☐ I am requesting a preliminary JD
- ☐ I am requesting a "no permit required" letter as I believe my proposed activity is not regulated.
- ☐ I am unclear as to which JD I would like to request and require additional information.

6. OWNERSHIP DETAILS:

- ☒ I currently own this property.
- ☐ I plan to purchase this property.
- ☐ I am an agent/consultant acting on behalf of the requestor.
- ☐ Other (please explain):

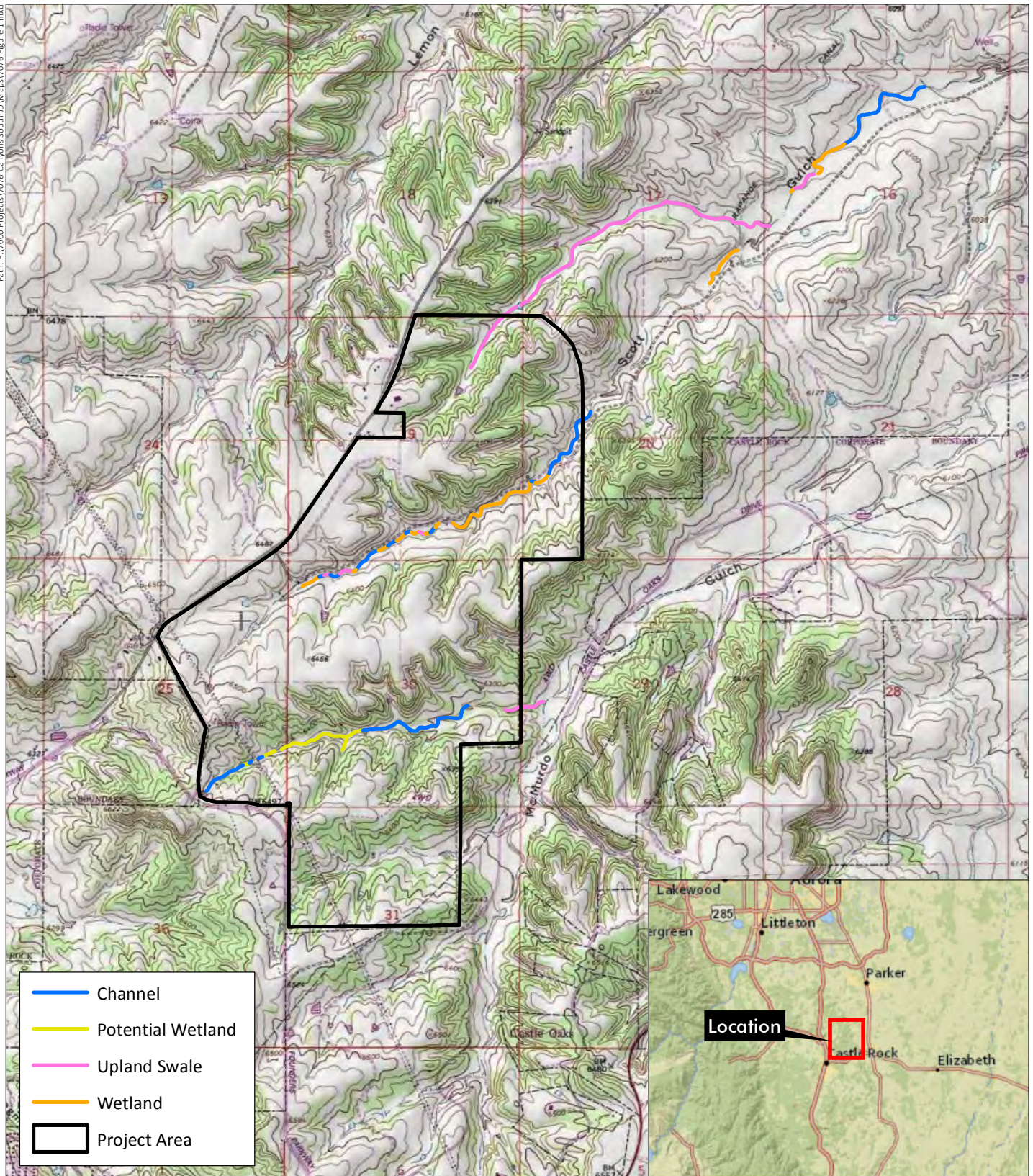
***Authorities:** Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Program of the U.S. Army Corps of Engineers; Final Rule for 33 CFR Parts 320-332. **Uses:** This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USACE website.

By signing below, you are indicating that you have the authority, or are acting as the duly authorized agent of a person or entity with such authority, to and do hereby grant Corps personnel right of entry to legally access the site if needed to perform the JD. Your signature shall be an affirmation that you possess the requisite property rights to request a JD on the subject property.

Signature:

Date:

12/21/17



Canyon South Property

Sections 17-20 and 30-31, T7S, R66W; Sections 14 and 15, T7S, R67W; 6th PM

UTM NAD 83: Zone 13N; 515558mE, 4363401mN

Latitude, Longitude: 39.419996°N, 104.819251°W

USGS Castle Rock North, CO Quadrangle

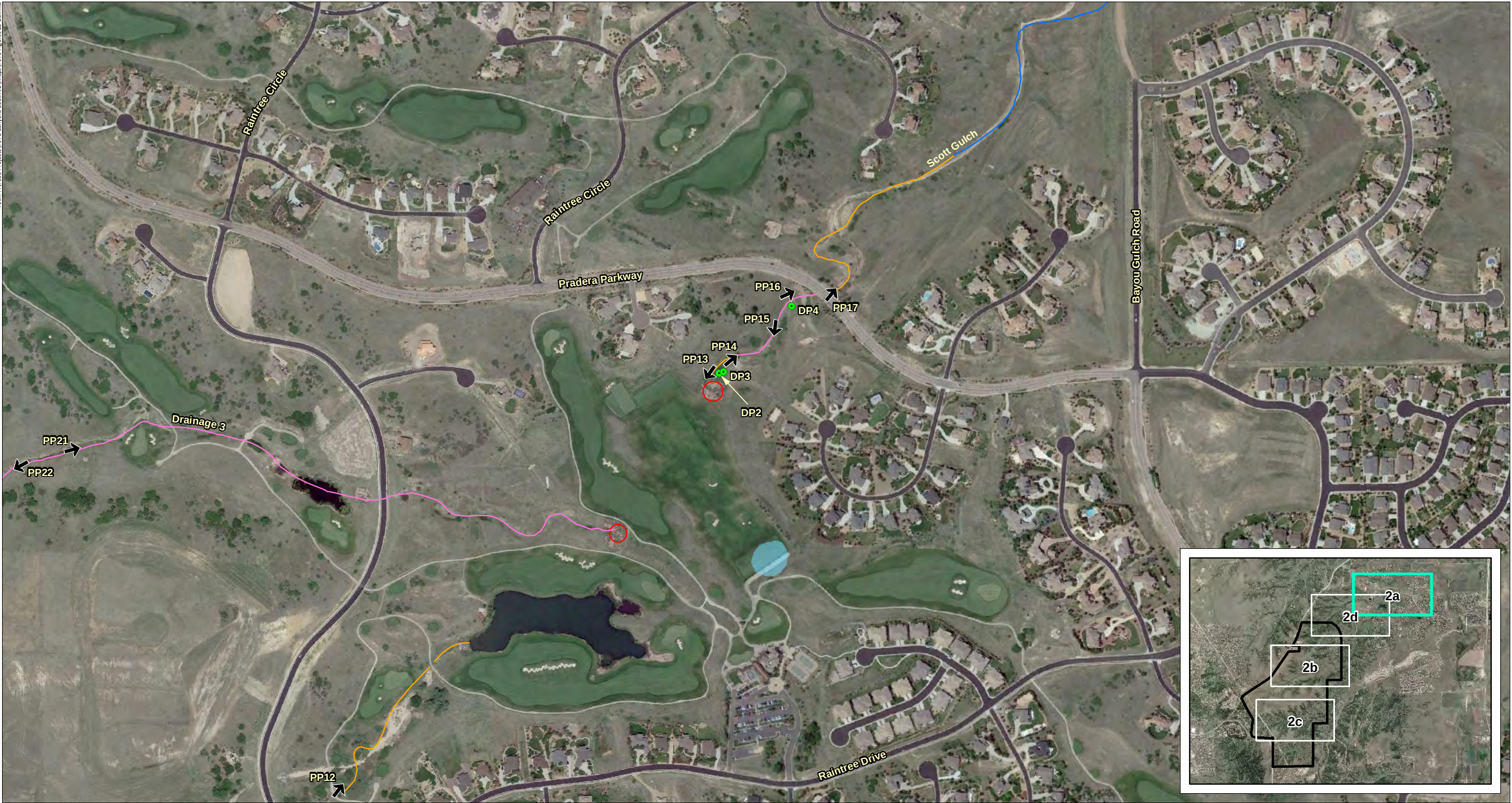
Douglas County, Colorado



Figure 1
Vicinity Map

Prepared for: Lowe Enterprises
File: 7076 Figure 1.mxd (GS)
December 19, 2017

ERO
ERO Resources Corp.



Canyon South Property

- Data Point
- ➔ Photo Point
- Channel
- Potential Wetland
- Upland Swale
- Wetland
- Weir
- Lake/Pond
- Property Boundary

Image Source: Google Earth©, June 2017

0 225 450 Feet



Figure 2a
Scott Gulch
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017





Canyon South Property

- Data Point
- ➔ Photo Point
- Channel
- Potential Wetland
- Upland Swale
- Wetland
- Weir
- Lake/Pond
- Property Boundary

Image Source: Google Earth©, June 2017

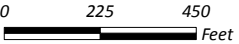


Figure 2b
Scott Gulch
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017





Canyon South Property

- | | | |
|---------------|---------------------|---------------------|
| ● Data Point | — Potential Wetland | □ Weir |
| ➔ Photo Point | — Upland Swale | ☁ Lake/Pond |
| — Channel | — Wetland | □ Property Boundary |

Image Source: Google Earth®, June 2017

0 225 450 Feet



Figure 2c
Drainage 1
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017





Canyon South Property

- | | | |
|---------------|---------------------|---------------------|
| ● Data Point | — Potential Wetland | □ Weir |
| ➔ Photo Point | — Upland Swale | ■ Lake/Pond |
| — Channel | — Wetland | □ Property Boundary |

Image Source: Google Earth®, June 2017

0 225 450 Feet



Figure 2d
Drainage 3
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017



PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 1 - View of extreme channel degradation on Scott Gulch following the 2013 floods. View is to the northeast..



Photo 2 - The upstream end of the Scott Gulch channel with in-channel wetland vegetation. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 3 - Channel section on upstream end of Scott Gulch supporting some wetland vegetation; headcutting is visible downstream. View is to the northeast.



Photo 4 - Upland swale/channel break near the upstream end of Scott Gulch. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 5 - Channel segment on upstream end of Scott Gulch lacking wetland vegetation. View is to the northeast.



Photo 6 - Narrow channel on Scott Gulch lacking wetland vegetation and upstream of fallen cottonwood tree. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 7 - A large stock pond located on Scott Gulch near the center of the project area. View is to the east.



Photo 8 - Wetlands in the Scott Gulch channel viewed below a large cutbank downstream of the stock pond. View is to the southeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 9 - A section of Scott Gulch showing channel and bank degradation following the 2013 floods. View is to the east.



Photo 10 - A section of a sandy bottom channel near the downstream end of the gulch near DP1. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 11 - A section of the channel on the adjacent property, located between the project area and the Pradera Golf community. Not shown on the figures. View is to the north.



Photo 12 - The Scott Gulch channel downstream of Raintree Drive and upstream of the large irrigation pond on the Pradera Golf Course. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 13 - A willow-dominated wetland located downstream of the lower overflow weir below the Pradera Golf Course greens. View is to the southwest.



Photo 14 - An upland break located downstream of the willow wetland, located near DP3. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 15 - The remnant Scott Gulch channel downstream of the overflow weir, which consists of an upland swale. View is to the south.



Photo 16 - An upland inclusion above the weir and culvert that pass under Pradera Parkway. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 17 - The Scott Gulch channel downstream of Pradera Parkway. View is to the northeast.



Photo 18 - A section of Drainage 1 showing a lack of defined channel. View is to the west.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 19 - A section of Drainage 1 showing sporadic evergreen tree saplings growing in the drainage bed. View is to the southwest.



Photo 20 - A large upland inclusion located near the downstream end of Drainage 1. View is to the west.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 21 – Downstream section of Drainage 3, upstream of Pradera Golf course, showing a channel with upland vegetation. View is to the northeast.



Photo 22 – Downstream section of Drainage 3 looking upstream, channel with upland vegetation. View is to the southwest.

CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION REQUEST
HISTORICAL IMAGERY LOG

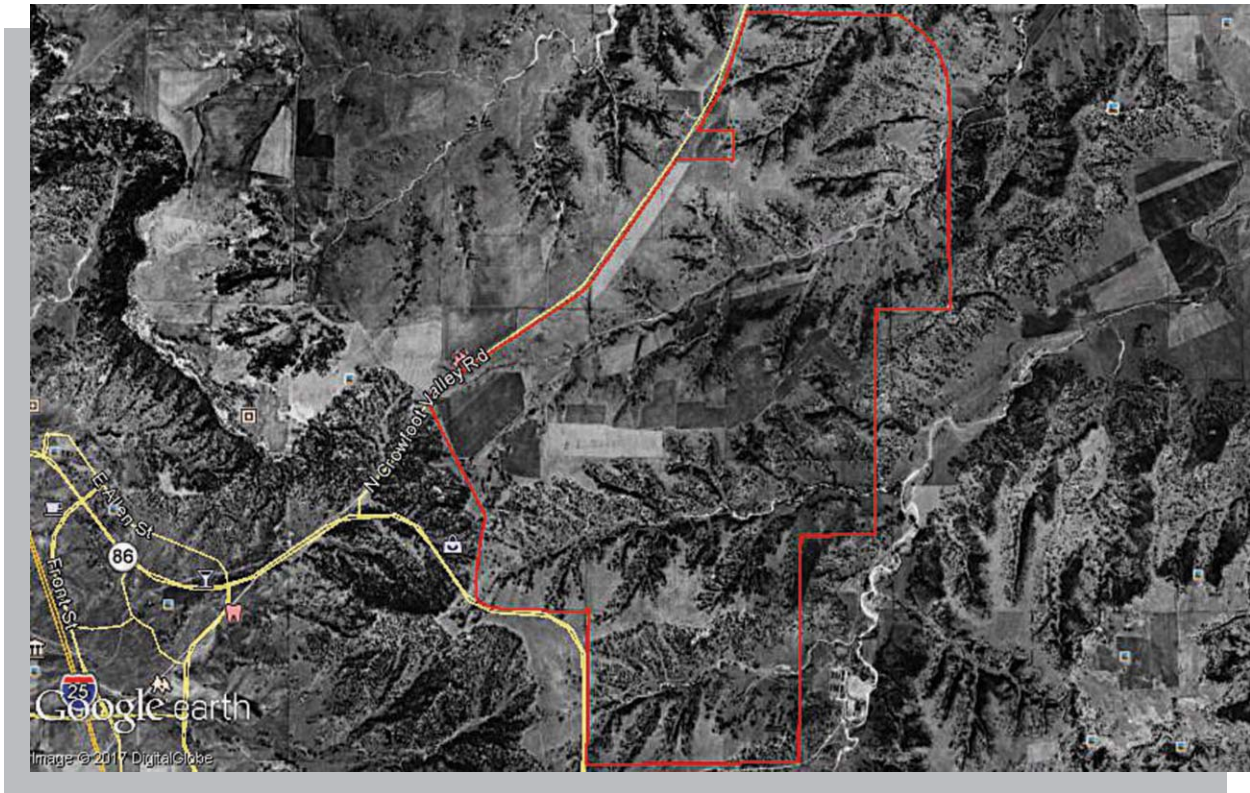


Photo 1 - 1937 imagery showing a continuous drainage in the location of Scott Gulch from the headwaters to the current location of the Pradera community and a continuous drainage at the location of Drainage 1.

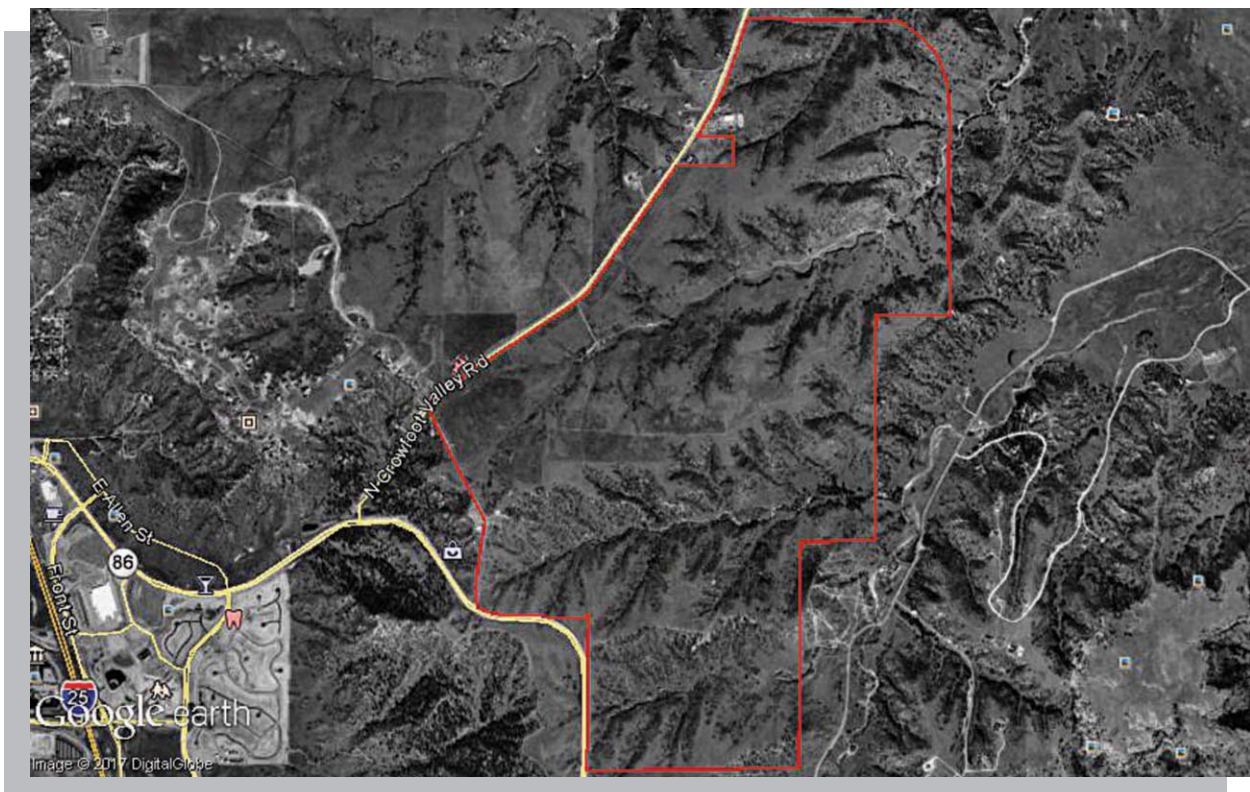


Photo 2 - 1999 imagery showing continuous drainage in the location of Scott Gulch and development activity west of the project area.

CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION REQUEST
HISTORICAL IMAGERY LOG

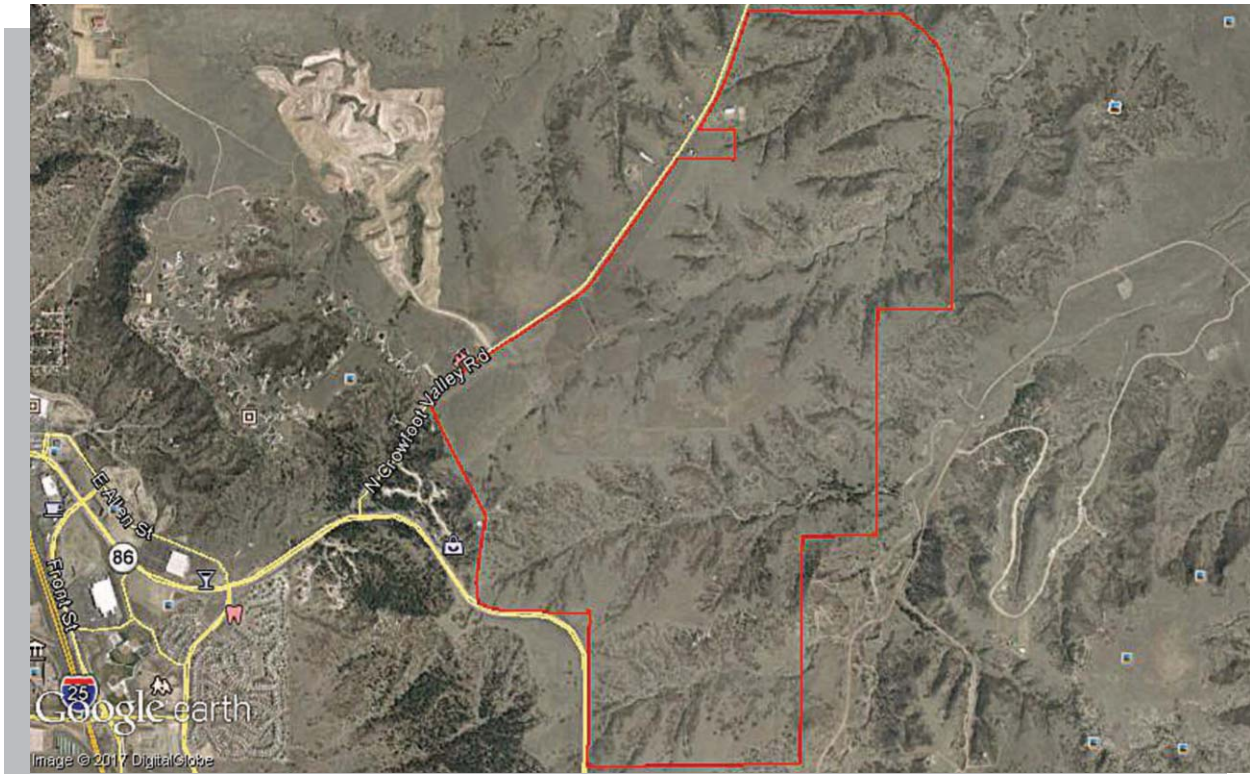


Photo 3 - 2003 imagery shows that the Scott Gulch drainage is continuous up to the Pradera community locations and development is expanding to the northeast and west of the property.

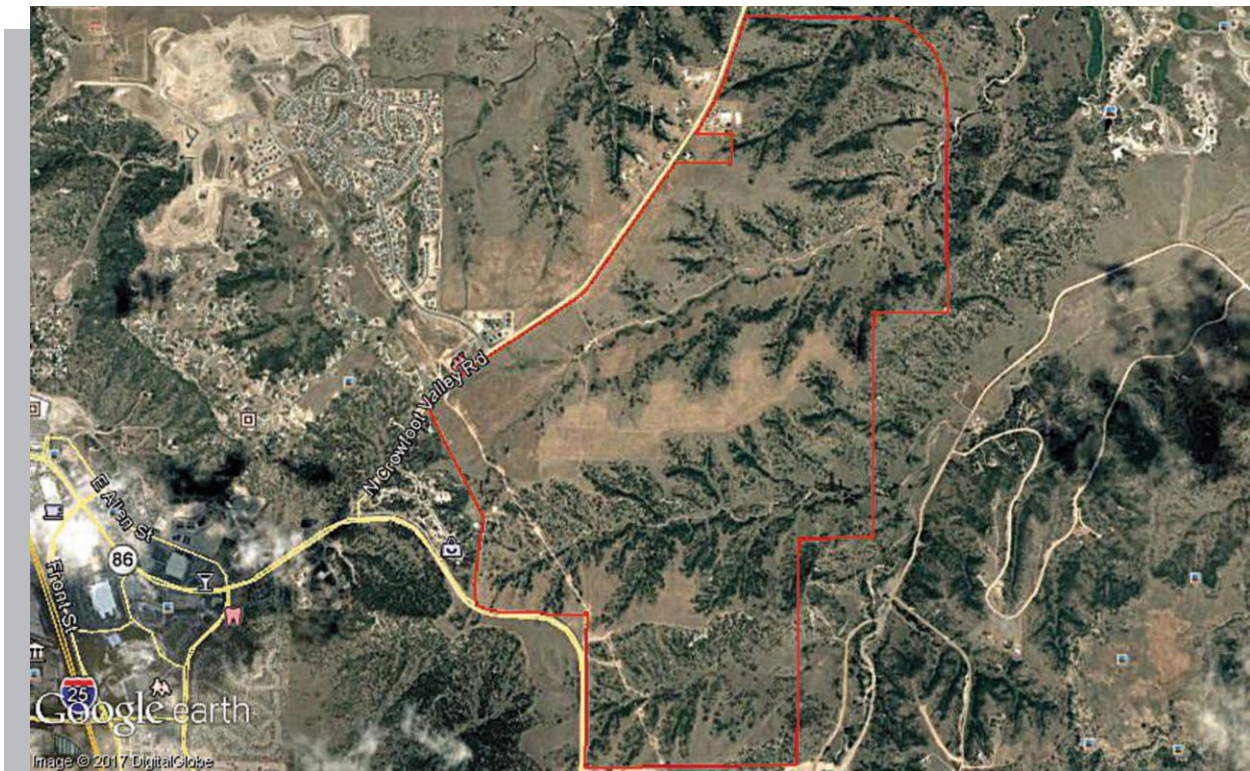


Photo 4 - 2005 imagery shows that the irrigation pond has been constructed on Scott Gulch and the Pradera Golf Course was developed.



Photo 5 - 1955 imagery showing a continuous channel along Drainage 1 at the location of the existing upland inclusion.

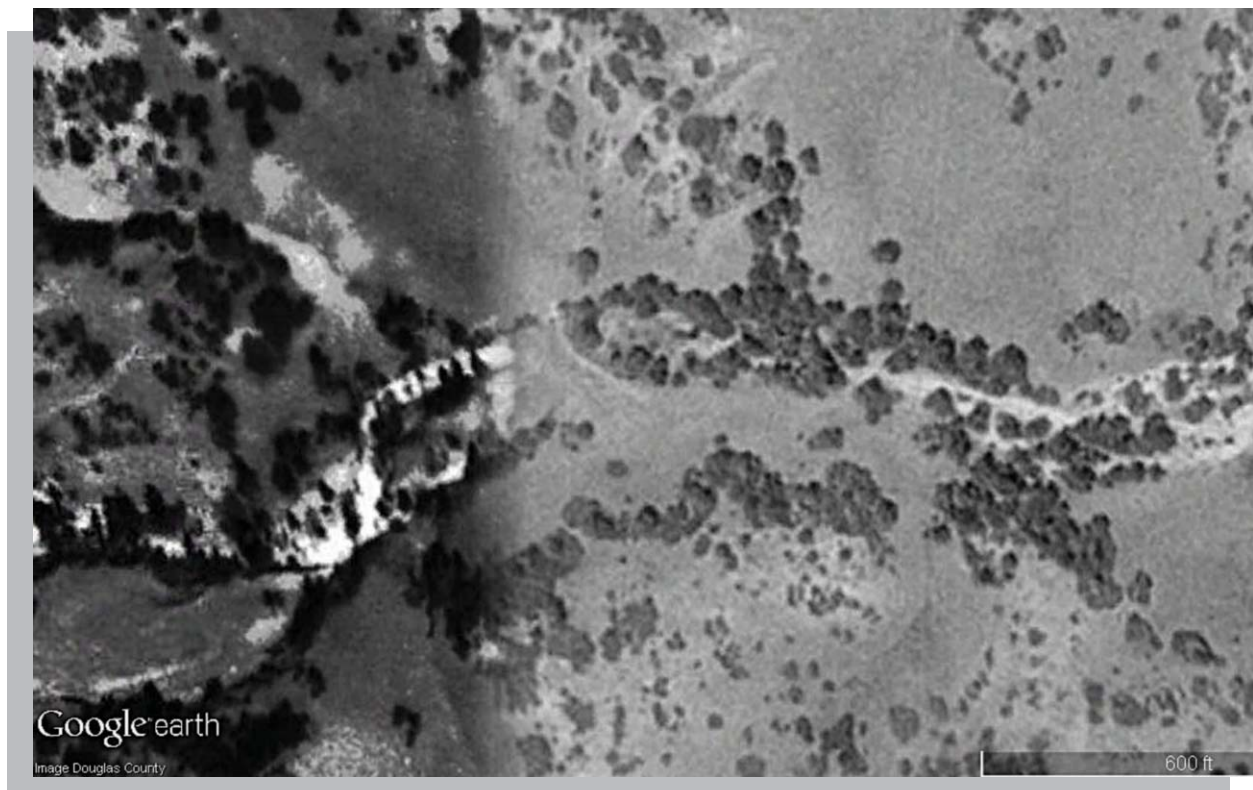


Photo 6 - 1993 imagery shows the upland inclusion on Drainage 1.



Photo 7 - 2017 imagery shows the current extent of the upland inclusion on Drainage 1.



Image 8 - 1937 imagery showing evidence of a drainage feature in the location of Drainage 3.



Image 9 - 1999 imagery showing Drainage 3 present in a similar location and condition as 1937.



