

FINAL DRAINAGE REPORT

FOR

CENTURA PARKER NHC

October 24, 2023

Prepared For:

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ENGINEER'S STATEMENT

This report for the final design of Centura Parker NHC 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.



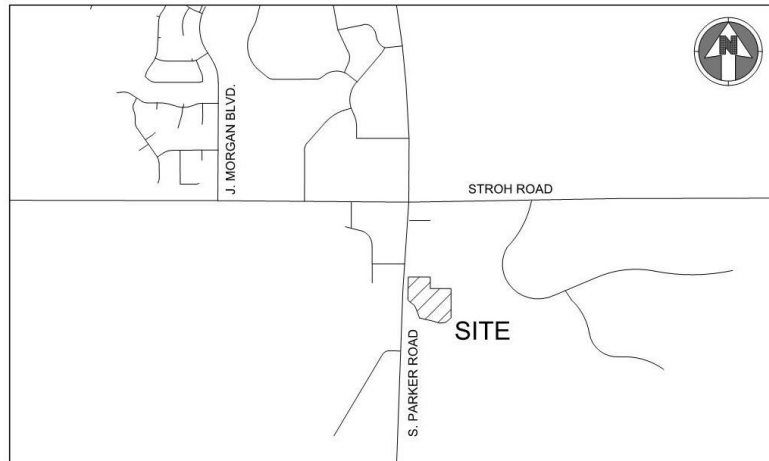
Jason D. Carr, P.E.
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No. 33854

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I. GENERAL LOCATION AND DESCRIPTION

A. Location



Vicinity Map

The proposed Centura Parker NHC (Project) is located southeast of the intersection of Stroh Road and S. Parker Road. More specifically, the Project is located on Filing No. 1, Lots 9-10 Parker Pointe Subdivision. The parcel is in the northeast 1/4 of Section 3, Township 3 South, Range 66 West of the Sixth Principal Meridian in the Town of Parker, Douglas County, and State of Colorado.

Locally, the project is located in a moderately developed area. Parker Road and retail development is located to the west while open space and large lot single family development is located to the east. Kinney Creek and open space/undeveloped areas. Located to the south of the Site.

B. Description of Property

The subject property is regionally located southeast of the intersection of Parker Road and Stroh Road in Parker, Colorado and has a total area of 4.08 acres. The property is currently undeveloped, covered with natural grasses and weeds.

Based on recent site survey and site observations, the general topography of the Property and immediate surrounding area ranges from gently sloping to moderately hilly terrain. Outlying areas exist in a similar state with localized areas very hilly. Elevations on the property range from approximately 5977 to 5965 feet. The property naturally slopes to the south and southwest towards Kinney Creek.

According to the Natural Resource Conservation Service (NRCS) Mapping on site soils are predominantly Bresser-Trucon Sandy Loam (BtE) and Loamy Alluvial Land (Lu). These soils are categorized as Hydrologic Soil Group B.

C. PROPOSED DEVELOPMENT

The Project includes the construction of 2 story neighborhood health center, surface parking. lot, walking trails, utilities, drainage infrastructure, and associated landscaping and hardscape improvements. The facility will provide primary care, radiology, laboratory space, pharmacy, and general support spaces.

D. FLOODPLAIN

The Flood Insurance Rate Map Number 08035C0182G, dated October 2020, the project site is located within FEMA Unshaded Zone X except the south portion of the property which is within Zone A. Zone A is defined as no base flood elevations determined. The base flood is defined as the flood that has a 1% chance of being equaled or exceeded in any given year (100-year), while unshaded Zone X is defined as areas determined to be outside of the 0.2% annual chance (500-year) floodplain.

A LOMR is currently being processed by others to adjust the current mapping and bring the property completely out of the 100-year floodplain.

The Master Developer will make improvements to the stream. Our project will not impact it.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

According to the "Final Drainage Report prepared by Perception design Group, inc. dated November 28, 2018, (Master Report), The site falls within two major drainage basins. The southerly portion of the site is tributary to Kinney Creek while areas north of the site's existing high point ridge are tributary to Stroh Gulch. The southerly line of basin H1 defines the historic break between the two basins. Per the Town of Parker, most of this historic runoff to Stroh Gulch is captured and conveyed via storm sewer to the new regional detention pond located immediately east of the property and ultimately released 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 identifies 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 SR1plus 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" dated April 2004. A floodplain was delineated 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. Sub-Basin Description

To facilitate design, the site is divided into multiple sub-basins described as follows and are delineated on the final drainage map.

Basins A1, A2 and A3 are used to represent developed on-site basins that will drain to the regional pond. Basins O1 and O2 are on-site basins comprised landscape and open space that drain directly off site, flowing south directly to Kinney Creek. runoff from O2 goes west initially, then south to the Creek in the swale adjacent to Parker Road as shown in the master drainage report by perception. Stormwater runoff from the proposed development will be captured by roof drains or overland flow to curb inlets and area inlets. Captured flows will be conveyed east to an existing storm sewer network which drains runoff to the regional pond.

III. DRAINAGE DESIGN CRITERIA

A. REGULATIONS

1. Town of Parker Storm Drainage and Environmental Drainage Criteria Manual.
2. Urban Drainage Storm Drainage Criteria Manual Volumes 1 through 3.

B. Development Criteria Reference and Constrains

The MASTER drainage report has been defined as the development criteria for the proposed site improvements as follows:

1- 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 Gluch. 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.

2- Hydrology:

Runoff is calculated for both the 5 year and 100-year storms using 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 version 3.07 UD-Detention spreadsheet. This spreadsheet is also utilized to calculate allowable release rates.

3- Hydraulics:

Storm sewer capacities are calculated using Hydraflow Storm Sewers extension for AutoCAD Civil 3D version 2017. The system is designed 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.

4- Water Quality Enhancement:

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

C. Hydrologic Criteria

The proposed drainage system is designed in accordance with the CRITERIA and the MANUAL. Per the CRITERIA, the minor and major storms were considered to have a 5-year and 100-year recurrence interval, respectively. The Rational Method was used to quantify rainfall and peak runoff values for the project site. The one-hour point rainfall depths were determined from the CRITERIA and are summarized in the table below:

Table 1 - One-Hour Point Rainfall Depths

Return Period	One-Hour Point Rainfall (inches)
Minor (5-Year)	1.39
Major (100-Year)	2.60

Developed flow rates were calculated using composite imperviousness coefficients from the MANUAL. Refer to Appendix B for detailed calculations and design aids.

D. Hydraulic Criteria

Final storm sewer sizes and water surface profiles were analyzed using the Bentley Storm CAD hydraulic modeling software. Per the CRITERIA, the minor and major storms were considered to have a 5-year and 100-year return period, respectively.

All proposed inlets are designed in accordance with the MHFD CRITERIA and the MANUAL. Proposed sump inlets will accommodate flows analyzed under the 100-year storm event. Supporting hydraulic calculations are provided in Appendix C.

E. WAIVER/VARIANCE FROM CRITERIA

There are no variances requested for this site.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

Proposed drainage patterns across the project site remain consistent with conveyance patterns described in the MASTER report. Developed on-site runoff will sheet flow to the east and will be captured by sump inlets. The landscape areas to the east of the proposed building will overland flow and captured by sump area inlets. Roof drains will collect rainwater and internally route flows to a roof drain connection. Captured flows will be conveyed via storm sewer to the east of the project site to the regional facility. A proposed drainage plan is provided in Appendix D. The proposed storm sewer system will adequately convey fully developed runoff for the 5-year and 100-year design storms. Basins along the perimeter of the project site are landscape and open space and runoff will drain directly into Kinney Creek and then to the west crossing parker road via existing box culvert.

B. Specific Details

The project site is comprised of three on-site sub-basins, and two off-site sub-basins consisting of approximately 4.08 acres with a composite impervious value of approximately 45%. A proposed drainage plan is provided in Appendix D for reference. The MASTER DRAINAGE had minor and major rational C factors of 0.81 and 0.88 anticipated for this site, and our calculation determined that the rational coefficients are lower at 0.77 and 0.84 specifically sub basins O2 and O1 have rational coefficients of 0.07 and 0.50. The following table show this comparison:

	SA. MIRO REPORT		MASTER REPORT	
Basin ID	O1	O2	L9	L10
C 100-YR	0.49	0.50	0.88	0.88
C 5-YR	0.05	0.07	0.81	0.81

The sub-basins associated with the proposed development are described as follows:

Basin A:

Basin A is approximately a total of 2.10 acres and consists of the proposed NHC building, the majority of the parking lot, drives, and associated landscaping. The areas within Basin A slope from west to east and are routed via overland flow, swales, curb and gutter, and proposed drainage infrastructure to area inlets, grated manholes, and curb inlets. The developed runoff for the basin produces undetained flows of $Q_5=6.12$ cfs and $Q_{100}=12.68$ cfs. Stormwater within this basin will be routed to the proposed inlet within Sub-basin A3 before connecting to existing City stormwater infrastructure east of the site that ultimately outfalls to stormwater detention and water quality pond.

RUNOFF SUMMARY									
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	DIRECT RUNOFF 5YR (CFS)	TOTAL RUNOFF 5YR (CFS)	DIRECT RUNOFF 100YR (CFS)	TOTAL RUNOFF 100YR (CFS)
A1	A1	0.37	90%	0.77	0.84	1.34	1.34	2.73	2.73
A2	A2	0.24	94%	0.80	0.86	0.84	0.84	1.68	1.68
A3	A3	1.49	85%	0.73	0.82	3.94	4.78	8.27	9.95

Off-site Sub-Basins:

Basins O1 and O2 are approximately a total of 1.98 acres that lie along the south and west perimeter of the site and consist almost entirely of landscaping. The areas within the O Basins are constrained by existing site grades that require the flows to drain off-site without being captured by proposed stormwater infrastructure. The proposed drainage patterns mimic existing site conditions in that the area is entirely landscaped cover, is conveyed via overland flow, and discharges west of the site where existing stormwater infrastructure ultimately routes flows to South Parker Road. The developed runoff for the basin produces undetained flows of $Q_5=0.38$ cfs and $Q_{100}=6.08$ cfs.

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
O1	O1	1.31	2%	0.05	0.49	0.19	3.45
O2	O2	0.67	4%	0.07	0.50	0.19	2.63
O1 Future	O1	1.31	95%	0.81	0.86	4.88	9.69

C. DETENTION AND WATER QUALITY

According to the MASTER report, water quality and detention for the project site is provided in the regional detention pond located east project site. This extended detention basin has been sized to

accommodate tributary flows for the fully developed condition. The proposed use for the property is consistent with those uses anticipated in the master report, therefore, no additional on-site water quality treatment or detention storage is required. According to the MASTER report, this regional drainage facility has been adequately sized to treat and detain all developed flows prior to discharging into Kinney Creek.

V. ENVIRONMENTAL PROTECTION CRITERIA

The project will include disturbance of approximately 3.14 acres. The soils on site belong primarily to NRCS Hydrologic Group B and exhibit a moderate hazard of erosion by water. The site consists of native vegetation including native grasses and weeds. The construction plans include detailed Construction BMP Plans to mitigate and prevent erosion and sediment transportation. Final locations of erosion control measures are to be determined by the Contractor and Erosion Control Inspector and updated as necessary during construction. Further, the project will require an application to the State of Colorado, Colorado Dept. of Health for a Construction Activities Stormwater permit, prior to land disturbance.

The erosion control measures are placed on the site to reduce the on-site erosion, prevent sediment from entering the storm sewer system, and to eliminate sediment deposit off-site. Vehicle tracking control pads will be placed at all access locations for the site. Diversion ditches connecting to temporary sediment basins, silt fences will be used around the perimeter of the site. Inlet protection per the Town of Parker standard details will be constructed around all inlets shown on plans. Erosion control matting will be used on all slopes steeper than 4:1. All disturbed areas not being covered by asphalt, concrete, or landscaping will be seeded with an approved seeding mixture as soon as practical after final grading occurs or for any areas of disturbed land that will be exposed for longer than 30 days. All erosion control measures shall be inspected weekly at a minimum and maintained and repaired by the Contractor during construction as needed. The Contractor shall also inspect and repair all erosion control measures as needed following each heavy precipitation or snowmelt.

VI. SUMMARY

A. COMPLIANCE WITH STANDARDS

This report conforms to the Town of Parker Storm Drainage and Environmental Criteria Manual, the Urban Drainage and Flood Control District Manual, and the associated master drainage report. The proposed drainage system will provide adequate conveyance of developed stormwater runoff to downstream, existing stormwater infrastructure and ultimately the water quality and detention facility without adversely affecting downstream facilities.

B. SUMMARY OF CONCEPT

The Centura Parker Neighborhood Health Center drainage and stormwater infrastructure improvements will provide stormwater conveyance for the minor and major storm events and will safely and efficiently route flows to the downstream receiving drainageways. Fully developed flows will be conveyed via overland flow and curb and gutter to proposed inlets. The proposed storm sewer system will discharge into the existing storm sewer infrastructure to the east of the project site which remains in conformance with the approved MASTER drainage report.

The hydraulic grade line for the minor year storm will remain within the proposed storm sewer while the hydraulic grade line for the major year storm will remain one foot below finished grade. These measures will effectively control runoff from proposed development and minimize adverse impacts to downstream facilities.

VII. REFERENCES

1. "Geotechnical Engineering Report for Proposed Centura Parker NHC",
Ground Engineering, Inc., Dated November 14, 2022.
2. "Final Drainage Report Parker Pointe",
Perception design group, inc., Dated November 28, 2018.
3. "Storm Drainage and Environmental Criteria Manual", Town of Parker, Revised and Adopted
February 2014.
4. "Urban Storm Drainage Criteria Manual". Latest revision.

VIII.APPENDIX

Appendix A: MAPS & DESIGN AIDS

**FEMA Firm Maps
Town of Parker Rainfall Values
Web Soil Survey**

National Flood Hazard Layer FIRMette



104°45'46"W 39°28'42"N



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

1:6,000

104°45'9"W 39°28'14"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
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 **5/8/2023 at 3:10 AM** 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.

NOTES TO USERS

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

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

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

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations** and **floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

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

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

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.

