Final Drainage Report
for
Compark Village South Single Family

Compark Village South, Filing No.1, Amendment 3
Parker, Colorado

Prepared For:

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ENGINEER'S CERTIFICATE

This final drainage report amendment for the Compark Village South project 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.

Prepared By:

_____

Kristofer K. Wiest, P.E.
State of Colorado No. 46080
For and on Behalf of Merrick & Company

I. GENERAL LOCATION AND DESCRIPTION

A. Location

Compark Village South (CVS) Filing No. 1, Amendment 1 lies in what was previously referred to as Tract G. Compark Village South Single Family ((CVS-SF) hereinafter referred to as the "Site") is located in the South Half of Section 6, Township 6 South, Range 66 West of the Sixth Principal Meridian, Town of Parker, County of Douglas, State of Colorado, Tract A. General project boundaries include Deer Track Lane to the north, CVS Filing No. 1, Amendment 1, Tract B to the east, CVS Filing No. 1, Amendment 1, Tract K to the south, and Racoon Trail Way to the west.

B. Description of Property

The Site consists of approximately 7.686 acres and is currently undeveloped land with vegetation consisting of native grasses and shrubs. Prior to the commencement of construction activities at the Site, the Site will be mass graded per the Final Road & Storm Drainage Construction Plan for Compark South Filing No. 2, approved by the Town of Parker on February 24, 2021 and completed by Manhard Consulting LLC.. The design intent of the mass grading is for the Site to generally slope from south to north at 4-14% grades, with the steeper grades along the south side of the Site. The Site is anticipated to consist of 33 single-family lots with a private drive and utilities to serve the lots. The Site will include a paved street, curb and gutter, hardscaping, and landscaping. The proposed improvements will disturb most of the Site with excavation, grading, utility installation, hardscape, and other construction activities.

Adjacent subdivisions include Grand View Estates to the south, Stonegate to the southeast, Compark to the north and east, and Green Acres to the west. A Douglas County subdivision map has been included for reference in Appendix A.

There is a major drainage channel located south of the Site, Happy Canyon Creek, which is tributary Cherry Creek. There are also two regional detention basins, both of which are located along Belford Avenue, one to the north and one to the west.

There are two soil types on the Site as identified by the Natural Resource Conservation Service (NRCS) Web Soil Survey: Newlin Gravelly Sandy Loam, and Fondis Clay Loam. These soils are classified as hydrologic group B and C respectively. Newlin Gravelly Sandy Loam makes up the majority of the site leading to the storm pipes and inlets being sized assuming soil type B. Refer to Appendix A of this report for the soil survey.

C. Floodplain Information

The Site is located within the Happy Canyon Creek major drainage basin which has a regulatory 100-year floodplain. The FEMA regulatory floodplain is located off-site and southeast of the Site. FIRM map 08035C0062H, Effective date: September 4, 2020 indicates that the Site is located in Zone X which poses a minimal flood hazard. The Site construction activities will not negatively impact the floodplain. The FIRM map has been included in Appendix A for reference.

II. DRAINAGE BASINS AND SUB-BASINS

A. Basin Description

The Site lies within the Green Acres Tributary, which is a Tributary of Happy Canyon Creek, the Site is located approximately 1.5 miles upstream of the confluence. The Green Acres Tributary consists of approximately 1.4 square miles. Much of the basin is in the process of being developed, the Site is being completed in coordination with the Compark Village South Development Project (hereinafter referred to as CVS Development). The CVS Development will construct a regional detention basin located north of Belford Avenue and across from Wild Fox Street. The regional detention basin will provide water quality treatment and detention for the Site. Known previous drainage studies completed applicable to the Site have been listed below for reference:

- *UDFCD - Outfall System Planning - Happy Canyon Creek Watershed within Douglas County, prepared by Kiowa Consultants, June 1993*. MHFD, in conjunction with sponsor partners Town of Parker and Douglas County, are planning on updating the Happy Canyon Creek OSP.
- Green Acres Tributary is a part of the Happy Canyon Creek watershed. There are several existing drainage studies covering the upstream area of the Green Acres Tributary development projects. See the Meridian Office Park, Filings 4 & 5 master drainage analysis for further detail.
- *Happy Canyon Creek Major Drainageway Plan, prepared by Muller Engineering Company, March 2014.*
- *Amendment to Happy Canyon Creek Major Drainageway Plan, March 2014, prepared by Manhard Consulting, February 2016.*
- *Final Drainage Report Amendment – Compark Village South, Filing No. 1 Parker, Colorado prepared by Manhard Consulting, July 2020.*
- *Final Drainage Report – Compark Village South, Filing No. 1 – Belford Ave Site Plan Amendment Parker, Colorado. Prepared by Manhard Consulting June 2021* (hereinafter referred to as the CVS F1 Report).
- *Final Drainage Report – Compark Village South Filing No. 2 and Filing 2, Amd 1, Parker, Colorado. Prepared by Manhard Consulting July 2020* (hereinafter referred to as the CVS F2 Report).
- *Final Drainage Report for Green Acres Tributary Project prepared by RESPEC June 2020.*
- *Final Drainage Report for Compark Village South Multi-Family – Compark Village South, Filing No. 1, Amendment 2, Parker, Colorado. Prepared by Merrick and Company September 10, 2021* (hereinafter referred to as CVS MF Report). As of the date of this report, the above-mentioned report has not been approved and is in the review process with the Town of Parker.

The Site is within sub-basins CVS-14b, 15, 15A, 17, 17A, and 18 as described in the CVS F2 Report. All of the sub-basins as described within the report convey the peak storm runoff directly to the regional detention basin designed within the same report via two alternative routes described in further detail below. This detention basin will release restricted flows into an existing box culvert under E-470 and into the Green Acres Tributary (GAT) in compliance with the Master Drainage Report for Compark Village South and Town of Parker requirements.

B. Sub-Basin Description

The Site is comprised of 21 sub-basins. The proposed basins and design points are depicted on the drainage plan provided in Appendix A. These sub-basins have been determined based on land use, area, roadway slopes, storm sewer locations, and inlet capacities.

The following on-site sub-basins are captured by both proposed on-site and existing off-site storm sewer infrastructure and are conveyed to the regional detention pond to the western forebay, A1-3, and C1, as well as the following off-site sub-basins, OS1-5.

The following on-site sub-basins are captured by both proposed on-site and existing off-site storm sewer infrastructure and are conveyed to the regional detention pond to the southern forebay, D1, E1, F1, G1-2, J1, I1, and H1 as well as the following off-site sub-basins, OS6-8.

Peak storm runoff from Basin I2 will perform as it historically has, runoff will sheet flow to the southeast where it will be captured by Happy Canyon Creek.

Historically, all sub-basins have been tributary to Green Acres Tributary which confluences with Happy Canyon Creek upstream of Jordan Road and ultimately joins Cherry Creek.

Basin A1 (0.33 acres)
The basin will remain mostly undisturbed with drainage patterns to the north per historical conditions. A proposed drainage swale will be constructed along the northern edge of the basin to capture on-site and off-site peak storm runoff and prevent it from overland conveyance through the single-family lots. The proposed drainage swale will convey captured runoff off-site to an existing CDOT Type C inlet (inlet 7-5 per the CVS F2 Report) located at design point 2. Runoff coefficients calculated are C_5=0.05 and C_{100}=0.49; the peak storm event flows are calculated as Q_2=0.0 cfs and Q_{100}=1.2 cfs.

Basin A2 (0.88 acres)
The basin will be developed into overlot grading for single-family homes and right-of-way improvements to include landscape and hardscape. Runoff from the basin will sheet flow to the 4-inch mountable curb and gutter and conveyed to a proposed 10’ Type R inlet to the west at design point 4. Runoff coefficients calculated are C_2=0.47 and C_{100}=0.70; the peak storm event flows are calculated as Q_2=0.1 cfs and Q_{100}=3.8 cfs.

Basin A3 (0.63 acres)
The basin will be developed into overlot grading for single-family homes and right-of-way improvements to include landscape and hardscape. Runoff from the basin will sheet flow to the 4-inch mountable curb and gutter and conveyed to a proposed 10’ Type R inlet to the west at design point 7. Runoff coefficients calculated are C_2=0.28 and C_{100}=0.35; the peak storm event flows are calculated as Q_2=0.9 cfs and Q_{100}=3.9 cfs.

Basin C1 (1.84 acres)
The basin will be developed into overlot grading for single-family homes. Runoff from the basin will sheet flow to the 4-inch mountable curb and gutter and conveyed to an existing 10’ Type R inlet to the northwest (inlet 5-5 per the CVS F2 Report) at design point 9. Runoff

coefficients calculated are C_2=0.41 and C_{100}=0.67; the peak storm event flows are calculated as Q_2=2.2 cfs and Q_{100}=10.8 cfs.

Basin D1 (0.75 acres)
The basin will be developed into overlot grading for single-family homes. Runoff from the basin will sheet flow to the 4-inch mountable curb and gutter and conveyed to an existing 10' Type R inlet to the northwest (inlet 2-11 per the CVS F2 Report) at design point 11. Runoff coefficients calculated are C_2=0.41 and C_{100}=0.67; the peak storm event flows are calculated as Q_2=0.9 cfs and Q_{100}=4.4 cfs.

Basin E1 (0.32 acres)
The basin will be developed into overlot grading for single-family homes. Runoff from the basin will sheet flow to the 4-inch mountable curb and gutter and conveyed to a proposed 10' Type R inlet to the east at design point 20. Runoff coefficients calculated are C_2=0.37 and C_{100}=0.65; the peak storm event flows are calculated as Q_2=0.3 cfs and Q_{100}=1.6 cfs.

Basin F1 (0.69 acres)
The basin will be developed into overlot grading for single-family homes and right-of-way improvements to include landscape and hardscape. Runoff from the basin will sheet flow to the 4-inch mountable curb and gutter and conveyed to a proposed 10' Type R inlet to the east at design point 19. Runoff coefficients calculated are C_2=0.46 and C_{100}=0.69; the peak storm event flows are calculated as Q_2=0.7 cfs and Q_{100}=2.9 cfs.

Basin G1 (0.22 acres)
The basin will remain mostly undisturbed with drainage patterns to the north per historical conditions. A proposed drainage swale will be constructed along the northern edge of the basin to capture on-site and off-site peak storm runoff and prevent it from overland conveyance through the single-family lots. The proposed drainage swale will convey captured runoff off-site to a proposed CDOT Type C inlet with a closed mesh grate located at design point 18. Runoff coefficients calculated are C_2=0.05 and C_{100}=0.49; the peak storm event flows are calculated as Q_2=0.01 cfs and Q_{100}=0.9 cfs.

Basin G2 (0.06 acres)
The basin will consist of a proposed drainage swale which will convey the peak storm runoff to the north, where it will be captured at a low point with a proposed CDOT Type C inlet with a closed mesh grate at design point 18. Runoff coefficients calculated are C_2=0.05 and C_{100}=0.49; the peak storm event flows are calculated as Q_2=0.01 cfs and Q_{100}=0.3 cfs.

Basin H1 (0.11 acres)
The basin will be developed into right-of-way improvements to include landscape and hardscape. Runoff from the basin will sheet flow to curb and gutter where it will be conveyed off-site to an existing 10' Type R inlet (inlet A-5 per the CVS MF Report). Runoff coefficients calculated are C_2=0.49 and C_{100}=0.71; the peak storm event flows are calculated as Q_2=0.2 cfs and Q_{100}=0.7 cfs.

Basin I1 (0.60 acres)
The basin will be developed into a park/open space consisting of landscaping and hardscape. Runoff from the basin will sheet flow and conveyed overland to the northwest to a low point where it will be captured by a Type C inlet with a closed mesh grate at design

point 15. Runoff coefficients calculated are C_2=0.74 and C_{100}=0.85; the peak storm event flows are calculated as Q_2=0.1 cfs and Q_{100}=2.4 cfs.

Basin I2 (0.03 acres)
The basin will be developed into a park/open space consisting of hardscape. Runoff from the basin will sheet flow and conveyed overland off-site. Runoff coefficients calculated are C_2=0.06 and C_{100}=0.50; the peak storm event flows are calculated as Q_2=0.1 cfs and Q_{100}=0.2 cfs.

Basin J1 (1.22 acres)
The basin will be developed into a park/open space consisting of landscaping. Runoff from the basin will sheet flow to the north, where it will be captured at a low point with a proposed CDOT Type C inlet with a closed mesh grate at design point 21. Runoff coefficients calculated are C_2=0.05 and C_{100}=0.49; the peak storm event flows are calculated as Q_2=0.01 cfs and Q_{100}=5.4 cfs.

Basin OS1 (0.87 acres)
The basin will remain mostly undisturbed with drainage patterns to the north per historical conditions. A proposed drainage swale will be constructed along the northern edge of the basin to capture off-site peak storm runoff and prevent it from overland conveyance into Bunny Hop Lane right-of-way. The proposed drainage swale will convey captured runoff to an existing CDOT Type C inlet (inlet 7-5 per the CVS F2 Report) located at design point 2. Runoff coefficients calculated are C_2=0.12 and C_{100}=0.53; the peak storm event flows are calculated as Q_2=0.1 cfs and Q_{100}=2.6 cfs.

Basin OS2 (0.30 acres)
The basin will remain undeveloped and runoff from the basin will remain as it historically has as overland flow to the north. Runoff from the basin will be conveyed by 4-inch mountable curb and gutter east to a proposed 10’ Type R inlet at design point 4. Runoff coefficients calculated are C_2=0.08 and C_{100}=0.51; the peak storm event flows are calculated as Q_2=0.01 cfs and Q_{100}=0.9 cfs.

Basin OS3 (0.30 acres)
The basin will remain undeveloped and runoff from the basin will remain as it historically has as overland flow to the north. Runoff from the basin will be conveyed by 4-inch mountable curb and gutter east to an existing 15’ Type R inlet at design point 5 (inlet 6-5 per the CVS F2 Report). Runoff coefficients calculated are C_2=0.07 and C_{100}=0.50; the peak storm event flows are calculated as Q_2=0.01 cfs and Q_{100}=0.9 cfs.

Basin OS4 (0.16 acres)
The basin is comprised of existing right-of-way improvements, to include local residential roadway, sidewalk, and landscaping. Runoff from the basin will remain as it historically has, conveyed by 4-inch mountable curb and gutter north to an existing 10’ Type R on-grade inlet at design point 7 (inlet 6-5B per the CVS F2 Report). Runoff coefficients calculated are C_2=0.66 and C_{100}=0.80; the peak storm event flows are calculated as Q_2=0.4 cfs and Q_{100}=1.2 cfs.

Basin OS5 (0.31 acres)
The basin is comprised of existing right-of-way improvements, to include local residential roadway, sidewalk, and landscaping. Runoff from the basin will be conveyed by 4-inch

mountable curb and gutter west to an existing 10' Type R sump inlet at design point 9 (inlet 5-5 per the CVS F2 Report). Runoff coefficients calculated are C_2=0.64 and C_{100}=0.78; the peak storm event flows are calculated as Q_2=0.5 cfs and Q_{100}=2.1 cfs.

Basin OS6 (0.25 acres)
The basin is comprised of existing right-of-way improvements, to include local residential roadway, sidewalk, and landscaping. Runoff from the basin will be conveyed by 4-inch mountable curb and gutter east to an existing 10' Type R on-grade inlet at design point 10 (inlet 2-11 per the CVS F2 Report). Runoff coefficients calculated are C_2=0.61 and C_{100}=0.77; the peak storm event flows are calculated as Q_2=0.5 cfs and Q_{100}=1.7 cfs.

Basin OS7 (0.18 acres)
The basin will remain mostly undisturbed with drainage patterns to the north per historical conditions. Runoff will sheet flow across the basin to a proposed drainage swale and then conveyed to a proposed CDOT Type C inlet with a closed mesh grate located at design point 18. Runoff coefficients calculated are C_2=0.17 and C_{100}=0.55; the peak storm event flows are calculated as Q_2=0.1 cfs and Q_{100}=0.9 cfs.

Basin OS8 (0.08 acres)
The basin will remain mostly undisturbed with drainage patterns to the north per historical conditions. Runoff will sheet flow across the basin to a proposed drainage swale and then conveyed to a proposed CDOT Type C inlet with a closed mesh grate located at design point 18. Runoff coefficients calculated are C_2=0.23 and C_{100}=0.62; the peak storm event flows are calculated as Q_2=0.1 cfs and Q_{100}=0.5 cfs.

III. DRAINAGE CHANNELS

A. Happy Canyon Creek

Happy Canyon Creek is a major basin that is tributary to Cherry Creek. The portion of Happy Canyon Creek thalweg that extends up near the Site is a natural sandy bottom channel. The thalweg has an existing natural meander bend located near the southeast corner of the Site. No apparent head cutting exists within this channel reach. The active channel is a dry stream bed the experiences active flows during wet seasonal conditions.

As previously stated, the site is located within the Zone X floodplain adjacent to Happy Canyon Creek. No major channel improvements are anticipated for Happy Canyon Creek with this project.

IV. DRAINAGE DESIGN CRITERIA

A. Regulations

This final drainage report is prepared in accordance with the *Town of Parker Storm Drainage Design (Addendum to the Urban Storm Drainage Criteria Manuals Volumes 1, 2, and 3)* and the *MHFD.*

No detention pond improvements are included as part of this project. Per the previously stated drainage reports, the regional detention pond to the north is sufficiently sized to accommodate the water quality and detention pond volumes for the Site.

The Town of Parker Land Use and Development Code (CODE) includes the Town of Parker adopted floodplain regulations. The policy requires compliance with floodplain regulations along all major drainageways that have floodplain designation and, where, necessary, the design and construction of that portion of the major drainageway improvements within the new development area. The Site is located outside of the major drainage way located just south of the Site, Happy Canyon Creek. The proposed improvements will not negatively impact the proposed drainageway.

B. Development Criteria Reference and Constraints

The previously mentioned CVS F1 & F2 Report prepared by Manhard Consulting created a couple of assumptions based on information at the time of designing the regional detention basin located north of Belford Avenue. In order to ensure the regional detention basins compliance with the Town of Parker and Mile High Flood Control Districts (MHFD) requirements, and the design as described in these reports, the Site is constrained to these assumptions. If these assumptions are not met, additional design and modification is required to ensure the regional detention basins capability for providing the necessary water quality treatment and detention volumes it is designed to receive.

The CVS F1 Report assumed the future drainage basins, the imperviousness of these basins, and where runoff would be routed from these basins. 2.53 acres within the Site was assumed it would be developed into single family homes with a 48% overall imperviousness, the remaining 5.16 acres of the Site was assumed it would be developed into multi-family with an overall imperviousness of 75%. The overall assumed imperviousness of the Site is 66.1%, the improvements proposed within this report contain an overall imperviousness of 35%, well below that which the regional detention pond was designed for. The CVS F1 Report ‘Contributory Drainage Areas to Det Basin Exhibit’ has been provided in Appendix A for reference, the exhibit has been marked up to depict the Site and the assumed development impervious areas for the Site.

In addition, the CVS F2 Report breaks out the future assumed developments into drainage sub-basins to be collected by two separate storm sewer systems taking alternative routes that outfall into the regional detention basin. Compliance with these assumptions must be met in order to ensure the existing storm sewer infrastructure operates per the original design. In order to ensure compliance with the CVS F2 Report a comparison of the peak storm event runoff rates captured at each inlet and design point was completed, Table 1 below depicts a brief summary of the findings (as of the date of this report, the analysis is still in progress and will be added with the next submittal). The CVS F2 Report Proposed Drainage Area Map – Filing No. 2 has been marked up with the Site and applicable notes and included for reference in Appendix A.

C. Hydrological Criteria

The minor storm design rainfall is the 2-year event, and the major storm design rainfall is the 100-year event. Runoff conveyance coefficients were calculated using the equations found

in Table 6-4 of the *Urban Storm Drainage Criteria Manual.* Time of concentration calculations were based on land use as well as distance and slope of travel.

2-year and 100-year event storm flows are calculated using the Rational Method. Percent imperviousness values are from Town of Parker Strom Drainage and Environmental *Criteria* and are summarized below:

Description	Percent Impervious (%)
Parking lot: Paved	100
Roof Area	90
Lawns, Clayey Soil	2

Runoff coefficients are from Town of Parker *Criteria* using hydrologic Soil Group C.

Rainfall intensities (I) for the area are approximated by the equation:

$$I = \frac{28.5P_1}{(10+Tc)^{0.786}}$$

The 1-hour design point rainfall values (P_1) used are 1.06 for the 2-year rainfall and 2.60 for the 100-year rainfall per the Town of Parker Storm Drainage and Environmental Criteria Manual. T_c represents the time of concentration in minutes and consists of overland flow time plus travel time.

All hydrological calculations including a summary of the calculated minor and major rainfall event flows are provided in Appendix B. Basin maps are included in Appendix A.

D. Hydraulic Criteria

Street flow conveyance was designed to meet the Town of Parker design criteria for a Local Street Classification, which states no curb overtopping, flow may spread to crown of street. Storm sewer inlets are located to intercept storm runoff prior the street flow maximum flow conveyance criteria are met. Street capacity calculations have been completed using Bentley FlowMaster V8i, and the storm sewer inlets were sized using the *Urban Storm Drainage Criteria Manual* UD-Inlet spreadsheet version 5.01. The calculations have been provided in Appendix C for reference.

Storm sewer conveyance was designed to meet the Town of Parker Storm Drainage and Environmental Criteria for the 2-year and 100-year peak storm event. Bentley StromCAD was used to analyze the sizing, hydraulic grade line (HGL), energy losses, velocities, and other design parameters for the proposed storm sewer. The Town of Parker Criteria require in the initial storm event, the hydraulic grade line must be located below the crown of the pipe; In the major storm event, the hydraulic grade line must be located 12-inches below finished grade as a maximum condition. See Appendix C for the StormCAD analysis.

E. Variances

The Town of Parker does allow for variances from the design standards in appropriate cases. It is not anticipated that a variance will be required for the proposed Site improvements.

V. DRAINAGE FACILITY DESIGN

A. General Concept

The overall intent of the drainage design for the Site is to comply with the previous drainage reports and tie-in to the existing regional detention pond located to the north.

The proposed drainage design conveys developed runoff via sheet flow and gutter flow to inlets with sizing in Appendix C.

A trapezoidal channel located along the southern portion of the property running east and west is designed to capture and convey runoff from on-site and off-site basins from the south. The channel is designed with a highpoint centered on the residential lots, designed to redirect flows to the east and west away from the residential lots. Both channels outfall at a Type C inlet where flows will then be routed to the regional detention and water quality pond to the north. The channel sizing analysis was completed using Bentley FlowMaster V8i, the results have been provided in Appendix C for reference.

Water quality and detention will be provided within the regional detention basin as described in the CVS F1 Report.

B. Specific Details

As mentioned previously in this report, the site will be divided into multiple drainage sub-basins. The onsite runoff will be routed through the site via gutters and sheet flow and intercepted by inlets in sump and on-grade conditions. Flows captured by the inlets will be routed via the storm sewer directly to the existing detention/water quality regional detention pond. The detention pond has been sized to accommodate the flows resulting from the areas shown on the drainage map.

Water Quality and Maintenance

Stormwater quality is provided by the existing detention pond designed by Manhard and described within the previously stated drainage reports.

Temporary sediment and erosion control will be provided with a stabilized staging area, portable toilet protection, a concrete washout, vehicle tracking control, surface roughening, debris trash control, seeding and mulching, and erosion control blankets to slopes greater than 4:1. Inlet protection, rock socks, and rough cut street control will also be used to protect existing storm infrastructure and provide water quality measures during construction.

The Town of Parker Storm Drainage and Environmental Criteria require Tier 3 New Development and Redevelopment must install Permanent Best Management Practices (PBMP) that provide Water Quality Control Volume (WQCV) designed and constructed to capture and treat, at a minimum, the 80th percentile runoff event. The regional detention and water quality pond located north of Belford Ave has been designed to provide the necessary volume for this Site's 7.7 acres of improvements. Of the 7.7 acres, approximately 7 of those

acres will be conveyed to the regional detention pond for detention and water quality treatment. The runoff from sub-basin I1's 0.6 acres will perform as it historically has and sheet flow down to Happy Canyon Creek. Sub-basin I1 will become a Park area and the imperviousness will remain relatively unchanged.

VI. Environmental Protection Criteria

A. General

Site Drainage improvements are intended to minimize the impact to the environment. The Site is located. The Site is located outside of the major drainage way located just south of the Site, Happy Canyon Creek. The proposed improvements will not negatively impact the proposed drainageway. The development adheres to the Ordinance No. 3.171 adopted by the Town of Parker in June, 2001, more specifically Section 13.10.220 – Stream Protection Standards of the Town of Parker Land Use and Development Code.

B. Construction BMP Plan

Construction BMPs shall be placed during construction to minimize soil erosion and the movement of sediment offsite. Construction BMPs shall be placed during the initial and interim phases of construction. The intent of the initial BMPs are to fulfill water quality objectives during the overlot and roadway rough grading phase of the project. Once the initial phase of earthmoving and rough grading is complete, interim BMP placement can be made. Interim BMPs are in place for fine grading, utility construction, and street construction. Construction plans will contain all appropriate Stormwater Management Details. In addition, a stormwater Management Plan will be prepared to meet the Town of Parker, State of Colorado, and EPA criteria.

VII. CONCLUSIONS

A. Compliance with Standards

The on-site drainage design complies with the Mile High Flood Control District's *Urban Storm Drainage Criteria Manual (Addendum to the Urban Storm Drainage Criteria Manuals Volumes 1, 2, and 3)* and *Town of Parker Storm Drainage and Environmental Criteria Manual*. The design is consistent with the drainage design proposed in the previously mentioned drainage reports.

B. Drainage Concept

The Site storm sewer infrastructure will adequately convey 2-year and 100-year peak storm event runoff to the regional detention and water quality pond located north of Belford Avenue with the exception sub-basin I1 which, due to the topography, will be conveyed to Happy Canyon Creek by direct sheet flow.

REFERENCES

1. Town of Parker Storm Drainage and Environmental Criteria Manual (Addendum to Urban Storm Drainage Criteria Manuals Volumes 1, 2, and 3), Town of Parker – Stormwater, Town of Parker, Colorado, Revised February 2014.

2. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/ accessed [July 24, 2021].

3. Mile High Flood Control District. Urban Storm Drainage Criteria Manual. Volume 1. Revised August 2018.

4. Mile High Flood Control District. Urban Storm Drainage Criteria Manual. Volume 2. Revised September 2017.

5. Urban Drainage and Flood Control District. Urban Storm Drainage Criteria Manual. Volume 3. Updated January 2021.

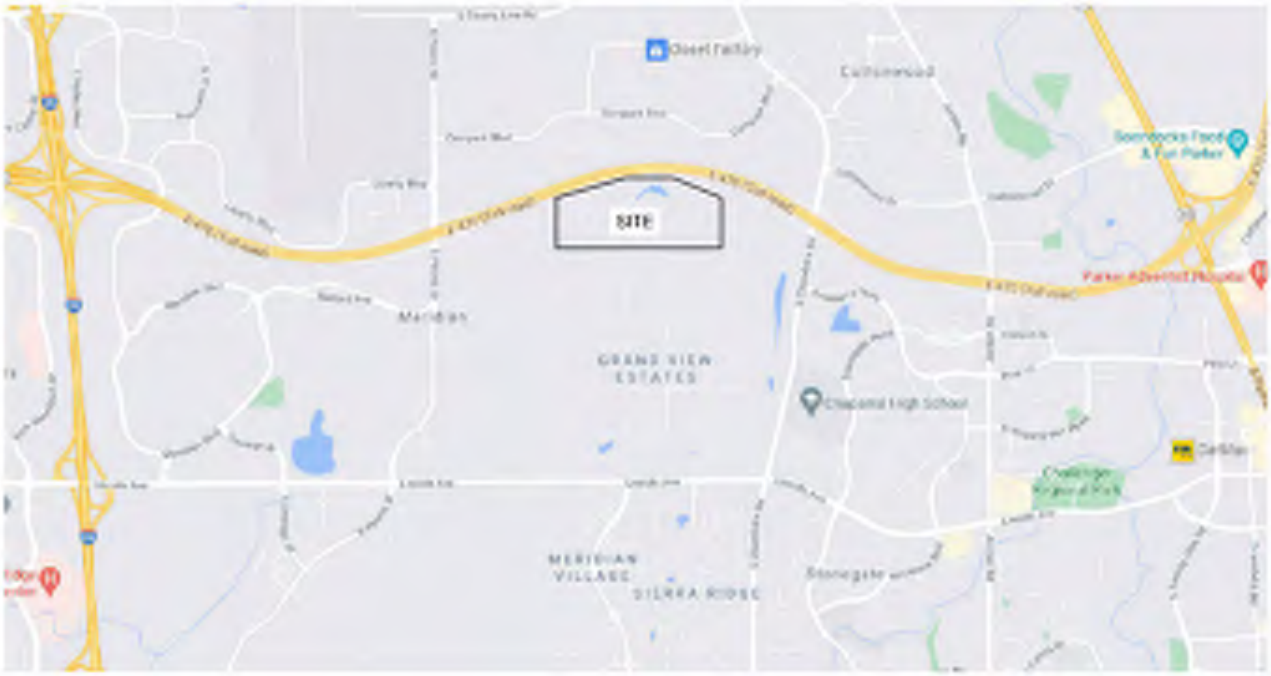
6. Manhard Consulting, LTD. Final Drainage Report Amendment Compark Village South, Filing No. 1. Prepared for 470 Compark, LLC. July 31, 2020.

7. Manhard Consulting, LTD. Final Drainage Report Compark Village South, Filing No. 1 - Belford Ave Site Plan Amendment. Prepared for Belford North Metropolitan District. June 18, 2021.

8. Manhard Consulting, LTD. Final Drainage Report Compark Village South, Filing No. 1. Prepared for 470 Compark, LLC. October 27, 2017.

APPENDICES

Appendix A: Maps



Vicinity Map

(N.T.S.)

