



FINAL DRAINAGE REPORT

**PARKER POINTE SUBDIVISION
FILING NO. 1
LOT 7
MCDONALD'S**
Parker, Colorado

Prepared for:

McDonald's USA, LLC
4643 South Ulster Street, Suite 1300
Denver, CO 80237
(312) 599-2876

Prepared by:

Kimley-Horn and Associates, Inc.
2 North Nevada Avenue, Suite 300
Colorado Springs, CO 80903
(719) 453-0180

Kimley»Horn

Project #: 096806018
Prepared: July 19, 2022





PARKER POINTE
SUBDIVISION FILING NO. 1
LOT 7
MCDONALD'S

PARKER, COLORADO

DRAINAGE REPORT

JULY 22, 2022

Prepared by:

Kimley»»Horn

TABLE OF CONTENTS

ENGINEER'S STATEMENT.....	4
GENERAL LOCATION AND DESCRIPTION	5
LOCATION	5
DESCRIPTION OF PROPERTY	5
DESCRIPTION OF PROJECT	6
DRAINAGE BASINS AND SUB-BASINS.....	6
MAJOR DRAINAGE BASIN DESCRIPTION.....	6
SUB-BASIN DESCRIPTION.....	6
DRAINAGE DESIGN CRITERIA	8
REGULATIONS	8
COMPLIANCE WITH TOWN'S STREAM PRESERVATION STANDARDS.....	8
DEVELOPMENT CRITERIA REFERENCE AND CONSTRAINTS	8
HYDROLOGIC CRITERIA.....	8
HYDRAULIC CRITERIA.....	9
DRAINAGE DESIGN.....	10
GENERAL CONCEPT.....	10
FLOODPLAIN DEVELOPMENT PERMIT	10
ENVIRONMENTAL PROTECTION CRITERIA.....	10
GENERAL	10
CONSTRUCTION BMP PLAN.....	10
PERMANENT BMP PLAN.....	10
CONCLUSIONS.....	10
COMPLIANCE WITH STANDARDS.....	10
DRAINAGE CONCEPT	10
SEDIMENT AND EROSION CONTROL CONCEPT	11
REFERENCES	11
APPENDIX.....	12
APPENDIX A – FIRM, SOILS AND DRAINAGE MAP	
APPENDIX B – HYDROLOGIC COMPUTATIONS	

APPENDIX C – HYDRAULIC COMPUTATIONS
APPENDIX D – INLET COMPUTATIONS
APPENDIX E – REFERENCE REPORT EXCERPTS

ENGINEER'S STATEMENT

"This report for the drainage design of the Parker Pointe Subdivision Filing No. 1, Lot 7 McDonald's Development was prepared by me or under my direct supervision in accordance with the provisions of the Town of Parker Storm Drainage and Environmental Criteria Manual. I understand that the Town of Parker and its designated town authority do not and will not assume liability for drainage facilities designed by others."

Jessica McCallum, P.E.

Registered Professional Engineer

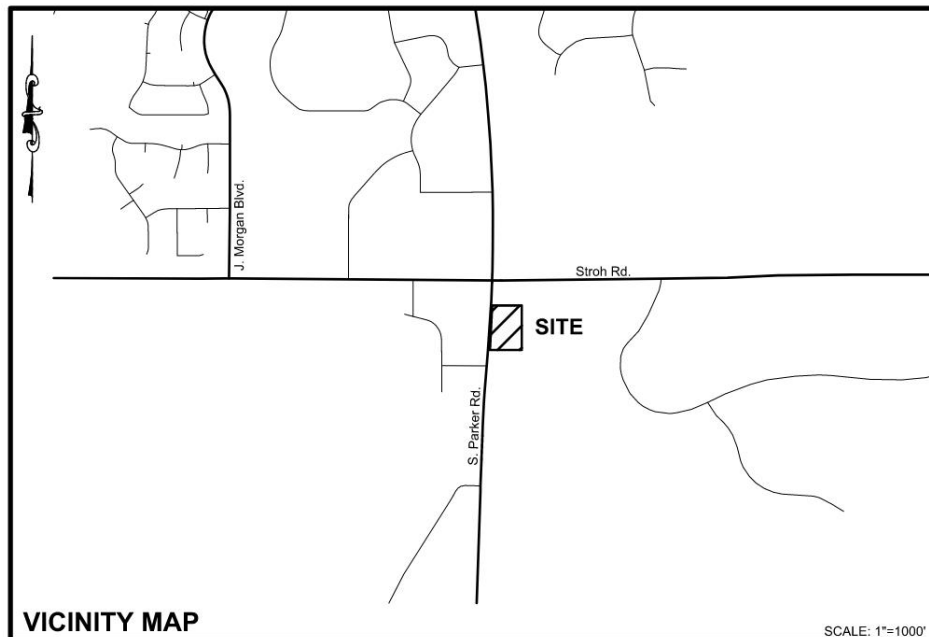
State of Colorado No. 59054

GENERAL LOCATION AND DESCRIPTION

The purpose of this report is to outline the drainage plan for the McDonald's Development near the southeast corner of South Parker Road and Stroh Road in the Town of Parker, County of Douglas, State of Colorado (herein the "Project").

LOCATION

The Site is located on Lot 7 of the Parker Pointe Subdivision Filing No. 1 development (the "Site"). More specifically, the Site is located in the Section 3, Township 7 South, Range 66 West of the Sixth Principal Meridian, Town of Parker, County of Douglas, State of Colorado. A vicinity map is provided below for reference.



DESCRIPTION OF PROPERTY

The overall site is approximately 1.48 acres of undeveloped land. The existing topography generally drains from northeast to southwest to South Parker Road. The Site is to be overlot graded with the Parker Pointe Subdivision master development. Overlot topography generally drains from north to the south to the proposed internal private drives to be routed to a regional detention pond for water quality and detention. The overall site varies in elevation from a low of approximately 5970 feet to a high of approximately 5979 feet. Respective runoff sheet flows across the property from north to south at slopes on average of 2%.

The existing vacant ground cover consists of sparse vegetation of native weeds and grasses. A review of the Natural Resource Conservation Service (NRCS) Web Soil Survey determined that the Site is made up primarily of Bresser-Truckton Sandy Loam which is consistent with an NRCS Soil Type B. Soil Type B was utilized for calculations included within this report. The NRCS study is found in **Appendix A** of the report.

Groundwater was not encountered. It is assumed that the existing foundations and utilities serving the previous structures will be removed per the Parker Pointe Master Development and therefore, there will be no geological hazards on site during construction of the McDonald's.

DESCRIPTION OF PROJECT

The Project is anticipated to consist of a new single-story McDonald's fast-food restaurant with dual drive-thru lanes, drive aisles, parking on the south, east, and west side of the building, landscaping, and associated utility improvements. The proposed building will be oriented from north to south centered in the Site. Drive aisles are proposed to loop around the building to provide internal traffic circulation as well as emergency access throughout the Project. Runoff from the Project will be captured by proposed inlets and storm sewer infrastructure which will route the runoff to the regional detention pond.

Roadway infrastructure proposed within the overall development adjacent to the Project will provide access from the Project to the adjacent right-of-way and access roadways. Project access will be obtained through both the private east shared access road and the private south shared access road.

Water quality and detention for this property and the adjacent rights-of-way are provided off-site within the existing detention pond which is located south of the Parker Pointe development. Therefore, no additional water quality or detention is proposed with this project.

DRAINAGE BASINS AND SUB-BASINS

MAJOR DRAINAGE BASIN DESCRIPTION

This project falls within the limits and is tributary to both Kinney Creek and Stroh Gulch as outlined in the "*Final Drainage Report Parker Pointe*" prepared by Perception Design Group, Inc., dated November 28, 2018 (the "*Master Drainage Report*"). The Site falls within Sub-basins L13, IN1, and U2 of the Master Drainage Report.

Per the Master Drainage Report, the assumed weighted imperviousness for the Site was 95.0%. The proposed Site has a weighted imperviousness of 81.1% which is less than the assumed 95.0%.

By scaled map location and graphical review of the Flood Insurance Rate Map (FIRM) Number 08035C0182G, dated March 16, 2016, the Site lies within an area classified as Zone X. Areas classified as Zone X are considered areas of minimal flood hazard, usually depicted by Flood Insurance Rate Maps as areas outside of the 500-year floodplain. The FIRM map is included in **Appendix A**.

Drainage infrastructure is provided per the Master Development to convey stormwater to the existing detention pond for water quality treatment and detention and then outfalls to Kinney Creek.

SUB-BASIN DESCRIPTION

The Site has been divided into sub-basins that are tributary to the existing storm sewer system which conveys flows downstream to the existing detention pond south of the Site. Further information regarding the basin characteristics, runoff, coefficients and drainage patterns can be found in **Appendix B**.

Existing Runoff Conditions

The Site falls within Sub-basins L13, IN1, and U2 of the Master Drainage Report. Sub-basin L13 was assigned an imperviousness value of 95% with runoff flowing from north to south. Sub-basin IN1 was assigned an imperviousness value of 100% with runoff flowing from north to south. Sub-basin U2 was assigned an imperviousness value of 80.4% with runoff flowing from east to west. Flows from sub-basins L13 and IN1 are ultimately conveyed to the existing detention pond for water quality treatment and detention. Sub-basin U2 is conveyed to a grass swale for water quality treatment before discharge into S.

Parker Road. The 5-year and 100-year runoff values for Sub-basin L13 are 2.78 cfs and 5.69 cfs, respectively. The 5-year and 100-year runoff values for Sub-basin IN1 are 1.10 cfs and 2.21 cfs, respectively. The 5-year and 100-year runoff values for Sub-basin U2 are 1.04 cfs and 1.13 cfs, respectively. The existing drainage map from the Master Report is provided in **Appendix E**.

Proposed Runoff Conditions

Sub-basin A1 is 0.12 acres consisting of the northwest corner of the Site with a concrete parking lot and landscaping. Runoff from this basin will surface flow to a proposed inlet at Design Point A1 where it will be conveyed via storm sewer to the existing storm sewer system and outfall to the regional detention pond. If the inlet were to plug the runoff would pond until ultimately flowing over the proposed parking lot top back of curb and sheet flow to S. Parker Road.

Sub-basin A2 is 0.10 acres consisting of the middle northern portion of the Site with a concrete parking lot, drive-thru lanes, and landscaping. Runoff from this basin will surface flow to a proposed inlet at Design Point A2 where it will be conveyed via storm sewer to the existing storm sewer system and outfall to the regional detention pond. If the inlet were to plug the runoff would pond until ultimately flowing over the proposed top back of curb and onto the northern adjacent property.

Sub-basin A3 is 0.18 acres consisting of the northeast corner of the Site with a concrete parking lot, the northeast access, the trash enclosure, and landscaping. Runoff from this basin will surface flow to a proposed inlet at Design Point A3 where it will be conveyed via storm sewer to the existing storm sewer system and outfall to the regional detention pond. If the inlet were to plug the runoff would pond until ultimately flowing into Sub-basin A2.

Sub-basin A4 is 0.14 acres consisting of the west portion of the Site with concrete drive aisles, drive-thru lane, and landscaping. Runoff from this basin will surface flow to a proposed inlet at Design Point A4 where it will be conveyed via storm sewer to the existing storm sewer system and outfall to the regional detention pond. If the inlet were to plug the runoff would pond until ultimately flowing over the proposed parking lot top back of curb and sheet flow to S. Parker Road.

Sub-basin A5 is 0.28 acres consisting of the east portion of the Site with a concrete parking lot, drive-thru lanes, and landscaping. Runoff from this basin will surface flow to a proposed inlet at Design Point A5 where it will be conveyed via existing storm sewer system and outfall to the regional detention pond. If the inlet were to plug the runoff would pond until ultimately flowing into the existing inlet at Design Point A6.

Sub-basin A6 is 0.11 acres consisting of the southwest corner of the Site with a concrete parking lot, drive-thru lanes, and landscaping. Runoff from this basin will surface flow to an existing inlet at Design Point A6 where it will be conveyed via storm sewer to the existing storm sewer system and outfall to the regional detention pond. If the inlet were to plug the runoff would pond until ultimately flowing over the proposed parking lot top back of curb and sheet flow to S. Parker Road.

Sub-basin A7 is 0.15 acres consisting of the southeast corner of the Site with a concrete parking lot and landscaping. Runoff from this basin will surface flow to an existing inlet at Design Point A7 where it will be conveyed via storm sewer to the existing storm sewer system and outfall to the regional detention pond. If the inlet were to plug the runoff would pond until ultimately flowing over the proposed parking lot top back of curb and sheet flow to Napa Avenue.

Sub-basin R is 0.12 acres and consists of the roof area. Runoff from this basin will be routed to one roof drain at Design Point R1 which outfalls into the proposed storm sewer system and eventually to the existing storm sewer system to outfall to the regional detention pond.

Sub-basin OS1 is 0.03 acres consisting of the west hillside spanning the west property line of the Site. Runoff from this basin will sheet flow to S. Parker Road, following historic drainage patterns. It is not realistic to capture the flow from this area due to the existing hillside along the west property line.

Sub-basin OS2 is 0.12 acres consisting of the middle south portion of the Site. Runoff from this basin will sheet flow to Napa Avenue.

Sub-basin RD1 is 0.14 acres consisting of the north half of Napa Avenue. Runoff sheet flows in Napa Avenue to an existing swale for water quality treatment, following historic drainage patterns. It is not realistic to capture the flow from this area due to the existing roadway slopes.

DRAINAGE DESIGN CRITERIA

REGULATIONS

The *Town of Parker Storm Drainage and Environmental Criteria Manual* (the “CRITERIA”) and the *Urban Storm Drainage Criteria Manual* (the “MANUAL”) provided by Mile High Flood District (MHFD) were used for the drainage design and preparation of this letter.

There are no proposed deviations from the Town of Parker and MHFD floodplain regulations and ordinance.

COMPLIANCE WITH TOWN’S STREAM PRESERVATION STANDARDS

There are no existing stream buffers within the Project area.

DEVELOPMENT CRITERIA REFERENCE AND CONSTRAINTS

The FIRM panel cited in the Major Drainage Basin Description Section shows no portion of the Site to be located within the 100-year floodplain. The proposed storm facilities are in compliance with the CRITERIA and the MANUAL. Site drainage is not significantly impacted by such constraints as utilities or existing development.

The proposed approach included pipe flow into an existing storm sewer system. Additional detail regarding onsite drainage patterns is provided in the Drainage Facility Design Section.

The proposed Project is in general compliance with the Master Drainage Report.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per Table 2.3 of the CRITERIA. Table 5.1 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table RO-5 of the MANUAL by calculating weighted impervious values for each specific site basin. No modifications are proposed to any off-site drainage structure.

The rainfall intensity values used for the 5-year event and 100-year event are 1.9 inches/hour and 2.6 inches/hour, respectively.

Hydrologic design criteria utilized to analyze runoff conditions consists of the Rational Method as approved by the Criteria. Also, for sub-basins less than 160 acres in size, the Rational Method can be utilized as approved by the Manual.

Hydrologic calculations are provided in **Appendix B**.

HYDRAULIC CRITERIA

STORM SEWER PIPE HYDRAULICS

StormCAD was utilized to analyze pipe flows and conveyance capacity to the existing swale based upon direct runoff and time of concentration calculations for respective design point tributary areas. StormCAD modeling software allows the designer to analyze the system with respect to system conveyance timing and corresponding hydraulic gradient and capacity calculations.

Storm sewer design and modeling consists of design intervals as outlined by the following design storm events:

- Minor Storm: 5-year Storm Event
- Major Storm: 100-year Storm Event

Compliant with the Town Criteria, the Hydraulic Grade Line (HGL) for the minor event shall be contained within the pipe and for the major event shall be at least 12-inches below the finished grade elevation for the length of the pipe.

The resulting hydraulic analysis has been included in **Appendix C**.

GUTTER CAPACITY, INLET HYDRAULICS AND OUTFALL PROTECTION

Applicable design methods have been utilized to size proposed storm sewer inlets, which includes the use of UD-Inlet, v4.06 MHFD spreadsheets and nomographs.

The gutter capacity, inlet hydraulic and outfall protection analysis will consist of design intervals as outlined by the following design storm events:

- Minor Storm: 5-year Storm Event
- Major Storm: 100-year Storm Event

Analysis of the gutter capacity of internal access drives, curb cuts, riprap dissipation and Inlet Hydraulic Calculations have been included in **Appendix D**.

VARIANCE FROM CRITERIA

At this time, no variances from the Criteria are being requested.

DRAINAGE DESIGN

GENERAL CONCEPT

The Project consists of a proposed McDonald's fast-food restaurant with a dual drive-thru, drive aisles, parking, landscaping, and utility improvements.

Water quality and detention has been provided downstream of the Site within an existing detention pond south of the Site. Thus, no additional water quality or detention improvements are proposed with this Project.

FLOODPLAIN DEVELOPMENT PERMIT

This site does not fall within a FEMA floodplain and no floodplain modifications are required for this project therefore a floodplain development permit from the Town of Parker is not required.

ENVIRONMENTAL PROTECTION CRITERIA

GENERAL

No impacts to threatened or endangered species are anticipated as a result of the Project, and the Project is understood to comply with the State and Federal environmental permitting regulations. Additionally, no existing wetlands or Waters of the US are adjacent to the project site or are anticipated to be impacted by the proposed improvements.

CONSTRUCTION BMP PLAN

Construction BMPs will be used throughout the redevelopment of the Site in order to comply with Section 8.2 of the CRITERIA. Construction BMPs implemented onsite include silt fences and construction fence around the perimeter of the Site, vehicle tracking control, and a concrete washout area. The full list of construction BMPs to be implemented will be shown with the Project's Civil Construction Documents.

PERMANENT BMP PLAN

The existing detention pond acts as the Water Quality Enhancement BMP for the Project Site.

CONCLUSIONS

COMPLIANCE WITH STANDARDS

The drainage design presented within this report conforms to the Town of Parker Storm Drainage and Environmental Criteria Manual. The existing detention pond will not be adversely affected by the Project, and the Project meets Mile High Flood District requirements.

DRAINAGE CONCEPT

The drainage design discussed herein effectively controls the storm runoff from the Project by conveying developed runoff to the existing storm sewer system where it is then conveyed to the regional detention facility. The proposed developed imperviousness falls below the assumed imperviousness outlined in the

Master Drainage Report resulting in less than or equal to runoff than assumed to the existing detention pond.

SEDIMENT AND EROSION CONTROL CONCEPT

The Construction BMP plans are designed to prevent erosion within the Site during and after construction. BMPs are in place to prevent erosion during construction including silt fence around the perimeter of the Site, vehicle tracking control, and a concrete washout area.

REFERENCES

Final Drainage Report Parker Pointe, Perception Design Group, Inc.; November 28, 2018.

Town of Parker Storm Drainage and Environmental Criteria Manual, Town of Parker; February 1996, Revised and Adopted February 2014.

Urban Storm Drainage Criteria Manual, Volume 1-3, Urban Drainage and Flood Control District, Denver, CO.; latest editions. (Provided by Mile High Flood Control District)

APPENDIX

APPENDIX A – FIRM, SOILS AND DRAINAGE MAP

APPENDIX B – HYDROLOGIC COMPUTATIONS

APPENDIX C – HYDRAULIC COMPUTATIONS

APPENDIX D – INLET COMPUTATIONS

APPENDIX E – REFERENCE REPORT EXCERPTS

APPENDIX A – FIRM, SOILS AND DRAINAGE MAPS

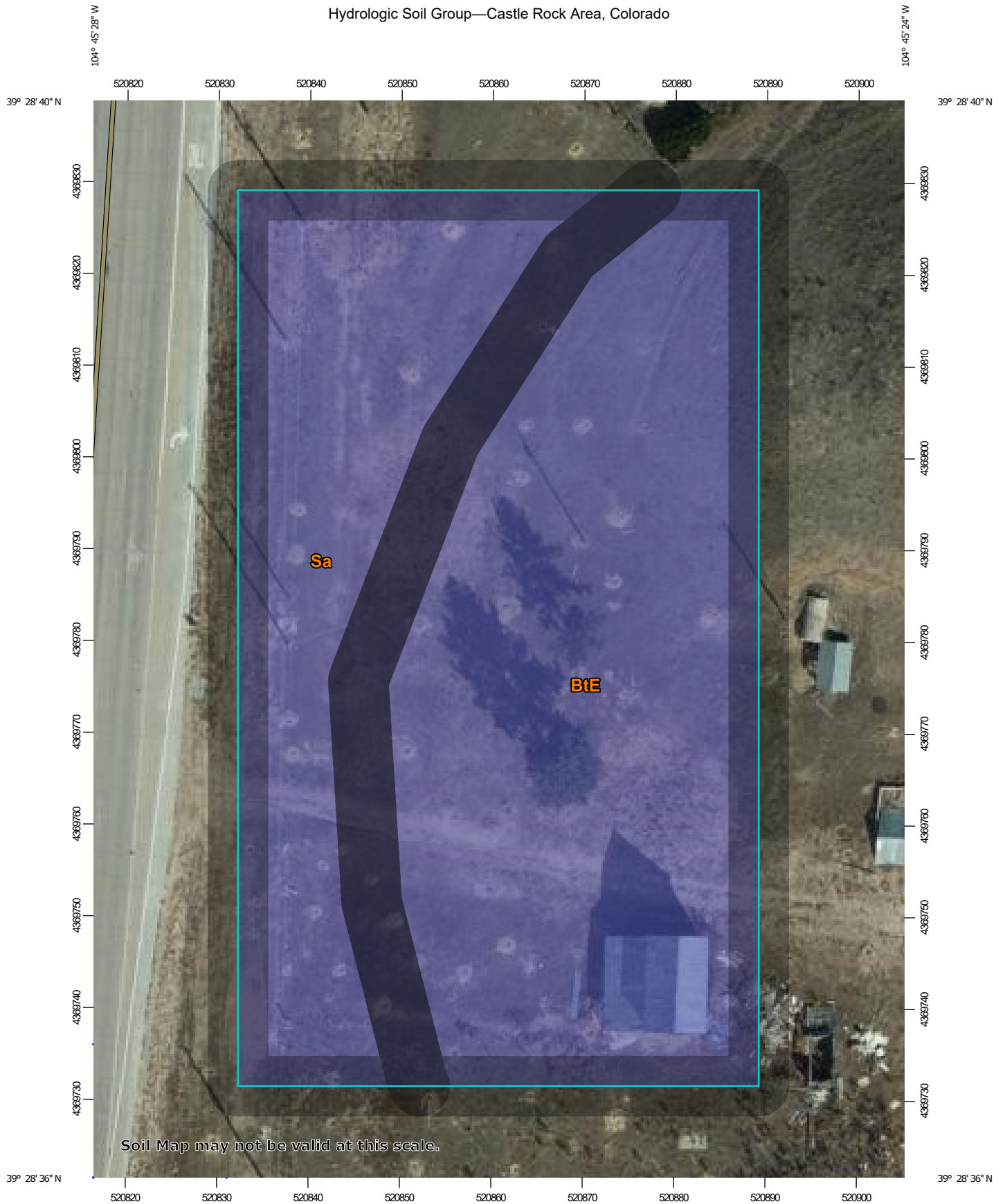
FEMA FIRM Map

NRCS Soil Map

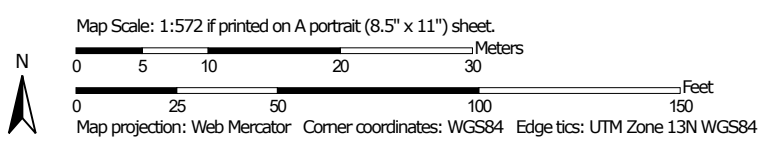
Proposed Drainage Maps



Hydrologic Soil Group—Castle Rock Area, Colorado




Soil Map may not be valid at this scale.