Image 10 - 1993 imagery shows the construction of an irrigation pond and adjacent greens on the downstream end of Drainage 3.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-02
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): swale/basin Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐	Hydic Soil Present? Yes ☒ No ☐	Wetland Hydrology Present? Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes ☒ No ☐
Remarks: Wetland below overflow weir on Scott Gulch			

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)																
1. _____																				
2. _____																				
3. _____																				
4. _____																				
				Prevalence Index worksheet: <table border="0"> <tr> <td>Total % Cover of:</td> <td>Multiply by:</td> </tr> <tr> <td>OBL species</td> <td>x 1 = _____</td> </tr> <tr> <td>FACW species</td> <td>x 2 = _____</td> </tr> <tr> <td>FAC species</td> <td>x 3 = _____</td> </tr> <tr> <td>FACU species</td> <td>x 4 = _____</td> </tr> <tr> <td>UPL species</td> <td>x 5 = _____</td> </tr> <tr> <td>Column Totals:</td> <td>(A) _____ (B) _____</td> </tr> <tr> <td colspan="2">Prevalence Index = B/A = _____</td> </tr> </table>	Total % Cover of:	Multiply by:	OBL species	x 1 = _____	FACW species	x 2 = _____	FAC species	x 3 = _____	FACU species	x 4 = _____	UPL species	x 5 = _____	Column Totals:	(A) _____ (B) _____	Prevalence Index = B/A = _____	
Total % Cover of:	Multiply by:																			
OBL species	x 1 = _____																			
FACW species	x 2 = _____																			
FAC species	x 3 = _____																			
FACU species	x 4 = _____																			
UPL species	x 5 = _____																			
Column Totals:	(A) _____ (B) _____																			
Prevalence Index = B/A = _____																				
Sapling/Shrub Stratum (Plot size: _____) 1. <u>Salix exigua</u> <u>25</u> Y FACW 2. _____ 3. _____ 4. _____ 5. _____ <u>25</u> = Total Cover																				
Herb Stratum (Plot size: 5X5) 1. <u>Carex nebrascensis</u> <u>80</u> Y OBL 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ <u>65</u> = Total Cover																				
Woody Vine Stratum (Plot size: _____) 1. _____ 2. _____ _____ = Total Cover																				
% Bare Ground in Herb Stratum <u>20</u>																				

Hydrophytic Vegetation Indicators:
☐ 1 - Rapid Test for Hydrophytic Vegetation
☒ 2 - Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0¹
☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: Dp-02**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	10YR 3/1	100					Clayloam	
4-9	7.5YR 3/2	97	2.5YR4/6	3	C	PL/M	Sandloam ☒	faint redox

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.²Location: PL=Pore Lining, M=Matrix.**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- | | |
|--|---|
| ☐ Histosol (A1) | ☐ Sandy Gleyed Matrix (S4) |
| ☐ Histic Epipedon (A2) | ☐ Sandy Redox (S5) |
| ☐ Black Histic (A3) | ☐ Stripped Matrix (S6) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Mucky Mineral (F1) |
| ☐ Stratified Layers (A5) (LRR F) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ 1 cm Muck (A9) (LRR F, G, H) | ☐ Depleted Matrix (F3) |
| ☐ Depleted Below Dark Surface (A11) | ☒ Redox Dark Surface (F6) |
| ☐ Thick Dark Surface (A12) | ☐ Depleted Dark Surface (F7) |
| ☐ Sandy Mucky Mineral (S1) | ☐ Redox Depressions (F8) |
| ☐ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ High Plains Depressions (F16) |
| ☐ 5 cm Mucky Peat or Peat (S3) (LRR F) | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- | |
|--|
| ☐ 1 cm Muck (A9) (LRR I, J) |
| ☐ Coast Prairie Redox (A16) (LRR F, G, H) |
| ☐ Dark Surface (S7) (LRR G) |
| ☐ High Plains Depressions (F16) |
| (LRR H outside of MLRA 72 & 73) |
| ☐ Reduced Vertic (F18) |
| ☐ Red Parent Material (TF2) |
| ☐ Very Shallow Dark Surface (TF12) |
| ☐ Other (Explain in Remarks) |

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|--|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☒ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☒ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- | |
|---|
| ☐ Surface Soil Cracks (B6) |
| ☐ Sparsely Vegetated Concave Surface (B8) |
| ☐ Drainage Patterns (B10) |
| ☐ Oxidized Rhizospheres on Living Roots (C3) |
| (where tilled) |
| ☐ Crayfish Burrows (C8) |
| ☐ Saturation Visible on Aerial Imagery (C9) |
| ☐ Geomorphic Position (D2) |
| ☐ FAC-Neutral Test (D5) |
| ☐ Frost-Heave Hummocks (D7) (LRR F) |

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-03
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Remarks: Wetland below overflow weir on Scott Gulch	

Tree Stratum (Plot size: _____)		Absolute % Cover	Dominant Species?	Indicator Status
1.	_____			
2.	_____			
3.	_____			
4.	_____			
			= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)		Absolute % Cover	Dominant Species?	Indicator Status
1.	_____			
2.	_____			
3.	_____			
4.	_____			
5.	_____			
			= Total Cover	
Herb Stratum (Plot size: 5X5)		Absolute % Cover	Dominant Species?	Indicator Status
1.	Bromus tectorum	60	Y	FACU
2.	Herb unknown (dead)			
3.	_____			
4.	_____			
5.	_____			
6.	_____			
7.	_____			
8.	_____			
9.	_____			
10.	_____			
		60	= Total Cover	
Woody Vine Stratum (Plot size: _____)		Absolute % Cover	Dominant Species?	Indicator Status
1.	_____			
2.	_____			
			= Total Cover	
% Bare Ground in Herb Stratum		40		
Remarks: _____				

Dominance Test worksheet:	
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-):	0 (A)
Total Number of Dominant Species Across All Strata:	1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0 (A/B)
Prevalence Index worksheet:	
Total % Cover of:	Multiply by:
OBL species	x 1 = _____
FACW species	x 2 = _____
FAC species	x 3 = _____
FACU species	x 4 = _____
UPL species	x 5 = _____
Column Totals:	(A) _____ (B) _____
Prevalence Index = B/A = _____	
Hydrophytic Vegetation Indicators:	
☐ 1 - Rapid Test for Hydrophytic Vegetation	
☐ 2 - Dominance Test is >50%	
☐ 3 - Prevalence Index is ≤3.0 ¹	
☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
☐ Problematic Hydrophytic Vegetation ¹ (Explain)	
¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Hydrophytic Vegetation Present?	
Yes	☐ No ☒

SOIL

Sampling Point: Dp-03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6	10YR 3/1	100					Clayloam	
6-12	7.5YR 4/3	100					sands/gr	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| ☐ Histosol (A1) | ☐ Sandy Gleyed Matrix (S4) |
| ☐ Histic Epipedon (A2) | ☐ Sandy Redox (S5) |
| ☐ Black Histic (A3) | ☐ Stripped Matrix (S6) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Mucky Mineral (F1) |
| ☐ Stratified Layers (A5) (LRR F) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ 1 cm Muck (A9) (LRR F, G, H) | ☐ Depleted Matrix (F3) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Redox Dark Surface (F6) |
| ☐ Thick Dark Surface (A12) | ☐ Depleted Dark Surface (F7) |
| ☐ Sandy Mucky Mineral (S1) | ☐ Redox Depressions (F8) |
| ☐ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ High Plains Depressions (F16) |
| ☐ 5 cm Mucky Peat or Peat (S3) (LRR F) | |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|---|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☐ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☐ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-04
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Hydric Soil Present? Yes ☐ No ☒	
Wetland Hydrology Present? Yes ☐ No ☒	
Remarks: upland swale/remnant channel	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
		= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species <u> </u> x 1 = _____ FACW species <u> </u> x 2 = _____ FAC species <u> </u> x 3 = _____ FACU species <u> </u> x 4 = _____ UPL species <u> </u> x 5 = _____ Column Totals: <u> </u> (A) _____ (B) Prevalence Index = B/A = _____
		= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)				
1. _____				
2. _____				
3. _____				
4. _____				
5. _____				
		= Total Cover		
Herb Stratum (Plot size: <u>5X5</u>)				
1. <u>Bromus inermis</u>	<u>35</u>	<u>Y</u>	<u>FACU</u>	
2. <u>Elymus trachycalus</u>	<u>5</u>		<u>FACU</u>	
3. <u>Thlaspi arvense</u>	<u>4</u>		<u>FACU</u>	
4. <u>Elymus canadensis</u>	<u>10</u>		<u>FACU</u>	
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
		= Total Cover		
Woody Vine Stratum (Plot size: _____)				
1. _____				
2. _____				
		= Total Cover		
% Bare Ground in Herb Stratum <u>46</u>				
Hydrophytic Vegetation Indicators: ☐ 1 - Rapid Test for Hydrophytic Vegetation ☐ 2 - Dominance Test is >50% ☐ 3 - Prevalence Index is ≤3.0 ¹ ☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ☐ Problematic Hydrophytic Vegetation ¹ (Explain)				
Hydrophytic Vegetation Present? Yes ☐ No ☒				

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

SOIL

Sampling Point: Dp-04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | | | |
|--------------------------|--|--------------------------|------------------------------------|
| ☐ | Histosol (A1) | ☐ | Sandy Gleyed Matrix (S4) |
| ☐ | Histic Epipedon (A2) | ☐ | Sandy Redox (S5) |
| ☐ | Black Histic (A3) | ☐ | Stripped Matrix (S6) |
| ☐ | Hydrogen Sulfide (A4) | ☐ | Loamy Mucky Mineral (F1) |
| ☐ | Stratified Layers (A5) (LRR F) | ☐ | Loamy Gleyed Matrix (F2) |
| ☐ | 1 cm Muck (A9) (LRR F, G, H) | ☐ | Depleted Matrix (F3) |
| ☐ | Depleted Below Dark Surface (A11) | ☐ | Redox Dark Surface (F6) |
| ☐ | Thick Dark Surface (A12) | ☐ | Depleted Dark Surface (F7) |
| ☐ | Sandy Mucky Mineral (S1) | ☐ | Redox Depressions (F8) |
| ☐ | 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ | High Plains Depressions (F16) |
| ☐ | 5 cm Mucky Peat or Peat (S3) (LRR F) | | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (**LRR I, J**)
- ☐ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ☐ Dark Surface (S7) (**LRR G**)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|---|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☐ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☐ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☒ Oxidized Rhizospheres on Living Roots (C3)
(where tilled)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-01
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): Channel Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐ No ☒	Is the Sampled Area within a Wetland?	Yes ☐ No ☒
Hydric Soil Present?	Yes ☐ No ☒		
Wetland Hydrology Present?	Yes ☐ No ☒		
Remarks: Channel bed			

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
		= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species ☐ x 1 = _____ FACW species ☐ x 2 = _____ FAC species ☐ x 3 = _____ FACU species ☐ x 4 = _____ UPL species ☐ x 5 = _____ Column Totals: ☐ (A) _____ (B) _____ Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: _____) 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ _____ = Total Cover				
Herb Stratum (Plot size: <u>5X5</u>) 1. <u>Agrostis gigantea</u> <u>35</u> Y FACW 2. <u>Festuca pratensis</u> <u>25</u> Y FACU 3. <u>Elymus canadensis</u> <u>5</u> FACU 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ _____ = Total Cover				
Woody Vine Stratum (Plot size: _____) 1. _____ 2. _____ _____ = Total Cover				
% Bare Ground in Herb Stratum <u>35</u>				

Hydrophytic Vegetation Indicators:
☐ 1 - Rapid Test for Hydrophytic Vegetation
☐ 2 - Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0¹
☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks:

SOIL

Sampling Point: Dp-01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹		
0-4	10YR 6/2	98	2.5YR 4/8	2	C	PL	Sand relic redox
4-14	2.4YR 4/2	100				Clay/Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| ☐ Histosol (A1) | ☐ Sandy Gleyed Matrix (S4) |
| ☐ Histic Epipedon (A2) | ☐ Sandy Redox (S5) |
| ☐ Black Histic (A3) | ☐ Stripped Matrix (S6) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Mucky Mineral (F1) |
| ☐ Stratified Layers (A5) (LRR F) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ 1 cm Muck (A9) (LRR F, G, H) | ☐ Depleted Matrix (F3) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Redox Dark Surface (F6) |
| ☐ Thick Dark Surface (A12) | ☐ Depleted Dark Surface (F7) |
| ☐ Sandy Mucky Mineral (S1) | ☐ Redox Depressions (F8) |
| ☐ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ High Plains Depressions (F16) |
| ☐ 5 cm Mucky Peat or Peat (S3) (LRR F) | |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|---|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☐ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☐ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☒ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:



DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
DENVER REGULATORY OFFICE, 9307 SOUTH WADSWORTH BOULEVARD
LITTLETON, COLORADO 80128-6901

April 28, 2021

SUBJECT: Approved Jurisdictional Determination – Corps File No. NWO-2021-00560-DEN, Canyons South Property Parcel, Douglas County, Colorado

Erik Clore
Lowe Enterprises
5299 DTC Blvd., Ste 1260
Greenwood Village, CO 80111

Dear Mr. Clore:

This letter is in reference to the property located at approximate latitude 39.402243, longitude -104.823604, in Douglas County, Colorado. The submittal dated February 24, 2021 and received March 23, 2021, consists of a request for an Approved Jurisdictional Determination for the above project site. The delineated area located on the subject property has been reviewed in accordance with Section 404 of the Clean Water Act (Section 404) under which the U.S. Army Corps of Engineers regulates the discharge of dredged and fill material, and any excavation activity associated with a dredge and fill project in waters of the United States.

At your request, an Approved Jurisdictional Determination (JD) has been prepared for the approximate 340-acre review area. Based on the April 5, 2021 site visit and a review of available information, we have determined that the review area contains an ephemeral stream and in-channel wetlands. The ephemeral stream and its in-channel wetlands are excluded waters or features. Therefore, the review area does not contain waters of the United States. The discharge of fill material onto this project site does not require a Department of the Army permit under Section 404.

The JD is attached to this letter. If you are not in agreement with the JD decision, you may request an administrative appeal under regulation 33 CFR 331, by using the attached Appeal Form and Administrative Appeal Process form. The request for appeal must be received within 60 days from the date of this letter. It is not necessary to submit a Request for Appeal if you do not object to the JD.

This JD is valid for a period of five years from the date of this letter, unless new information warrants revisions of the JDs before the expiration date, or unless the Corps has identified, after a possible public notice and comment, that specific geographic areas with rapidly changing environmental conditions merit re-verification on a more frequent basis.

If there are any questions please feel free to contact Celena Cui at (303) 979-4120 or by e-mail at Celena.H.Cui@usace.army.mil, and reference **Corps File No. NWO-2021-00560-DEN**.

Sincerely,

A handwritten signature in black ink, appearing to read 'K. Downing', with a stylized flourish at the end.

Kiel Downing
Chief, Denver Regulatory Office

Enclosure(s)

cc: Justin Apfel, Great Ecology



**U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE**

I. ADMINISTRATIVE INFORMATION

Completion Date of Approved Jurisdictional Determination (AJD): 4/28/2021

ORM Number: Omaha District, Denver Regulatory Office, NWO-2021-00560-DEN, Canyon South

Associated JDs: N/A

Review Area Location¹: State/Territory: Colorado City: Castle Rock County/Parish/Borough: Douglas County

Center Coordinates of Review Area: Latitude 39.402489 Longitude -104.822882

II. FINDINGS

A. Summary: Check all that apply. At least one box from the following list MUST be selected. Complete the corresponding sections/tables and summarize data sources.

- ☐ The review area is comprised entirely of dry land (i.e., there are no waters or water features, including wetlands, of any kind in the entire review area). Rationale: N/A or describe rationale.
- ☐ There are "navigable waters of the United States" within Rivers and Harbors Act jurisdiction within the review area (complete table in Section II.B).
- ☐ There are "waters of the United States" within Clean Water Act jurisdiction within the review area (complete appropriate tables in Section II.C).
- ☒ There are waters or water features excluded from Clean Water Act jurisdiction within the review area (complete table in Section II.D).

B. Rivers and Harbors Act of 1899 Section 10 (§ 10)²

§ 10 Name	§ 10 Size	§ 10 Criteria	Rationale for § 10 Determination
N/A.	N/A.	N/A.	N/A.

C. Clean Water Act Section 404

Territorial Seas and Traditional Navigable Waters ((a)(1) waters): ³				
(a)(1) Name	(a)(1) Size	(a)(1) Criteria	Rationale for (a)(1) Determination	
N/A.	N/A.	N/A.	N/A.	

Tributaries ((a)(2) waters):				
(a)(2) Name	(a)(2) Size	(a)(2) Criteria	Rationale for (a)(2) Determination	
N/A.	N/A.	N/A.	N/A.	

Lakes and ponds, and impoundments of jurisdictional waters ((a)(3) waters):				
(a)(3) Name	(a)(3) Size	(a)(3) Criteria	Rationale for (a)(3) Determination	
N/A.	N/A.	N/A.	N/A.	

Adjacent wetlands ((a)(4) waters):				
(a)(4) Name	(a)(4) Size	(a)(4) Criteria	Rationale for (a)(4) Determination	
N/A.	N/A.	N/A.	N/A.	

¹ Map(s)/figure(s) are attached to the AJD provided to the requestor.

² If the navigable water is not subject to the ebb and flow of the tide or included on the District's list of Rivers and Harbors Act Section 10 navigable waters list, do NOT use this document to make the determination. The District must continue to follow the procedure outlined in 33 CFR part 329.14 to make a Rivers and Harbors Act Section 10 navigability determination.

³ A stand-alone TNW determination is completed independently of a request for an AJD. A stand-alone TNW determination is conducted for a specific segment of river or stream or other type of waterbody, such as a lake, where upstream or downstream limits or lake borders are established. A stand-alone TNW determination should be completed following applicable guidance and should NOT be documented on the AJD Form.



**U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE**

D. Excluded Waters or Features

Excluded waters ((b)(1) – (b)(12)): ⁴				
Exclusion Name	Exclusion Size		Exclusion ⁵	Rationale for Exclusion Determination
Ephemeral Stream	Approx. 5,000	linear feet	(b)(3) Ephemeral feature, including an ephemeral stream, swale, gully, rill, or pool.	The stream has a discontinuous ordinary high water mark and is best characterized as an ephemeral stream within the project reach. During the site visit, the stream contained areas with pooling water or no water. No water was observed at the Castle Oaks Drive culvert.
Channel Wetlands	N/A.	N/A.	(b)(1) Non-adjacent wetland.	The wetlands are located within the channel bottom of the ephemeral stream. Therefore, the wetlands are not adjacent to a tributary that has perennial or intermittent flow. In addition, the wetlands are separated from McMurdo Gulch by an upland swale.

III. SUPPORTING INFORMATION

A. Select/enter all resources that were used to aid in this determination and attach data/maps to this document and/or references/citations in the administrative record, as appropriate.

☒ Information submitted by, or on behalf of, the applicant/consultant: [April 2021 Delineation and Data Sheet](#)

This information [is](#) sufficient for purposes of this AJD.

Rationale: [N/A](#)

☐ Data sheets prepared by the Corps: [Title\(s\) and/or date\(s\)](#).

☒ Photographs: [Aerial: Google Earth Image, 6 October 2019](#)

☒ Corps site visit(s) conducted on: [4/5/2021](#)

☐ Previous Jurisdictional Determinations (AJDs or PJDs): [ORM Number\(s\) and date\(s\)](#).

☒ Antecedent Precipitation Tool: [provide detailed discussion in Section III.B.](#)

☐ USDA NRCS Soil Survey: [Title\(s\) and/or date\(s\)](#).

☐ USFWS NWI maps: [Title\(s\) and/or date\(s\)](#).

☒ USGS topographic maps: [1965 Castle Rock North, 1: 24,000](#)

Other data sources used to aid in this determination:

Data Source (select)	Name and/or date and other relevant information
USGS Sources	N/A.
USDA Sources	N/A.
NOAA Sources	N/A.
USACE Sources	N/A.
State/Local/Tribal Sources	N/A.
Other Sources	N/A.

⁴ Some excluded waters, such as (b)(2) and (b)(4), may not be specifically identified on the AJD form unless a requestor specifically asks a Corps district to do so. Corps districts may, in case-by-case instances, choose to identify some or all of these waters within the review area.

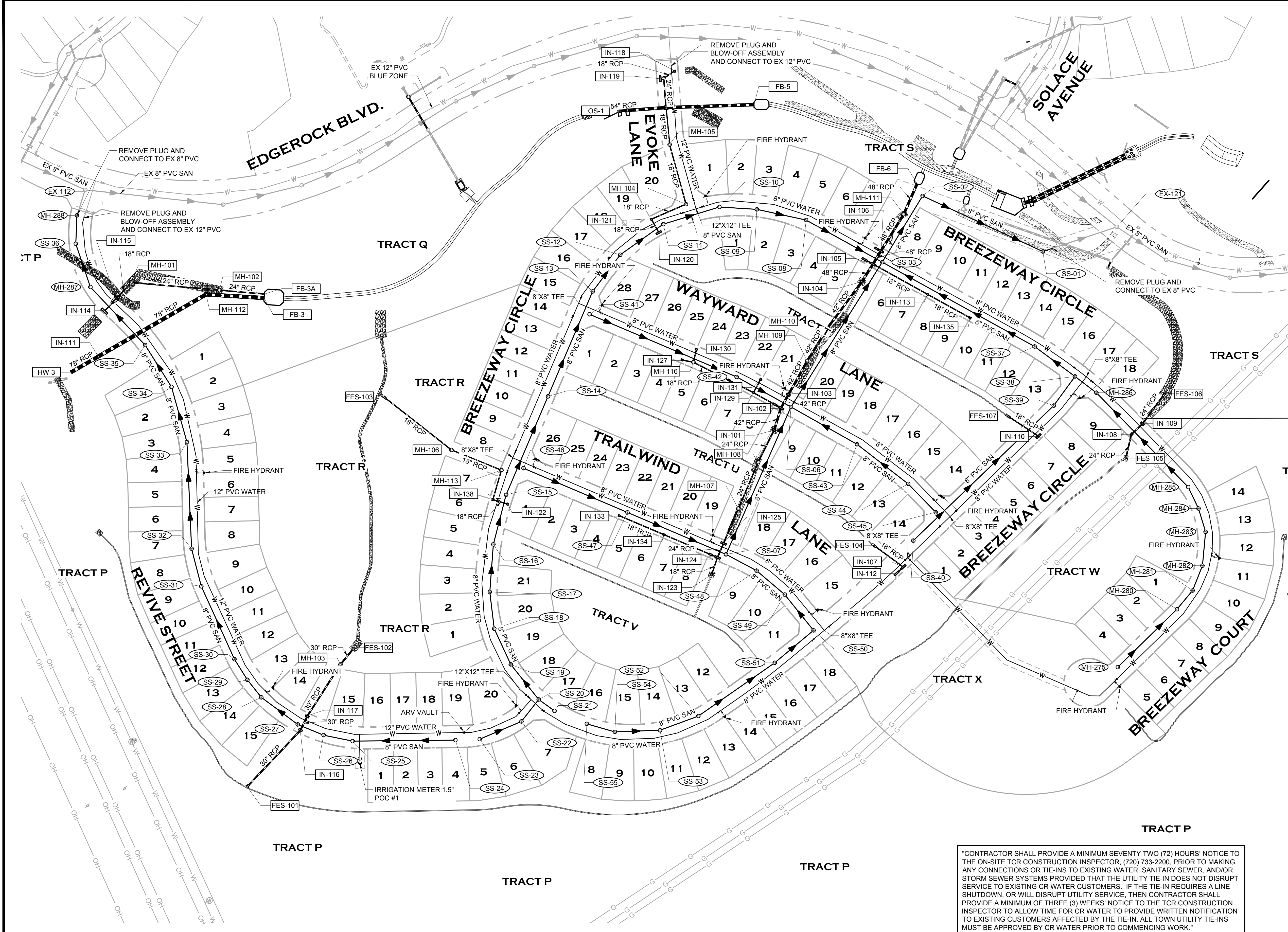
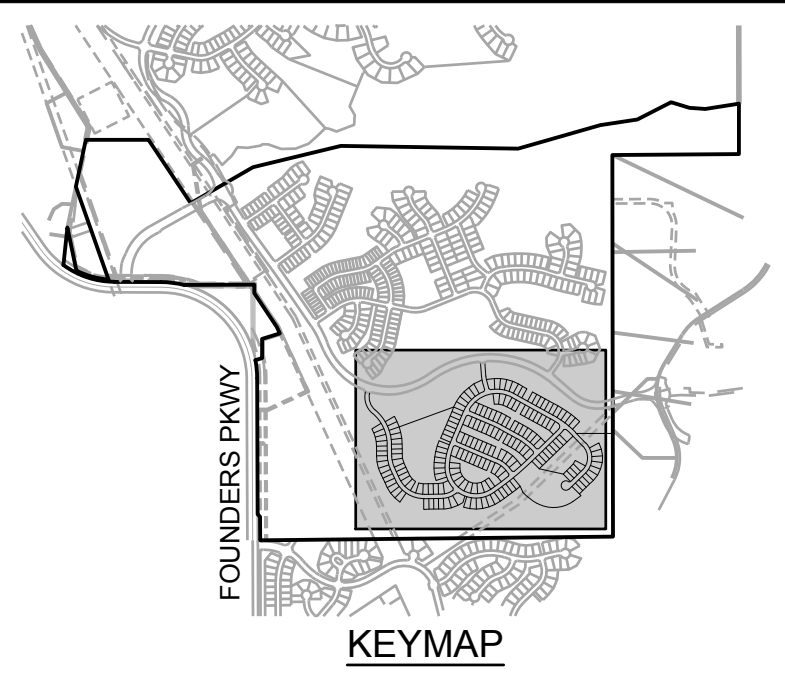
⁵ Because of the broad nature of the (b)(1) exclusion and in an effort to collect data on specific types of waters that would be covered by the (b)(1) exclusion, four sub-categories of (b)(1) exclusions were administratively created for the purposes of the AJD Form. These four sub-categories are not new exclusions, but are simply administrative distinctions and remain (b)(1) exclusions as defined by the NWPR.



**U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE**

- B. Typical year assessment(s):** Site visit was performed during the wet season with the three months prior indicating normal conditions.
- C. Additional comments to support AJD:** N/A or provide additional discussion as appropriate.

PATH: K:\HINES\PCADD\CIVIL\42 FILING 2 CD\420U1.DWG
PLOT BY: ROD SIGMON PLOT DATE: 11/5/2025 8:08 AM
XREFS:



- CONSTRUCTION NOTES:**
1. ALL UTILITY CONSTRUCTION WITHIN THE CANYONS FAR SOUTH SITE WILL CONFORM TO THE TOWN OF CASTLE ROCK STANDARDS AND SPECIFICATIONS.
 2. ALL DIMENSIONS ARE TO FLOWLINE, EXCEPT PROFILES, WHICH ARE CENTERLINE DIMENSIONS, UNLESS OTHERWISE NOTED.
 3. SEE SHEET TY1 FOR TYPICAL CONDUIT TRENCH SECTION.

- LEGEND**
- ⊙ PROPOSED STORM DRAIN MANHOLE
 - PROPOSED STORM DRAIN
 - PROPOSED STORM DRAIN INLET
 - ⊙ EXISTING STORM DRAIN MANHOLE
 - EXISTING STORM DRAIN
 - EXISTING STORM DRAIN INLET
 - PROPOSED SANITARY SEWER MAIN
 - ⊙ PROPOSED SANITARY SEWER MANHOLE
 - EXISTING SANITARY SEWER MAIN
 - ⊙ EXISTING SANITARY SEWER MANHOLE
 - PROPOSED WATERMAIN
 - ⊙ PROPOSED FIRE HYDRANT
 - ⊙ PROPOSED GATE VALVE
 - EXISTING WATERMAIN
 - ⊙ EXISTING FIRE HYDRANT
 - ⊙ EXISTING GATE VALVE
 - PROPOSED CONDUIT
 - ⊙ PROPOSED LIGHTPOLE

811 UNCC CALL BEFORE YOU DIG
811 OR 1-800-922-1987
Utility Notification Center of Colorado

PROFESSIONAL ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY, AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY:

DEVELOPMENT SERVICES DATE
TOCR PROJECT NO: CD24-0012

"CONTRACTOR SHALL PROVIDE A MINIMUM SEVENTY TWO (72) HOURS' NOTICE TO THE ON-SITE TCR CONSTRUCTION INSPECTOR, (720) 733-2200, PRIOR TO MAKING ANY CONNECTIONS OR TIE-INS TO EXISTING WATER, SANITARY SEWER, AND/OR STORM SEWER SYSTEMS PROVIDED THAT THE UTILITY TIE-IN DOES NOT DISRUPT SERVICE TO EXISTING CR WATER CUSTOMERS. IF THE TIE-IN REQUIRES A LINE SHUTDOWN, OR WILL DISRUPT UTILITY SERVICE, THEN CONTRACTOR SHALL PROVIDE A MINIMUM OF THREE (3) WEEKS' NOTICE TO THE TCR CONSTRUCTION INSPECTOR TO ALLOW TIME FOR CR WATER TO PROVIDE WRITTEN NOTIFICATION TO EXISTING CUSTOMERS AFFECTED BY THE TIE-IN. ALL TOWN UTILITY TIE-INS MUST BE APPROVED BY CR WATER PRIOR TO COMMENCING WORK."

DATE	REVISION DESCRIPTION

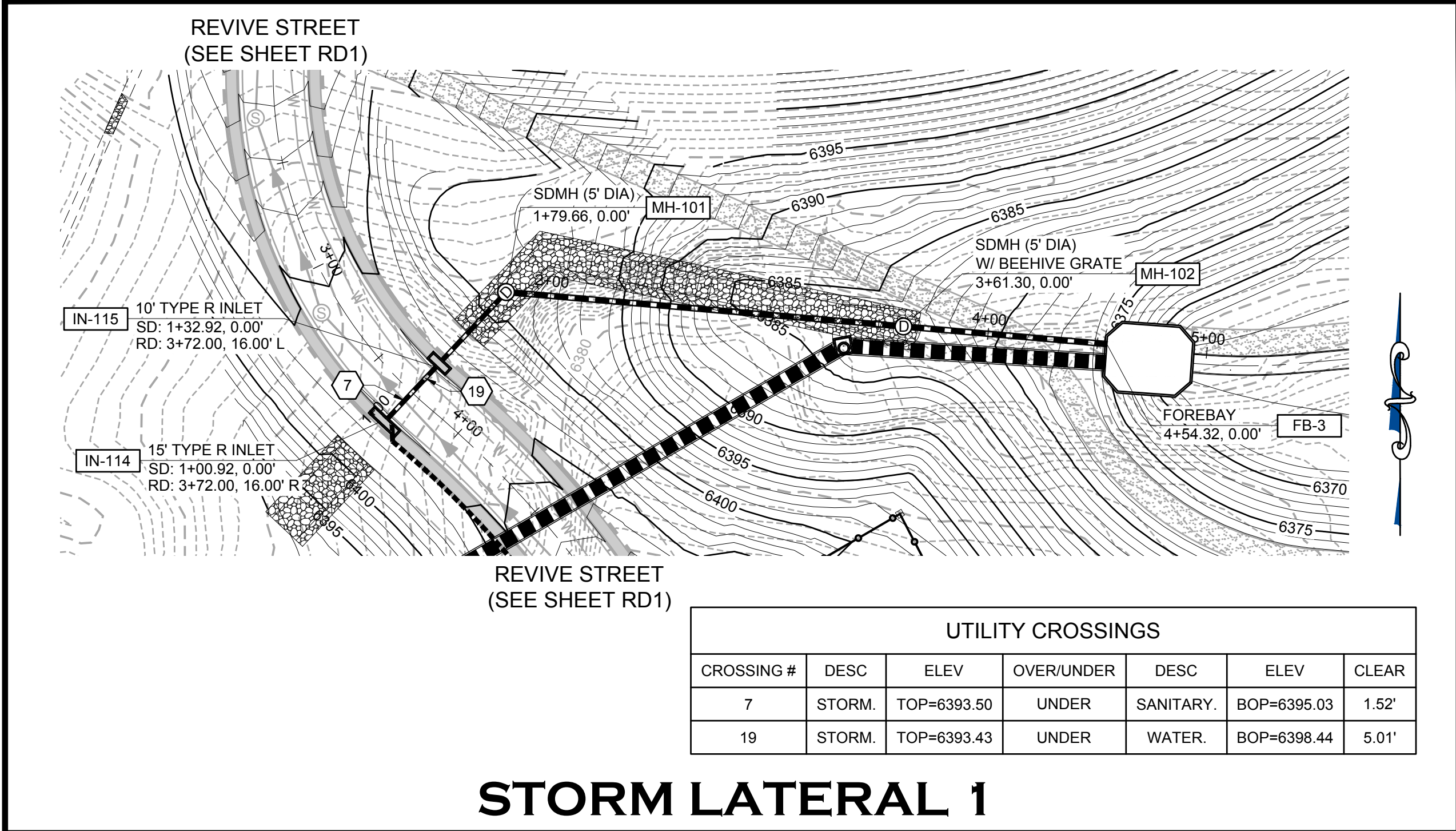
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Chk BKM	Dnw RLS
Des RLS	

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(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

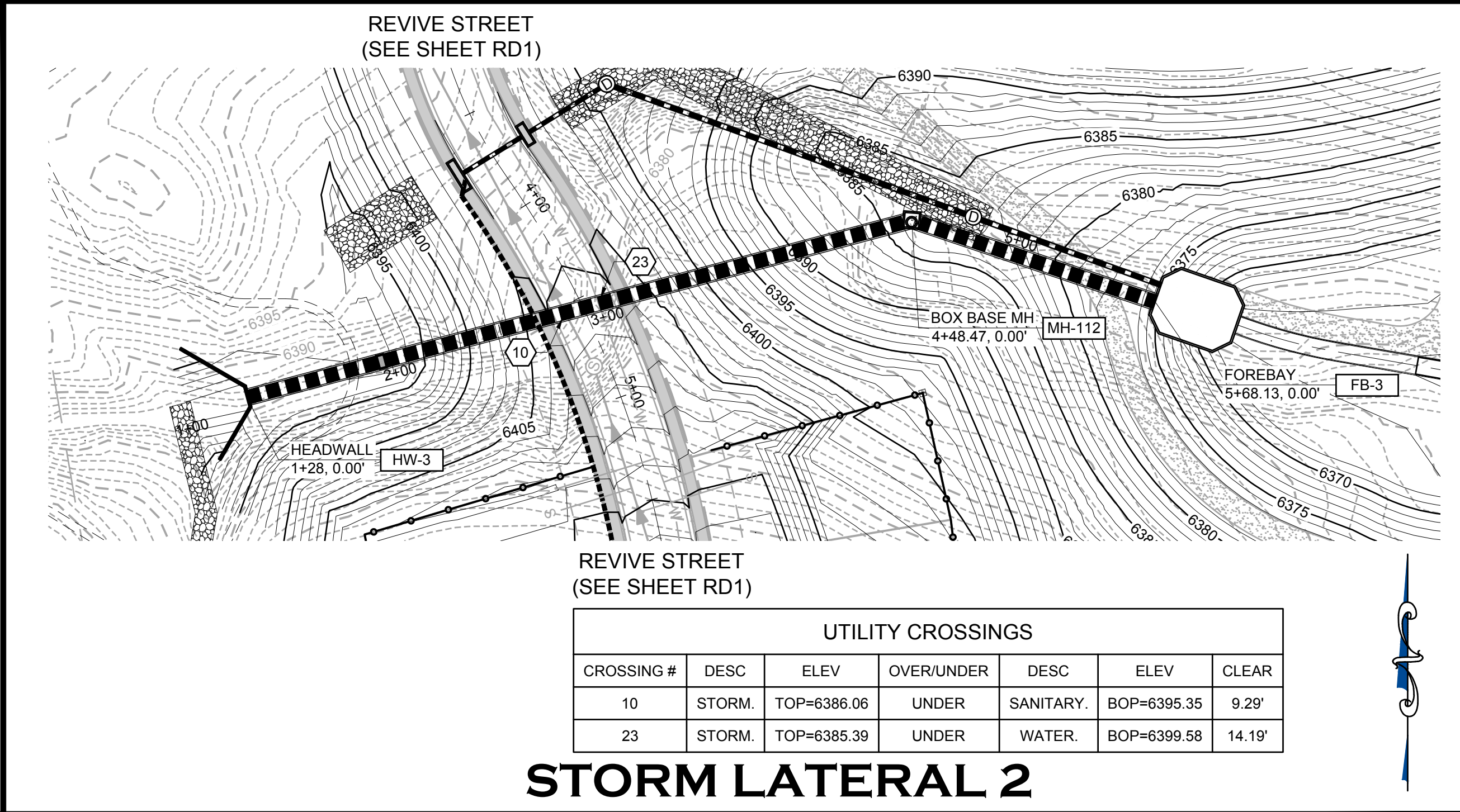
CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
OVERALL UTILITY PLAN

Sheet
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of
142
Date
NOVEMBER 7, 2025

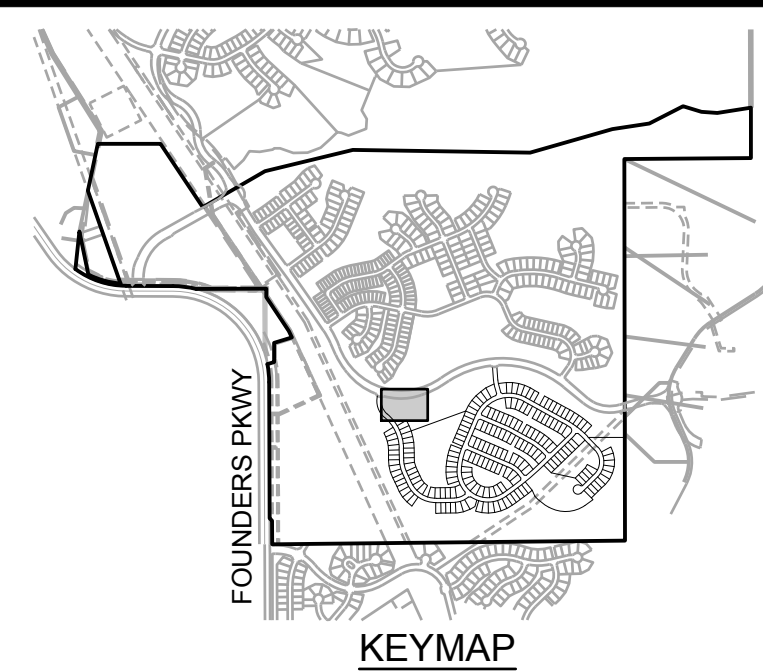
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STORM LATERAL 1



STORM LATERAL 2



GENERAL NOTES:

- ALL STORM LOCATED WITHIN THE RIGHT-OF-WAY IS PUBLIC AND ALL STORM SEWER OUTSIDE OF RIGHT-OF-WAY IS PRIVATE. ALL PRIVATE STORM SEWER WILL BE OWNED AND MAINTAINED BY THE METROPOLITAN DISTRICT.
- ALL STORM IS SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
- ALL DRAINAGE CHANNELS AND SWALES ARE PRIVATE AND SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
- THE METROPOLITAN DISTRICT WILL BE RESPONSIBLE FOR MAINTAINING ALL CHANNEL IMPROVEMENTS (RIPRAP, ETC.).
- IN ALL LOCATIONS WHERE STORM SEWER CROSSES WATER, ABOVE OR BELOW, EACH STORM SEWER JOINT WITHIN THE TRENCH WIDTH OF THE CROSSING SHALL BE ENCASED IN A 6" THICK CONCRETE COLLAR EXTENDING 6" BEYOND BOTH SIDES OF THE JOINT.
- WHERE DOUBLE CDOT TYPE R INLETS ARE UTILIZED, A PIPE SHALL BE PLACED BETWEEN THE 2 INLETS. FLOW WILL BE PASSED BETWEEN THE INLETS VIA A 18" RCP.
- THE CONTRACTOR SHALL GRADE AROUND LOW TAILWATER BASINS AND RIPRAP PADS TO BLEND THEM INTO EXISTING GRADE.
- SEE CUT-OFF WALL DETAIL ON DT6 FOR FES TOE WALL AND RESTRAINT DETAILS.
- SEE DETAIL SHEET DT6 FOR LOW TAILWATER BASINS.