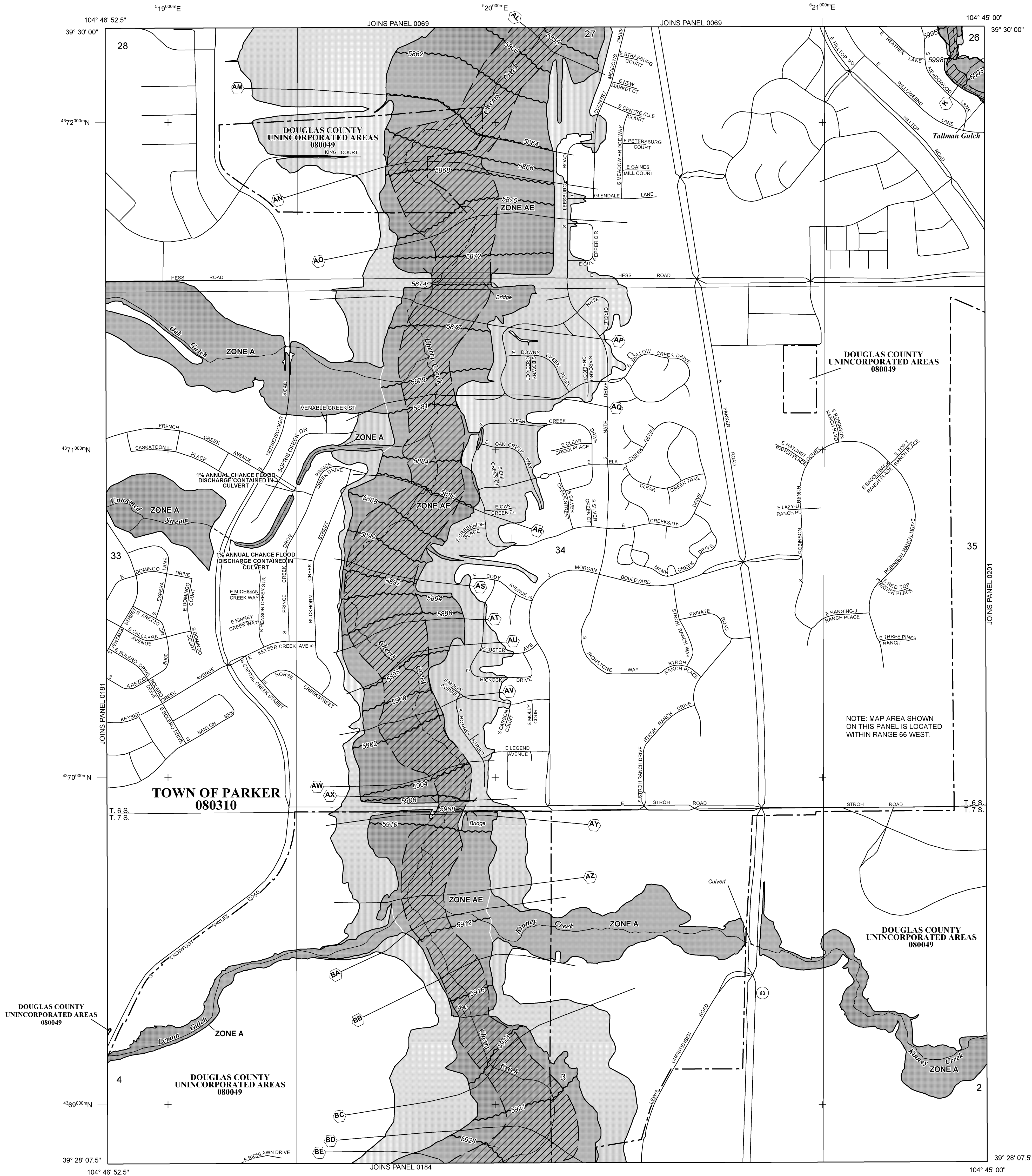


TABLE 5.1
ONE-HOUR POINT RAINFALL

Frequency of Design Event (yr)	One-hour Point Rainfall, P_1 (in)
2	0.99
5	1.39
10	1.64
25	1.98
50	2.31
100	2.60

5.3 FLOOD HYDROLOGY OVERVIEW

Various methods exist to determine appropriate flood peaks or hydrographs for storm drainage planning and design. Methods for determining flood peaks or hydrographs are the Rational Method, the Colorado Urban Hydrograph Procedure (CUHP), and Urban Drainage Stormwater Management (UDSWM) model. The Town of Parker discourages the use of computer models other than CUHP and UDSWM since these programs are preferred, if not required, by UDFCD for studies involving major drainageways where UDFCD approval is sought or where maintenance eligibility is requested.

The three methods are briefly described in this section, and a discussion of their applicability to the Town of Parker is discussed. UDSWM is mostly used to combine and route the hydrographs generated using CUHP.

In general, the Rational Method is the most widely used and accepted technique for determining peak flows in urban areas for small basins. Within the constraints outlined in the MANUAL, use of the Rational Method provides a relatively simple but effective way to analyze storm runoff.

CUHP is somewhat more complicated than the Rational Method. It allows a manual computation of a runoff hydrograph which may be used for further hydraulic routing through channels and/or detention ponds. Historically, CUHP is best used in urban areas for which runoff coefficients have been derived. However, recent improvements by UDFCD include consideration for different soil types, thus CUHP is now more applicable to rural areas. The reader is referred to UDFCD for the latest version of CUHP.

UDSWM is a computer model that generates runoff hydrographs and routes and combines these hydrographs. UDSWM is a modified version of the Runoff Block of the Environmental Protection Agency's Storm Water Management Model (SWMM). It has been modified to be used in conjunction with CUHP. Table 5.2 herein provides guidance on selecting the appropriate method for a given project.

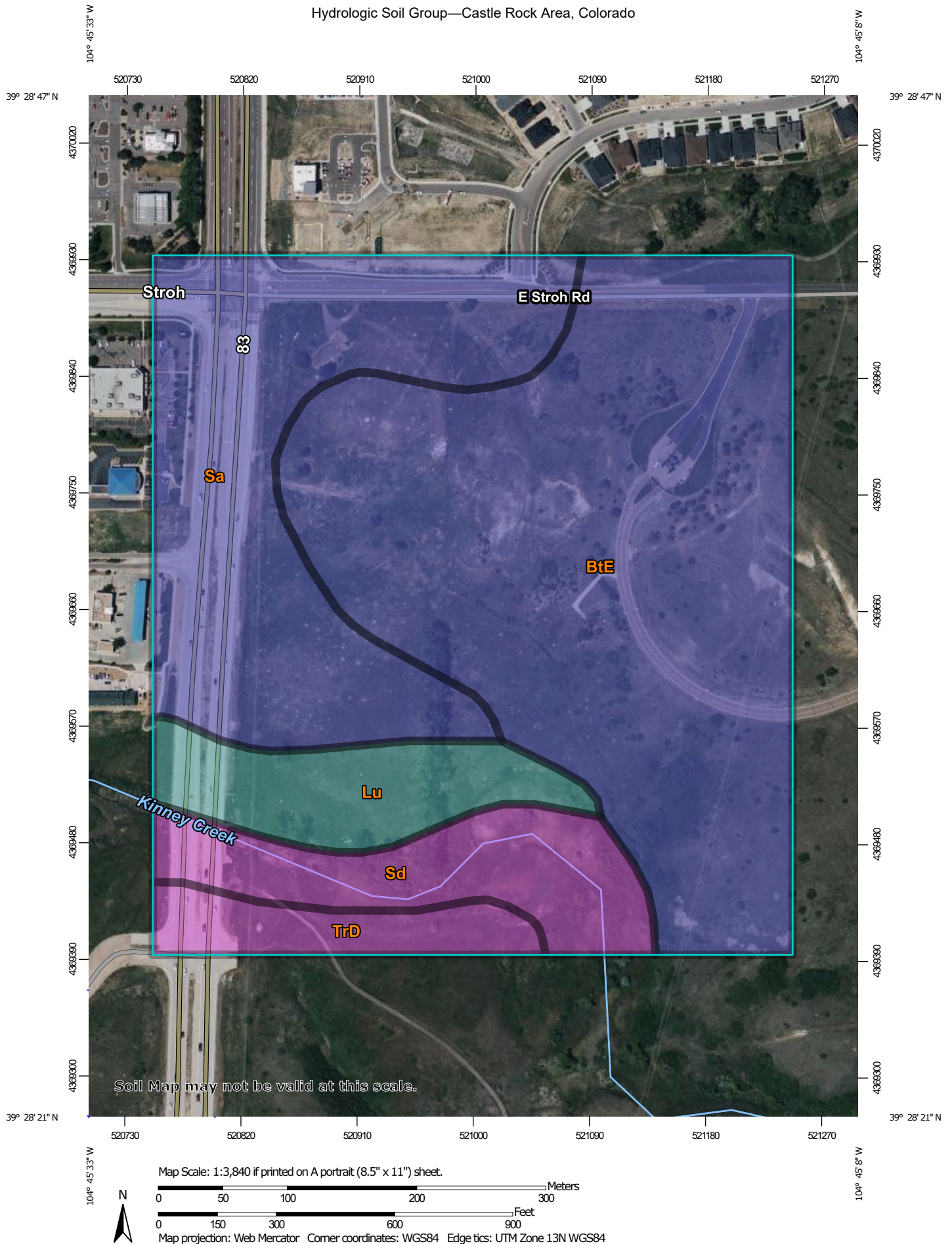
Soil Map—Castle Rock Area, Colorado



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BtE	Bresser-Truckton sandy loams, 5 to 25 percent slopes	33.8	50.9%
Lu	Loamy alluvial land, dark surface	5.3	8.0%
Sa	Sampson loam	18.0	27.1%
Sd	Sandy alluvial land	6.3	9.5%
TrD	Truckton sandy loam, 3 to 9 percent slopes	3.0	4.5%
Totals for Area of Interest		66.4	100.0%

Hydrologic Soil Group—Castle Rock Area, Colorado



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	33.8	50.9%
Lu	Loamy alluvial land, dark surface	C	5.3	8.0%
Sa	Sampson loam	B	18.0	27.1%
Sd	Sandy alluvial land	A	6.3	9.5%
TrD	Truckton sandy loam, 3 to 9 percent slopes	A	3.0	4.5%
Totals for Area of Interest			66.4	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.

Appendix B

Hydrologic Calculations



Composite C Calculations

Project Information

Project Name: Parker NHC
Miro Project No: 22057
Revised Date: 10/24/2023
Calculated By: FKF

Jurisdiction Impervious Value

Pond Area 100%
Landscape Area 2%
Paved Area 100%
Roof Area 90%

Coefficient Equations

$C_{CD(2)} = 0.83I^{1.122}$ $C_{CD(10)} = 0.74i + 0.132$
 $C_{CD(5)} = 0.82i + 0.035$ $C_{CD(100)} = 0.4i + 0.484$

*NOTE: C_{CD} Equations from UDFCD Criteria Manual updated March 2017

Basin Designation	A _{pond} (ft ²)	A _{landscape} (ft ²)	A _{paved} (ft ²)	A _{roof} (ft ²)	A _{total} (acres)	Impervious-ness	C _{CD} 02 yr	C _{CD} 05 yr	C _{CD} 10 yr	C _{CD} 100 yr
A1				15,986	0.37	90%	0.74	0.77	0.80	0.84
A2		654	9,616		0.24	94%	0.77	0.80	0.83	0.86
A3		9,817	55,261		1.49	85%	0.69	0.73	0.76	0.82
O1		57,103			1.31	2%	0.01	0.05	0.15	0.49
O2		28,652	571		0.67	4%	0.02	0.07	0.16	0.50
O1 FUTURE			57,103		1.31	95%	0.78	0.81	0.84	0.86
TOTAL		96,225	122,552	15,986	5.39	59%	0.46	0.52	0.57	0.72



TIME OF CONCENTRATION

Project Information

Project Name: Parker NHC
 S.A. Project No: 22057
 Revised Date: 10/24/2023
 Calculated By: FKF

Conveyance Coefficient Value

Grassed Waterway 15
 Heavy Meadow 2.5
 Nearly Bare Ground 10
 Paved Areas and Shallow Paved Swales 20
 Short Pasture and Lawns 7
 Tillage / Field 5

Time of Concentration Equations

$$t_t = 0.395(1.1 - C_s)L^{1/2} / S^{1/3} \quad t_t = (L/v)/60$$

$$t_c \text{ check: } t_c = (26-17i) + (L/(60(14i+19)S^{1/2}))$$

*NOTE: Cv Values, T_i, T_b & T_c Equations from UDFCD Criteria Manual updated March 2017

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t _i)			TRAVEL TIME (t _t)						t _i + t _t	t _c CHECK (urbanized basins)	FINAL t _c USED
Basin Designation	Area (acres)	C _{CD} 05 yr	length (ft)	slope %	t _i (min)	length (ft)	slope %	Type of Land Surface	Conveyance Coefficient Cv	velocity (ft/sec)	t _t (min)	t _c (min)	Total Length (ft)	t _c (min)
A1	0.37	0.77	64	0.88%	5.00	0	0.00%	Paved areas and shallow paved swales	20	0.00	0.00	5.00	64	5.00
A2	0.24	0.80	90	1.50%	4.50	231	1.30%	Paved areas and shallow paved swales	20	2.28	1.69	6.19	321	6.19
A3	1.49	0.73	270	1.50%	9.64	208	1.20%	Paved areas and shallow paved swales	20	2.19	1.58	11.22	478	11.22
O1	1.31	0.05	65	0.70%	17.48	99	1.00%	Paved areas and shallow paved swales	20	2.00	0.83	18.31	165	18.31
O2	0.67	0.07	60	7.9%	7.37	0	0.00%	Paved areas and shallow paved swales	20	0.00	0.00	7.37	60	7.37
O1 FUTURE	1.31	0.81	65	0.7%	4.76	99	1.00%	Paved areas and shallow paved swales	20	2.00	0.83	5.59	164	5.59



Runoff Calculations (Rational Method)

Project Information

Project Name: **Parker NHC**
 S.A. Project No: **22057**
 Revised Date: **10/24/2023**
 Calculated By: **FKF**

Intensity Equation

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

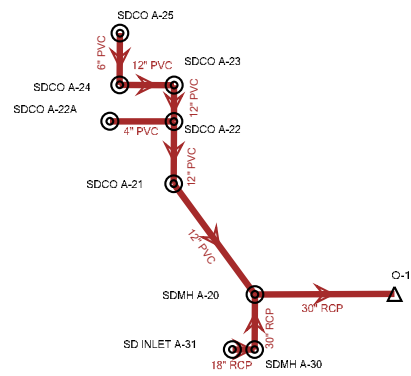
*NOTE: P & Intensity Equation from UDFCD Criteria Manual

Basin Designation	Area (ac.)	'c'	cA	t _c (min)	P ₁	intensity (in/hr)	Q (cfs)	
A1	0.37	0.74	0.27	5.00	0.99	3.36	0.91	02 YR
		0.77	0.28		1.39	4.71	1.34	05 YR
		0.80	0.29		1.64	5.56	1.63	10 YR
		0.84	0.31		2.60	8.82	2.73	100 YR
A2	0.24	0.77	0.18	6.19	0.99	3.16	0.58	02 YR
		0.80	0.19		1.39	4.44	0.84	05 YR
		0.83	0.19		1.64	5.24	1.02	10 YR
		0.86	0.20		2.60	8.31	1.68	100 YR
A3	1.49	0.69	1.04	11.22	0.99	2.56	2.65	02 YR
		0.73	1.10		1.39	3.59	3.94	05 YR
		0.76	1.14		1.64	4.24	4.83	10 YR
		0.82	1.23		2.60	6.71	8.27	100 YR
O1	1.31	0.01	0.01	18.31	0.99	2.04	0.03	02 YR
		0.05	0.07		1.39	2.86	0.19	05 YR
		0.15	0.19		1.64	3.38	0.65	10 YR
		0.49	0.64		2.60	5.35	3.45	100 YR
O2	0.67	0.02	0.01	7.37	0.99	2.99	0.04	02 YR
		0.07	0.05		1.39	4.20	0.19	05 YR
		0.16	0.11		1.64	4.96	0.54	10 YR
		0.50	0.34		2.60	7.86	2.63	100 YR
O1 FUTURE	1.31	0.78	1.03	5.59	0.99	3.26	3.35	02 YR
		0.81	1.07		1.39	4.57	4.88	05 YR
		0.84	1.09		1.64	5.40	5.91	10 YR
		0.86	1.13		2.60	8.56	9.69	100 YR