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.

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado
 Survey Area Data: Version 14, Aug 31, 2021

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

Date(s) aerial images were photographed: Oct 3, 2018—Dec 4, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BtE	Bresser-Truckton sandy loams, 5 to 25 percent slopes	B	0.9	63.2%
Sa	Sampson loam	B	0.5	36.8%
Totals for Area of Interest			1.4	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

National Flood Hazard Layer FIRMMette



104°45'45"W 39°28'51"N



Legend

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

- | | | |
|------------------------------------|--|--|
| SPECIAL FLOOD HAZARD AREAS | | Without Base Flood Elevation (BFE)
<i>Zone A, V, A99</i> |
| | | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i> |
| | | Regulatory Floodway |
| OTHER AREAS OF FLOOD HAZARD | | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> |
| | | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i> |
| | | Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i> |
| | | Area with Flood Risk due to Levee <i>Zone D</i> |
| OTHER AREAS | | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i> |
| | | Effective LOMRs |
| GENERAL STRUCTURES | | Area of Undetermined Flood Hazard <i>Zone D</i> |
| | | Channel, Culvert, or Storm Sewer |
| | | Levee, Dike, or Floodwall |
| OTHER FEATURES | | 20.2 Cross Sections with 1% Annual Chance |
| | | 17.5 Water Surface Elevation |
| | | Coastal Transect |
| | | Base Flood Elevation Line (BFE) |
| | | Limit of Study |
| | | Jurisdiction Boundary |
| | | Coastal Transect Baseline |
| | | Profile Baseline |
| | | Hydrographic Feature |
| MAP PANELS | | Digital Data Available |
| | | No Digital Data Available |
| | | Unmapped |
| | | The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location. |

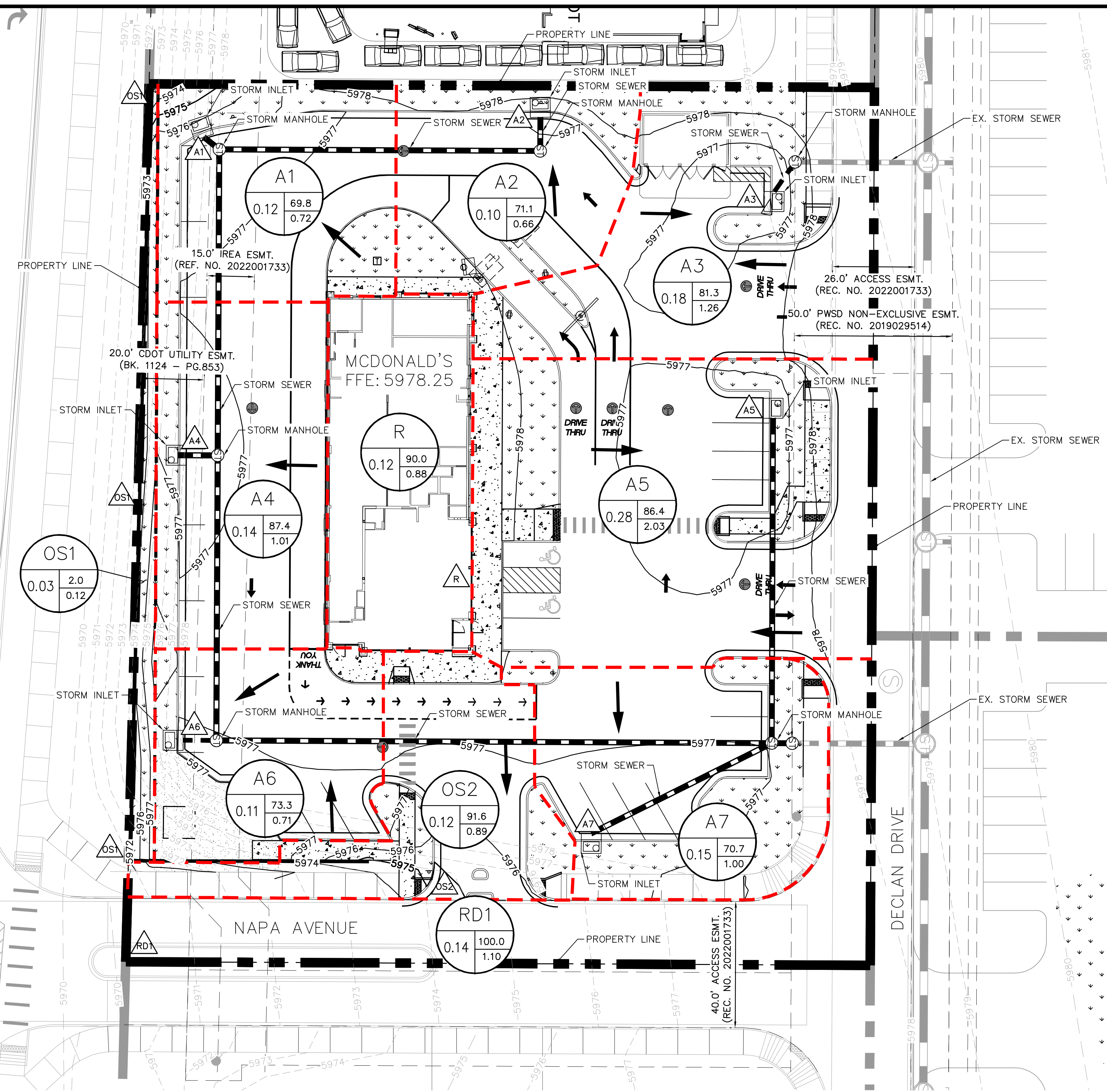


This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

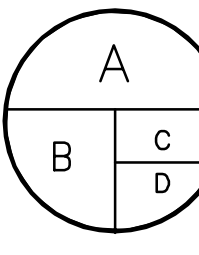
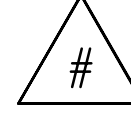
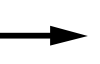

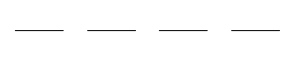


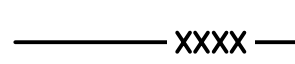
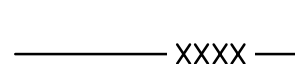




The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **11/18/2021 at 6:25 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

SOUTH PARKER ROAD



LEGEND

-  A = BASIN DESIGNATION
B = AREA (ACRES)
C = BASIN IMPERVIOUSNESS
D = 100YR DESIGN STORM RUNOFF (CFS)
-  # = DESIGN POINT
-  FLOW DIRECTION
-  PROPERTY BOUNDARY
-  EASEMENT
-  EXISTING STORM SEWER
-  DRAINAGE BASIN BOUNDARY
-  PROPOSED MAJOR CONTOUR
-  PROPOSED MINOR CONTOUR
-  EXISTING MAJOR CONTOUR
-  EXISTING MINOR CONTOUR
-  PROPOSED STORM SEWER
-  PROPOSED STORM INLET

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
A1	A1	0.12	0.21	0.72	0.40	1.37
A2	A2	0.10	0.20	0.66	0.20	0.66
A3	A3	0.18	0.40	1.26	0.40	1.26
A4	A4	0.14	0.34	1.01	0.71	2.29
A5	A5	0.28	0.67	2.03	0.67	2.03
A6	A6	0.11	0.21	0.71	0.91	2.96
A7	A7	0.15	0.29	1.00	1.18	3.87
R	R	0.12	0.29	0.88	0.29	0.88
OS1	OS1	0.03	0.00	0.12	0.00	0.12
OS2	OS2	0.12	0.30	0.89	0.30	0.89
RD1	RD1	0.14	0.39	1.10	0.39	1.10

DRAINAGE EXHIBIT – MCDONALD'S SOUTH PARKER ROAD AND STROH ROAD, PARKER, CO



APPENDIX B – HYDROLOGIC COMPUTATIONS

Sub-Basin Impervious Area Calculations

Sub-Basin Runoff Calculations



The one-hour point rainfall depths for different frequency events are shown in Table 5.1 herein. Rainfall intensity as a function of the one-hour point rainfall and the time of concentration can be approximated by the following equation which appears in the MANUAL as Equation RA-5.

$$I = (28.5P_1)/(10+t_c)^{0.786}$$

Where, I = rainfall intensity (in/hr)
P₁ = one-hour point rainfall depth (in)
t_c = time of concentration (min)

	<u>2-yr</u>	<u>5-yr</u>	<u>10-yr</u>	<u>100-yr</u>
P ₁ =	0.99	1.39	1.64	2.6

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF				LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE				PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT				WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
					C2	C5	C10	C100			C2	C5	C10	C100			C2	C5	C10	C100		C2	C5	C10	C100
A1	5,161	0.12	0	90%	0.74	0.76	0.78	0.84	1,593	2%	0.01	0.01	0.07	0.44	3,568	100%	0.84	0.86	0.86	0.90	69.8%	0.58	0.60	0.62	0.76
A2	4,545	0.10	0	90%	0.74	0.76	0.78	0.84	1,340	2%	0.01	0.01	0.07	0.44	3,205	100%	0.84	0.86	0.86	0.90	71.1%	0.60	0.61	0.63	0.76
A3	7,997	0.18	0	90%	0.74	0.76	0.78	0.84	1,527	2%	0.01	0.01	0.07	0.44	6,470	100%	0.84	0.86	0.86	0.90	81.3%	0.68	0.70	0.71	0.81
A4	5,953	0.14	0	90%	0.74	0.76	0.78	0.84	766	2%	0.01	0.01	0.07	0.44	5,187	100%	0.84	0.86	0.86	0.90	87.4%	0.73	0.75	0.76	0.84
A5	12,194	0.28	0	90%	0.74	0.76	0.78	0.84	1,696	2%	0.01	0.01	0.07	0.44	10,498	100%	0.84	0.86	0.86	0.90	86.4%	0.72	0.74	0.75	0.84
A6	4,635	0.11	0	90%	0.74	0.76	0.78	0.84	1,262	2%	0.01	0.01	0.07	0.44	3,373	100%	0.84	0.86	0.86	0.90	73.3%	0.61	0.63	0.64	0.77
A7	6,461	0.15	0	90%	0.74	0.76	0.78	0.84	1,934	2%	0.01	0.01	0.07	0.44	4,527	100%	0.84	0.86	0.86	0.90	70.7%	0.59	0.61	0.62	0.76
R	5,161	0.12	5,161	90%	0.74	0.76	0.78	0.84	0	2%	0.01	0.01	0.07	0.44	0	100%	0.84	0.86	0.86	0.90	90.0%	0.74	0.76	0.78	0.84
OS1	1,356	0.03	0	90%	0.74	0.76	0.78	0.84	1,356	2%	0.01	0.01	0.07	0.44	0	100%	0.84	0.86	0.86	0.90	2.0%	0.01	0.01	0.07	0.44
OS2	5,117	0.12	0	90%	0.74	0.76	0.78	0.84	439	2%	0.01	0.01	0.07	0.44	4,678	100%	0.84	0.86	0.86	0.90	91.6%	0.77	0.79	0.79	0.86
RD1	6,029	0.14	0	90%	0.74	0.76	0.78	0.84	0	2%	0.01	0.01	0.07	0.44	6,029	100%	0.84	0.86	0.86	0.90	100.0%	0.84	0.86	0.86	0.90
TOTAL	64,609	1.48	5,161	90%	0.74	0.76	0.78	0.84	11,913	2%	0.01	0.01	0.07	0.44	47,535	100%	0.84	0.86	0.86	0.90	81.1%	0.68	0.70	0.65	0.81

McDonald's Stroh
Drainage Report
Parker, CO

McDonald's - Drainage Report																
Proposed Runoff Calculations																
Time of Concentration																
Watercourse Coefficient																
				Forest & Meadow	2.50	Short Grass Pasture & Lawns	7.00					Grassed Waterway	15.00			
				Fallow or Cultivation	5.00	Nearly Bare Ground	10.00					Paved Area & Shallow Gutter	20.00			
DESIGN POINT	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c) min.
	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(2)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	
A1	A1	5,161	0.12	0.58	68	1.7%	6.5	53.4	2.0%	20.00	2.8	0.3	6.8	121.4	10.7	6.8
A2	A2	4,545	0.10	0.60	59	1.6%	6.0	46	2.0%	20.00	2.8	0.3	6.3	104.7	10.6	6.3
A3	A3	7,997	0.18	0.68	86	1.8%	5.8	25	3.3%	20.00	3.6	0.1	5.9	111	10.6	5.9
A4	A4	5,953	0.14	0.73	47	2.5%	3.4	48	1.8%	20.00	2.7	0.3	5.0	95	10.5	5.0
A5	A5	12,194	0.28	0.72	85	2.1%	5.0	50	1.9%	20.00	2.7	0.3	5.3	135	10.8	5.3
A6	A6	4,635	0.11	0.61	47	1.4%	5.4	29	2.0%	20.00	2.8	0.2	5.6	75.5	10.4	5.6
A7	A7	6,461	0.15	0.59	32	2.1%	4.1	25	2.2%	20.00	3.0	0.1	5.0	57.2	10.3	5.0
R	R	5,161	0.12	0.74	45	1.0%	4.4	0	1.0%	20.00	2.0	0.0	5.0	45	10.3	5.0
OS1	OS1	1,356	0.03	0.01	8	33.0%	1.8	0	1.0%	10.00	1.0	0.0	5.0	8	10.0	5.0
OS2	OS2	5,117	0.12	0.77	78	4.1%	3.3	0	1.0%	20.00	2.0	0.0	5.0	78	10.4	5.0
RD1	RD1	6,029	0.14	0.84	215	3.8%	4.5	0	1.0%	20.00	2.0	0.0	5.0	215	11.2	5.0

McDonald's - Drainage Report Proposed Runoff Calculations (Rational Method Procedure)												
BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1	A1	0.12	0.58	6.8	0.07	3.07	0.21	6.8	0.13	3.07	0.40	Flows from A1 and A2
A2	A2	0.10	0.60	6.3	0.06	3.15	0.20					
A3	A3	0.18	0.68	5.9	0.13	3.21	0.40					
A4	A4	0.14	0.73	5.0	0.10	3.36	0.34	6.8	0.23	3.07	0.71	Flows from A1, A2, and A4
A5	A5	0.28	0.72	5.3	0.20	3.31	0.67					
A6	A6	0.11	0.61	5.6	0.07	3.26	0.21	6.8	0.30	3.07	0.91	Flows from A1, A2, A4, and A6
A7	A7	0.15	0.59	5.0	0.09	3.36	0.29	6.8	0.38	3.07	1.18	Flows from A1, A2, A4, A6, and A7
R	R	0.12	0.74	5.0	0.09	3.36	0.29					
OS1	OS1	0.03	0.01	5.0	0.00	3.36	0.00					
OS2	OS2	0.12	0.77	5.0	0.09	3.36	0.30					
RD1	RD1	0.14	0.84	5.0	0.12	3.36	0.39					

McDonald's - Drainage Report												
Proposed Runoff Calculations												
Design Storm 100 Year												
(Rational Method Procedure)												
BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1	A1	0.12	0.76	6.8	0.09	8.06	0.72	6.8	0.17	8.06	1.37	Flows from A1 and A2
A2	A2	0.10	0.76	6.3	0.08	8.27	0.66					
A3	A3	0.18	0.81	5.9	0.15	8.42	1.26					
A4	A4	0.14	0.84	5.0	0.11	8.82	1.01	6.8	0.28	8.06	2.29	Flows from A1, A2, and A4
A5	A5	0.28	0.84	5.3	0.23	8.68	2.03					
A6	A6	0.11	0.77	5.6	0.08	8.56	0.71	6.8	0.37	8.06	2.96	Flows from A1, A2, A4, and A6
A7	A7	0.15	0.76	5.0	0.11	8.82	1.00	6.8	0.48	8.06	3.87	Flows from A1, A2, A4, A6, and A7
R	R	0.12	0.84	5.0	0.10	8.82	0.88					
OS1	OS1	0.03	0.44	5.0	0.01	8.82	0.12					
OS2	OS2	0.12	0.86	5.0	0.10	8.82	0.89					
RD1	RD1	0.14	0.90	5.0	0.12	8.82	1.10					

McDonald's - Drainage Report Proposed Runoff Calculations (Rational Method Procedure)												
BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1	A1	0.118	0.58	6.8	0.07	3.75	0.26	6.8	0.13	3.07	0.40	Flows from A1 and A2
A2	A2	0.104	0.60	6.3	0.06	3.85	0.24					
A3	A3	0.184	0.68	5.9	0.13	3.92	0.49					
A4	A4	0.137	0.73	5.0	0.10	4.12	0.41	6.8	0.23	3.07	0.71	Flows from A1, A2, and A4
A5	A5	0.28	0.72	5.3	0.20	4.05	0.82					
A6	A6	0.106	0.61	5.6	0.07	3.99	0.26	6.8	0.30	3.07	0.91	Flows from A1, A2, A4, and A6
A7	A7	0.148	0.59	5.0	0.09	4.12	0.36	6.8	0.38	3.07	1.18	Flows from A1, A2, A4, A6, and A7
R	R	0.118	0.74	5.0	0.09	4.12	0.36					
OS1	OS1	0.031	0.01	5.0	0.00	4.12	0.00					
OS2	OS2	0.117	0.77	5.0	0.09	4.12	0.37					
RD1	RD1	0.138	0.84	5.0	0.12	4.12	0.48					

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
A1	A1	0.12	0.21	0.72	0.40	1.37
A2	A2	0.10	0.20	0.66	0.20	0.66
A3	A3	0.18	0.40	1.26	0.40	1.26
A4	A4	0.14	0.34	1.01	0.71	2.29
A5	A5	0.28	0.67	2.03	0.67	2.03
A6	A6	0.11	0.21	0.71	0.91	2.96
A7	A7	0.15	0.29	1.00	1.18	3.87
R	R	0.12	0.29	0.88	0.29	0.88
OS1	OS1	0.03	0.00	0.12	0.00	0.12
OS2	OS2	0.12	0.30	0.89	0.30	0.89
RD1	RD1	0.14	0.39	1.10	0.39	1.10

APPENDIX C – HYDRAULIC COMPUTATIONS

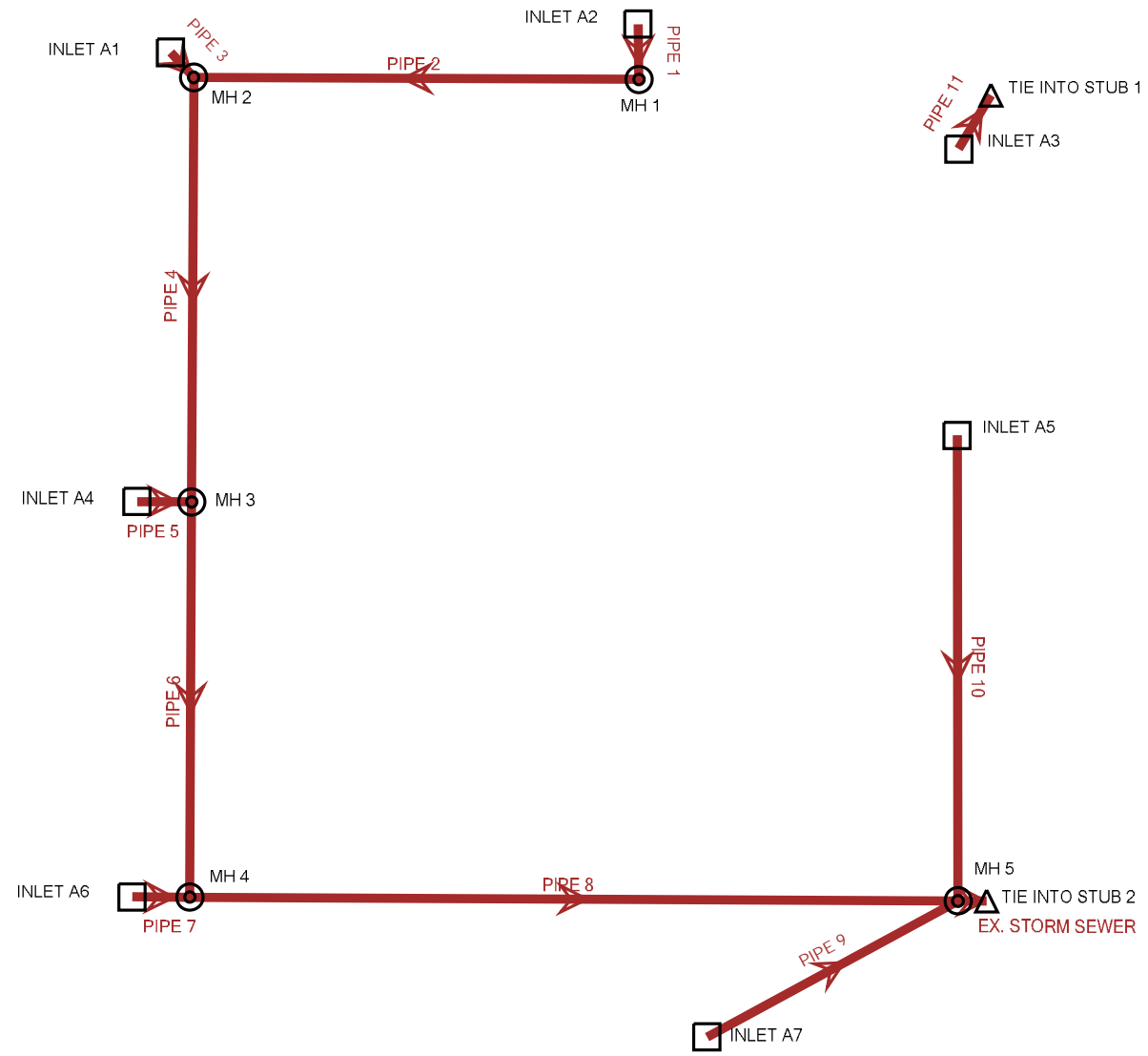
StormCAD Map

StormCAD Results Tables

StormCAD Result Profiles (100yr and 5yr)