① INDICATES UTILITY CROSSING NUMBER
(SEE CROSSING TABLE LEFT COLUMN)

BASIS OF BEARINGS

PROJECT BEARINGS ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., BEARING SOUTH 00°03'56" EAST, FROM THE EAST QUARTER CORNER OF SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515".

PROFESSIONAL ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY, AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

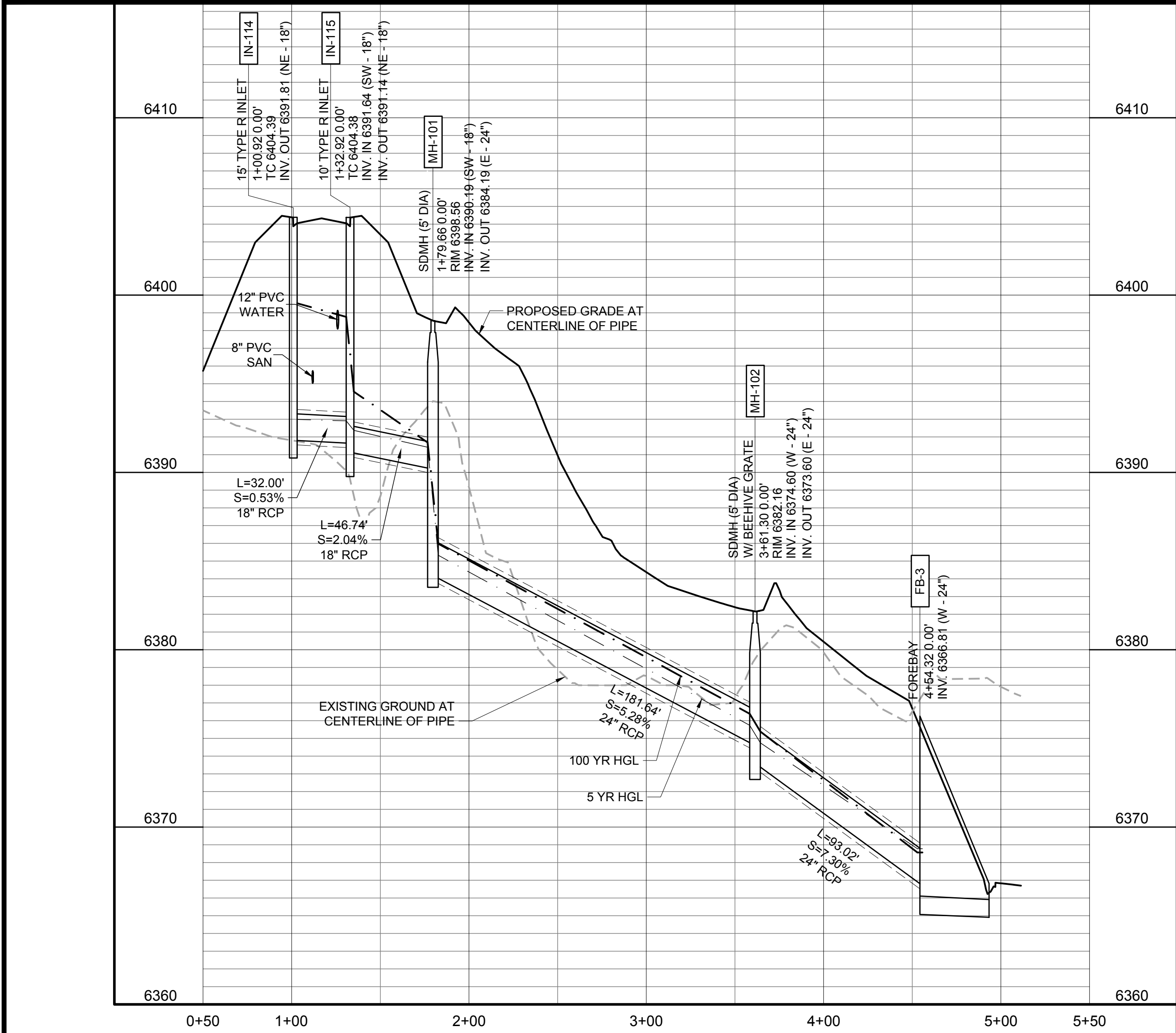
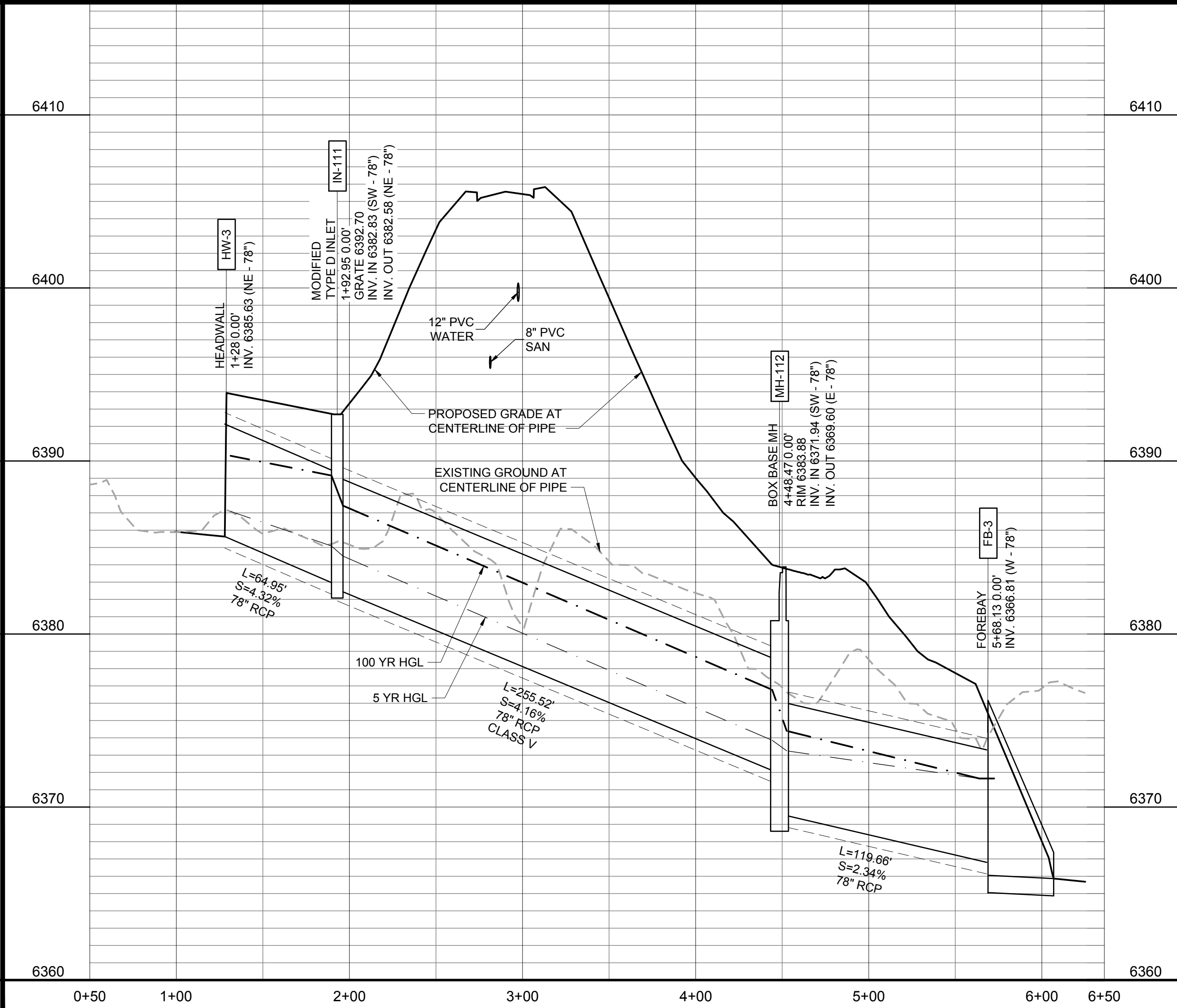
BRIAN K. MOSS
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TOWN APPROVAL BLOCK

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APPROVED BY:

DEVELOPMENT SERVICES
TOCR PROJECT NO: CD24-0012



DATE	REVISION DESCRIPTION

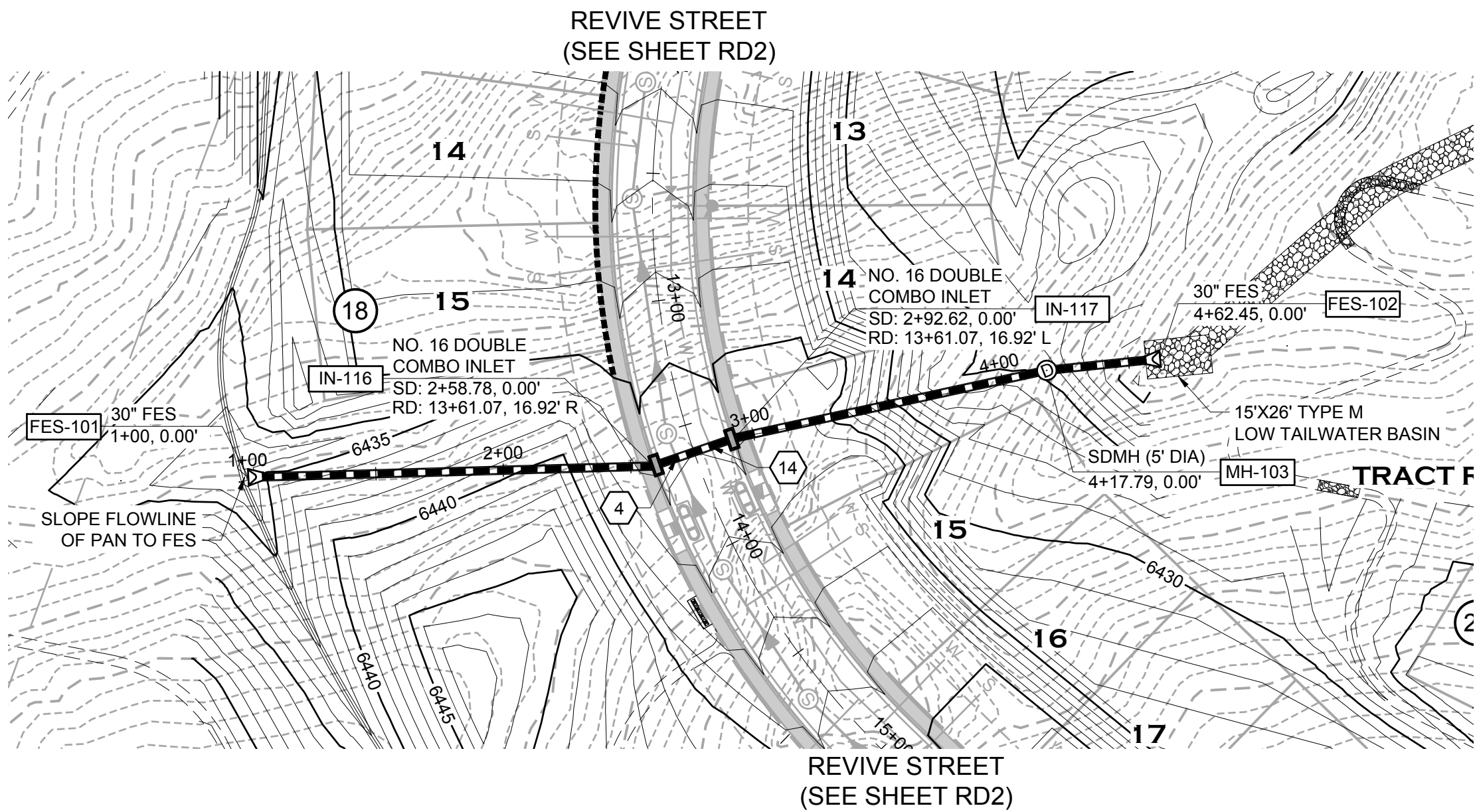
Job Number HINES LP		
Chk BKM	Dwn RLS	Des RLS
Drawing Name 42SD1.dwg		

PROJECT BENCHMARK (AZTEC #401) DOUGLAS COUNTY BENCHMARK TT17A (NAVD88 DATUM) ELEVATION=6483.68
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CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
STORM DRAIN PLAN AND PROFILE

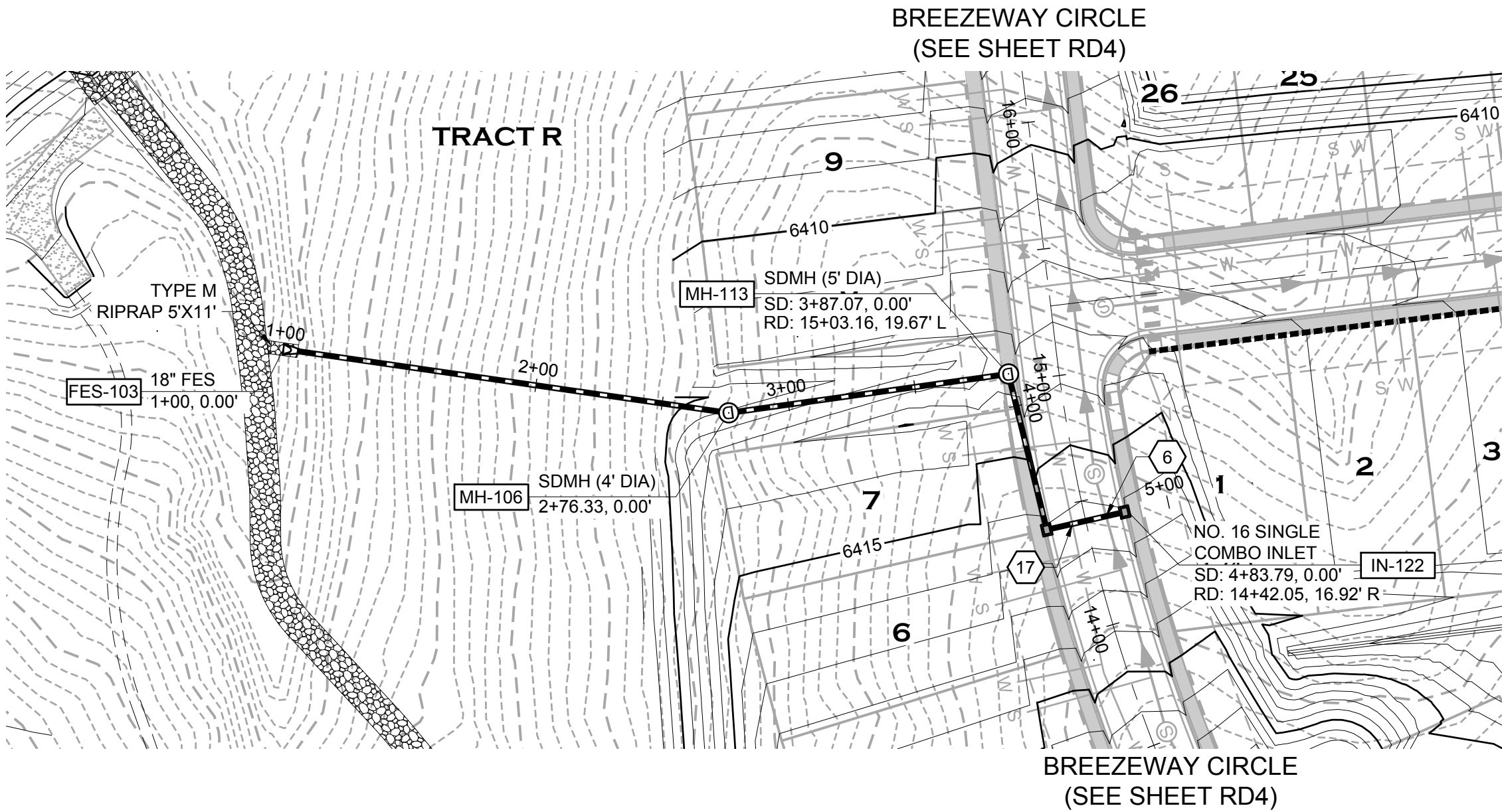
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SD1
of
142
Date
NOVEMBER 7, 2025

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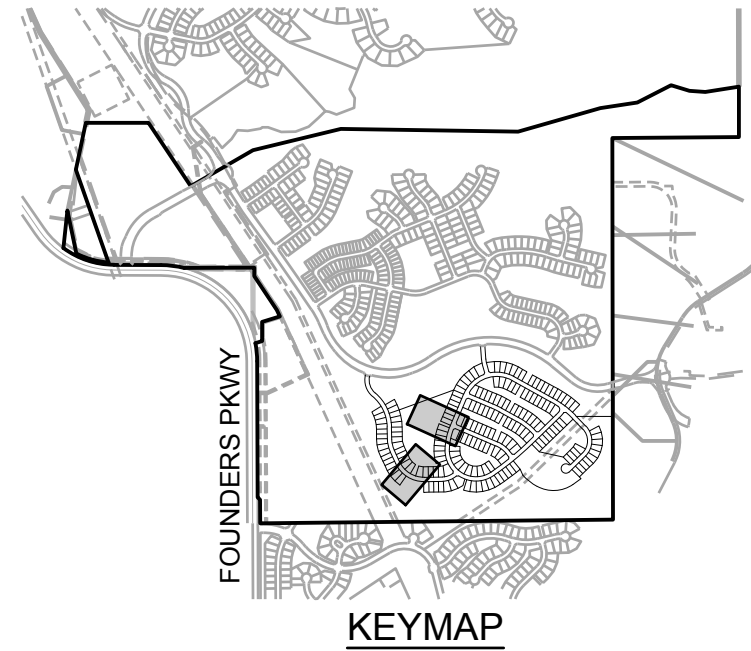
UTILITY CROSSINGS						
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV	CLEAR
4	SANITARY	TOP=6423.04	UNDER	STORM	BOP=6426.45	3.40'
14	STORM	TOP=6429.14	UNDER	WATER	BOP=6430.64	1.50'

STORM LATERAL 3



UTILITY CROSSINGS						
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV	CLEAR
6	SANITARY	TOP=6403.66	UNDER	STORM	BOP=6407.90	4.24'
17	STORM	TOP=6409.83	UNDER	WATER	BOP=6411.34	1.51'

STORM LATERAL 4



GENERAL NOTES:

- ALL STORM LOCATED WITHIN THE RIGHT-OF-WAY IS PUBLIC AND ALL STORM SEWER OUTSIDE OF RIGHT-OF-WAY IS PRIVATE. ALL PRIVATE STORM SEWER WILL BE OWNED AND MAINTAINED BY THE METROPOLITAN DISTRICT.
- ALL STORM IS SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
- ALL DRAINAGE CHANNELS AND SWALES ARE PRIVATE AND SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
- THE METROPOLITAN DISTRICT WILL BE RESPONSIBLE FOR MAINTAINING ALL CHANNEL IMPROVEMENTS (RIPRAP, ETC.).
- IN ALL LOCATIONS WHERE STORM SEWER CROSSES WATER, ABOVE OR BELOW, EACH STORM SEWER JOINT WITHIN THE TRENCH WIDTH OF THE CROSSING SHALL BE ENCASED IN A 6" THICK CONCRETE COLLAR EXTENDING 6" BEYOND BOTH SIDES OF THE JOINT.
- WHERE DOUBLE CDOT TYPE R INLETS ARE UTILIZED, A PIPE SHALL BE PLACED BETWEEN THE 2 INLETS. FLOW WILL BE PASSED BETWEEN THE INLETS VIA A 18" RCP.
- THE CONTRACTOR SHALL GRADE AROUND LOW TAILWATER BASINS AND RIPRAP PADS TO BLEND THEM INTO EXISTING GRADE.
- SEE CUT-OFF WALL DETAIL ON DT6 FOR FES TOE WALL AND RESTRAINT DETAILS.
- SEE DETAIL SHEET DT6 FOR LOW TAILWATER BASINS.

① INDICATES UTILITY CROSSING NUMBER
(SEE CROSSING TABLE LEFT COLUMN)

BASIS OF BEARINGS

PROJECT BEARINGS ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., BEARING SOUTH 00°03'56" EAST, FROM THE EAST QUARTER CORNER OF SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515".

PROFESSIONAL ENGINEER CERTIFICATION

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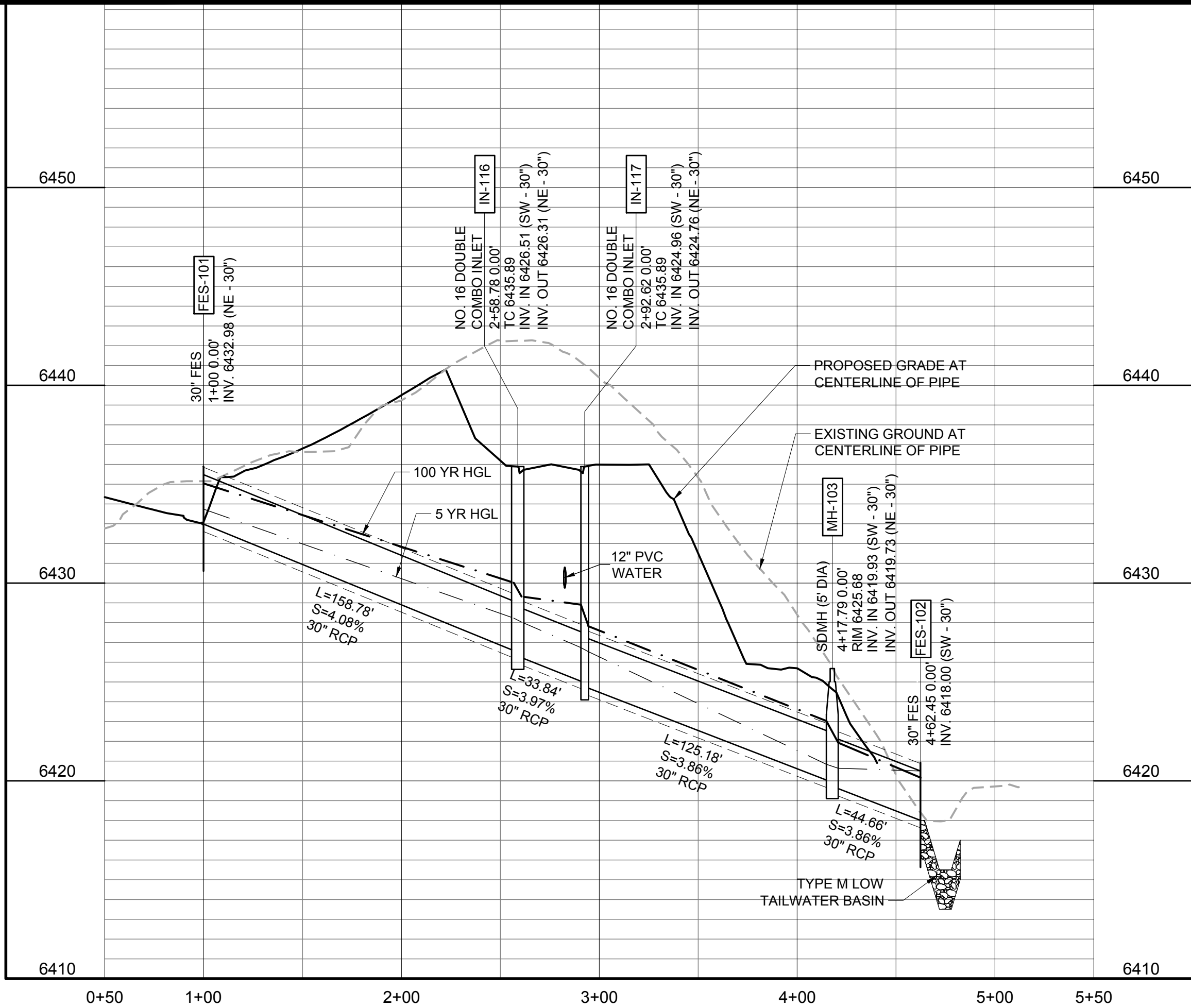
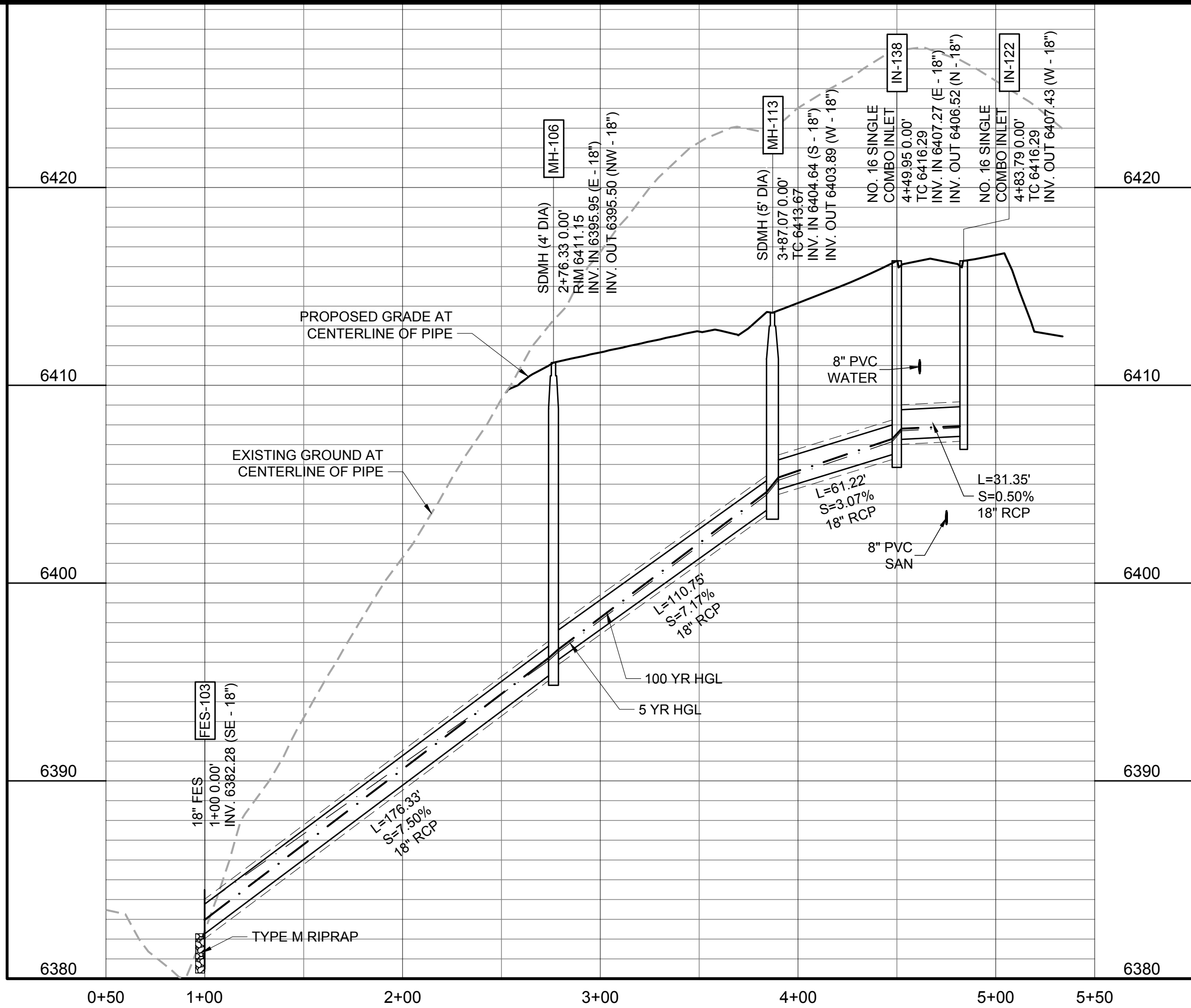
BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY:

DEVELOPMENT SERVICES
TOCR PROJECT NO: CD24-0012



DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Drw RLS	Des RLS
Drawing Name 42SD2.dwg		

PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

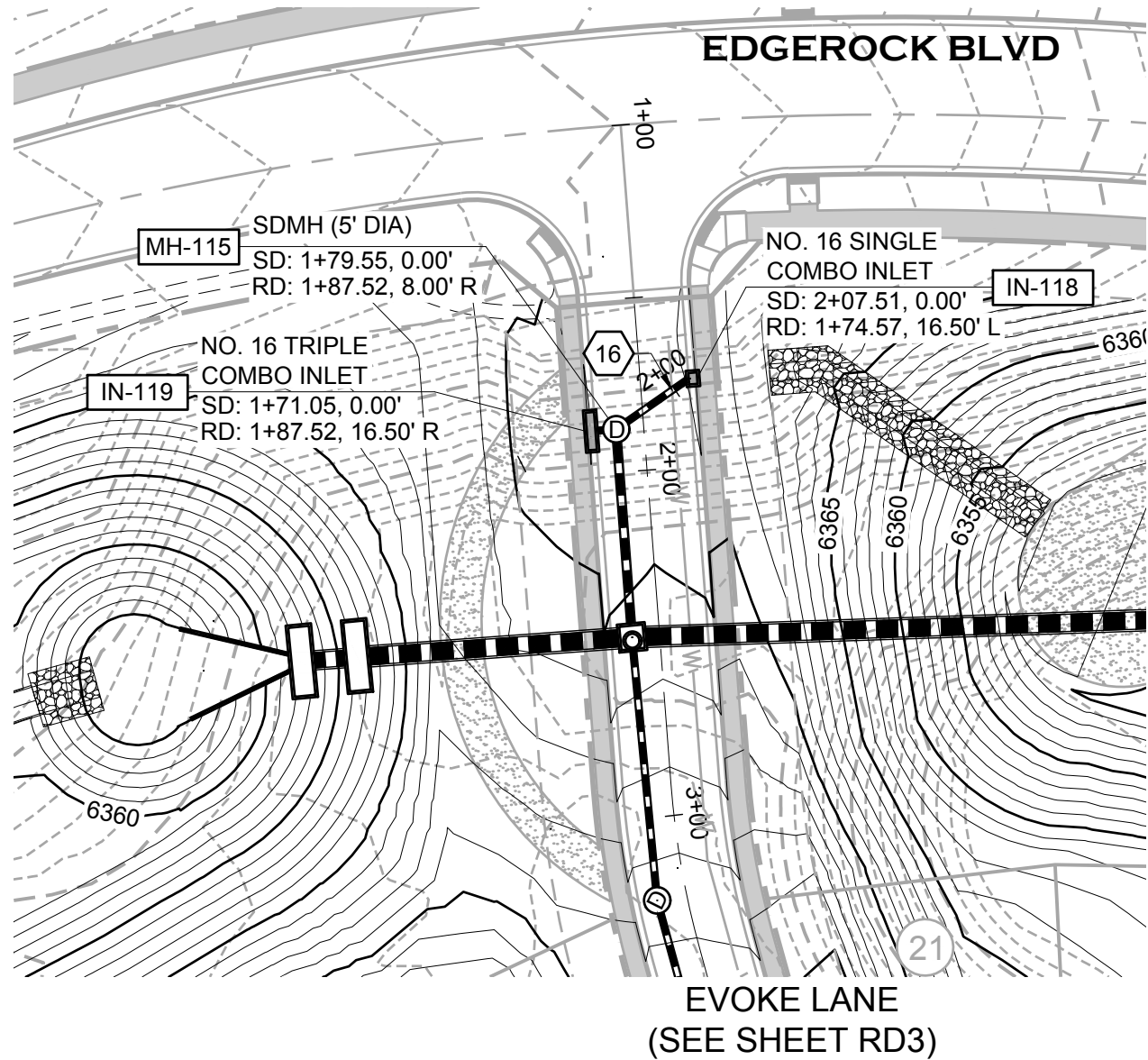
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ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
STORM DRAIN PLAN AND PROFILE