SUBDIVISIONS

Douglas County, Colorado

Legend

- Platted Subdivisions
- 35 Acre Developments (May Include Unrecorded Subdivisions)
- County Boundary
- Townships
- Sections
- Municipalities
- Parks
- Pike National Forest
- Lakes
- Intermittent Lakes
- Streams

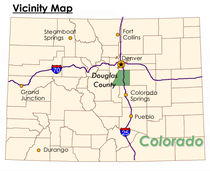
Roads

- Interstate
- US Highway
- State Highway
- Toll Highway
- Major Road
- Local Road
- Gated Community
- Entrance/Exit Ramp

1 0.5 0 1 2

Scale in Miles

Vicinity Map



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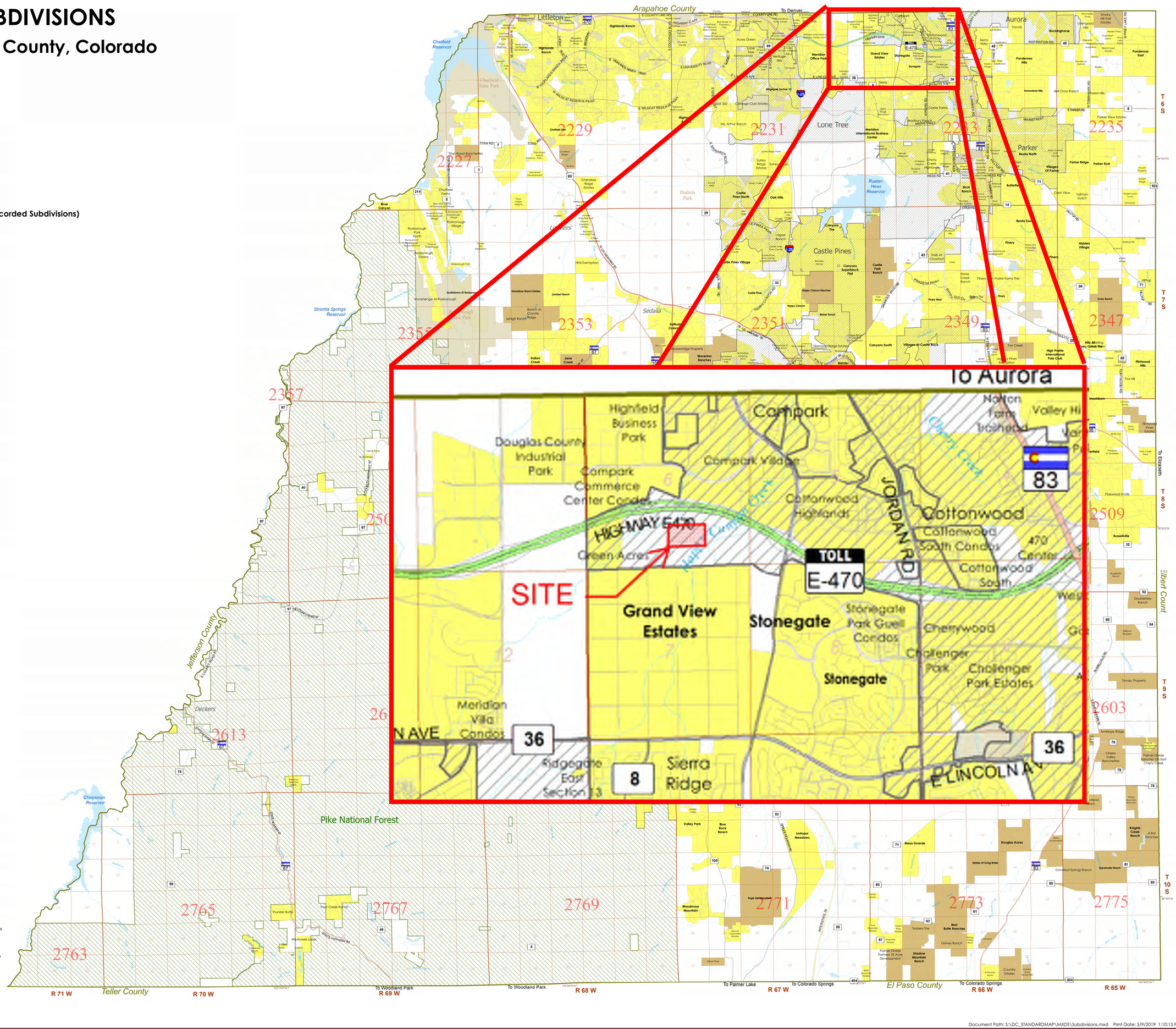

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Castle Rock Area, Colorado

September 21, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

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

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 13, Jun 5, 2020

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FoB	Fondis clay loam, 1 to 3 percent slopes	4.0	8.9%
Lo	Loamy alluvial land	0.2	0.4%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	40.7	90.7%
Totals for Area of Interest		**44.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The

delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Castle Rock Area, Colorado

FoB—Fondis clay loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: jqyn
Elevation: 5,500 to 6,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Fondis and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fondis

Setting

Landform: Buttes, hills, ridges, mesas
Landform position (three-dimensional): Crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over sedimentary rock coarse-silty outwash derived from arkose

Typical profile

H1 - 0 to 7 inches: clay loam
H2 - 7 to 24 inches: clay
H3 - 24 to 60 inches: sandy clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R049XY208CO - Clayey Foothill DRAFT (1-2018) MLRA 49
Hydric soil rating: No

Minor Components

Kutch
Percent of map unit: 7 percent
Hydric soil rating: No

Buick
Percent of map unit: 6 percent
Hydric soil rating: No

Satanta
Percent of map unit: 6 percent
Hydric soil rating: No

Aquic haplustolls
Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Lo—Loamy alluvial land

Map Unit Setting
National map unit symbol: jqzb
Elevation: 7,000 to 8,000 feet
Mean annual precipitation: 17 to 19 inches
Mean annual air temperature: 44 to 46 degrees F
Frost-free period: 115 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition
Loamy alluvial land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loamy Alluvial Land

Setting
Landform: Flood plains, swales
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile
H1 - 0 to 20 inches: sandy loam
H2 - 20 to 40 inches: stratified loamy sand to clay loam
H3 - 40 to 60 inches: sand and gravel

Properties and qualities
Slope: 1 to 5 percent
Drainage class: Well drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: FrequentNone
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Ecological site: R049XY036CO - Overflow
Hydric soil rating: No

Minor Components

Bresser
Percent of map unit: 7 percent
Hydric soil rating: No

Sampson
Percent of map unit: 7 percent
Hydric soil rating: No

Sandy alluvial land
Percent of map unit: 5 percent

Fluvaquentic haplustolls
Percent of map unit: 1 percent
Landform: Terraces
Hydric soil rating: Yes

NeE—Newlin gravelly sandy loam, 8 to 30 percent slopes

Map Unit Setting
National map unit symbol: jqzg
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 49 to 51 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition
Newlin and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newlin

Setting
Landform: Terraces, mesas, plateaus

Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Unconformable sandy and gravelly and/or mixed source alluvium

Typical profile

H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 17 inches: gravelly sandy clay loam
H3 - 17 to 22 inches: gravelly sandy loam
H4 - 22 to 60 inches: very gravelly sand

Properties and qualities

Slope: 8 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XB215CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 5 percent
Hydric soil rating: No

Satanta

Percent of map unit: 4 percent
Hydric soil rating: No

Stapleton

Percent of map unit: 4 percent
Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

1DWLRQDO)ORRG+D]DUG/DHU)6WWH

FEMA

)HHW

%DVHG RQ 1DWLRQDO)ORRG ,QVXUDQFH 3URJUDP '),50 GDWHG 2FWREHU

1 inch = 1

/HJHQG

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=RQH$ 9 $
L:WK%)(RU'HSWK =RQH$($ 9($
5HGXFHG)ORRGG

$QQXDO &KDQFH)ORRG+D]DUG $UHDV
R DQQXDO FKDQFHORRGZDWHUDH
G+D]DUGHVWKDQRQHIRRW RU ZKGUDLQDJH
DUHDV R OHVV WKDQRQHVTXDUHPLOH=RQH;

)XWXUH&RQGLWLRQV $QQXDO
&KDQFH)ORRG+D]DUG =RQH;

$UHDZLWK5HGXFHG)ORRG5LVNGXHWR
/HYHH 6HH1RWHV =RQH;

$UHDZLWK)ORRG5LVNGXHWR/HYHH =RQH'

$UHDRI0LQLPDO)ORRG+D]DUG =RQH;
(IIHFWLYH/HWWHU
$UHDRI8QGHWHUPLQHG)ORRG+D]DUG =RQH'

&KDQQHO &XOYHUW RU 6WUXFWXUH
/HYHH RU)ORRGZDOO

&URVV6HFWLRQ ZLWK$QQXDO &KDQFH
DWHU 6XUIDFH(OHYDWLRQ
&RDVWDO 7UDQVHFW
%DVH)ORRG(OHYDWLRQ/LQH %)(
/LPLW R 6WUXFWXUH
-XULVGLFWLRQ%RXQGDU\
&RDVWDO 7UDQVHFW %DVHOLQH
3URJUHVV%DVHOLQH
+LJKZDWU)HDWXUH

L:LWKDDDWWHQXDWLRQ
R:LWKDDDWWHQXDWLRQ
8QSSHG

7KHSLQGLVSODFHGWKHSSLVDQDSSURSULDWH
SRQW VHOHFWHGE\WKHXVHU DQGGRHVQRW UHSUHV
DQDWKRULWDWLYHSURSHUW\ORFDWLRQ

7KLVPSFRPSOHLHVZLWK$VVWDQGDUGVIRU WKHXVHR
GL.LWDO IORRGPS/LI LW LVQRW YRLGDV GHVFULEHGEHORZ
7KHEDVHPS VKRZQFRPSOLHVZLWK$VEDVHPS
DFFXUDF\ VWDQGDUGV

7KHIORRGKDJDUGLQIRUPDWLQLV GHULYHGGLUHFWO\IURPWKH
DWKRULWDWLYHEVEVHUYLFHVSURYLGHGE\ 7KLVPS
ZVHSFUWHGRQ DW DQGGRHVQW
UHOHFW FKDQHVRU DQGRQVV VXEVHXHQW WRWKLVGDWHDQG
WLFI 7KHJHDQGHIHFWLYHLQRUDPWLRQBFKDQHRU
EHFRPXSUVHGGE\QHZGDWDRYHU WLFI

7KLVPSLBHLV YRLGLI WKHRQHRU RHWKIRO ORWLQPS
HOHQWVV GRQW DSSHDU EDVHPSLBHU\ IORRGRQHODEHOV
OHHQG VFDOHEDU PSFUHDWLRQGDWH FRRLW\LGHQWLILHUV
)5$DQHO QHEU DQG)5$IIHFWLYHGDWH DSLBHV IRU
XQPSSHGDQGXQRGHUQL}HGDUHDV FDQQW EHXVHGIRU
UHDOWRU\SUSRVHV

%DVHPS 86DWLRQDO 2FHDQLF\DWPRVSKHULF $GPLQLVWUDWLRQ

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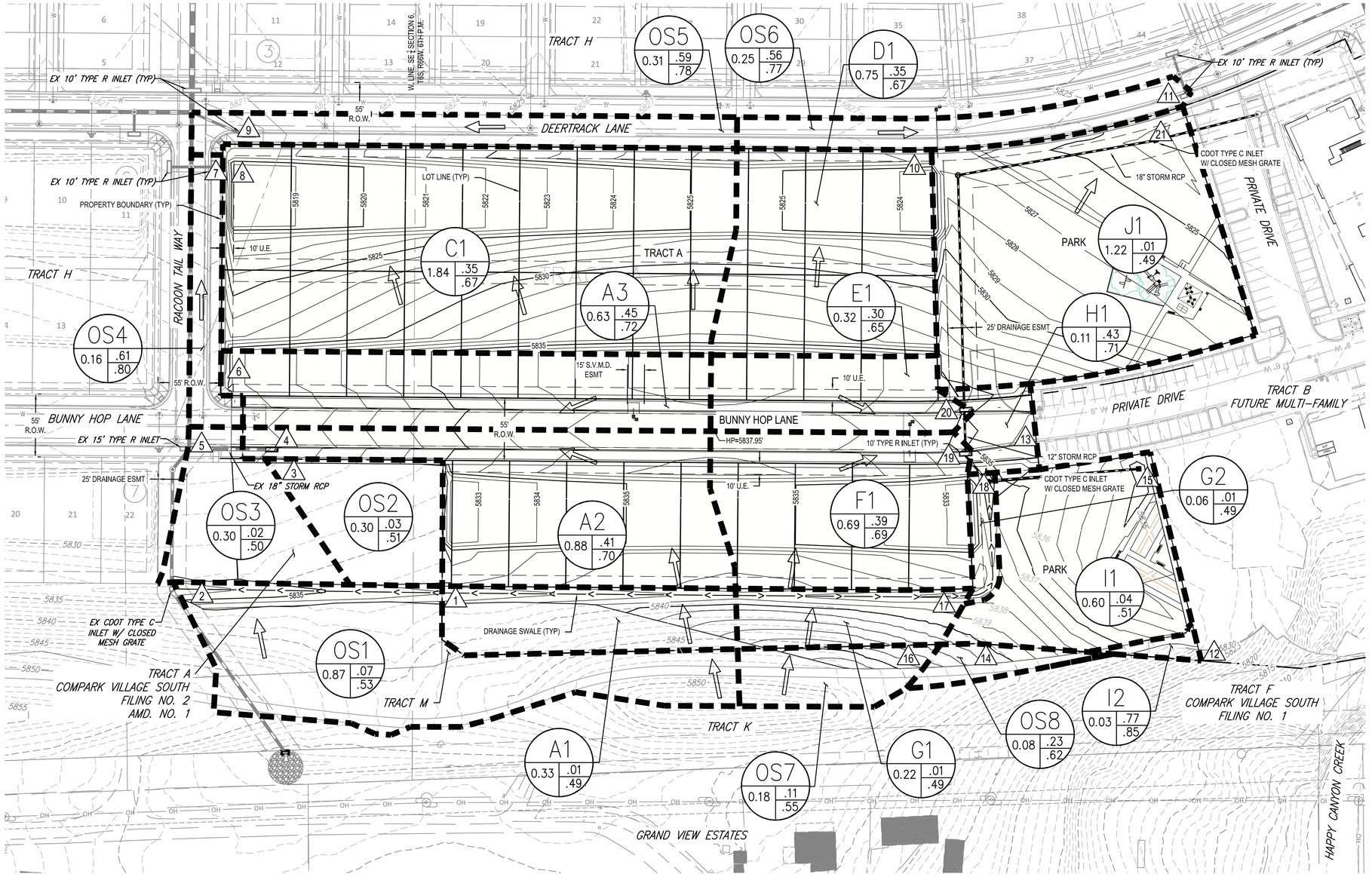
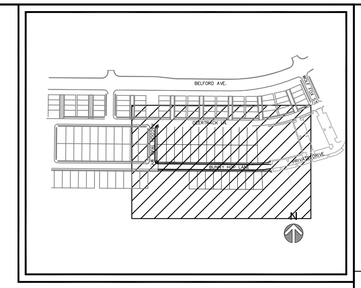




SUMMARY RUNOFF TABLE

Basin	Design Point	Area (ac)	Imp (%)	5-Yr Peak Flow (cfs)	100-Yr Peak Flow (cfs)
A1	1	0.33	2%	0.0	1.2
OS1	2	0.87	11%	0.1	2.6
`CVS 14A	2	4.01	55%	0.2	10.2
ΣA1+OS1+CVS 14A	2	5.21	44%	0.3	14.0
OS2	3	0.30	6%	0.0	0.9
A2	4	0.88	54%	0.9	3.8
ΣA2 + OS2	4	1.17	41%	0.9	4.7
OS3	5	0.30	4%	0.0	0.9
ΣOS2+DP2+DP4	5	6.68	42%	1.3	19.6
A3	6	0.63	58%	0.9	3.9
OS4	7	0.16	77%	0.4	1.2
ΣOS4+A3	7	0.79	61%	1.3	5.0
C1	8	1.84	46%	2.2	10.8
OS5	9	0.31	73%	0.6	2.1
ΣC1 + OS5	9	2.14	50%	2.8	12.9
D1	10	0.75	46%	0.9	4.4
OS6	11	0.25	71%	0.5	1.7
ΣD1 + OS6	11	1.00	52%	1.4	6.1
I2	12	0.03	90%	0.1	0.2
H1	13	0.11	55%	0.2	0.7
OS8	14	0.08	32%	0.1	0.5
I1	15	0.60	6%	0.1	2.4
ΣI1 + OS8	15	0.68	9%	0.1	2.9
OS7	16	0.18	16%	0.1	0.9
G1	17	0.22	2%	0.0	0.9
ΣG1 + OS7	17	0.40	8%	0.1	1.8
G2	18	0.06	2%	0.0	0.3
ΣG1 + G2 + OS7	18	0.46	8%	0.1	2.1
F1	19	0.69	51%	0.7	2.9
ΣDP15 + DP18 + F1	19	1.15	39%	0.9	7.9
E1	20	0.32	41%	0.3	1.6
ΣDP19 + E1	20	1.47	40%	1.2	9.5
J1	21	1.22	2%	0.0	5.4
ΣDP20 + J1	21	2.68	23%	1.2	14.9

*REFER TO CVS F2 REPORT AS REFERENCED IN THIS REPORT
**DP# - REFERS TO CARRYOVER FROM DESIGN POINT #

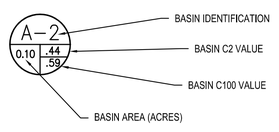
N

100' 0 50' 100' 200'
1" = 100' HOR.

LEGEND:

- PROPERTY BOUNDARY
- LOT LINE
- 5555 PROPOSED MAJOR CONTOUR
- 5555 PROPOSED MINOR CONTOUR
- 5555 EXISTING MAJOR CONTOUR
- 5555 EXISTING MINOR CONTOUR
- DRAINAGE BASIN BOUNDARY
- 16 DESIGN POINT
- FLOW ARROWS
- STORM SEWER
- DRAINAGE SWALE
- STORM INLET
- STORM MANHOLE
- S EX SANITARY MANHOLE
- ST EX STORM MANHOLE
- SD EX STORM SERVICE
- EX STORM INLET

PROPOSED BASIN:



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 file with the Town of Parker.

Town of Parker, Director of Engineering/Public Works Date

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CENTURY Living

REV	REVISION DESCRIPTION	DATE	CHKD	APPR

COMPARK VILLAGE SOUTH
PRIVATE IMPROVEMENT CONSTRUCTION PLANS
DRAINAGE MAP

TITLE

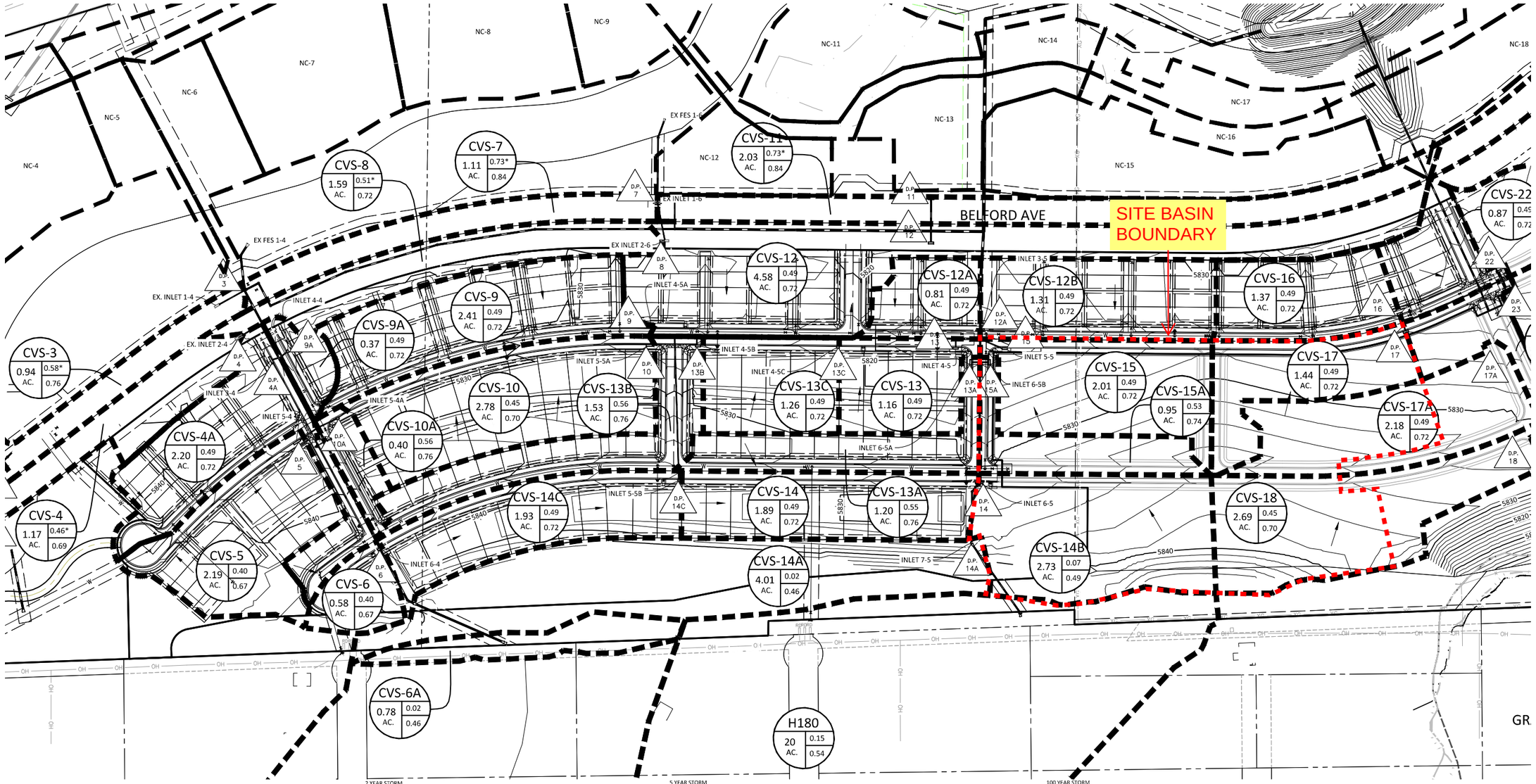
ISSUED FOR REVIEW

PE STAMP

FOR AND ON BEHALF OF MERRICK & COMPANY

JOB NUMBER 65120560
DATE 2/25/2022
SHEET 1 OF 1
1

File Location:C:\DEN\Projects\65050-00 Compark South\DESIGN\Drainage\Basin Maps\65050-DMAP-SF.dwg Plot Date:4/22/2022 5:52 AM Last Saved By: KBLACK



2 YEAR STORM

5 YEAR STORM

100 YEAR STORM

NOTE: BYPASS FLOWS NOT INTERCEPETED BY ON GRADE INLETS HAVE BEEN REDUCED BY 50% AND ADDED TO THE DIRECT FLOW AT THE NEXT DOWNHILL INLET PER SECTION 6.3.2 OF THE TOWN OF PARKER STORM DRAINAGE AND ENVIRONMENTAL CRITERIA MANUAL

LEGEND

- XX — SUB-BASIN #
- X.XX / X.XX — 2/5-YEAR RUNOFF COEFFICIENT (*DENOTES 5-YEAR RUNOFF)
- AREA (ACRES) — 100-YEAR RUNOFF COEFFICIENT
- PROPOSED SUB-BASIN BOUNDARY

N

0 50 100 200

SCALE: 1"=100'

DRAWN BY: ASD, RAK

NO.	DATE	REVISIONS
4	07/20/2020	REVISED TO ADD OFF-LINE DET BASIN
3	12/21/2016	REVISED PER TOWN COMMENTS

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COMPARK SOUTH

TOWN OF PARKER, CO

PROPOSED DRAINAGE AREA MAP - FILING NO. 2

PROJ. MGR.: RLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 3 OF 3

CLCPKC3

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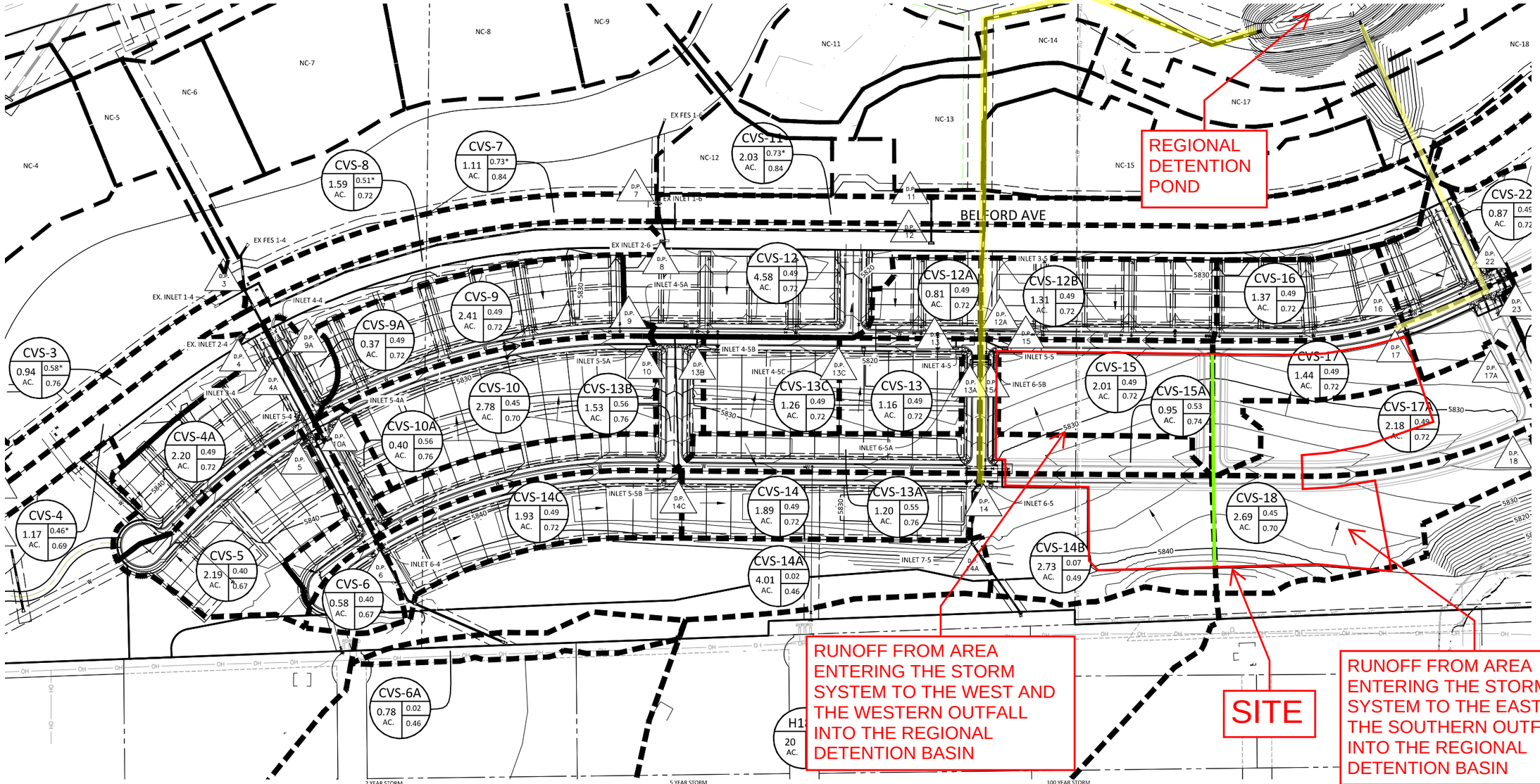
Plotted: 7/20/2020 4:05 PM Dwg Name: P:\Civil\3\ComSouth\13-Filing 1 No GAT\ComSouth03 Ultimate Belford Ave\Documents\Engineering\Storm\Storm Report\Drainage Exhibits\Drainage Basin Map 7-21-20.dwg Updated By: ADrucker



2 YEAR STORM

5 YEAR STORM

100 YEAR STORM

NOTE: BYPASS FLOWS NOT INTERCEPETED BY ON GRADE INLETS HAVE BEEN REDUCED BY 50% AND ADDED TO THE DIRECT FLOW AT THE NEXT DOWNHILL INLET PER SECTION 6.3.2 OF THE TOWN OF PARKER STORM DRAINAGE AND ENVIRONMENTAL CRITERIA MANUAL

LEGEND

- SUB-BASIN #
- AREA (ACRES)
- 2/5-YEAR RUNOFF COEFFICIENT (*DENOTES 5-YEAR RUNOFF)
- 100-YEAR RUNOFF COEFFICIENT
- PROPOSED SUB-BASIN BOUNDARY

PROPOSED DRAINAGE AREA MAP - FILING NO. 2

DATE	REVISIONS	DRAWN BY
07/20/2020	REVISED TO ADD OFF-LINE DET BASIN	ASD
12/21/2016	REVISED PER TOWN COMMENTS	RAK

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PROJ. MGR.: RLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 3 OF 3