Scenario: 100-Year



FlexTable: Conduit Table

Active Scenario: 5-Year

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
PIPE 11	INLET A3	TIE INTO STUB 1	0.005	18.0	0.18	1.76	7.43	2.4	5,972.90	5,972.83
PIPE 1	INLET A2	MH 1	0.010	18.0	0.20	2.30	10.35	1.9	5,973.74	5,973.60
PIPE 7	INLET A6	MH 4	0.020	18.0	0.21	0.12	14.85	1.4	5,971.30	5,971.23
PIPE 2	MH 1	MH 2	0.007	18.0	0.20	2.08	9.01	2.2	5,973.09	5,972.41
PIPE 8	INLET A6	MH 5	0.007	18.0	0.96	3.32	9.01	10.7	5,971.17	5,969.84
PIPE 9	INLET A7	MH 5	0.056	18.0	0.29	4.73	24.85	1.2	5,973.37	5,969.83
EX. STORM SEWER	MH 5	TIE INTO STUB 2	0.008	18.0	1.92	4.09	9.14	21.0	5,969.83	5,969.74
PIPE 10	INLET A5	MH 5	0.035	18.0	0.67	5.20	19.76	3.4	5,973.58	5,969.83
PIPE 6	MH 3	INLET A6	0.007	18.0	0.75	3.09	9.01	8.3	5,971.79	5,971.17
PIPE 4	MH 2	MH 3	0.007	18.0	0.41	2.58	9.01	4.6	5,972.41	5,971.79
PIPE 5	MH 3	INLET A4	0.020	18.0	0.34	0.19	14.85	2.3	5,971.79	5,971.79
PIPE 3	INLET A1	MH 2	0.061	18.0	0.21	4.44	26.04	0.8	5,973.11	5,972.56

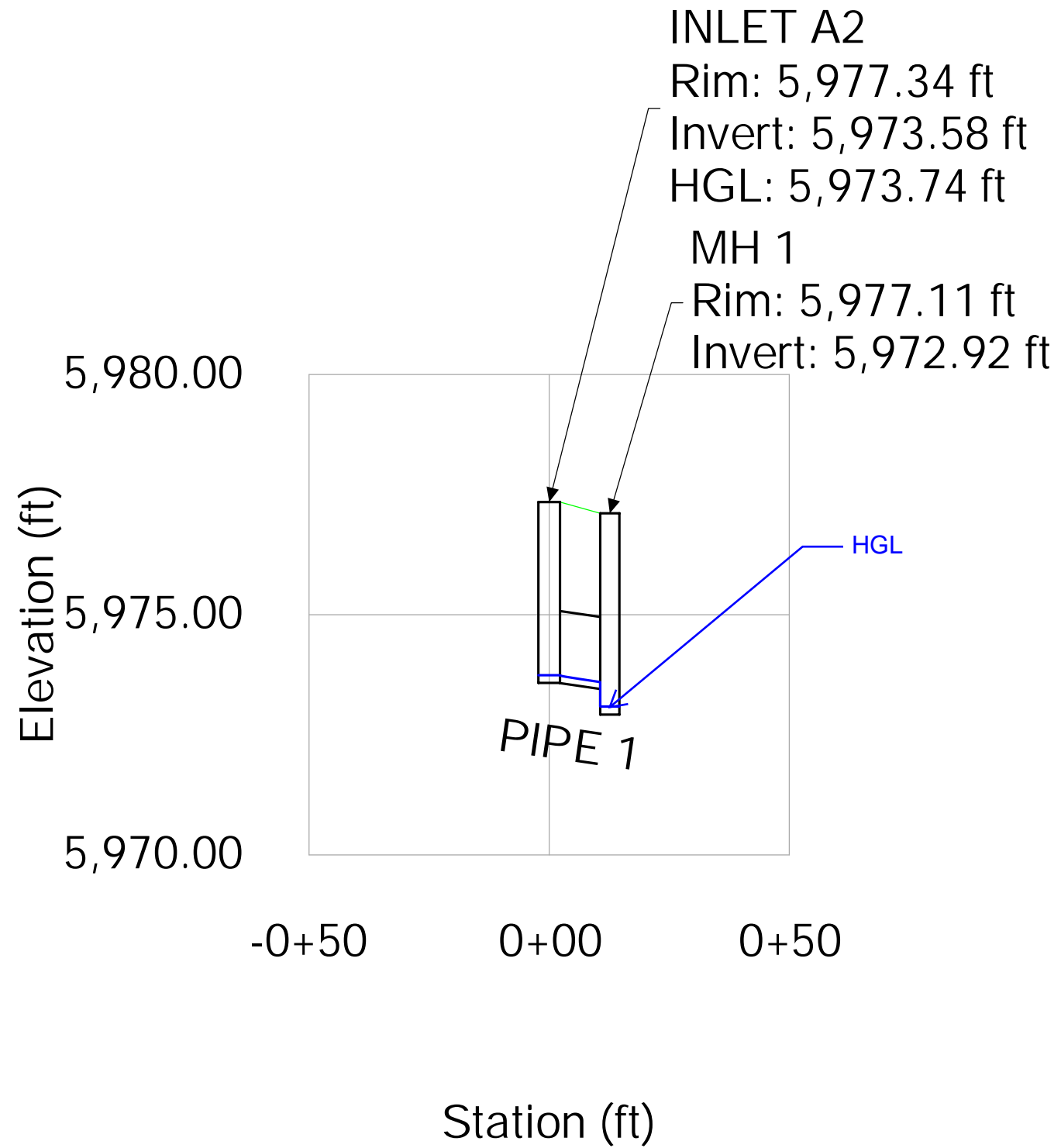
FlexTable: Catch Basin Table
Active Scenario: 5-Year

Label	Inlet Type	Flow (Additional Subsurface) (cfs)	Capture Efficiency (Calculated) (%)	Elevation (Invert) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
INLET A3	Full Capture	0.18	100.0	5,972.74	5,972.90	5,972.90
INLET A2	Full Capture	0.20	100.0	5,973.58	5,973.74	5,973.74
INLET A5	Full Capture	0.67	100.0	5,973.28	5,973.58	5,973.58
INLET A7	Full Capture	0.29	100.0	5,973.17	5,973.37	5,973.37
MH 4	Full Capture	0.21	100.0	5,971.07	5,971.30	5,971.30
INLET A4	Full Capture	0.34	100.0	5,970.34	5,971.79	5,971.79
INLET A1	Full Capture	0.21	100.0	5,972.87	5,973.11	5,973.11

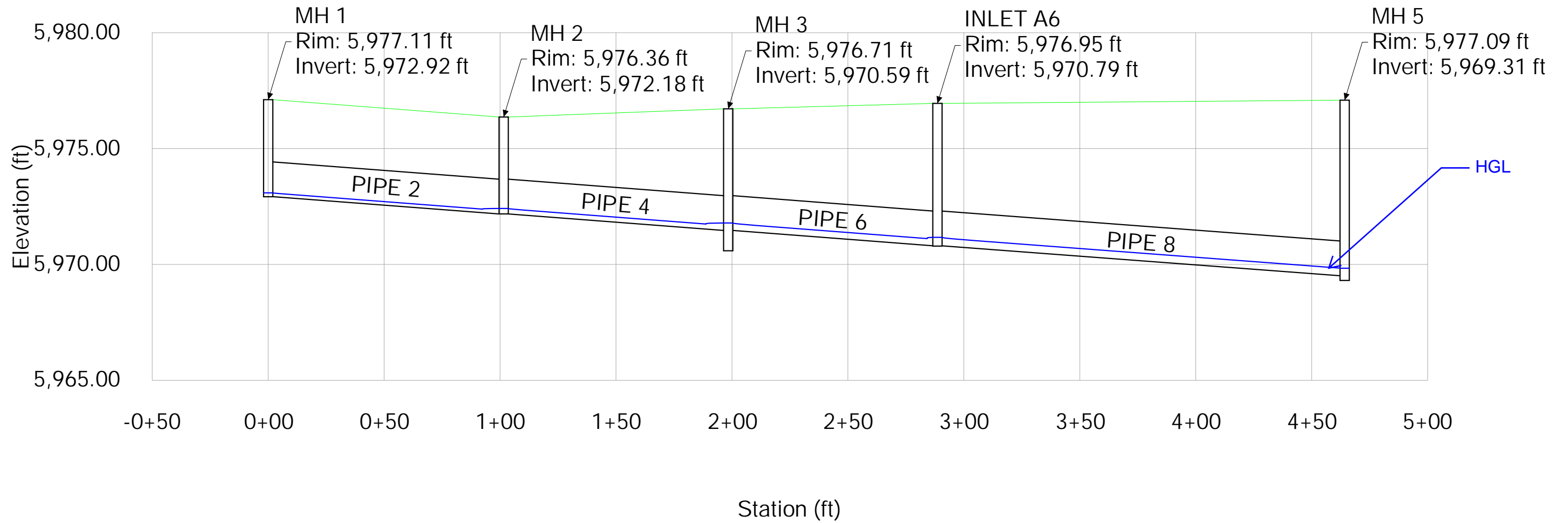
FlexTable: Manhole Table
Active Scenario: 5-Year

Label	Elevation (Invert) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
MH 1	5,972.92	5,973.09	5,973.09
MH 5	5,969.31	5,969.83	5,969.83
INLET A6	5,970.79	5,971.17	5,971.17
MH 3	5,970.59	5,971.79	5,971.79
MH 2	5,972.18	5,972.41	5,972.41

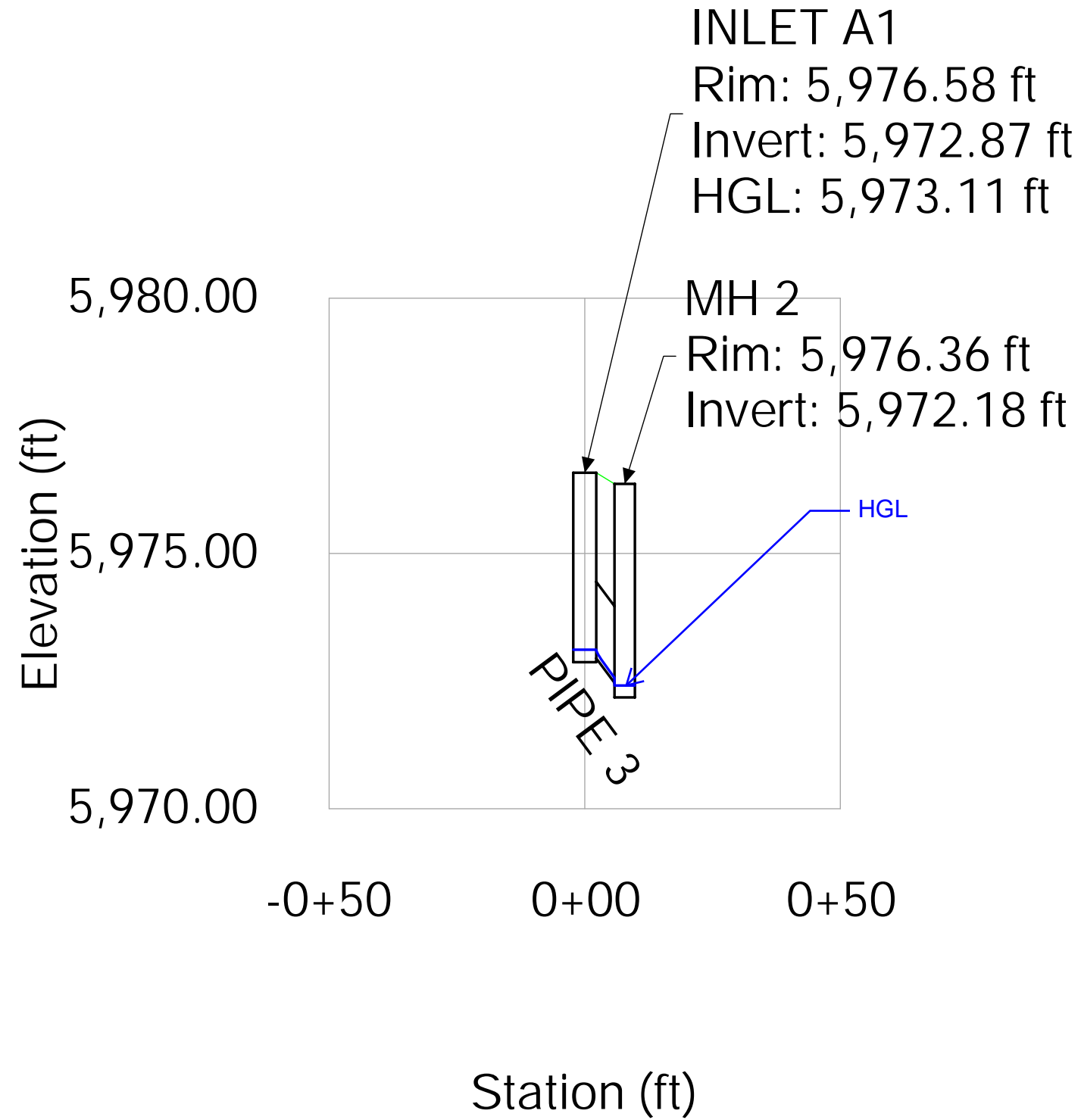
Profile Report
Engineering Profile - Pipe 1 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 5-Year



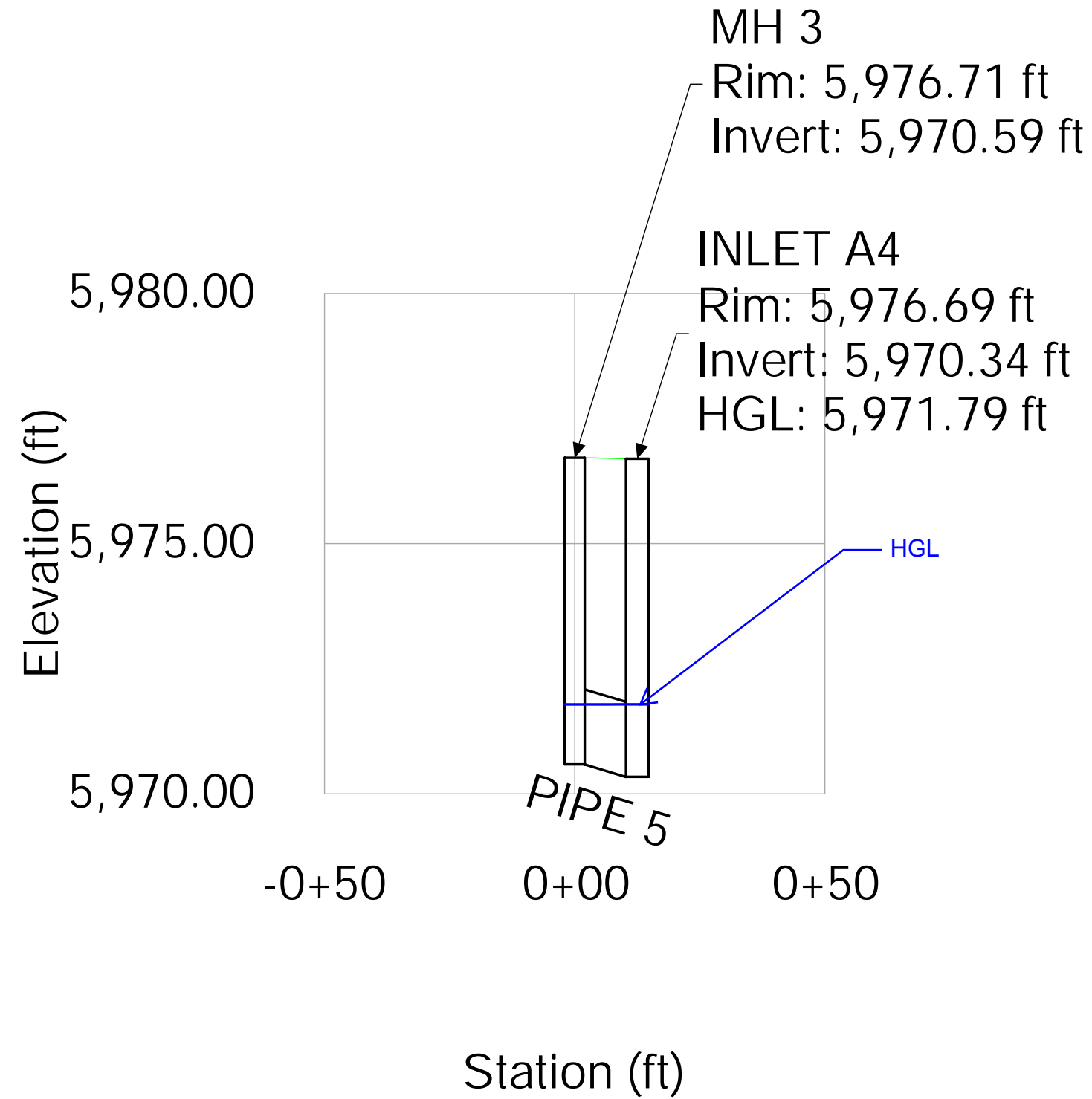
Profile Report
 Engineering Profile - Pipe 2 - 8 (McDonald's Stroh_StormCAD.stsw)
 Active Scenario: 5-Year



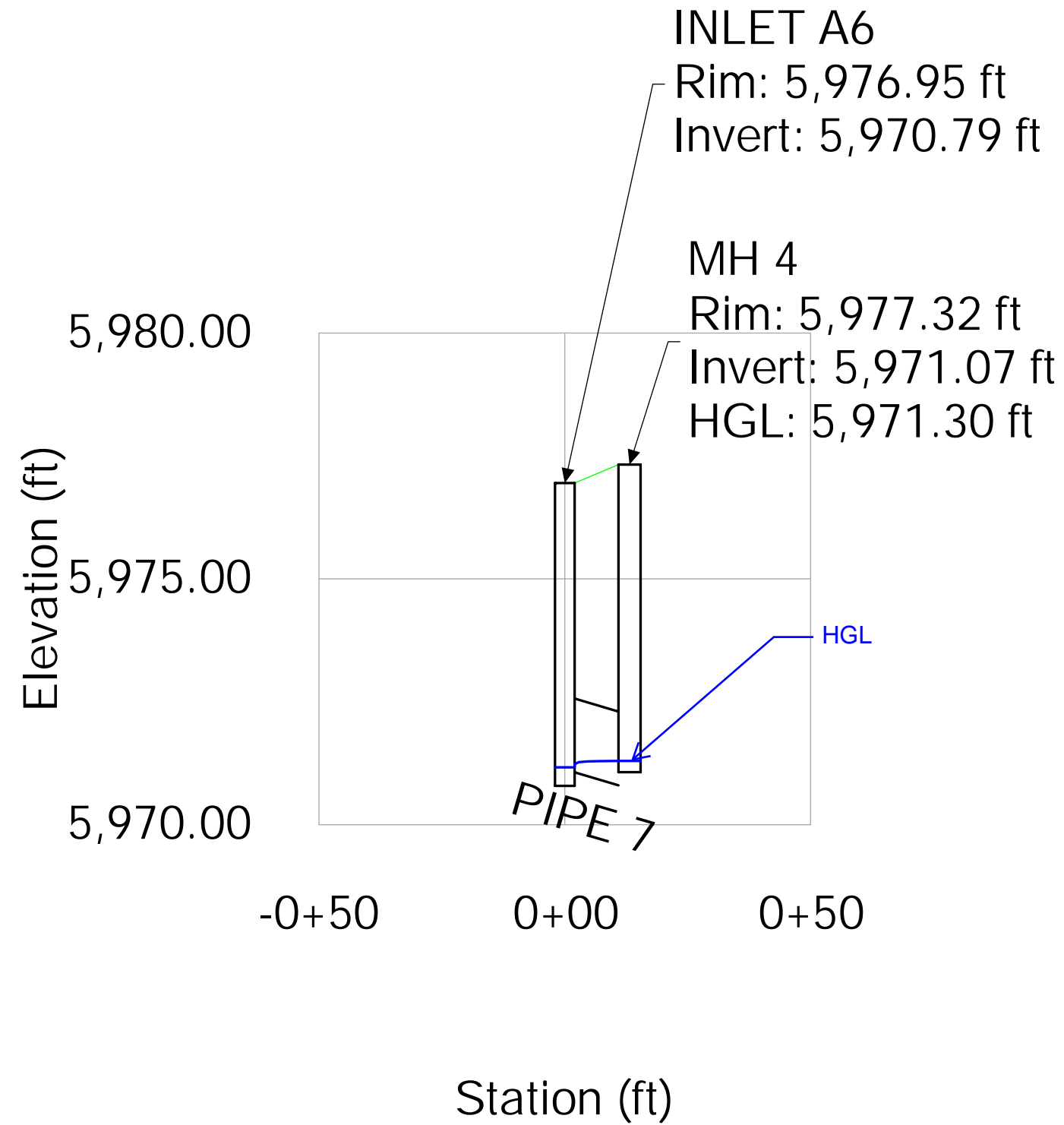
Profile Report
Engineering Profile - Pipe 3 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 5-Year