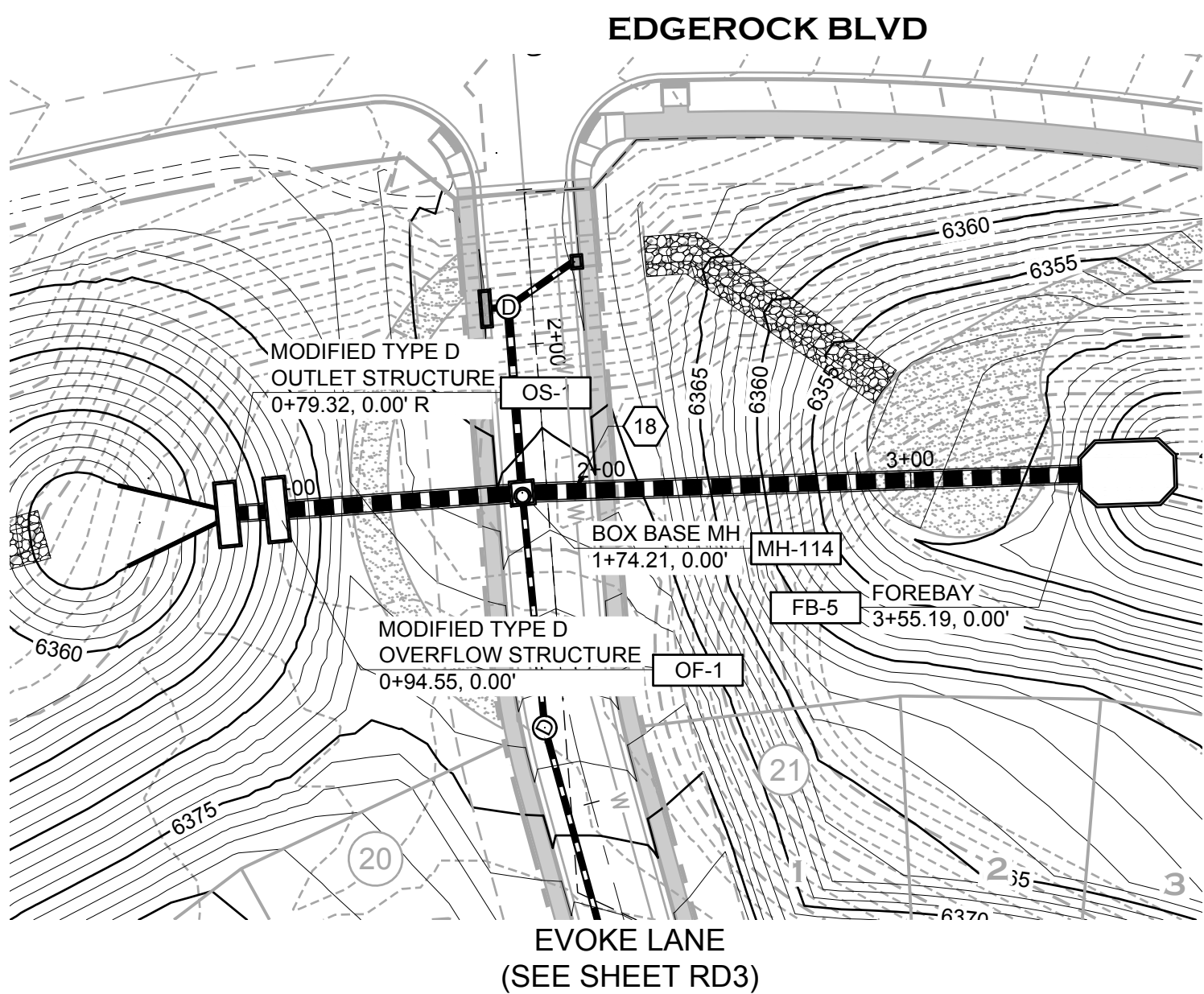
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SD2
of
142
Date
NOVEMBER 7, 2025

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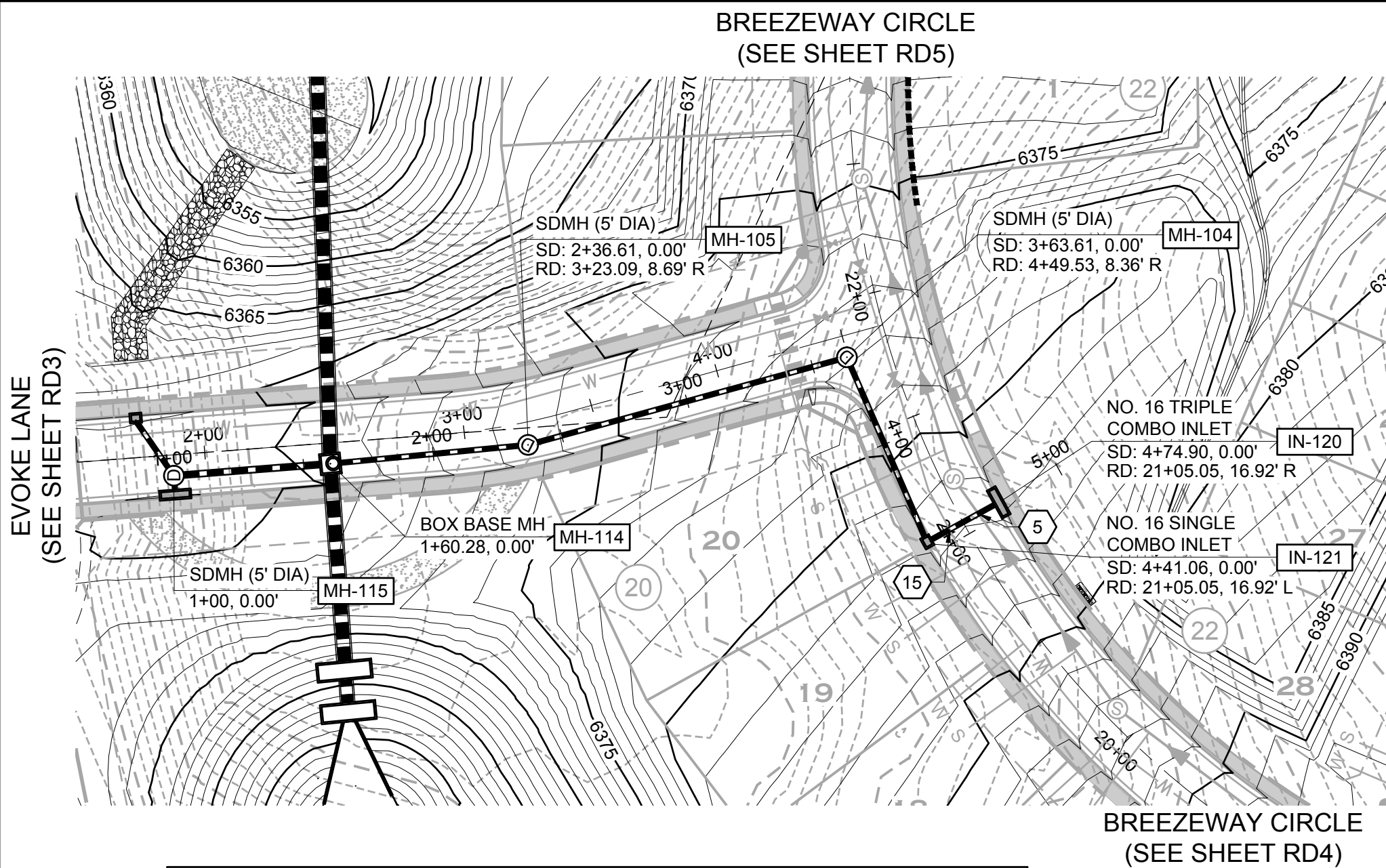
UTILITY CROSSINGS					
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	CLEAR
16	STORM.	TOP=6361.65	UNDER	WATER.	BOP=6363.15 1.50'

STORM LATERAL 5



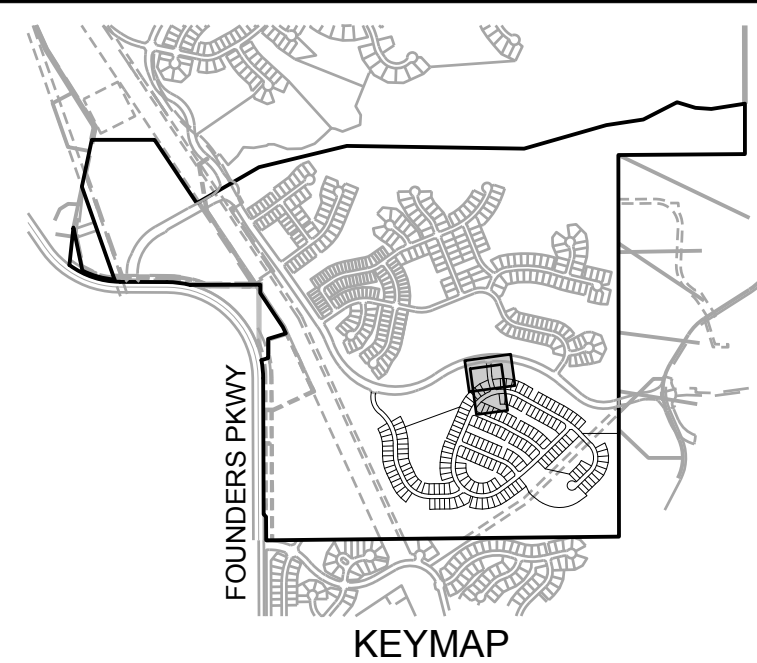
UTILITY CROSSINGS					
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	CLEAR
18	STORM.	TOP=6354.66	UNDER	WATER.	BOP=6364.17 9.51'

STORM LATERAL 6



UTILITY CROSSINGS					
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	CLEAR
5	SANITARY.	TOP=6367.15	UNDER	STORM.	BOP=6371.35 4.21'
15	STORM.	TOP=6373.16	UNDER	WATER.	BOP=6376.08 2.92'

STORM LATERAL 7



GENERAL NOTES:

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- SEE DETAIL SHEET DT6 FOR LOW TAILWATER BASINS.

① INDICATES UTILITY CROSSING NUMBER
(SEE CROSSING TABLE LEFT COLUMN)

BASIS OF BEARINGS

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BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY:

DEVELOPMENT SERVICES
TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Drw RLS	Des RLS
Drawing Name 42SD3.dwg		

PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

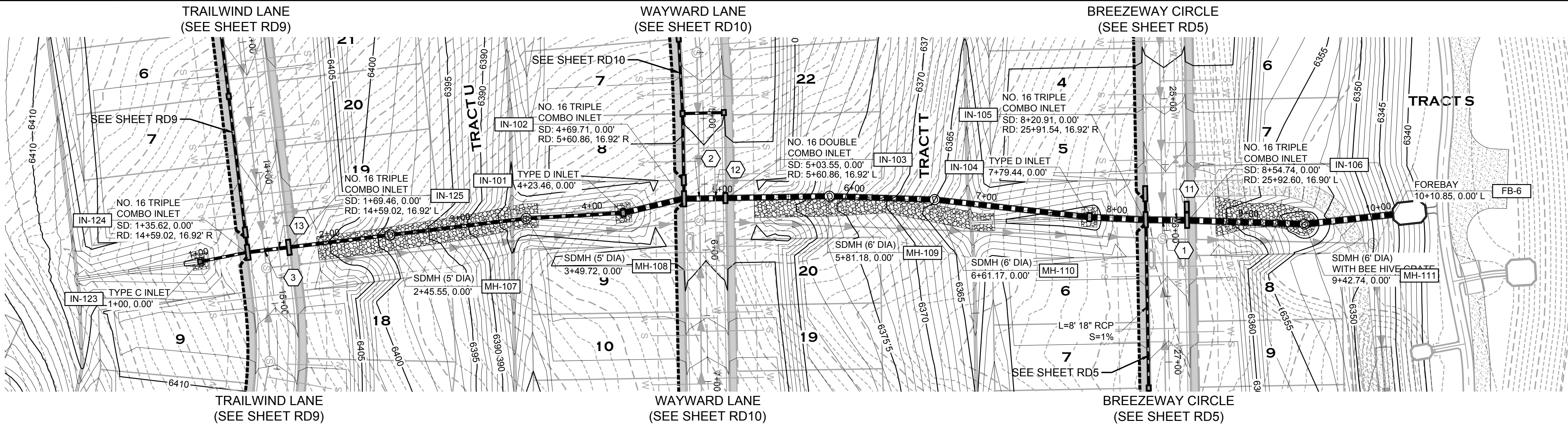
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ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
STORM DRAIN PLAN AND PROFILE

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of
142
Date
NOVEMBER 7, 2025

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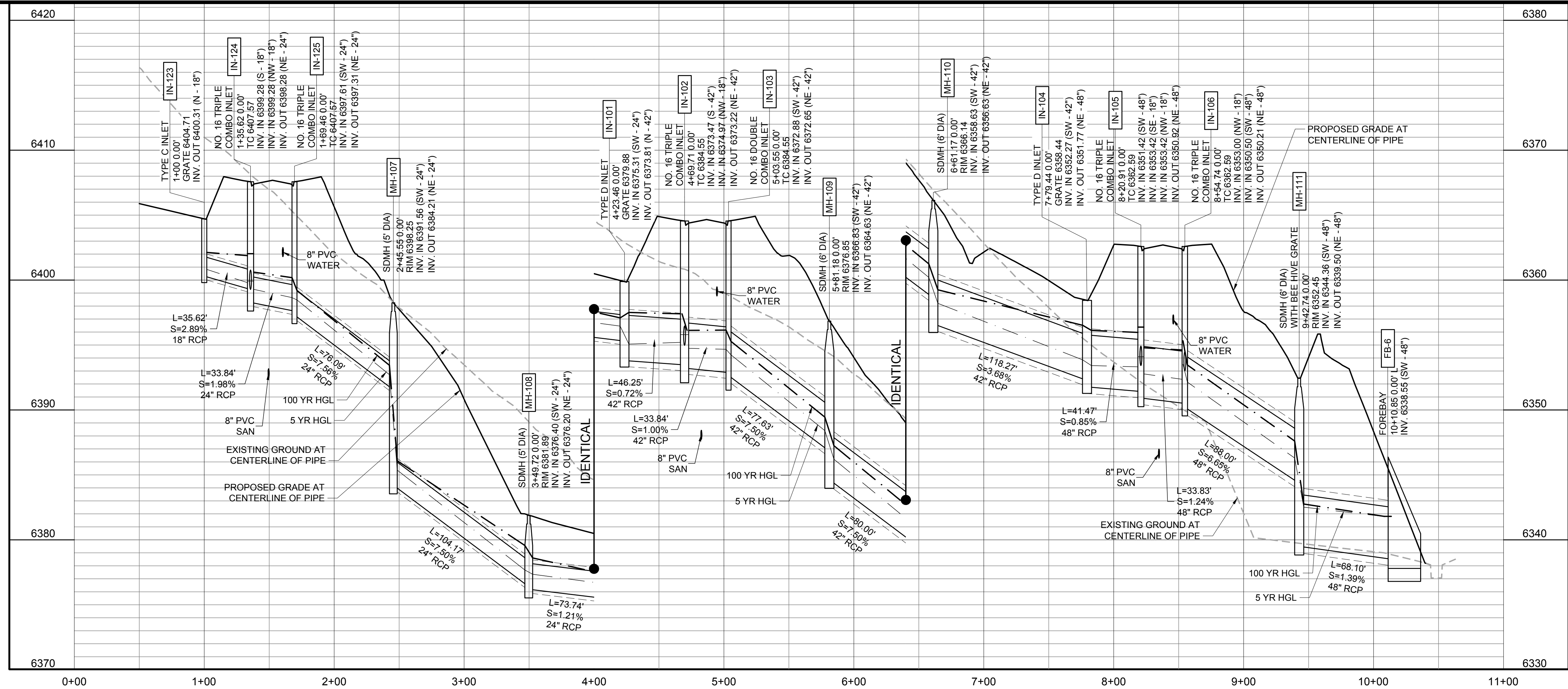
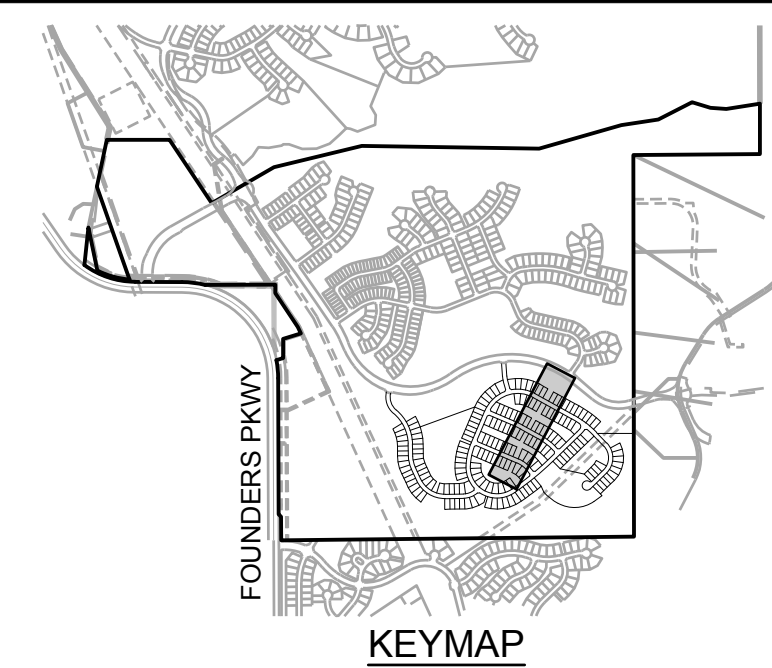


UTILITY CROSSINGS					
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV
3	SANITARY	TOP=6393.27	UNDER	STORM	BOP=6397.72
13	STORM	TOP=6400.08	UNDER	WATER	BOP=6401.80

UTILITY CROSSINGS					
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV
2	SANITARY	TOP=6368.44	UNDER	STORM	BOP=6372.63
12	STORM	TOP=6376.93	UNDER	WATER	BOP=6378.77

UTILITY CROSSINGS					
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV
1	SANITARY	TOP=6346.99	UNDER	STORM	BOP=6350.25
11	STORM	TOP=6355.11	UNDER	WATER	BOP=6356.62

STORM LATERAL 8



GENERAL NOTES:

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(SEE CROSSING TABLE LEFT COLUMN)

BASIS OF BEARINGS

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BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

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APPROVED BY:

DEVELOPMENT SERVICES
TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Drw RLS	Des RLS
42SD4.dwg		

PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

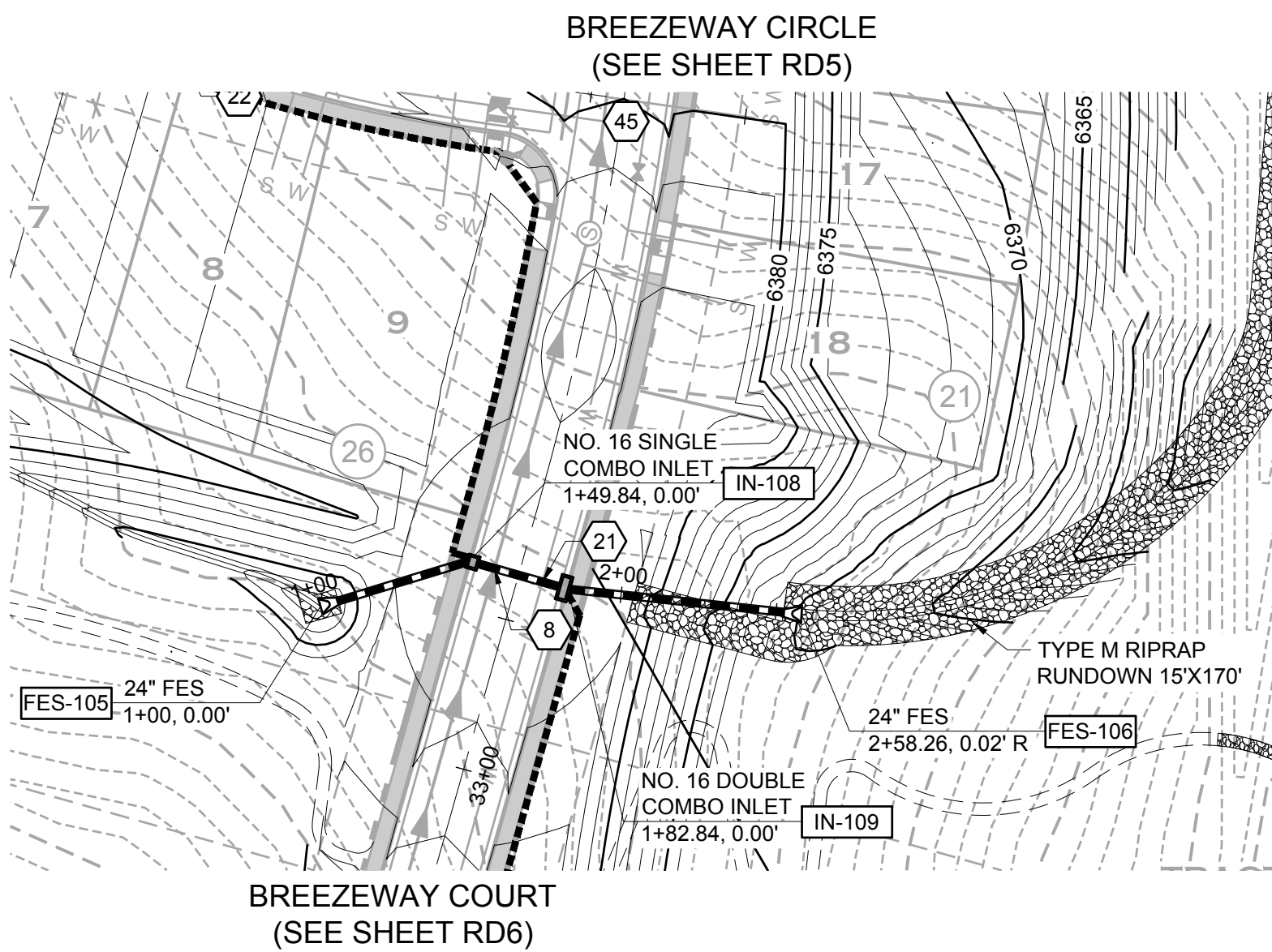
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ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
STORM DRAIN PLAN AND PROFILE

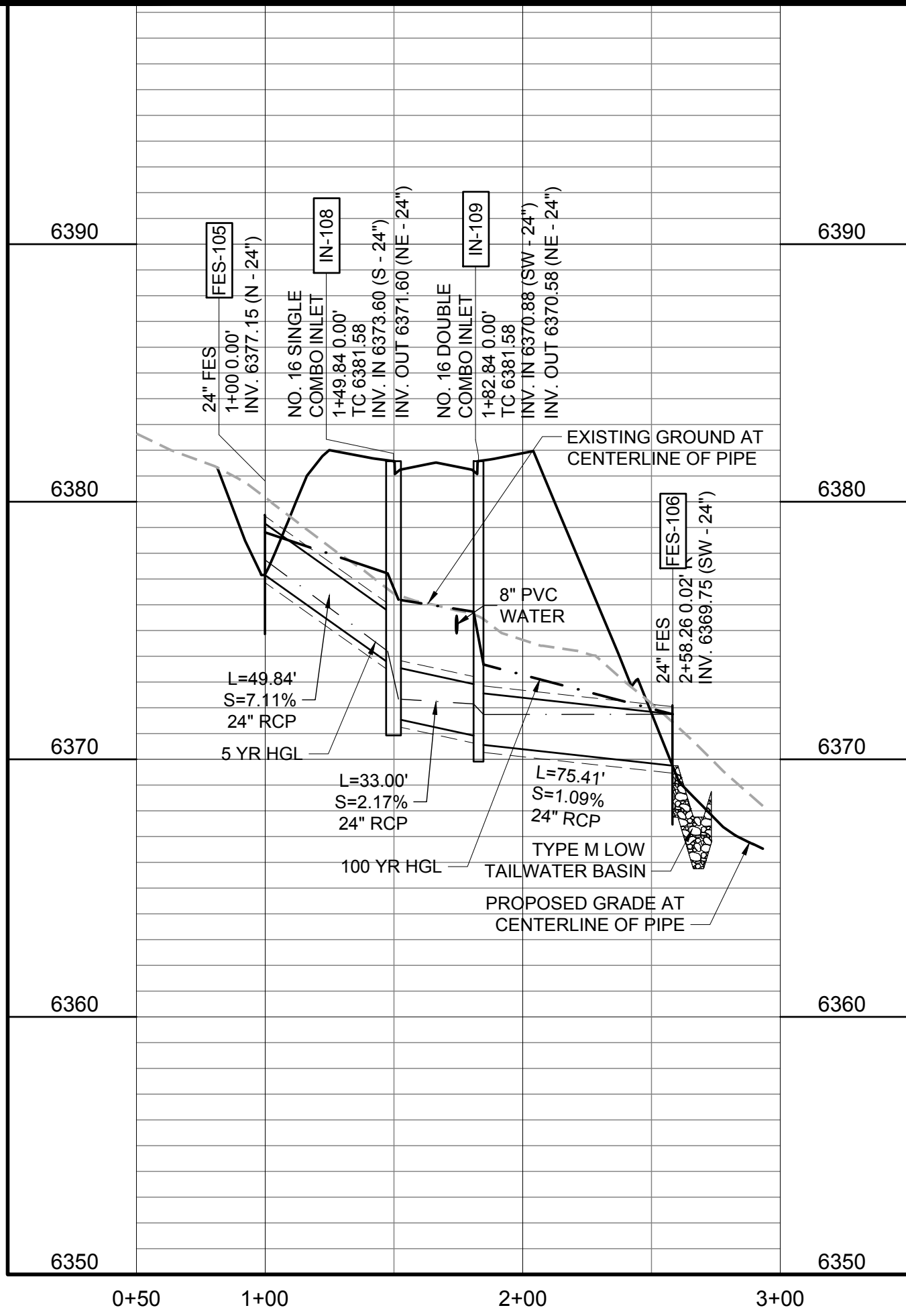
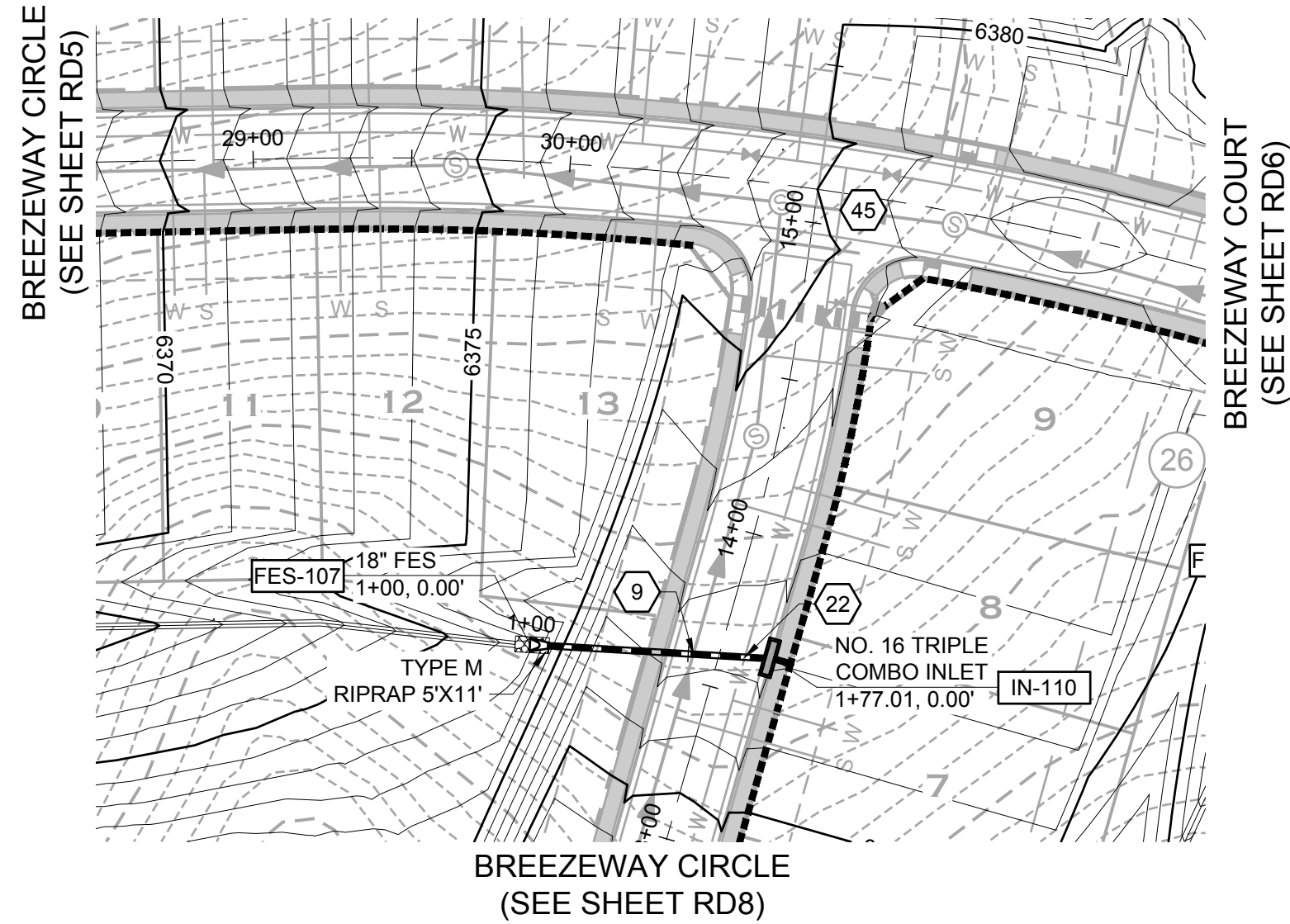
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of
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Date
NOVEMBER 7, 2025