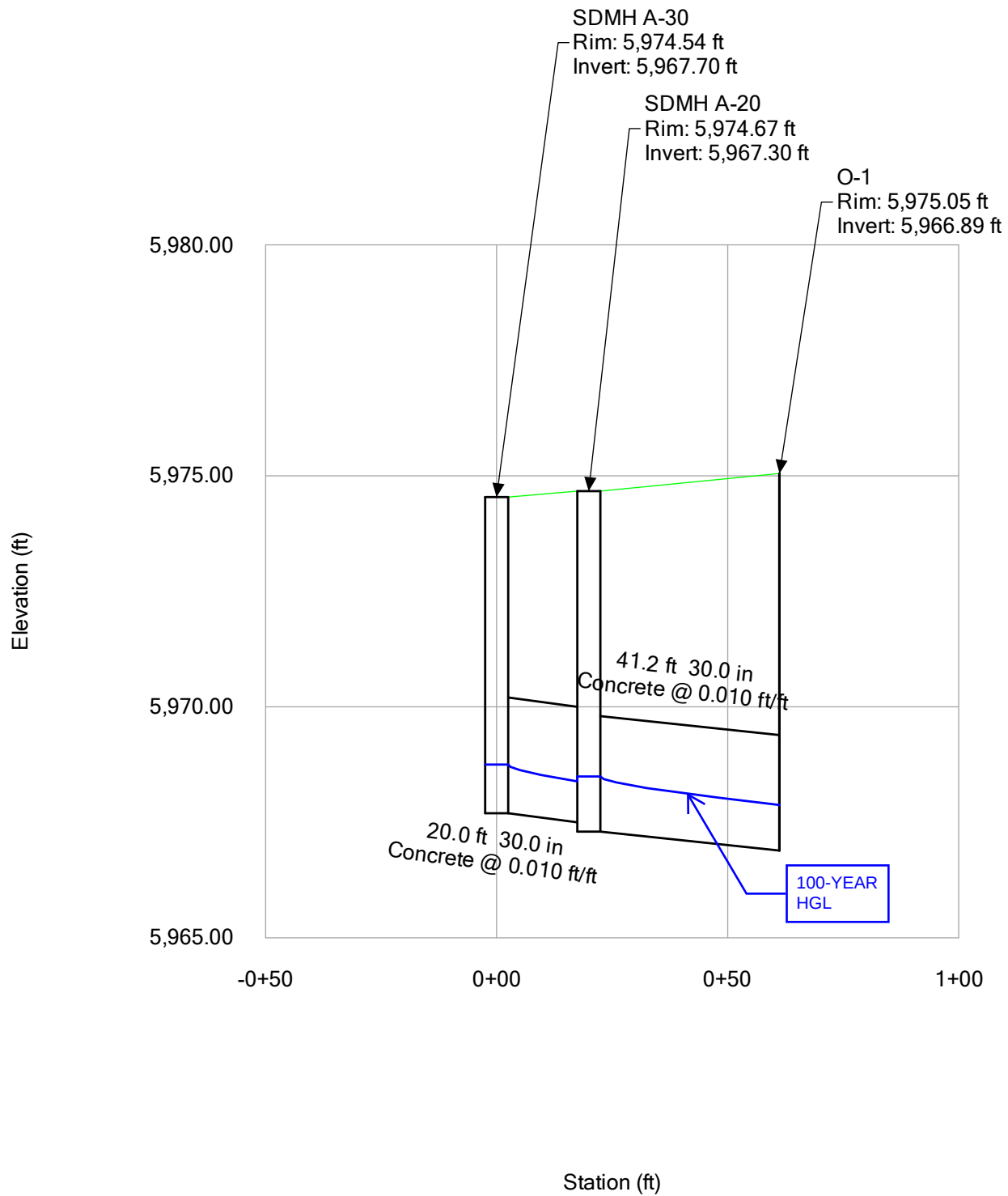
Appendix C
Hydraulic Calculations

StormCAD Results
Inlet Capacity

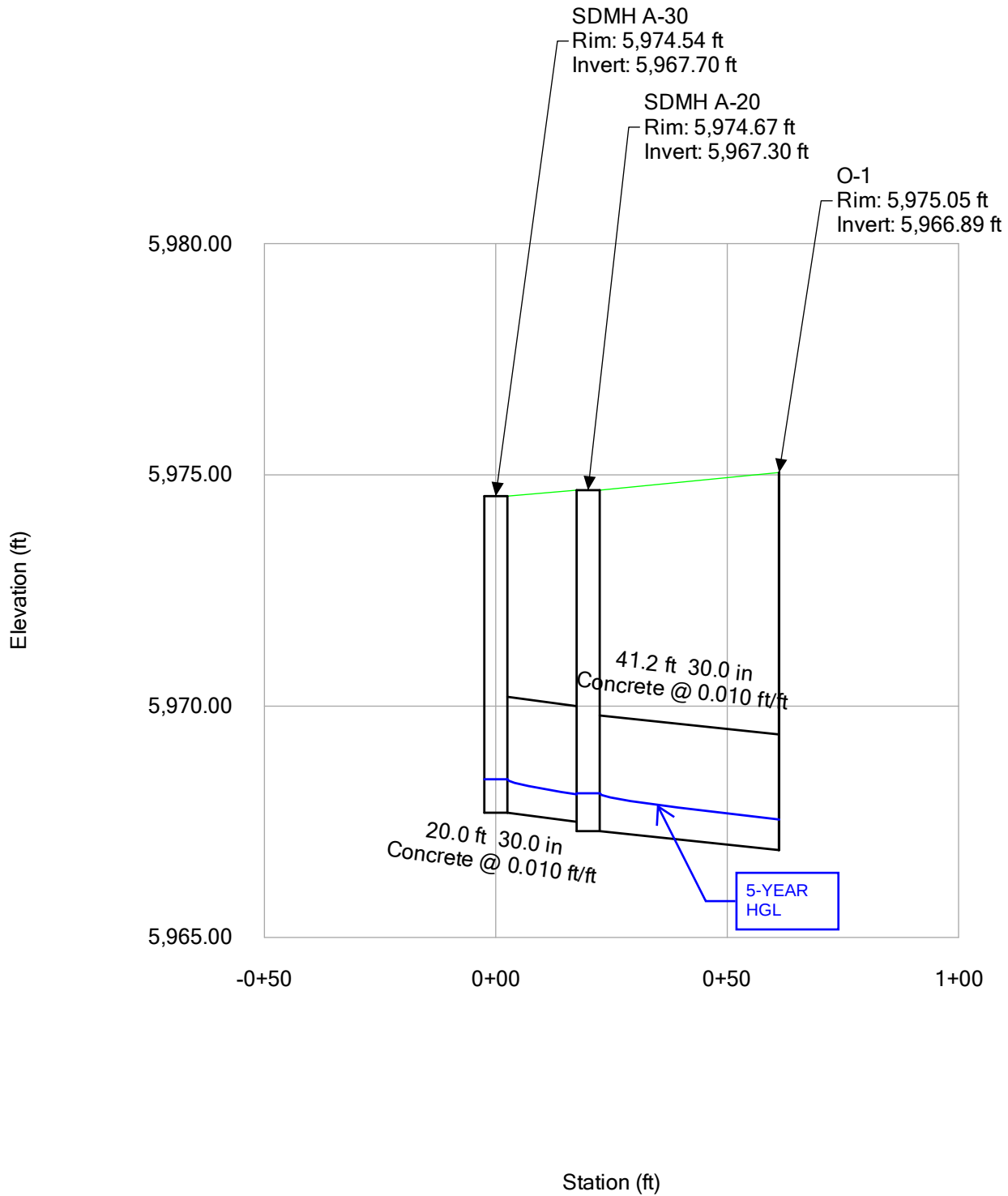
STORMCAD PLAN VIEW



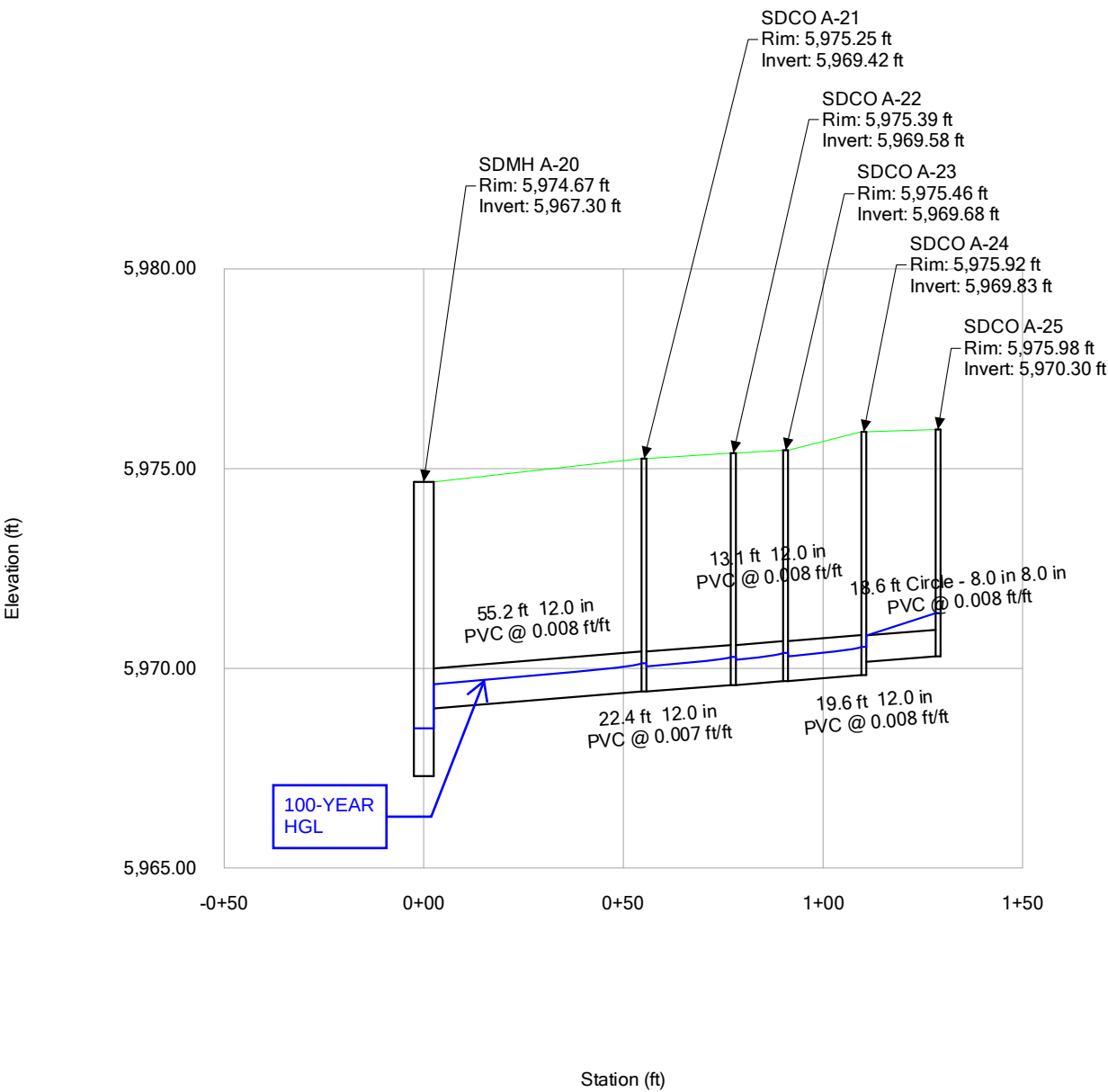
Profile Report **Engineering Profile - STORM LINE A (100-YEAR)**



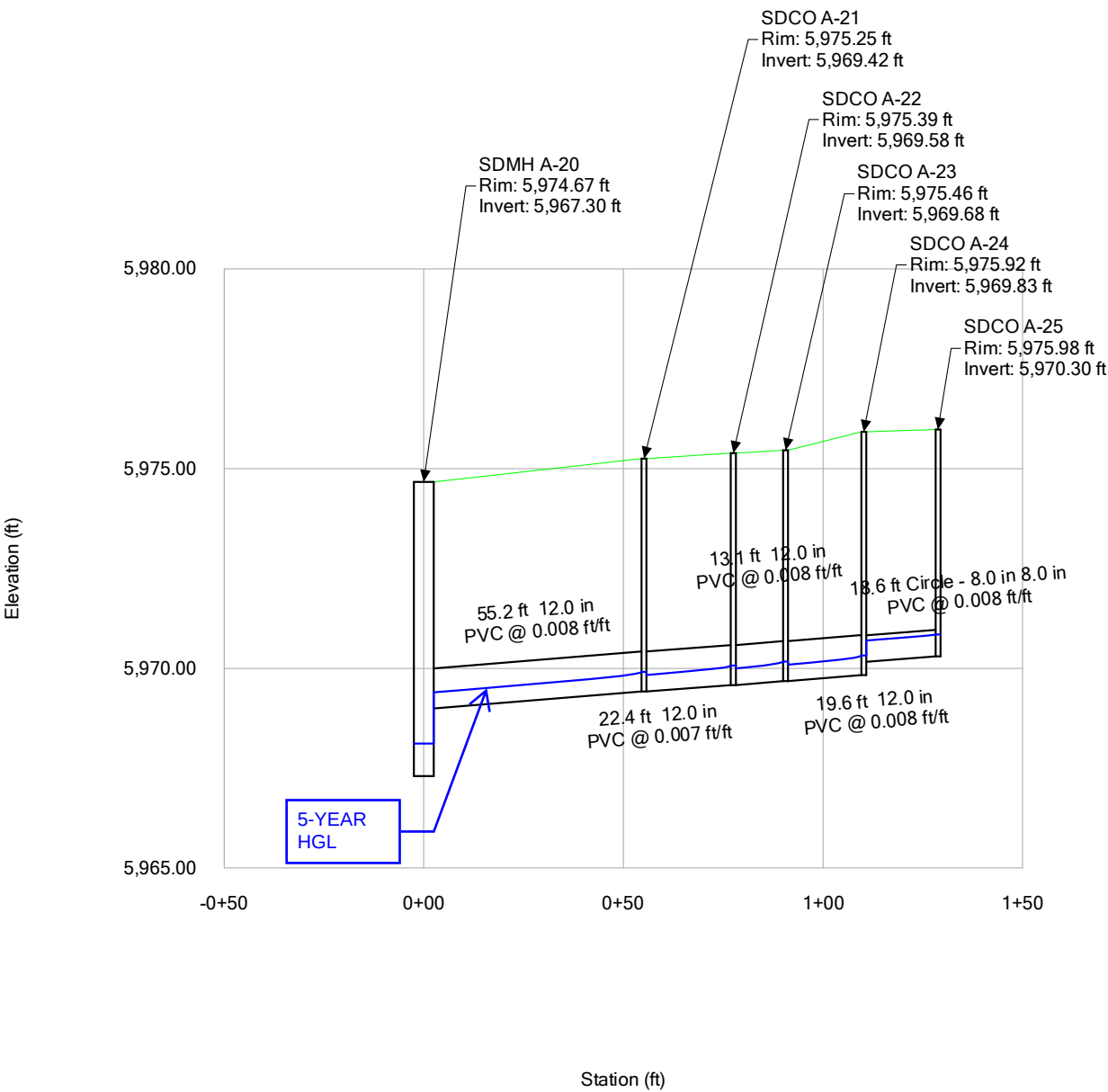
Profile Report **Engineering Profile - STORM LINE A (5-YEAR)**



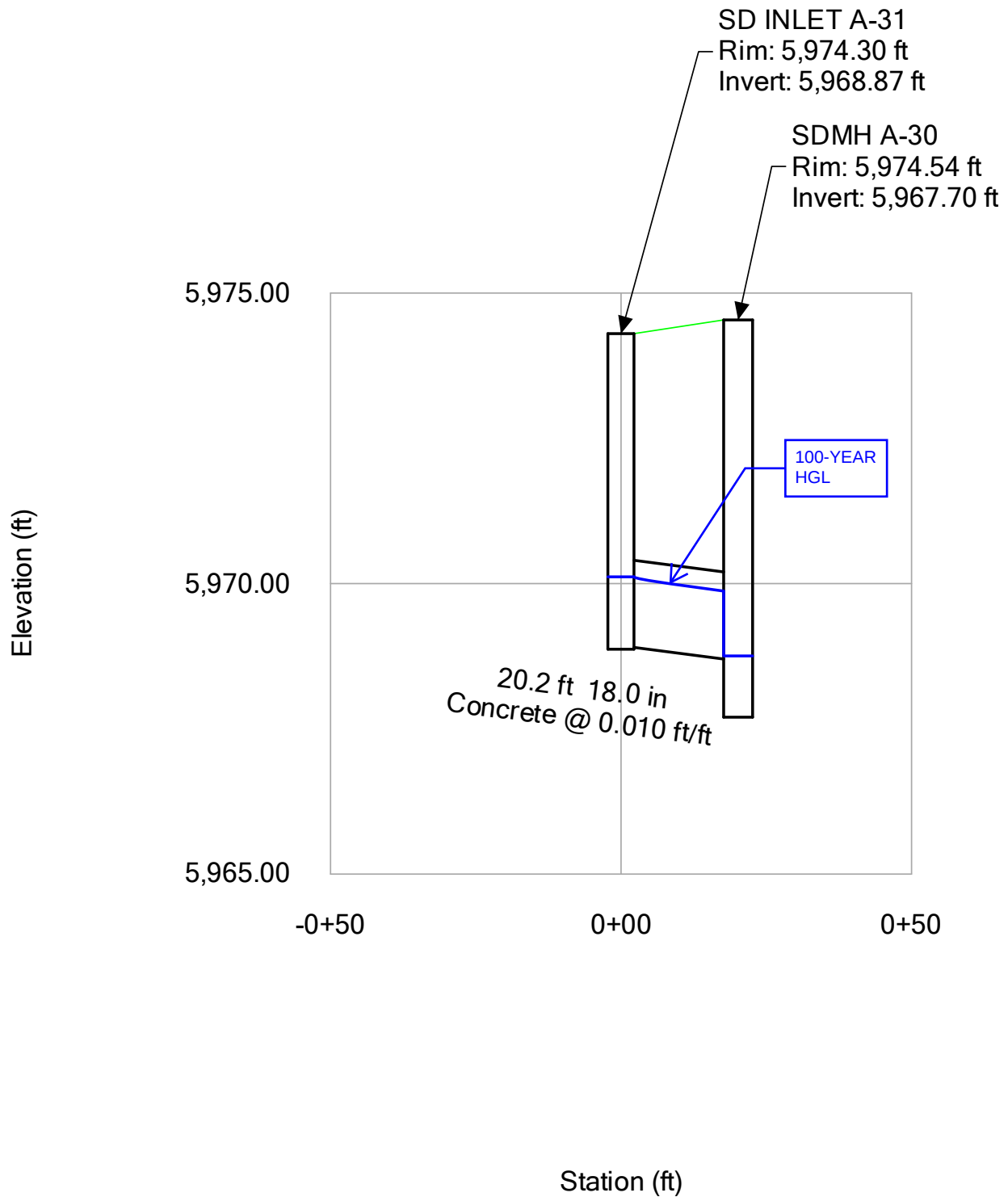
Profile Report
Engineering Profile - STORM LINE A-20 (100-YEAR)