CLCPKC3

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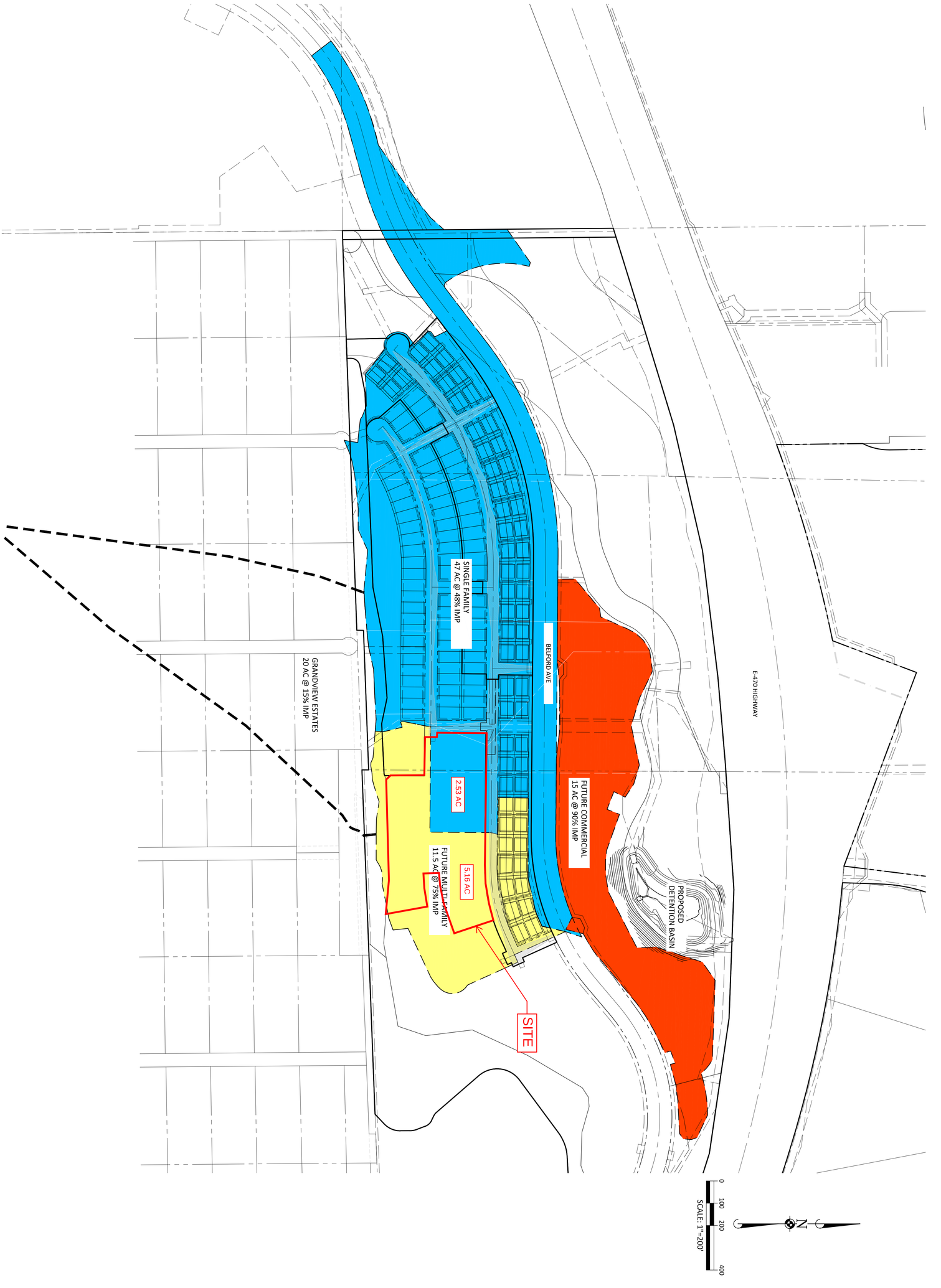
Plotted: 7/20/2020 4:05 PM Date Name: P:\Civil\3\Com\South\3 Filing 1 No GAT\Com\South\03 Ultimate Belford Ave\Documents\Engineering\Storm\Water Reports\Drainage Exhibits\Drainage Basin Map 7.21.20.dwg Updated By: ADrucker

Plotted: 5/6/2020 10:35 AM Dwg Name: P:\Clcpkc3\ComSouth12-Filing 1 No GAT\ComSouth03-Ultimate Belford Ave\Documents\Engineering\StormWater Reports\Drainage Exhibits\Drainage Areas to Det Basin.dwg Updated By: ADrucker



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SHEET 1 OF 1
CLCPKC3

DATE: 3.2.20
DRAWN BY: ASD
PROJ. MGR.: JE
PROJ. MGR.: GTI

COMPARK VILLAGE SOUTH FILING NO. 1

TOWN OF PARKER, CO

CONTRIBUTORY DRAINAGE AREAS TO DET BASIN EXHIBIT

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DATE	REVISIONS	DRAWN BY

####

Appendix B: Hydrologic Computations

Table 6-3. Recommended percentage imperviousness values

Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only)**:**	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries	10
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

MERRICK & COMPANY

Developed Composite C-Factor and Impervious Analysis

Compark Village South - (Tract A)

Calculated by: KB
Checked by: KW
Date: 4/22/2022

UDFCD - TABLE 6-4, SOIL GROUP C/D

Basin	Land Use	Area (acres)	I value	C2	C10	C100
A1	PROPOSED LANDSCAPE	0.33	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.00	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.33	**0.02**	0.01	0.15	0.49
A2	PROPOSED LANDSCAPE	0.08	0.02	0.01	0.15	0.49
	PROPOSED SINGLE FAMILY (0.25 AC or LESS)	0.60	0.45	0.34	0.47	0.67
	PROPOSED WALKS	0.03	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.17	1.00	0.83	0.87	0.89
		0.88	**0.54**	0.41	0.53	0.70
A3	PROPOSED LANDSCAPE	0.07	0.02	0.01	0.15	0.49
	PROPOSED SINGLE FAMILY (0.25 AC or LESS)	0.35	0.45	0.34	0.47	0.67
	PROPOSED BUILDING AND WALKS	0.05	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.16	1.00	0.83	0.87	0.89
		0.63	**0.58**	0.45	0.56	0.72
C1	PROPOSED LANDSCAPE	0.00	0.02	0.01	0.15	0.49
	PROPOSED SINGLE FAMILY (0.25 AC or LESS)	1.79	0.45	0.34	0.47	0.67
	PROPOSED BUILDING AND WALKS	0.05	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		1.84	**0.46**	0.35	0.47	0.67
D1	PROPOSED LANDSCAPE	0.00	0.02	0.01	0.15	0.49
	PROPOSED SINGLE FAMILY (0.25 AC or LESS)	0.74	0.45	0.34	0.47	0.67
	PROPOSED BUILDING AND WALKS	0.01	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.75	**0.46**	0.35	0.47	0.67
E1	PROPOSED LANDSCAPE	0.04	0.02	0.01	0.15	0.49
	PROPOSED PARK	0.16	0.10	0.06	0.21	0.53
	PROPOSED BUILDING AND WALKS	0.02	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.09	1.00	0.83	0.87	0.89
		0.32	**0.41**	0.30	0.43	0.65
F1	PROPOSED LANDSCAPE	0.04	0.02	0.01	0.15	0.49
	PROPOSED SINGLE FAMILY (0.25 AC or LESS)	0.53	0.45	0.34	0.47	0.67
	PROPOSED BUILDING AND WALKS	0.03	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.09	1.00	0.83	0.87	0.89

MERRICK & COMPANY

Developed Composite C-Factor and Impervious Analysis

Compark Village South - (Tract A)

Calculated by: KB
Checked by: KW
Date: 4/22/2022

		UDFCD - TABLE 6-4, SOIL GROUP C/D				
		0.69	**0.51**	0.39	0.51	0.69
G1	PROPOSED LANDSCAPE	0.22	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.00	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.22	**0.02**	0.01	0.15	0.49
G2	PROPOSED LANDSCAPE	0.06	0.02	0.01	0.15	0.49
	PROPOSED SINGLE FAMILY (0.25 AC or LESS)	0.00	0.45	0.34	0.47	0.67
	PROPOSED BUILDING AND WALKS	0.00	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.06	**0.02**	0.01	0.15	0.49
H1	PROPOSED LANDSCAPE	0.05	0.02	0.01	0.15	0.49
	PROPOSED SINGLE FAMILY (0.25 AC or LESS)	0.00	0.45	0.34	0.47	0.67
	PROPOSED BUILDING AND WALKS	0.02	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.05	1.00	0.83	0.87	0.89
		0.11	**0.55**	0.43	0.54	0.71
I1	PROPOSED LANDSCAPE	0.57	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.03	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.60	**0.06**	0.04	0.18	0.51
I2	PROPOSED LANDSCAPE	0.00	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.03	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.03	**0.90**	0.74	0.80	0.85
J1	PROPOSED LANDSCAPE	1.22	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.00	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		1.22	**0.02**	0.01	0.15	0.49

		TOTAL AREA	TOTAL IMP
	TOTAL DEVELOPED IMPERVIOUSNESS	**7.67**	**0.35**

OS1	PROPOSED LANDSCAPE	0.78	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.08	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.87	**0.11**	0.07	0.21	0.53
OS2	PROPOSED LANDSCAPE	0.28	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.01	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.30	**0.06**	0.03	0.17	0.51
OS3	PROPOSED LANDSCAPE	0.29	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.01	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.30	**0.04**	0.02	0.16	0.50

MERRICK & COMPANY

Developed Composite C-Factor and Impervious Analysis

Compark Village South - (Tract A)

Calculated by: KB
Checked by: KW
Date: 4/22/2022

UDFCD - TABLE 6-4, SOIL GROUP C/D

OS4	PROPOSED LANDSCAPE	0.04	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.01	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.11	1.00	0.83	0.87	0.89
		0.16	**0.77**	0.61	0.70	0.80
OS5	PROPOSED LANDSCAPE	0.08	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.02	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.21	1.00	0.83	0.87	0.89
		0.31	**0.73**	0.59	0.67	0.78
OS6	PROPOSED LANDSCAPE	0.07	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.01	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.16	1.00	0.83	0.87	0.89
		0.25	**0.71**	0.56	0.65	0.77
OS7	PROPOSED LANDSCAPE	0.15	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.03	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.18	**0.16**	0.11	0.25	0.55
OS8	PROPOSED LANDSCAPE	0.05	0.02	0.01	0.15	0.49
	PROPOSED BUILDING AND WALKS	0.03	0.90	0.74	0.80	0.85
	PROPOSED PAVEMENT	0.00	1.00	0.83	0.87	0.89
		0.08	**0.32**	0.23	0.37	0.62

	TOTAL AREA	TOTAL IMP
TOTAL OFF-SITE IMPERVIOUSNESS	**2.44**	**0.29**
TOTAL CONVEYED TO REGIONAL FACILITY (BLUE BASIN ID'S)	**10.09**	**0.33**

MERRICK & COMPANY

STANDARD FORM SF-2
TIME OF CONCENTRATION

4/22/2022

CALCULATED BY: *KB* PROJECT: Compark Village South - (Tract A) JOB NO: 65119686
CHECKED BY: *KW* BASIN: LOCATION: Town of Parker, CO

SUB-BASIN DATA				INITIAL/OVERLAND TIME (Tc)			TRAVEL TIME Gutter (Tt)						Tc CHECK (Urbanized Basins)			FINAL Tc	CONVEYANCE REMARKS
DESIGNATION	AREA (acres)	IMPERVIOUS %	C_5	LENGTH (ft)	SLOPE (%)	Ti (min)	LENGTH (ft)	AVG. SLOPE ΔY	(%)	Conv. Type*	VEL (fps)	Tt (min)	COMP Tc (min)	TOTAL LENGTH (ft)	Tc=(26-17i)+L/(60*(14i+9)*sqrt(S)) (min)	(min)**	
A1	0.33	2%	0.01	40	16.0	5.0	240	2.8	1.2	3	0.8	5.3	10.3	280	26.0	**10.3**	Building Roof
A2	0.88	54%	0.41	120	1.5	11.9	375	5.0	1.3	6	2.3	2.7	14.6	495	17.1	**14.6**	Paved Gutter
A3	0.63	58%	0.45	20	3.2	3.6	375	5.0	1.3	6	2.3	2.7	6.3	395	16.4	**6.3**	Paved Gutter
C1	1.84	46%	0.35	25	2.5	5.0	185	10.5	5.7	6	4.8	0.6	5.7	210	18.2	**5.7**	Paved Gutter
D1	0.75	46%	0.35	25	2.5	5.0	185	10.5	5.7	6	4.8	0.6	5.7	210	18.3	**5.7**	Paved Gutter
E1	0.32	41%	0.30	25	1.5	6.3	175	1.0	0.6	6	1.5	1.9	8.2	200	19.3	**8.2**	Paved Gutter
F1	0.69	51%	0.39	120	1.5	12.2	350	5.0	1.4	6	2.4	2.4	14.7	470	17.5	**14.7**	Paved Gutter
G1	0.22	2%	0.01	40	16.0	5.0	200	2.8	1.4	5	1.8	1.9	6.9	240	25.9	**6.9**	Grass Swale
G2	0.06	2%	0.01	15	20.0	2.8	100	1.5	1.5	5	1.8	0.9	3.7	115	25.8	**5.0**	Grass Swale
H1	0.11	55%	0.43	18	1.5	4.5	50	1.3	2.6	6	3.2	0.3	4.8	68	16.7	**5.0**	Paved Gutter
I1	0.60	6%	0.04	25	4.0	6.1	140	6.0	4.3	3	1.4	1.6	7.7	165	25.1	**7.7**	Pasture
I2	0.03	90%	0.74	25	4.0	2.1	140	6.0	4.3	6	4.1	0.6	2.6	165	10.8	**5.0**	Paved Gutter
J1	1.22	2%	0.01	10	3.0	4.3	10	3.0	30.0	3	3.8	0.0	4.4	20	25.7	**5.0**	Pasture
OS1	0.87	11%	0.07	100	3.6	12.2	215	2.5	1.2	3	0.8	4.7	17.0	315	24.5	**17.0**	Pasture
OS2	0.30	6%	0.03	100	3.5	12.7	130	3.4	2.6	3	1.1	1.9	14.7	230	25.3	**14.7**	Pasture
OS3	0.30	4%	0.02	100	3.5	12.9	25	0.5	2.0	3	1.0	0.4	13.3	125	25.6	**13.3**	Pasture
OS4	0.16	77%	0.61	15	1.5	3.0	200	7.5	3.8	6	3.9	0.9	3.8	215	13.1	**5.0**	Paved Gutter
OS5	0.31	73%	0.59	15	1.5	3.1	415	7.0	1.7	6	2.6	2.7	5.8	430	13.7	**5.8**	Paved Gutter
OS6	0.25	71%	0.56	15	1.5	3.3	300	3.0	1.0	6	2.0	2.5	5.8	315	14.1	**5.8**	Paved Gutter
OS7	0.18	16%	0.11	20	16.0	3.2	25	4.0	16.0	3	2.8	0.1	3.4	45	23.3	**5.0**	Pasture
OS8	0.08	32%	0.23	15	10.0	2.8	20	2.0	10.0	3	2.2	0.2	3.0	35	20.5	**5.0**	Pasture

* Note: Conveyance Coefficients - Type 1-Heavy Meadow, Type 2-Tillage/Field, Type 3-Short Pasture and lawns, Type 4-Nearly Bare Soil, Type 5-Grassed Waterway, Type 6-Paved areas and shallow paved swales. The maximum initial/overland length shall not exceed 300 feet.

** Based on Assumption that Building roofs will take 5 min to fully contribute to storm system

MERRICK & COMPANY

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: KB
DATE: 4/22/2022
CHECKED BY: KW

JOB NO: 65110570
PROJECT: Compark Village South - (Tract A)
DESIGN STORM: 2 Year

		DIRECT RUNOFF						TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		
DESIGN POINT	AREA DESIG.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)
	A1	0.33	0.01	10.3	0.00	2.8	0.01												
	A2	0.88	0.41	14.6	0.36	2.4	0.88												
	A3	0.63	0.45	6.3	0.28	3.4	0.95												
	C1	1.84	0.35	5.7	0.64	3.5	2.23												
	D1	0.75	0.35	5.7	0.26	3.5	0.90												
	E1	0.32	0.30	8.2	0.10	3.1	0.30												
	F1	0.69	0.39	14.7	0.27	2.4	0.66												
	G1	0.22	0.01	6.9	0.00	3.3	0.01												
	G2	0.06	0.01	5.0	0.00	3.6	0.00												
	H1	0.11	0.43	5.0	0.05	3.6	0.17												
	I1	0.60	0.04	7.7	0.02	3.2	0.07												
	I2	0.03	0.74	5.0	0.02	3.6	0.08												
	J1	1.22	0.01	5.0	0.01	3.6	0.05												
	OS1	0.87	0.07	17.0	0.06	2.3	0.13												
	OS2	0.30	0.03	14.7	0.01	2.4	0.02												
	OS3	0.30	0.02	13.3	0.01	2.5	0.02												
	OS4	0.16	0.61	5.0	0.10	3.6	0.36												
	OS5	0.31	0.59	5.8	0.18	3.5	0.62												
	OS6	0.25	0.56	5.8	0.14	3.5	0.48												
	OS7	0.18	0.11	5.0	0.02	3.6	0.07												
	OS8	0.08	0.23	5.0	0.02	3.6	0.07												

5-YEAR RAINFALL = 1.39 IN/HR., 100-YEAR RAINFALL = 2.60 IN/HR.
*value known from Master Drainage Report

MERRICK & COMPANY

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: KB
DATE: 4/22/2022
CHECKED BY: KW
JOB NO: 65110570
PROJECT: Compark Village South - (Tract A)
DESIGN STORM: 100 Year

		DIRECT RUNOFF						TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		
DESIGN POINT	AREA DESIG.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)
	A1	0.33	0.49	10.3	0.16	7.1	1.17												
	A2	0.88	0.70	14.6	0.62	6.1	3.78												
	A3	0.63	0.72	6.2	0.45	8.5	3.86												
	C1	1.84	0.67	5.7	1.24	8.8	10.83												
	D1	0.75	0.67	5.7	0.50	8.7	4.40												
	E1	0.32	0.65	8.2	0.21	7.8	1.62												
	F1	0.69	0.69	14.7	0.48	6.1	2.93												
	G1	0.22	0.49	6.9	0.11	8.3	0.90												
	G2	0.06	0.49	5.0	0.03	9.1	0.27												
	H1	0.11	0.71	5.0	0.08	9.1	0.72												
	I1	0.60	0.51	7.7	0.31	8.0	2.43												
	I2	0.03	0.90	5.0	0.03	9.1	0.24												
	J1	1.22	0.49	5.0	0.60	9.1	5.43												
	OS1	0.87	0.53	17.0	0.46	5.7	2.61												
	OS2	0.30	0.51	14.7	0.15	6.1	0.92												
	OS3	0.30	0.50	13.3	0.15	6.4	0.95												
	OS4	0.16	0.80	5.0	0.13	9.1	1.16												
	OS5	0.31	0.78	5.8	0.24	8.7	2.09												
	OS6	0.25	0.77	5.8	0.19	8.7	1.68												
	OS7	0.18	0.55	5.0	0.10	9.1	0.91												
	OS8	0.08	0.62	5.0	0.05	9.1	0.45												

5-YEAR RAINFALL = 1.39 IN/HR., 100-YEAR RAINFALL = 2.60 IN/HR.
*value known from Master Drainage Report

Appendix C: Hydraulic Computations

Bentley FlowMaster Analysis

Street Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02600	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	100.00
0+15	99.70
0+17	99.62
0+18	100.12
0+31	100.38

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00, 100.00)	(0+15, 99.70)	0.013
(0+15, 99.70)	(0+17, 99.62)	0.013
(0+17, 99.62)	(0+18, 100.12)	0.013
(0+18, 100.12)	(0+31, 100.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	40.74	ft³/s
Elevation Range	99.62 to 100.38 ft	
Flow Area	5.10	ft²
Wetted Perimeter	17.83	ft
Hydraulic Radius	0.29	ft

Street Capacity

Results

Top Width		17.50	ft
Normal Depth		0.50	ft
Critical Depth		0.77	ft
Critical Slope		0.00349	ft/ft
Velocity		8.00	ft/s
Velocity Head		0.99	ft
Specific Energy		1.49	ft
Froude Number		2.61	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.77	ft
Channel Slope	0.02600	ft/ft
Critical Slope	0.00349	ft/ft

Cross Section for Street Capacity

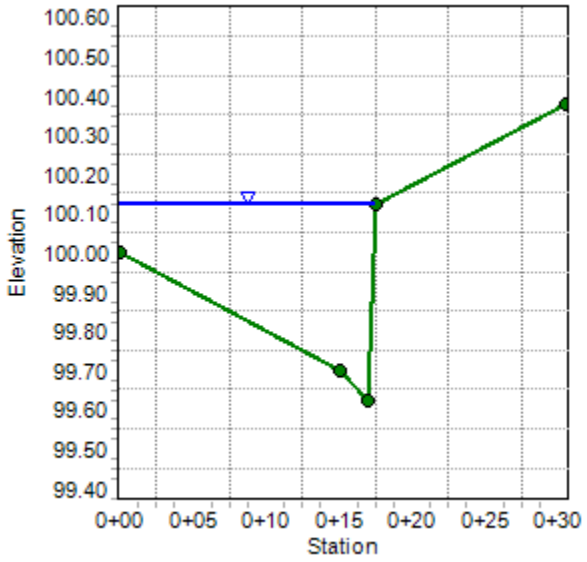
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02600	ft/ft
Normal Depth	0.50	ft
Discharge	40.74	ft³/s

Cross Section Image



Trapezoidal Channel

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Normal Depth	1.00	ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft

Results

Discharge	27.20	ft^3/s
Flow Area	9.50	ft^2
Wetted Perimeter	17.15	ft
Hydraulic Radius	0.55	ft
Top Width	17.00	ft
Critical Depth	0.84	ft
Critical Slope	0.02311	ft/ft
Velocity	2.86	ft/s
Velocity Head	0.13	ft
Specific Energy	1.13	ft
Froude Number	0.68	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.84	ft
Channel Slope	0.01000	ft/ft

Trapezoidal Channel

GVF Output Data

Critical Slope	0.02311	ft/ft

Cross Section for Trapezoidal Channel

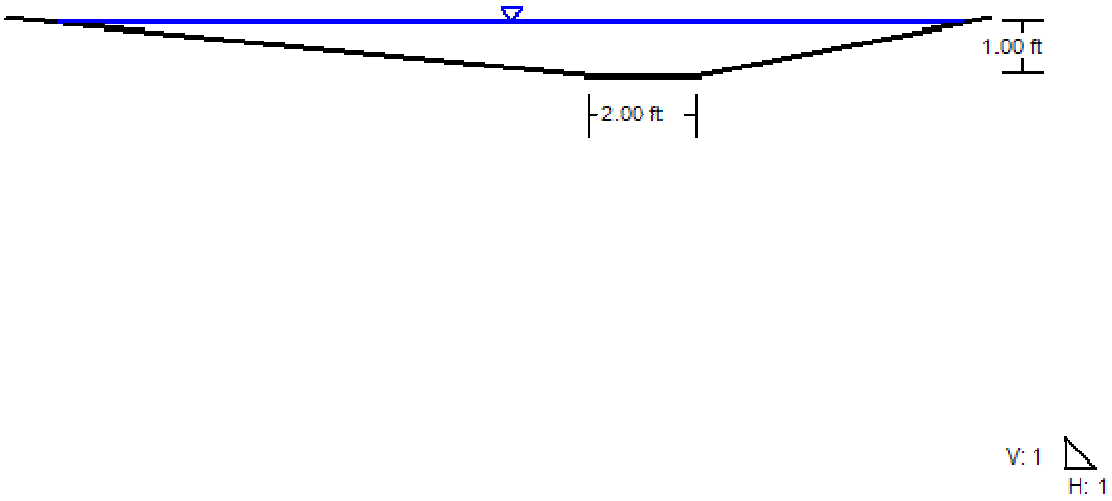
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Normal Depth	1.00	ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	27.20	ft³/s

Cross Section Image



DP1 Trapezoidal Channel - 100YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.20	ft³/s

Results

Normal Depth	0.25	ft
Flow Area	0.94	ft²
Wetted Perimeter	5.71	ft
Hydraulic Radius	0.16	ft
Top Width	5.68	ft
Critical Depth	0.18	ft
Critical Slope	0.03578	ft/ft
Velocity	1.28	ft/s
Velocity Head	0.03	ft
Specific Energy	0.27	ft
Froude Number	0.55	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.25	ft
Critical Depth	0.18	ft
Channel Slope	0.01000	ft/ft

DP1 Trapezoidal Channel - 100YR

GVF Output Data

Critical Slope	0.03578	ft/ft

Cross Section for DP1 Trapezoidal Channel - 100YR

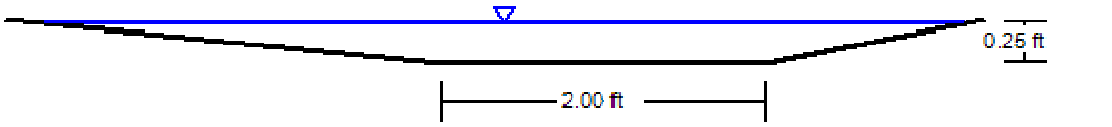
Project Description

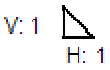
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Normal Depth	0.25	ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.20	ft³/s

Cross Section Image





DP2 Trapezoidal Channel - 100YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	3.90	ft³/s

Results

Normal Depth	0.43	ft
Flow Area	2.24	ft²
Wetted Perimeter	8.50	ft
Hydraulic Radius	0.26	ft
Top Width	8.43	ft
Critical Depth	0.33	ft
Critical Slope	0.03015	ft/ft
Velocity	1.74	ft/s
Velocity Head	0.05	ft
Specific Energy	0.48	ft
Froude Number	0.60	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.43	ft
Critical Depth	0.33	ft
Channel Slope	0.01000	ft/ft

DP2 Trapezoidal Channel - 100YR

GVF Output Data

Critical Slope	0.03015	ft/ft

Cross Section for DP2 Trapezoidal Channel - 100YR

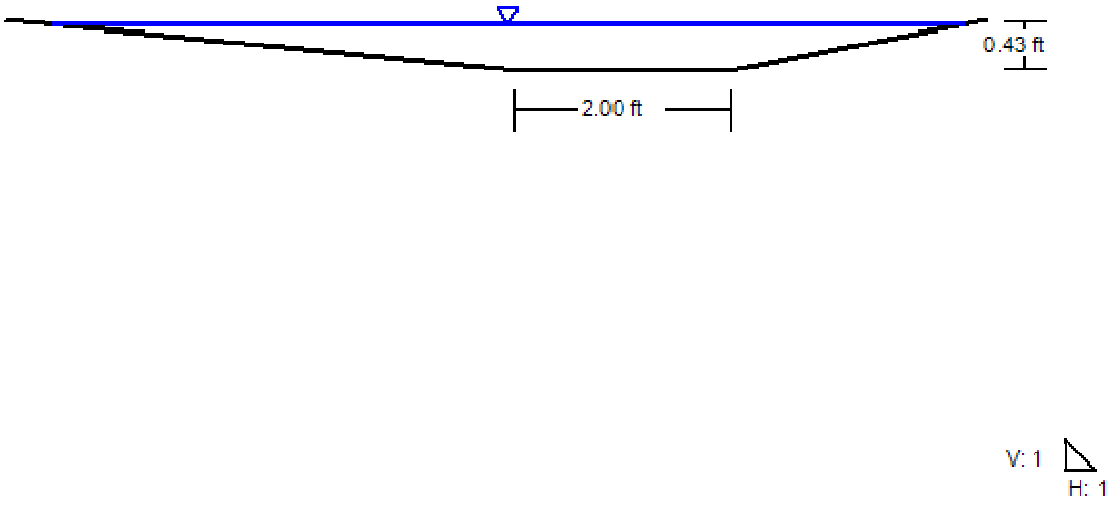
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Normal Depth	0.43	ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	3.90	ft³/s

Cross Section Image



DP15 Trapezoidal Channel - 100YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.80	ft³/s

Results

Normal Depth	0.30	ft
Flow Area	1.26	ft²
Wetted Perimeter	6.52	ft
Hydraulic Radius	0.19	ft
Top Width	6.47	ft
Critical Depth	0.22	ft
Critical Slope	0.03369	ft/ft
Velocity	1.42	ft/s
Velocity Head	0.03	ft
Specific Energy	0.33	ft
Froude Number	0.57	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.30	ft
Critical Depth	0.22	ft
Channel Slope	0.01000	ft/ft

DP15 Trapezoidal Channel - 100YR

GVF Output Data

Critical Slope	0.03369	ft/ft

Cross Section for DP15 Trapezoidal Channel - 100YR

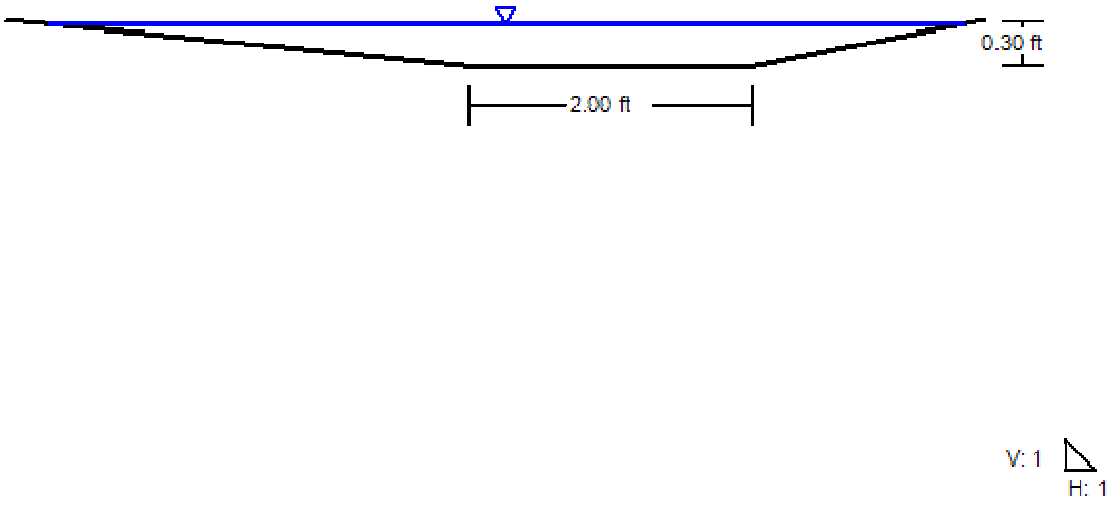
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Normal Depth	0.30	ft
Left Side Slope	10.00	ft/ft (H:V)
Right Side Slope	5.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.80	ft³/s

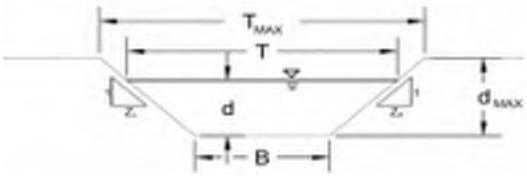
Cross Section Image



Inlet Sizing
UD-Inlet Calculations

AREA INLET IN A SWALE

DP 2



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.030	
Channel Invert Slope	S_O =	0.0100	ft/ft
Bottom Width	B =	2.00	ft
Left Side Slope	Z1 =	5.00	ft/ft
Right Side Sloe	Z2 =	5.00	ft/ft

Check one of the following soil types:

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

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**12.00**	**12.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**24.0**	**24.0**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.00**	**1.00**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.3**	**14.0**	**cfs**
Water Depth	**d** =	**0.11**	**0.79**	**ft**

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

AREA INLET IN A SWALE

DP 2

Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.11	0.79	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**0.7**	**12.9**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**92**	**%**

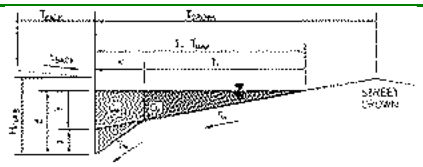
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

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

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

Project:

Inlet ID: **DP 4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

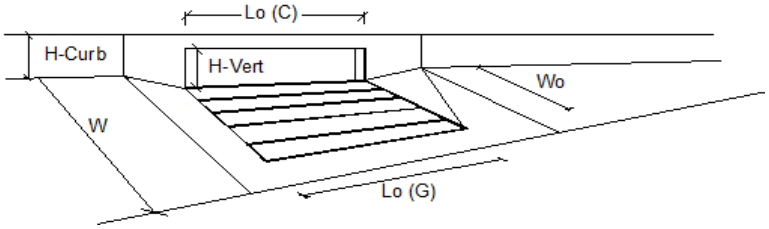
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**19.8**	**19.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

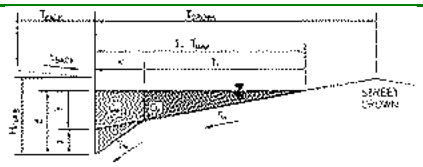
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.9**	**4.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

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

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

Project:

Inlet ID: **DP 5**



Gutter Geometry:

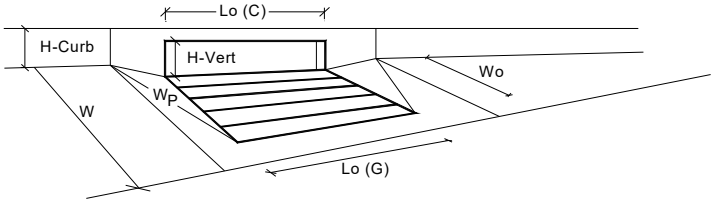
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



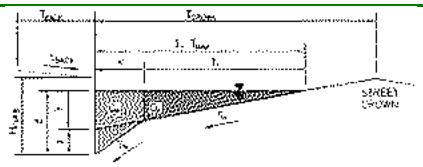
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	5.6	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.30	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.53	0.53	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	0.76	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.0**	**8.0**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	3.9	18.5	cfs

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

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

Project:

Inlet ID: **DP7**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.038	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

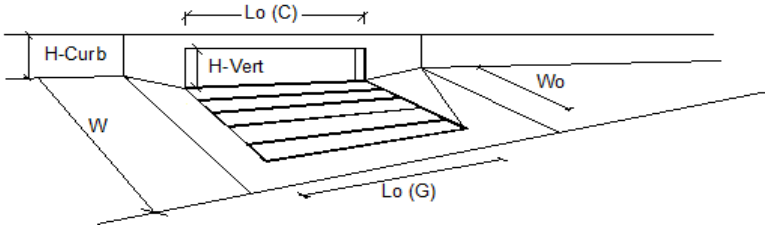
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**27.3**	**27.3**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

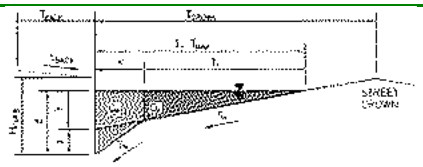
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**9.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**61**	**%**

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

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

Project:

Inlet ID: **DP9**



Gutter Geometry:

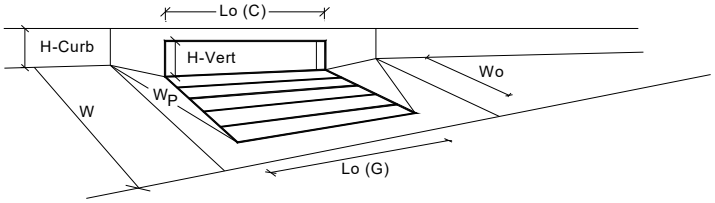
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



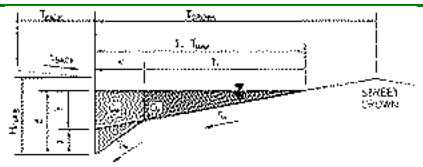
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	7.3	7.3	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.44	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.69	0.69	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**13.5**	**13.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.8	12.9	cfs

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

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

Project:

Inlet ID: **DP11**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

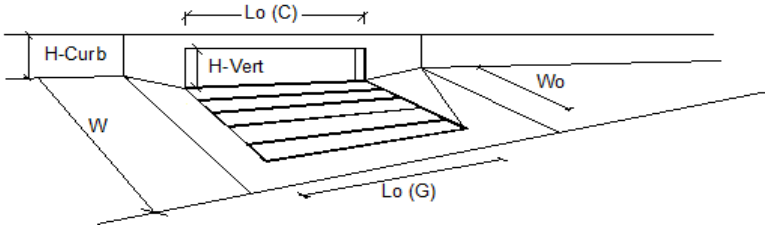
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**19.8**	**19.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

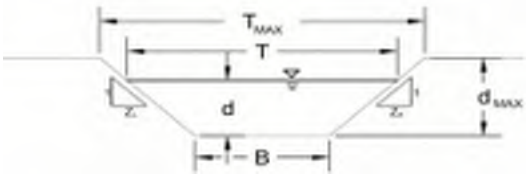


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.4**	**5.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**92**	**%**

AREA INLET IN A SWALE

DP15



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.030	
Channel Invert Slope	S_O =	0.0100	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	20.00	ft/ft
Right Side Sloe	Z2 =	20.00	ft/ft

Check one of the following soil types:

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

Choose One:
- ○ Non-Cohesive
- ◉ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**30.00**	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**29.0**	**29.0**	cfs
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.75**	**0.75**	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.1**	**2.9**	cfs
Water Depth	d =	**0.09**	**0.32**	ft

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

AREA INLET IN A SWALE

DP15

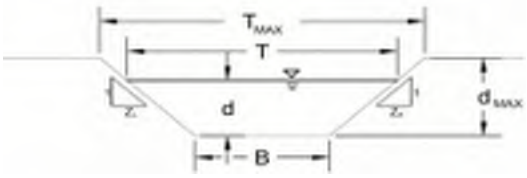
Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.09	0.32	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**0.5**	**3.3**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

AREA INLET IN A SWALE

DP18



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.030	
Channel Invert Slope	S_O =	0.0100	ft/ft
Bottom Width	B =	2.00	ft
Left Side Slope	Z1 =	5.00	ft/ft
Right Side Sloe	Z2 =	5.00	ft/ft

Check one of the following soil types:

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

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**12.00**	**12.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**24.0**	**24.0**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.00**	**1.00**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.0**	**0.3**	**cfs**
Water Depth	**d** =	**0.00**	**0.11**	**ft**

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

AREA INLET IN A SWALE

DP18

Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.00	0.11	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**0.0**	**0.7**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

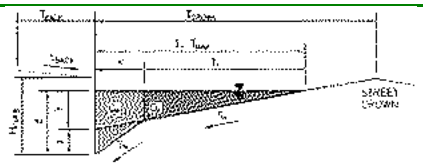
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

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

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

Project:

Inlet ID: **DP19**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

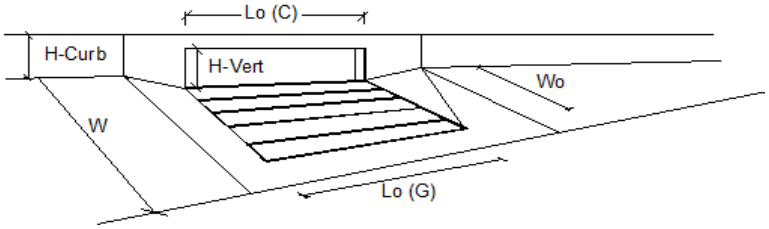
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**22.2**	**22.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

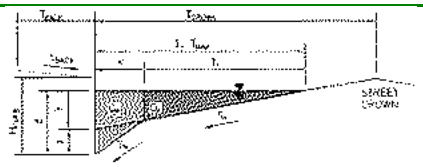
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.7**	**2.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

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

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

Project:

Inlet ID: **DP20**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

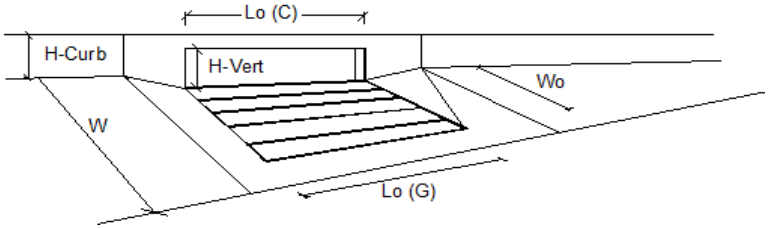
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**22.2**	**22.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

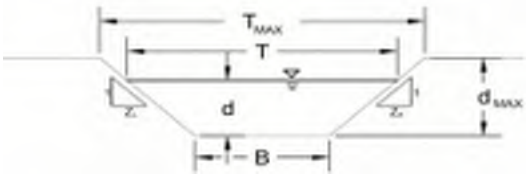


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.3**	**1.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

AREA INLET IN A SWALE

DP21



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.030	
Channel Invert Slope	S_O =	0.0100	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	20.00	ft/ft
Right Side Sloe	Z2 =	20.00	ft/ft

Check one of the following soil types:

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

Choose One:
- ○ Non-Cohesive
- ◉ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**30.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**29.0**	**29.0**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.75**	**0.75**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.0**	**5.4**	**cfs**
Water Depth	**d** =	**0.01**	**0.40**	**ft**

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

AREA INLET IN A SWALE

DP21

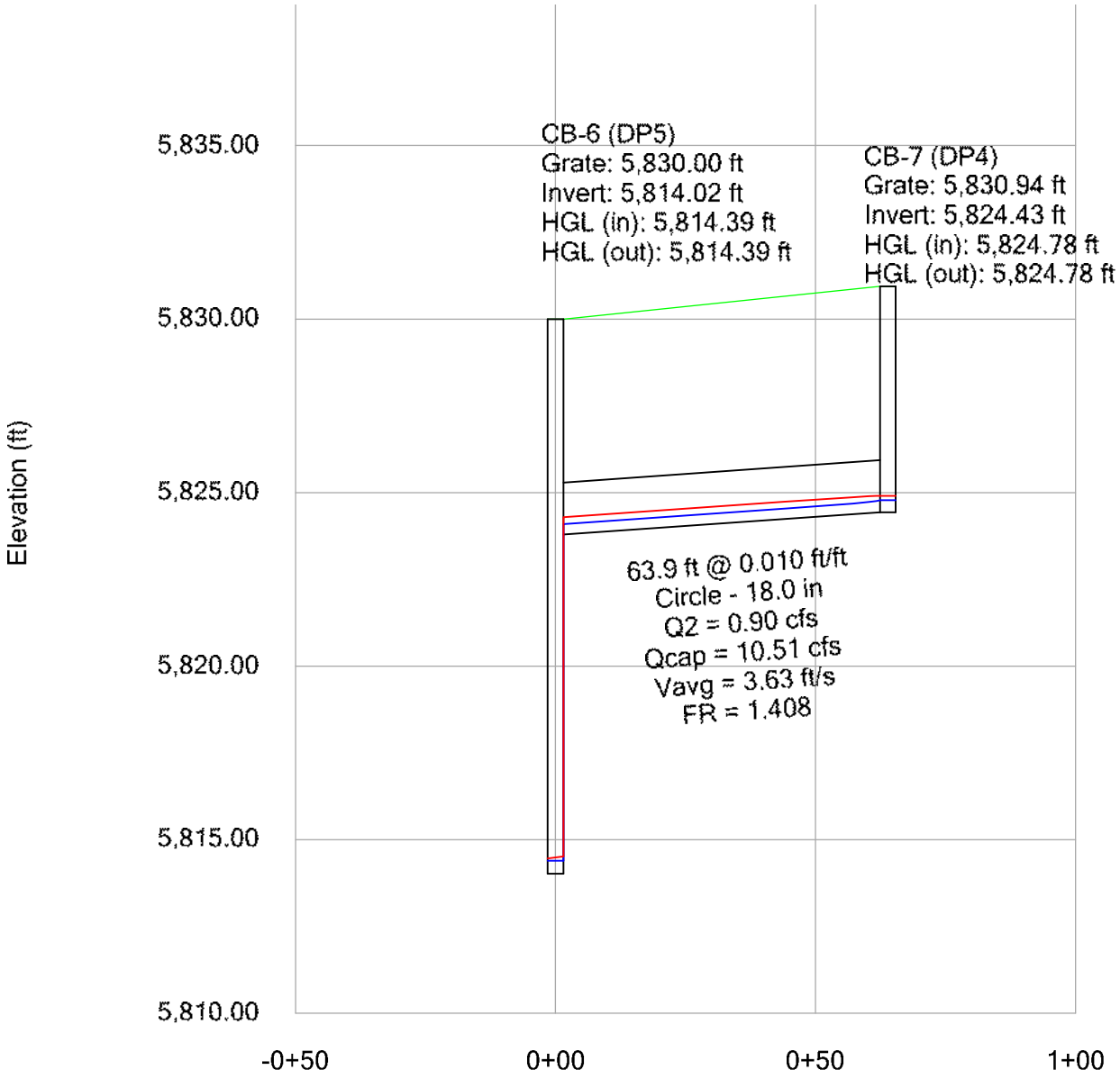
Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	

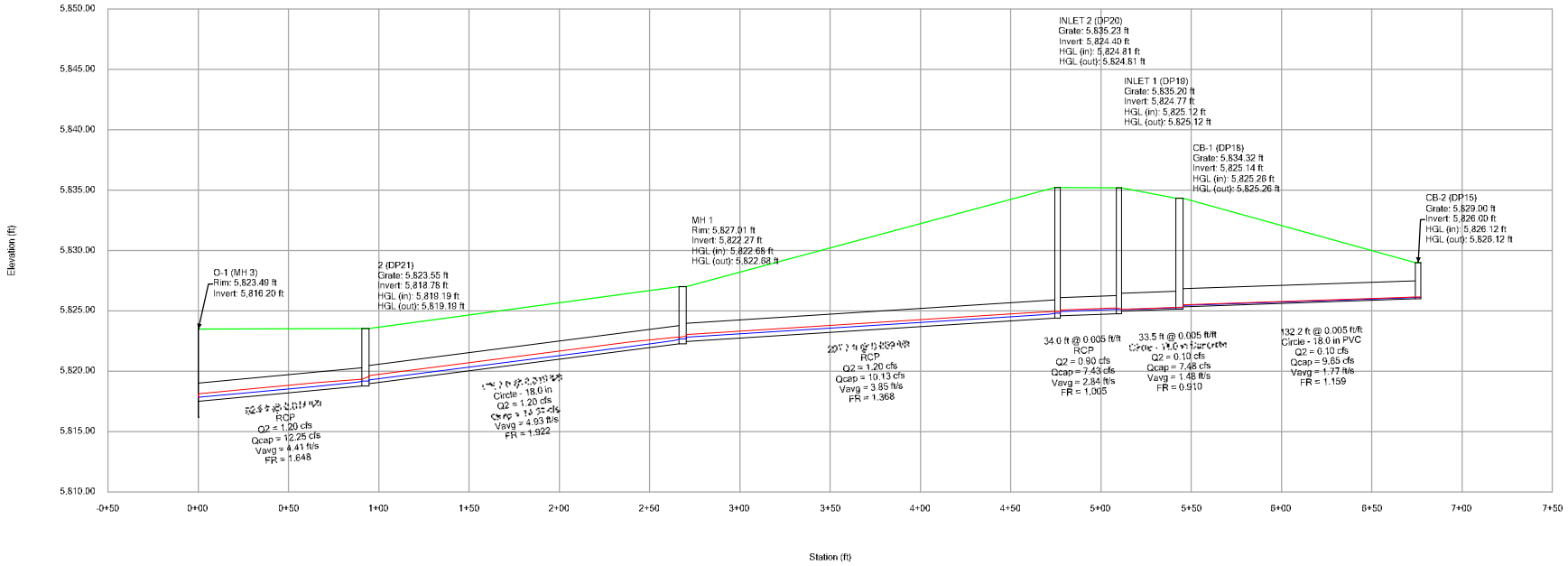
		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.01	0.40	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**0.0**	**4.7**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**86**	**%**

StormCAD Analysis Output

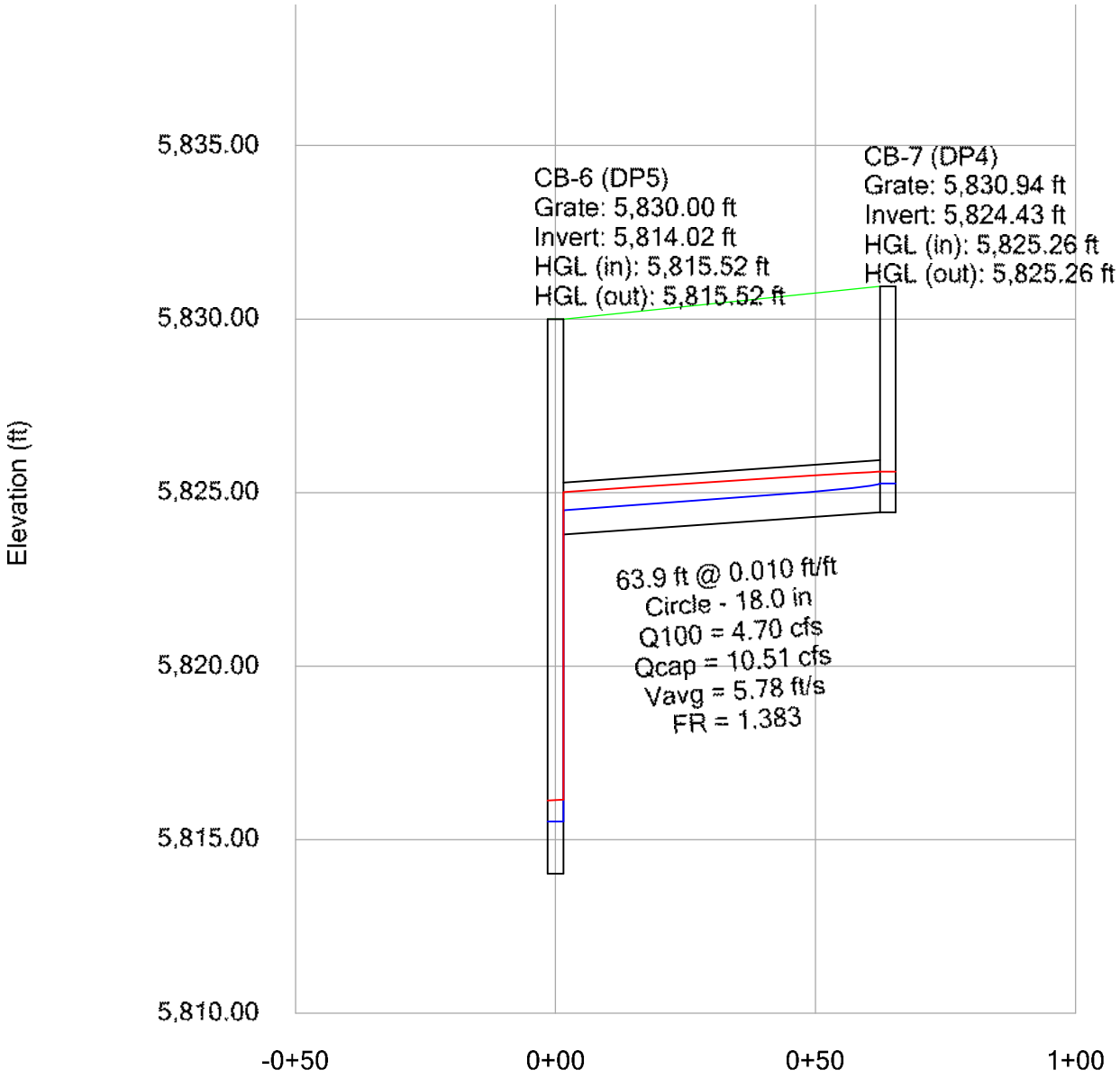
COMPARK SF - 2YR PEAK STORM



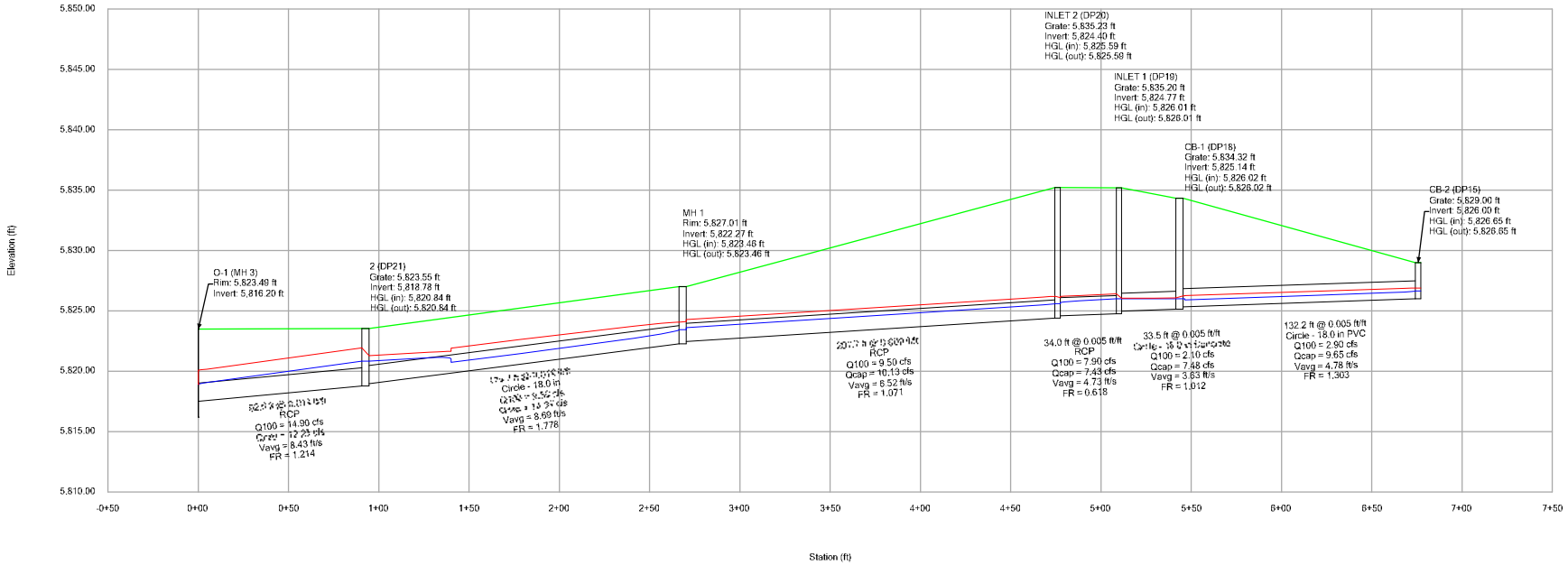
COMPARK SF - 2YR PEAK STORM



COMPARK SF - 100YR PEAK STORM



COMPARK SF - 100YR PEAK STORM



Appendix D: Excerpts from Referenced Drainage Studies

Final Drainage Report Amendment

Compark Village South, Filing No. 1
Parker, Colorado

P.N. CLCPKC3

Prepared for:
470 Compark, LLC
1001 Bannock Street, Suite 240
Denver, CO 80204

Prepared by:
Manhard Consulting
7600 E Orchard Road, Suite 150N
Greenwood Village, Colorado 80111
Contact: Rick Moore, P.E.
303-708-0500

Initially Submitted September 30, 2019
Revised March 2, 2020
Revised May 5, 2020
Revised July 31, 2020

Compark Village South
Drainage Amendment

July 31, 2020

This final drainage report amendment for the Compark Village South project 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.

Prepared by:

Amie S. Drucker, P.E.
Registered Professional Engineer
State of Colorado No. 49038

COLORADO REGISTERED AMIE S. DRUCKER 49038 11/17/20 PROFESSIONAL ENGINEER

Reviewed by:

Ricky J Moore, P.E.
Registered Professional Engineer
State of Colorado No. 30877

COLORADO REGISTERED RICKY J. MOORE 30877 11-17-20 PROFESSIONAL ENGINEER

TABLE OF CONTENTS

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III. DRAINAGE DESIGN CRITERIA
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APPENDIX A
Drainage Amendment Exhibit
Drainage Areas to Detention Basin Exhibit

APPENDIX B
Compark Village South Filing No. 2 Proposed Drainage Area Map
% Impervious Calculations

APPENDIX C
UD Detention – CVS Filing No. 2 + Belford Ave + 15 ac Commercial +11 ac CVS Filing No. 3
UD Detention – Filing 2 to Inlet 1-3
UD Detention – Filing 2 to Inlet 1-4
UD Detention – Filing 2 to Inlet 1-6
UD Detention – Grand View Estates (H180)
UD Detention – Grand View Estates (H170)
UD Detention – CVS Filing No. 2 + Belford Ave + 15 ac Commercial +Grand View Estates (H180) +11 ac CVS Filing No. 3

APPENDIX D
StormCAD profiles

APPENDIX E
Pipe Outlet Rip Rap Sizing Calculations

I. GENERAL LOCATION AND DESCRIPTION

A. Scope

This is an amendment to the "Final Drainage Report, Compark Village South, Filing No. 1", prepared by Manhard Consulting, dated November 20, 2015, last revised October 21, 2016. The original scope of this project included realignment of the Green Acres Tributary and construction of an on-line regional detention pond. Since preparation of the previous design, it has been determined by a consultant for Mile High Flood Control District that the on-line regional detention basin is not required for this area. The realignment and improvements to the Green Acres Tributary will now be designed and permitted by RESPEC, the MHFD's consultant.

This amendment is to design an off-line detention basin to control the runoff and provide water quality treatment for the proposed stormwater runoff from Compark Village South Filing No. 1 Belford Avenue improvements and the Compark Village South Filing No. 2 residential subdivision, as well as, a portion of the Compark Village South Filing No. 3 project. Drainage criteria utilized for the design are in accordance with the *Town of Parker Storm Drainage and Environmental Criteria Manual and Urban Drainage and Flood Control District*.

II. DRAINAGE BASINS AND SUB-BASINS

A. Basin Description

The basins and sub-basins utilized to size the proposed detention basin were taken from the "Final Drainage Report, Compark Village South Filing No. 1", prepared by Manhard Consulting, dated November 20, 2015, last revised October 21, 2016. The areas include Belford Avenue from a high point at station 35+15 to the next high point at station 77+41, the 47 acres that comprise the CVS F2 project 11.5 acres of future multi-family development in CVS F3, the 15 acres of future commercial land between the Green Acres Tributary and Belford Avenue and 20 acres of off-site Grand View Estates property that currently drains through this property (H180).

In the original design, there were three direct discharges to the Green Acres Tributary and one discharge to the regional detention pond. The direct

discharge into the proposed arch culvert crossing of Belford Avenue will remain unchanged with this amendment. The other direct discharges into the Green Acres Tributary will remain, but baffle walls will be added to the structures upstream of the GAT to direct the 2 year storm runoff to a drainage pipe that will convey the runoff to the proposed off-line detention basin for water quality treatment. The elevations of the tops of the baffle walls were set at the 2 yr design storm HGL taken from the StormCAD model. The model includes rating tables in the diversion manholes to reflect the proposed diversion of the 2 yr storm flows from the pipes to the GAT. Flows greater than the 2 year storm will overtop the baffle walls and directly discharge to the Green Acres Tributary. The previous discharge to the regional detention pond will be upsized from a 42" RCP to a 60" RCP to convey the runoff from the original design plus the flows from a 2 year storm from the upstream drainage basins that previously discharged directly to the GAT. The drainage system has been revised to route the runoff from STMH 11-12 across the future commercial tract, along Green Acres Tributary and into the proposed off-line detention basin. Although runoff from portions of Belford Avenue and CVS F2 will be directly discharged to the GAT, storage and water quality treatment for these areas will be provided in the proposed detention basin. That is, compensatory storage and treatment will be provided in the proposed detention basin.

Sizing of the proposed Forebay A includes 40 acres of Grandview Estates in addition to the 93.5 acres utilized to size the detention basin. This property drains into the CVS system and was included in the calculations for the 2 year runoff being directed to the detention basin. Flows greater than the 2 year design storm will pass over the baffle wall in the diversion manhole and will discharge directly to the Green Acres Tributary, therefore, this area was not included in the sizing of the proposed detention basin.

III. DRAINAGE DESIGN CRITERIA

A. Regulations

The regulations, guidelines, and drainage design criteria to be used are those contained within the *Town of Parker Storm Drainage Design and Environmental Criteria* and the *Urban Storm Drainage Criteria Manual*. The general drainage concept is to construct a full spectrum extended detention

basin to provide detention and water quality treatment for the proposed stormwater runoff from a portion of Belford Avenue, the entire Compark Village South Filing No. 2 subdivision, a portion of the Compark Village South Filing No. 3 tract and the portion of the commercial tract between the Green Acres Tributary and Belford Avenue.

B. Hydrologic Criteria

The stormwater system associated with Belford Avenue (major collector) was designed for a 5 yr minor storm and the 100 yr major storm. Detailed design information for the system can be found in "Final Drainage Report, Compark Village South, Filing No. 1", prepared by Manhard Consulting, dated November 20, 2015, last revised October 21, 2016. The UDFCD UD Detention worksheet was utilized to design the proposed extended detention basin, the proposed outlet structure, emergency overflow weir, as well as, to calculate the direct runoff from the Grand View Estates property that currently drains across this property.

The UD Detention workbook was completed for the portions of Belford Avenue, all of Compark Village South Filing No. 2, an 11.5 acre portion of Compark Village South Filing No. 3 and 15 acres of commercial area north of Belford Avenue to calculate the allowable release rates for the proposed development without the Grand View Estates area. Then the workbook was utilized to calculate the runoff from the Grand View Estates drainage basin. The 100-year runoff from Grand View Estates will be "passed through" the detention basin, i.e. the allowable 90% of the 100-year discharge from the CVS F2 basin, 42.7 cfs, was increased to include the runoff of 26.8 cfs as calculated by the UD Worksheet for the 20 acre drainage basin.