Profile Report
Engineering Profile - Pipe 5 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 5-Year



Profile Report
Engineering Profile - Pipe 7 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 5-Year



Profile Report
Engineering Profile - Pipe 9 (McDonald's Stroh_StormCAD.stsw)

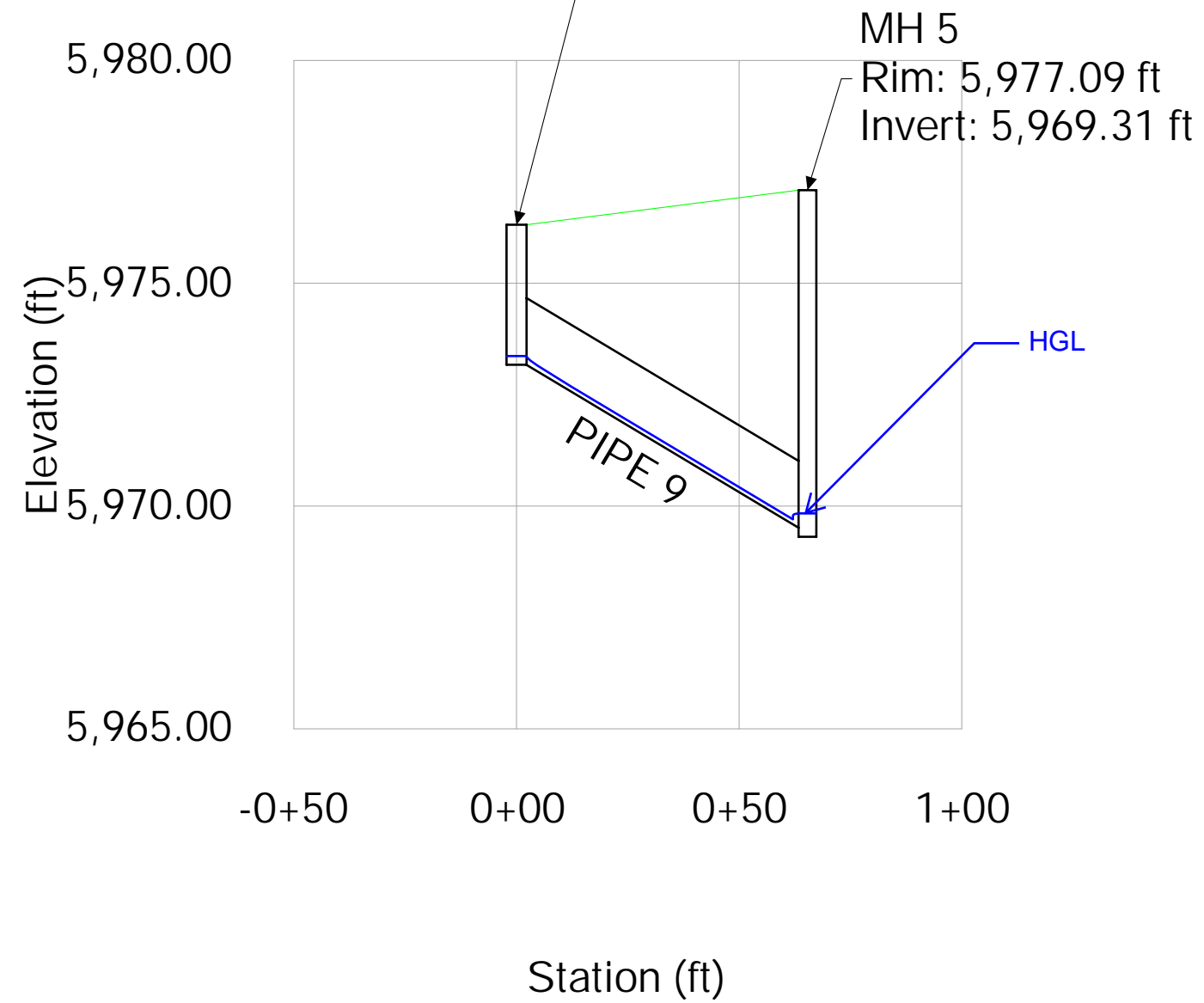
Active Scenario: 5-Year

INLET A7

Rim: 5,976.31 ft

Invert: 5,973.17 ft

HGL: 5,973.37 ft



Profile Report
Engineering Profile - Pipe 10 (McDonald's Stroh_StormCAD.stsw)

Active Scenario: 5-Year

INLET A5

Rim: 5,976.19 ft

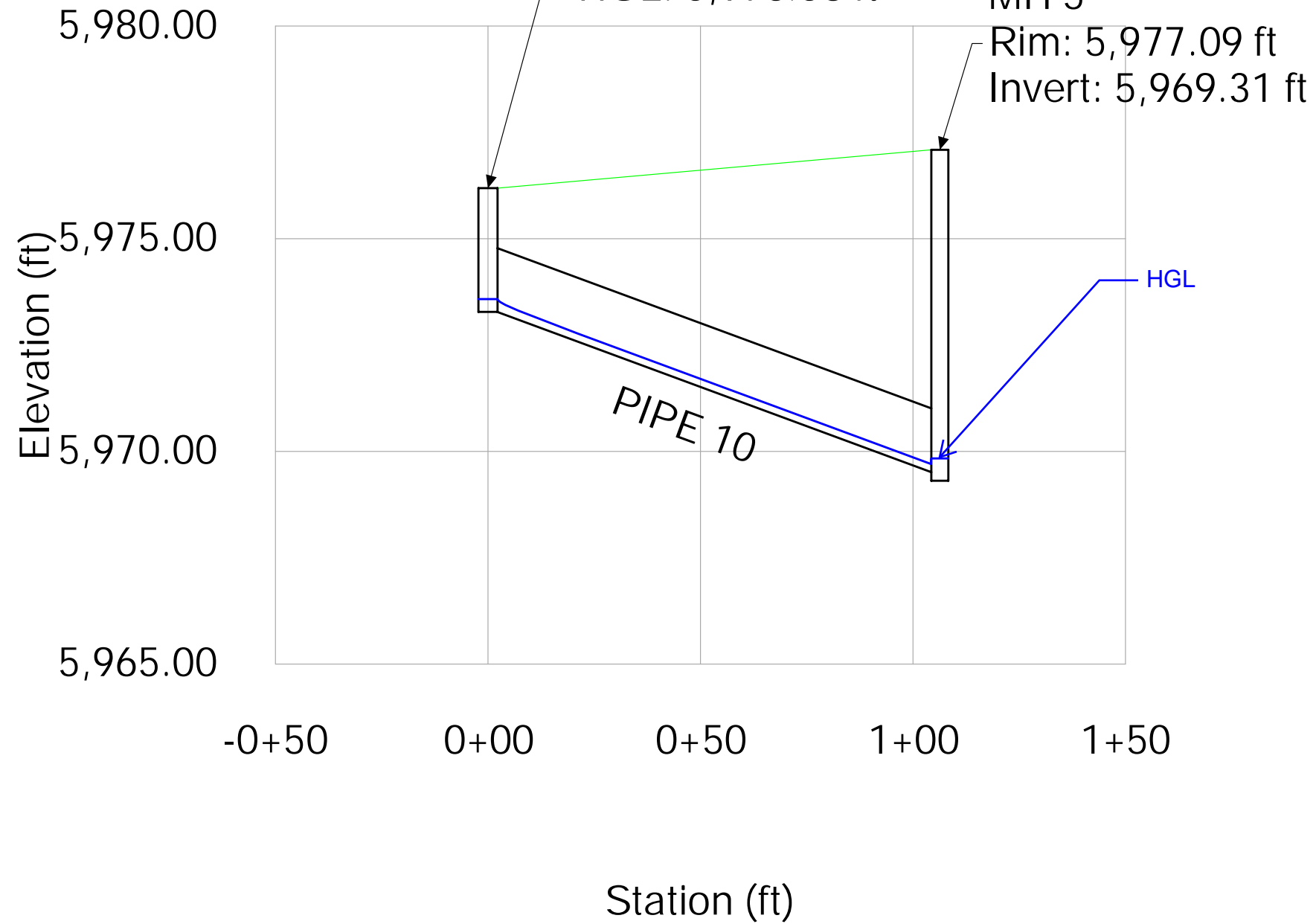
Invert: 5,973.28 ft

HGL: 5,973.58 ft

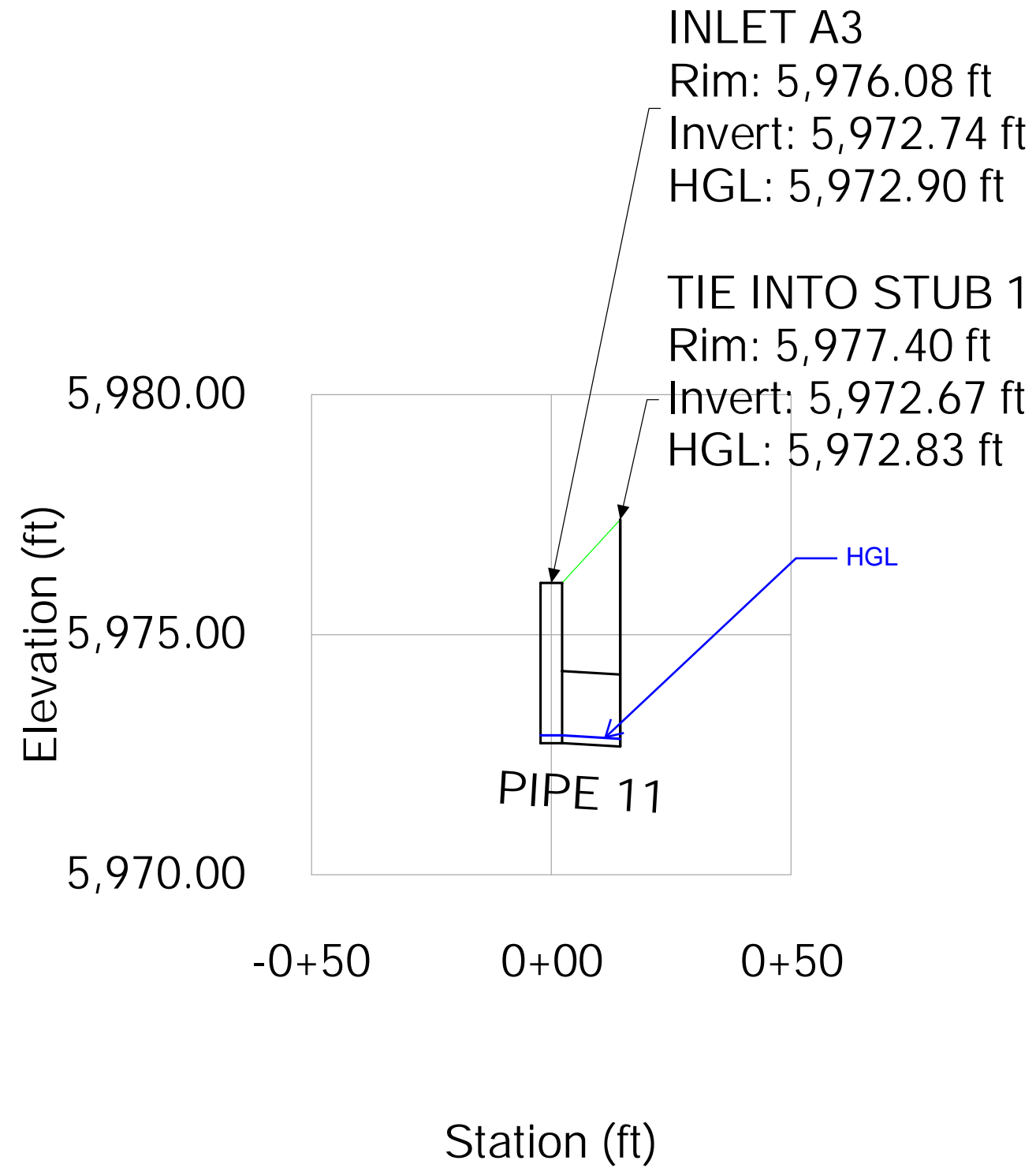
MH 5

Rim: 5,977.09 ft

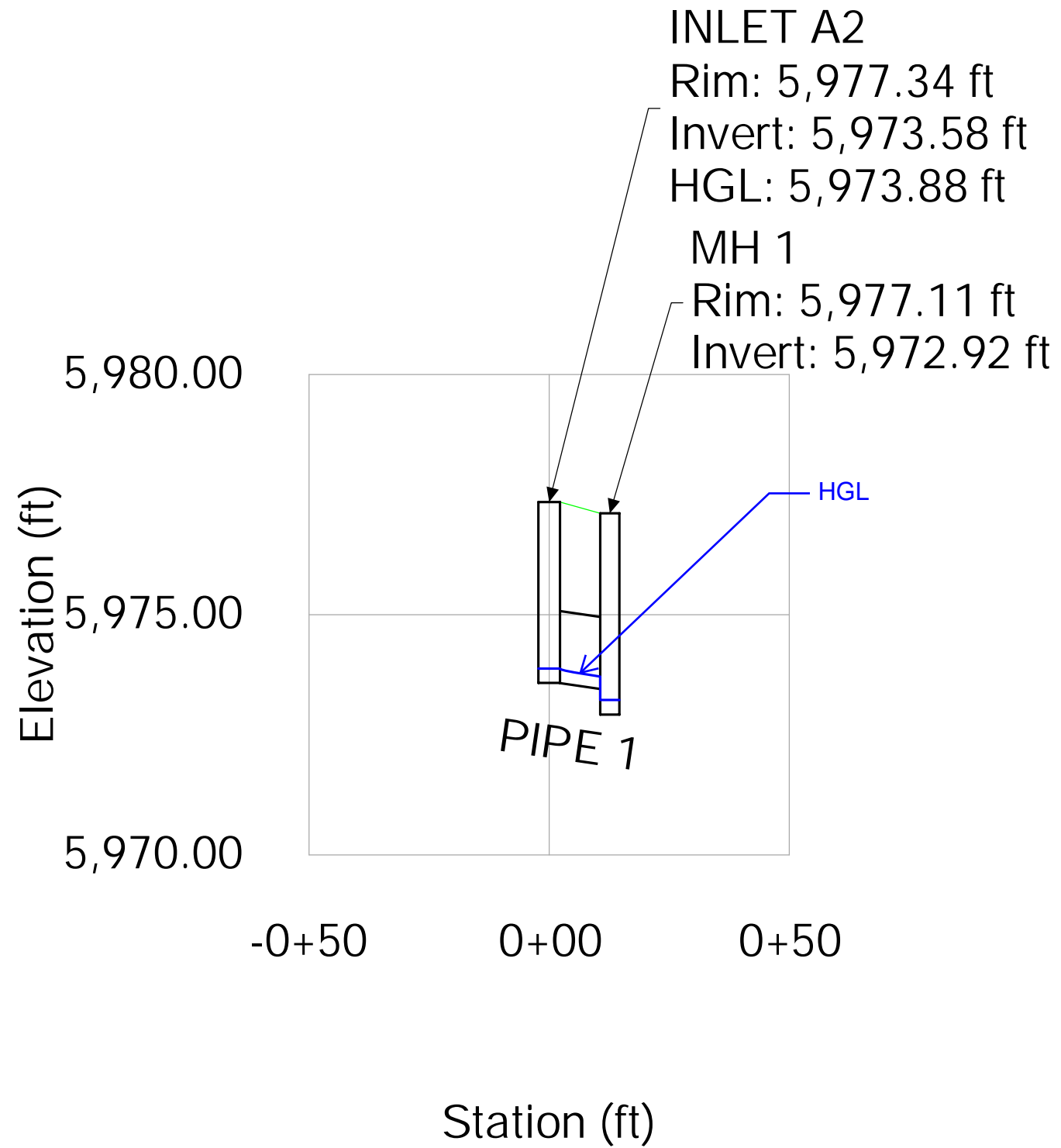
Invert: 5,969.31 ft



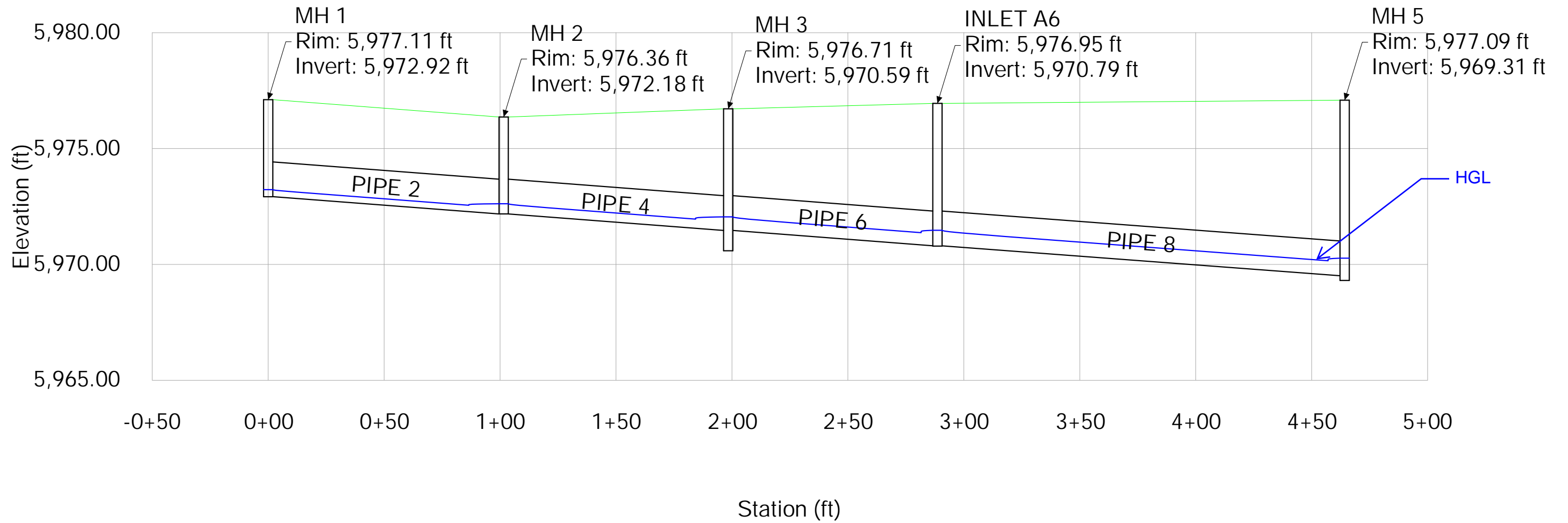
Profile Report
Engineering Profile - Pipe 11 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 5-Year



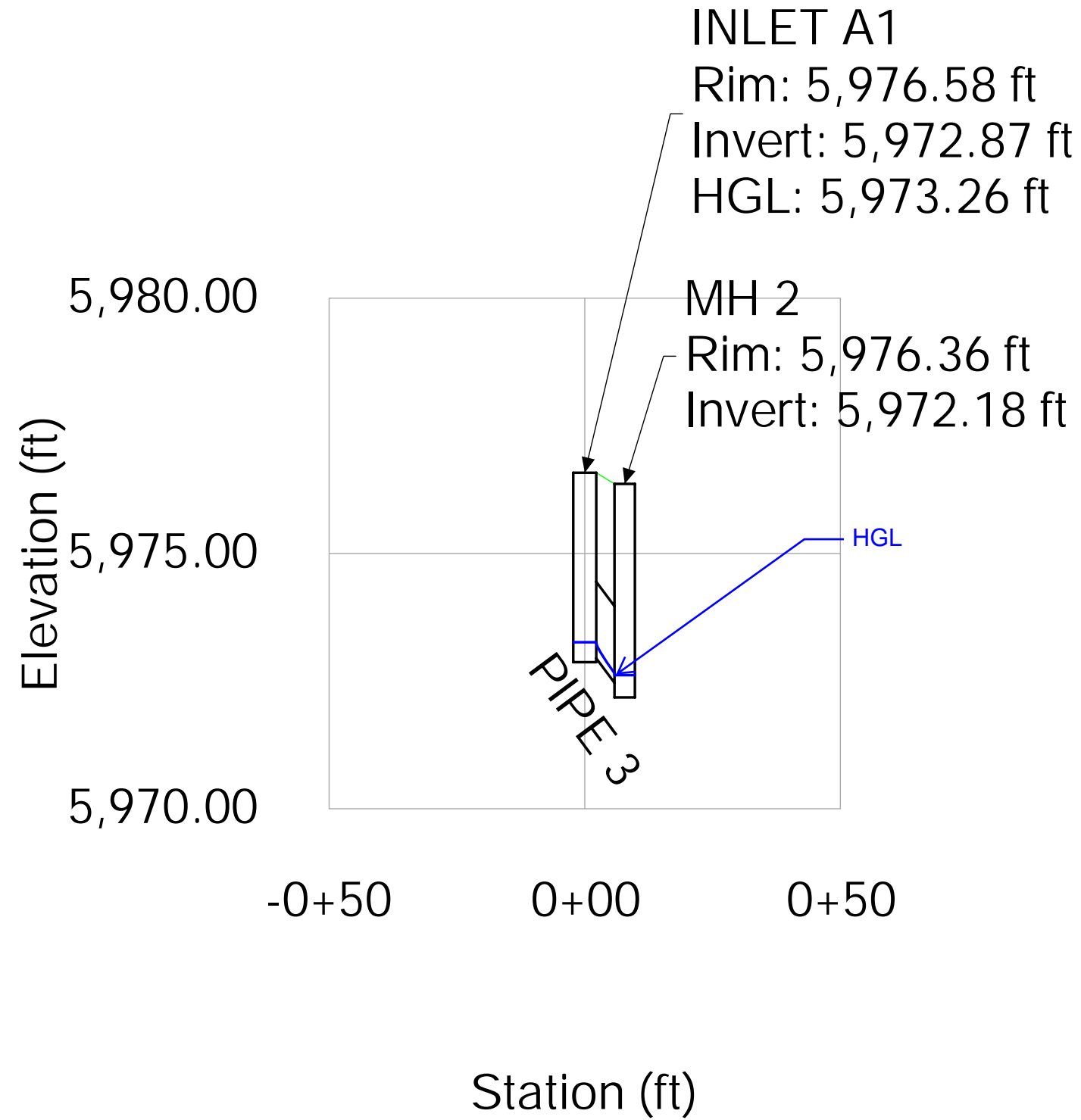
Profile Report
Engineering Profile - Pipe 1 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 100-Year