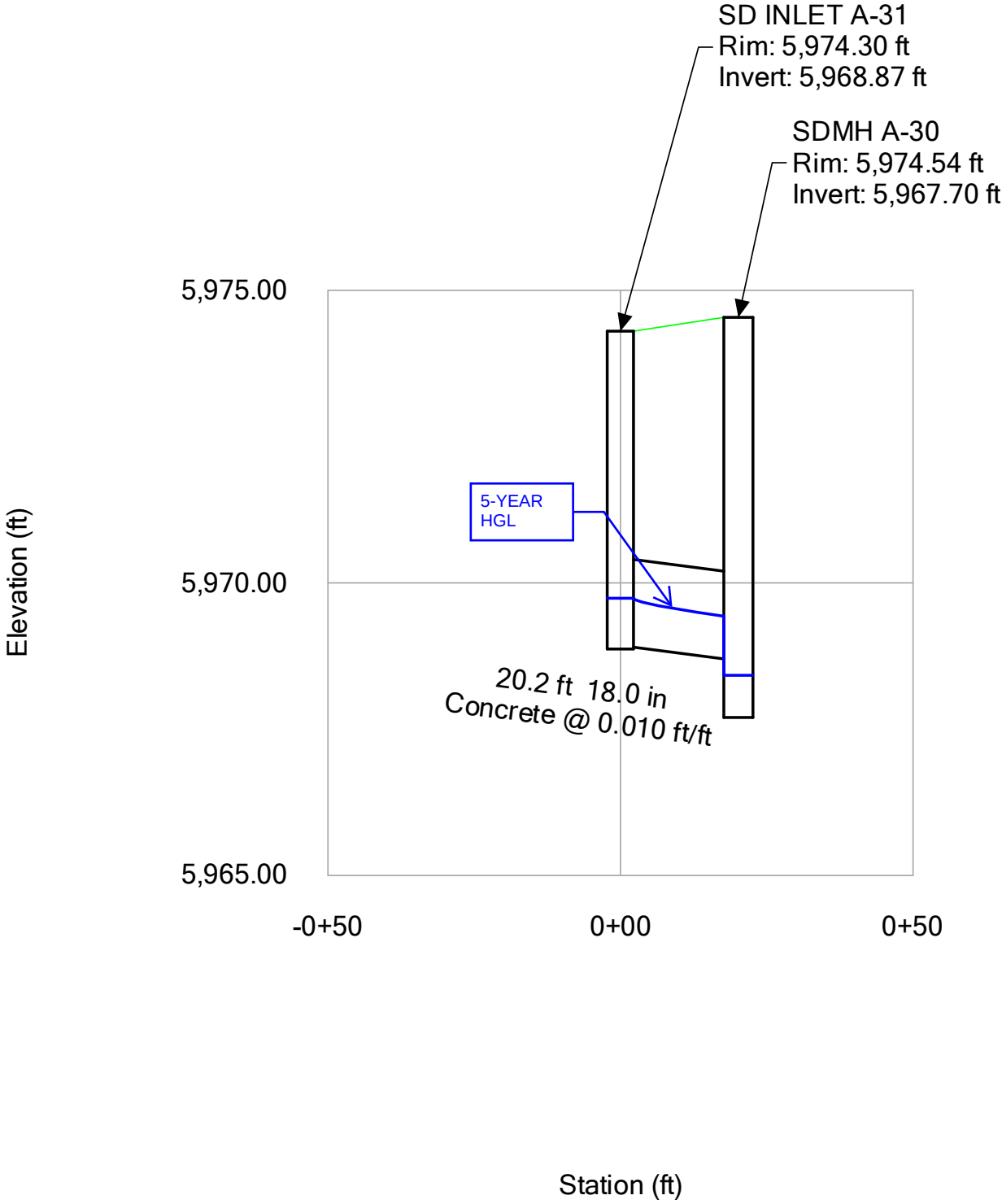
Profile Report
Engineering Profile - STORM LINE A-20 (5-YEAR)



Profile Report **Engineering Profile - STORM LINE A-30 (100-YEAR)**



Profile Report
Engineering Profile - STORM LINE A-30 (5-YEAR)



Scenario 100-Year
FlexTable Conduit

Start Node	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Material
SDMH A-20	O-1	5,966.89	41.2	0.01	30	12.68	7.35	40.9	Concrete
SDCO A-25	SDCO A-24	5,970.16	18.6	0.008	8	2.73	7.82	1.36	PVC
SDCO A-24	SDCO A-23	5,969.68	19.6	0.008	12	2.73	5.54	4.05	PVC
SDCO A-22A	SDCO A-22	5,970.25	23.1	0.01	4	0	0	0.25	PVC
SDCO A-23	SDCO A-22	5,969.58	13.1	0.008	12	2.73	5.53	4.04	PVC
SDCO A-22	SDCO A-21	5,969.42	22.4	0.007	12	2.73	5.39	3.92	PVC
SDCO A-21	SDMH A-20	5,969.00	55.2	0.008	12	2.73	5.52	4.04	PVC
SD INLET A-31	SDMH A-30	5,968.70	20.2	0.01	18	9.95	6.74	10.46	Concrete
SDMH A-30	SDMH A-20	5,967.50	20	0.01	30	9.95	6.89	41.07	Concrete

Scenario 5-Year
FlexTable Conduit

Start Node	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Material
SDMH A-20	O-1	5,966.89	41.2	0.01	30	6.12	5.99	40.9	Concrete
SDCO A-25	SDCO A-24	5,970.16	18.6	0.008	8	1.34	4.45	1.36	PVC
SDCO A-24	SDCO A-23	5,969.68	19.6	0.008	12	1.34	4.63	4.05	PVC
SDCO A-22A	SDCO A-22	5,970.25	23.1	0.01	4	0	0	0.25	PVC
SDCO A-23	SDCO A-22	5,969.58	13.1	0.008	12	1.34	4.62	4.04	PVC
SDCO A-22	SDCO A-21	5,969.42	22.4	0.007	12	1.34	4.52	3.92	PVC
SDCO A-21	SDMH A-20	5,969.00	55.2	0.008	12	1.34	4.62	4.04	PVC
SD INLET A-31	SDMH A-30	5,968.70	20.2	0.01	18	4.78	5.79	10.46	Concrete
SDMH A-30	SDMH A-20	5,967.50	20	0.01	30	4.78	5.59	41.07	Concrete

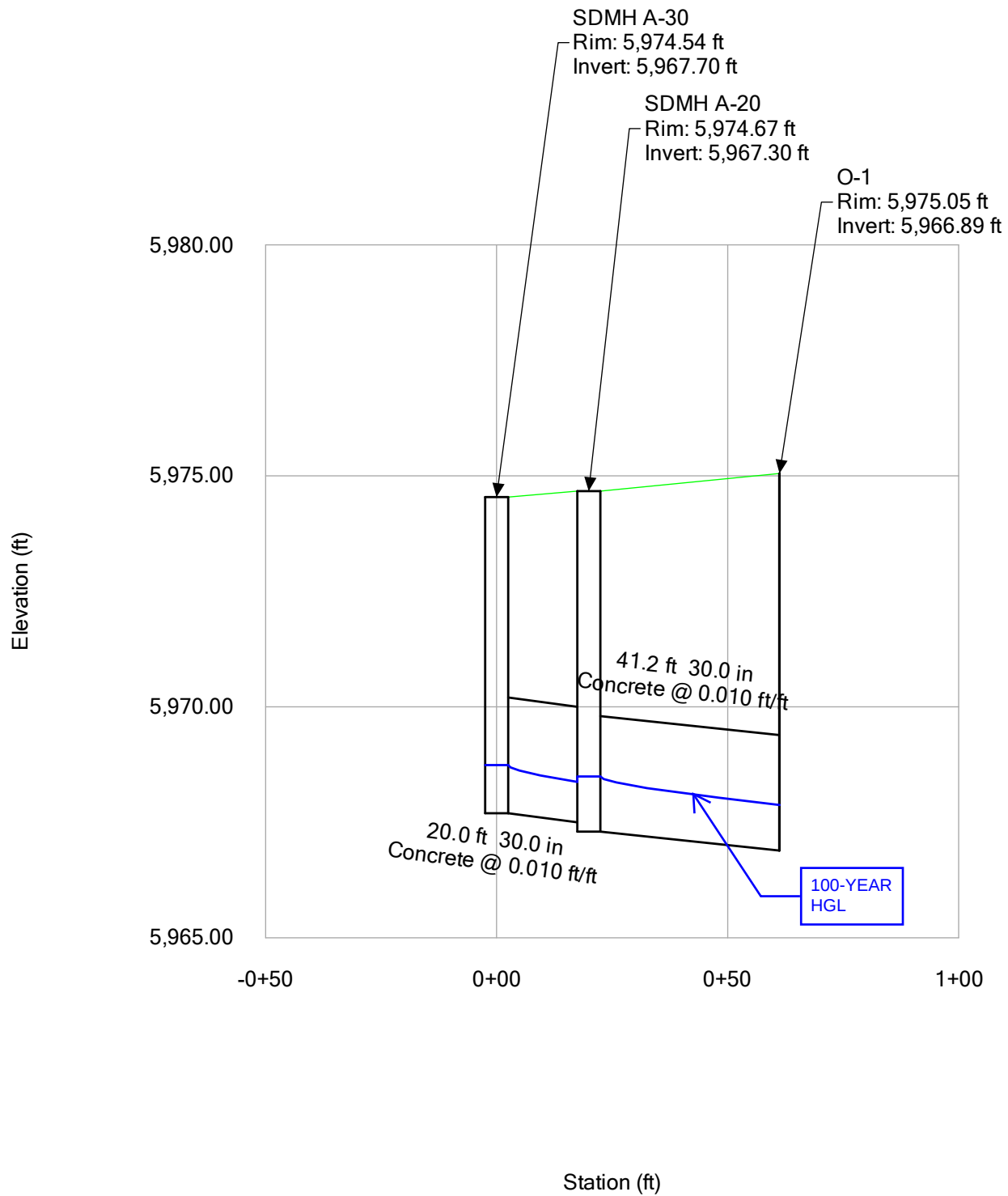
Scenario 100-Year
FlexTable Manhole

Label	Elevation (Rim) (ft)	Elevation (Invert Out) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (Out) (ft)	System Flow Time (min)	Notes
SDCO A-25	5,975.98	5,970.30	2.73	5,971.38	5,972.33	0	CLEANOUT
SDCO A-24	5,975.92	5,969.83	2.73	5,970.54	5,970.87	0.04	CLEANOUT
SDCO A-22A	5,975.95	5,970.48	0	5,970.48	5,970.48	0	CLEANOUT
SDCO A-23	5,975.46	5,969.68	2.73	5,970.39	5,970.72	0.099	CLEANOUT
SDCO A-22	5,975.39	5,969.58	2.73	5,970.29	5,970.62	0.138	CLEANOUT
SDCO A-21	5,975.25	5,969.42	2.73	5,970.13	5,970.46	0.207	CLEANOUT
SD INLET A-31	5,974.30	5,968.90	9.95	5,970.12	5,970.77	0	DOUBLE TYPE 16 COMBO
SDMH A-30	5,974.54	5,967.70	9.95	5,968.75	5,969.15	0.05	5' DIA.
SDMH A-20	5,974.67	5,967.30	12.68	5,968.50	5,968.96	0.374	5' DIA.

Scenario 5-Year
FlexTable Manhole

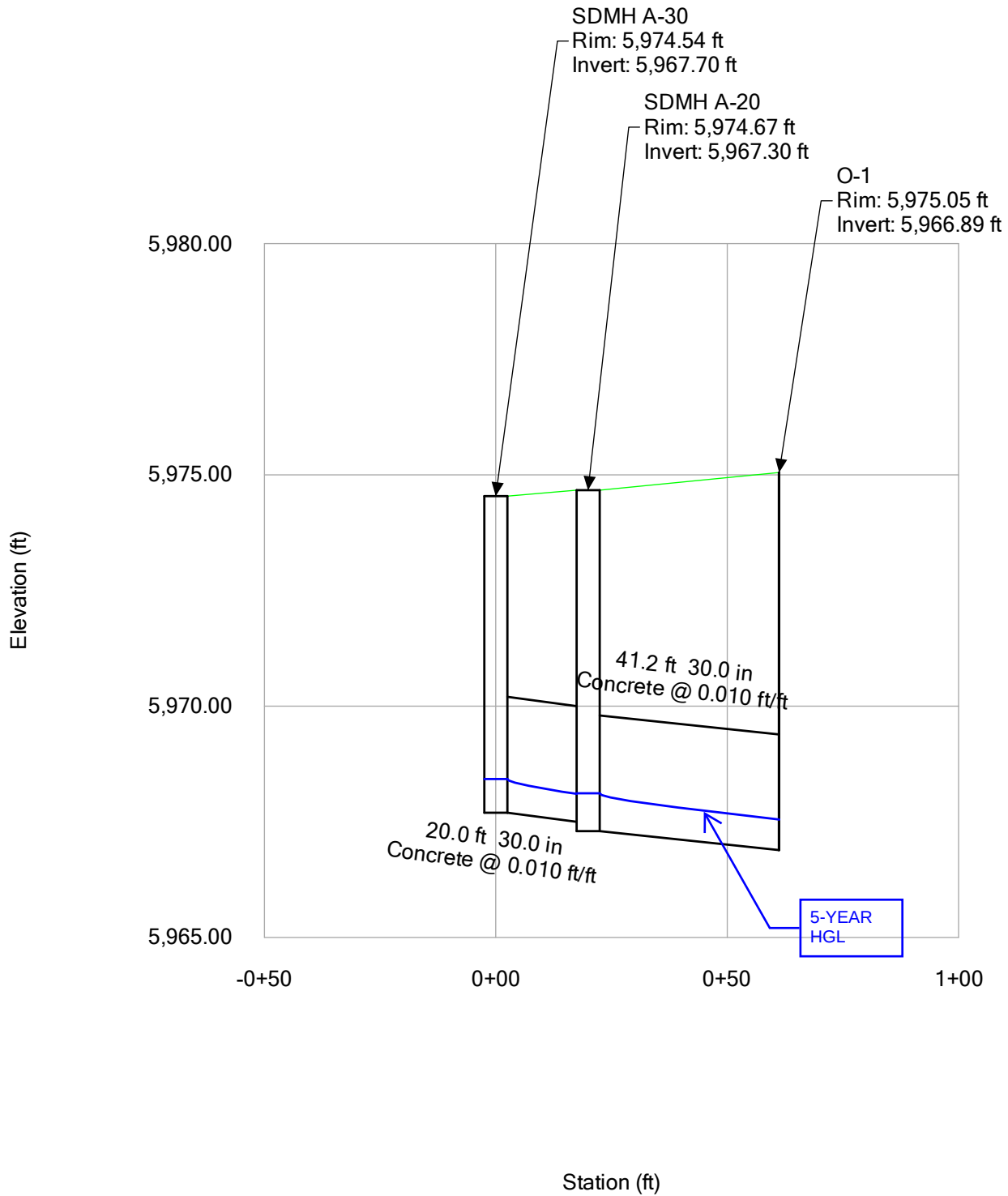
Label	Elevation (Rim) (ft)	Elevation (Invert Out) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (Out) (ft)	System Flow Time (min)	Notes
SDCO A-25	5,975.98	5,970.30	1.34	5,970.85	5,971.14	0	CLEANOUT
SDCO A-24	5,975.92	5,969.83	1.34	5,970.32	5,970.51	0.07	CLEANOUT
SDCO A-22A	5,975.95	5,970.48	0	5,970.48	5,970.48	0	CLEANOUT
SDCO A-23	5,975.46	5,969.68	1.34	5,970.17	5,970.36	0.14	CLEANOUT
SDCO A-22	5,975.39	5,969.58	1.34	5,970.07	5,970.26	0.187	CLEANOUT
SDCO A-21	5,975.25	5,969.42	1.34	5,969.91	5,970.10	0.27	CLEANOUT
SD INLET A-31	5,974.30	5,968.90	4.78	5,969.74	5,970.08	0	DOUBLE TYPE 16 COMBO
SDMH A-30	5,974.54	5,967.70	4.78	5,968.42	5,968.68	0.058	5' DIA.
SDMH A-20	5,974.67	5,967.30	6.12	5,968.12	5,968.42	0.469	5' DIA.