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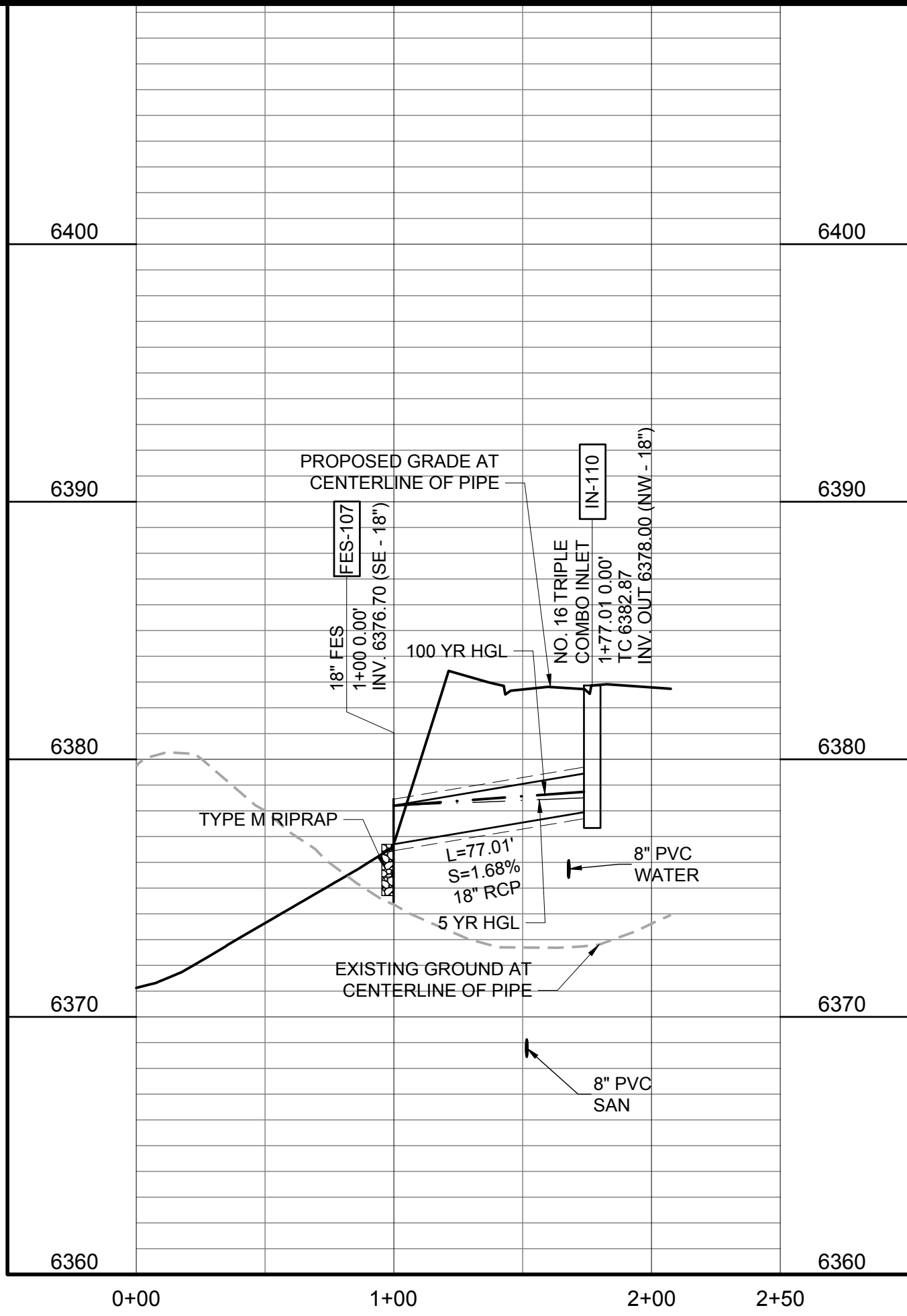
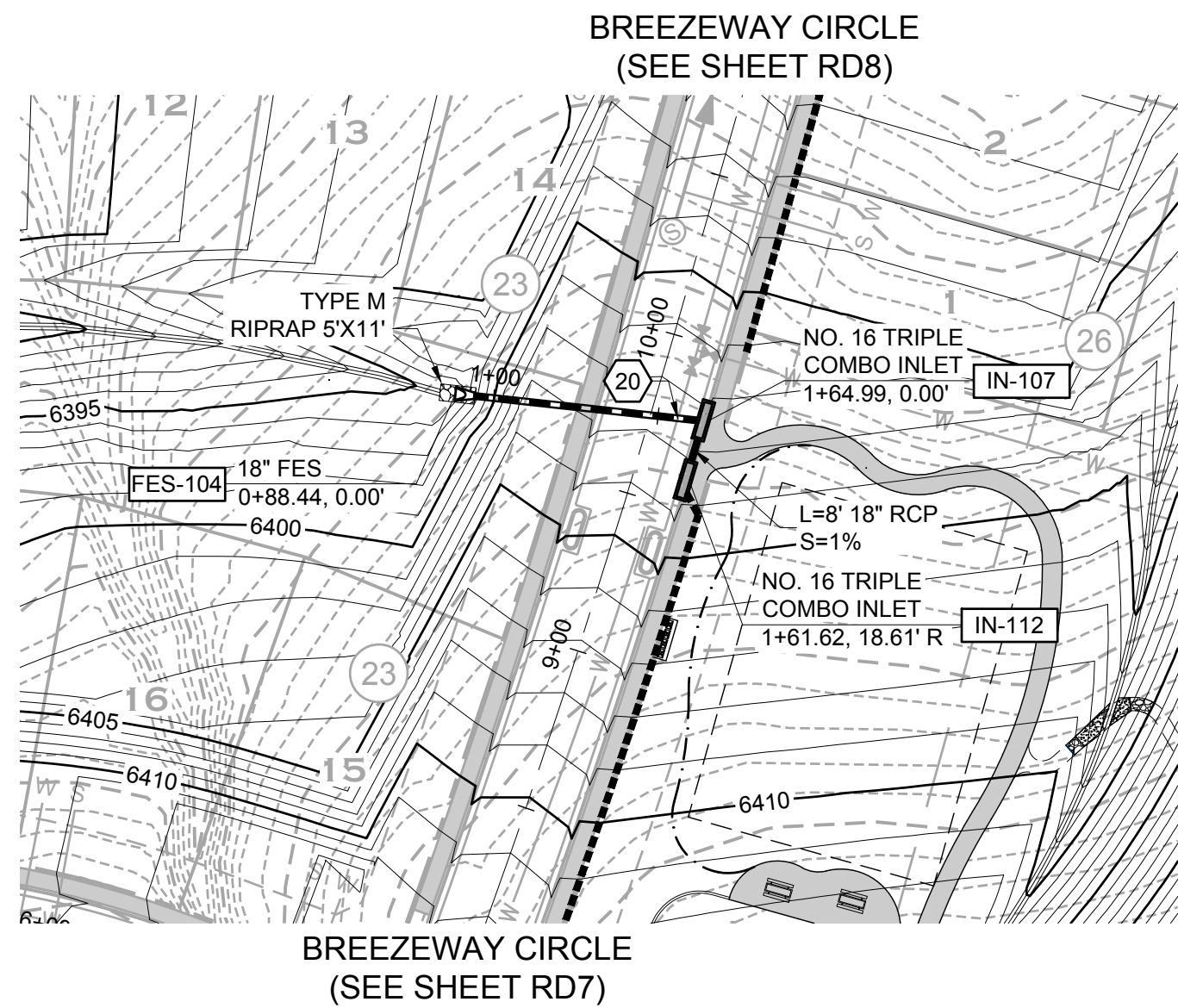
UTILITY CROSSINGS						
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV	CLEAR
8	SANITARY.	TOP=6369.08	UNDER	STORM.	BOP=6371.12	2.05'
21	STORM.	TOP=6373.36	UNDER	WATER.	BOP=6374.88	1.52'

STORM LATERAL 9



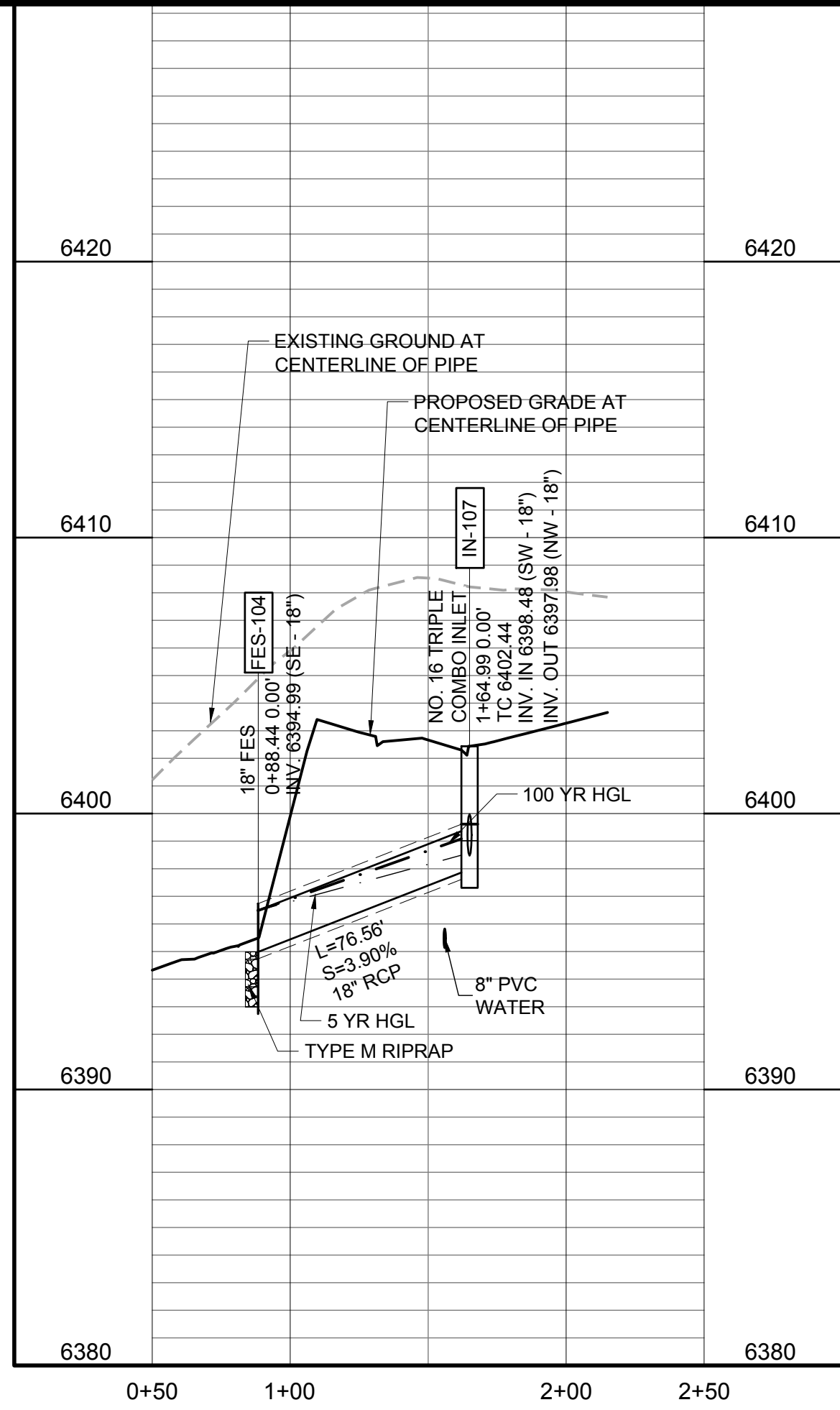
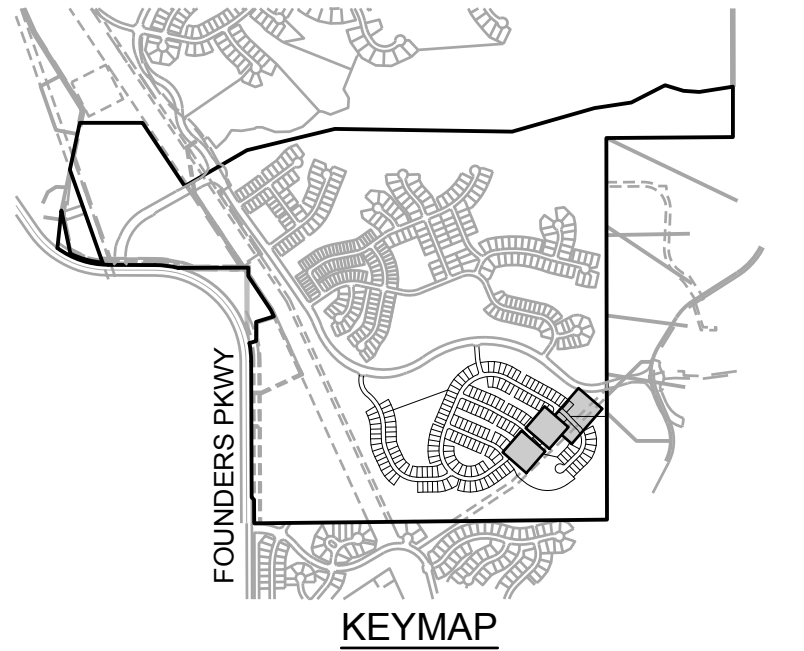
UTILITY CROSSINGS						
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV	CLEAR
9	SANITARY.	TOP=6369.14	UNDER	STORM.	BOP=6377.32	8.18'
22	WATER.	TOP=6376.10	UNDER	STORM.	BOP=6377.60	1.50'

STORM LATERAL 10



UTILITY CROSSINGS						
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV	CLEAR
20	WATER.	TOP=6395.83	UNDER	STORM.	BOP=6397.38	1.54'

STORM LATERAL 11



GENERAL NOTES:

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(SEE CROSSING TABLE LEFT COLUMN)

BASIS OF BEARINGS

PROJECT BEARINGS ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., BEARING SOUTH 00°03'56" EAST, FROM THE EAST QUARTER CORNER OF SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515".

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STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

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APPROVED BY:

DEVELOPMENT SERVICES DATE
TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Drw RLS	Des RLS

0 25 50 100 1 inch = 50 ft. HORIZ. 1 inch = 5 ft. VERT.	Drawing Name: 42SD5.dwg
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PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

Hines

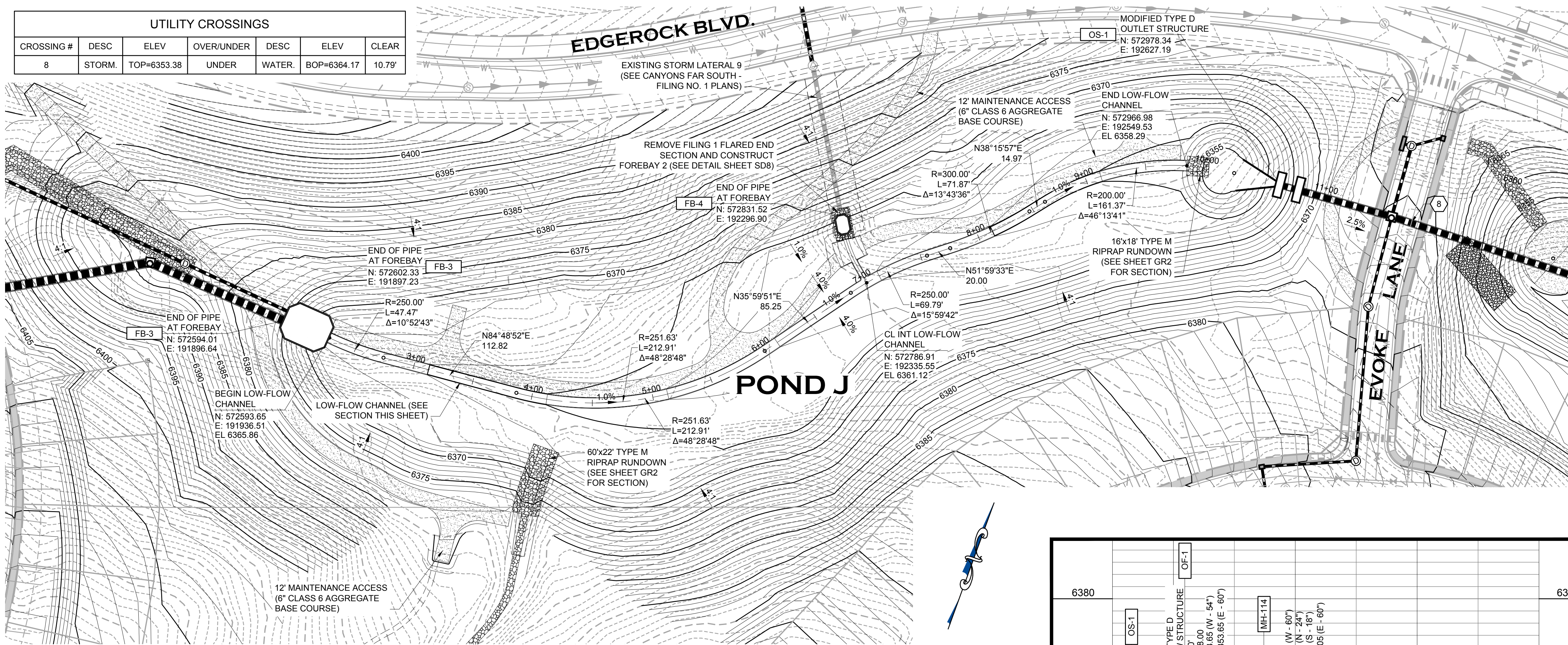
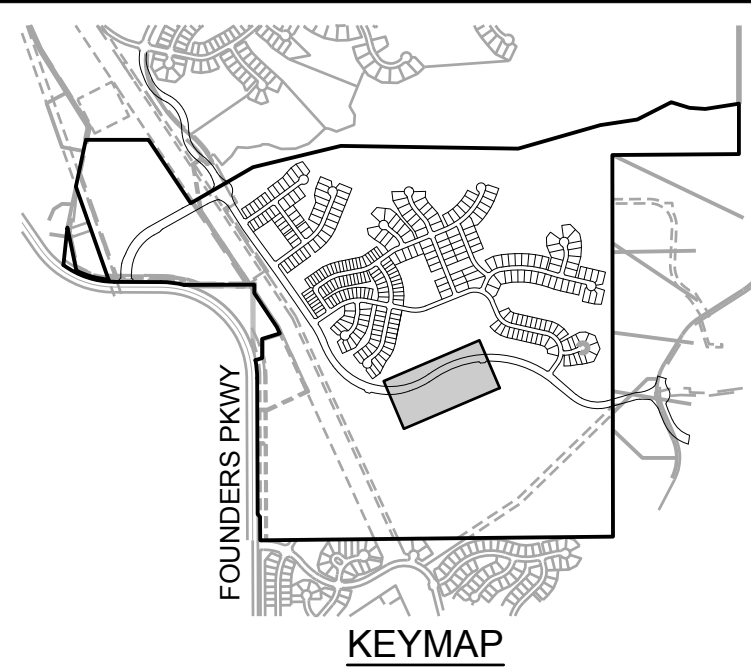
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ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
STORM DRAIN PLAN AND PROFILE

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of
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Date
NOVEMBER 7, 2025

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UTILITY CROSSINGS						
CROSSING #	DESC	ELEV	OVER/UNDER	DESC	ELEV	CLEAR
8	STORM.	TOP=6353.38	UNDER	WATER.	BOP=6364.17	10.79'



GENERAL NOTES:

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- THE CONTRACTOR SHALL GRADE AROUND LOW TAILWATER BASINS AND RIPRAP PADS TO BLEND THEM INTO EXISTING GRADE.
- ALL FLARED END SECTIONS SHALL BE RESTRAINED AND HAVE A CUT-OFF WALL, SEE DETAIL ON SHEET D17 FOR WALL AND RESTRAINT DETAILS.

1 INDICATES UTILITY CROSSING NUMBER (SEE CROSSING TABLE LEFT COLUMN)

BASIS OF BEARINGS

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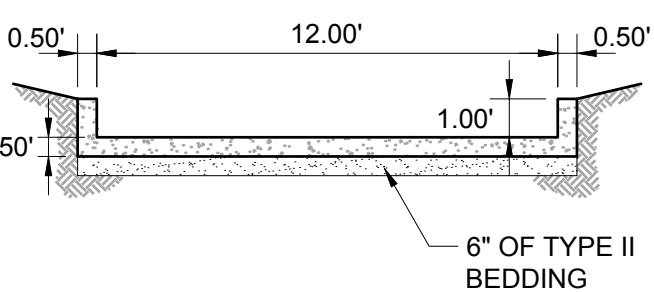
BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

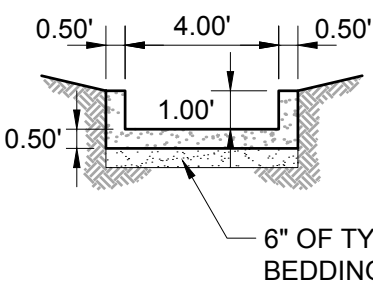
TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

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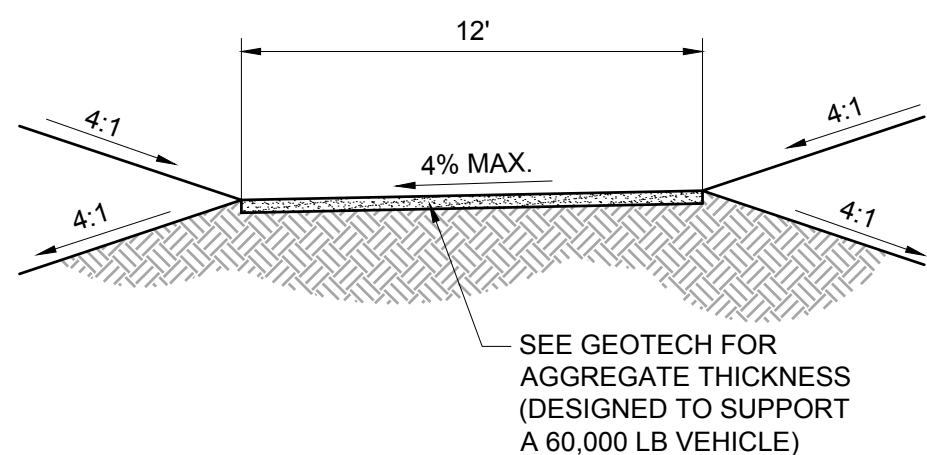
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TOCR PROJECT NO: CD24-0011



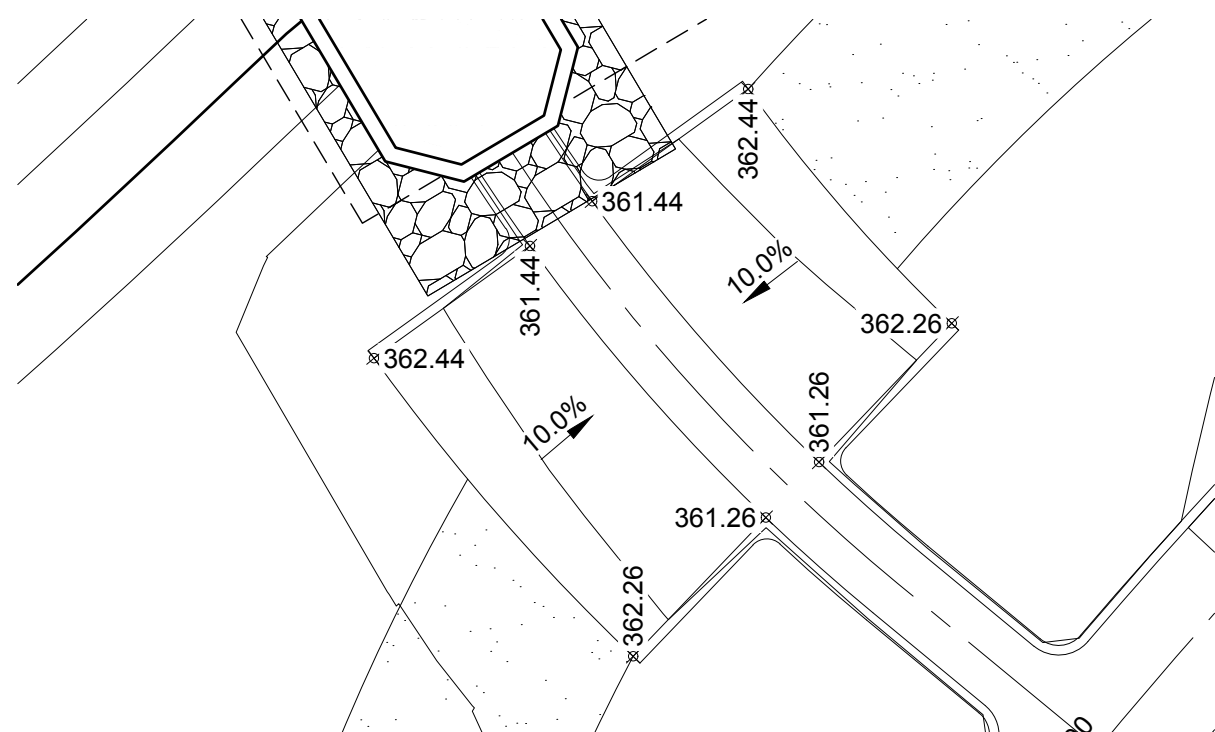
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1" = 5'



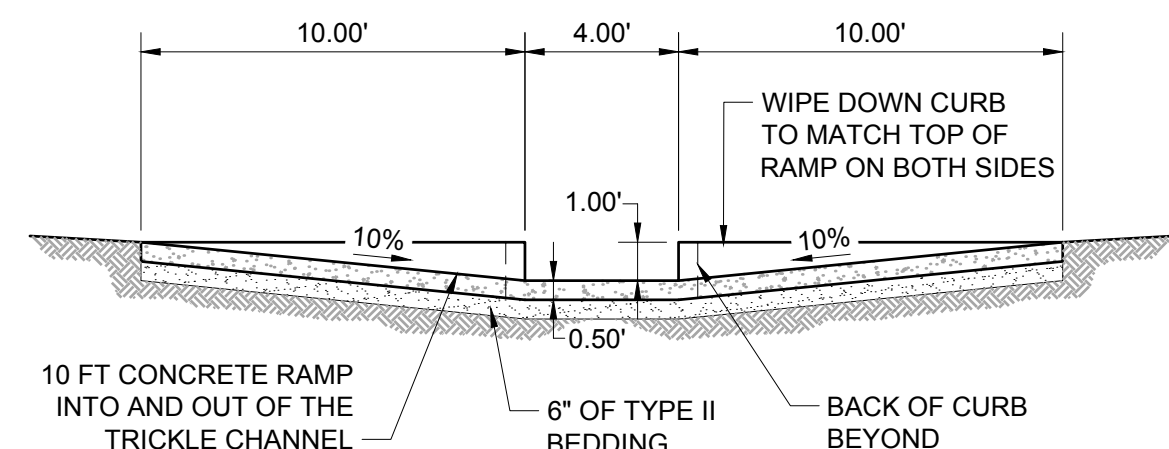
POND J TRICKLE CHANNEL SECTION 4
1" = 5'



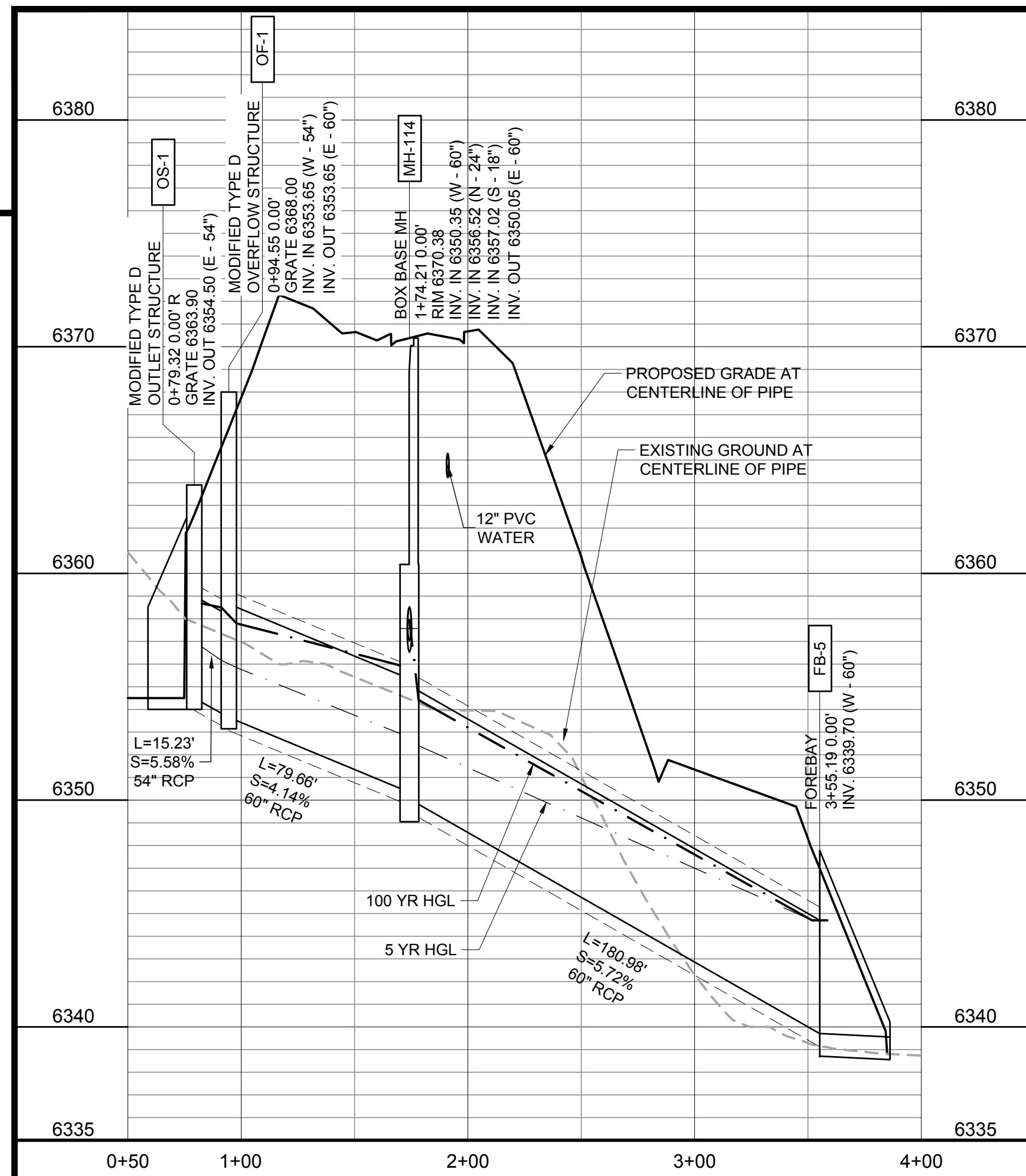
POND MAINTENANCE PATH DETAIL
N.T.S.