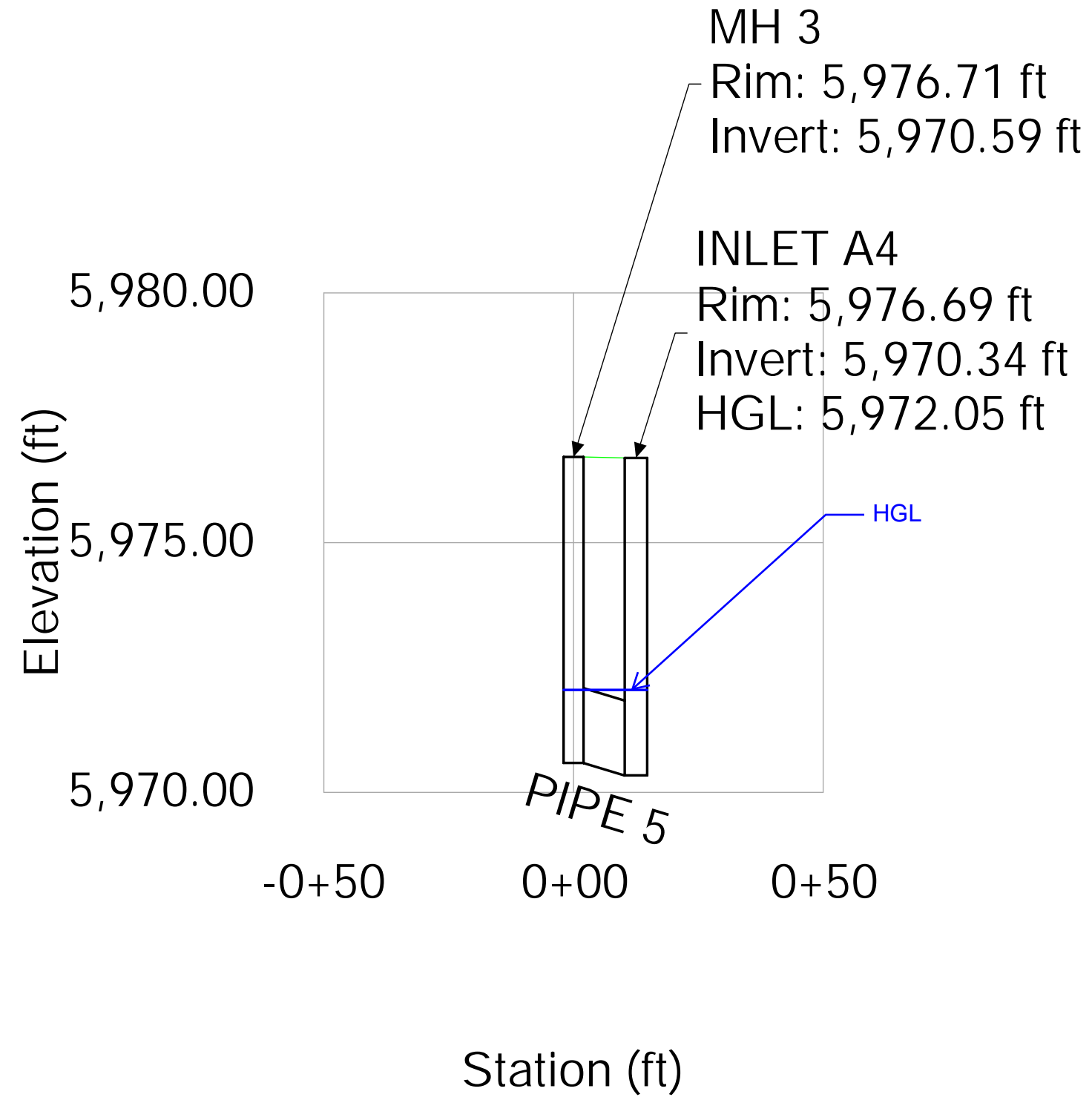
Profile Report
 Engineering Profile - Pipe 2 - 8 (McDonald's Stroh_StormCAD.stsw)
 Active Scenario: 100-Year



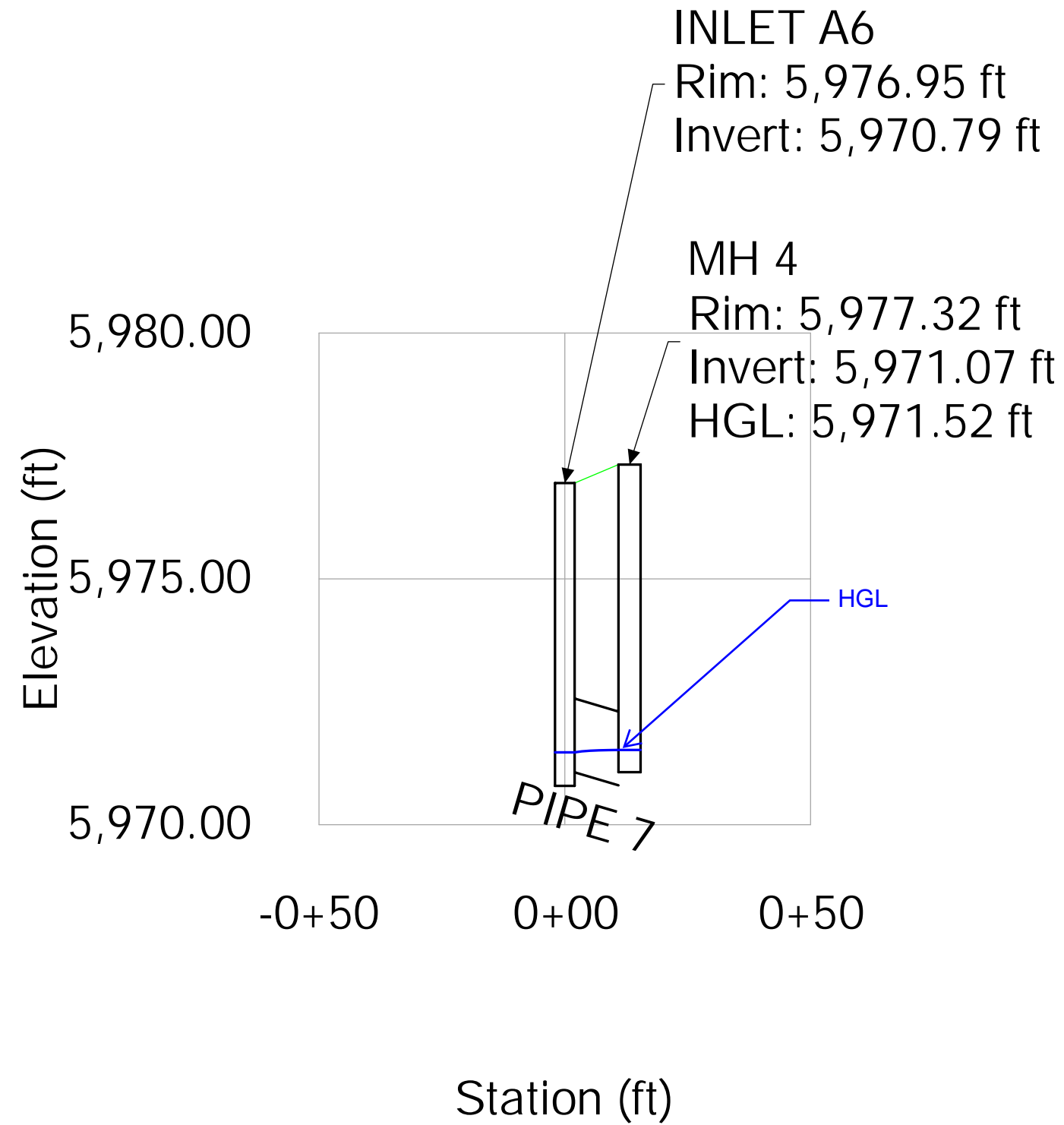
Profile Report
Engineering Profile - Pipe 3 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 100-Year



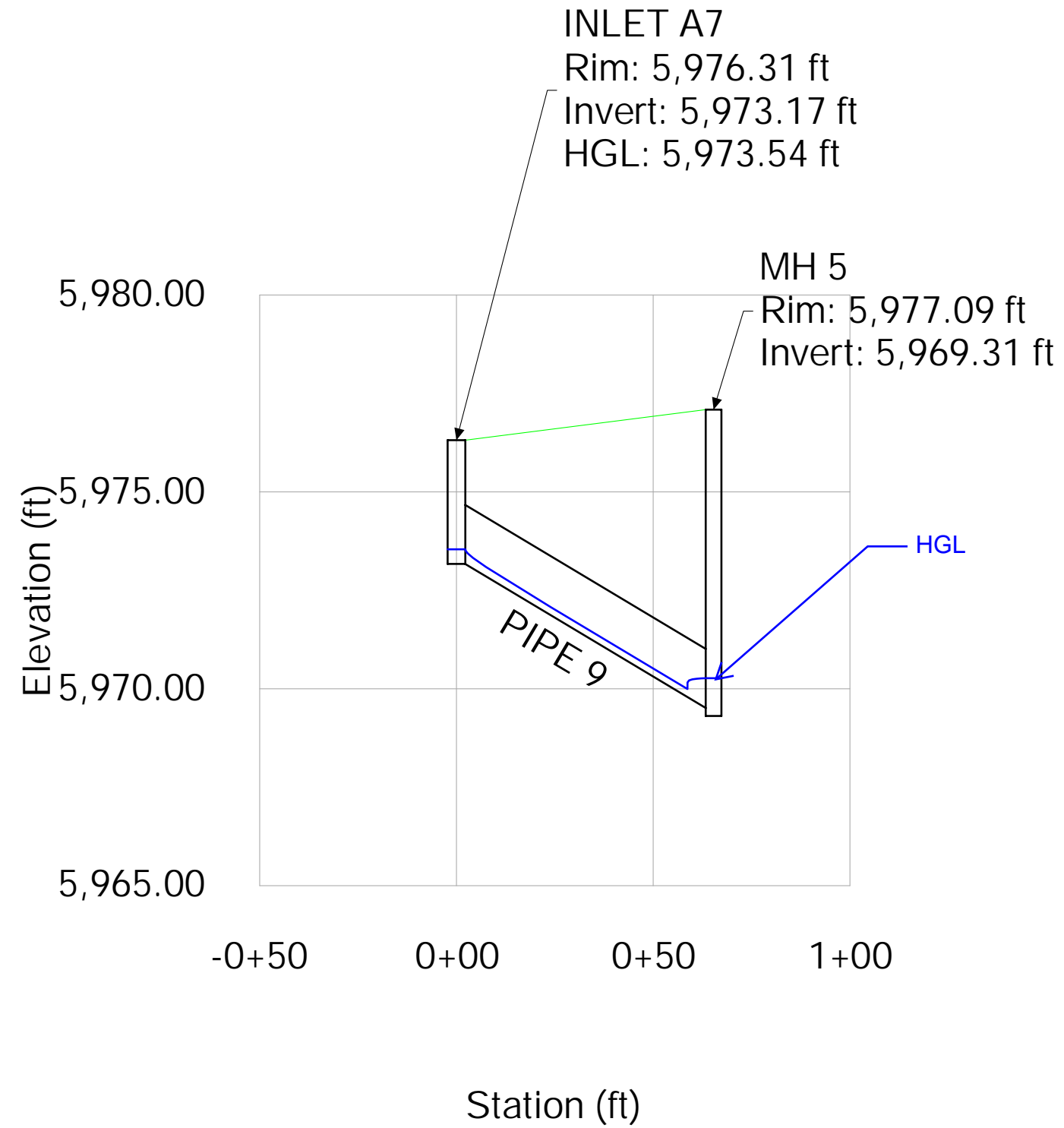
Profile Report
Engineering Profile - Pipe 5 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 100-Year



Profile Report
Engineering Profile - Pipe 7 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 100-Year



Profile Report
Engineering Profile - Pipe 9 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 100-Year



Profile Report
Engineering Profile - Pipe 10 (McDonald's Stroh_StormCAD.stsw)

Active Scenario: 100-Year

INLET A5

Rim: 5,976.19 ft

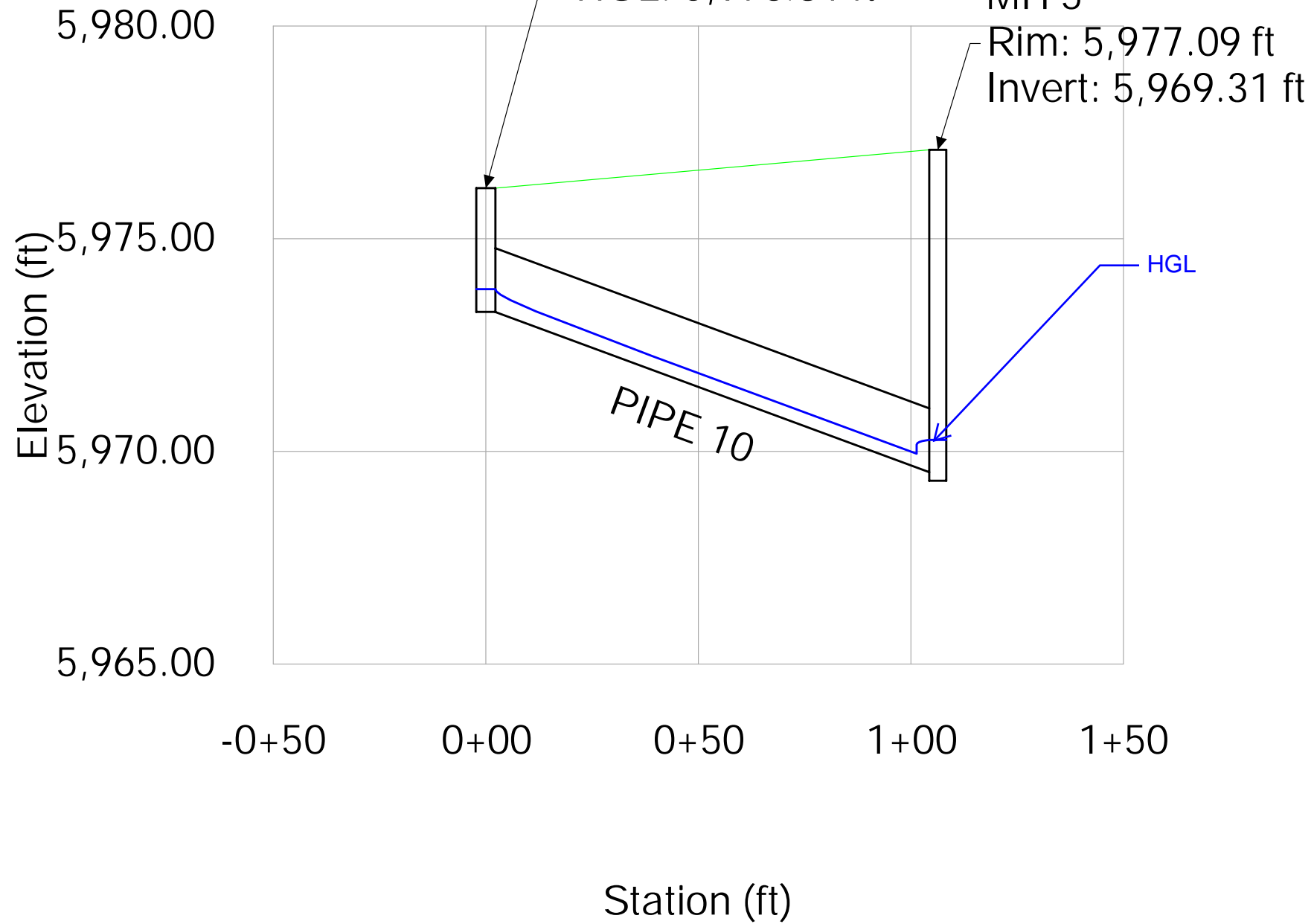
Invert: 5,973.28 ft

HGL: 5,973.81 ft

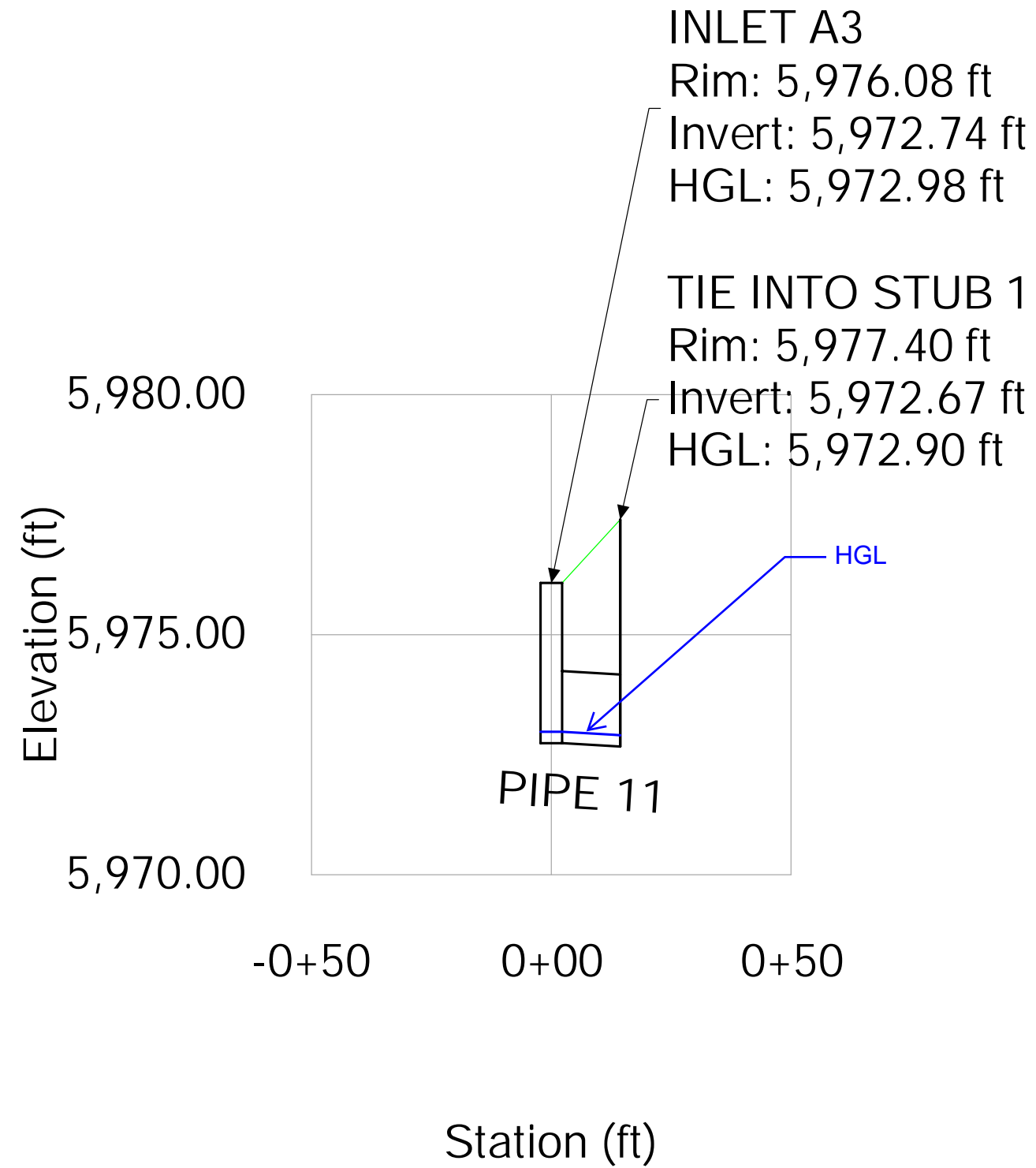
MH 5

Rim: 5,977.09 ft

Invert: 5,969.31 ft



Profile Report
Engineering Profile - Pipe 11 (McDonald's Stroh_StormCAD.stsw)
Active Scenario: 100-Year



APPENDIX D – INLET COMPUTATIONS

UD-Inlet Sizing

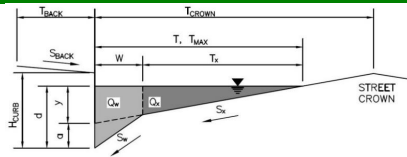


ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

Project: McDonald's Stroh, Parker, CO

Inlet ID: Inlet A1



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)

$T_{BACK} = 0.0$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

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)

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 25.0$ ft
 $W = 2.00$ ft
 $S_X = 0.026$ ft/ft
 $S_W = 0.083$ ft/ft
 $S_0 = 0.000$ ft/ft
 $n_{STREET} = 0.013$

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	
$T_{MAX} =$	25.0	25.0	ft
$d_{MAX} =$	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

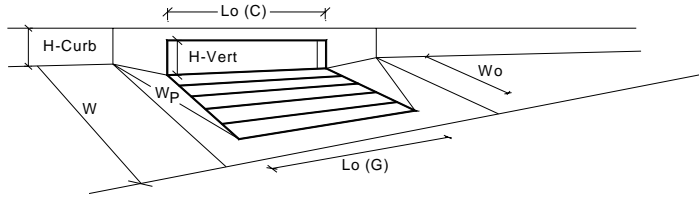
$Q_{allow} =$

Minor Storm	Major Storm
SUMP	SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

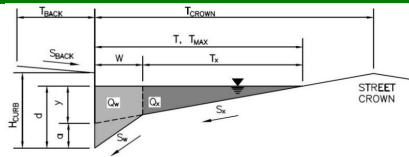


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	6.0	inches
Grate Information	MINOR	MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	0.2	0.7	cfs