Profile Report **Engineering Profile - STORM LINE A (100-YEAR) FUTURE**

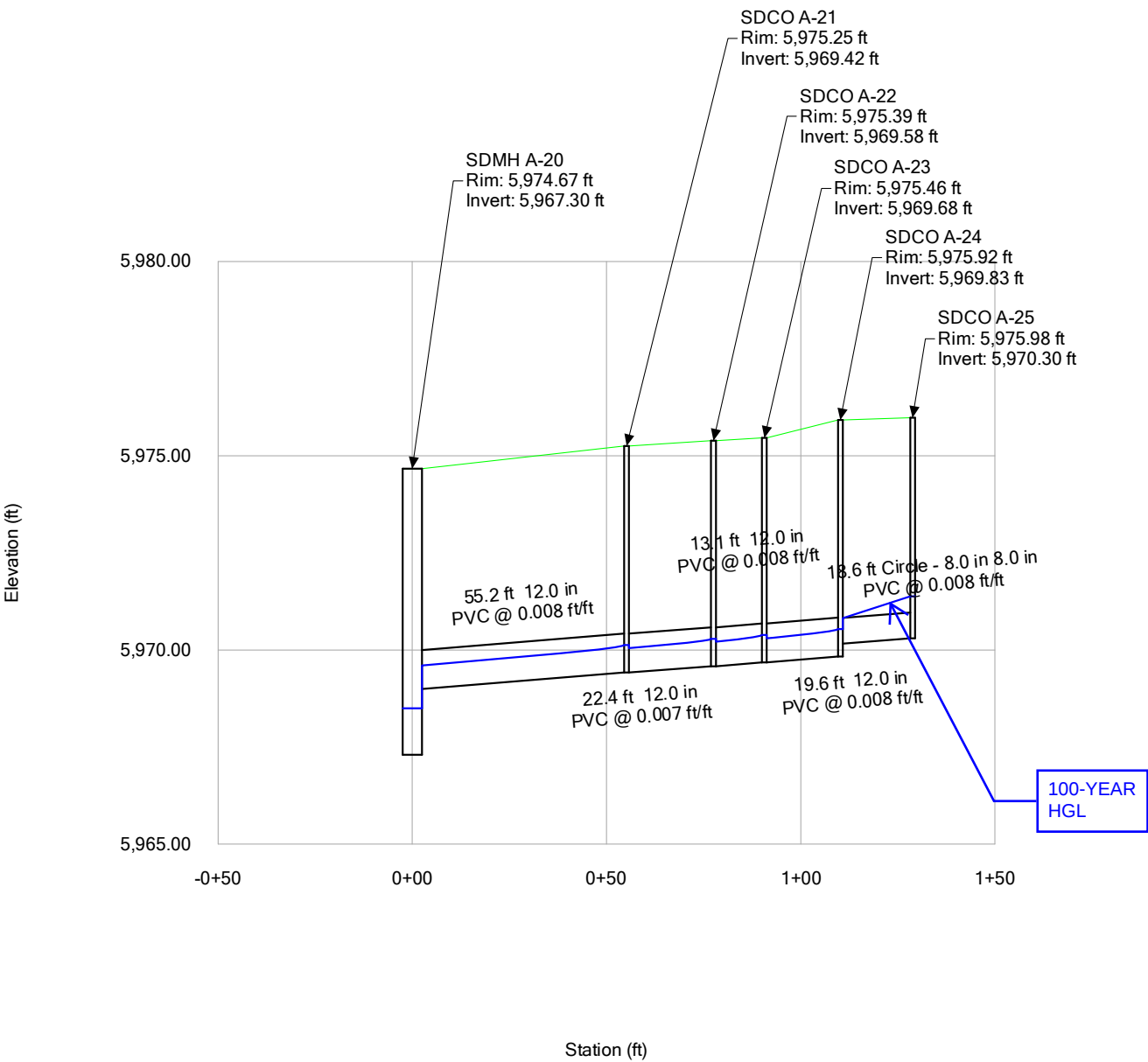


Profile Report

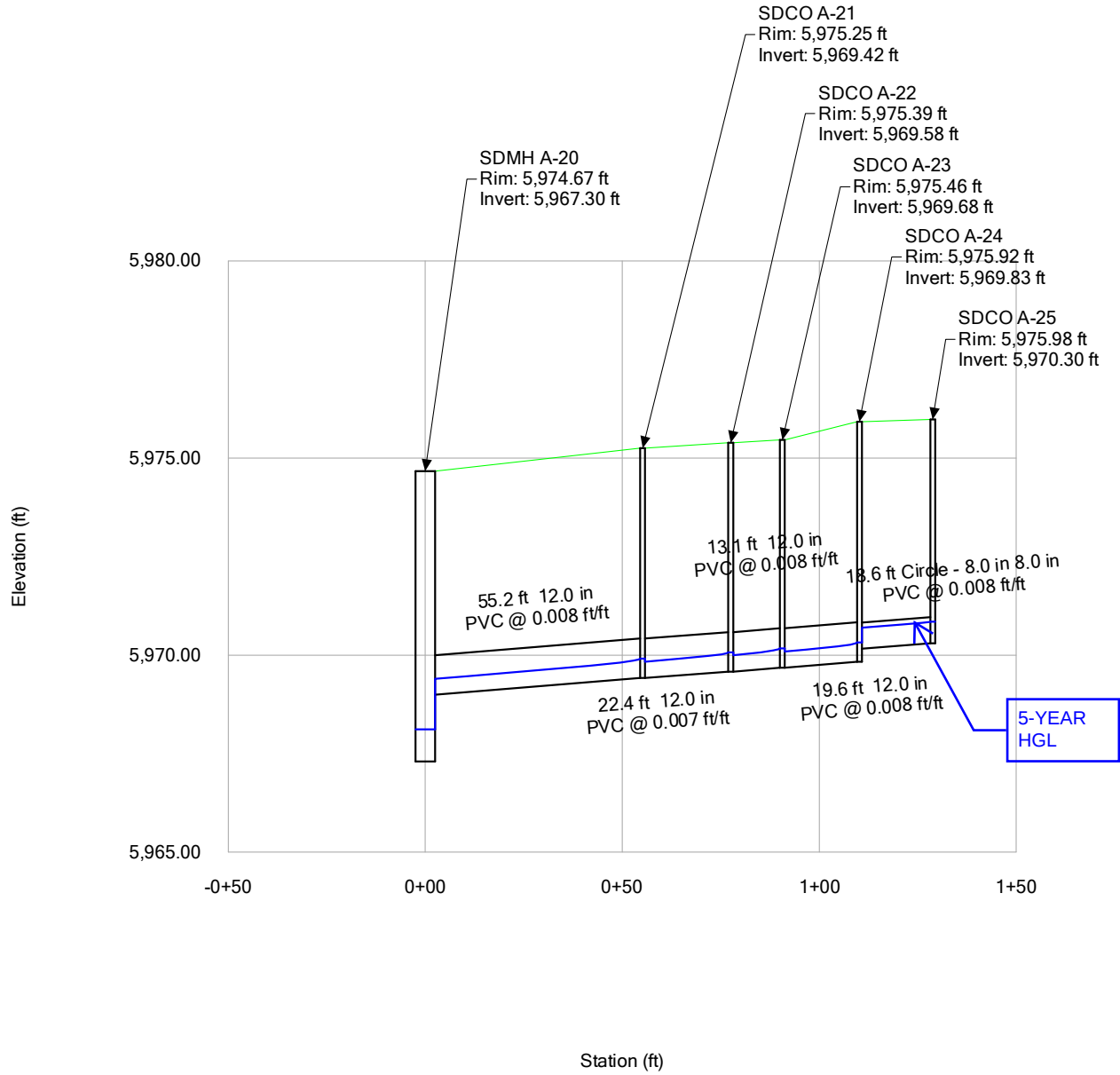
Engineering Profile - STORM LINE A (5-YEAR) FUTURE



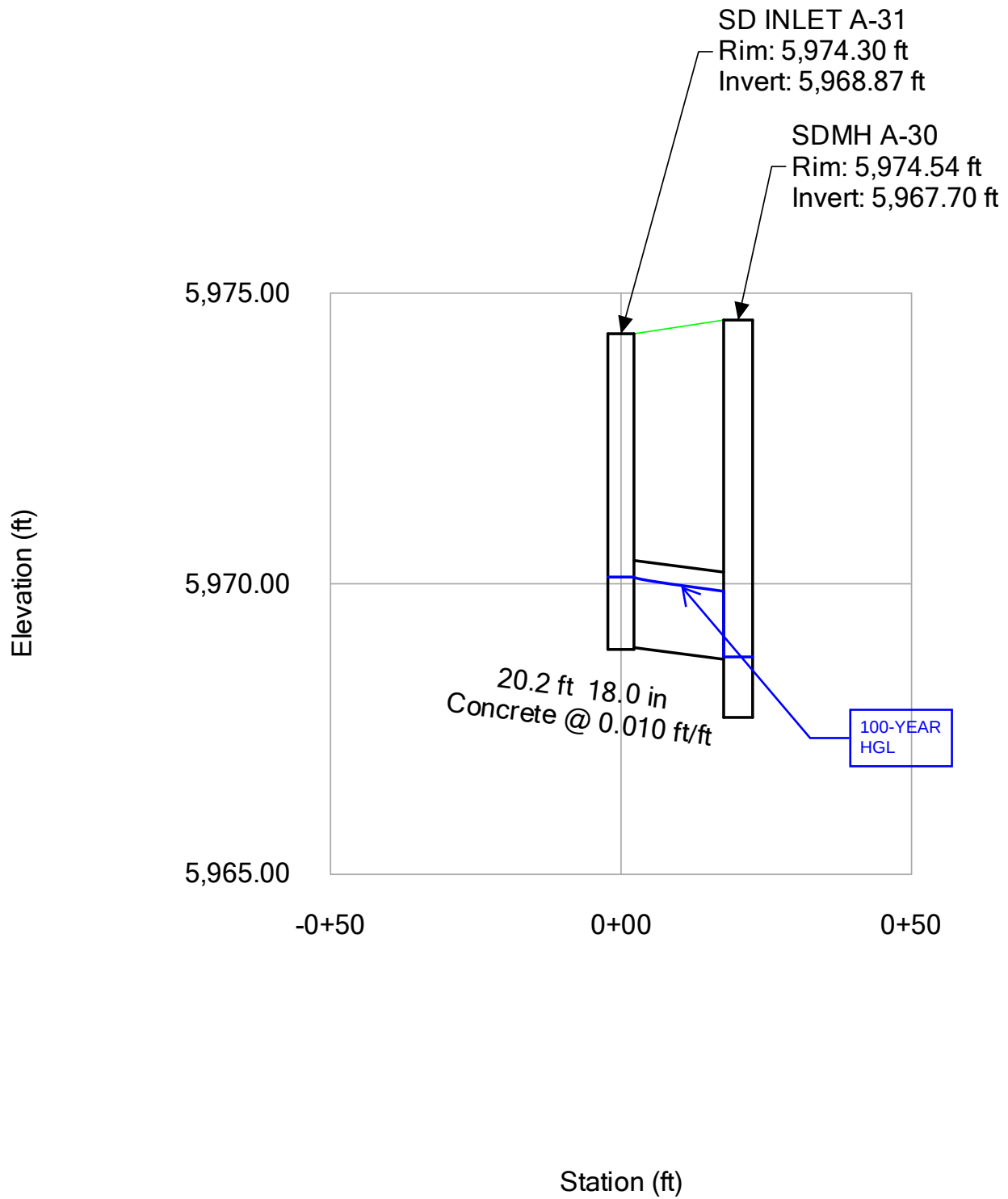
Profile Report
Engineering Profile - STORM LINE A-20 (100-YEAR) FUTURE



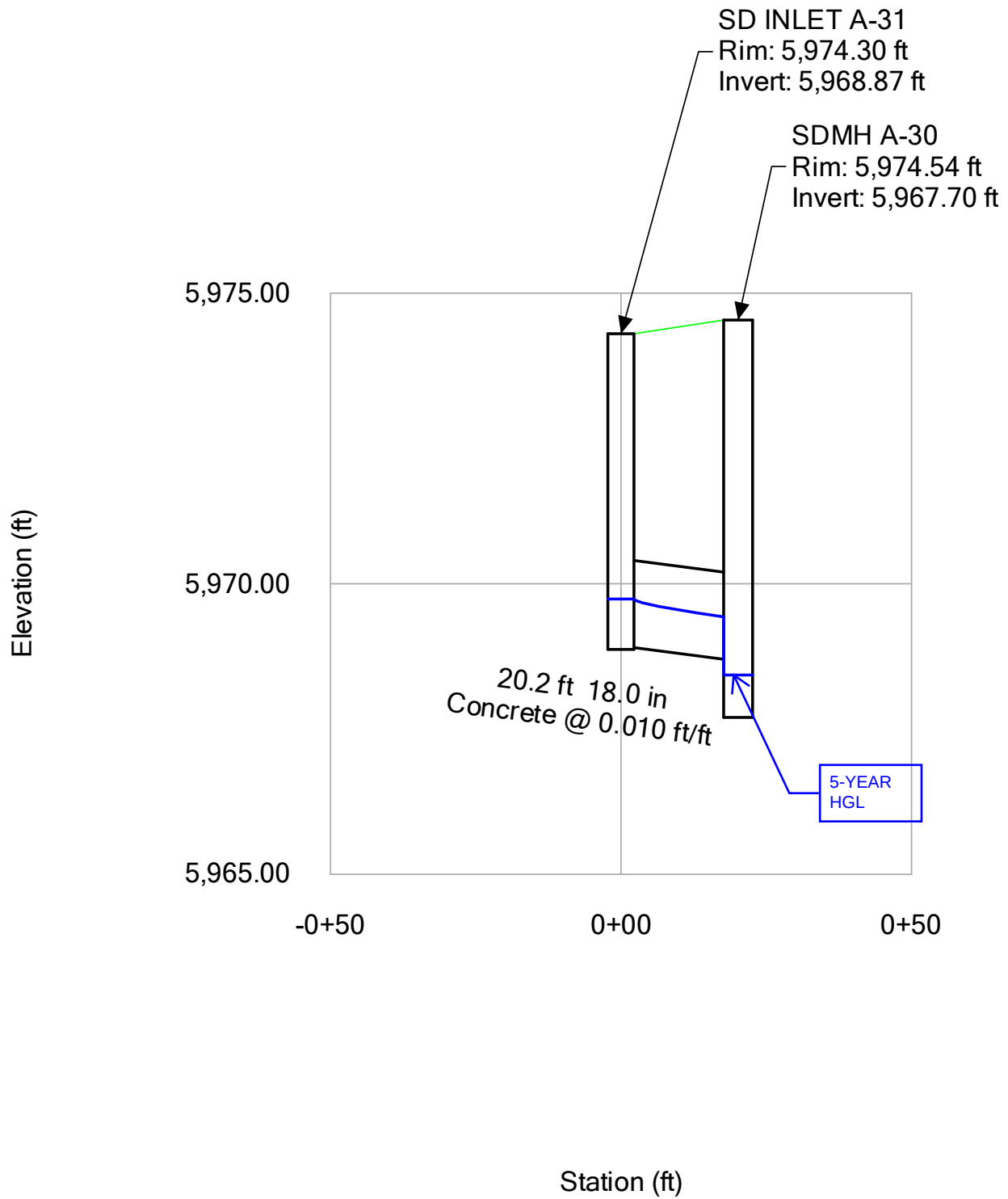
Profile Report **Engineering Profile - STORM LINE A-20 (5-YEAR) FUTURE**