Drainage Areas to Proposed Detention Basin (See Appendix A):

- 15 ac Commercial (South of Green Acres Trib) @ 90% Impervious (assumed)
- 47 ac CVS Filing No. 2 Residential @ 48% Impervious (calculated)
- 11.5 ac CVS Filing No. 3 Multi-Family @ 75% Impervious (assumed)
- 20 ac Grandview Estates (H180) @ 15% Impervious

Total DA=93.5 ac @ 51% Impervious

Use UD Detention to Calculate Allowable Release of Developed Areas (No Grandview Estates)

Total DA=73.5 ac @ 61% Impervious
From Spreadsheet 100 yr Predeveloped = 65.3 cfs

90% Predeveloped = 58.8 cfs
Direct Discharge to GAT - 26 cfs (Calculated using UD Detention)
32.8 cfs

Allowable 100 yr Release from Detention Basin:

32.8 cfs (Developed runoff) + 26.8 cfs (H180 Undetained Grand View runoff) = **59.6 cfs**

Summary of Predeveloped vs. Postdeveloped Discharges to Green Acres Tributary:

Design Storm Event	Predeveloped Flows to GAT (cfs) H170 + H180 (Grand View Estates)	Predeveloped Flows to GAT (cfs) CVS	Total Predeveloped Flow to GAT (cfs)	Developed Detained Flows (cfs)	Bypass Flows to GAT (cfs)	Total Postdeveloped Flow to GAT (cfs)
2 year	6.2	0.5	6.7	0.9	0.0	0.9
5 year	11.6	1.8	13.4	1.1	12.1	13.2
10 year	21.8	9.7	31.5	7.4	23.1	30.5
25 year	48.9	32.9	81.8	43.5	49.5	93.0
50 year	67.8	46.9	114.7	53.4	68.1	121.5
100 year	92.2	65.3	157.5	57.3	92.0	149.3
500 year	144.9	104.1	249.0	187.8	144.3	332.1

*See Appendix C for supporting runoff calculations

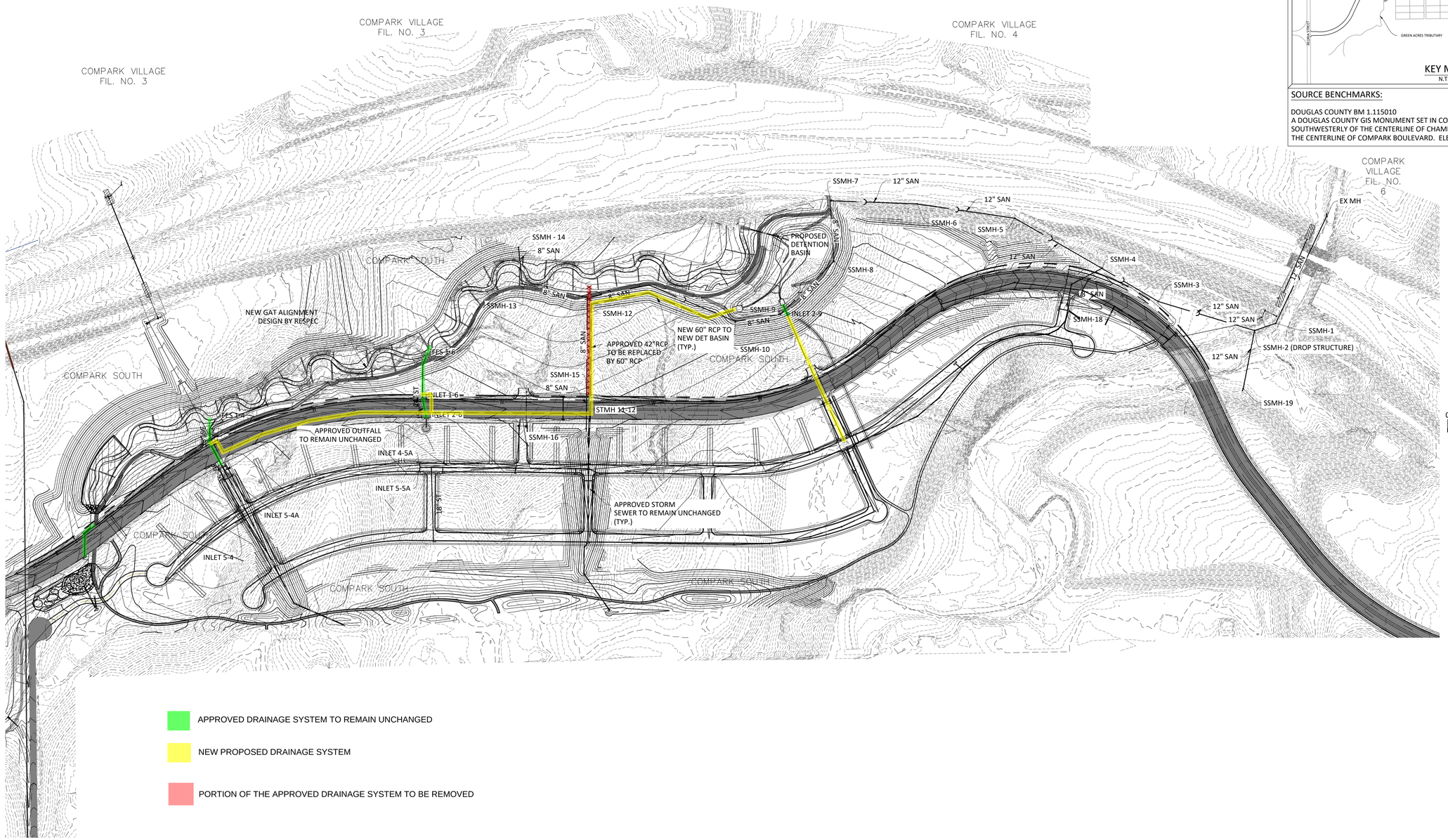
C. Variance from Criteria

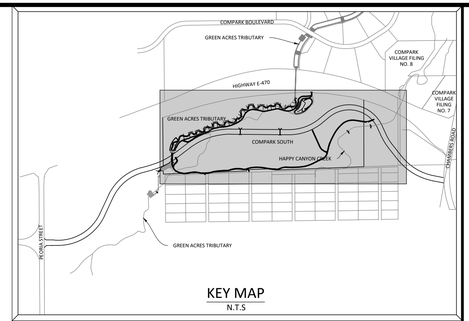
No variance is required.

IV. CONCLUSION

This final drainage report amendment complies with all major standards of the Town of Parker and the Urban Drainage Flood Control District. This overall plan for the site's drainage design is effective and economical for controlling damage due to excess storm runoff and minimizing erosive discharges.

Appendix A





KEY MAP
N.T.S

SOURCE BENCHMARKS:

DOUGLAS COUNTY BM 1.115010
A DOUGLAS COUNTY GIS MONUMENT SET IN CONCRETE LOCATED APPROXIMATELY 130 FEET SOUTHWESTERLY OF THE CENTERLINE OF CHAMBERS ROAD AND 95 FEET NORTHWESTERLY OF THE CENTERLINE OF COMPARK BOULEVARD. ELEVATION = 5752.84 (NAVD 88)

APPROVED DRAINAGE SYSTEM TO REMAIN UNCHANGED

NEW PROPOSED DRAINAGE SYSTEM

PORTION OF THE APPROVED DRAINAGE SYSTEM TO BE REMOVED

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

DRAWN BY | REVISIONS | DATE

Manhard CONSULTING
7600 East Orchard Road, Suite 150-N, Greenwood Village, CO 80111 ph: 303.708.0500 manhard.com
Civil Engineering & Surveying | Water Resource Management | Construction Management

PRELIMINARY COMPARK VILLAGE SOUTH, F1 - BELFORD AVENUE

TOWN OF PARKER, COLORADO

DRAINAGE AMENDMENT EXHIBIT

PROJ. MGR.: GTI
PROJ. ASSOC.: ASD
DRAWN BY: ASD
DATE: 09/2019

SHEET 1 OF 1

CLCPKC3

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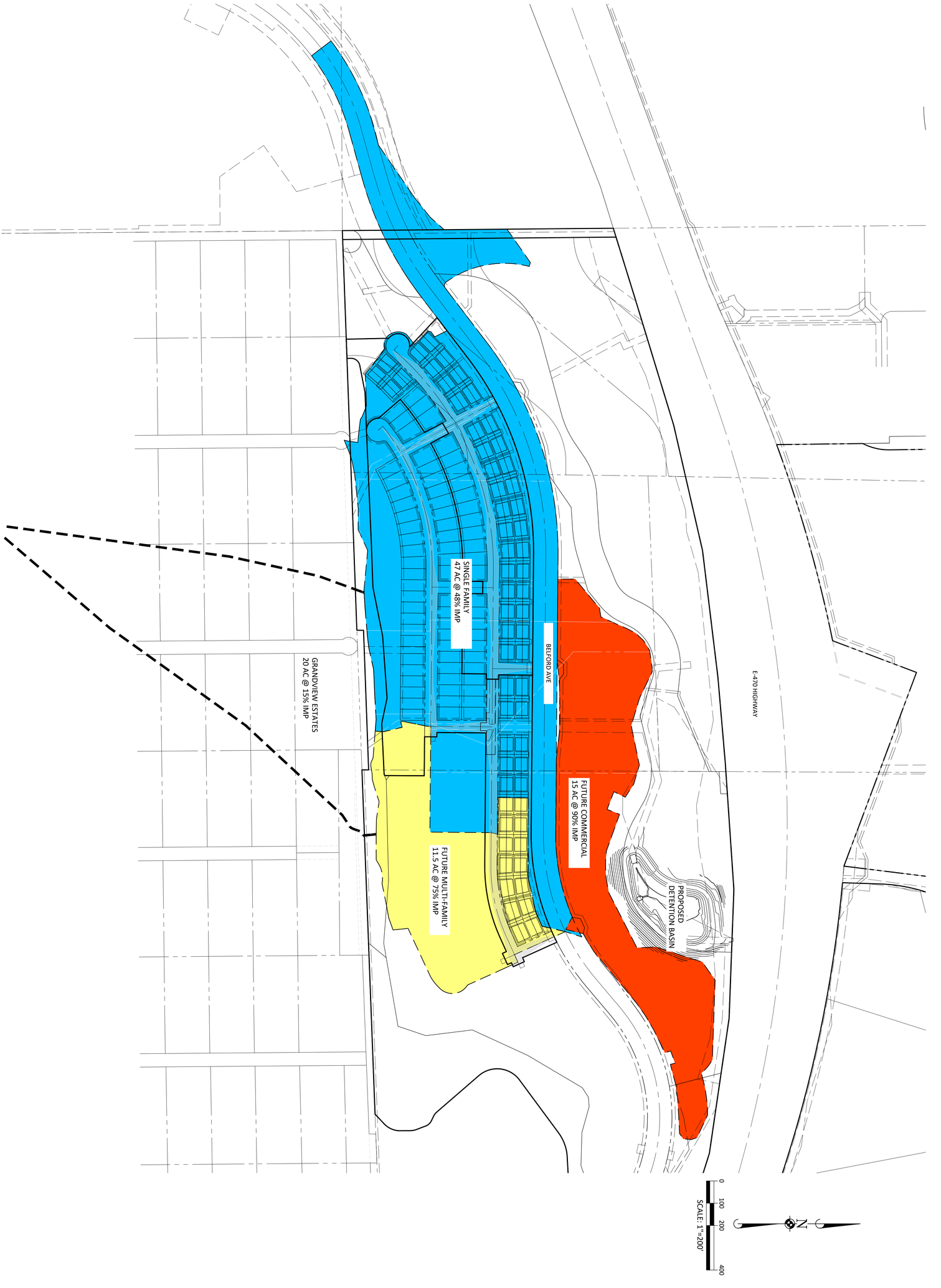
Plotted: 3/7/2020 7:28 AM Dwg Name: P:\Clcpkc3\ComSouth02-GreenAcresTrib\dwg\Engr\Work Area\ASD\2019 Detention Basin\Drainage Amendment Exhibit.dwg Updated By: ADucker

Plotted: 5/6/2020 10:35 AM Dwg Name: P:\Clcpkc3\ComSouth12-Filing 1 No GAT\ComSouth03-Ultimate Belford Ave\Documents\Engineering\StormWater Reports\Drainage Exhibits\Drainage Areas to Det Basin.dwg, Updated By: ADrucker



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SHEET 1 OF 1
CLCPKC3

DATE: 3-2-20
DRAWN BY: ASD
PROJ. MGR.: JE
PROJ. ANDVC.: GTI

COMPARK VILLAGE SOUTH FILING NO. 1

TOWN OF PARKER, CO

CONTRIBUTORY DRAINAGE AREAS TO DET BASIN EXHIBIT

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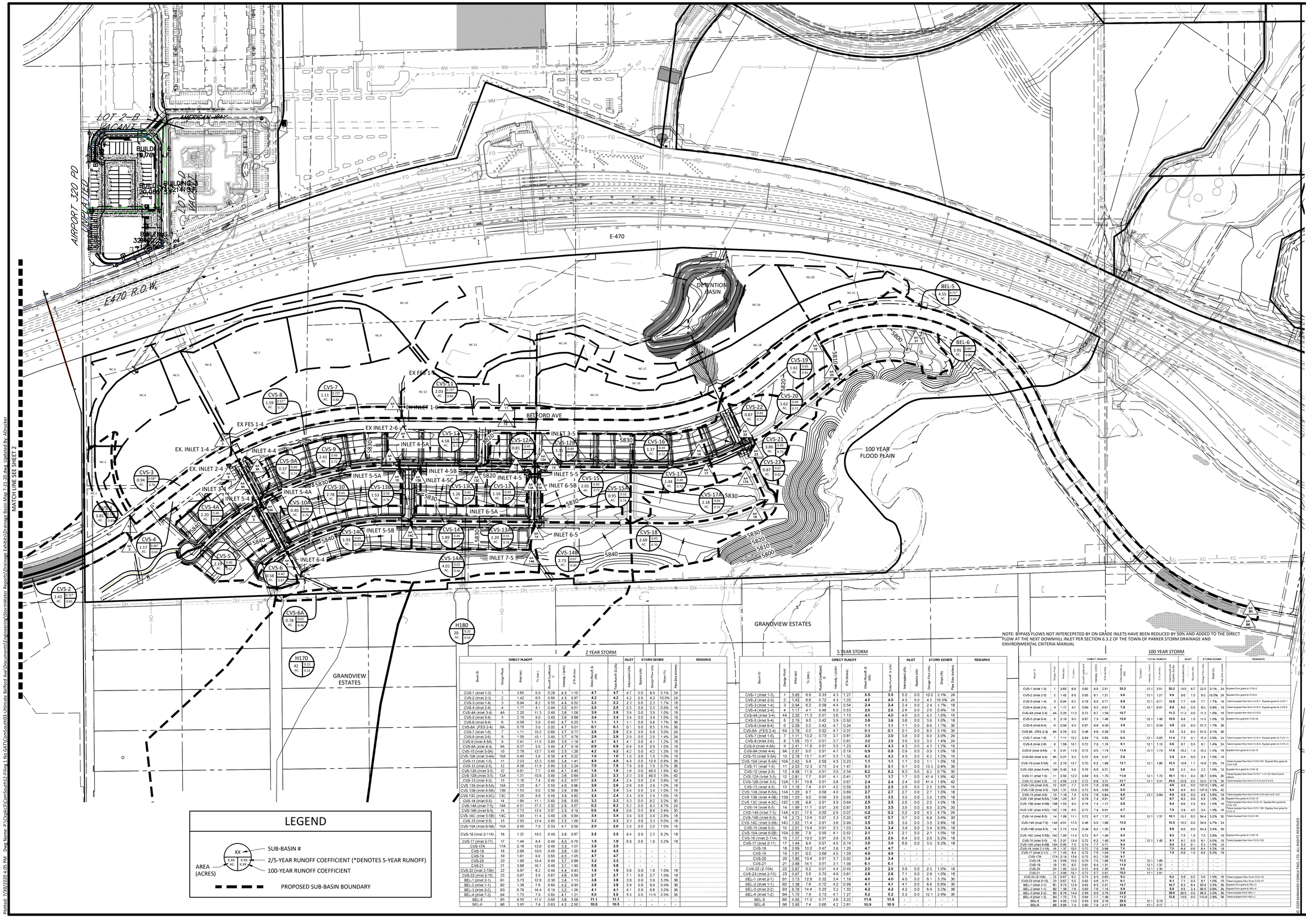
DATE	REVISIONS	DRAWN BY

####

Appendix B



LEGEND

- XX — SUB-BASIN #
- AREA (ACRES) — 2/5-YEAR RUNOFF COEFFICIENT (*DENOTES 5-YEAR RUNOFF)
- 100-YEAR RUNOFF COEFFICIENT
- PROPOSED SUB-BASIN BOUNDARY

NOTE: BYPASS FLOWS NOT INTERCEPTED BY ON GRADE INLETS HAVE BEEN REDUCED BY 50% AND ADDED TO THE DIRECT FLOW AT THE NEXT DOWNHILL INLET PER SECTION 6.3.2 OF THE TOWN OF PARKER STORM DRAINAGE AND ENVIRONMENTAL CRITERIA MANUAL

2 YEAR STORM

	DIRECT RUNOFF							INLET	STORM SEWER				REMARKS
Basin ID	Design Point	Area (ac)	T_c (min.)	Runoff Coefficient	Intensity, I (in/hr)	CYA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	Intercepted (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (inlet 1-3)	1	3.85	6.9	0.28	4.3	1.10	**4.7**	4.7	0.0	8.9	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	6.6	0.69	4.3	0.97	**4.2**	4.2	4.2	0.0	4.2	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.2	0.55	4.4	0.52	**2.3**	2.3	0.0	2.3	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	4.1	0.44	5.0	0.51	**2.5**	2.5	0.0	2.5	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.49	3.6	1.08	**3.9**	3.9	0.0	3.9	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.40	3.9	0.86	**3.4**	3.4	0.0	3.4	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.40	4.7	0.23	**1.1**	1.1	0.0	0.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	0.1	0.0	8.5	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.69	3.7	0.77	**2.9**	2.9	0.0	5.8	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.49	3.7	0.76	**2.9**	2.9	0.0	2.9	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.49	3.5	1.18	**4.1**	4.1	0.0	4.1	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.49	4.7	0.18	**0.9**	0.9	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.45	3.3	1.26	**4.2**	4.2	0.0	4.2	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.56	4.5	0.22	**1.0**	1.0	0.0	1.0	1.0%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.69	3.4	1.41	**4.9**	4.9	0.0	12.8	0.6%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.49	3.5	2.24	**7.9**	7.9	0.0	7.9	0.7%	36	
CVS-12A (inlet 3-5)	12	0.81	7.7	0.49	4.1	0.40	**1.6**	1.6	0.0	40.0	1.9%	42	
CVS-12B (inlet 4-5B)	12A	1.31	10.8	0.49	3.6	0.64	**2.3**	2.3	0.0	40.0	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.49	4.2	0.57	**2.4**	2.4	0.0	2.4	3.6%	18	
CVS-13A (inlet 6-5A)	13A	1.20	8.7	0.55	4.0	0.66	**2.6**	2.6	0.0	2.6	1.0%	18	
CVS-13B (inlet 4-5B)	13B	1.53	9.0	0.56	3.9	0.96	**3.4**	3.4	0.0	3.4	1.0%	18	
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.49	3.9	0.62	**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.49	3.6	0.93	**3.3**	3.3	0.0	8.2	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	0.2	0.0	4.3	4.7%	24	
CVS-14B (inlet 6-5)	14B	2.73	13.4	0.07	3.3	0.19	**0.6**	0.6	0.6	0.0	8.6	3.4%	30
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.49	3.6	0.94	**3.4**	3.4	0.0	3.4	2.8%	18	
CVS-15 (inlet 5-5)	15	2.05	13.4	0.49	3.3	1.00	**3.3**	3.3	0.0	3.3	1.0%	18	
CVS-15A (inlet 6-5B)	15A	9.95	7.9	0.53	4.1	0.50	**2.0**	2.0	0.0	2.0	1.0%	18	
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.49	3.8	0.67	**2.5**	2.5	0.4	0.0	2.5	5.2%	18
CVS-17 (inlet 2-11)	17	1.44	8.4	0.49	4.0	0.70	**1.9**	1.9	0.8	0.0	1.9	5.2%	18
CVS-17A	17A	2.18	13.6	0.49	3.3	1.07	**3.6**	**3.5**	-	-	-	-	-
CVS-18	18	2.69	10.0	0.45	3.8	1.20	**4.5**	**4.5**	-	-	-	-	-
CVS-19	19	1.61	6.6	0.65	4.5	1.05	**4.7**	**4.7**	-	-	-	-	-
CVS-20	20	1.80	10.4	0.49	3.7	0.86	**3.3**	**3.3**	-	-	-	-	-
CVS-21	21	3.88	16.1	0.51	3.1	1.90	**5.8**	**5.8**	-	-	-	-	-
CVS-22 (inlet 2-10A)	22	0.87	6.2	0.77	4.4	0.43	**1.9**	**1.9**	0.6	0.0	1.9	1.0%	18
CVS-23 (inlet 2-10)	23	0.87	5.5	0.70	4.6	0.56	**2.7**	**2.7**	1.1	0.0	2.7	1.0%	18
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.30	3.4	1.13	**3.8**	**3.8**	0.0	0.0	5.9	3.3%	36
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.69	4.2	0.95	**3.9**	**3.9**	3.9	0.0	8.4	0.9%	36
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.19	3.2	1.26	**4.1**	**4.1**	0.0	0.0	6.6	3.2%	36
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.69	4.1	1.21	**5.0**	**5.0**	0.0	11.6	2.9%	36	
BEL-5	B5	4.55	11.0	0.68	3.6	3.08	**11.1**	**11.1**	-	-	-	-	-
BEL-6	B6	3.95	7.4	0.63	4.2	2.50	**10.5**	**10.5**	-	-	-	-	-

5 YEAR STORM

	DIRECT RUNOFF							INLET	STORM SEWER				REMARKS
Basin ID	Design Point	Area (ac)	T_c (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CYA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	Intercepted (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (inlet 1-3)	1	3.85	6.9	0.33	4.3	1.27	**5.5**	**5.5**	0.0	10.0	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	6.6	0.72	4.3	1.03	**4.5**	**4.5**	4.5	0.0	4.5	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.2	0.58	4.4	0.54	**2.4**	**2.4**	0.0	2.4	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	4.1	0.46	5.0	0.53	**2.6**	**2.6**	0.0	2.6	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.51	3.6	1.13	**4.0**	**4.0**	0.0	4.0	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.42	3.9	0.90	**3.5**	**3.6**	0.0	3.6	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.42	4.7	0.24	**1.1**	**1.1**	0.0	0.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	**0.1**	0.0	8.5	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.73	3.7	0.81	**3.0**	**3.0**	0.0	6.0	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.51	3.7	0.81	**3.0**	**3.0**	0.0	3.0	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.51	3.5	1.23	**4.3**	**4.3**	0.0	4.3	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.51	4.7	0.19	**0.9**	**0.9**	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.47	3.3	1.32	**4.3**	**4.3**	0.0	4.3	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.59	4.5	0.23	**1.1**	**1.1**	0.0	1.1	1.0%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.73	3.4	1.47	**5.1**	**5.1**	0.0	13.3	0.6%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.51	3.5	2.34	**8.2**	**8.2**	0.0	8.2	0.7%	36	
CVS-12A (inlet 3-5)	12	0.81	7.7	0.51	4.1	0.41	**1.7**	**1.7**	0.0	41.4	1.9%	42	
CVS-12B (inlet 4-5B)	12A	1.31	10.8	0.51	3.6	0.67	**2.4**	**2.4**	0.0	41.4	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.51	4.2	0.59	**2.5**	**2.5**	2.5	0.0	2.5	3.6%	18
CVS-13A (inlet 6-5A)	13A	1.20	8.7	0.58	4.0	0.69	**2.7**	**2.7**	0.0	2.7	1.0%	18	
CVS-13B (inlet 4-5B)	13B	1.53	9.0	0.59	3.9	1.00	**3.5**	**3.5**	0.0	3.5	1.0%	18	
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.51	3.9	0.64	**2.5**	**2.5**	0.0	2.5	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.51	3.6	0.97	**3.5**	**3.5**	0.0	8.5	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.0	4.3	4.7%	24	
CVS-14B (inlet 6-5)	14B	2.73	13.4	0.07	3.3	0.20	**0.7**	**0.7**	0.0	8.8	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.49	3.6	0.97	**3.5**	**3.5**	0.0	3.5	2.8%	18	
CVS-15 (inlet 5-5)	15	2.01	13.4	0.51	3.3	1.03	**3.4**	**3.4**	0.0	3.4	5.0%	18	
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.55	4.1	0.52	**2.1**	**2.1**	2.1	0.0	2.1	1.0%	18
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.51	3.8	0.70	**2.6**	**2.6**	0.4	0.0	2.6	5.2%	18
CVS-17 (inlet 2-11)	17	1.44	8.4	0.51	4.0	0.74	**3.0**	**3.0**	0.8	0.0	3.0	5.2%	18
CVS-17A	17A	2.18	13.6	0.49	3.3	1.07	**3.6**	**3.5**	-	-	-	-	-
CVS-18	18	2.69	10.0	0.47	3.8	1.25	**4.7**	**4.7**	-	-	-	-	-
CVS-19	19	1.61	6.6	0.68	4.5	1.09	**4.9**	**4.9**	-	-	-	-	-
CVS-20	20	1.80	10.4	0.51	3.7	0.92	**3.4**	**3.4**	-	-	-	-	-
CVS-21	21	3.88	16.1	0.51	3.1	1.98	**6.1**	**6.1**	-	-	-	-	-
CVS-22 (inlet 2-10A)	22	0.87	6.2	0.81	4.4	0.45	**2.0**	**2.0**	0.6	0.0	2.0	1.0%	18
CVS-23 (inlet 2-10)	23	0.87	5.5	0.70	4.6	0.61	**2.8**	**2.8**	7.1	0.0	2.8	1.0%	18
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.32	3.4	1.18	**4.0**	**4.0**	0.0	6.1	3.3%	36	
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.72	4.2	0.99	**4.1**	**4.1**	4.1	0.0	8.8	0.9%	36
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.20	3.2	1.32	**4.2**	**4.2**	0.0	6.9	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.72	4.1	1.27	**5.2**	**5.2**	0.0	12.1	2.9%	36	
BEL-5	B5	4.55	11.0	0.71	3.6	3.22	**11.6**	**11.6**	-	-	-	-	-
BEL-6	B6	3.95	7.4	0.66	4.2	2.61	**10.9**	**10.9**	-	-	-	-	-

100 YEAR STORM

	DIRECT RUNOFF							TOTAL RUNOFF			INLET	STORM SEWER		REMARKS
Basin ID	Design Point	Area (ac)	T_c (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CYA (Acres)	Direct Runoff, Q (cfs)	T_c (min.)	Intensity, I (in/hr)	Total Runoff, Q (cfs)	Intercepted (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (inlet 1-3)	1	3.85	6.9	0.65	6.0	2.51	**20.2**	12.1	2.51	**20.2**	13.5	6.7	22.5	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	6.6	0.85	6.1	1.21	**9.9**	12.1	1.21	**9.9**	9.0	1.0	9.0	10.0%	24	Bypass flow goes to CVS-4
CVS-3 (inlet 1-4)	3	0.94	6.2	0.76	6.3	0.71	**6.9**	12.1	0.71	**12.6**	7.7	4.9	7.7	1.7%	18	Takes bypass flow from CVS-1. Bypass goes to CVS-7.
CVS-4 (inlet 2-4)	4	1.17	4.1	0.69	9.3	0.81	**7.5**	12.1	0.81	**8.5**	8.0	0.5	8.0	0.9%	18	Takes bypass flow from CVS-2. Bypass goes to CVS-8.
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.72	6.7	1.59	**10.7**			**11.2**	11.2	0.0	11.2	1.0%	18	Takes bypass flow from CVS-3 & 4
CVS-5 (inlet 5-4)	5	2.19	9.0	0.67	7.3	1.48	**10.0**	12.1	1.48	**10.0**	10.0	0.0	11.0	1.0%	18	Bypass flow goes to CVS-4A
CVS-6 (inlet 6-4)	6	0.58	5.0	0.67	8.8	0.39	**3.5**	12.1	0.39	**3.5**	3.5	0.0	51.3	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.46	8.8	0.36	**3.2**			**3.2**	3.2	0.0	51.0	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.84	7.9	0.83	**6.5**	12.1	0.83	**11.4**	7.3	4.1	15.4	3.0%	24	Takes bypass flow from CVS-3 & 9. Bypass goes to CVS-11.
CVS-8 (inlet 2-6)	8	1.59	10.1	0.72	7.9	1.15	**8.5**	12.1	1.15	**8.6**	8.1	0.5	8.1	1.4%	24	Takes bypass flow from CVS-4 & 10. Bypass goes to CVS-12.
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.72	6.5	1.74	**11.4**	12.1	1.74	**11.6**	10.2	1.4	10.2	1.2%	18	Bypass flow goes to CVS-12
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.72	8.8	0.27	**2.4**			**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.70	6.2	1.86	**12.1**	12.1	1.86	**12.3**	10.8	1.7	10.8	1.2%	18	Takes bypass flow from CVS-10A. Bypass flow goes to CVS-13B
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.76	8.5	0.31	**2.6**			**2.6**	2.2	0.0	2.2	1.0%	18	Bypass flow goes to CVS-10
CVS-11 (inlet 1-5)	11	3.00	12.3	0.84	6.5	1.70	**19.1**	12.1	1.70	**19.1**	15.4	0.0	28.7	0.6%	36	Takes bypass flow from CVS-7 *(1.7)-12.3& Add Comm Values*
CVS-12 (inlet 2-5)	12	4.58	11.9	0.72	6.6	3.31	**21.7**	12.1	3.31	**25.4**	23.6	0.0	23.6	0.7%	36	Takes bypass flow from CVS-8 and CVS-9
CVS-12A (inlet 3-5)	12	0.81	7.7	0.72	7.8	0.59	**4.5**			**4.5**	4.5	0.0	137.0	1.9%	42	
CVS-12B (inlet 4-5B)	12A	1.31	10.8	0.72	6.9	0.65	**5.0**			**9.4**	9.4	0.0	137.0	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.72	7.9	0.84	**6.5**	12.1	0.84	**6.9**	5.9	0.0	9.8	3.6%	18	Takes bypass flow from CVS-13A and CVS-13C.
CVS-13A (inlet 6-5A)	13A	1.20	8.7	0.74	7.4	0.91	**6.7**			**6.7**	6.2	0.5	9.2	1.0%	18	Bypass flow goes to CVS-13
CVS-13B (inlet 4-5B)	13B	1.53	9.0	0.76	7.3	1.17	**8.5**			**5.4**	6.9	2.5	6.9	1.0%	18	Takes bypass flow from CVS-5. Bypass flow goes to CVS-15C
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.72	7.4	0.91	**6.7**			**7.9**	3.9	4.0	3.9	1.0%	18	Takes bypass flow from CVS 10B. Bypass flow goes to CVS-13B
CVS-14 (inlet 6-5)	14	1.89	11.1	0.72	6.7	1.37	**9.2**	12.1	1.37	**10.1**	10.1	0.0	54.4	3.2%	30	Takes bypass flow from CVS-14C
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.46	3.8	1.98	**19.2**			**19.2**	10.2	10.2	34.9	4.7%	24	
CVS-14B (inlet 6-5)	14	2.73	13.4	0.49	6.2	1.26	**8.4**			**9.5**	9.5	0.0	54.4	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.72	6.7	1.40	**9.3**			**9.3**	7.5	1.8	7.5	2.8%	18	Bypass flow goes to CVS-14
CVS-15 (inlet 5-5)	15	2.01	13.4	0.72	6.2	1.45	**9.0**	12.1	1.45	**9.1**	9.1	0.0	9.1	5.0%	18	Takes bypass flow from CVS-17A
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.74	7.7	0.71	**5.4**			**5.4**	5.3	0.1	5.3	1.0%	18	
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.72	7.0	0.99	**7.6**			**7.0**	6.4	0.6	6.4	5.2%	18	
CVS-17 (inlet 2-11)	17	1.44	8.4	0.72	7.5	1.04	**7.8**			**7.8**	6.9	0.5	6.9	5.2%	18	
CVS-17A	17A	2.18	13.6	0.72	6.2	1.58	**9.7**									
CVS-18	18	2.69	10.0	0.70	7.0	1.88	**15.2**	12.1	1.88	-	-	-	-	-	-	
CVS-19	19	1.61	6.6	0.81	8.4	1.31	**10.9**	12.1	1.31	-	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.72	6.9	1.30	**9.0**	12.1	1.30	-	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.72	5.7	2.81	**15.0**	12.1	2.81	-	-	-	-	-	-	
CVS-22 (2-10A)	22	0.87	6.2	0.72	8.3	0.65	**5.2**	5.8	0.2	**5.8**	5.6	0.0	5.6	1.0%	18	Takes bypass flow from CVS-19
CVS-23 (inlet 2-10)	23	0.87	5.5	0.92	9.6	0.71	**6.1**			**6.1**	7.1	0.5	6.1	1.0%	18	Takes bypass flow from CVS-17
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.62	6.3	2.31	**14.7**			**14.7**	8.3	6.4	63.8	3.3%	36	Bypass flow goes to BEL-4
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.83	7.5	1.15	**8.9**			**8.9**	6.5	2.4	68.5	0.9%	36	Bypass flow goes to BEL-4
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.50	5.9	3.76	**29.0**	29.0	0.0	**29.0**	29.0	0.0	95.8	3.2%	36	Takes bypass flow from BEL-1
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.84	7.7	1.46	**11.2**			**13.6**	13.6	0.0	110.8	2.9%	36	Takes bypass flow from BEL-2
BEL-5	B5	4.55	11.0	0.83	6.8	3.78	**25.5**	12.1	3.78	-	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.80	7.9	3.17	**24.9**	12.1	3.17	-	-	-	-	-	-	