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

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

Project: McDonald's Stroh, Parker, CO
 Inlet ID: Inlet A2



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)

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

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)

$H_{CURB} =$ inches
 $T_{CROWN} =$ ft
 $W =$ ft
 $S_x =$ ft/ft
 $S_w =$ ft/ft
 $S_0 =$ ft/ft
 $n_{STREET} =$

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	
$T_{MAX} =$	<input type="text" value="10.0"/>	<input type="text" value="10.0"/>	ft
$d_{MAX} =$	<input type="text" value="6.0"/>	<input type="text" value="6.0"/>	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

$Q_{allow} =$

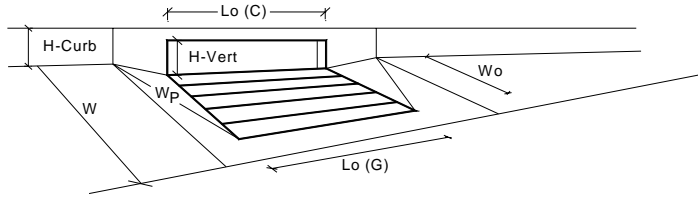
Minor Storm
SUMP

Major Storm
SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

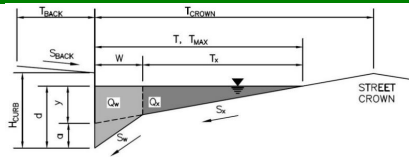


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	3.7	3.7	inches
Grate Information	MINOR	MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.14	0.14	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.48	0.48	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	1.5	1.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	0.2	0.7	cfs

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

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

Project: McDonald's Stroh, Parker, CO
 Inlet ID: Inlet A3



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)

$T_{BACK} = 0.0$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 18.0$ ft
 $W = 2.00$ ft
 $S_x = 0.034$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_0 = 0.000$ ft/ft
 $n_{STREET} = 0.013$

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	
$T_{MAX} =$	18.0	18.0	ft
$d_{MAX} =$	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

$Q_{allow} =$

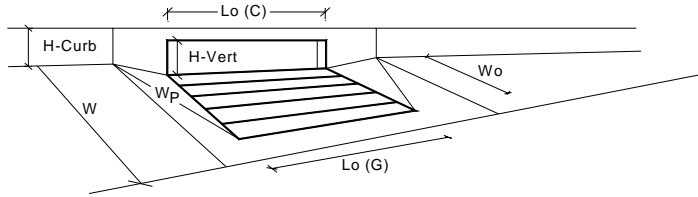
Minor Storm
SUMP

Major Storm
SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



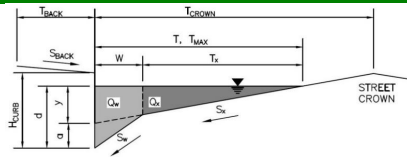
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	6.0	inches
Grate Information	MINOR	MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	0.4	1.3	cfs

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

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

Project: McDonald's Stroh, Parker, CO

Inlet ID: Inlet A4



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)

$T_{BACK} = 0.0$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

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)

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 24.0$ ft
 $W = 2.00$ ft
 $S_x = 0.023$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_0 = 0.000$ ft/ft
 $n_{STREET} = 0.013$

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	
$T_{MAX} =$	24.0	24.0	ft
$d_{MAX} =$	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

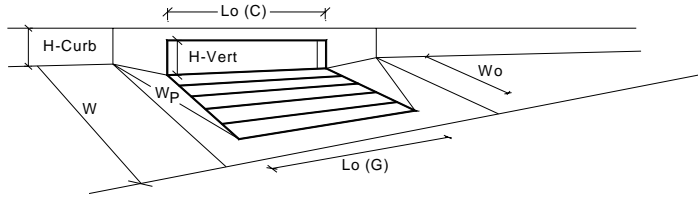
$Q_{allow} =$

Minor Storm	Major Storm
SUMP	SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



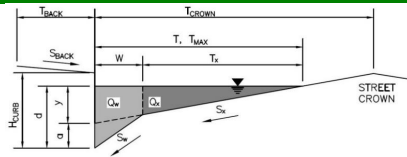
Design Information (Input)	MINOR		MAJOR		
Type of Inlet	CDOT Type R Curb Openi		CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00			inches
Number of Unit Inlets (Grate or Curb Opening)	1	1			
Water Depth at Flowline (outside of local depression)	6.0	6.0			inches
Grate Information	MINOR		MAJOR		<input type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A			feet
Width of a Unit Grate	N/A	N/A			feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A			
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A			
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A			
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A			
Curb Opening Information	MINOR		MAJOR		
Length of a Unit Curb Opening	5.00	5.00			feet
Height of Vertical Curb Opening in Inches	6.00	6.00			inches
Height of Curb Orifice Throat in Inches	6.00	6.00			inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40			degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00			feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10			
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60			
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67			
Low Head Performance Reduction (Calculated)	MINOR		MAJOR		
Depth for Grate Midwidth	N/A	N/A			ft
Depth for Curb Opening Weir Equation	0.33	0.33			ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	0.77			
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00			
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A			
Total Inlet Interception Capacity (assumes clogged condition)	MINOR		MAJOR		
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	5.4	5.4			cfs
Q PEAK REQUIRED =	0.3	1.0			cfs

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

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

Project: McDonald's Stroh, Parker, CO

Inlet ID: Inlet A5



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)

$T_{BACK} = 0.0$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

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)

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 18.0$ ft
 $W = 2.00$ ft
 $S_X = 0.018$ ft/ft
 $S_W = 0.083$ ft/ft
 $S_0 = 0.000$ ft/ft
 $n_{STREET} = 0.013$

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	
$T_{MAX} =$	18.0	18.0	ft
$d_{MAX} =$	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

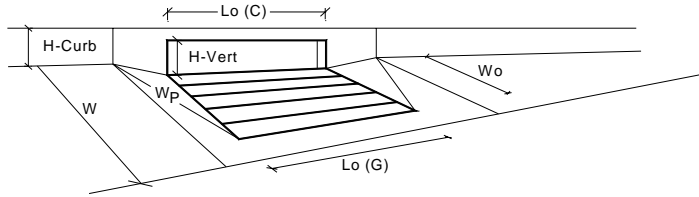
$Q_{allow} =$

Minor Storm	Major Storm
SUMP	SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

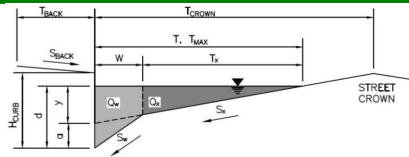


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.4	5.4	inches
Grate Information	MINOR	MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.28	0.28	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.69	0.69	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	4.2	4.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	0.7	2.0	cfs

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

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

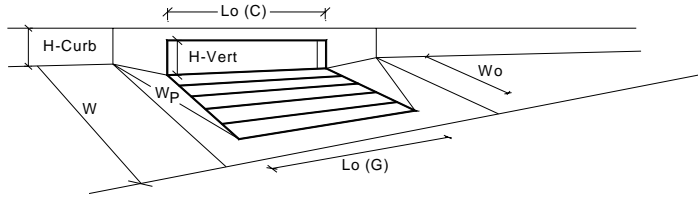
Project: McDonald's Stroh, Parker, CO
 Inlet ID: Inlet A6



Gutter Geometry:							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.0"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px; text-align: center;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px; text-align: center;" type="text" value="24.0"/> ft						
Gutter Width	$W = $ <input style="width: 50px; text-align: center;" type="text" value="2.00"/> ft						
Street Transverse Slope	$S_X = $ <input style="width: 50px; text-align: center;" type="text" value="0.018"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px; text-align: center;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = $ <input style="width: 50px; text-align: center;" type="text" value="0.000"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px; text-align: center;" type="text" value="0.013"/>						
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;">ft</td> </tr> <tr> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="24.0"/></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="24.0"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	<input style="width: 50px; text-align: center;" type="text" value="24.0"/>	<input style="width: 50px; text-align: center;" type="text" value="24.0"/>	
Minor Storm	Major Storm	ft					
<input style="width: 50px; text-align: center;" type="text" value="24.0"/>	<input style="width: 50px; text-align: center;" type="text" value="24.0"/>						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;">inches</td> </tr> <tr> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="6.0"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	<input style="width: 50px; text-align: center;" type="text" value="6.0"/>	<input style="width: 50px; text-align: center;" type="text" value="6.0"/>	
Minor Storm	Major Storm	inches					
<input style="width: 50px; text-align: center;" type="text" value="6.0"/>	<input style="width: 50px; text-align: center;" type="text" value="6.0"/>						
Check boxes are not applicable in SUMP conditions	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
MAJOR STORM Allowable Capacity is based on Depth Criterion							
$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;">cfs</td> </tr> <tr> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="SUMP"/></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="SUMP"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm	cfs	<input style="width: 50px; text-align: center;" type="text" value="SUMP"/>	<input style="width: 50px; text-align: center;" type="text" value="SUMP"/>	
Minor Storm	Major Storm	cfs					
<input style="width: 50px; text-align: center;" type="text" value="SUMP"/>	<input style="width: 50px; text-align: center;" type="text" value="SUMP"/>						

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



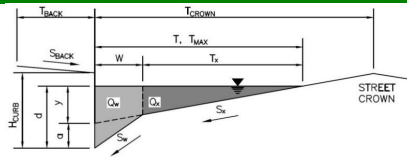
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	6.0	inches
Grate Information	MINOR	MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	0.2	0.7	cfs

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

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

Project: McDonald's Stroh, Parker, CO

Inlet ID: Inlet A7



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)

$T_{BACK} = 0.0$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

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)

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 18.0$ ft
 $W = 2.00$ ft
 $S_x = 0.024$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_0 = 0.000$ ft/ft
 $n_{STREET} = 0.013$

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	
$T_{MAX} =$	18.0	18.0	ft
$d_{MAX} =$	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

$Q_{allow} =$

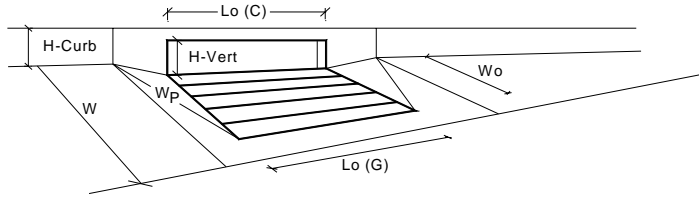
Minor Storm
SUMP

Major Storm
SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	6.0	inches
Grate Information	MINOR	MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	0.3	1.0	cfs

APPENDIX E – REFERENCE REPORT EXCERPTS

Final Drainage Report for Parker Pointe



**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

**PREPARED FOR:
PARKER & STROH, LLC
975 LINCOLN STREET, SUITE 204
DENVER, CO 80203**

**CONTACT: DAN YACOVETTA
303-699-3368**



**6901 SOUTH PIERCE STREET, SUITE 315
LITTLETON, CO 80128
CONTACT: JERRY DAVIDSON, P.E.
(303) 232-5255**

JOB #2015-015

NOVEMBER 28, 2018

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

I. CERTIFICATION PAGE

This report for the final design of (Name of Development) was prepared by me or under my direct supervision in accordance with the provisions of the Town of Parker Storm Drainage and Environmental Criteria Manual. I understand that the Town of Parker and its designated town authority do not and will not assume liability for drainage facilities designed by others.

Jerry W. Davidson, P.E.
Colorado P.E. License No. 30226
For and on Behalf of
Perception Design Group, Inc.

Seal and Date

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

II GENERAL LOCATION AND DESCRIPTION

A. Site Location:

This Final Drainage Report is prepared by Perception Design Group, Inc. as part of the Construction Plan / Final Plat submittal process for the Parker Pointe project proposed in Parker, Colorado. Parker Pointe, (Project / Site) is located on an unplatted parcel of land situated at the southeast corner of South Parker Road and Stroh Road. See appendix for vicinity map. The Site lies within the southwest quarter of Section 3, Township 7 South, Range 66 West of the 6th Prime Meridian, Douglas County, State of Colorado. The site is bounded by South Parker Road to the west, and Stroh Road to the north. Adjacent developments include the Colorado Golf club in Douglas County to the east, new commercial and residential development in the Town of Parker on the north side of Stroh Road, Commercial development in Parker on the west side of Parker Road, and undeveloped open space in Douglas County south of the property.

B. Site Location:

The Site occupies approximately 14.7 acres. Ground cover consists of pasture grasses. Site topography generally slopes from a tall mound in the northerly portion of the site down to the southwest towards Kinney Creek. Runoff north of the mound flows northwesterly towards the intersection of Stroh Road and Parker Road. Slopes vary widely from 3:1 on the mound to 6% over flatter portions of the site.

Site soils as shown by the USDA Web Soil Survey indicate that primarily Sampson Loam and Bresser Truckton Sandy Loam soil is present. This soil is sandy clay loam in nature. It is a type B hydrologic soil. Additionally Loamy Alluvial Land soils are present to a lesser extent. This soil is also clay loam in nature. It is a type C hydrologic soil.

The site falls within the Cherry Creek basin. The Kinney Creek tributary lies along the southern border of the site. This tributary has a delineated floodplain which encroaches on the extreme southwest corner of the site.

There are no irrigation canals or ditches on site. Additionally, there are no significant geologic features on site.

The site is presently partially developed with a house and barns. These structures are to be removed as a part of the proposed development. As a part of this application, the site will be developed with graded pad sites for commercial and retail businesses, drives, and utilities.

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

III DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins:

The site falls within two major drainage basins. The southerly portion of the site is tributary to Kinney Creek. Areas from the peak of the aforementioned mound and to the north are tributary to Stroh Gulch. The southerly line of basin H1 defines the historic break between the two basins. Per the Town of Parker, the majority of this runoff to Stroh Gulch is captured and conveyed via storm sewer to the new detention pond and ultimately to Kinney Creek. A final drainage report was prepared for Stroh Crossing Filing No. 1 by Calibre Engineering. This is the development on the north side of Stroh Road. This report anticipated runoff from the Parker Pointe property and made allowance to handle the flow. Basin ST-2b from the Calibre report quantifies 18.9 cfs for the basin. Basin SR2 in this report indicates 4.1 cfs tributary to Stroh Road downstream of the newly placed inlet on Stroh Road for Basin SR1 plus carryover from Inlet SR1 of 3.2 cfs for a total tributary to Stroh Gulch of 7.3 cfs.

Kinney Creek was studied by WRC Engineering Inc. in a report entitled “Flood Hazard Area Delineation for Kinney Creek Fonder Draw and Tributaries” date April 2004. Floodplain was determined along the southwest corner of the site. Minor grading is proposed in the floodplain along Parker Road. Roadway widening encroaches upon and places fill in the floodplain. To mitigate this the shoulder borrow ditch is shifted east in similar size to replace filled floodplain with like volume and shape.

B. Minor Drainage Basins:

To facilitate design, the site is divided into multiple sub-basins described as follows:

Basins L1 thru L15 are used to represent each of the proposed lots. As development conditions are not yet determined, an assumed 95% imperviousness is established for each basin. A storm sewer stub is provided for each lot to convey developed runoff to the extended detention basin at the southeast corner of the site providing both detention and water quality facilities. While Basins L10 thru L15 drain towards Parker road in the overlot condition, it is required that these lots convey site runoff to the mainline storm sewer down the center access drive. Due to the presence of the Magellan gas pipeline and it's limited cover requirements as well as site visibility lines to the easterly lots, The west side of lots 10 thru 15 will remain below the center access drive. The storm sewer has been placed at maximum depth to accommodate these lots “bucking” grade with the storm sewer system.

Basins L1A thru L5A represents the easterly portion of Lots 1 thru 5. Runoff from these

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

basins flow overland to the east to the drainage swale along the east property line thence into the extended detention facility. As development conditions are not yet determined, an assumed 95% imperviousness is established for each basin.

Basins IN1 thru IN3 are established to quantify runoff collected in a series of inlets along the central north-south access drive. This runoff is piped to the extended detention basin at the southeast corner of the site providing both detention and water quality facilities.

Basin SR1 is used to quantify runoff to Stroh Road from the road itself as well as offsite areas to the east. Detention and water quality are provided for this basin. See additional discussion under Major Basins above.

Basin SR2 (along with basin U4) is used to quantify runoff to the new inlet at the intersection of Stroh Road and Parker Road. Detention and water quality are not provided for this basin.

Basin PR1 combines with Basins U2 and PR2 to define runoff to the new pair of inlets located at the low point of Parker Road. Basin PR1 is separated to quantify new paved area requiring water quality treatment. Treatment for Basin PR1 combined with Basin U2 is provided in a grass swale in the ROW of Parker Road leading down to Kinney Creek.

Basin PR2 is used to quantify runoff from existing Parker Road improvements to the new pair of inlets located at the low point of Parker Road. Water quality is not provided for this basin. Total flow to the inlets is a combination of Basins PR1, PR2, and U2.

Basin PR3 is not illustrated on the plan. This basin is used to quantify new paved areas in Parker Road north of Stroh Road. This basin encompasses the new left turn bay on Parker Road to Stroh Road. Runoff from this basin is treated for water quality in the existing grass buffer along the west side of Parker Road.

Basin U1 is on-site area that is not tributary to the detention / water quality facility. This basin encompasses Tracts A and B which are floodplain and mouse habitat areas. Detention and water quality are not provided for this basin.

Basin U2 is on-site area that is not tributary to the detention / water quality facility. This basin quantifies runoff escaping the site down the access road to Parker Road. Detention is not provided for this basin, however, water quality is provided in the grass swale referenced above in the PR1 basin description.

Basin U3 is on-site area that is not tributary to the detention / water quality facility. Runoff from this basin adjacent to Parker Road flows overland into Parker Road.

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

Detention and water quality are not provided for this basin.

Basin U4 is on-site area that is not tributary to the detention / water quality facility. Runoff from this basin enters Stroh Road and is collected in inlet SR2.

Basin H1 is a historic basin quantifying historic runoff to Stroh Road. It is used as a check for Calibre basin ST-2b. Basin H1 indicates runoff of 17.0 cfs while basin ST2-b indicates 18.9 cfs. Variance is due to more accurate topography available for the Parker Pointe site and better defined drainage basin as well as differences in time of concentration.

Basin OS1 quantifies flows entering the extended detention pond from offsite flows from the Colorado Golf Club property east of the Parker Pointe property. Detention and water quality are provided for this offsite flow area in its present condition.

IV DRAINAGE DESIGN CRITERIA

A. Regulations:

Design calculations and methodologies are based upon the Town of Parker Storm Drainage and Environmental Criteria Manual. Additionally, the Urban Drainage Storm Drainage Criteria Manual Volumes 1 thru 3 are utilized.

B. Drainage Studies, Outfall System Plans:

The Final Drainage Report for Stroh Crossing Filing No. 1 by Calibre Engineering is used to identify allowable site discharge to Stroh Gulch. The WRC Engineering Inc. report entitled "Flood Hazard Area Delineation for Kinney Creek Fonder Draw and Tributaries" date April 2004 was utilized to map the floodplain elevations along the south property line. This study has negligible impact on the design presented.

C. Hydrology:

Runoff is calculated for both the 5 year and 100 year storms using the rational method. On-site basins utilize a 5 minute time of concentration with 5 year intensity of 4.7 in/hr and 100 year at 8.85 in/hr. Detention storage volumes are calculated using the UDFCD ver 3.07 UD-Detention spreadsheet. This spreadsheet is also utilized to calculate allowable release rates.

D. Hydraulics:

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

Storm sewer capacities are calculated using Hydraflow Storm Sewers extension for AutoCAD Civil 3D ver 2017. The system is designed such to provide minimal surcharge for the 100 year event, and no surcharge for the 5 year event. The Hydraflow software is also used to calculate hydraulic grade lines for the storm sewer.

E. Water Quality Enhancement:

Water quality is achieved in an extended detention facility designed to EURV specifications using UDFCD ver 3.07 UD-Detention spreadsheet.

V STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities:

Developed stormwater is generally conveyed towards the central north south driveway where stubs are provided that connect to a storm sewer mainline. The storm main runs in a southerly then easterly direction to the proposed EDB detention facility. Total developed site runoff tributary to the EDB is 146.51 cfs. Storm sewer outfall into the EDB occurs at a concrete forebay. Outfall from the EDB is controlled to code levels and discharged via storm sewer pipe to Kinney Creek where riprap is provided to control erosion. Storm sewer is placed in an easement for perpetual maintenance. Do to the depth of the pond and invert of the adjacent Kinney Creek, outfall is piped westerly to discharge near the box culvert under Parker Road where more favorable elevations exist.

B. Stormwater Storage Facilities:

Stormwater storage on site is accomplished in an extended detention basin located offsite near the southeast corner of the site. Required pond design elements are summarized below:

<u>Volume Element</u>	<u>Volume</u>	<u>Elevation</u>	<u>Release Rate</u>
WQCV	0.566 Ac-Ft	5966.12	41 hours
EURV + WQCV	1.472 Ac-Ft	5968.03	70 hours
100 year	2.753 Ac-Ft	5970.05	36.7 cfs
Storage Provided	2.753 Ac-Ft	5970.05	

Outflow metering is accomplished in a concrete outlet structure. 2 orifices are used. One for WQ and EURV while a second is used covering the outfall pipe to limit the 100 year flow. A double type D inlet is proposed to provide sufficient weir flow to accommodate

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

the 100 year release rate. Micropool and trash racks are provided. Emergency overflow occurs directly into Kinney Creek via overflow weir and riprap embankment.

Allowable 100 year discharge must be reduced to allow for uncaptured basin U1 thru U4. The combined 100 year un-detained flow from basins U1 thru U4 is 4.4 cfs. Allowable detention discharge as shown on the UDFCD spreadsheet is 44.5 cfs. The outlet structure design limits discharge to 36.7 cfs. This provides adequate compensation for the uncaptured flows.

A maintenance access is provided entering at the northwest corner of the pond. Roadbase surfacing is provided and slopes not exceeding 10% are employed to enhance access for maintenance. An easement is provided over the pond should Town access, inspection, or repairs be required.

C. Water quality Enhancement Best Management Practices:

The EDB pond design includes water quality capture volume. Developed flows are conveyed via underground storm sewer to a single discharge point into the pond. At this point, a concrete forebay is provided to capture heavier particulate material.