TRICKLE CHANNEL VEHICLE CROSSING
1" = 10'



TRICKLE CHANNEL VEHICLE CROSSING SECTION
1" = 5'



DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Drw RLS	Des RLS
Drawing Name 42SD6.dwg		

PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

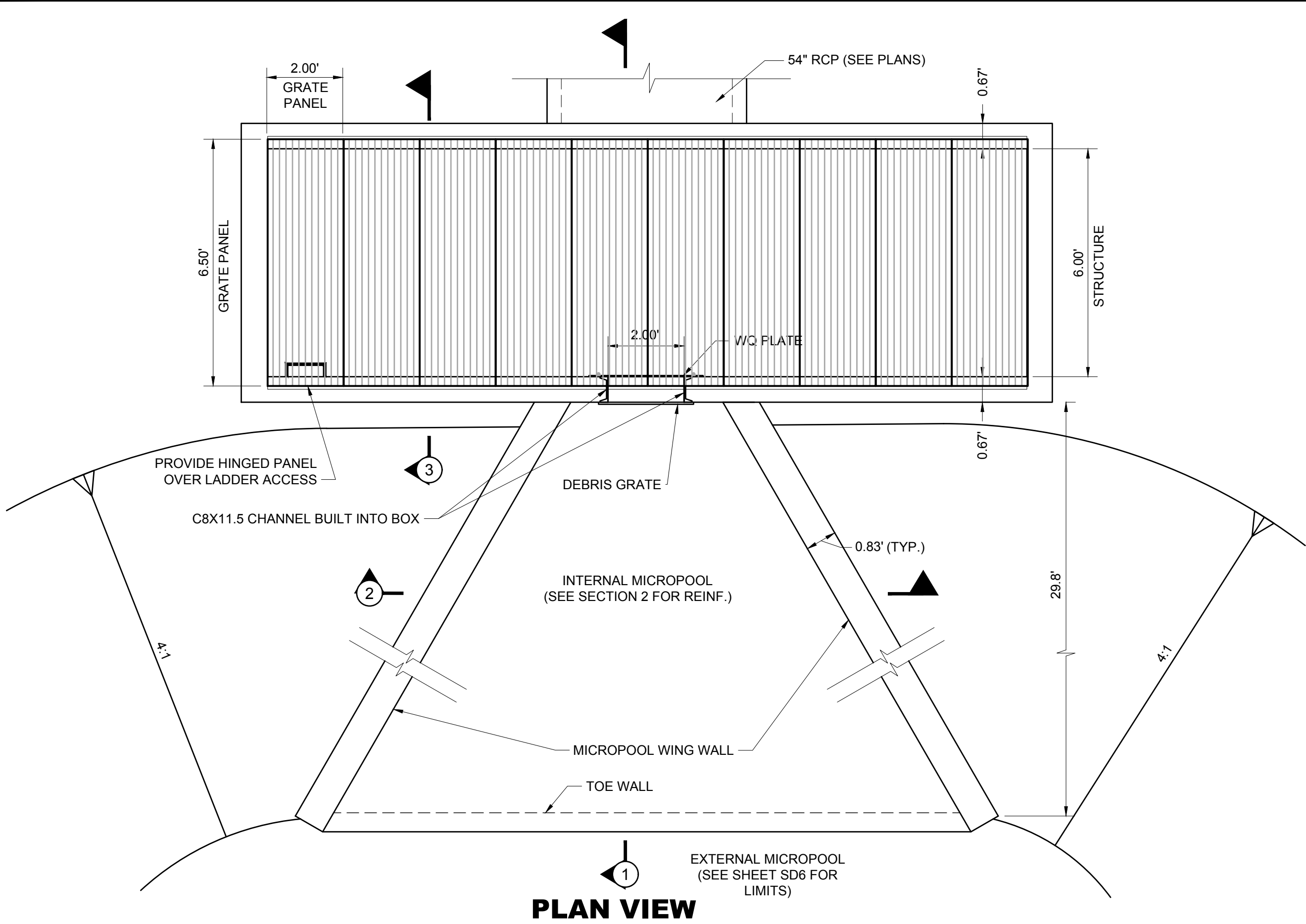
Hines

COVER
ENGINEERING

CANYONS FAR SOUTH FILING 1
GRADING, ROADWAY, & UTILITY PLANS
POND J DETAILS

Sheet
SD6
of
142
Date
NOVEMBER 7, 2025

PATH: K:\HINES\LP\CADD\CIVIL\42 FILING 2 CD\S42SD7-SD9.DWG
 PLOTTED BY: ROD SIGMON PLOT DATE: 11/5/2025 1:03 PM
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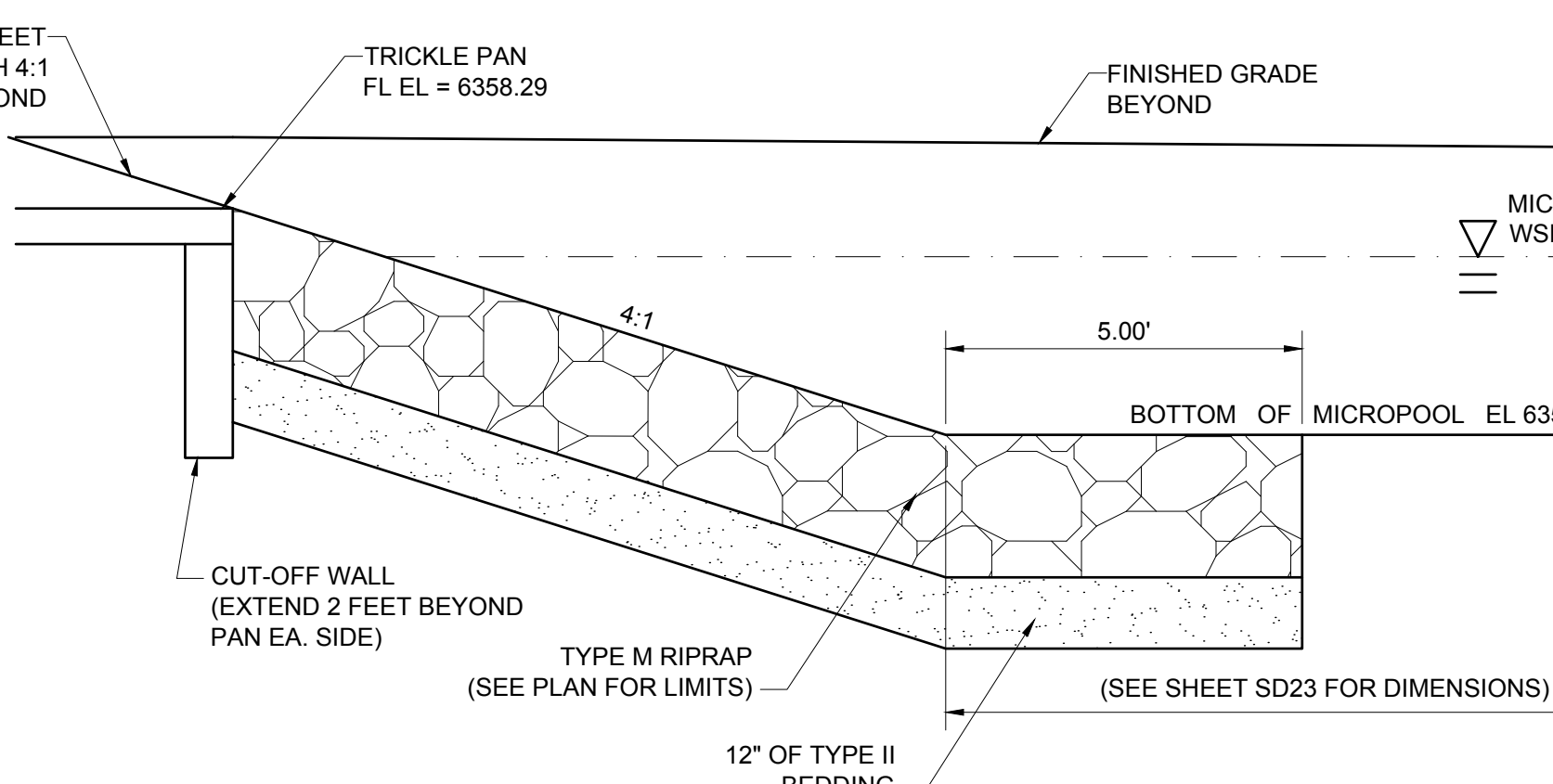
PLAN VIEW

REINFORCING STEEL

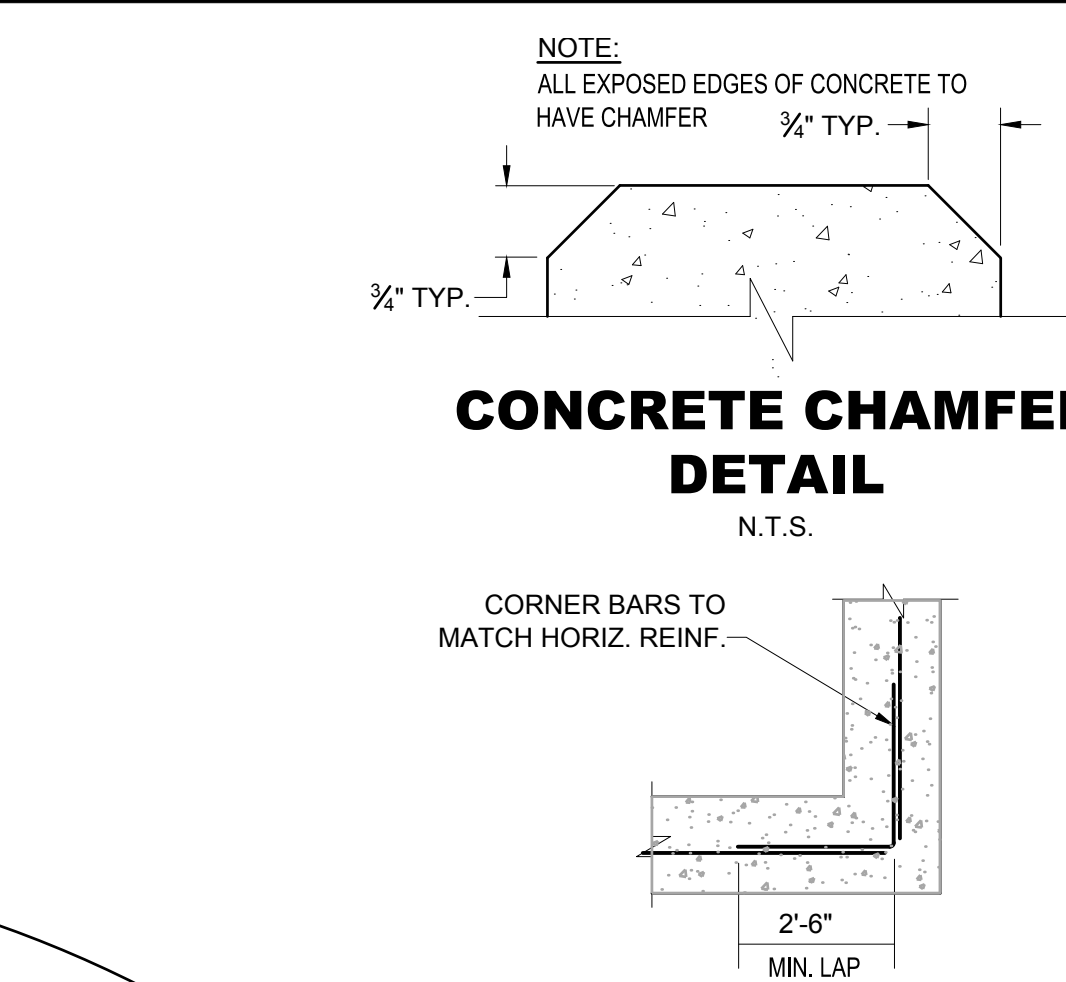
- FABRICATE AND PLACE REINFORCING BARS IN ACCORDANCE WITH CRSI "MANUAL OF STANDARD PRACTICE" AND CRSI "RECOMMENDED PRACTICE FOR PLACING REINFORCING BARS".
- REINFORCING STEEL TO COMPLY WITH ASTM A615, GRADE 60.
- LAP REINFORCING STEEL IN CONCRETE 2'-6" MINIMUM.
- PROVIDE REINFORCING STEEL WITH PROTECTIVE COVERING OF CONCRETE AS NOTED IN SECTIONS.
- DO NOT USE BRICK OR POROUS MATERIAL TO SUPPORT FOOTING STEEL OFF THE GROUND.
- SUBMIT SHOP DRAWINGS.
- WHERE SINGLE CURTAIN OF REINFORCEMENT SHOWN, CENTER BARS IN WALL.
- REFER TO DETAIL THIS SHEET FOR CORNER BARS.

CONCRETE

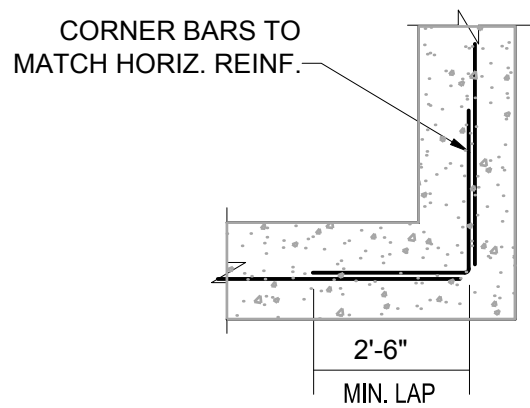
- ALL CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF ACI 301 "SPECIFICATIONS FOR STRUCTURAL BUILDINGS," EXCEPT AS MODIFIED BY THE SUPPLEMENTAL REQUIREMENTS CONTAINED HEREIN OR SHOWN ON THE DRAWINGS, AND AS SPECIFIED IN SECTION 03000.
- ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS 4,500 PSI.
- CEMENT SHALL CONFORM TO ASTM C 150, TYPE III; CONTRACTOR SHALL SUBSTITUTE 20% OF CLASS F FLYASH FOR CEMENT.
- AGGREGATES ASTM C 33.
- CONCRETE SHALL CONTAIN 6" AIR ENTRAINMENT, ±1%.
- PROVIDE 3/4" CHAMFER ON ALL EXPOSED EDGES PER DETAIL ABOVE.
- WATER CEMENT RATIO SHALL BE 0.45 MAX.
- MAXIMUM WATER SOLUBLE CHLORIDE ION CONTENT = 0.3%.



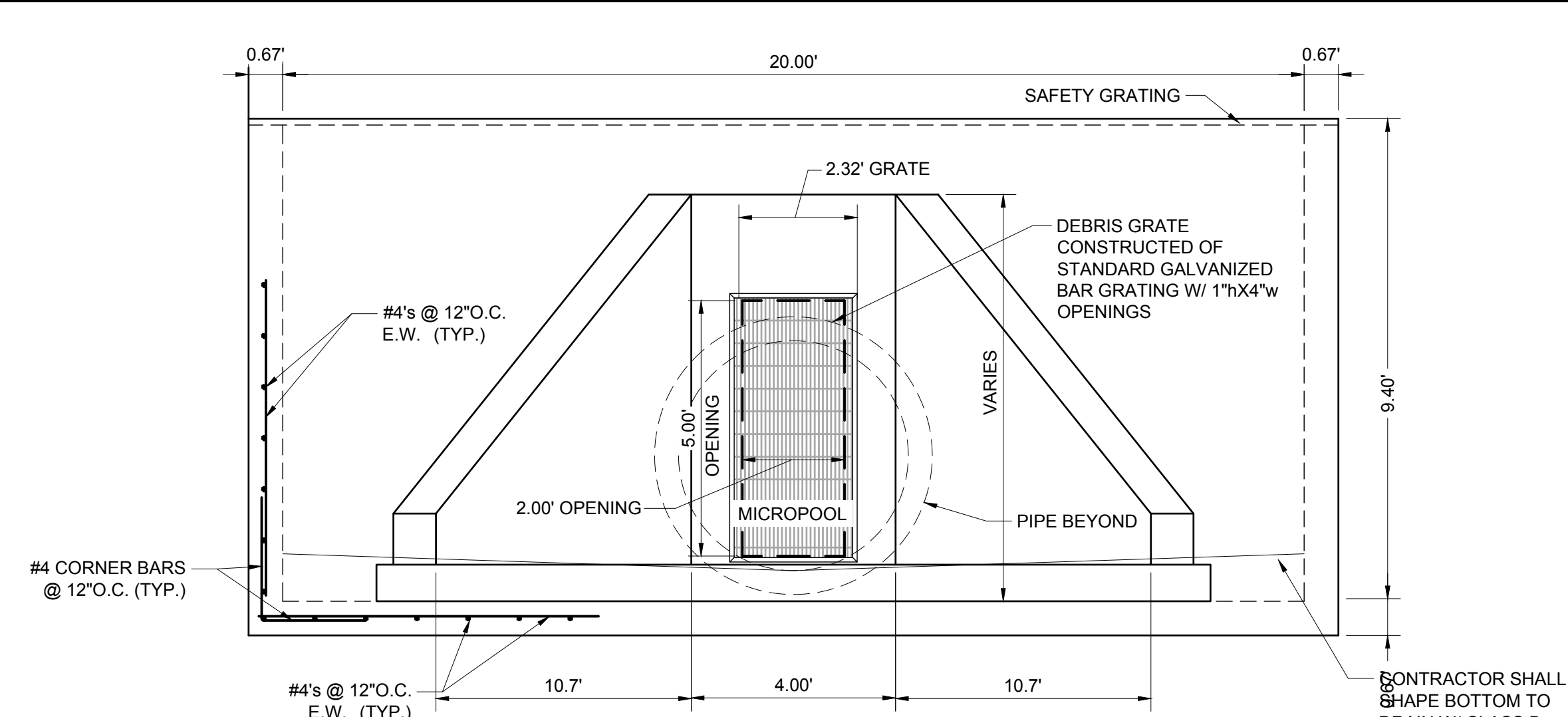
SECTION 2
N.T.S.



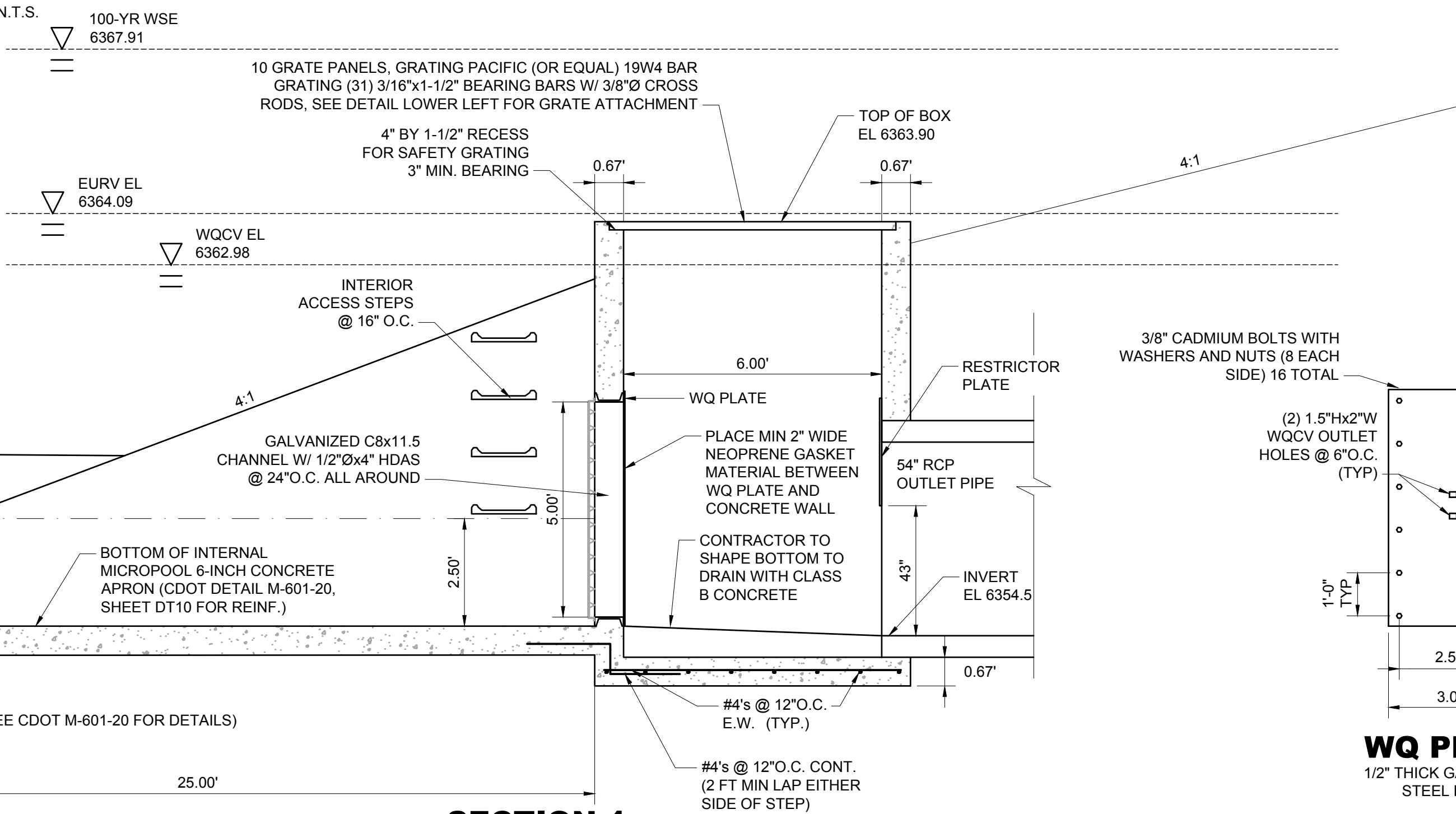
CONCRETE CHAMFER
DETAIL
N.T.S.



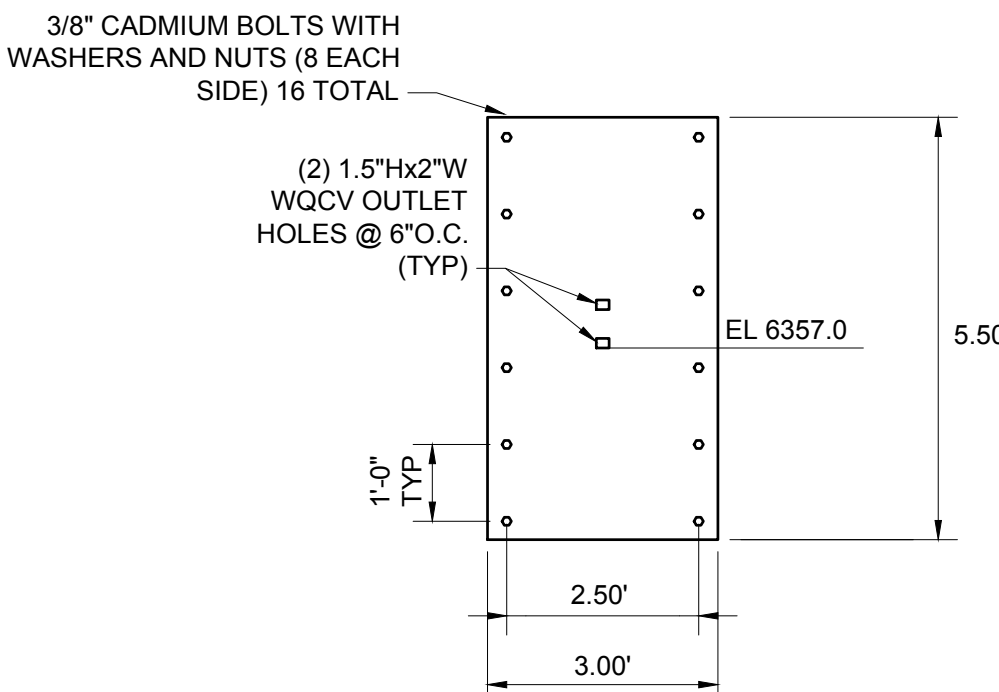
TYPICAL CORNER
REINFORCING DETAIL
N.T.S.



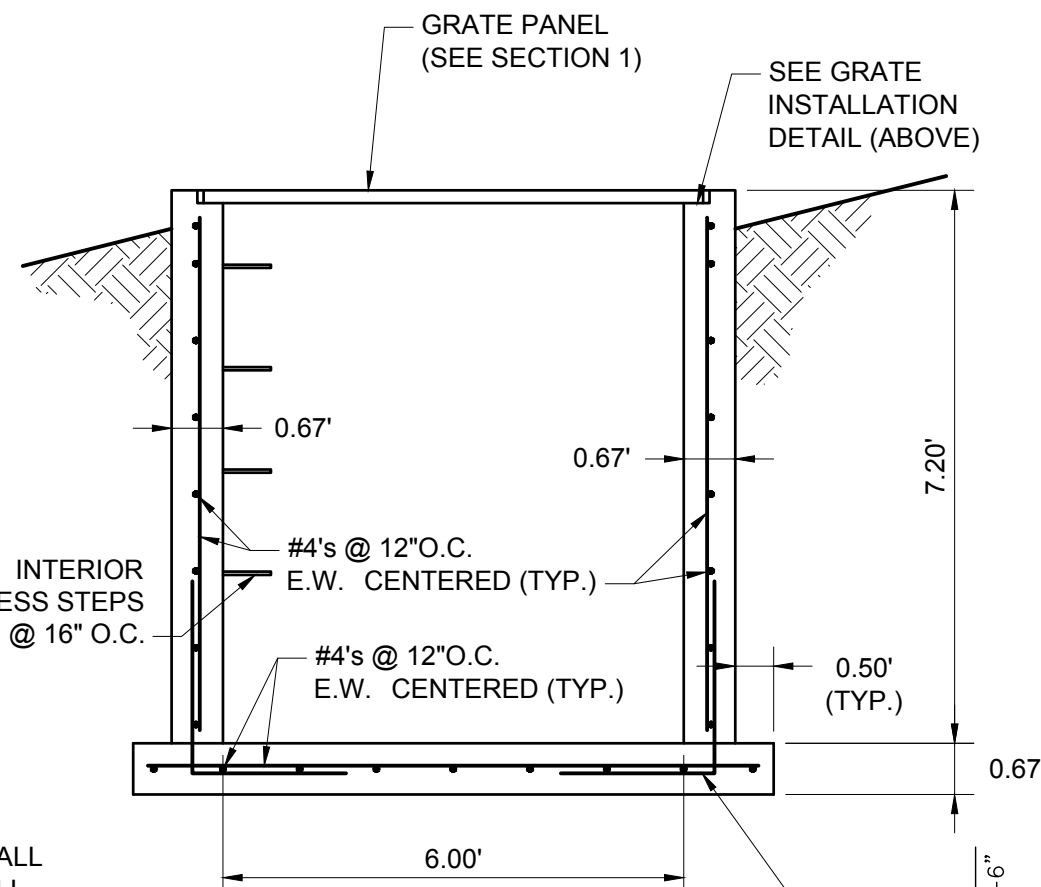
FRONT VIEW



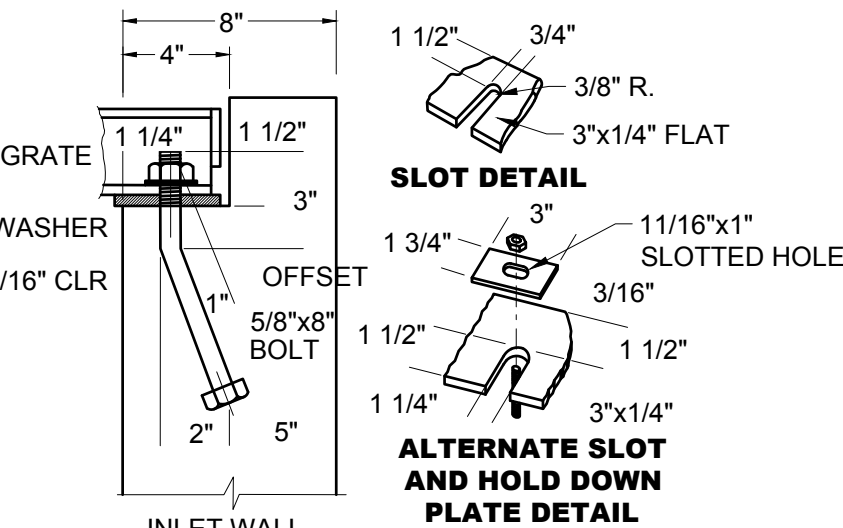
SECTION 1
N.T.S.



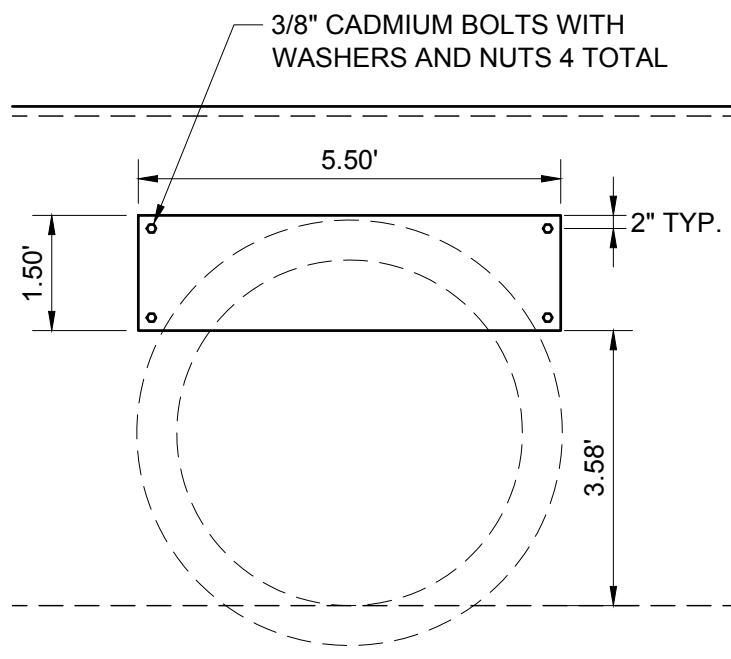
WQ PLATE
1/2\"/>



SECTION 3
N.T.S.



GRATE INSTALLATION
DETAIL
N.T.S.



RESTRICTOR PLATE

PROFESSIONAL ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY, AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY: _____ DATE: _____

DEVELOPMENT SERVICES _____ DATE: _____

TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP			Drawing Name: 42SD7-SD9.dwg
Chk BKM	Drw RLS	Des RLS	

PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A

(NAVD88 DATUM)
ELEVATION=6483.68

Hines

COVER
ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
POND J DETAILS

Sheet
SD7
of
142
Date
NOVEMBER 7, 2025

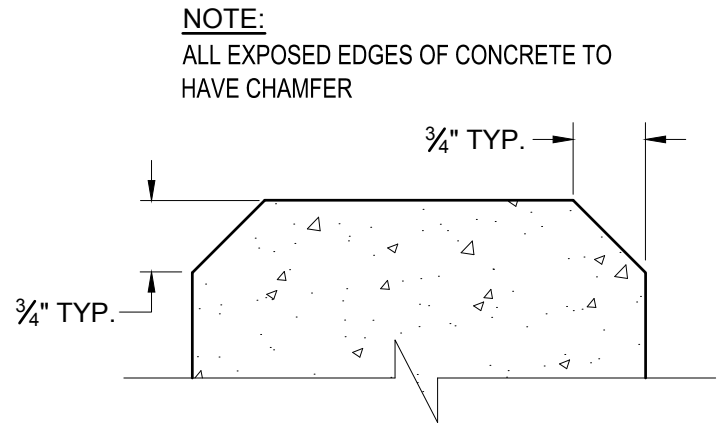
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 PLOTTED BY: ROD SIGMON PLOT DATE: 11/5/2025 1:03 PM
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REINFORCING STEEL

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- SUBMIT SHOP DRAWINGS.
- WHERE SINGLE CURTAIN OF REINFORCEMENT SHOWN, CENTER BARS IN WALL.
- REFER TO DETAIL THIS SHEET FOR CORNER BARS.

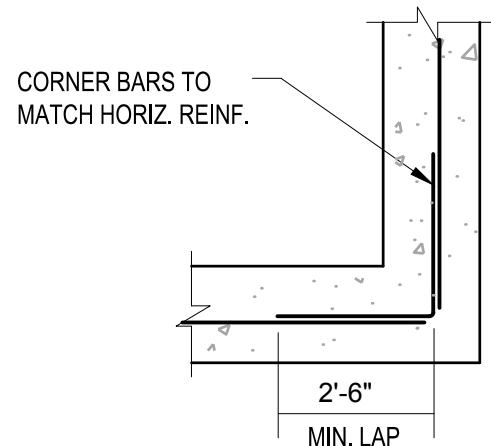
CONCRETE

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- MAXIMUM WATER SOLUBLE CHLORIDE ION CONTENT = 0.3%.



CONCRETE CHAMFER
DETAIL

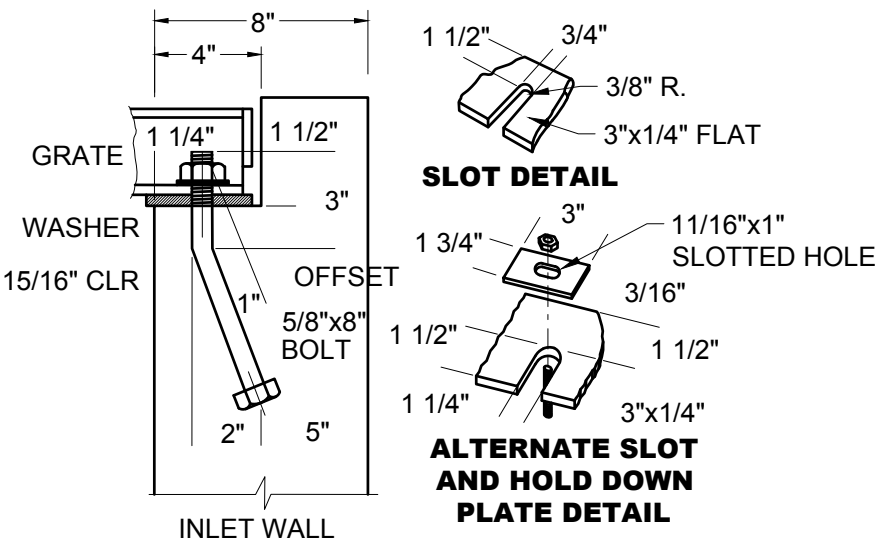
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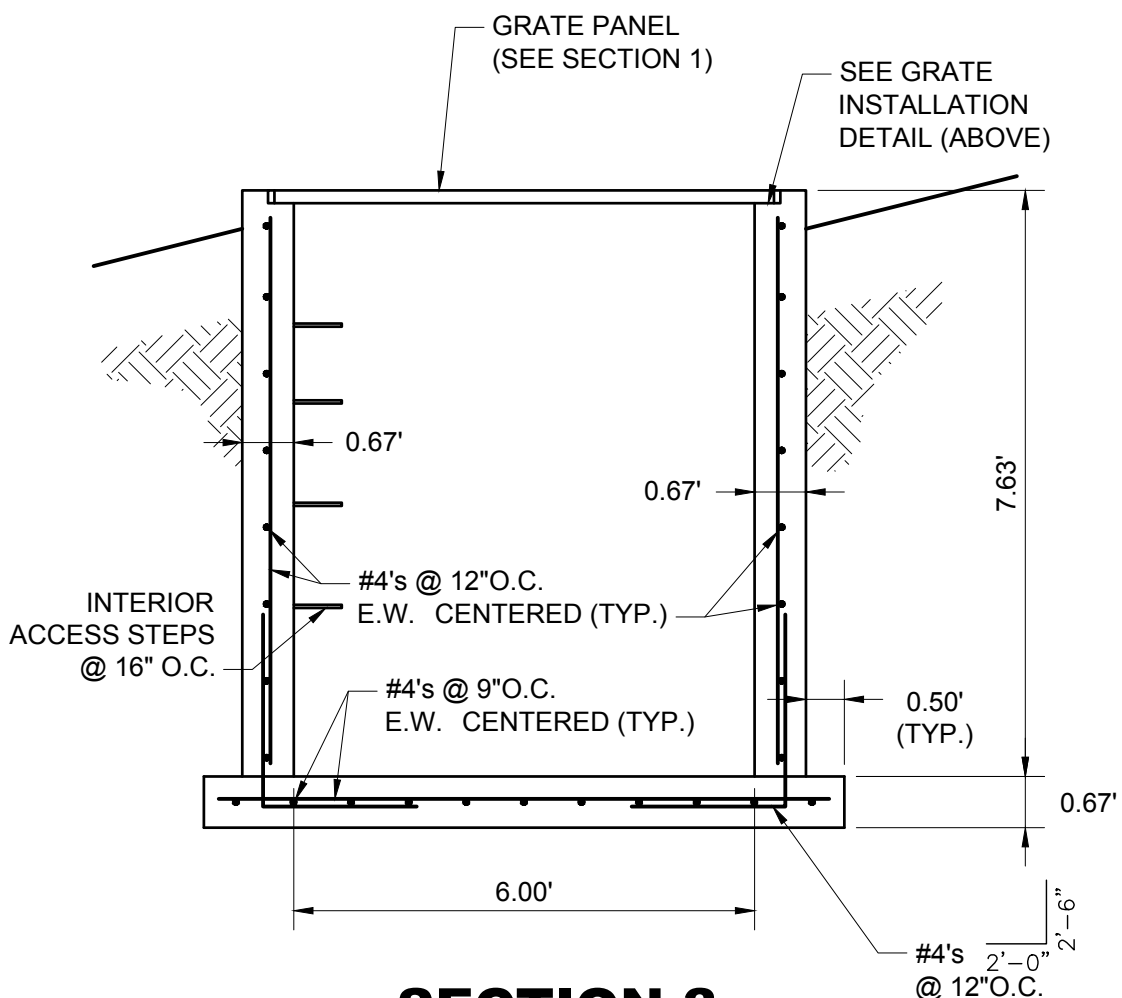
TYPICAL CORNER OF
CONCRETE WALLS AND FOOTINGS

TYPICAL CORNER
REINFORCING DETAIL

N.T.S.