Profile Report
Engineering Profile - STORM LINE A-30 (100-YEAR) FUTURE



Profile Report **Engineering Profile - STORM LINE A-30 (5-YEAR) FUTURE**



Scenario 100-Year
FlexTable Conduit

(100-YEAR) FUTURE

Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Material
SDMH A-20	O-1	5967.3	5966.89	41.2	0.01	30	12.68	7.35	40.9	Concrete
SDCO A-25	SDCO A-24	5970.3	5970.16	18.6	0.008	8	2.73	7.82	1.36	PVC
SDCO A-24	SDCO A-23	5969.83	5969.68	19.6	0.008	12	2.73	5.54	4.05	PVC
SDCO A-22A	SDCO A-22	5970.48	5970.25	23.1	0.01	4	0	0	0.25	PVC
SDCO A-23	SDCO A-22	5969.68	5969.58	13.1	0.008	12	2.73	5.53	4.04	PVC
SDCO A-22	SDCO A-21	5969.58	5969.42	22.4	0.007	12	2.73	5.39	3.92	PVC
SDCO A-21	SDMH A-20	5969.42	5969	55.2	0.008	12	2.73	5.52	4.04	PVC
SD INLET A-31	SDMH A-30	5968.9	5968.7	20.2	0.01	18	9.95	6.74	10.46	Concrete
SDMH A-30	SDMH A-20	5967.7	5967.5	20	0.01	30	9.69	6.84	41.07	Concrete

Scenario
FlexTable

5-Year
Conduit

(5-YEAR) FUTURE

Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Material
SDMH A-20	O-1	5967.3	5966.89	41.2	0.01	30	6.12	5.99	40.9	Concrete
SDCO A-25	SDCO A-24	5970.3	5970.16	18.6	0.008	8	1.34	4.45	1.36	PVC
SDCO A-24	SDCO A-23	5969.83	5969.68	19.6	0.008	12	1.34	4.63	4.05	PVC
SDCO A-22A	SDCO A-22	5970.48	5970.25	23.1	0.01	4	0	0	0.25	PVC
SDCO A-23	SDCO A-22	5969.68	5969.58	13.1	0.008	12	1.34	4.62	4.04	PVC
SDCO A-22	SDCO A-21	5969.58	5969.42	22.4	0.007	12	1.34	4.52	3.92	PVC
SDCO A-21	SDMH A-20	5969.42	5969	55.2	0.008	12	1.34	4.62	4.04	PVC
SD INLET A-31	SDMH A-30	5968.9	5968.7	20.2	0.01	18	4.78	5.79	10.46	Concrete
SDMH A-30	SDMH A-20	5967.7	5967.5	20	0.01	30	4.88	5.62	41.07	Concrete

Scenario 100-Year
FlexTable Manhole

(100-YEAR) FUTURE

Label	Elevation (Rim) (ft)	Elevation (Invert Out) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (Out) (ft)	System Flow Time (min)	Notes
SDCO A-25	5975.98	5970.3	2.73	5971.38	5972.33	0	CLEANOUT
SDCO A-24	5975.92	5969.83	2.73	5970.54	5970.87	0.04	CLEANOUT
SDCO A-22A	5975.95	5970.48	0	5970.48	5970.48	0	CLEANOUT
SDCO A-23	5975.46	5969.68	2.73	5970.39	5970.72	0.099	CLEANOUT
SDCO A-22	5975.39	5969.58	2.73	5970.29	5970.62	0.138	CLEANOUT
SDCO A-21	5975.25	5969.42	2.73	5970.13	5970.46	0.207	CLEANOUT
SD INLET A-31	5974.3	5968.9	9.95	5970.12	5970.77	0	DOUBLE TYPE 16 COMBO
SDMH A-30	5974.54	5967.7	9.69	5968.74	5969.13	0.05	5' DIA.
SDMH A-20	5974.67	5967.3	12.68	5968.5	5968.96	0.374	5' DIA.

Scenario
FlexTable

5-Year
Manhole

(5-YEAR) FUTURE

Label	Elevation (Rim) (ft)	Elevation (Invert Out) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (Out) (ft)	System Flow Time (min)	Notes
SDCO A-25	5975.98	5970.3	1.34	5970.85	5971.14	0	CLEANOUT
SDCO A-24	5975.92	5969.83	1.34	5970.32	5970.51	0.07	CLEANOUT
SDCO A-22A	5975.95	5970.48	0	5970.48	5970.48	0	CLEANOUT
SDCO A-23	5975.46	5969.68	1.34	5970.17	5970.36	0.14	CLEANOUT
SDCO A-22	5975.39	5969.58	1.34	5970.07	5970.26	0.187	CLEANOUT
SDCO A-21	5975.25	5969.42	1.34	5969.91	5970.1	0.27	CLEANOUT
SD INLET A-31	5974.3	5968.9	4.78	5969.74	5970.08	0	DOUBLE TYPE 16 COMBO
SDMH A-30	5974.54	5967.7	4.88	5968.43	5968.69	0.058	5' DIA.
SDMH A-20	5974.67	5967.3	6.12	5968.12	5968.42	0.469	5' DIA.

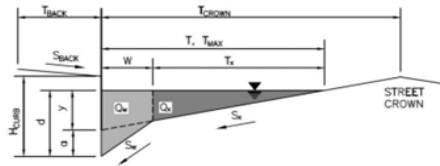
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project:

Inlet ID: SD Inlet A-31



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
 $S_{BACK} = 0.020$ ft/ft
 $n_{BACK} = 0.016$

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 26.0$ ft
 $W = 2.00$ ft
 $S_x = 0.010$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_o = 0.000$ ft/ft
 $n_{STREET} = 0.016$

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

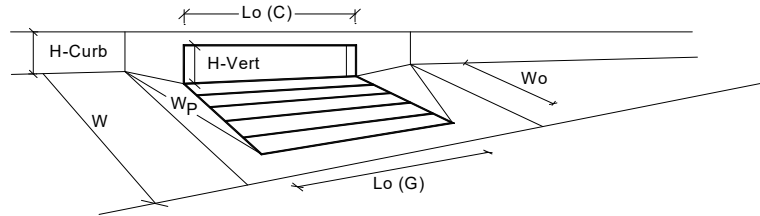
Minor Storm Major Storm
 $T_{MAX} = 26.0$ ft
 $d_{MAX} = 6.0$ inches
☐ ☐