Water quality treatment is also provided for the new paved areas of Parker Road. Basin PR1 is treated in a grass swale with discharge to Kinney Creek. Basin PR3 is treated in the existing grass buffer along the west side of Parker Road north of Stroh Road. UDFCD spreadsheets are provided for each treatment facility in the appendix.

D. Floodplain Modification:

Minor grading is proposed in the floodplain along Parker Road. Roadway widening encroaches upon and places fill in the floodplain. To mitigate this the shoulder borrow ditch is shifted east in similar size to replace filled floodplain with like volume and shape. A floodplain development permit will be required for this work as well as disturbances due to outfall construction. A no rise analysis has been performed and the results indicating compliance are included in the appendix.

E. Additional Permitting Requirements:

State stormwater permit for discharges during construction.
Town of Parker permits.
Douglas County permits.

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

V CONCLUSIONS

A. Compliance with Standards:

The plans and calculations presented are in compliance with Town of Parker, Douglas County, and Urban Drainage requirements.

B. Variances:

No variances are requested.

V REFERNCES

Urban Drainage and Flood Control District Drainage Criteria Manual, Current addition.
Town of Parker Storm Drainage Criteria Manual
Town of Parker Construction Best Management Practices
Douglas County Storm Drainage Design and Technical Criteria Manual
USDA Web Soil Survey

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

APPENDICES

APPENDIX A	HYDROLOGIC CALCULATIONS
APPENDIX B	DETENTION AND WATER QUALITY CALCULATIONS
APPENDIX C	HYDRAULIC CALCULATIONS
APPENDIX D	KEYMAP, FIRM, SOILS
APPENDIX E	DRAINAGE MAP
APPENDIX F	FLOODPLAIN NO RISE REPORT

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

APPENDIX A HYDROLOGIC CALCULATIONS

Perception Design Group, Inc.
 6901 South Pierce Street, Suite 315
 Littleton, Colorado 80128
 (303) 232-8088 Fax (303) 232-5255

Designed by: JWD
 Checked by: JWD
 Date: 18-Sep-17
 Job Number: 2015-015

Project: Parker Pointe

COMPOSITE RUNOFF COEFFICIENTS

TYPE B SOILS

Catchment	FUTURE COMMERCIAL		DRIVES/WALKS/ROOF		LANDSCAPING		Composite C	Catchment Area (Ac.)	Imperviousness
	Area (Ac.)	C	Area (Ac.)	C	Area (Ac.)	C			
	Imperviousness = 95%		Imperviousness = 100%		Imperviousness = 2%				
L12 (5 YR)	0.56	0.81	0.00	0.90	0.00	0.09	0.81	0.56	95.0%
L12 (100 YR)	0.56	0.88	0.00	0.96	0.00	0.36	0.88	0.56	
L13 (5 YR)	0.73	0.81	0.00	0.90	0.00	0.09	0.81	0.73	95.0%
L13 (100 YR)	0.73	0.88	0.00	0.96	0.00	0.36	0.88	0.73	
L14 (5 YR)	0.73	0.81	0.00	0.90	0.00	0.09	0.81	0.73	95.0%
L14 (100 YR)	0.73	0.88	0.00	0.96	0.00	0.36	0.88	0.73	
L15 (5 YR)	0.72	0.81	0.00	0.90	0.00	0.09	0.81	0.72	95.0%
L15 (100 YR)	0.72	0.88	0.00	0.96	0.00	0.36	0.88	0.72	
IN1 (5 YR)	0.00	0.81	0.26	0.90	0.00	0.09	0.90	0.26	100.0%
IN1 (100 YR)	0.00	0.88	0.26	0.96	0.00	0.36	0.96	0.26	
IN2 (5 YR)	0.00	0.81	0.53	0.90	0.00	0.09	0.90	0.53	100.0%
IN2 (100 YR)	0.00	0.88	0.53	0.96	0.00	0.36	0.96	0.53	
IN3 (5 YR)	0.00	0.81	0.11	0.90	0.00	0.09	0.90	0.11	100.0%
IN3 (100 YR)	0.00	0.88	0.11	0.96	0.00	0.36	0.96	0.11	
OS1 (5 YR)	0.00	0.81	1.21	0.90	22.13	0.09	0.13	23.34	7.1%
OS1 (100 YR)	0.00	0.88	1.21	0.96	22.13	0.36	0.39	23.34	
SR1 (5 YR)	0.00	0.81	0.40	0.90	3.35	0.09	0.18	3.75	12.5%

Perception Design Group, Inc.
 6901 South Pierce Street, Suite 315
 Littleton, Colorado 80128
 (303) 232-8088 Fax (303) 232-5255

Designed by: JWD
 Checked by: JWD
 Date: 18-Sep-17
 Job Number: 2015-015

Project: Parker Pointe

COMPOSITE RUNOFF COEFFICIENTS

TYPE B SOILS

Catchment	FUTURE COMMERCIAL		DRIVES/WALKS/ROOF		LANDSCAPING		Composite C	Catchment Area (Ac.)	Imperviousness
	Area (Ac.)	C	Area (Ac.)	C	Area (Ac.)	C			
	Imperviousness = 95%		Imperviousness = 100%		Imperviousness = 2%				
SR1 (100 YR)	0.00	0.88	0.40	0.96	3.35	0.36	0.42	3.75	
AREA TO POND	11.31	0.88	2.51	0.96	25.48	0.36	0.55	39.30	35.0%
U1 (5 YR)	0.00	0.81	0.00	0.90	1.37	0.09	0.09	1.37	2.0%
U1 (100 YR)	0.00	0.88	0.00	0.96	1.37	0.36	0.36	1.37	
U2 (2 YR)	0.00	0.79	0.24	0.89	0.06	0.02	0.72	0.30	
U2 (5 YR)	0.00	0.81	0.24	0.90	0.06	0.09	0.74	0.30	80.4%
U2 (100 YR)	0.00	0.88	0.24	0.96	0.06	0.36	0.84	0.30	
U3 (5 YR)	0.00	0.81	0.00	0.90	0.17	0.09	0.09	0.17	2.0%
U3 (100 YR)	0.00	0.88	0.00	0.96	0.17	0.36	0.36	0.17	
U4 (5 YR)	0.00	0.81	0.14	0.90	0.09	0.09	0.58	0.23	61.7%
U4 (100 YR)	0.00	0.88	0.14	0.96	0.09	0.36	0.73	0.23	
POND DESIGN NUMBERS	11.31	0.88	2.89	0.96	27.17	0.36	0.54	41.37	34.3%
SR2 (5 YR)	0.00	0.81	0.31	0.90	0.01	0.09	0.87	0.32	96.9%
SR2 (100 YR)	0.00	0.88	0.31	0.96	0.01	0.36	0.94	0.32	
PR1 (2 YR)	0.00	0.79	0.35	0.89	0.07	0.02	0.75	0.42	
PR1 (5 YR)	0.00	0.81	0.35	0.90	0.07	0.09	0.77	0.42	83.7%
PR1 (100 YR)	0.00	0.88	0.35	0.96	0.07	0.36	0.86	0.42	

Perception Design Group, Inc.
 6901 South Pierce Street, Suite 315
 Littleton, Colorado 80128
 (303) 232-8088 Fax (303) 232-5255

Designed by: JWD
 Checked by: JWD
 Date: 18-Sep-17
 Job Number: 2015-015

Project: Parker Pointe

RUNOFF CALCULATIONS

(RATIONAL METHOD)

Design Storm: 5-Yr.

		Direct Runoff						
Design	Basin	Area	Runoff	CA	Tc	I	Q	
Point	Desig.	(Acres)	Coefficient		(min)	(in/hr)	(cfs)	
	H1	10.52	0.09	0.95	26.0	2.30	2.18	
	L1	0.71	0.81	0.58	5.0	4.70	2.70	
	L2	0.50	0.81	0.41	5.0	4.70	1.90	
	L2A	0.19	0.81	0.15	5.0	4.70	0.72	
	L3	0.43	0.81	0.35	5.0	4.70	1.64	
	L3A	0.16	0.81	0.13	5.0	4.70	0.61	
	L4	0.63	0.81	0.51	5.0	4.70	2.40	
	L4A	0.24	0.81	0.19	5.0	4.70	0.91	
	L5	0.63	0.81	0.51	5.0	4.70	2.40	
	L5A	0.24	0.81	0.19	5.0	4.70	0.91	
	L6	0.78	0.81	0.63	5.0	4.70	2.97	
	L7	0.68	0.81	0.55	5.0	4.70	2.59	
	L8	0.87	0.81	0.70	5.0	4.70	3.31	
	L9	0.71	0.81	0.58	5.0	4.70	2.70	
	L10	0.88	0.81	0.71	5.0	4.70	3.35	
	L11	0.92	0.81	0.75	5.0	4.70	3.50	
	L12	0.56	0.81	0.45	5.0	4.70	2.13	
	L13	0.73	0.81	0.59	5.0	4.70	2.78	
	L14	0.73	0.81	0.59	5.0	4.70	2.78	
	L15	0.72	0.81	0.58	5.0	4.70	2.74	
	IN1	0.26	0.90	0.23	5.0	4.70	1.10	
	IN2	0.53	0.90	0.48	5.0	4.70	2.24	
	IN3	0.11	0.9	0.10	5.0	4.70	0.47	
	SR1	3.75	0.18	0.68	22.4	2.60	1.76	
	SR2	0.32	0.87	0.28	5.0	4.70	1.31	
	PR1	0.42	0.77	0.32	5.0	4.70	1.52	
	PR2	0.91	0.96	0.87	5.0	4.70	4.11	
	U1	1.37	0.09	0.12	5.0	4.70	0.58	
	U2	0.3	0.74	0.22	5.0	4.70	1.04	
	U3	0.17	0.09	0.02	5.0	4.70	0.07	
	U4	0.23	0.58	0.13	5.0	4.70	0.63	
	OS1	23.34	0.13	3.03	25.5	2.50	7.59	

Perception Design Group, Inc.
 6901 South Pierce Street, Suite 315
 Littleton, Colorado 80128
 (303) 232-8088 Fax (303) 232-5255

Designed by: JWD
 Checked by: JWD
 Date: 18-Sep-17
 Job Number: 2015-015

Project: Parker Pointe

RUNOFF CALCULATIONS

(RATIONAL METHOD)

Design Storm: 100-Yr.

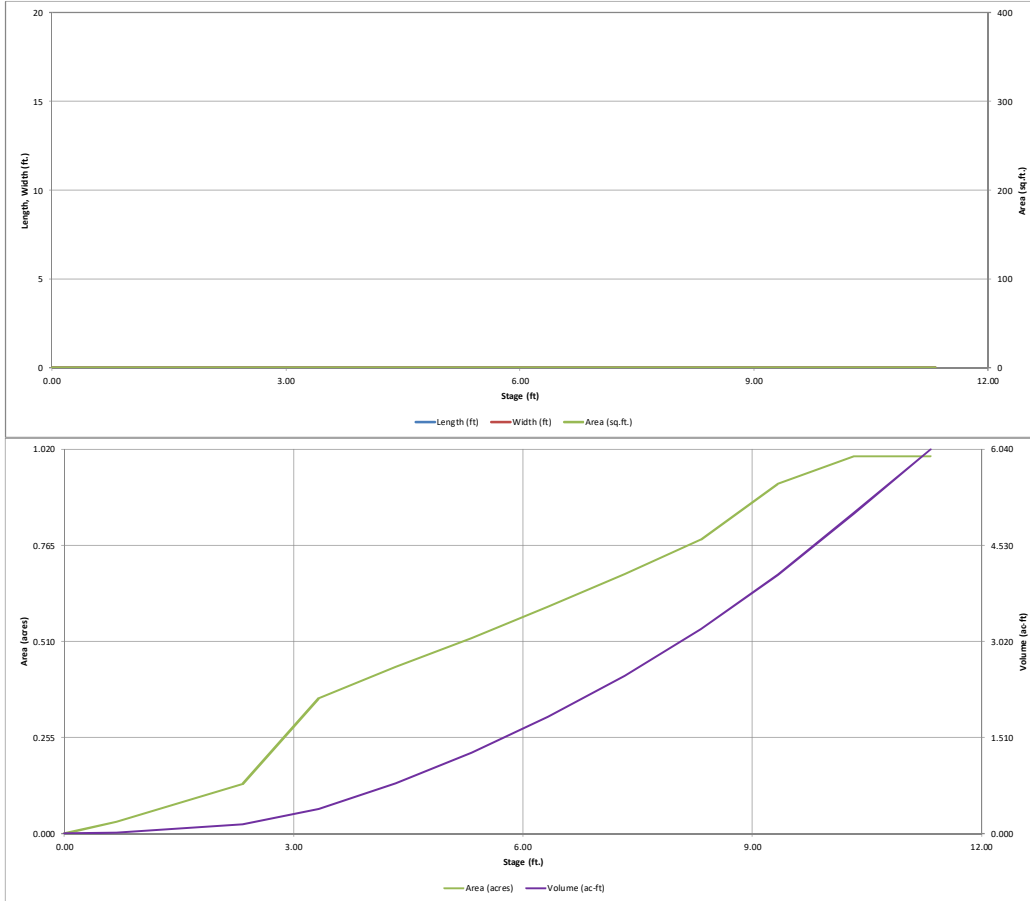
		Direct Runoff						
Design	Basin	Area	Runoff	CA	Tc	I	Q	
Point	Desig.	(Acres)	Coefficient		(min)	(in/hr)	(cfs)	
	H1	10.52	0.36	3.79	26.0	4.50	17.04	
	L1	0.71	0.88	0.62	5.0	8.85	5.53	
	L2	0.50	0.88	0.44	5.0	8.85	3.89	
	L2A	0.19	0.88	0.17	5.0	8.85	1.48	
	L3	0.43	0.88	0.38	5.0	8.85	3.35	
	L3A	0.16	0.88	0.14	5.0	8.85	1.25	
	L4	0.63	0.88	0.55	5.0	8.85	4.91	
	L4A	0.24	0.88	0.21	5.0	8.85	1.87	
	L5	0.63	0.88	0.55	5.0	8.85	4.91	
	L5A	0.24	0.88	0.21	5.0	8.85	1.87	
	L6	0.78	0.88	0.69	5.0	8.85	6.07	
	L7	0.68	0.88	0.60	5.0	8.85	5.30	
	L8	0.87	0.88	0.77	5.0	8.85	6.78	
	L9	0.71	0.88	0.62	5.0	8.85	5.53	
	L10	0.88	0.88	0.77	5.0	8.85	6.85	
	L11	0.92	0.88	0.81	5.0	8.85	7.16	
	L12	0.56	0.88	0.49	5.0	8.85	4.36	
	L13	0.73	0.88	0.64	5.0	8.85	5.69	
	L14	0.73	0.88	0.64	5.0	8.85	5.69	
	L15	0.72	0.88	0.63	5.0	8.85	5.61	
	IN1	0.26	0.96	0.25	5.0	8.85	2.21	
	IN2	0.53	0.96	0.51	5.0	8.85	4.50	
	IN3	0.11	0.96	0.11	5.0	8.85	0.93	
	SR1	3.75	0.42	1.58	22.4	4.90	7.72	
TOTAL FLOW TO FOREBAY							103.45	
	OS1	23.34	0.39	9.10	25.5	4.50	40.96	
TOTAL TO POND		39.30					144.41	
	U1	1.37	0.36	0.49	25.5	4.50	2.22	
	U2	0.3	0.84	0.25	25.5	4.50	1.13	
	U3	0.17	0.36	0.06	25.5	4.50	0.28	
	U4	0.23	0.73	0.17	25.5	4.50	0.76	
UN-CAPTURED SITE RUNOFF							4.38	
	SR2	0.32	0.94	0.30	5.0	8.85	2.66	
	PR1	0.42	0.86	0.36	5.0	8.85	3.20	
	PR2	0.91	0.96	0.87	5.0	8.85	7.73	

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

APPENDIX B DETENTION AND WATER QUALITY CALCULATIONS

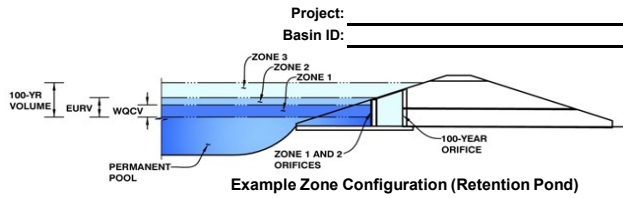
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.80	0.566	Orifice Plate
Zone 2 (EURV)	5.71	0.906	Orifice Plate
Zone 3 (100-year)	7.73	1.281	Weir&Pipe (Circular)
		2.753	Total

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)

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

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	1.00	2.00	3.00				
Orifice Area (sq. inches)	1.50	1.50	1.50	1.50				

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft ²
Vertical Orifice Centroid =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	5.71	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	% , grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _g =	5.71	N/A	feet
Over Flow Weir Slope Length =	6.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.73	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	25.20	N/A	ft ²
Overflow Grate Open Area w/ Debris =	12.60	N/A	ft ²

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

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	23.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	2.89	N/A	ft ²
Outlet Orifice Centroid =	0.96	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	72.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	50.00	feet
Spillway End Slopes =	3.00	H:V
Freeboard above Max Water Surface =	2.00	feet

Calculated Parameters for Spillway

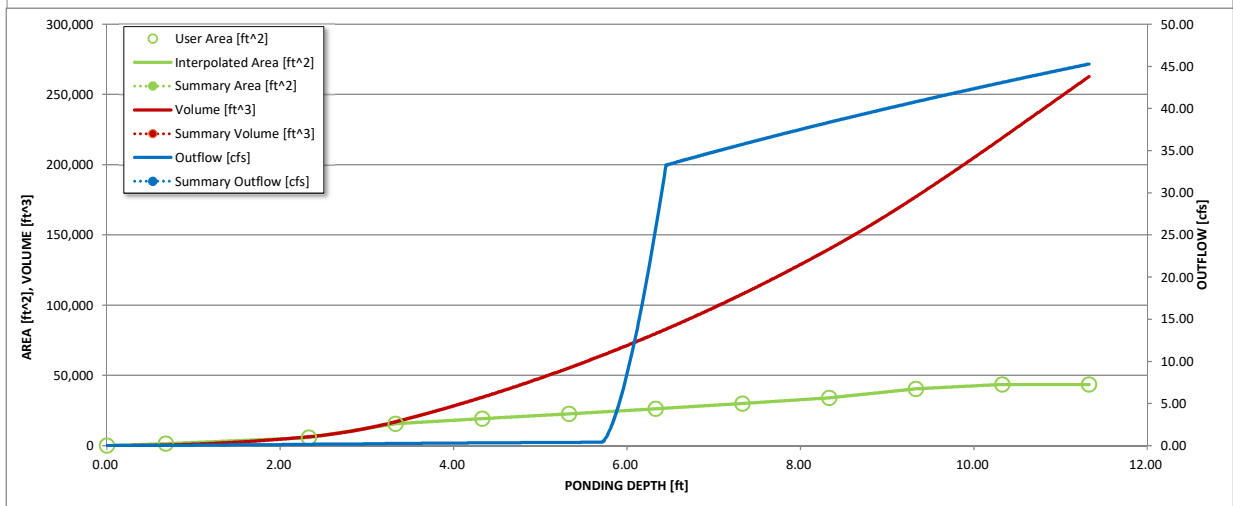
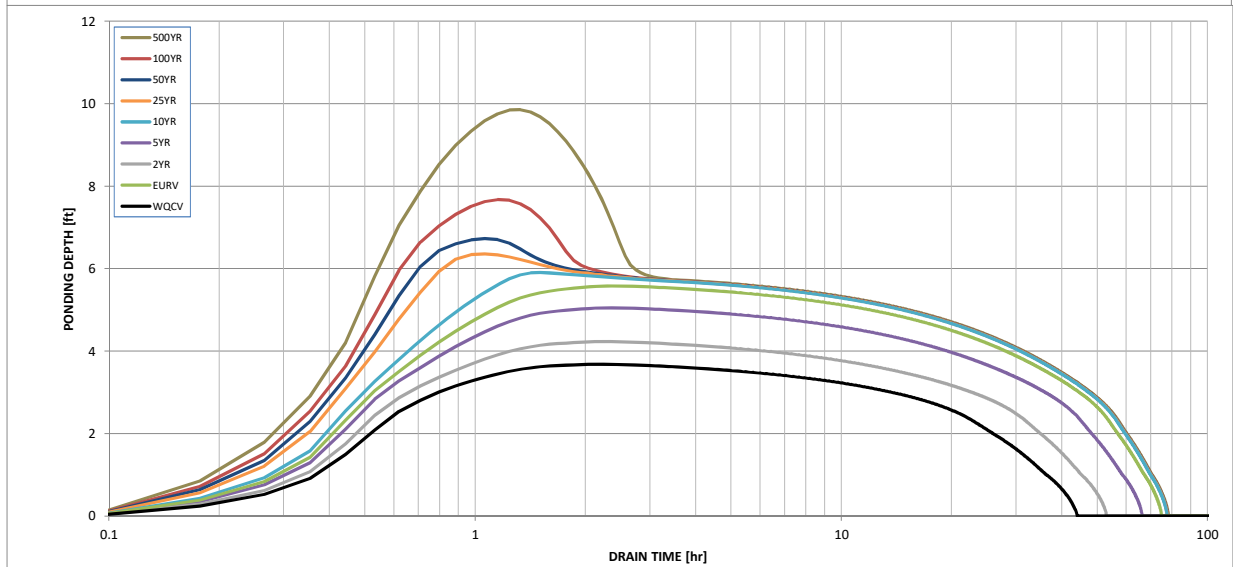
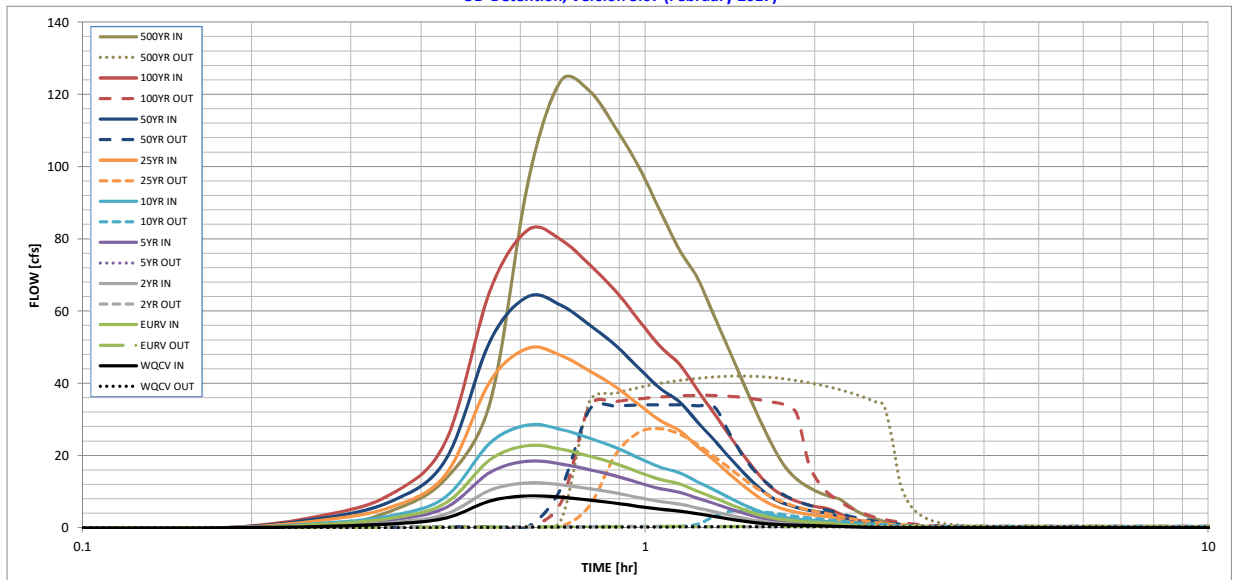
Spillway Design Flow Depth =	0.65	feet
Stage at Top of Freeboard =	74.65	feet
Basin Area at Top of Freeboard =	1.00	acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in)	0.53	1.07	0.83	1.11	1.36	1.72	2.01	2.32	3.10
Calculated Runoff Volume (acre-ft)	0.566	1.472	0.799	1.191	1.844	3.245	4.201	5.449	8.252
OPTIONAL Override Runoff Volume (acre-ft)									
Inflow Hydrograph Volume (acre-ft)	0.566	1.471	0.799	1.191	1.844	3.246	4.201	5.442	8.249
Predevelopment Unit Peak Flow, q (cfs/acre)	0.00	0.00	0.01	0.02	0.17	0.60	0.87	1.20	1.90
Predevelopment Peak Q (cfs)	0.0	0.0	0.4	0.7	6.9	24.9	35.8	49.5	78.5
Peak Inflow Q (cfs)	8.9	22.8	12.5	18.5	28.5	49.7	64.1	82.5	123.8
Peak Outflow Q (cfs)	0.3	0.4	0.3	0.4	4.9	27.5	34.1	36.7	42.0
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.6	0.7	1.1	1.0	0.7	0.5
Structure Controlling Flow	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	N/A	0.2	1.1	1.3	1.4	1.6
Max Velocity through Grate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	38	64	45	57	65	61	58	55	50
Time to Drain 99% of Inflow Volume (hours)	41	70	50	62	71	69	67	66	63
Maximum Ponding Depth (ft)	3.68	5.58	4.23	5.05	5.91	6.36	6.73	7.68	9.86
Area at Maximum Ponding Depth (acres)	0.39	0.54	0.43	0.50	0.57	0.60	0.64	0.72	0.97
Maximum Volume Stored (acre-ft)	0.521	1.398	0.747	1.124	1.581	1.844	2.073	2.717	4.559