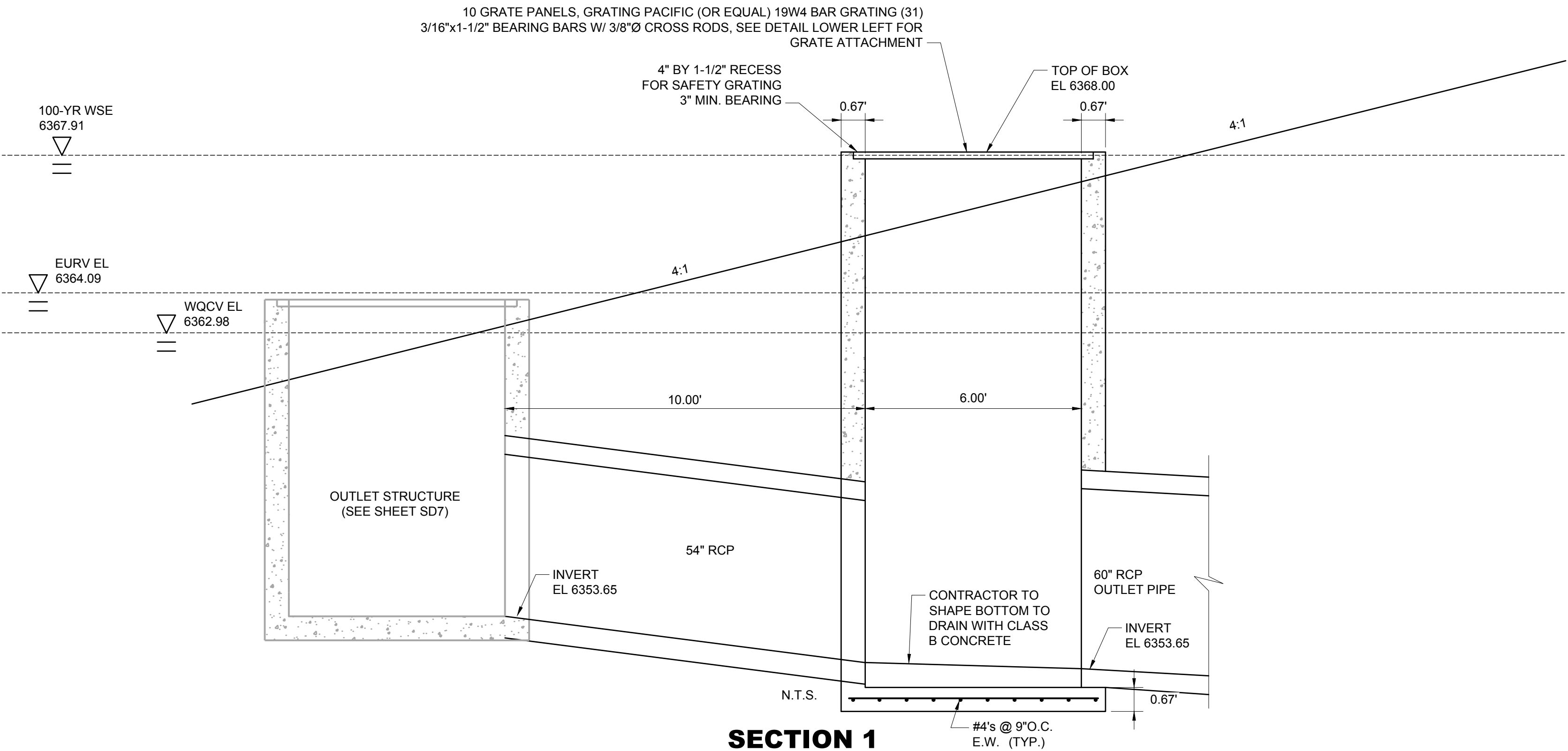


GRATE INSTALLATION DETAIL

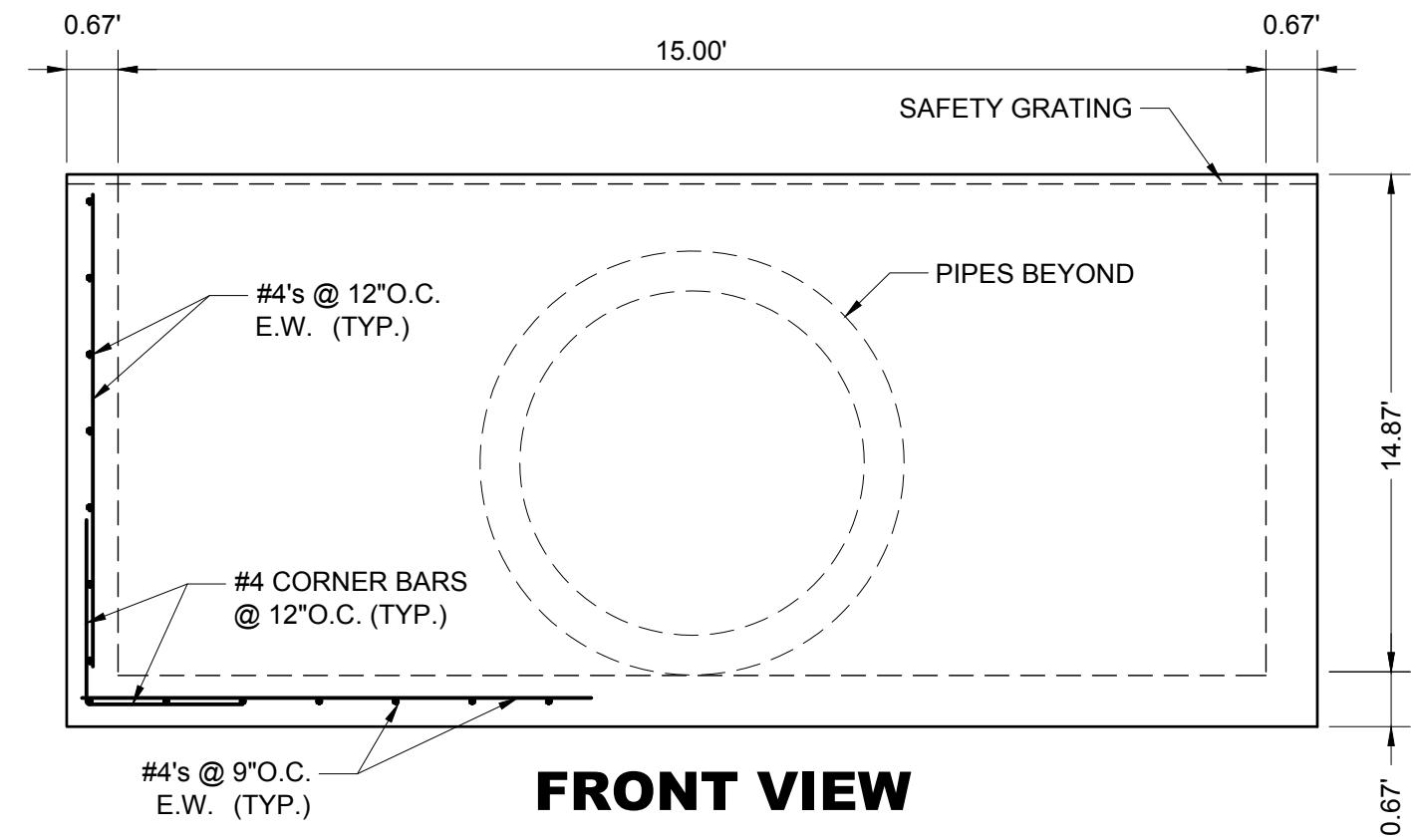


SECTION 3

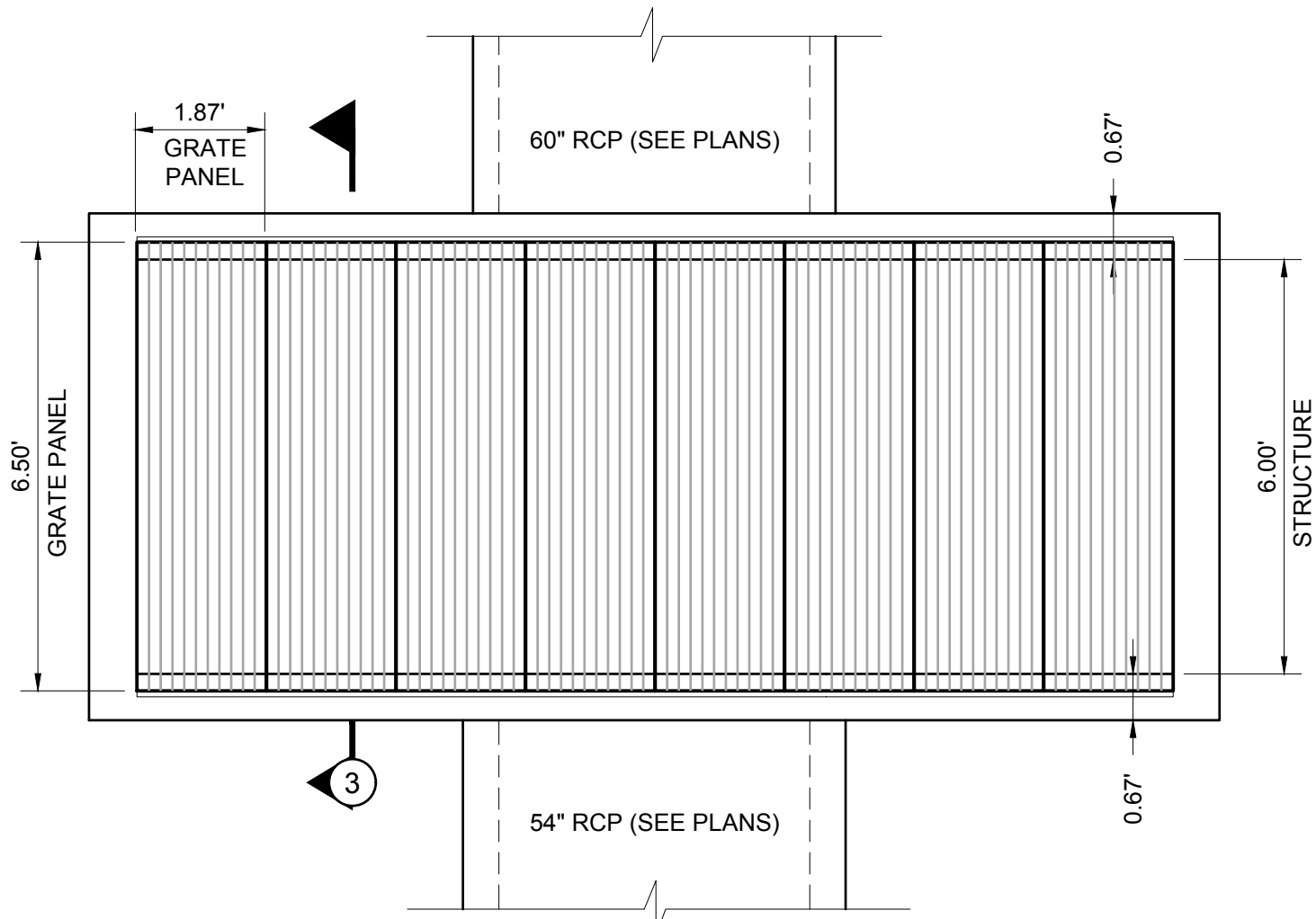
N.T.S.



SECTION 1



FRONT VIEW



EMERGENCY OVERFLOW BOX - PLAN VIEW

PROFESSIONAL ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY, AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY:

DEVELOPMENT SERVICES

TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Drw RLS	Des RLS

Drawing Name: 42SD8.dwg	
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PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

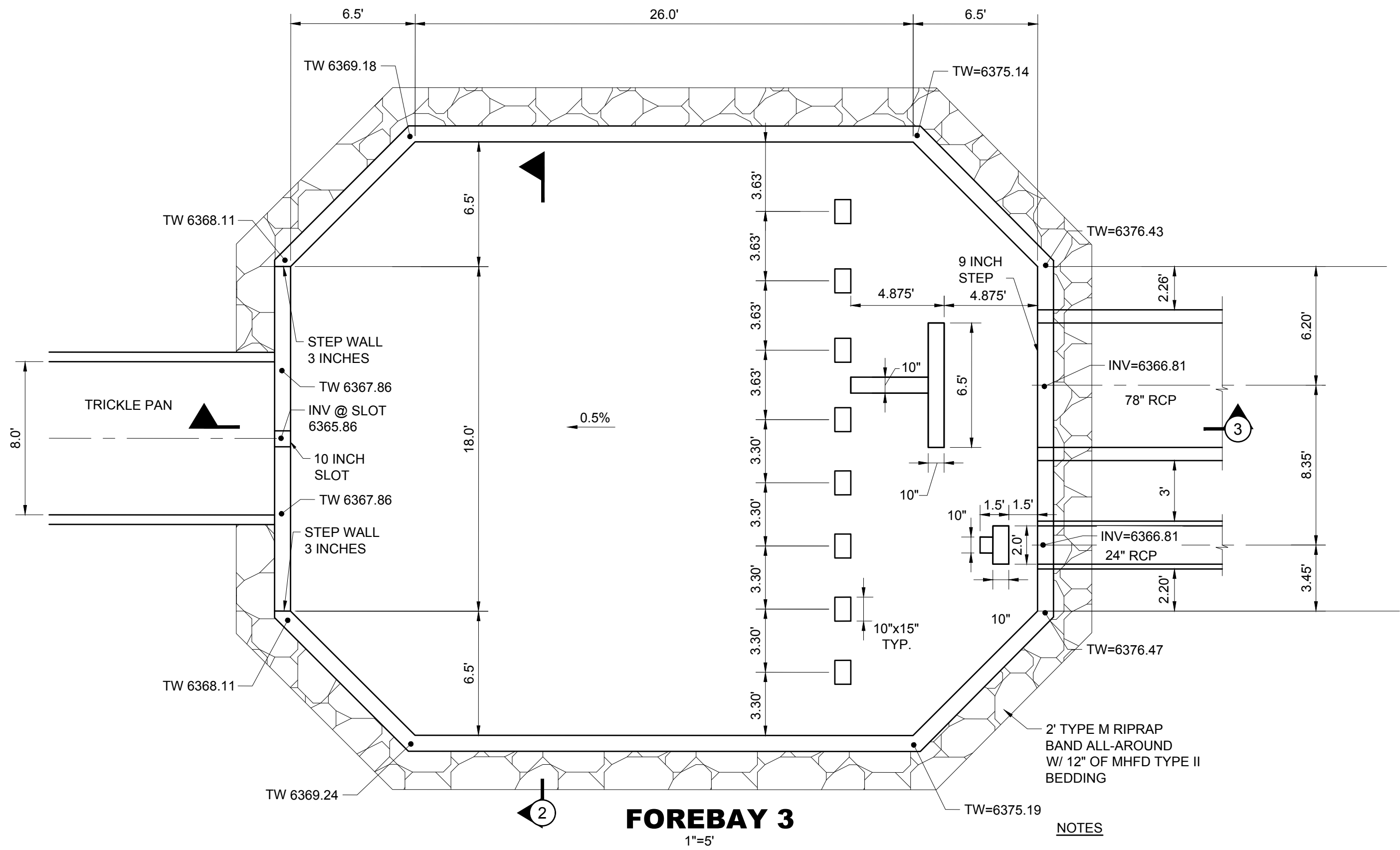
Hines

COVER
ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
POND J DETAILS

Sheet
SD8
Date
NOVEMBER 7, 2025
40 of 142

PATH: K:\HINES\LP\CADD\CIVIL\42 FILING 2 CD\SD42SD7-SD9.DWG
 PLOTTED BY: ROD SIGMON PLOT DATE: 11/5/2025 1:03 PM
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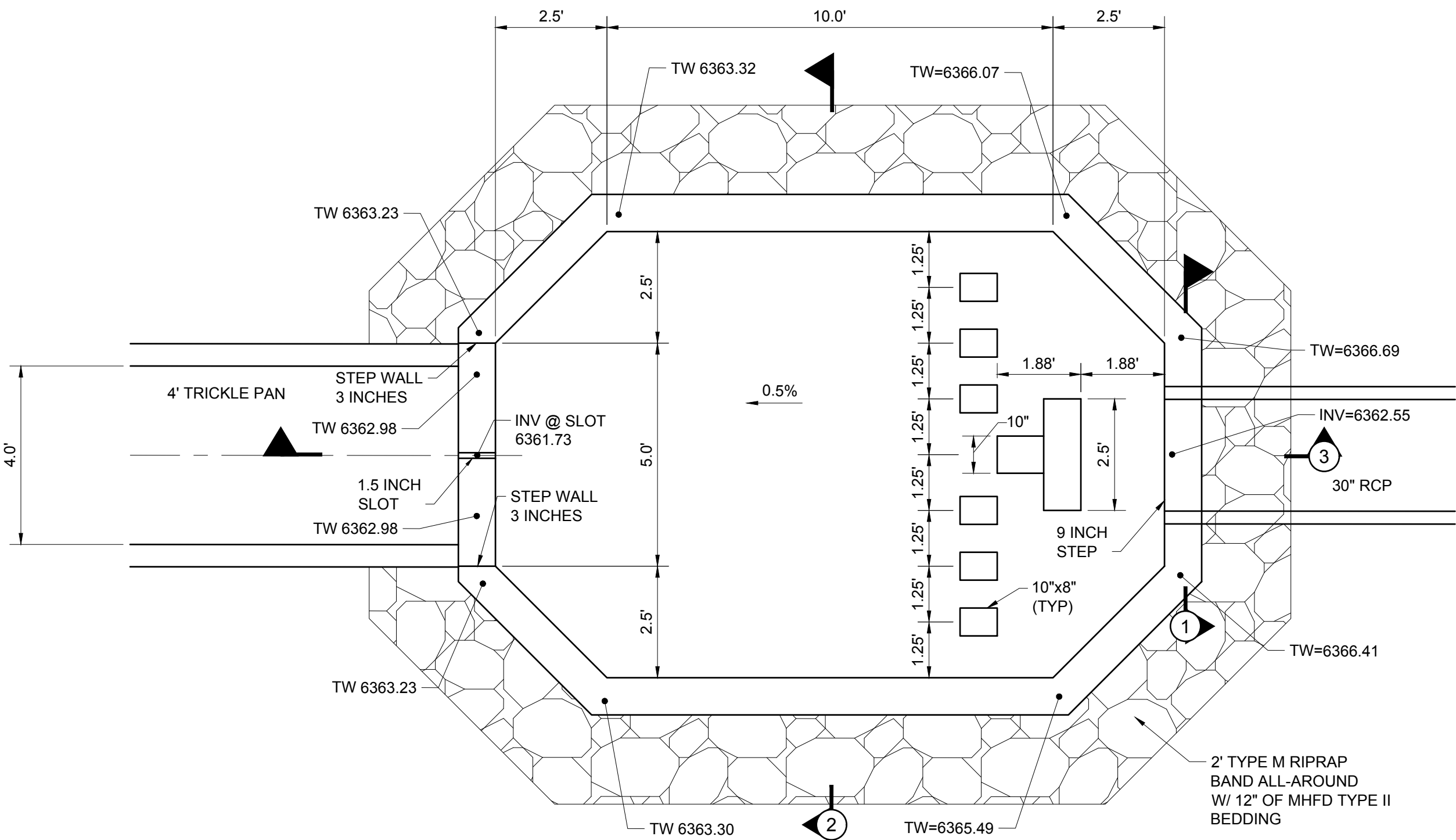


FOREBAY 3

1"=5'

NOTES

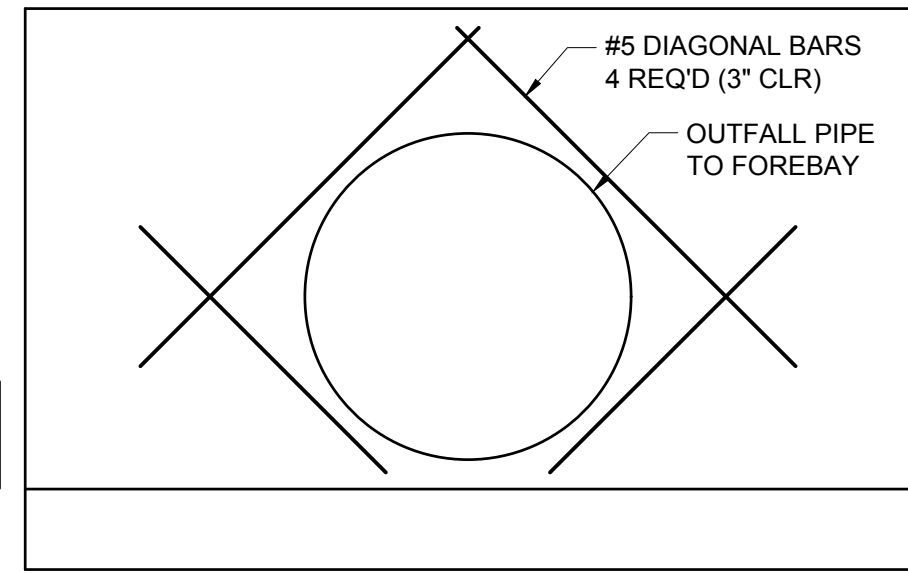
1. INSTALL 6" PVC WATERSTOP AT BASE OF ALL EXTERIOR WALLS.
2. TW = TOP OF WALL ELEVATION



FOREBAY 4

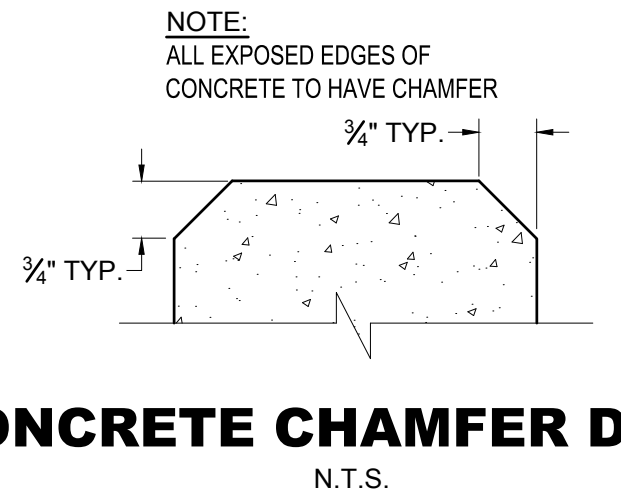
(SEE SHEET SD6 FOR LOCATION)
1"=2.5'

RE: SECTION 2 FOR
WALL AND FOOTING
REINFORCEMENT



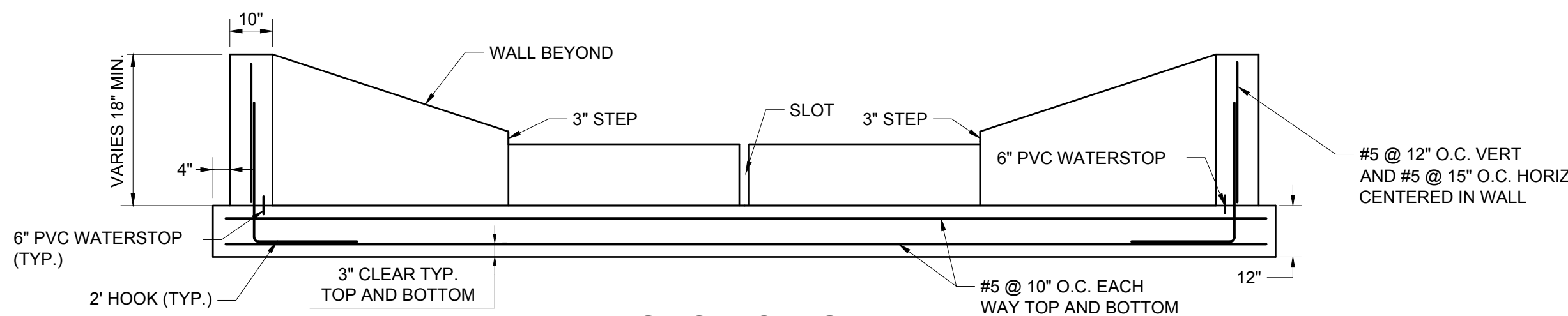
SECTION 1

N.T.S.



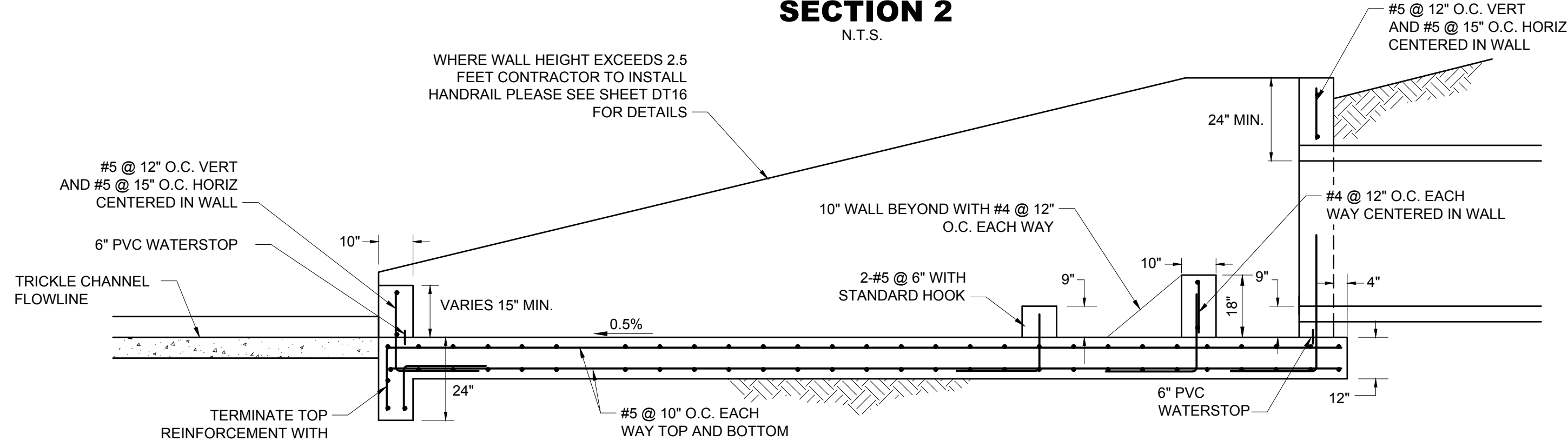
CONCRETE CHAMFER DETAIL

N.T.S.



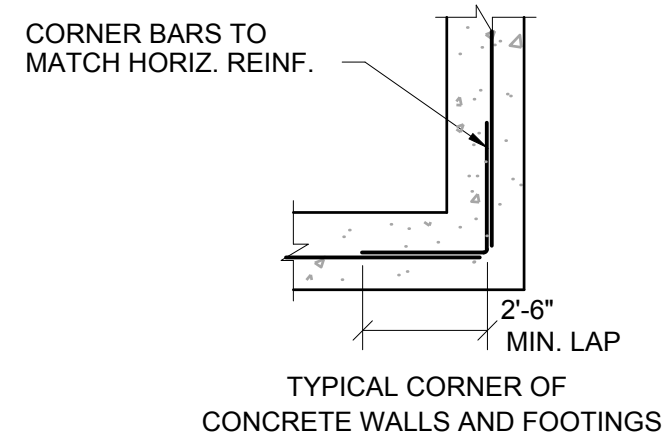
SECTION 2

N.T.S.



SECTION 3

N.T.S.



**TYPICAL CORNER
REINFORCING DETAIL**

N.T.S.

PROFESSIONAL ENGINEER CERTIFICATION

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BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

DATE

TOWN APPROVAL BLOCK

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APPROVED BY:

DEVELOPMENT SERVICES

DATE

TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Drw RLS	Des RLS

Drawing Name: 42SD7-SD9.dwg	
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PROJECT BENCHMARK

(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A

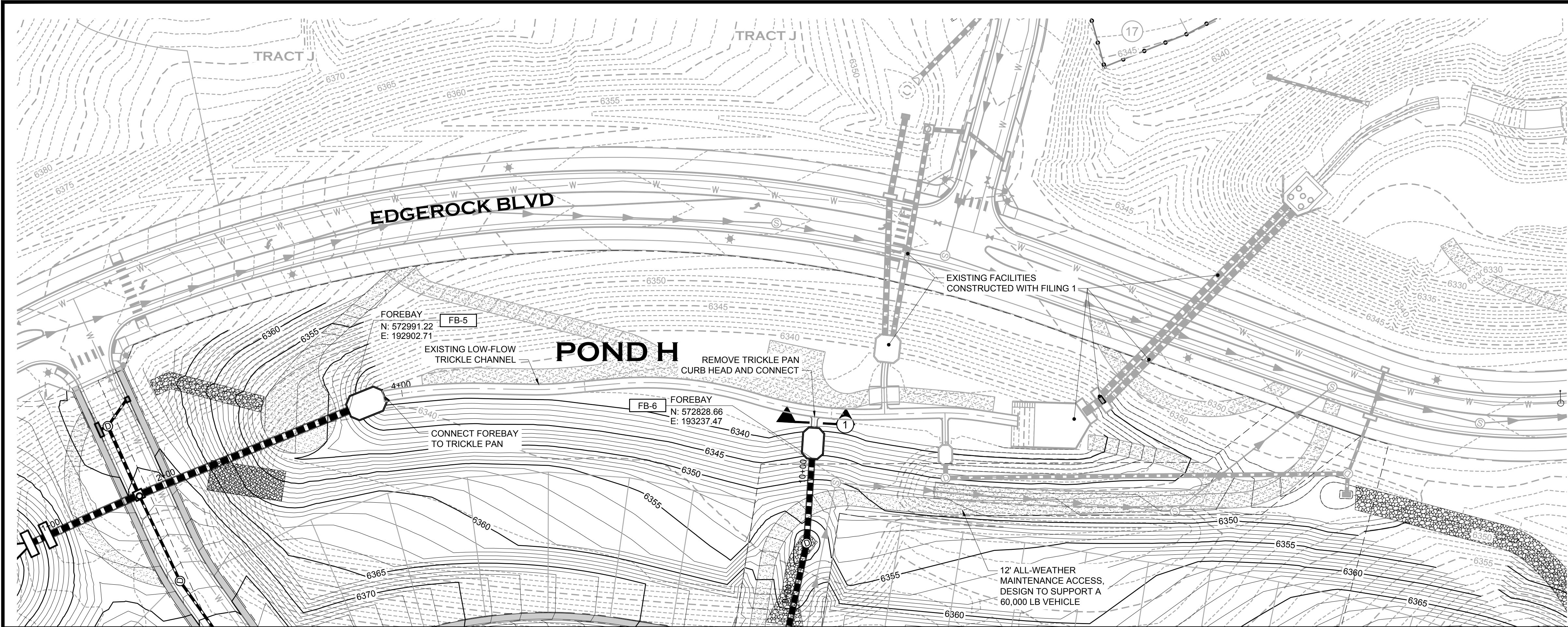
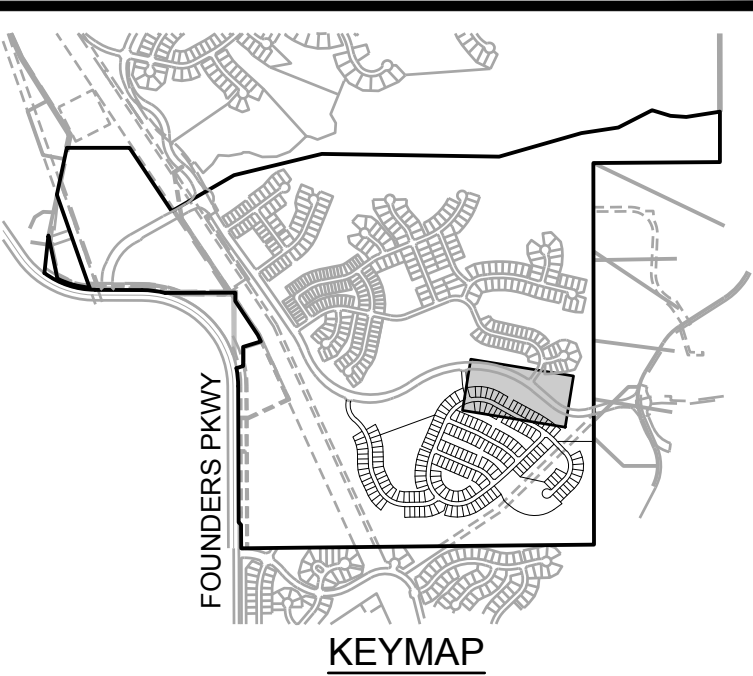
(NAVD88 DATUM)
ELEVATION=6483.68