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

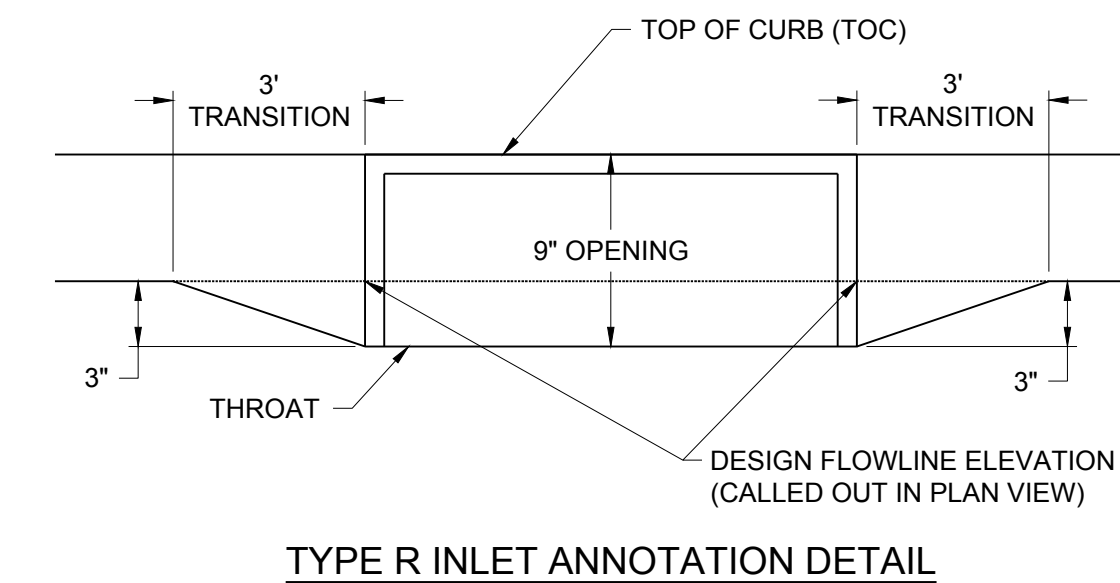
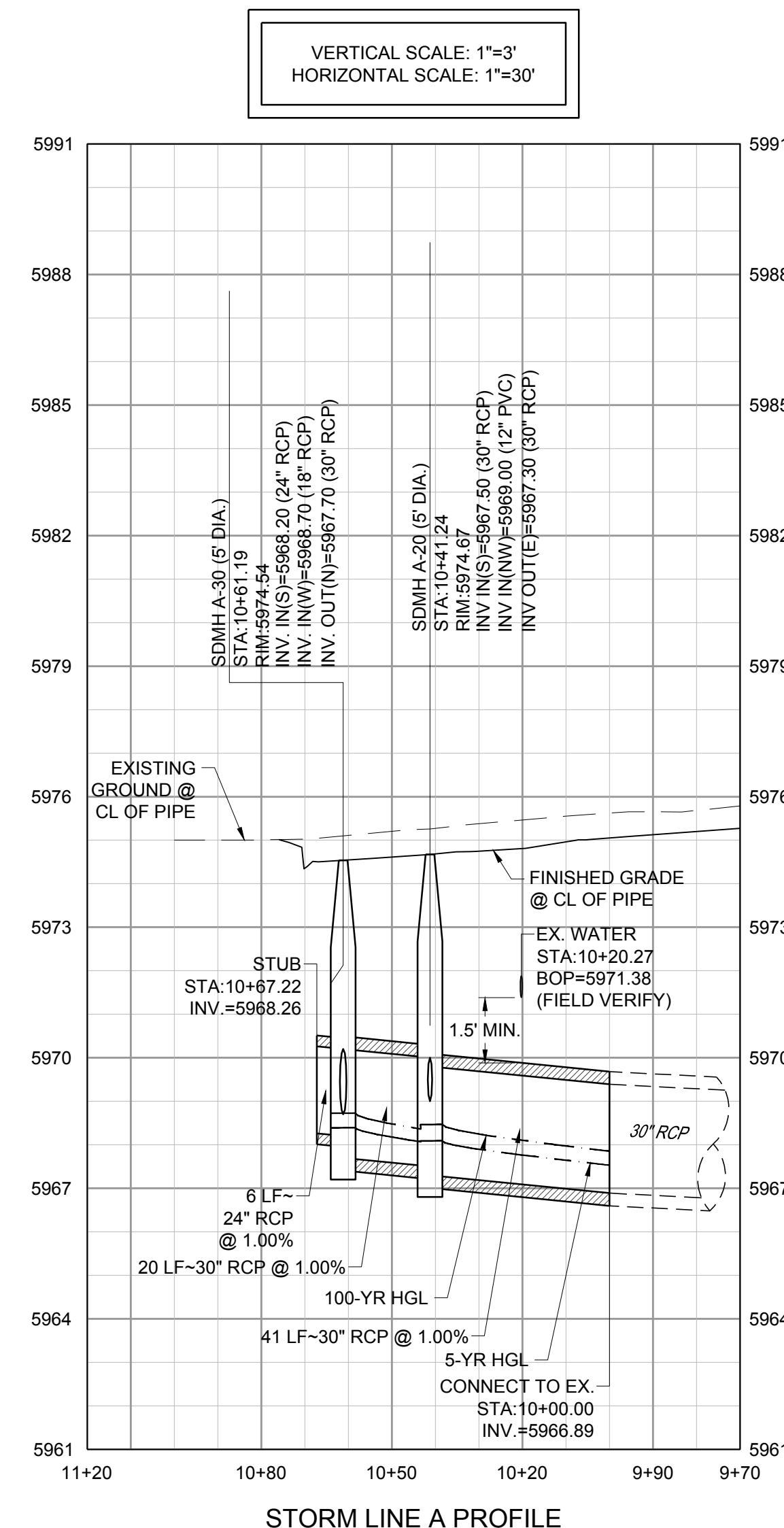
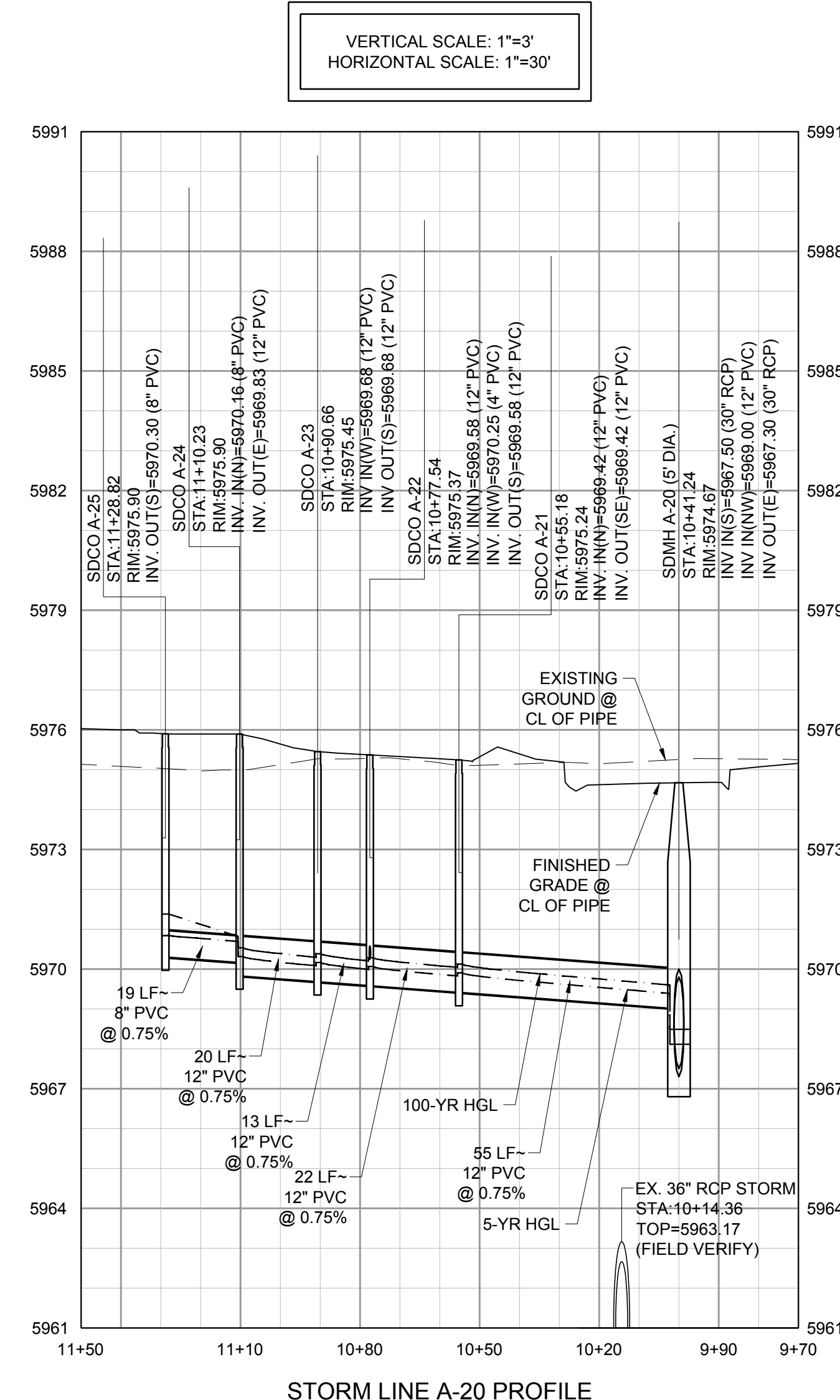
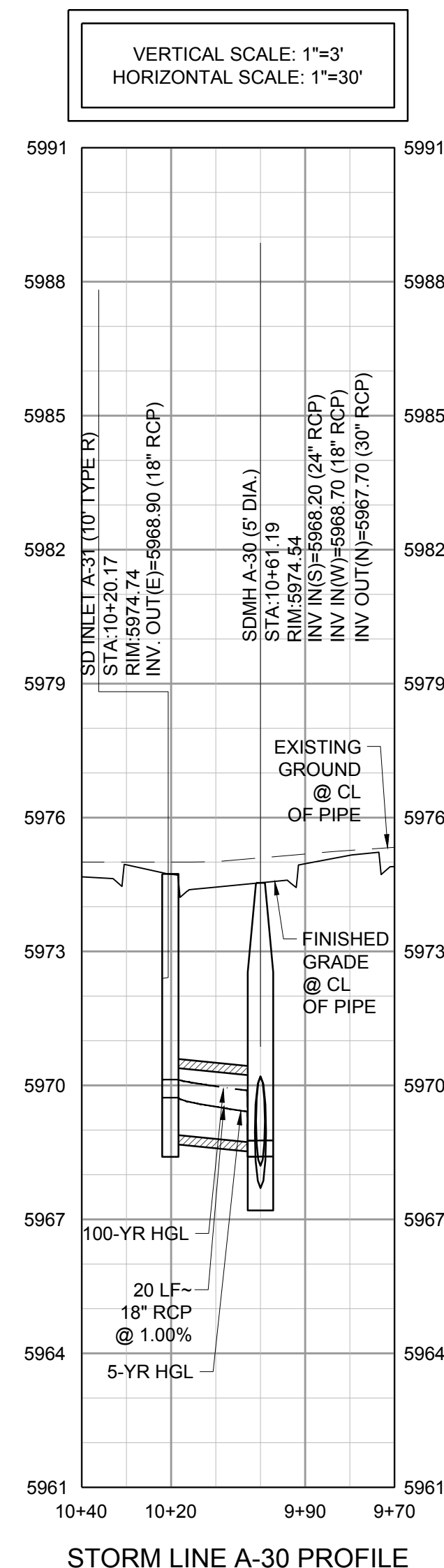
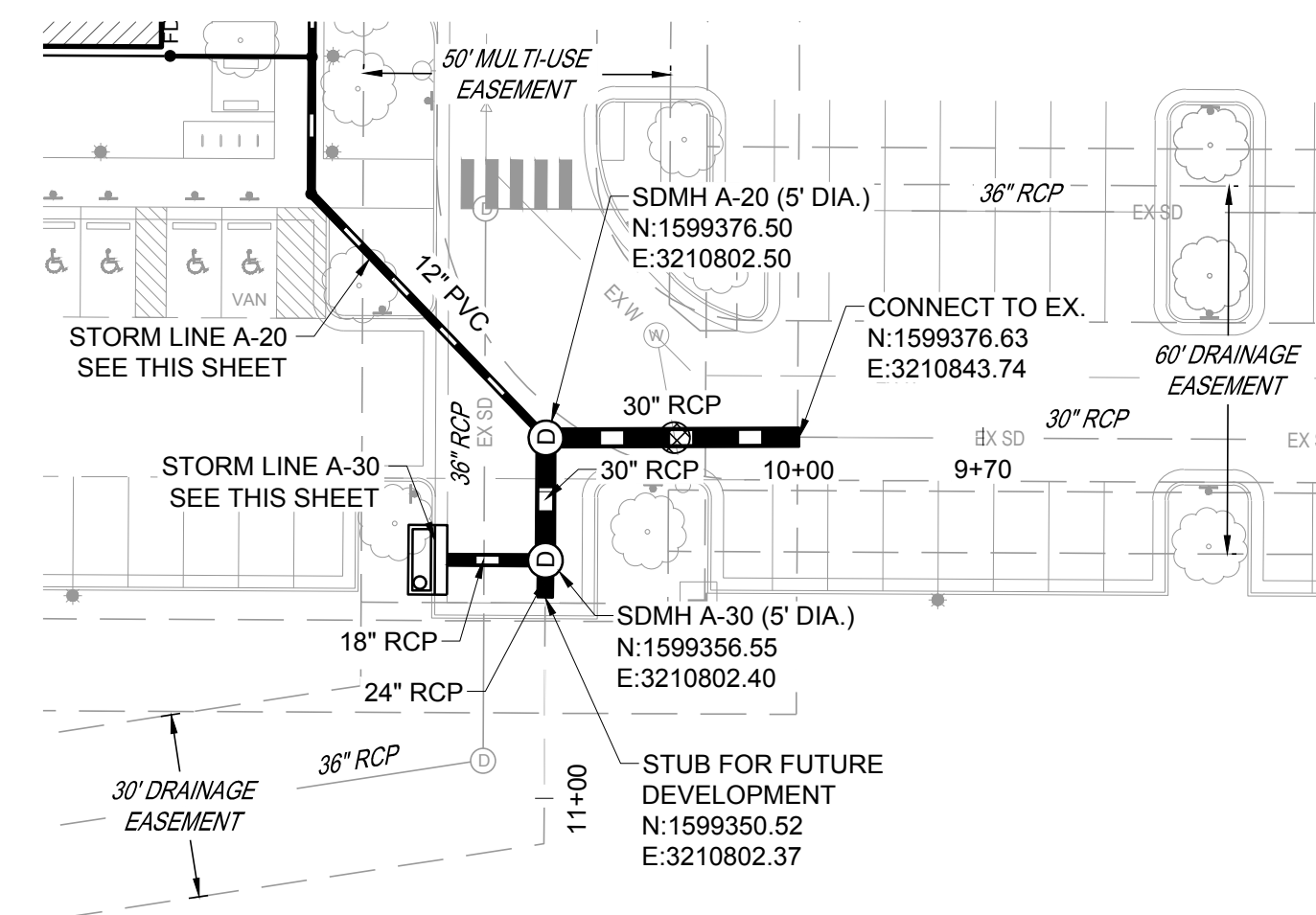
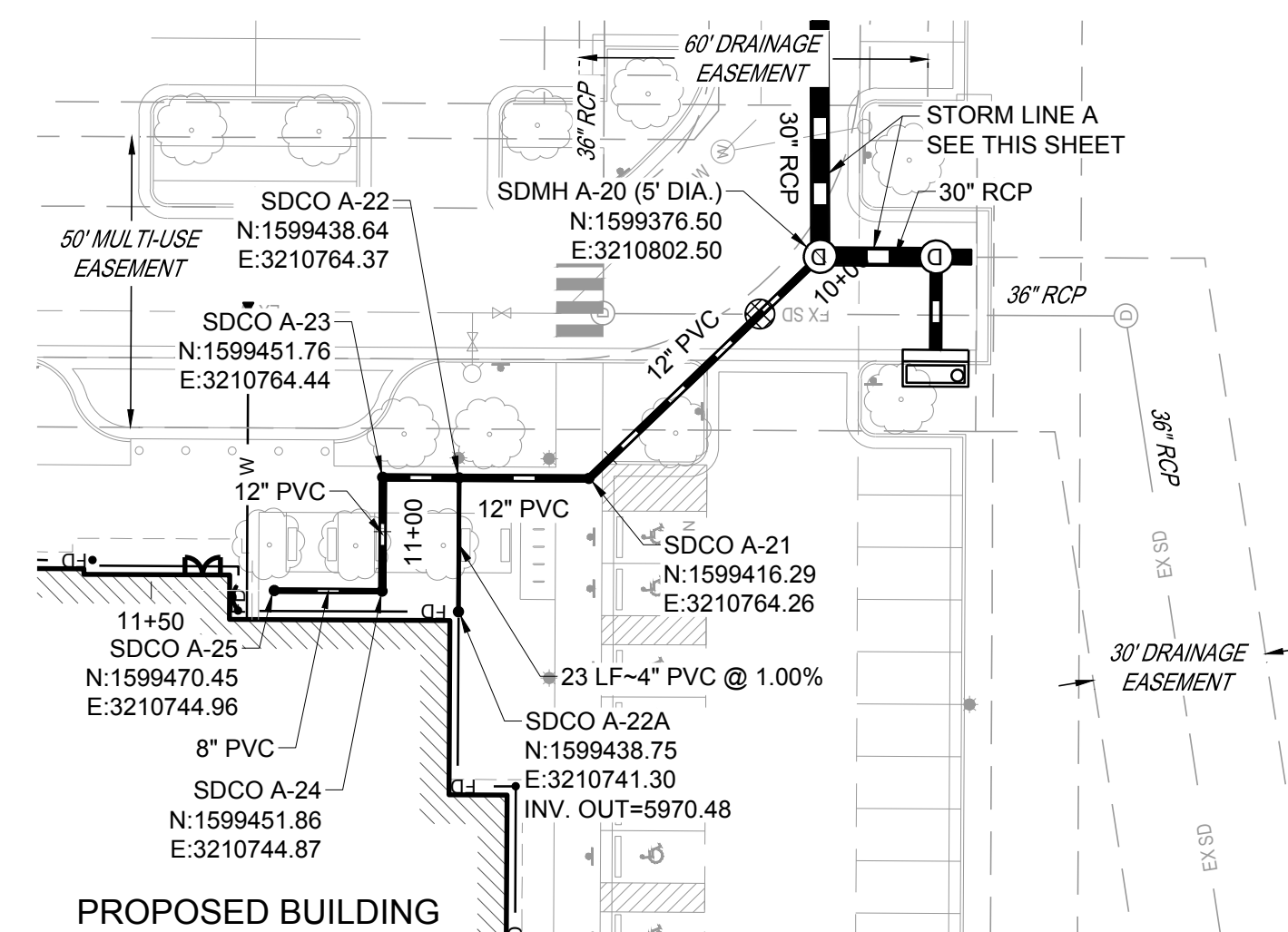
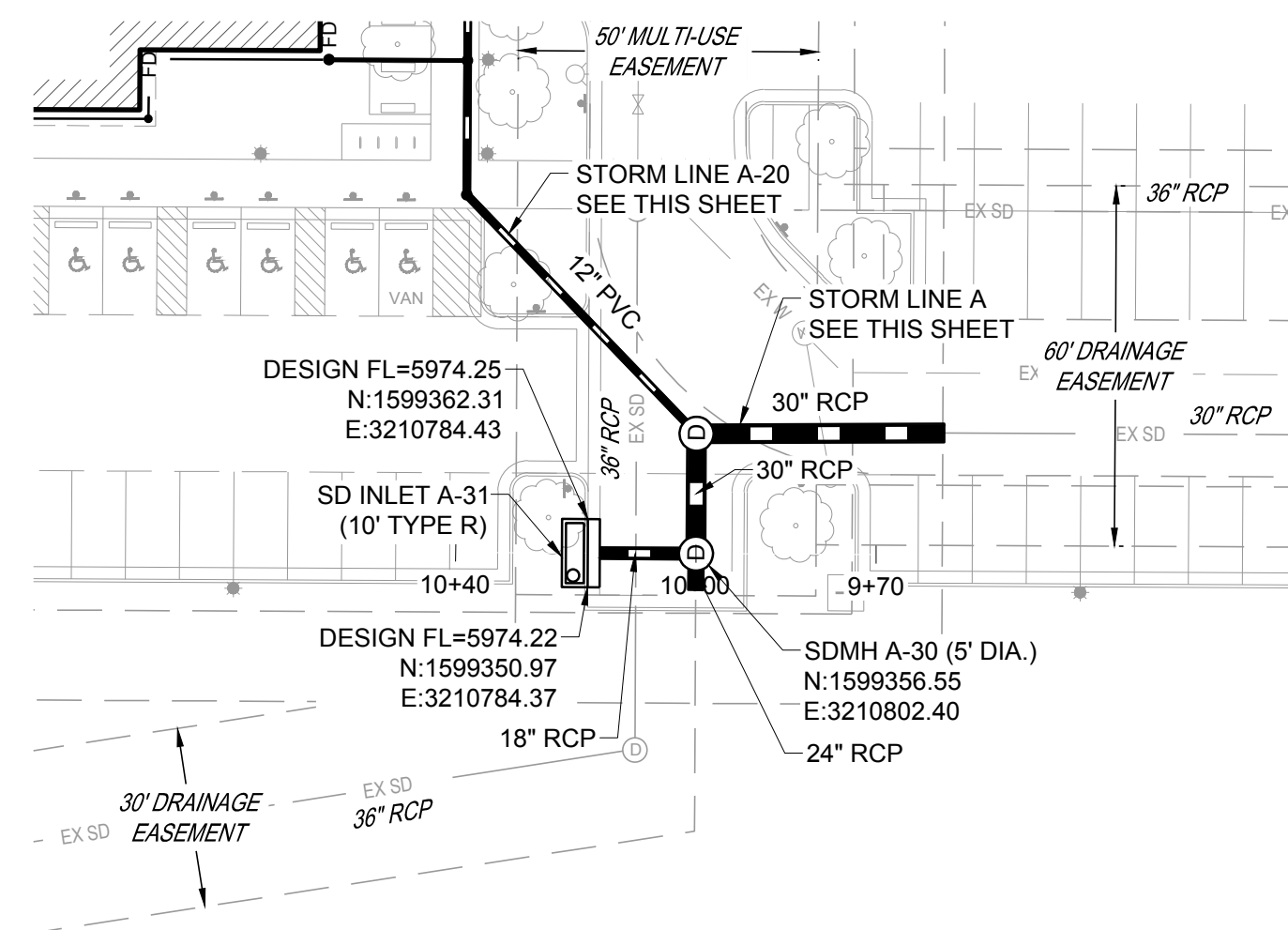
Minor Storm Major Storm
 $Q_{allow} = \text{SUMP}$ SUMP cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	Denver No. 16 Combination				
Local Depression (additional to continuous gutter depression 'a' from above)					
Number of Unit Inlets (Grate or Curb Opening)					
Water Depth at Flowline (outside of local depression)					
Grate Information					
Length of a Unit Grate					
Width of a Unit Grate					
Open Area Ratio for a Grate (typical values 0.15-0.90)					
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)					
Grate Weir Coefficient (typical value 2.15 - 3.60)					
Grate Orifice Coefficient (typical value 0.60 - 0.80)					
Curb Opening Information					
Length of a Unit Curb Opening					
Height of Vertical Curb Opening in Inches					
Height of Curb Orifice Throat in Inches					
Angle of Throat (see USDCM Figure ST-5)					
Side Width for Depression Pan (typically the gutter width of 2 feet)					
Clogging Factor for a Single Curb Opening (typical value 0.10)					
Curb Opening Weir Coefficient (typical value 2.3-3.7)					
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)					
Low Head Performance Reduction (Calculated)					
Depth for Grate Midwidth					
Depth for Curb Opening Weir Equation					
Grated Inlet Performance Reduction Factor for Long Inlets					
Curb Opening Performance Reduction Factor for Long Inlets					
Combination Inlet Performance Reduction Factor for Long Inlets					
Total Inlet Interception Capacity (assumes clogged condition)					
WARNING: Inlet Capacity < Q Peak for Minor and Major Storms					
		MINOR		MAJOR	
Type =	Denver No. 16 Combination				
a _{local} =	2.00	2.00		inches	
No =	2	2			
Ponding Depth =	4.9	4.9		inches	
		MINOR		MAJOR	
L _o (G) =	3.00	3.00		feet	
W _o =	1.73	1.73		feet	
A _{ratio} =	0.31	0.31			
C _r (G) =	0.50	0.50			
C _w (G) =	3.60	3.60			
C _o (G) =	0.60	0.60			
		MINOR		MAJOR	
L _o (C) =	3.00	3.00		feet	
H _{vert} =	6.50	6.50		inches	
H _{throat} =	5.25	5.25		inches	
Theta =	0.00	0.00		degrees	
W _p =	2.00	2.00		feet	
C _r (C) =	0.10	0.10			
C _w (C) =	3.70	3.70			
C _o (C) =	0.66	0.66			
		MINOR		MAJOR	
d _{Grate} =	0.43	0.43		ft	
d _{Curb} =	0.24	0.24		ft	
RF _{Grate} =	0.57	0.57			
RF _{Curb} =	N/A	N/A			
RF _{Combination} =	0.57	0.57			
		MINOR		MAJOR	
Q _a =	4.2	4.2		cfs	
Q _{PEAK REQUIRED} =	4.78	9.95		cfs	



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Town of Parker, Director of Engineering/Public Works

Date _____



S.A. MIRO INC.
CONSULTING ENGINEERS
4582 South Ulster Street
Suite 750, Denver, CO 80237
303-741-3737
www.samiro.com



Know what's **below**.
Call before you dig.