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REVISIONS	DATE	DRAWN BY
REVISED TO ADD OFF-LINE DET BASIN	07/30/2020	ASD
REVISED PER TOWN COMMENTS	11/21/2016	RAK

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Civil Engineering | Surveying & Geospatial Services | GIS
Water Resource Management | Construction Management

COMPARK VILLAGE SOUTH
TOWN OF PARKER, CO
PROPOSED DRAINAGE AREA MAP

PROJ. MGR.: RLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 1 OF 3
CLCPKC3

Plotted: 7/30/2020 4:05 PM By: Dug Nampi: P:\Cptac\3 Com\South\12 Filing 1 No GAT\Com\South\3-Ultimate Belford Ave\Documents\Engineering\Storm\Water Reports\Drainage Exhibits\Drainage Basin Map 7-23-20.dwg Updated By: Abucker

LEGEND

- XX — SUB-BASIN #
- AREA (ACRES) — X.XX AC. / X.XX* — 2/5-YEAR RUNOFF COEFFICIENT (*DENOTES 5-YEAR RUNOFF)
- 100-YEAR RUNOFF COEFFICIENT
- PROPOSED SUB-BASIN BOUNDARY

2 YEAR STORM

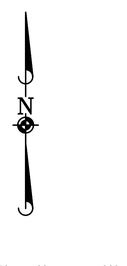
Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity - i (in/hr)	CA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	DIRECT RUNOFF: Intercepted (cfs)	INLET: Bypass (cfs)	STORM SEWER: Design Flow (cfs)	STORM SEWER: Slope (%)	STORM SEWER: Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.28	4.3	1.10	**4.7**	**4.7**	4.7	0.0	8.9	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	8.6	0.69	4.3	0.97	**4.2**	**4.2**	4.2	0.0	4.2	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.2	0.55	4.4	0.52	**2.3**	**2.3**	2.3	0.0	2.3	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	7.6	0.50	4.1	0.51	**2.5**	**2.5**	2.5	0.0	2.5	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.49	3.6	1.08	**3.9**	**3.9**	3.9	0.0	3.9	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.40	3.9	0.86	**3.4**	**3.4**	3.4	0.0	3.4	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.40	4.7	0.23	**1.1**	**1.1**	1.1	0.0	9.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	**0.1**	0.0	0.0	8.5	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.69	3.7	0.77	**2.9**	**2.9**	2.9	0.0	5.6	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.49	3.7	0.78	**2.9**	**2.9**	2.9	0.0	2.9	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.49	3.5	1.18	**4.1**	**4.1**	4.1	0.0	4.1	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.49	4.7	0.18	**0.9**	**0.9**	0.9	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.45	3.3	1.26	**4.2**	**4.2**	4.2	0.0	4.2	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.56	4.5	0.22	**1.0**	**1.0**	1.0	0.0	1.0	0.5%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.69	3.4	1.41	**4.9**	**4.9**	4.9	0.0	12.6	0.8%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.49	3.5	2.24	**7.9**	**7.9**	7.9	0.0	7.9	0.7%	36	
CVS-12A (inlet 3-5)	12	0.61	7.7	0.49	4.1	0.45	**1.6**	**1.6**	1.6	0.0	40.0	1.5%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.49	3.6	0.64	**2.3**	**2.3**	2.3	0.0	40.0	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.49	4.2	0.57	**2.4**	**2.4**	2.4	0.0	2.4	3.6%	18	
CVS-13A (inlet 8-5A)	13A	1.20	8.7	0.55	4.0	0.66	**2.6**	**2.6**	2.6	0.0	2.6	1.0%	18	
CVS-13B (inlet 4-5B)	13B	1.53	9.0	0.56	3.9	0.86	**3.4**	**3.4**	3.4	0.0	3.4	1.0%	18	
CVS-13C (inlet 4-5C)	13C	1.26	8.8	0.49	3.9	0.62	**2.4**	**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.49	3.6	0.83	**3.3**	**3.3**	3.3	0.0	8.2	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.2	0.0	4.3	4.7%	24	
CVS-14B (inlet 6-5)	14	2.73	13.4	0.07	3.3	0.20	**0.6**	**0.6**	0.6	0.0	3.4	4.0%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.49	3.6	0.84	**3.4**	**3.4**	3.4	0.0	3.4	2.8%	18	
CVS-15A (inlet 5-5B)	15A	0.95	7.9	0.53	4.1	0.50	**2.0**	**2.0**	2.0	0.0	2.0	1.0%	18	
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.49	3.8	0.67	**2.5**	**2.5**	6.4	0.0	2.5	5.2%	18	
CVS-17 (inlet 2-11)	17	1.44	8.4	0.49	4.0	0.70	**1.9**	**1.9**	6.8	0.0	1.9	5.2%	18	
CVS-17A	17A	2.18	13.6	0.49	3.3	1.07	**3.5**	**3.5**	-	-	-	-	-	
CVS-18	18	2.69	10.0	0.45	3.8	1.20	**4.5**	**4.5**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.68	4.5	1.09	**4.9**	**4.7**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.49	3.7	0.88	**3.3**	**3.3**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.49	3.1	1.90	**5.8**	**5.5**	-	-	-	-	-	
CVS-22 (inlet 2-10A)	22	0.67	6.2	0.49	4.4	0.43	**1.9**	**1.9**	5.6	0.0	1.9	1.0%	18	
CVS-23 (inlet 2-10)	23	0.67	5.5	0.67	4.6	0.58	**2.7**	**2.7**	7.1	0.0	2.7	1.0%	18	
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.30	3.4	1.13	**3.8**	**3.8**	3.8	0.0	5.6	3.3%	36	
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.69	4.2	0.95	**3.9**	**3.9**	3.9	0.0	8.4	0.9%	36	
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.19	3.2	1.26	**4.1**	**4.1**	4.1	0.0	0.6	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.69	4.1	1.21	**5.0**	**5.0**	5.0	0.0	11.6	2.9%	36	
BEL-5	B5	4.55	11.0	0.66	3.6	3.08	**11.1**	**11.1**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.83	4.2	2.50	**10.5**	**10.5**	-	-	-	-	-	

5 YEAR STORM

Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity - i (in/hr)	CA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	DIRECT RUNOFF: Intercepted (cfs)	INLET: Bypass (cfs)	STORM SEWER: Design Flow (cfs)	STORM SEWER: Slope (%)	STORM SEWER: Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.33	4.3	1.27	**5.5**	**5.5**	5.5	0.0	10.0	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	8.6	0.72	4.3	1.03	**4.5**	**4.5**	4.5	0.0	4.5	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.2	0.58	4.4	0.54	**2.4**	**2.4**	2.4	0.0	2.4	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	7.6	0.53	4.1	0.53	**2.6**	**2.6**	2.6	0.0	2.6	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.51	3.6	1.13	**4.0**	**4.0**	4.0	0.0	4.0	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.42	3.9	0.92	**3.6**	**3.6**	3.6	0.0	3.6	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.42	4.7	0.24	**1.1**	**1.1**	1.1	0.0	9.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	**0.1**	0.1	0.0	8.5	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.73	3.7	0.81	**3.0**	**3.0**	3.0	0.0	5.0	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.51	3.7	0.81	**3.0**	**3.0**	3.0	0.0	3.0	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.51	3.5	1.23	**4.3**	**4.3**	4.3	0.0	4.3	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.51	4.7	0.19	**0.9**	**0.9**	0.9	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.47	3.3	1.32	**4.3**	**4.3**	4.3	0.0	4.3	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.59	4.5	0.23	**1.1**	**1.1**	1.1	0.0	1.1	1.0%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.73	3.4	1.47	**5.1**	**5.1**	5.1	0.0	13.3	0.8%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.51	3.5	2.34	**8.2**	**8.2**	8.2	0.0	8.2	0.7%	36	
CVS-12A (inlet 3-5)	12	0.61	7.7	0.51	4.1	0.47	**1.7**	**1.7**	1.7	0.0	41.4	1.5%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.51	3.6	0.67	**2.4**	**2.4**	2.4	0.0	41.4	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.51	4.2	0.59	**2.5**	**2.5**	2.5	0.0	2.5	3.6%	18	
CVS-13A (inlet 8-5A)	13A	1.20	8.7	0.58	4.0	0.69	**2.7**	**2.7**	2.7	0.0	2.7	1.0%	18	
CVS-13B (inlet 4-5B)	13B	1.53	9.0	0.59	3.9	0.90	**3.5**	**3.5**	3.5	0.0	3.5	1.0%	18	
CVS-13C (inlet 4-5C)	13C	1.26	8.8	0.51	3.9	0.64	**2.5**	**2.5**	2.5	0.0	2.5	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.51	3.6	0.97	**3.5**	**3.5**	3.5	0.0	8.5	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.2	0.0	4.3	4.7%	24	
CVS-14B (inlet 6-5)	14	2.73	13.4	0.07	3.3	0.20	**0.7**	**0.7**	0.7	0.0	8.8	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.51	3.6	0.99	**3.5**	**3.5**	3.5	0.0	3.5	2.8%	18	
CVS-15 (inlet 5-5)	15	2.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.2	0.0	4.3	4.7%	24	
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.55	4.1	0.52	**2.1**	**2.1**	2.1	0.0	2.1	1.0%	18	
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.51	3.8	0.70	**2.6**	**2.6**	6.4	0.0	2.6	5.2%	18	
CVS-17 (inlet 2-11)	17	1.44	8.4	0.49	4.0	0.70	**1.9**	**1.9**	6.8	0.0	1.9	5.2%	18	
CVS-17A	17A	2.18	13.6	0.49	3.3	1.07	**3.5**	**3.5**	-	-	-	-	-	
CVS-18	18	2.69	10.0	0.47	3.8	1.25	**4.7**	**4.7**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.68	4.5	1.09	**4.9**	**4.9**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.51	3.7	0.92	**3.4**	**3.4**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.51	3.1	1.98	**6.1**	**6.1**	-	-	-	-	-	
CVS-22 (2-10A)	22	0.67	6.2	0.51	4.4	0.45	**2.0**	**2.0**	5.6	0.0	2.0	1.0%	18	
CVS-23 (inlet 2-10)	23	0.67	5.5	0.70	4.6	0.61	**2.8**	**2.8**	7.1	0.0	2.8	1.0%	18	
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.32	3.4	1.18	**4.0**	**4.0**	4.0	0.0	5.1	3.3%	36	
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.72	4.2	0.99	**4.1**	**4.1**	4.1	0.0	8.4	0.9%	36	
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.20	3.2	1.32	**4.2**	**4.2**	4.2	0.0	0.6	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.73	4.1	1.27	**5.2**	**5.2**	5.2	0.0	12.1	2.9%	36	
BEL-5	B5	4.55	11.0	0.71	3.6	3.22	**11.6**	**11.6**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.88	4.2	2.61	**10.9**	**10.9**	-	-	-	-	-	

100 YEAR STORM

Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	CA (Acres)	Direct Runoff, Q (cfs)	TOTAL RUNOFF: Tc (min.)	TOTAL RUNOFF: Intensity - i (in/hr)	TOTAL RUNOFF: CA (Acres)	TOTAL RUNOFF: Total Runoff, Q (cfs)	INLET: Intercepted (cfs)	INLET: Bypass (cfs)	STORM SEWER: Design Flow (cfs)	STORM SEWER: Slope (%)	STORM SEWER: Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.65	2.51	**20.2**		12.1	2.51	**30.2**	13.5	6.7	22.5	3.1%	24	Bypass flow goes to CVS-5
CVS-2 (inlet 2-3)	2	1.42	8.6	0.85	1.21	**9.9**		12.1	1.21	**9.9**	9.0	1.0	9.0	10.0%	24	Bypass flow goes to CVS-4
CVS-3 (inlet 1-4)	3	0.94	6.2	0.78	0.73	**6.9**		12.1	0.71	**12.6**	11.2	1.4	7.7	4.9	18	Takes bypass flow from CVS-1 & bypass goes to CVS-7
CVS-4 (inlet 2-4)	4	1.17	4.1	0.69	0.81	**7.5**		12.1	0.81	**8.5**	8.0	0.5	8.0	0.9%	18	Takes bypass flow from CVS-2 & bypass goes to CVS-8
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.72	6.7	**10.7**				**11.2**	11.2	0.0	11.2	1.0%	18	Takes bypass flow from CVS-5
CVS-5 (inlet 5-4)	5	2.19	9.0	0.67	7.3	**10.9**		12.1	1.40	**10.8**	9.8	1.0	11.0	1.0%	18	Bypass flow goes to CVS-4A
CVS-6 (inlet 6-4)	6	0.58	5.0	0.67	8.8	**3.5**		12.1	0.29	**3.5**	3.5	0.0	51.3	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.48	8.8	0.38				**3.2**	3.2	0.0	51.0	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.84	7.0	0.93		12.1	0.93	**11.4**	7.3	4.1	15.4	3.0%	24	Takes bypass flow from CVS-U bypass goes to CVS-11
CVS-8 (inlet 2-6)	8	1.59	10.1	0.72	7.0	1.15		12.1	1.15	**8.6**	8.1	0.5	8.1	1.4%	24	Takes bypass flow from CVS-9 bypass goes to CVS-12
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.72	8.5	1.74		12.1	1.74	**11.6**	10.2	1.4	10.2	1.2%	18	Bypass flow goes to CVS-12
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.72	8.8	0.27				**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.70	6.2	1.96		12.1	1.96	**12.3**	10.6	1.7	10.6	1.2%	18	Takes bypass flow from CVS-10A. Bypass flow goes to CVS-13B.
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.76	8.5	0.31				**2.6**	2.2	0.4	2.2	1.0%	18	Bypass flow goes to CVS-10
CVS-11 (inlet 1-5)	11	2.03	12.3	0.84	8.5	1.70		12.1	1.70	**15.1**	15.1	0.0	39.7	0.8%	36	Takes bypass flow from CVS-T 1-31-20 Add Corvus Corner
CVS-12 (inlet 2-5)	12	4.58	11.9	0.72	6.6	3.31		12.1	3.31	**23.6**	23.6	0.0	23.6	0.7%	36	Takes bypass flow from CVS-8 and CVS-E
CVS-12A (inlet 3-5)	12	0.61	7.7	0.72	7.8	0.59				**4.5**	4.5	0.0	137.0	1.9%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.72	8.6	0.95				**9.4**	9.4	0.0	137.0	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.72	7.9	0.94		12.1	0.94	**9.9**	9.9	0.0	8.9	3.6%	18	Takes bypass flow from CVS-13A and CVS-13C.
CVS-13A (inlet 8-5A)	13A	1.20	8.7	0.78	7.4	0.91				**6.7**	6.2	0.5	6.3	1.0%	18	Bypass flow goes to CVS-13
CVS-13B (inlet 4-5B)	13B	1.53	9.0	0.76	7.3	1.17				**9.6**	8.9	2.5	8.9	1.0%	18	Takes bypass flow from CVS-3B. Bypass flow goes to CVS-13C
CVS-13C (inlet 4-5C)	13C	1.26	8.8	0.72	7.4	0.91				**6.7**	7.9	3.9	4.0	3.9	18	Takes bypass flow from CVS-13B bypass two goes to CVS-13
CVS-14 (inlet 6-5)	14	1.89	11.1	0.72	6.7	1.37		12.1	1.37	**10.1**	10.1	0.0	54.4	3.2%	30	Takes bypass from CVS-14C
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.48	5.5	1.88				**10.2**	10.2	0.0	34.8	4.7%	24	
CVS-14B (inlet 6-5)	14	2.73	13.4	0.49	6.2	1.35				**9.5**	9.5	0.0	54.4	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.72	6.7	1.40		12.1	1.40	**9.3**	7.5	1.8	7.5	2.8%	18	Bypass flow goes to CVS-14
CVS-15 (inlet 5-5)	15	2.01	13.4	0.72	6.2	1.45		12.1	1.45	**9.1**	9.1	0.0	9.1	5.0%	18	Takes bypass flow from CVS-15A
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.74	7.2	0.71				**6.4**	5.3	1.1	5.3	1.0%	18	
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.72	7.0	0.99				**7.6**	6.6	0.6	6.4	5.2%	18	
CVS-17 (inlet 2-11)	17	1.44	8.4	0.72	7.5	1.04				**7.8**	6.8	1.0	6.8	5.2%	18	
CVS-17A	17A	2.18	13.6	0.72	6.2	1.56				**9.7**	-	-	-	-	-	
CVS-18	18	2.69	10.0	0.72	7.0	1.89		12.1	1.89	**13.2**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.81	8.4	1.31		12.1	1.31	**11.9**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.72	6.9	1.30		12.1	1.30	**9.0**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.72	5.7	2.81		12.1	2.81	**18.0**	-	-	-	-	-	
CVS-22 (2-10A)	22	0.67	6.2	0.72	8.3	0.62				**5.2**	5.0	0.2	5.0	1.0%	18	Takes bypass flow from CVS-10
CVS-23 (inlet 2-10)	23	0.67	5.5	0.82	8.6	0.71				**6.1**	5.1	1.0	5.1	1.0%	18	Takes bypass flow from CVS-17
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.62	8.3	2.31				**14.7**	8.3	6.4	62.6	3.3%	36	Bypass flow goes to BEL-3
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.83	7.8	1.15				**8.9**	8.5	2.4	66.5	0.9%	36	Bypass flow goes to BEL-4
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.56	8.0	3.78				**22.5**	29.0	0.0	95.6	3.2%	36	Takes bypass from BEL-1
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.84	7.7	1.46				**15.2**	13.6	1.6	110.9	2.9%	36	Takes bypass from BEL-2
BEL-5	B5	4.55	11.0	0.83	6.8	3.78		12.1	3.78	**26.5**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.80	7.9	3.17		12.1	3.17	**24.9**	-	-	-	-	-	



0 50 100 200

SCALE: 1"=200'

DATE	REVISIONS	DRAWN BY
07/20/2020	B REVISED TO ADD OFF-LINE DET BASIN	ASD
11/21/2016	A REVISED PER TOWN COMMENTS	RAK

Manhard CONSULTING
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Civil Engineering • Surveying • Water Resource Management • Construction Management • GIS

COMPARK SOUTH
TOWN OF PARKER, CO
PROPOSED DRAINAGE AREA MAP

PROJ. MGR.: RLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 2 OF 3
CLCPKC3

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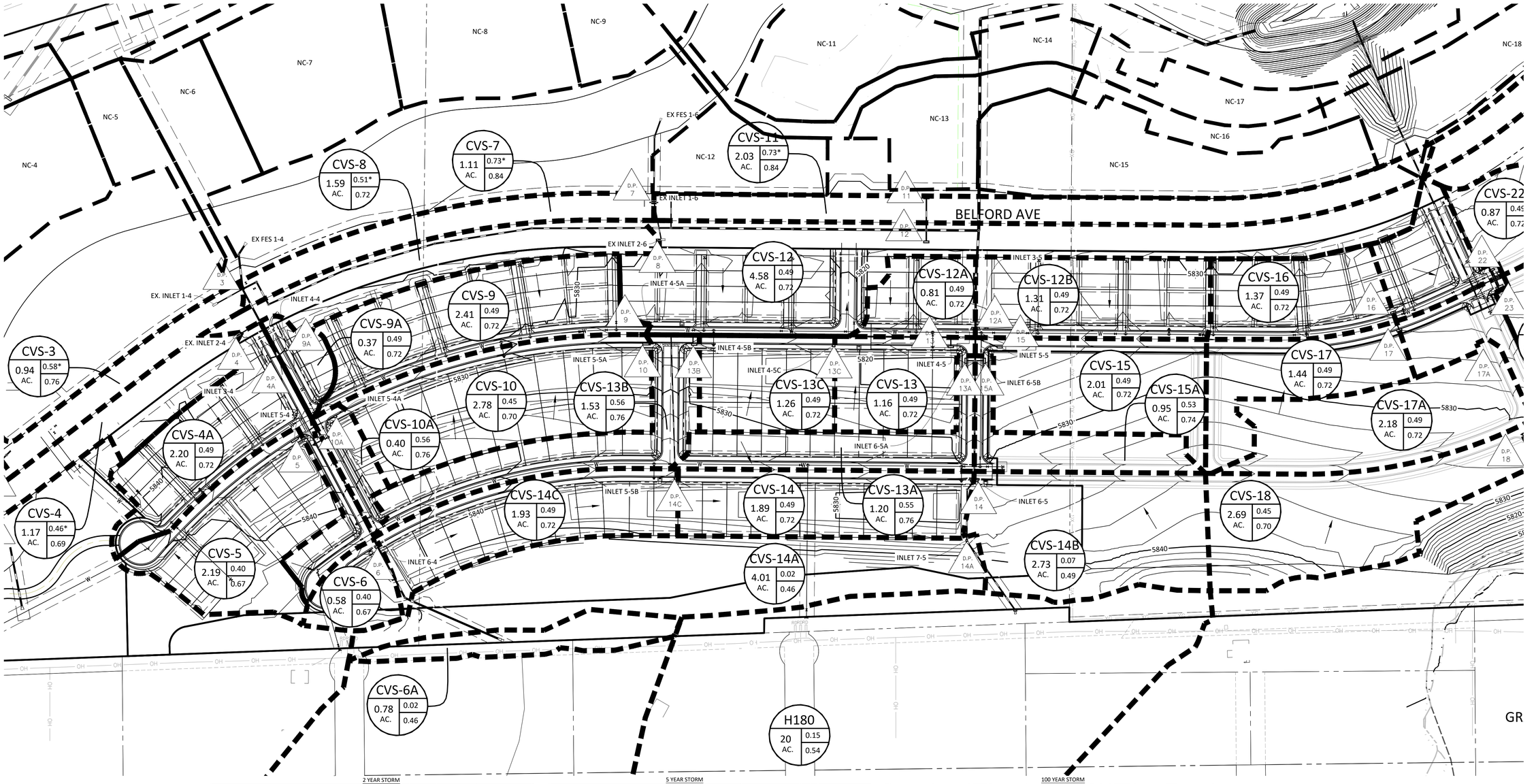
Plotted: 7/30/2020 4:05 PM Dwg Name: P:\Clpk23\Com\South12-Filing 1 No GIT\Com\South03-Ultimate Belford Ave\Documents\Engineering\Storm Water Reports\Drainage Exhibits\Drainage Basin Map 7-21-20.dwg Updated By: ADrucker



2 YEAR STORM

Basin ID	Design Point	DIRECT RUNOFF: Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CYA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	INLET: Intercepted (cfs)	STORM SEWER: Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.28	4.3	1.10	**4.7**	**4.7**	4.7	0.0	4.9	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	8.6	0.69	4.3	0.97	**4.2**	**4.2**	0.0	4.2	4.10.0%	24		
CVS-3 (inlet 1-4)	3	0.94	6.2	0.55	4.4	0.52	**2.3**	**2.3**	2.3	0.0	2.3	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	4.1	0.44	5.0	0.51	**2.5**	**2.5**	2.5	0.0	2.5	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.51	3.6	1.06	**3.9**	**3.9**	3.8	0.0	3.9	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.40	3.9	0.88	**3.4**	**3.4**	3.4	0.0	3.4	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.40	4.7	0.23	**1.1**	**1.1**	1.1	0.0	9.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	**0.1**	0.1	0.0	8.5	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.69	3.7	0.77	**2.9**	**2.9**	2.9	0.0	5.8	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.49	3.7	0.78	**2.9**	**2.9**	2.9	0.0	2.9	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.49	3.5	1.18	**4.1**	**4.1**	4.1	0.0	4.1	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.49	4.7	0.18	**0.9**	**0.9**	0.9	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.45	3.3	1.26	**4.2**	**4.2**	4.2	0.0	4.2	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.56	4.5	0.22	**1.0**	**1.0**	1.0	0.0	1.0	1.0%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.69	3.6	1.41	**4.9**	**4.9**	0.0	12.8	0.8%	36		
CVS-12 (inlet 2-5)	12	4.58	11.9	0.49	3.5	2.24	**7.9**	**7.9**	7.9	0.0	7.9	0.7%	36	
CVS-12A (inlet 3-5)	12	0.81	7.7	0.49	4.1	0.40	**1.6**	**1.6**	1.6	0.0	40.0	1.0%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.49	3.6	0.64	**2.3**	**2.3**	2.3	0.0	40.0	1.5%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.49	4.2	0.57	**2.4**	**2.4**	2.4	0.0	2.4	3.6%	18	
CVS-13A (inlet 6-5A)	13A	1.20	8.7	0.55	4.0	0.66	**2.6**	**2.6**	2.6	0.0	2.6	1.0%	18	
CVS 13B (inlet 4-5B)	13B	1.53	9.0	0.56	3.9	0.66	**3.4**	**3.4**	3.4	0.0	3.4	1.0%	18	
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.49	3.9	0.62	**2.4**	**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.49	3.6	0.93	**3.3**	**3.3**	3.3	0.0	8.2	1.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.2	0.0	0.0	4.3	4.7%	24
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.91	3.6	0.99	**3.5**	**3.5**	3.5	0.0	8.5	3.2%	30	
CVS-14B (inlet 6-5)	14B	2.73	13.4	0.07	3.3	0.19	**0.6**	**0.6**	0.6	0.0	8.6	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.49	3.6	0.94	**3.4**	**3.4**	3.4	0.0	3.4	2.8%	18	
CVS-15 (inlet 5-5)	15	2.05	13.4	0.49	3.3	1.00	**3.3**	**3.3**	3.3	0.0	3.3	5.0%	18	
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.53	4.1	0.50	**2.0**	**2.0**	2.0	0.0	2.0	1.0%	18	
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.49	3.8	0.67	**2.6**	**2.5**	6.4	0.0	2.5	5.2%	18	
CVS-17 (inlet 2-11)	17	1.44	8.4	0.49	4.0	0.70	**1.9**	**1.9**	6.8	0.0	1.9	5.2%	18	
CVS-17A	17A	2.18	13.6	0.49	3.3	0.71	**3.5**	**3.5**	-	-	-	-	-	
CVS-18	18	2.69	10.0	0.45	3.8	1.20	**4.5**	**4.5**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.65	4.5	1.09	**4.7**	**4.7**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.49	3.7	0.88	**3.3**	**3.3**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.49	3.1	1.90	**5.8**	**5.8**	-	-	-	-	-	
CVS-22 (inlet 2-10A)	22	0.87	6.2	0.49	4.4	0.43	**1.9**	**1.9**	1.9	0.0	1.9	1.0%	18	
CVS-23 (inlet 2-10)	23	0.87	5.5	0.70	4.6	0.56	**2.7**	**2.7**	2.7	0.0	2.7	1.0%	18	
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.30	3.4	1.13	**3.8**	**3.8**	3.8	0.0	5.9	3.3%	36	
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.69	4.2	0.95	**3.9**	**3.9**	3.9	0.0	8.4	0.9%	36	
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.19	3.2	1.26	**4.1**	**4.1**	4.1	0.0	6.6	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.69	4.1	1.39	**5.0**	**5.2**	5.2	0.0	12.1	2.9%	36	
BEL-5	B5	4.55	11.0	0.68	3.6	3.08	**11.1**	**11.1**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.63	4.2	2.50	**10.5**	**10.5**	-	-	-	-	-	