Hines

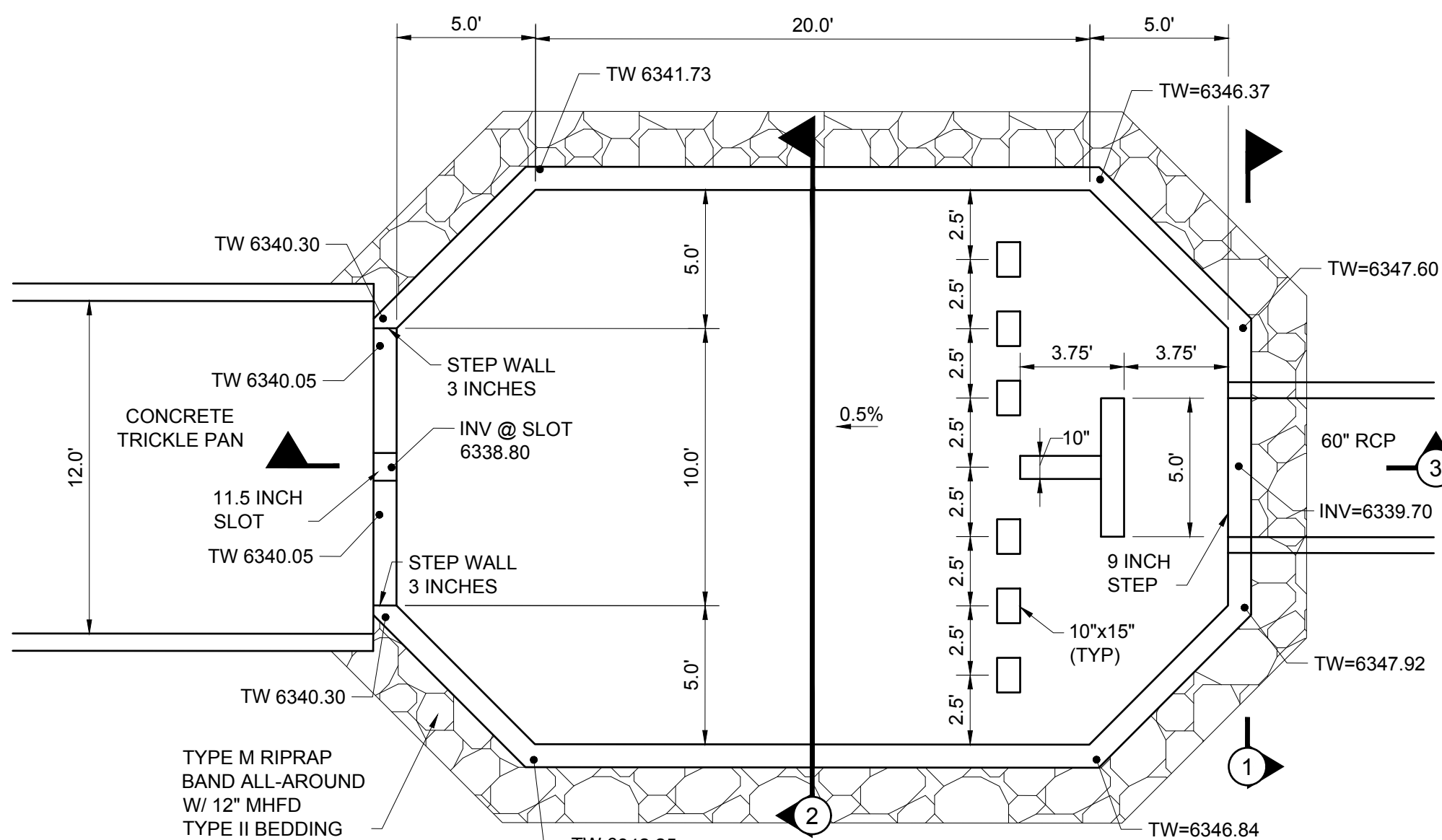
COVER
ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
POND J DETAILS

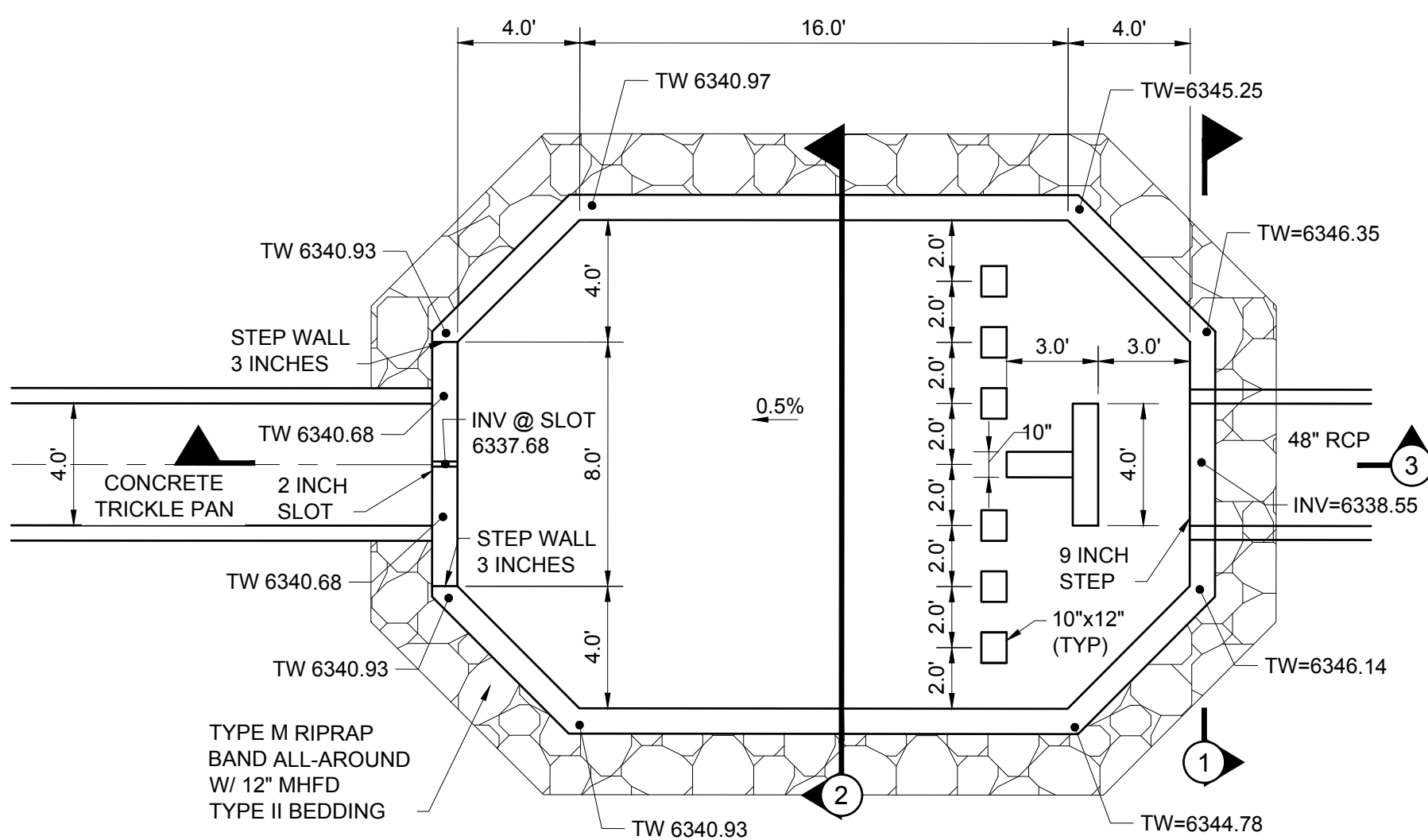
Sheet
SD9
of
142
Date
NOVEMBER 7, 2025



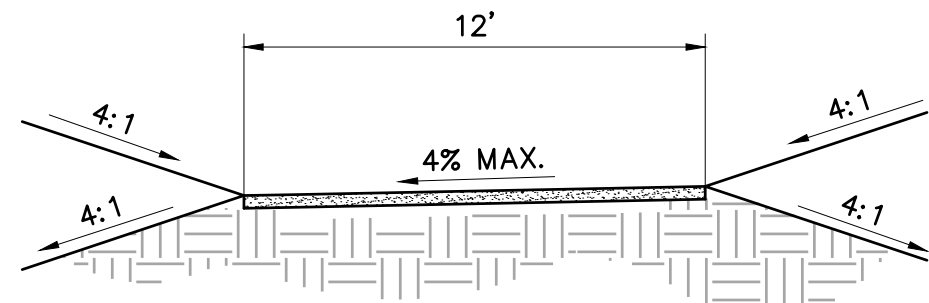
- GENERAL NOTES:**
- ALL STORM LOCATED WITHIN THE RIGHT-OF-WAY IS PUBLIC AND ALL STORM SEWER OUTSIDE OF RIGHT-OF-WAY IS PRIVATE. ALL PRIVATE STORM SEWER WILL BE OWNED AND MAINTAINED BY THE METROPOLITAN DISTRICT.
 - ALL STORM IS SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
 - ALL DRAINAGE CHANNELS AND SWALES ARE PRIVATE AND SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
 - THE METROPOLITAN DISTRICT WILL BE RESPONSIBLE FOR MAINTAINING ALL CHANNEL IMPROVEMENTS (RIPRAP, ETC.).
 - IN ALL LOCATIONS WHERE STORM SEWER CROSSES WATER, ABOVE OR BELOW, EACH STORM SEWER JOINT WITHIN THE TRENCH WIDTH OF THE CROSSING SHALL BE ENCASED IN A 6" THICK CONCRETE COLLAR EXTENDING 6" BEYOND BOTH SIDES OF THE JOINT.
 - WHERE DOUBLE CDOT TYPE R INLETS ARE UTILIZED, A PIPE SHALL BE PLACED BETWEEN THE 2 INLETS. FLOW WILL BE PASSED BETWEEN THE INLETS VIA A 18" RCP.
 - THE CONTRACTOR SHALL GRADE AROUND LOW TAILWATER BASINS AND RIPRAP PADS TO BLEND THEM INTO EXISTING GRADE.
 - SEE CUT-OFF WALL DETAIL ON SD6 FOR FES TOE WALL AND RESTRAINT DETAILS.
- ① INDICATES UTILITY CROSSING NUMBER (SEE CROSSING TABLE LEFT COLUMN)



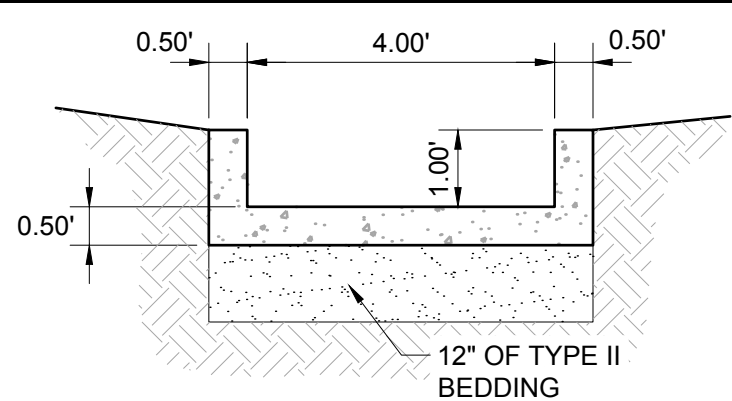
FOREBAY 5
1"=5'
(SEE SHEET SD11 FOR SECTIONS AND REINFORCEMENT)



FOREBAY 6
1"=5'
(SEE SHEET SD11 FOR SECTIONS AND REINFORCEMENT)



**POND MAINTENANCE PATH
DETAIL**
N.T.S.



**POND H TRICKLE CHANNEL
SECTION 1**
N.T.S.

BASIS OF BEARINGS
PROJECT BEARINGS ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., BEARING SOUTH 00°03'56" EAST, FROM THE EAST QUARTER CORNER OF SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515".

PROFESSIONAL ENGINEER CERTIFICATION
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REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK
TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY: _____

DEVELOPMENT SERVICES _____ DATE _____
TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

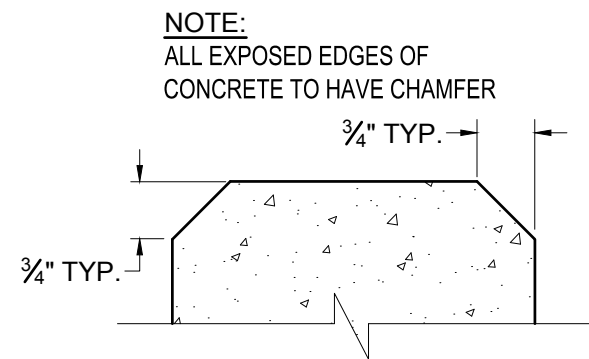
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Drawing Name 42SD10.dwg		

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(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

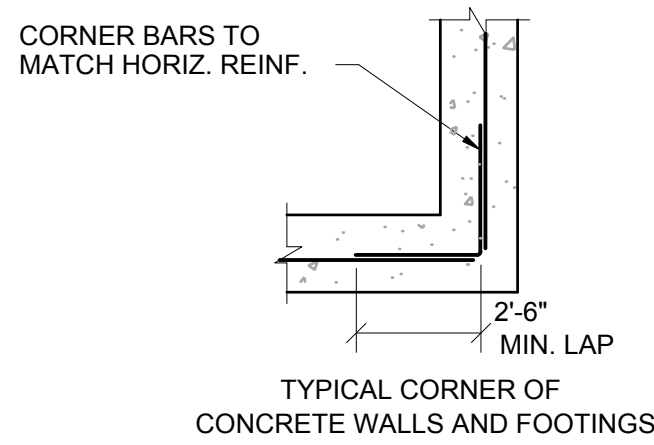
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GRADING, ROADWAY, & UTILITY PLANS
POND H DETAILS

Sheet
SD10
of
42
Date
NOVEMBER 7, 2025

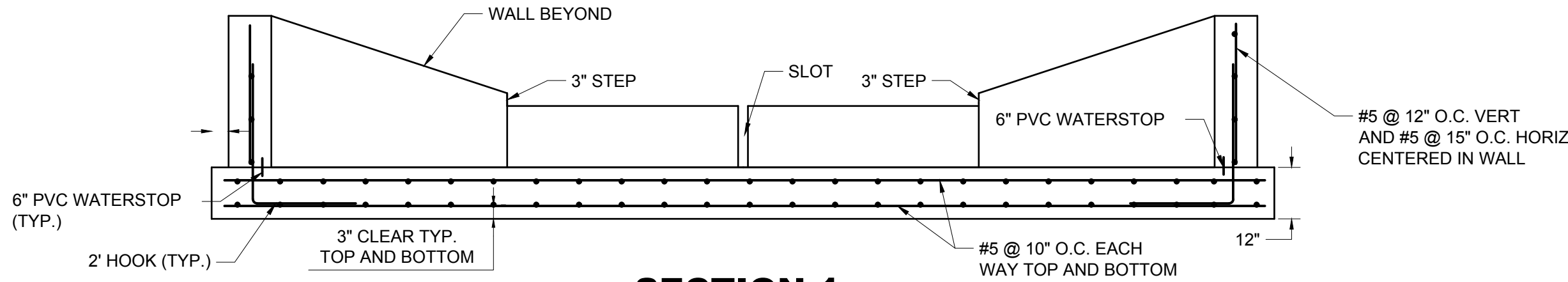
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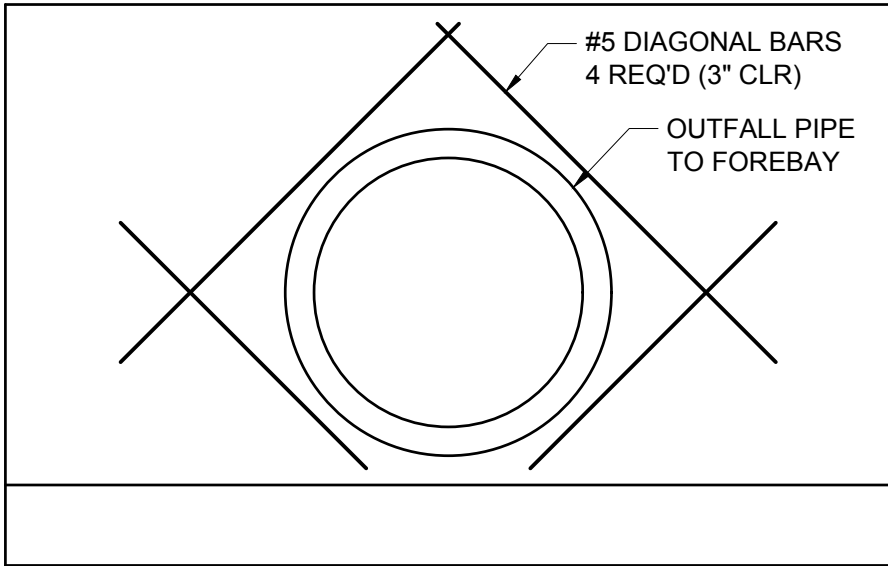
CONCRETE CHAMFER DETAIL
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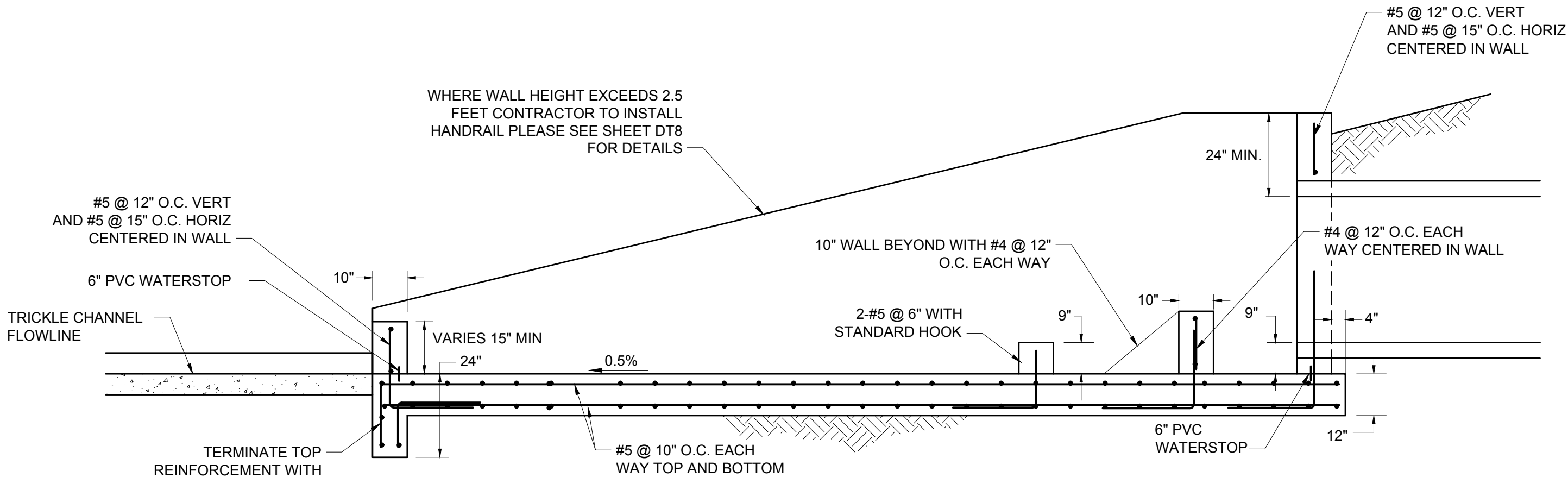
TYPICAL CORNER REINFORCING DETAIL
 N.T.S.



SECTION 1
 N.T.S.



SECTION 3
 N.T.S.



SECTION 2

PROFESSIONAL ENGINEER CERTIFICATION

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 STATE OF COLORADO NO. 37702

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APPROVED BY:

DEVELOPMENT SERVICES

TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP			
Chk BKM	Drw RLS	Des RLS	Drawing Name 42SD11-SD12.dwg

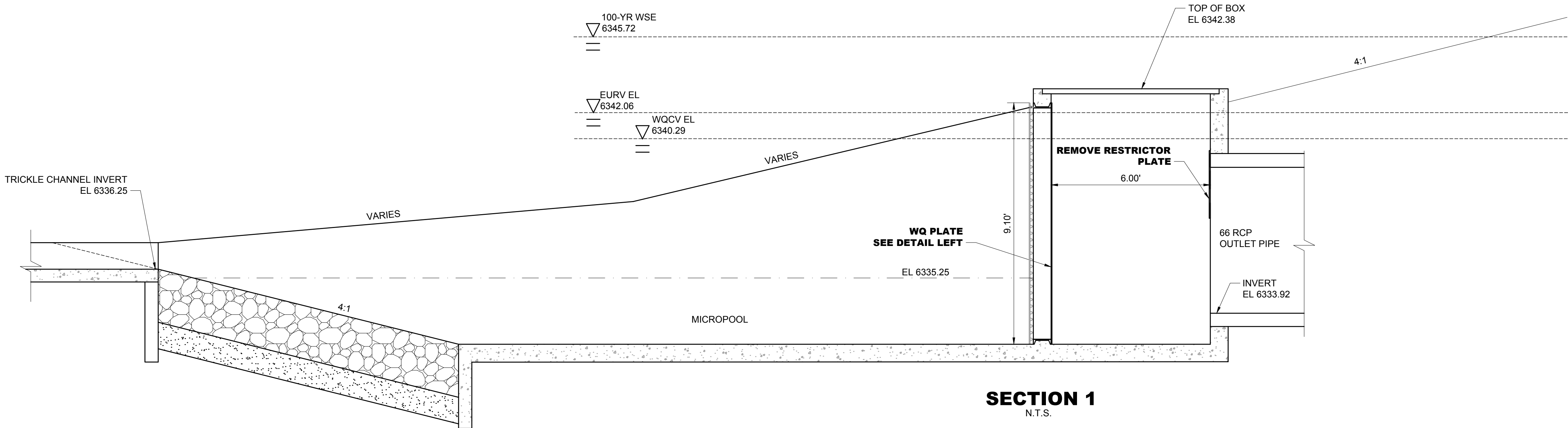
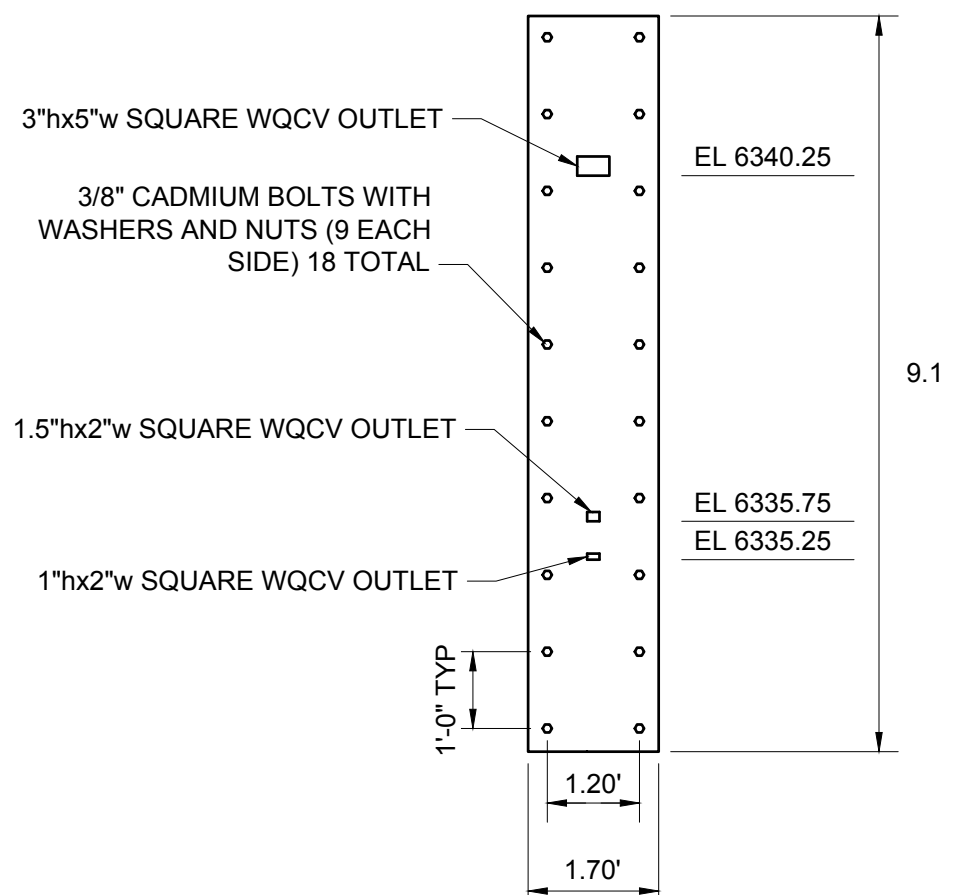
PROJECT BENCHMARK
(AZTEC #401) DOUGLAS COUNTY BENCHMARK TT17A
(NAVD88 DATUM) ELEVATION=6483.68

CANYONS FAR SOUTH FILING 2
 GRADING, ROADWAY, & UTILITY PLANS
POND H DETAILS

Sheet
SD11
 Date
 NOVEMBER 7, 2025

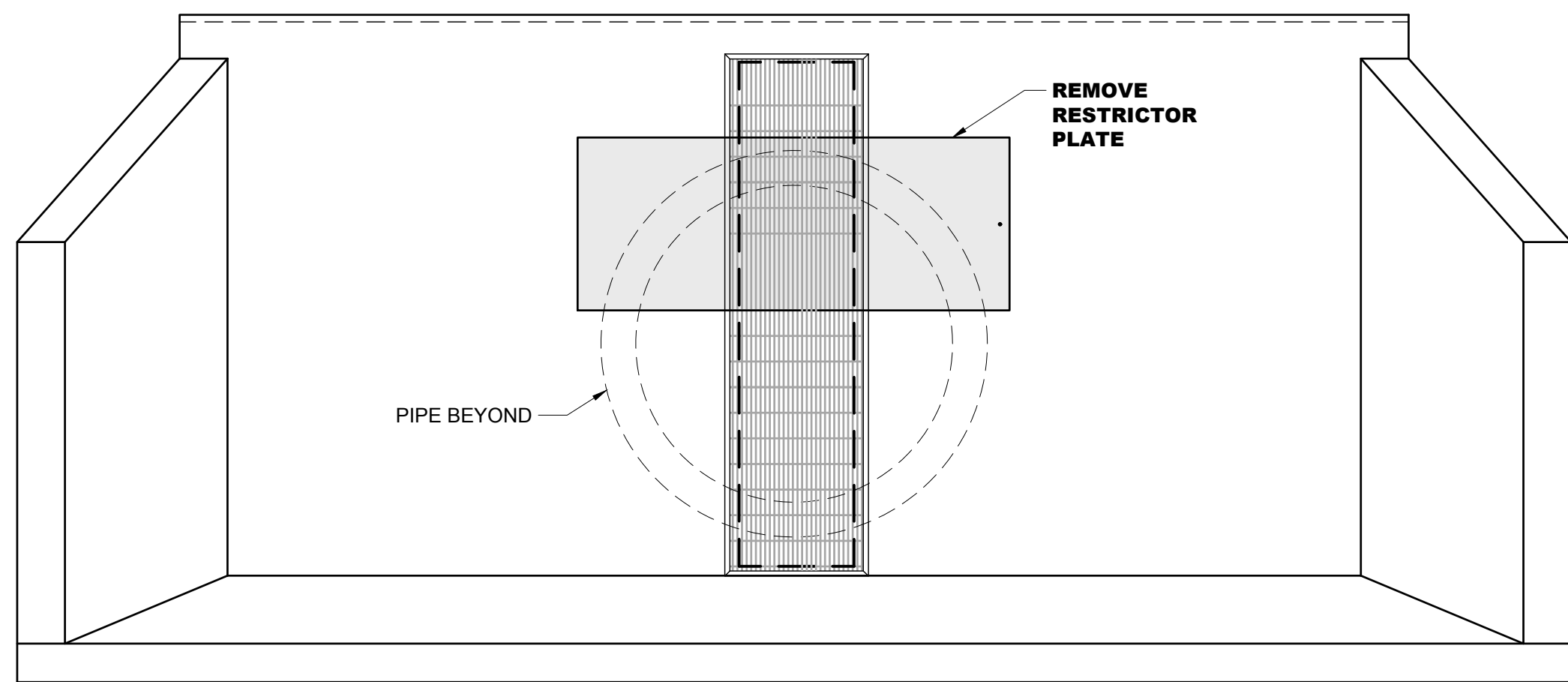
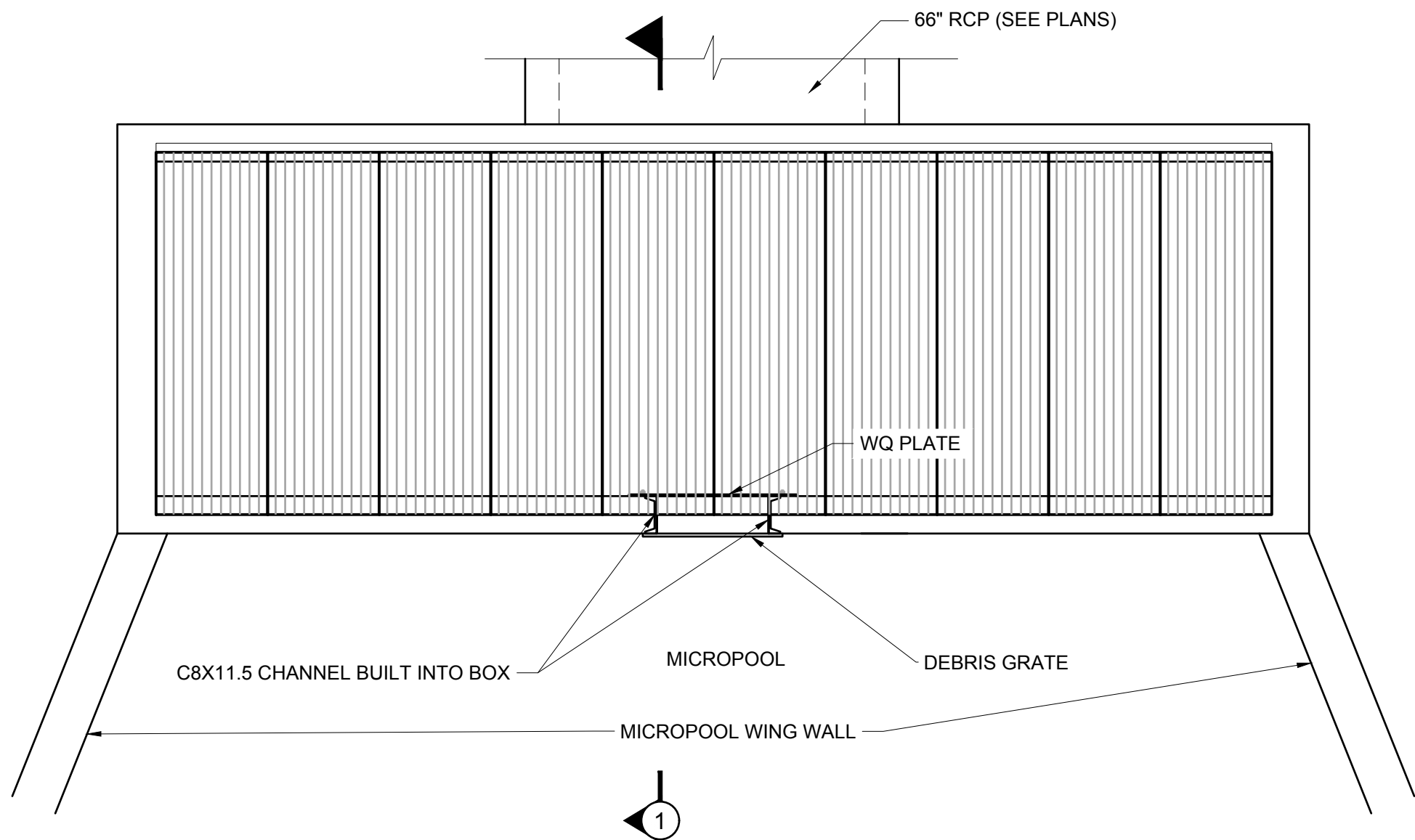
43
 of
 142

PATH: K:\HINES\LP\CADD\CIVIL\42 FILING 2 CD\S42SD11-SD12.DWG
PLOT DATE: 11/5/2025 1:05 PM
XREFS:



FILING 2 WQ PLATE
1/2" THICK ALUMINUM
REMOVE AND REPLACE
EXISTING PLATE

EXISTING STRUCTURE MODIFICATIONS
CHANGES TO THIS STRUCTURE FOR THE
FINAL PHASE ARE LIMITED TO REMOVING
AND REPLACING THE WATER QUALITY PLATE
AND REMOVING A RESTRICTOR PLATE FROM
THE OUTFALL PIPE



PROFESSIONAL ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION
PLANS WERE PREPARED UNDER MY DIRECT
SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE
TOWN OF CASTLE ROCK AND STATE OF COLORADO
STANDARDS AND STATUTES, RESPECTIVELY, AND THAT I
AM FULLY RESPONSIBLE FOR ALL DESIGN AND
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TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY
APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT
SERVICES APPROVAL

APPROVED BY:

DEVELOPMENT SERVICES

TOCR PROJECT NO: CD24-0012

DATE	REVISION DESCRIPTION

Job Number HINES LP			Drawing Name: 42SD11-SD12.dwg
Chk BKM	Dnw RLS	Des RLS	

PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

Hines

COVER
ENGINEERING

CANYONS FAR SOUTH FILING 2
GRADING, ROADWAY, & UTILITY PLANS
POND H DETAILS

Sheet
SD12
Date
NOVEMBER 7, 2025
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