[illegible]

**PARKER NHC
PARKER, CO 80134**

STORM PLAN AND PROFILES

PROJECT:

DRAWING TITLE:

FILE PATH: C:\Users\FKFIACCDOCS\S. A. Miro, Inc\Civil\Jobs\22057 Parker NHC\05 CAD\Plans and Details\C331-STRM-PROF.dwg C331 - 10/22/2023

DESIGNED BY:	SSM
DRAWN BY:	SSM
CHECKED BY:	JDC
MIRO JOB NO.	22057
DRAWING NUMBER:	

C-331



BA
BOULDER ASSOCIATES

1426 PEARL STREET, SUITE 300
BOULDER, COLORADO 80302
303.499.7795



S.A. MIRO INC.
CONSULTING ENGINEERS
4582 South Ulster Street
Suite 750, Denver, CO 80237
303-741-3737
www.samiro.com

PROJECT	225280.00
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PARKER NHC

PARKER POINTE SUBDIVISION LOT
7,8,9,10, PARKER, CO 80134

**DESIGN DEVELOPMENT-
NOT FOR CONSTR.**

DATE 08/04/2023

REVISIONS

	DESCRIPTION	DATE
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SHEET TITLE

**STORM PLAN AND
PROFILES**

SHEET NUMBER

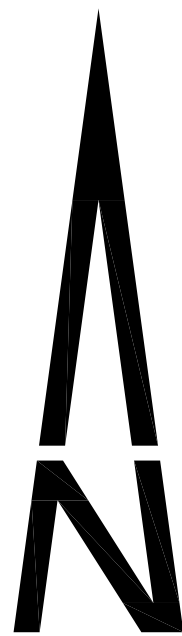
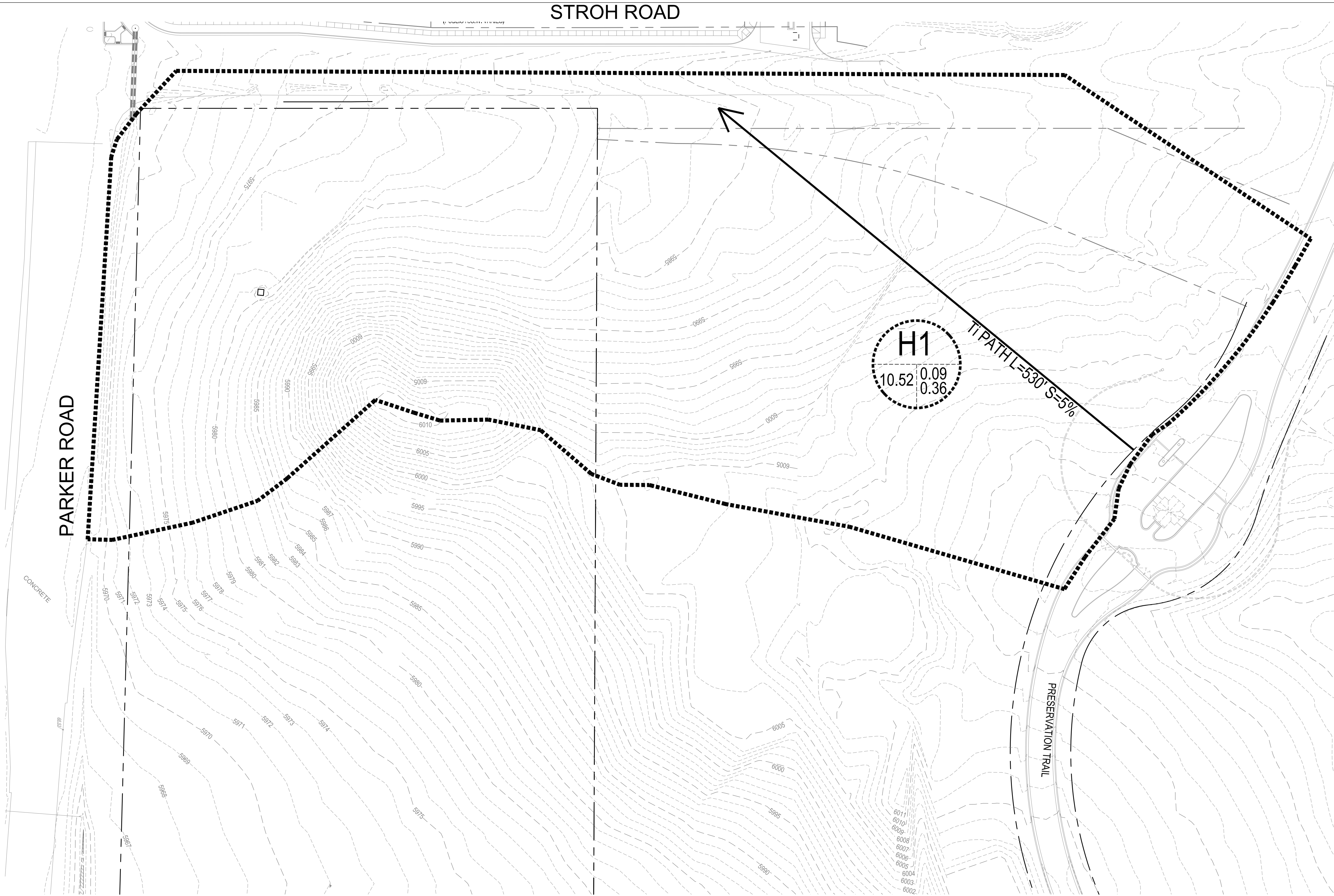
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Appendix D
DRAINAGE REPORTS AND PLANS

Master Drainage Plan

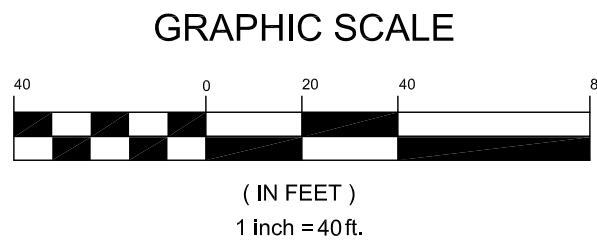
Proposed Drainage Plan

I:\PDG-NAS\PUBLIC\PROJECTS\2015-015 PARKER AND STROH\DWG\2015-015 DRAINAGE MAP.DWG 11/28/2018 10:26 AM



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)



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TOWN OF PARKER, DIRECTOR OF ENGINEERING

DATE

HISTORIC DRAINAGE PLAN

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

date: 10/01/17

SHEET

DP1

LOTS 1 THRU 15 AND TRACTS A AND B, PARKER POINTE
SOUTHEAST CORNER PARKER ROAD AND STROH ROAD
PARKER, COLORADO

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

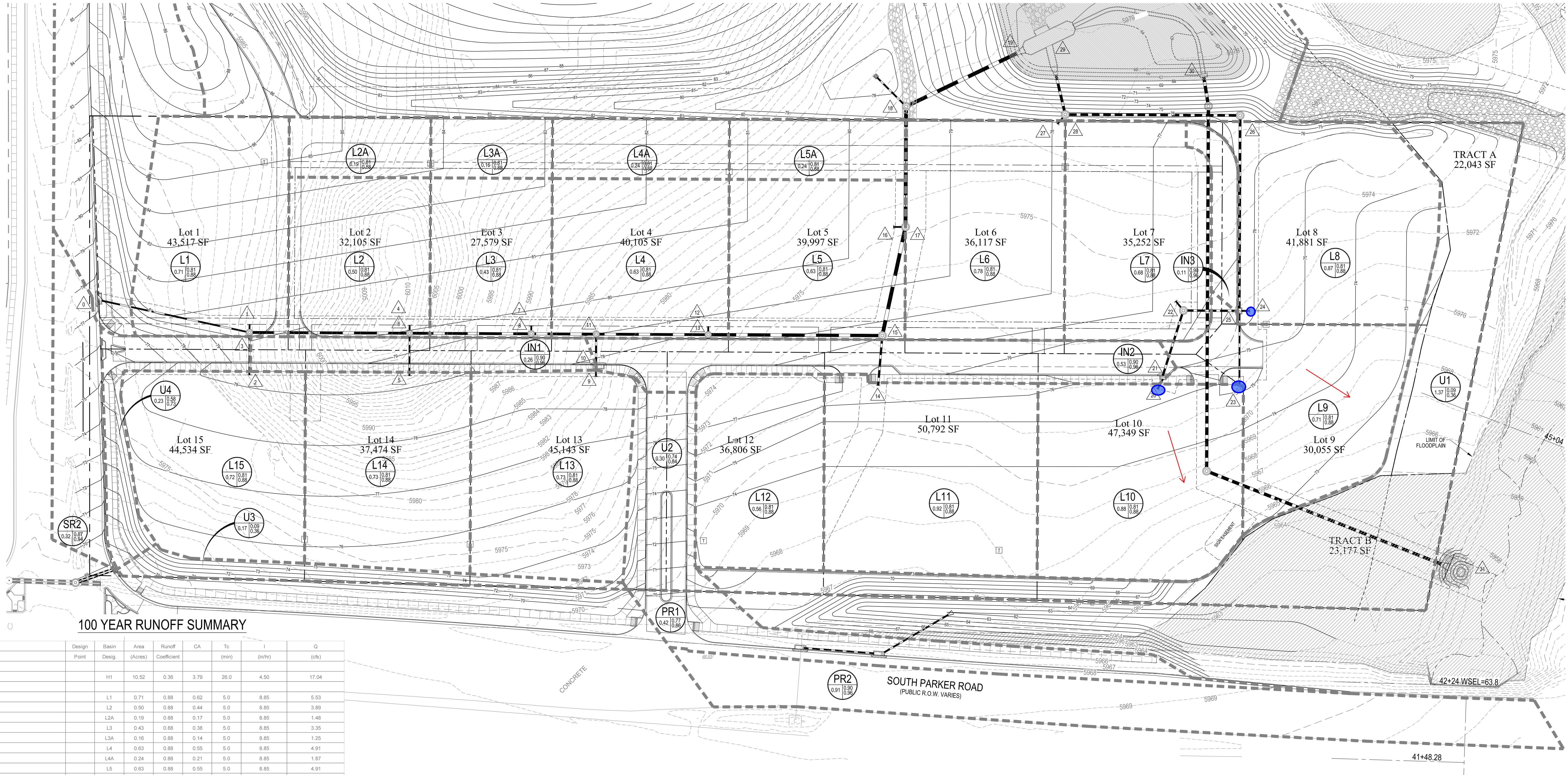
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08/31/18	FOURTH SUBMITTAL	
05/25/18	THIRD SUBMITTAL	
03/19/18	PWSD SUBMITTAL	
02/28/18	SECOND SUBMITTAL	
10/24/17	INITIAL SUBMITTAL	

REVISIONS

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STROH ROAD

SEE SHEET DP3



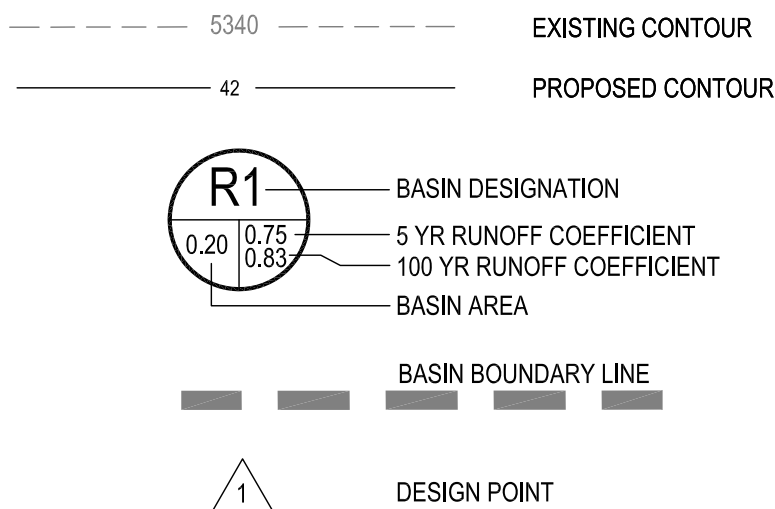
100 YEAR RUNOFF SUMMARY

Design Point	Basin Design.	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	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							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	0.78	
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	

DETENTION SUMMARY

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

LEGEND



BENCHMARK

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ELEVATION: 5970.79 FEET (NAVD 1988 DATUM)

DRAINAGE PLAN WEST

LOT 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	
08/21/18	FOURTH SUBMITTAL	
05/25/18	THIRD SUBMITTAL	
03/19/18	PWSD SUBMITTAL	
02/28/18	SECOND SUBMITTAL	
10/24/17	INITIAL SUBMITTAL	

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DESIGN GROUP, INC.
1801 SOUTH PIERCE STREET SUITE 315, LITTLETON, CO 80120 303.259.8888
WWW.PERCEPTIONDESIGNGROUP.COM

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TOWN OF PARKER, DIRECTOR OF ENGINEERING

DATE

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STROH ROAD

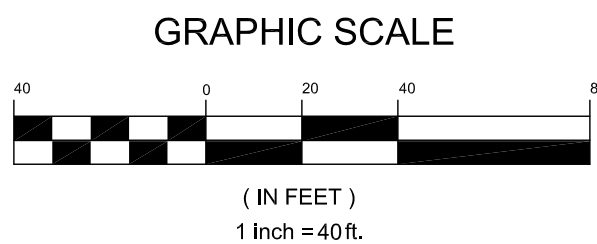
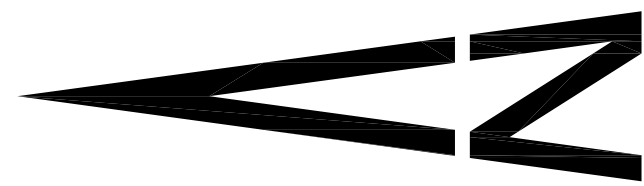
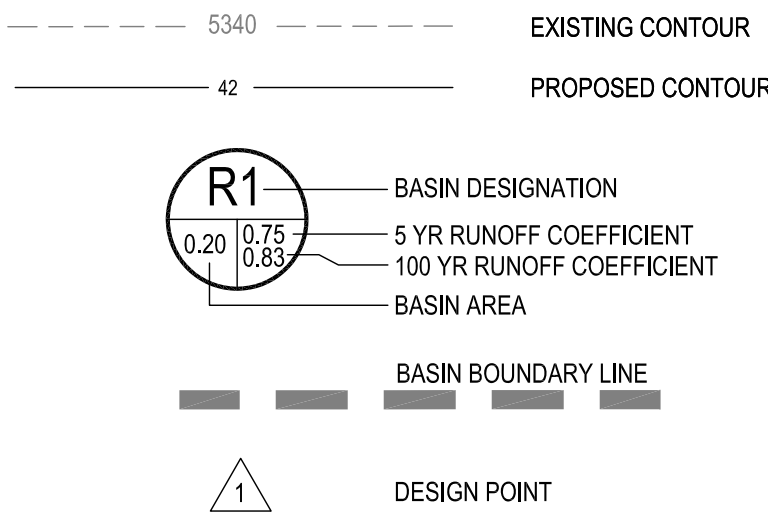
PRESERVATION TRAIL

SR1
3.51 0.18
0.42

OS1
23.34 0.13
0.39

SEE SHEET DP2

LEGEND



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)

CALL UTILITY NOTIFICATION
CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE
BEFORE YOU DIG, GRADE, OR EXCAVATE
FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES.

CAUTION: NOTICE TO CONTRACTOR THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

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TOWN OF PARKER, DIRECTOR OF ENGINEERING

DATE

DRAINAGE PLAN EAST

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

date: 10/01/17

SHEET

DP3

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

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08/31/18	FOURTH SUBMITTAL	
05/25/18	THIRD SUBMITTAL	
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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

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DESIGN GROUP, INC.
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