5 YEAR STORM

Basin ID	Design Point	DIRECT RUNOFF: Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CYA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	INLET: Intercepted (cfs)	Bypass (cfs)	STORM SEWER: Design Flow (cfs)	Slope (%)	Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.33	4.3	1.27	**5.5**	**5.5**	5.5	0.0	10.0	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	8.6	0.72	4.3	1.03	**4.5**	**4.5**	4.5	0.0	4.5	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.2	0.58	4.4	0.54	**2.4**	**2.4**	2.4	0.0	2.4	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	4.1	0.46	5.0	0.53	**2.6**	**2.6**	2.6	0.0	2.6	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.51	3.6	1.13	**4.0**	**4.0**	4.0	0.0	4.0	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.42	3.9	0.92	**3.6**	**3.6**	3.6	0.0	3.6	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.42	4.7	0.24	**1.1**	**1.1**	1.1	0.0	9.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	**0.1**	0.1	0.0	8.5	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.73	3.7	0.81	**3.0**	**3.0**	3.0	0.0	6.0	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.51	3.7	0.81	**3.0**	**3.0**	3.0	0.0	3.0	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.51	3.5	1.23	**4.3**	**4.3**	4.3	0.0	4.3	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.51	4.7	0.19	**0.9**	**0.9**	0.9	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.47	3.3	1.32	**4.3**	**4.3**	4.3	0.0	4.3	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.59	4.5	0.23	**1.1**	**1.1**	1.1	0.0	1.1	1.0%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.73	3.4	1.47	**5.1**	**5.1**	5.1	0.0	13.3	0.8%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.51	3.5	2.34	**8.2**	**8.2**	8.2	0.0	8.2	0.7%	36	
CVS-12A (inlet 3-5)	12	0.81	7.7	0.51	4.1	0.41	**1.7**	**1.7**	1.7	0.0	41.4	1.0%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.51	3.6	0.67	**2.4**	**2.4**	2.4	0.0	41.4	1.0%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.51	4.2	0.59	**2.5**	**2.5**	2.5	0.0	2.5	3.6%	18	
CVS 13A (inlet 6-5A)	13A	1.20	8.7	0.58	4.0	0.69	**2.7**	**2.7**	2.7	0.0	2.7	1.0%	18	
CVS 13B (inlet 4-5B)	13B	1.53	9.0	0.59	3.9	0.60	**3.5**	**3.5**	3.5	0.0	3.5	1.0%	18	
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.51	3.9	0.64	**2.5**	**2.5**	2.5	0.0	2.5	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.51	3.6	0.97	**3.5**	**3.5**	3.5	0.0	8.5	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.2	0.0	4.3	4.7%	24	
CVS-14B (inlet 6-5)	14	2.73	13.4	0.07	3.3	0.20	**0.7**	**0.7**	0.0	8.8	3.4%	30		
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.91	3.6	0.99	**3.5**	**3.5**	3.5	0.0	2.8%	18		
CVS-15 (inlet 5-5)	15	2.01	13.4	0.51	3.3	1.03	**3.4**	**3.4**	3.4	0.0	3.4	5.0%	18	
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.55	4.1	0.52	**2.1**	**2.1**	2.1	0.0	2.1	1.0%	18	
CVS-15 (inlet 2-11A)	16	1.37	10.0	0.51	3.8	0.70	**2.6**	**2.6**	6.4	0.0	2.6	5.2%	18	
CVS-17 (inlet 2-11)	17	1.44	8.4	0.51	4.0	0.74	**3.0**	**3.0**	6.6	0.0	3.0	5.2%	18	
CVS-18	18	2.69	10.0	0.47	3.8	1.25	**4.7**	**4.7**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.68	4.5	1.09	**4.9**	**4.9**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.51	3.7	0.92	**3.4**	**3.4**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.51	3.1	1.98	**6.1**	**6.1**	-	-	-	-	-	
CVS-22 (2-10A)	22	0.87	6.2	0.51	4.4	0.45	**2.0**	**2.0**	2.0	0.0	1.0%	18		
CVS-23 (inlet 2-10)	23	0.87	5.5	0.70	4.6	0.61	**2.8**	**2.8**	7.1	0.0	2.8	1.0%	18	
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.32	3.4	1.18	**4.0**	**4.0**	4.0	0.0	6.1	3.3%	36	
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.72	4.2	0.99	**4.1**	**4.1**	4.1	0.0	8.8	0.9%	36	
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.20	3.2	1.32	**4.2**	**4.2**	4.2	0.0	6.9	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.73	4.1	1.27	**5.2**	**5.2**	5.2	0.0	12.1	2.9%	36	
BEL-5	B5	4.55	11.0	0.71	3.6	3.22	**11.6**	**11.6**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.66	4.2	2.61	**10.9**	**10.9**	-	-	-	-	-	

100 YEAR STORM

Basin ID	Design Point	DIRECT RUNOFF: Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CYA (Acres)	Direct Runoff, Q (cfs)	TOTAL RUNOFF: Tc (min.)	Intensity, I (in/hr)	CYA (Acres)	Total Runoff, Q (cfs)	INLET: Equivalent Area	Equivalent Cv	Bypass (cfs)	STORM SEWER: Design Flow (cfs)	Slope (%)	Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.65	8.0	2.51	**20.2**	12.1	2.51	**20.2**	13.5	6.7	22.5	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	8.6	0.86	8.1	1.21	**9.9**	12.1	1.21	**9.9**	9.0	1.0	9.0	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.2	0.78	8.3	0.71	**5.9**	12.1	0.71	**12.6**	7.7	4.9	7.7	1.7%	18	Takes bypass flow from CVS-1. Bypass goes to CVS-7
CVS-4 (inlet 2-4)	4	1.17	4.1	0.69	9.3	0.81	**7.6**	12.1	0.81	**8.5**	8.0	0.5	8.0	0.9%	18	Takes bypass flow from CVS-2. Bypass goes to CVS-5
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.72	6.7	1.59	**10.7**				**11.2**	11.2	0.0	11.2	1.0%	18	Takes bypass flow from CVS-5
CVS-5 (inlet 5-4)	5	2.19	9.0	0.67	7.3	1.48	**10.8**	12.1	1.48	**10.9**	9.8	1.0	11.0	1.0%	18	Takes bypass flow goes to CVS-4A
CVS-6 (inlet 6-4)	6	0.58	5.0	0.67	8.5	0.39	**3.5**	12.1	0.39	**3.5**	0.0	0.0	51.3	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.40	8.8	0.36	**3.2**			**3.2**	3.2	0.0	51.0	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.84	7.5	0.85	**6.5**	13.1	0.85	**11.4**	7.3	4.1	10.4	3.0%	24	Takes bypass flow from CVS-7. Bypass goes to CVS-11
CVS-8 (inlet 2-6)	8	1.59	10.1	0.72	7.0	1.15	**8.1**	12.1	1.15	**8.6**	8.1	0.5	8.1	1.4%	24	Takes bypass flow from CVS-8. Bypass goes to CVS-12
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.72	6.5	1.74	**11.4**	12.1	1.74	**11.6**	10.2	1.4	10.2	1.2%	18	Takes bypass flow goes to CVS-12
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.72	8.5	0.27	**2.4**			**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.70	6.2	1.96	**12.1**	12.1	1.96	**12.3**	10.6	1.7	10.6	1.2%	18	Takes bypass flow from CVS-10A. Bypass flow goes to CVS-13D
CVS-10A (inlet 5-4A)	10A	0.40	5.8	0.76	8.5	0.31	**2.6**			**2.6**	2.2	0.4	2.2	1.0%	18	Takes bypass flow goes to CVS-10
CVS-11 (inlet 1-5)	11	2.03	12.3	0.84	6.5	1.70	**13.0**	12.1	1.70	**15.1**	15.1	0.0	35.7	0.8%	36	Takes bypass flow from CVS-7. 1-2-1-20 Acts Custer, Manor.
CVS-12 (inlet 2-5)	12	4.58	11.9	0.72	6.6	3.31	**21.7**	12.1	3.31	**23.6**	23.6	0.0	23.6	0.7%	36	Takes bypass flow from CVS-8 and CVS-9
CVS-12A (inlet 3-5)	12	0.81	7.7	0.72	7.8	0.59	**4.5**			**4.5**	0.0	0.0	137.0	1.0%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.73	6.8	0.95	**6.5**			**9.4**	9.4	0.0	137.0	1.5%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.72	7.9	0.84	**6.6**	12.1	0.84	**8.9**	8.9	0.0	8.9	2.6%	18	Takes bypass flow from CVS-12A and CVS 13C.
CVS 13A (inlet 6-5A)	13A	1.20	8.7	0.78	7.4	0.91	**6.7**			**6.7**	6.2	0.5	6.2	1.0%	18	Takes bypass flow goes to CVS-13
CVS 13B (inlet 4-5B)	13B	1.53	9.0	0.76	7.3	1.17	**8.5**			**9.4**	8.9	3.5	6.9	1.0%	18	Takes bypass flow from CVS-13C. Bypass flow goes to CVS-13
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.72	7.4	0.91	**6.7**			**7.9**	3.9	4.0	3.9	1.0%	18	Takes bypass flow from CVS 13B. Bypass flow goes to CVS 13
CVS-14 (inlet 6-5)	14	1.89	11.1	0.72	6.7	1.37	**9.2**	12.1	1.37	**10.1**	10.1	0.0	54.4	3.2%	30	Takes bypass flow from CVS-14C
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.46	5.5	1.86	**10.2**			**10.2**	10.2	0.0	34.8	4.7%	24	
CVS-14B (inlet 6-5)	14	2.73	13.4	0.49	6.2	1.35	**8.4**			**8.5**	8.5	0.0	54.4	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.72	6.7	1.40	**9.3**			**9.3**	7.5	1.8	7.5	2.8%	18	Bypass flow goes to CVS-14
CVS-15 (inlet 5-5)	15	2.01	13.4	0.72	6.2	1.45	**9.1**	12.1	1.45	**9.1**	7.9	0.0	9.1	5.0%	18	Takes bypass flow from CVS-15A
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.74	7.7	0.71	**5.4**			**5.4**	5.3	0.1	5.3	1.0%	18	
CVS-16 (inlet 2-11A)	16	1.37	10.0	0.72	7.0	0.99	**7.0**			**7.6**	6.4	0.0	6.4	5.2%	18	
CVS-17 (inlet 2-11)	17	1.44	8.4	0.72	7.5	1.04	**7.8**			**7.8**	6.8	1.0	6.8	5.2%	18	
CVS-17A	17A	2.18	13.6	0.72	6.6	1.58	**9.7**			-	-	-	-	-	-	
CVS-18	18	2.69	10.0	0.70	7.0	1.86	**13.2**	12.1	1.86	-	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.81	8.4	1.31	**11.0**	12.1	1.31	-	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.72	6.9	1.90	**12.4**	12.1	1.90	-	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.72	5.8	2.81	**16.0**	12.1	2.81	-	-	-	-	-	-	
CVS-22 (2-10A)	22	0.87	6.2	0.72	8.3	0.83	**6.2**			**6.2**	5.6	0.2	5.6	1.0%	18	Takes bypass flow from CVS-10
CVS-23 (inlet 2-10)	23	0.87	5.5	0.82	8.6	0.71	**6.1**			**6.1**	5.5	0.3	6.1	1.0%	18	Takes bypass flow from CVS-17
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.62	6.5	2.31	**14.7**			**14.7**	6.3	8.4	63.8	3.3%	36	Bypass flow goes to BEL-3
BEL-2 (inlet 1-1)	B2	1.38	7.6	0.83	7.8	1.15	**8.9**			**8.9**	6.5	2.4	56.5	0.8%	36	Bypass flow goes to BEL-4
BEL-3 (inlet 2-2)	B3	6.76	14.4	0.39	6.0	2.65	**22.5**			**22.5**	7.8	3.2%	7.8	3.2%	36	Takes bypass flow from BEL-1
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.84	7.7	1.48	**11.2**			**13.6**	13.6	0.0	110.8	2.9%	36	Takes bypass flow from BEL-2
BEL-5	B5	4.55	11.0	0.83	6.8	3.78	**25.5**	12.1	3.78	-	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.80	7.9	3.17	**24.9**	12.1	3.17	-	-	-	-	-	-	

NOTE: BYPASS FLOWS NOT INTERCEPTED BY ON GRADE INLETS HAVE BEEN REDUCED BY 50% AND ADDED TO THE DIRECT FLOW AT THE NEXT DOWNHILL INLET PER SECTION 6.3.2 OF THE TOWN OF PARKER STORM DRAINAGE AND ENVIRONMENTAL CRITERIA MANUAL

LEGEND

- SUB-BASIN #
- 2/5-YEAR RUNOFF COEFFICIENT (*DENOTES 5-YEAR RUNOFF)
- 100-YEAR RUNOFF COEFFICIENT
- AREA (ACRES)
- PROPOSED SUB-BASIN BOUNDARY

DRAWN BY	DATE	REVISIONS
ASD		
RAK		
ASD	07/20/2020	B REVISED TO ADD OFF-LINE DET BASIN
RAK	11/21/2016	A REVISED PER TOWN COMMENTS

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Civil Engineering & Consulting | Surveying | Water Resource Management | Construction Management

TOWN OF PARKER, CO
COMPARK SOUTH
PROPOSED DRAINAGE AREA MAP - FILING NO. 2

PROJ. MGR.: RLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 3 OF 3
CLCPKC3

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Plotted: 7/30/2020 4:05 PM Dwg Name: P:\Clcpkc3\ComSouth12-Filing 1 No GAT\ComSouth03-Ultimate Belford Ave\Documents\Engineering\Storm\Water Reports\Drainage Exhibits\Drainage Basin Map 7-21-20.dwg Updated By: ADrucker

Compark Villge South Filing No. 2
Proposed Sub-Basins to Detention Basin
9-27-19

	Design Pt	DA (ac)	% Imp	DA x % Imp
CVS-4A (Inlet 3-4)	4A	2.2	0.55	1.21
CVS-5 (Inlet 5-4)	5	2.19	0.45	0.9855
CVS-6 (Inlet 6-4)	6	0.58	0.45	0.261
CVS-6A (FES 2-4)	6A	0.78	0.02	0.0156
CVS-9 (Inlet 4-5A)	9	2.41	0.55	1.3255
CVS-9A (Inlet 4-4)	9A	0.37	0.55	0.2035
CVS-10 (Inlet 5-5A)	10	2.78	0.51	1.4178
CVS-10A (Inlet 5-4A)	10A	0.4	0.63	0.252
CVS-12 (Inlet 2-5)	12	4.58	0.55	2.519
CVS-12A (Inlet 3-5)	12	0.81	0.55	0.4455
CVS-12B (Inlet 3-5)	12A	1.31	0.55	0.7205
CVS-13 (Inlet 4-5)	13	1.16	0.55	0.638
CVS 13A (Inlet 6-5A)	13A	1.2	0.62	0.744
CVS 13B (Inlet 4-5B)	13B	1.53	0.63	0.9639
CVS 13C (Inlet 4-5C)	13C	1.26	0.55	0.693
CVS-14 (Inlet 6-5)	14	1.89	0.55	1.0395
CVS-14A (Inlet 7-5)	14A	4.01	0.02	0.0802
CVS-14B (Inlet 6-5)	14	2.73	0.08	0.2184
CVS-14C (Inlet 5-5B)	14C	1.93	0.55	1.0615
CVS-15 (Inlet 5-5)	15	2.05	0.55	1.1275
CVS-15A (Inlet 6-5B)	15A	0.95	0.59	0.5605
CVS-16	16	2.58	0.55	1.419
CVS-17	17	4.1	0.55	2.255
CVS-18	18	3.06	0.5	1.53
		46.86		21.6864

Overall % Imp = 21.69/46.86= 46.27913

Compark Village South
Belford Ave Proposed Sub-Basins to Det Basin
9-28-19

	Design Pt	DA	% Imp	DA x % Imp
CVS-1 (Inlet 1-3)	1	3.85	0.32	1.232
CVS-2 (Inlet 2-3)	2	1.42	0.77	1.0934
CVS-3 (Inlet 1-4)	3	0.94	0.62	0.5828
CVS-4 (Inlet 2-4)	4	1.17	0.49	0.5733
CVS-7 (Inlet 1-6)	7	1.11	0.78	0.8658
CVS-8 (Inlet 2-6)	8	1.59	0.55	0.8745
CVS-11 (Inlet 1-5)	11	2.03	0.78	1.5834
		12.11		6.8052

Total % Imp= 0.561949

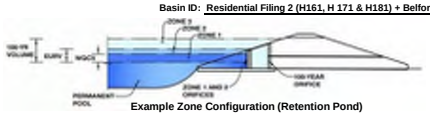
Appendix C

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Compark South

Basin ID: Residential Filing 2 (H161, H 171 & H181) + Belford Ave + 15 ac Commercial + 11.5 ac F3



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	73.50	acres	
Watershed Length =	3,100	ft	
Watershed Slope =	0.010	ft/ft	
Watershed Imperviousness =	61.00%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	75.0%	percent	
Percentage Hydrologic Soil Groups C/D =	25.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	Parker - Town Hall		
Water Quality Capture Volume (WQCV) =	1.467	acre-feet	
Excess Urban Runoff Volume (EURV) =	4.730	acre-feet	
2-yr Runoff Volume (P1 = 0.82 in.) =	2.782	acre-feet	
5-yr Runoff Volume (P1 = 1.1 in.) =	4.032	acre-feet	
10-yr Runoff Volume (P1 = 1.34 in.) =	5.411	acre-feet	
25-yr Runoff Volume (P1 = 1.69 in.) =	7.808	acre-feet	
50-yr Runoff Volume (P1 = 1.98 in.) =	9.536	acre-feet	
100-yr Runoff Volume (P1 = 2.29 in.) =	11.722	acre-feet	
500-yr Runoff Volume (P1 = 3.08 in.) =	16.853	acre-feet	
Approximate 2-yr Detention Volume =	2.607	acre-feet	
Approximate 5-yr Detention Volume =	3.791	acre-feet	
Approximate 10-yr Detention Volume =	4.938	acre-feet	
Approximate 25-yr Detention Volume =	5.874	acre-feet	
Approximate 50-yr Detention Volume =	6.358	acre-feet	
Approximate 100-yr Detention Volume =	7.176	acre-feet	

Optional User Override 1-hr Precipitation

	inches
	inches
	inches
	inches
	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	1.467	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.263	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.446	acre-feet
Total Detention Basin Volume =	7.176	acre-feet
Initial Surcharge Volume (ISV) =		ft^3
Initial Surcharge Depth (ISD) =		ft
Total Available Detention Depth (H_{total}) =		ft
Depth of Trickle Channel (H_{TC}) =		ft
Slope of Trickle Channel (S_{TC}) =		ft/ft
Slopes of Main Basin Sides (S_{main}) =		H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =		
Initial Surcharge Area (A_{ISV}) =		ft^2
Surcharge Volume Length (L_{ISV}) =		ft
Surcharge Volume Width (W_{ISV}) =		ft
Depth of Basin Floor (H_{FLOOR}) =		ft
Length of Basin Floor (L_{FLOOR}) =		ft
Width of Basin Floor (W_{FLOOR}) =		ft
Area of Basin Floor (A_{FLOOR}) =		ft^2
Volume of Basin Floor (V_{FLOOR}) =		ft^3
Depth of Main Basin (H_{MAIN}) =		ft
Length of Main Basin (L_{MAIN}) =		ft
Width of Main Basin (W_{MAIN}) =		ft
Area of Main Basin (A_{MAIN}) =		ft^2
Volume of Main Basin (V_{MAIN}) =		ft^3
Calculated Total Basin Volume (V_{total}) =		acre-feet

Depth Increment = ft

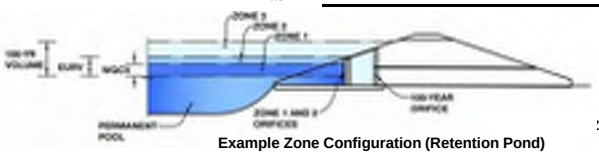
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool									

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Compark South

Basin ID:



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)			Orifice Plate
Zone 2 (EURV)			Orifice Plate
Zone 3 (100-year)			Weir&Pipe (Restrict)
			Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	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 =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =		ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =		inches
Orifice Plate: Orifice Area per Row =		sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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)								
Orifice Area (sq. inches)								

	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 =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

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

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

Calculated Parameters for Overflow Weir

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

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =		N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =		N/A	inches
Restrictor Plate Height Above Pipe Invert =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

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

Routed Hydrograph Results

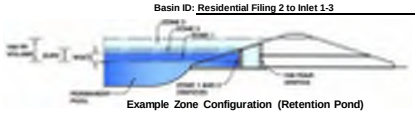
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.82	1.10	1.34	1.69	1.98	2.29	3.08
Calculated Runoff Volume (acre-ft) =	1.467	4.730	2.782	4.032	5.411	7.808	9.536	11.722	16.853
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.467	4.730	2.782	4.032	5.402	7.800	9.533	11.717	16.848
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.03	0.13	0.45	0.64	0.89	1.42
Predevelopment Peak Q (cfs) =	0.0	0.0	0.5	1.8	9.7	32.9	46.9	65.3	104.1
Peak Inflow Q (cfs) =	19.0	60.3	35.8	51.5	68.6	98.2	119.3	145.6	207.3
Peak Outflow Q (cfs) =									
Ratio Peak Outflow to Predevelopment Q =									
Structure Controlling Flow =									
Max Velocity through Grate 1 (fps) =									
Max Velocity through Grate 2 (fps) =									
Time to Drain 97% of Inflow Volume (hours) =									
Time to Drain 99% of Inflow Volume (hours) =									
Maximum Ponding Depth (ft) =									
Area at Maximum Ponding Depth (acres) =									
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Compark South

Basin ID: Residential Filing 2 to Inlet 1-3



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	5.27	acres
Watershed Length =	1,172	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	44.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	75.0%	percent
Percentage Hydrologic Soil Groups C/D =	25.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	
Water Quality Capture Volume (WQCV) =	0.084	acre-feet
Excess Urban Runoff Volume (EURV) =	0.238	acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.136	acre-feet
5-yr Runoff Volume (P1 = 1.1 in.) =	0.205	acre-feet
10-yr Runoff Volume (P1 = 1.34 in.) =	0.293	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	0.467	acre-feet
50-yr Runoff Volume (P1 = 1.98 in.) =	0.591	acre-feet
100-yr Runoff Volume (P1 = 2.29 in.) =	0.749	acre-feet
500-yr Runoff Volume (P1 = 3.08 in.) =	1.113	acre-feet
Approximate 2-yr Detention Volume =	0.128	acre-feet
Approximate 5-yr Detention Volume =	0.193	acre-feet
Approximate 10-yr Detention Volume =	0.260	acre-feet
Approximate 25-yr Detention Volume =	0.317	acre-feet
Approximate 50-yr Detention Volume =	0.345	acre-feet
Approximate 100-yr Detention Volume =	0.406	acre-feet

Optional User Override 1-hr Precipitation	
	inches
	inches
	inches
	inches
	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.084	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.155	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.168	acre-feet
Total Detention Basin Volume =	0.406	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

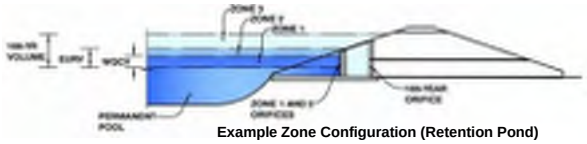
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	42	0.001		
5789	--	0.39	--	--	--	42	0.001	16	0.000
5790	--	1.39	--	--	--	1,078	0.025	566	0.013
5791	--	2.39	--	--	--	10,051	0.231	6,141	0.141
5792	--	3.39	--	--	--	38,742	0.889	30,537	0.701
5793	--	4.39	--	--	--	44,833	1.029	72,325	1.660
5794	--	5.39	--	--	--	48,989	1.125	119,236	2.737
5795	--	6.39	--	--	--	52,725	1.210	170,093	3.905
5796	--	7.39	--	--	--	56,510	1.297	224,710	5.159
5797	--	8.39	--	--	--	60,000	1.377	282,965	6.496

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Compark Village South

Basin ID: Filing 2 to Inlet 1-3



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.11	0.084	
Zone 2 (EURV)	2.69	0.155	
Zone 3 (100-year)	3.01	0.168	
		0.406	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 = ft^2

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 =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (optional)	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)								
Orifice Area (sq. inches)								

	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 =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

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

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Over Flow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			ft^2

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

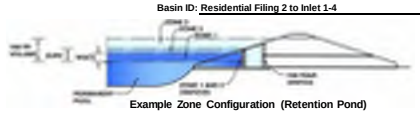
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.82	1.10	1.34	1.69	1.98	2.29	3.08
Calculated Runoff Volume (acre-ft) =	0.084	0.238	0.136	0.205	0.293	0.467	0.591	0.749	1.113
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.083	0.238	0.136	0.204	0.292	0.467	0.590	0.749	1.111
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.11	0.39	0.56	0.78	1.25
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.6	2.1	2.9	4.1	6.6
Peak Inflow Q (cfs) =	1.0	2.9	1.6	2.5	3.5	5.5	7.0	8.9	13.1
Peak Outflow Q (cfs) =									
Ratio Peak Outflow to Predevelopment Q =									
Structure Controlling Flow =									
Max Velocity through Grate 1 (fps) =									
Max Velocity through Grate 2 (fps) =									
Time to Drain 97% of Inflow Volume (hours) =									
Time to Drain 99% of Inflow Volume (hours) =									
Maximum Ponding Depth (ft) =									
Area at Maximum Ponding Depth (acres) =									
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Compark South

Basin ID: Residential Filing 2 to Inlet 1-4



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	8.63	acres
Watershed Length =	954	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	47.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	75.0%	percent
Percentage Hydrologic Soil Groups C/D =	25.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	
Water Quality Capture Volume (WQCV) =	0.143	acre-feet
Excess Urban Runoff Volume (EURV) =	0.419	acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.241	acre-feet
5-yr Runoff Volume (P1 = 1.1 in.) =	0.360	acre-feet
10-yr Runoff Volume (P1 = 1.34 in.) =	0.507	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	0.792	acre-feet
50-yr Runoff Volume (P1 = 1.98 in.) =	0.994	acre-feet
100-yr Runoff Volume (P1 = 2.29 in.) =	1.253	acre-feet
500-yr Runoff Volume (P1 = 3.08 in.) =	1.850	acre-feet
Approximate 2-yr Detention Volume =	0.226	acre-feet
Approximate 5-yr Detention Volume =	0.338	acre-feet
Approximate 10-yr Detention Volume =	0.453	acre-feet
Approximate 25-yr Detention Volume =	0.549	acre-feet
Approximate 50-yr Detention Volume =	0.597	acre-feet
Approximate 100-yr Detention Volume =	0.696	acre-feet

Optional User Override 1-hr Precipitation

	inches
	inches
	inches
	inches
	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.143	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.277	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.277	acre-feet
Total Detention Basin Volume =	0.696	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

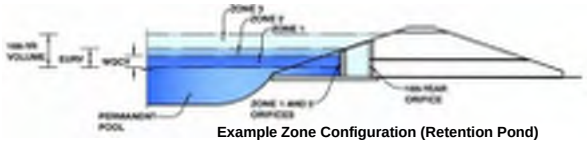
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	42	0.001		
5789	--	0.39	--	--	--	42	0.001	16	0.000
5790	--	1.39	--	--	--	1,078	0.025	566	0.013
5791	--	2.39	--	--	--	10,051	0.231	6,141	0.141
5792	--	3.39	--	--	--	38,742	0.889	30,537	0.701
5793	--	4.39	--	--	--	44,833	1.029	72,325	1.660
5794	--	5.39	--	--	--	48,989	1.125	119,236	2.737
5795	--	6.39	--	--	--	52,725	1.210	170,093	3.905
5796	--	7.39	--	--	--	56,510	1.297	224,710	5.159
5797	--	8.39	--	--	--	60,000	1.377	282,965	6.496

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Compark Village South

Basin ID: Filing 2 to Inlet 1-4



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.40	0.143	
Zone 2 (EURV)	3.03	0.277	
Zone 3 (100-year)	3.39	0.277	
		0.696	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 = ft^2

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 =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (optional)	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)								
Orifice Area (sq. inches)								

	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 =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

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

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Over Flow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			ft^2

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

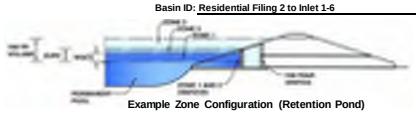
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.82	1.10	1.34	1.69	1.98	2.29	3.08
Calculated Runoff Volume (acre-ft) =	0.143	0.419	0.241	0.360	0.507	0.792	0.994	1.253	1.850
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.142	0.419	0.241	0.359	0.507	0.792	0.994	1.254	1.851
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.03	0.17	0.55	0.78	1.08	1.71
Predevelopment Peak Q (cfs) =	0.0	0.0	0.1	0.3	1.4	4.7	6.7	9.3	14.7
Peak Inflow Q (cfs) =	2.3	6.6	3.8	5.7	8.0	12.4	15.5	19.4	28.6
Peak Outflow Q (cfs) =									
Ratio Peak Outflow to Predevelopment Q =									
Structure Controlling Flow =									
Max Velocity through Grate 1 (fps) =									
Max Velocity through Grate 2 (fps) =									
Time to Drain 97% of Inflow Volume (hours) =									
Time to Drain 99% of Inflow Volume (hours) =									
Maximum Ponding Depth (ft) =									
Area at Maximum Ponding Depth (acres) =									
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Compark South

Basin ID: Residential Filing 2 to Inlet 1-6



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	2.70	acres
Watershed Length =	900	ft
Watershed Slope =	0.006	ft/ft
Watershed Imperviousness =	64.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	75.0%	percent
Percentage Hydrologic Soil Groups C/D =	25.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	
Water Quality Capture Volume (WQCV) =	0.056	acre-feet
Excess Urban Runoff Volume (EURV) =	0.183	acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.108	acre-feet
5-yr Runoff Volume (P1 = 1.1 in.) =	0.156	acre-feet
10-yr Runoff Volume (P1 = 1.34 in.) =	0.207	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	0.295	acre-feet
50-yr Runoff Volume (P1 = 1.98 in.) =	0.359	acre-feet
100-yr Runoff Volume (P1 = 2.29 in.) =	0.439	acre-feet
500-yr Runoff Volume (P1 = 3.08 in.) =	0.628	acre-feet
Approximate 2-yr Detention Volume =	0.101	acre-feet
Approximate 5-yr Detention Volume =	0.147	acre-feet
Approximate 10-yr Detention Volume =	0.190	acre-feet
Approximate 25-yr Detention Volume =	0.225	acre-feet
Approximate 50-yr Detention Volume =	0.244	acre-feet
Approximate 100-yr Detention Volume =	0.273	acre-feet