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



S-A-V-D Chart Axis Override

	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

POND TRICKLE PAN DESIGN

The open channel flow calculator

Select Channel Type: Rectangle ▾

Depth from Q ▾

Select unit system: Feet(ft) ▾

Channel slope:	0.05	ft/ft	Water depth(y):	0.22	ft	Bottom W(b):	3.5	ft
Flow velocity:	2.682216	ft/s	Left Slope (Z1):	0	to 1 (HV)	Right Slope (Z2):	0	to 1 (HV)
Flow discharge:	2.07	ft ³ /s	Input n value:	0.13	or select n	Status:	Calculation finished	
Wetted perimeter:	3.94	ft	Flow area:	0.77	ft ²	Reset		
Specific energy:	0.33	ft	Froude number:	1.01		Top width(T):	3.5	ft
Critical depth:	0.23	ft	Critical slope:	0.0045	ft/ft	Flow status:	Supercritical flow	
						Velocity head:	0.11	ft

Copyright 2000 Dr. Xing Fang, Department of Civil Engineering, Lamar University.

Design Procedure Form: Grass Swale (GS)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 1

Designer: Jerry Davidson
Company: Perception Design Group, Inc.
Date: June 25, 2018
Project: Parker Pointe
Location: BASINS PR1 AND U2

1. Design Discharge for 2-Year Return Period	$Q_2 = $ <input style="width: 50px;" type="text" value="1.80"/> cfs
2. Hydraulic Residence Time A) : Length of Grass Swale B) Calculated Residence Time (based on design velocity below)	$L_S = $ <input style="width: 50px;" type="text" value="375.0"/> ft $T_{HR} = $ <input style="width: 50px;" type="text" value="6.7"/> minutes
3. Longitudinal Slope (vertical distance per unit horizontal) A) Available Slope (based on site constraints) B) Design Slope	$S_{avail} = $ <input style="width: 50px;" type="text" value="0.005"/> ft / ft $S_D = $ <input style="width: 50px;" type="text" value="0.005"/> ft / ft
4. Swale Geometry A) Channel Side Slopes (Z = 4 min., horiz. distance per unit vertical) B) Bottom Width of Swale (enter 0 for triangular section)	$Z = $ <input style="width: 50px;" type="text" value="4.00"/> ft / ft $W_B = $ <input style="width: 50px;" type="text" value="1.00"/> ft
5. Vegetation A) Type of Planting (seed vs. sod, affects vegetal retardance factor)	Choose One <input style="width: 100px;" type="text"/> <input checked="" type="radio"/> Grass From Seed <input type="radio"/> Grass From Sod
6. Design Velocity (1 ft / s maximum)	$V_2 = $ <input style="width: 50px;" type="text" value="0.93"/> ft / s
7. Design Flow Depth (1 foot maximum) A) Flow Area B) Top Width of Swale C) Froude Number (0.50 maximum) D) Hydraulic Radius E) Velocity-Hydraulic Radius Product for Vegetal Retardance F) Manning's n (based on SCS vegetal retardance curve E for seeded grass) G) Cumulative Height of Grade Control Structures Required	$D_2 = $ <input style="width: 50px;" type="text" value="0.58"/> ft $A_2 = $ <input style="width: 50px;" type="text" value="1.9"/> sq ft $W_T = $ <input style="width: 50px;" type="text" value="5.6"/> ft $F = $ <input style="width: 50px;" type="text" value="0.28"/> $R_H = $ <input style="width: 50px;" type="text" value="0.33"/> $VR = $ <input style="width: 50px;" type="text" value="0.31"/> $n = $ <input style="width: 50px;" type="text" value="0.054"/> $H_D = $ <input style="width: 50px;" type="text" value="0.00"/> ft
8. Underdrain (Is an underdrain necessary?)	Choose One <input style="width: 100px;" type="text"/> <input checked="" type="radio"/> YES <input type="radio"/> NO AN UNDERDRAIN IS REQUIRED IF THE DESIGN SLOPE < 2.0%
9. Soil Preparation (Describe soil amendment)	_____ _____ _____
10. Irrigation	Choose One <input style="width: 100px;" type="text"/> <input type="radio"/> Temporary <input type="radio"/> Permanent

Notes: _____

Design Procedure Form: Grass Buffer (GB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 1

Designer: Jerry Davidson
Company: Perception Design Group, Inc.
Date: June 25, 2018
Project: Parker Pointe
Location: New Left Turn Lane on Parker Road - Basin P3

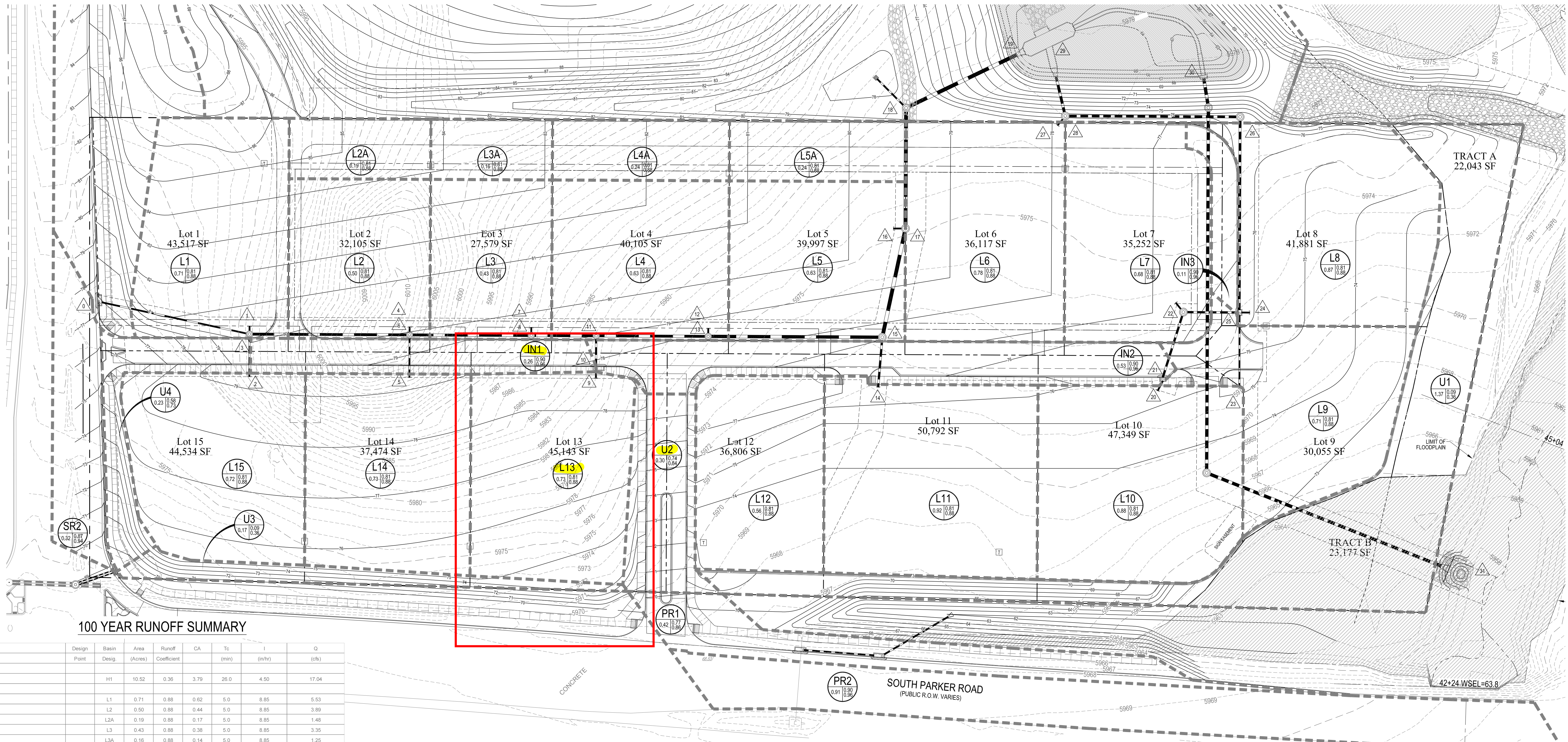
1. Design Discharge A) 2-Year Peak Flow Rate of the Area Draining to the Grass Buffer	$Q_2 = $ <input style="width: 50px;" type="text" value="0.7"/> cfs
2. Minimum Width of Grass Buffer	$W_G = $ <input style="width: 50px;" type="text" value="13"/> ft
3. Length of Grass Buffer (14' or greater recommended)	$L_G = $ <input style="width: 50px;" type="text" value="800"/> ft
4. Buffer Slope (in the direction of flow, not to exceed 0.1 ft / ft)	$S_G = $ <input style="width: 50px;" type="text" value="0.020"/> ft / ft
5. Flow Characteristics (sheet or concentrated) A) Does runoff flow into the grass buffer across the entire width of the buffer? B) Watershed Flow Length C) Interface Slope (normal to flow) D) Type of Flow Sheet Flow: $F_L * S_i \leq 1$ Concentrated Flow: $F_L * S_i > 1$	Choose One <input type="checkbox"/> Yes <input checked="" type="radio"/> No $F_L = $ <input style="width: 50px;" type="text" value="800"/> ft $S_i = $ <input style="width: 50px;" type="text" value="0.001"/> ft / ft SHEET FLOW
6. Flow Distribution for Concentrated Flows	Choose One <input type="radio"/> None (sheet flow) <input type="radio"/> Slotted Curbing <input type="radio"/> Level Spreader <input type="radio"/> Other (Explain): <hr/> <hr/>
7 Soil Preparation (Describe soil amendment)	Existing Buffer <hr/> <hr/>
8 Vegetation (Check the type used or describe "Other")	Choose One <input type="radio"/> Existing Xeric Turf Grass <input checked="" type="radio"/> Irrigated Turf Grass <input type="radio"/> Other (Explain): <hr/> <hr/>
9. Irrigation (*Select None if existing buffer area has 80% vegetation AND will not be disturbed during construction.)	Choose One <input type="radio"/> Temporary <input checked="" type="radio"/> Permanent <input type="radio"/> None*
10. Outflow Collection (Check the type used or describe "Other")	Choose One <input type="radio"/> Grass Swale <input type="radio"/> Street Gutter <input type="radio"/> Storm Sewer Inlet <input type="radio"/> Other (Explain): <hr/> <hr/>
Notes: <hr/> <hr/> <hr/>	

**FINAL DRAINAGE REPORT
PARKER POINTE
PARKER, COLORADO**

APPENDIX E DRAINAGE MAP

SEE SHEET DP3

STROH ROAD



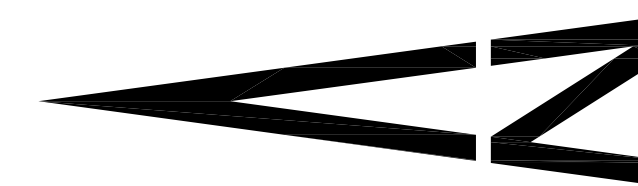
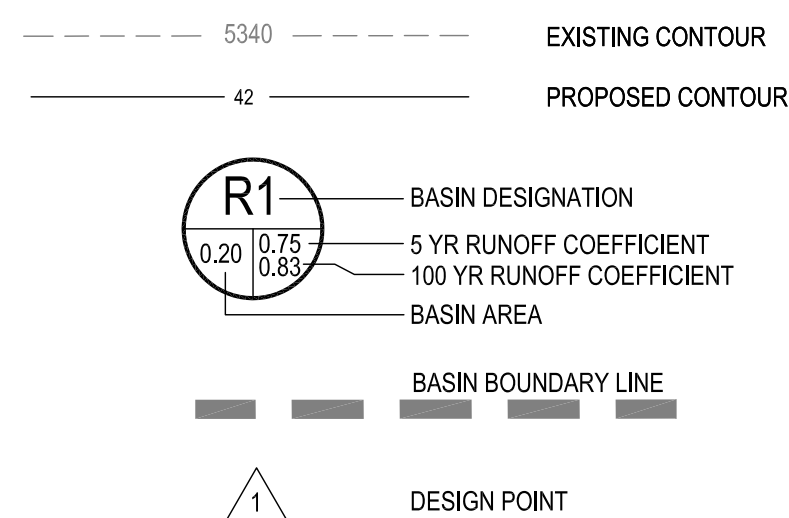
100 YEAR RUNOFF SUMMARY

Design Point	Basin Desig.	Area (Acres)	Runoff Coefficient	CA	Tc (min)	I (in/hr)	Q (cfs)
H1		10.52	0.36	3.79	26.0	4.50	17.04
L1	L1	0.71	0.88	0.62	5.0	8.85	5.53
L2	L2	0.50	0.88	0.44	5.0	8.85	3.89
L2A	L2A	0.19	0.88	0.17	5.0	8.85	1.48
L3	L3	0.43	0.88	0.38	5.0	8.85	3.35
L3A	L3A	0.16	0.88	0.14	5.0	8.85	1.25
L4	L4	0.63	0.88	0.55	5.0	8.85	4.91
L4A	L4A	0.24	0.88	0.21	5.0	8.85	1.87
L5	L5	0.63	0.88	0.55	5.0	8.85	4.91
L5A	L5A	0.24	0.88	0.21	5.0	8.85	1.87
L6	L6	0.78	0.88	0.69	5.0	8.85	6.07
L7	L7	0.68	0.88	0.60	5.0	8.85	5.30
L8	L8	0.87	0.88	0.77	5.0	8.85	6.78
L9	L9	0.71	0.88	0.62	5.0	8.85	5.53
L10	L10	0.88	0.88	0.77	5.0	8.85	6.85
L11	L11	0.92	0.88	0.81	5.0	8.85	7.16
L12	L12	0.56	0.88	0.49	5.0	8.85	4.36
L13	L13	0.73	0.88	0.64	5.0	8.85	5.69
L14	L14	0.73	0.88	0.64	5.0	8.85	5.69
L15	L15	0.72	0.88	0.63	5.0	8.85	5.61
IN1	IN1	0.26	0.96	0.25	5.0	8.85	2.21
IN2	IN2	0.53	0.96	0.51	5.0	8.85	4.50
IN3	IN3	0.11	0.96	0.11	5.0	8.85	0.93
SR1	SR1	3.75	0.42	1.58	22.4	4.90	7.72
TOTAL FLOW TO FOREBAY							103.45
OS1	OS1	23.34	0.39	9.10	25.5	4.50	40.96
TOTAL TO POND							144.41
U1	U1	1.37	0.36	0.49	25.5	4.50	2.22
U2	U2	0.3	0.84	0.25	25.5	4.50	1.13
U3	U3	0.17	0.36	0.06	25.5	4.50	0.28
U4	U4	0.23	0.73	0.17	25.5	4.50	0.78
UN-CAPTURED SITE RUNOFF							4.38
SR2	SR2	0.32	0.94	0.30	5.0	8.85	2.66
PR1	PR1	0.42	0.86	0.36	5.0	8.85	3.20
PR2	PR2	0.91	0.96	0.87	5.0	8.85	7.73

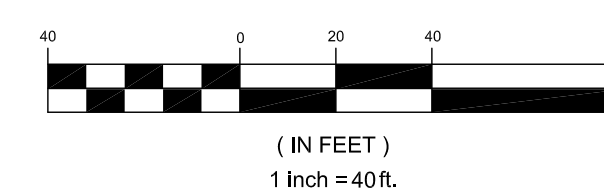
DETENTION SUMMARY

ZONE	VOLUME	ELEVATION	RELEASE RATE
WOCV	0.566 AC-FT		41 HOURS
EURV+WOCV	1.472 AC-FT	5968.03	70 HOURS
100 YEAR	2.753 AC-FT	5970.05	36.7 CFS

LEGEND



GRAPHIC SCALE



BENCHMARK

BENCHMARK: DOUGLAS COUNTY SURVEY CONTROL MONUMENT TT15A - 3" DIAMETER DOUGLAS COUNTY GIS ALUMINUM CAP AT THE NE CORNER OF STROH ROAD AND SOUTH PARKER ROAD (US HIGHWAY 63)
ELEVATION: 5970.79 FEET (NAVD 1988 DATUM)

THE TOWN OF PARKER REVIEW CONSTITUTES GENERAL COMPLIANCE WITH THE TOWN'S STANDARDS AND APPROVED VARIANCES. SUBJECT TO THESE PLANS BEING STAMPED, SIGNED, AND DATED BY THE PROFESSIONAL ENGINEER OF RECORD. REVIEW BY THE TOWN DOES NOT CONSTITUTE APPROVAL OF THE PLAN DESIGN OR ACCURACY AND CORRECTNESS OF ENGINEERING CALCULATIONS. ERRORS IN THE DESIGN OR CALCULATIONS REMAIN THE RESPONSIBILITY OF THE REGISTERED PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE ARE AFFIXED TO THIS DOCUMENT.

THIS REVIEW DOES NOT CONSTITUTE APPROVAL OF ANY PRIVATE ON-SITE IMPROVEMENTS WHICH MAY BE SHOWN. CONSTRUCTION CANNOT COMMENCE UNTIL ALL REQUIRED DRAINAGE/TRAFFIC REPORT(S), FINAL DEVELOPMENT PLAN(S), SPECIAL REVIEW(S), GRADING PERMIT, AND/OR OTHER PERMITS ARE COMPLETE, APPROVED AND ON THE FILE WITH THE TOWN OF PARKER.

TOWN OF PARKER, DIRECTOR OF ENGINEERING

DATE

DRAINAGE PLAN WEST

PARKER POINTE
LOTS 1 THRU 15 AND TRACTS A AND B, PARKER POINTE FILING NO. 1
SOUTHEAST CORNER PARKER ROAD AND STROH ROAD
PARKER, COLORADO

design by: JWD
approved by: JWD
project no.: 2015-015

date: 10/01/17

SHEET

DP2

PREPARED UNDER THE DIRECT SUPERVISION OF JERRY W. DAVIDSON, P.E. COLORADO REG # 30226 FOR AND ON BEHALF OF PERCEPTION DESIGN GROUP, INC.

NO.	DATE	DESCRIPTION
11/01/18		SIXTH SUBMITTAL
08/31/18		FOURTH SUBMITTAL
05/25/18		THIRD SUBMITTAL
03/19/18		PWSO SUBMITTAL
02/28/18		SECOND SUBMITTAL
10/24/17		INITIAL SUBMITTAL

REVISIONS

PERCEPTION DESIGN GROUP, INC.
6901 SOUTH PEERCE STREET SUITE 315, LITTLETON, CO 80120 303.259.8688
WWW.PERCEPTIONDESIGNGROUP.COM