Optional User Override 1-hr Precipitation

	inches
	inches
	inches
	inches
	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.056	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.127	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.090	acre-feet
Total Detention Basin Volume =	0.273	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

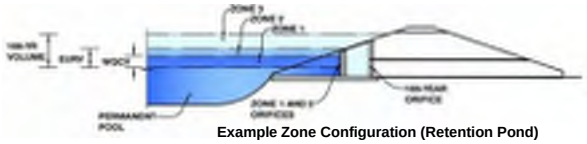
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	42	0.001		
5789	--	0.39	--	--	--	42	0.001	16	0.000
5790	--	1.39	--	--	--	1,078	0.025	566	0.013
5791	--	2.39	--	--	--	10,051	0.231	6,141	0.141
5792	--	3.39	--	--	--	38,742	0.889	30,537	0.701
5793	--	4.39	--	--	--	44,833	1.029	72,325	1.660
5794	--	5.39	--	--	--	48,989	1.125	119,236	2.737
5795	--	6.39	--	--	--	52,725	1.210	170,093	3.905
5796	--	7.39	--	--	--	56,510	1.297	224,710	5.159
5797	--	8.39	--	--	--	60,000	1.377	282,965	6.496

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Compark Village South

Basin ID: Filing 2 to Inlet 1-6



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.93	0.056	
Zone 2 (EURV)	2.55	0.127	
Zone 3 (100-year)	2.77	0.090	
		0.273	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 = ft^2

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 =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (optional)	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)								
Orifice Area (sq. inches)								

	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 =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

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

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Over Flow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			ft^2

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

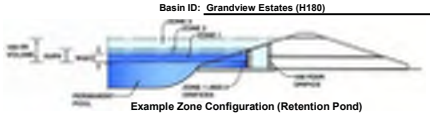
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.82	1.10	1.34	1.69	1.98	2.29	3.08
Calculated Runoff Volume (acre-ft) =	0.056	0.183	0.108	0.156	0.207	0.295	0.359	0.439	0.628
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.056	0.182	0.108	0.156	0.207	0.294	0.358	0.438	0.628
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.02	0.10	0.35	0.49	0.70	1.11
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.3	0.9	1.3	1.9	3.0
Peak Inflow Q (cfs) =	0.5	1.7	1.0	1.5	1.9	2.7	3.3	4.1	5.8
Peak Outflow Q (cfs) =									
Ratio Peak Outflow to Predevelopment Q =									
Structure Controlling Flow =									
Max Velocity through Grate 1 (fps) =									
Max Velocity through Grate 2 (fps) =									
Time to Drain 97% of Inflow Volume (hours) =									
Time to Drain 99% of Inflow Volume (hours) =									
Maximum Ponding Depth (ft) =									
Area at Maximum Ponding Depth (acres) =									
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Compark Village South

Basin ID: Grandview Estates (H180)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	20.00	acres
Watershed Length =	1,907	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	15.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	50.0%	percent
Percentage Hydrologic Soil Groups C/D =	50.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	
Water Quality Capture Volume (WQCV) =	0.155	acre-feet
Excess Urban Runoff Volume (EURV) =	0.275	acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.151	acre-feet
5-yr Runoff Volume (P1 = 1.1 in.) =	0.283	acre-feet
10-yr Runoff Volume (P1 = 1.34 in.) =	0.537	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	1.214	acre-feet
50-yr Runoff Volume (P1 = 1.98 in.) =	1.689	acre-feet
100-yr Runoff Volume (P1 = 2.29 in.) =	2.311	acre-feet
500-yr Runoff Volume (P1 = 3.08 in.) =	3.667	acre-feet
Approximate 2-yr Detention Volume =	0.141	acre-feet
Approximate 5-yr Detention Volume =	0.268	acre-feet
Approximate 10-yr Detention Volume =	0.408	acre-feet
Approximate 25-yr Detention Volume =	0.558	acre-feet
Approximate 50-yr Detention Volume =	0.611	acre-feet
Approximate 100-yr Detention Volume =	0.816	acre-feet

Optional User Override 1-hr Precipitation

	inches
	inches
	inches
	inches
	inches
	inches

Stage-Storage Calculation

Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =	20	ft^3
Initial Surcharge Depth (ISD) =		ft
Total Available Detention Depth (H_{total}) =		ft
Depth of Trickle Channel (H_{TC}) =		ft
Slope of Trickle Channel (S_{TC}) =		ft/ft
Slopes of Main Basin Sides (S_{main}) =		H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =		
Initial Surcharge Area (A_{ISV}) =		ft^2
Surcharge Volume Length (L_{ISV}) =		ft
Surcharge Volume Width (W_{ISV}) =		ft
Depth of Basin Floor (H_{FLOOR}) =		ft
Length of Basin Floor (L_{FLOOR}) =		ft
Width of Basin Floor (W_{FLOOR}) =		ft
Area of Basin Floor (A_{FLOOR}) =		ft^2
Volume of Basin Floor (V_{FLOOR}) =		ft^3
Depth of Main Basin (H_{MAIN}) =		ft
Length of Main Basin (L_{MAIN}) =		ft
Width of Main Basin (W_{MAIN}) =		ft
Area of Main Basin (A_{MAIN}) =		ft^2
Volume of Main Basin (V_{MAIN}) =		ft^3
Calculated Total Basin Volume (V_{total}) =		acre-feet

Depth Increment = ft

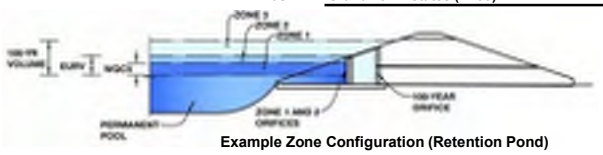
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool									

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Compark Village South

Basin ID: Grandview Estates (H180)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1			
Zone 2			
Zone 3			
			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 =		ft^2
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 =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (optional)	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)								
Orifice Area (sq. inches)								

	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 =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

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

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Over Flow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			ft^2

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

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

Routed Hydrograph Results

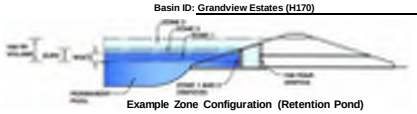
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.82	1.10	1.34	1.69	1.98	2.29	3.08
Calculated Runoff Volume (acre-ft) =	0.155	0.275	0.151	0.283	0.537	1.214	1.689	2.311	3.667
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.155	0.274	0.150	0.283	0.536	1.214	1.688	2.309	3.664
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.03	0.13	0.41	0.58	0.81	1.29
Predevelopment Peak Q (cfs) =	0.0	0.0	0.1	0.7	2.6	8.3	11.7	16.2	25.7
Peak Inflow Q (cfs) =	1.9	3.3	1.8	3.4	6.3	14.2	19.7	26.8	42.3
Peak Outflow Q (cfs) =									
Ratio Peak Outflow to Predevelopment Q =									
Structure Controlling Flow =									
Max Velocity through Grate 1 (fps) =									
Max Velocity through Grate 2 (fps) =									
Time to Drain 97% of Inflow Volume (hours) =									
Time to Drain 99% of Inflow Volume (hours) =									
Maximum Ponding Depth (ft) =									
Area at Maximum Ponding Depth (acres) =									
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Compark Village South

Basin ID: Grandview Estates (H170)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	42.00	acres	
Watershed Length =	2,378	ft	
Watershed Slope =	0.015	ft/ft	
Watershed Imperviousness =	15.00%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	50.0%	percent	
Percentage Hydrologic Soil Groups C/D =	50.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	Parker - Town Hall		
Water Quality Capture Volume (WQCV) =	0.327	acre-feet	
Excess Urban Runoff Volume (EURV) =	0.576	acre-feet	
2-yr Runoff Volume (P1 = 0.82 in.) =	0.316	acre-feet	
5-yr Runoff Volume (P1 = 1.1 in.) =	0.595	acre-feet	
10-yr Runoff Volume (P1 = 1.34 in.) =	1.128	acre-feet	
25-yr Runoff Volume (P1 = 1.69 in.) =	2.550	acre-feet	
50-yr Runoff Volume (P1 = 1.98 in.) =	3.547	acre-feet	
100-yr Runoff Volume (P1 = 2.29 in.) =	4.852	acre-feet	
500-yr Runoff Volume (P1 = 3.08 in.) =	7.700	acre-feet	
Approximate 2-yr Detention Volume =	0.295	acre-feet	
Approximate 5-yr Detention Volume =	0.562	acre-feet	
Approximate 10-yr Detention Volume =	0.856	acre-feet	
Approximate 25-yr Detention Volume =	1.173	acre-feet	
Approximate 50-yr Detention Volume =	1.282	acre-feet	
Approximate 100-yr Detention Volume =	1.714	acre-feet	

Optional User Override 1-hr Precipitation

	inches
	inches
	inches
	inches
	inches
	inches

Stage-Storage Calculation

Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =	43	ft^3
Initial Surcharge Depth (ISD) =		ft
Total Available Detention Depth (H_{total}) =		ft
Depth of Trickle Channel (H_{TC}) =		ft
Slope of Trickle Channel (S_{TC}) =		ft/ft
Slopes of Main Basin Sides (S_{main}) =		H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =		
Initial Surcharge Area (A_{ISV}) =		ft^2
Surcharge Volume Length (L_{ISV}) =		ft
Surcharge Volume Width (W_{ISV}) =		ft
Depth of Basin Floor (H_{FLOOR}) =		ft
Length of Basin Floor (L_{FLOOR}) =		ft
Width of Basin Floor (W_{FLOOR}) =		ft
Area of Basin Floor (A_{FLOOR}) =		ft^2
Volume of Basin Floor (V_{FLOOR}) =		ft^3
Depth of Main Basin (H_{MAIN}) =		ft
Length of Main Basin (L_{MAIN}) =		ft
Width of Main Basin (W_{MAIN}) =		ft
Area of Main Basin (A_{MAIN}) =		ft^2
Volume of Main Basin (V_{MAIN}) =		ft^3
Calculated Total Basin Volume (V_{total}) =		acre-feet

Depth Increment = ft

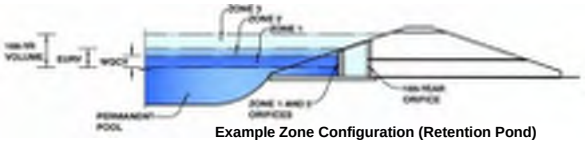
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool									

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Compark Village South

Basin ID: Grandview Estates (H170)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1			
Zone 2			
Zone 3			
		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 =		ft^2
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 =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (optional)	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)								
Orifice Area (sq. inches)								

	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 =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

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

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Over Flow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			ft^2

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =			ft^2
Outlet Orifice Centroid =			feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

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

Routed Hydrograph Results

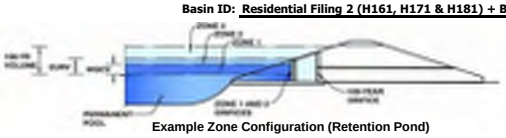
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.82	1.10	1.34	1.69	1.98	2.29	3.08
Calculated Runoff Volume (acre-ft) =	0.327	0.576	0.316	0.595	1.128	2.550	3.547	4.852	7.700
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.326	0.576	0.315	0.594	1.127	2.548	3.545	4.850	7.696
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.04	0.16	0.50	0.70	0.96	1.53
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	1.7	6.8	20.9	29.3	40.4	64.1
Peak Inflow Q (cfs) =	4.6	8.0	4.4	8.2	15.5	34.7	48.1	65.4	102.6
Peak Outflow Q (cfs) =									
Ratio Peak Outflow to Predevelopment Q =									
Structure Controlling Flow =									
Max Velocity through Grate 1 (fps) =									
Max Velocity through Grate 2 (fps) =									
Time to Drain 97% of Inflow Volume (hours) =									
Time to Drain 99% of Inflow Volume (hours) =									
Maximum Ponding Depth (ft) =									
Area at Maximum Ponding Depth (acres) =									
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.00 (December 2019)

Project: **Compark Village South**

Basin ID: **Residential Filing 2 (H161, H171 & H181) + Belford Ave + 15 ac Commercial + Grand View Estates (H180) + 11 ac Residential Filing 3**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	93.50	acres
Watershed Length =	3,100	ft
Watershed Length to Centroid =	1,550	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	51.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	75.0%	percent
Percentage Hydrologic Soil Groups C/D =	25.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.628	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	4.959	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	2.911	acre-feet	inches
5-yr Runoff Volume (P1 = 1.1 in.) =	4.244	acre-feet	inches
10-yr Runoff Volume (P1 = 1.34 in.) =	5.827	acre-feet	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	8.888	acre-feet	inches
50-yr Runoff Volume (P1 = 1.98 in.) =	11.140	acre-feet	inches
100-yr Runoff Volume (P1 = 2.29 in.) =	13.928	acre-feet	inches
500-yr Runoff Volume (P1 = 3.08 in.) =	20.373	acre-feet	inches
Approximate 2-yr Detention Volume =	2.689	acre-feet	
Approximate 5-yr Detention Volume =	3.992	acre-feet	
Approximate 10-yr Detention Volume =	5.299	acre-feet	
Approximate 25-yr Detention Volume =	6.373	acre-feet	
Approximate 50-yr Detention Volume =	6.921	acre-feet	
Approximate 100-yr Detention Volume =	7.994	acre-feet	

Define Zones and Basin Geometry

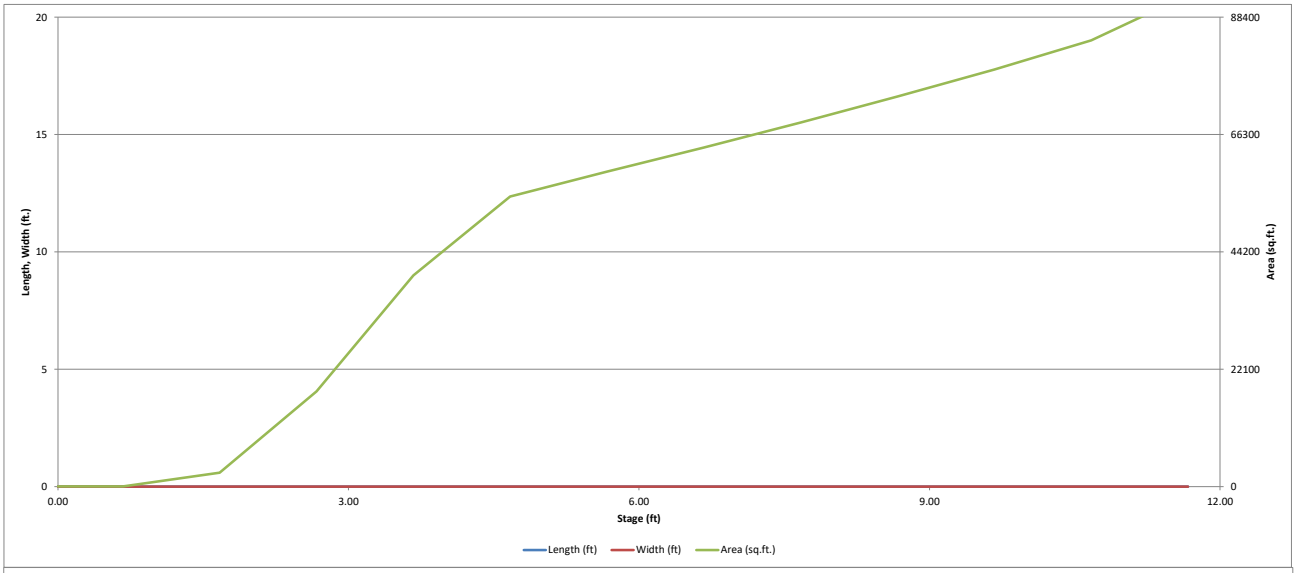
Zone 1 Volume (WQCV) =	1.628	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.331	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.035	acre-feet
Total Detention Basin Volume =	7.994	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

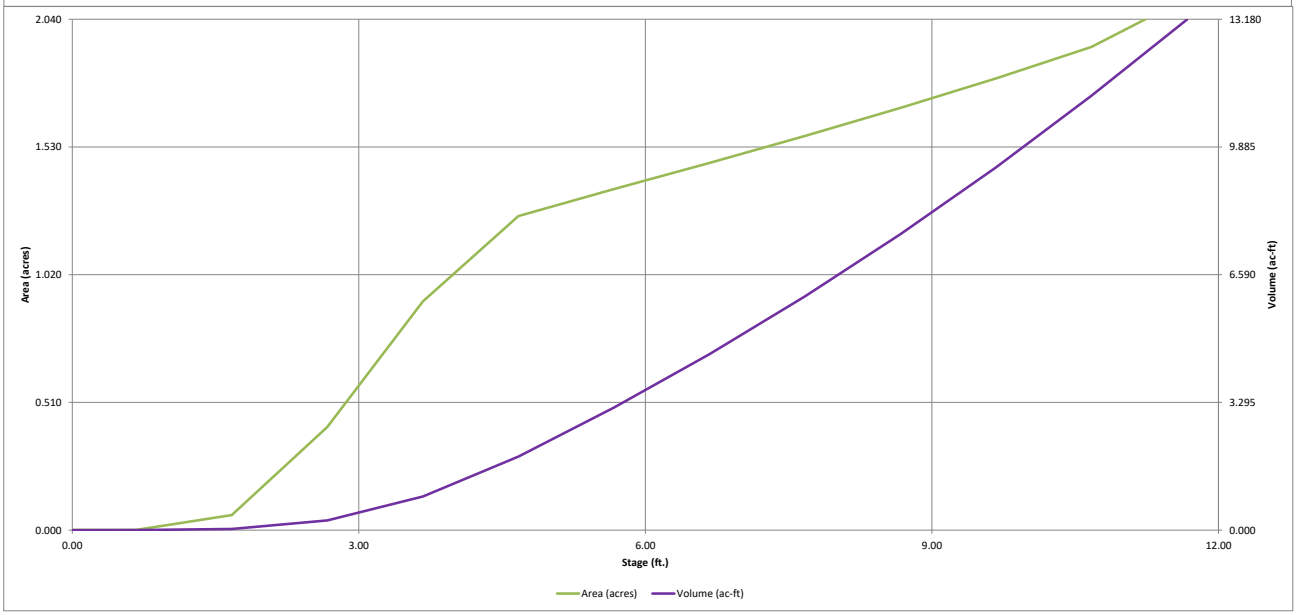
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	42	0.001		
5788	--	0.67	--	--	--	42	0.001	28	0.001
5789	--	1.67	--	--	--	2,629	0.060	1,361	0.031
5790	--	2.67	--	--	--	17,937	0.412	10,899	0.250
5791	--	3.67	--	--	--	39,784	0.913	37,754	0.867
5792	--	4.67	--	--	--	54,629	1.254	82,640	1.897
5793	--	5.67	--	--	--	59,323	1.362	137,703	3.161
5794	--	6.67	--	--	--	63,858	1.466	197,710	4.539
5795	--	7.67	--	--	--	68,566	1.574	262,573	6.028
5796	--	8.67	--	--	--	73,449	1.686	332,452	7.632
5797	--	9.67	--	--	--	78,549	1.803	407,534	9.356
5798	--	10.67	--	--	--	84,042	1.929	488,019	11.203
5799	--	11.67	--	--	--	92,571	2.125	573,719	13.171

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.00 (December 2019)





DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)

Project: **Compark Village South**

Basin ID: **Residential Filing 2 (H161, H171 & H181) + Belford Ave + 15 ac Commercial + Grand View Estates (H180) + 11 ac Residential Filing 3**

Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.44	1.628	Orifice Plate
Zone 2 (EURV)	6.96	3.331	Orifice Plate
Zone 3 (100-year)	8.89	3.035	Weir&Pipe (Restrict)
Total (all zones)		7.994	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.819E-02	ft^2
Depth at top of Zone using Orifice Plate =	7.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	28.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	5.50	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.30	4.60	6.90				
Orifice Area (sq. inches)	5.50	5.50	5.50	5.50				

	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			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.00	N/A	feet
Overflow Weir Front Edge Length =	11.33	N/A	feet	Overflow Weir Slope Length =	3.42	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.73	N/A	
Horiz. Length of Weir Sides =	3.42	N/A	feet	Overflow Grate Open Area w/o Debris =	27.12	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	13.56	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.23	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.03	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	0.95	N/A	feet
Restrictor Plate Height Above Pipe Invert =	20.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.68	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.67	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.56	feet
Spillway Crest Length =	150.00	feet	Stage at Top of Freeboard =	11.23	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.97	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	12.29	acre-ft

Calculated Parameters for Spillway

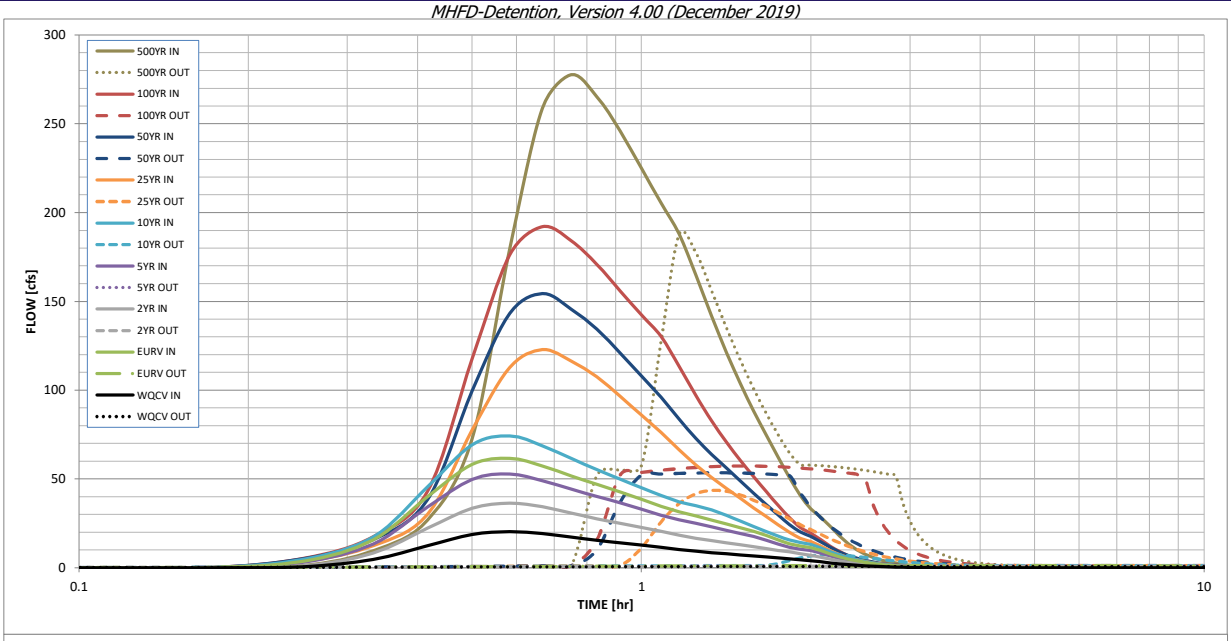
Routed Hydrograph Results

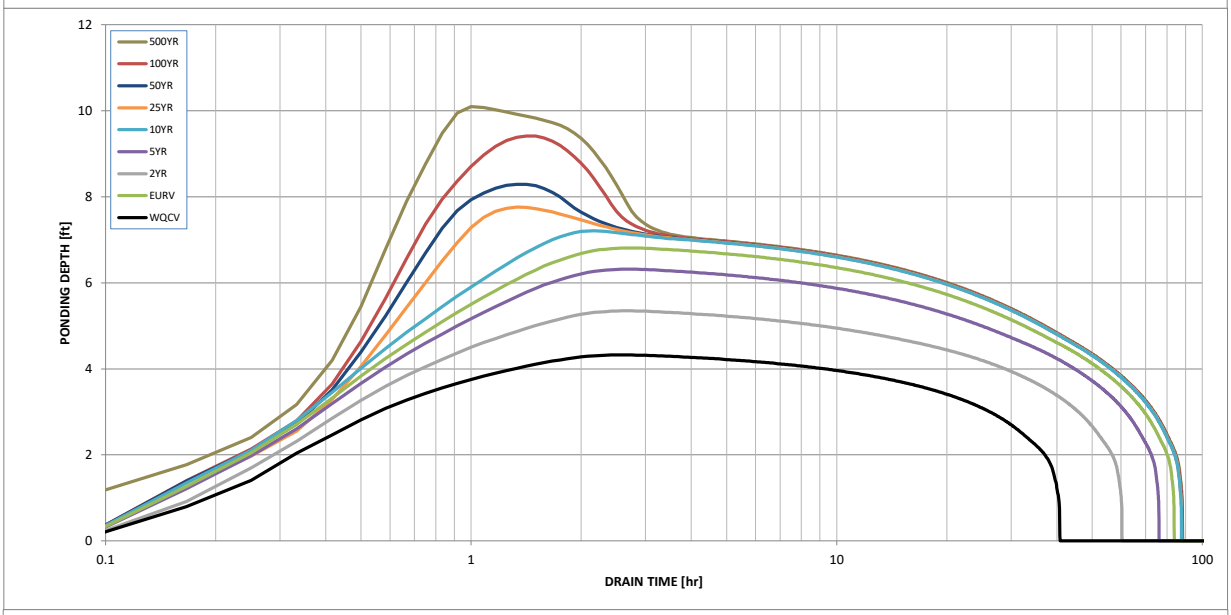
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

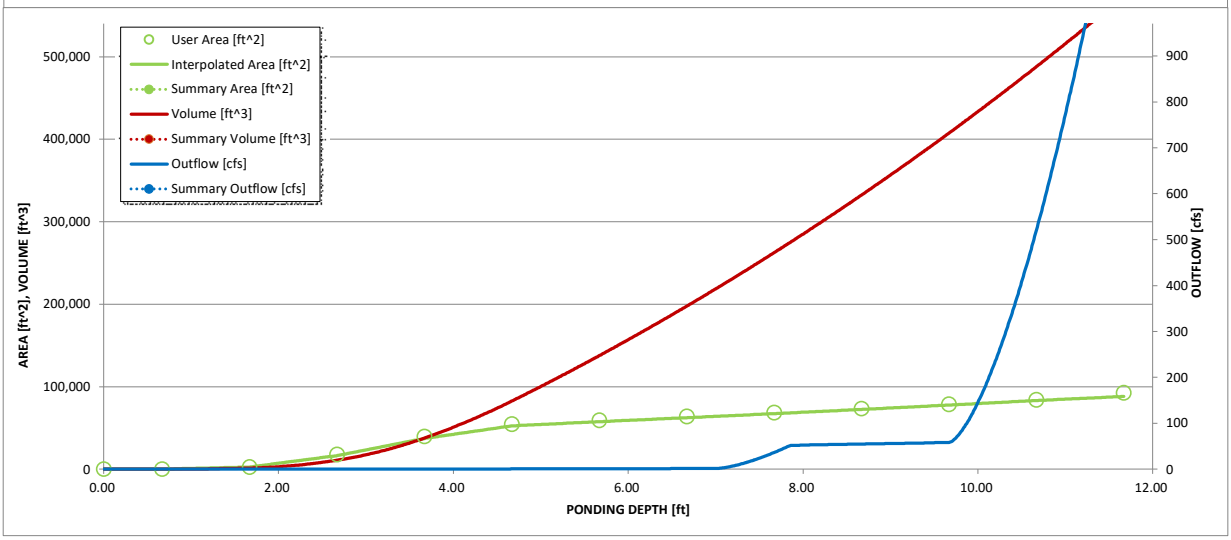
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.82	1.10	1.34	1.69	1.98	2.29	3.08
CUHP Runoff Volume (acre-ft) =	1.628	4.959	2.911	4.244	5.827	8.888	11.140	13.928	20.373
Inflow Hydrograph Volume (acre-ft) =	1.628	4.959	2.911	4.244	5.827	8.888	11.140	13.928	20.373
CUHP Predevelopment Peak Q (cfs) =	0.0	0.0	0.6	2.1	13.3	44.6	63.1	87.2	139.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	0.0	0.0							
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.14	0.48	0.68	0.93	1.49
Peak Inflow Q (cfs) =	20.3	61.7	36.3	52.8	74.3	122.8	154.4	192.0	277.7
Peak Outflow Q (cfs) =	0.6	1.1	0.9	1.1	7.4	43.5	53.4	57.3	187.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.6	1.0	0.8	0.7	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	1.6	1.9	2.0	2.1
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	77	56	70	80	77	75	73	69
Time to Drain 99% of Inflow Volume (hours) =	**40**	81	59	74	85	83	82	81	79
Maximum Ponding Depth (ft) =	4.33	6.81	5.35	6.32	7.21	7.76	8.30	9.42	10.10
Area at Maximum Ponding Depth (acres) =	1.08	1.45	1.28	1.39	1.49	1.55	1.62	1.75	1.84
Maximum Volume Stored (acre-ft) =	1.497	4.740	2.731	4.030	5.314	6.152	7.009	8.896	10.135

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.26
	0:15:00	0.54	3.62	0.96	3.10	4.60	3.52	5.07	5.24	9.50
	0:20:00	4.62	15.61	8.25	13.36	17.31	12.30	15.78	17.38	26.77
	0:25:00	12.42	40.01	22.21	34.24	45.51	30.06	38.26	43.03	72.45
	0:30:00	18.76	58.15	33.54	49.76	69.17	77.41	99.46	117.45	179.61
	0:35:00	20.28	61.65	36.26	52.76	74.25	112.72	143.21	176.21	258.78
	0:40:00	19.17	57.27	34.28	49.01	68.63	122.82	154.40	192.00	277.68
	0:45:00	17.23	51.66	30.81	44.21	61.54	116.36	145.61	184.13	265.26
	0:50:00	15.43	46.95	27.59	40.18	55.19	107.48	134.36	170.87	245.96
	0:55:00	13.96	42.64	24.95	36.49	49.81	96.52	120.88	155.89	224.77
	1:00:00	12.67	38.44	22.66	32.90	45.01	85.85	107.86	142.33	205.44
	1:05:00	11.46	34.57	20.48	29.58	40.65	76.19	96.02	130.22	188.01
	1:10:00	10.25	31.53	18.32	26.98	37.16	66.44	83.67	113.56	164.59
	1:15:00	9.26	29.12	16.55	24.92	34.90	57.83	72.71	96.86	141.61
	1:20:00	8.49	26.81	15.19	22.95	32.53	50.80	63.82	82.71	121.31
	1:25:00	7.83	24.58	14.01	21.03	29.42	44.71	56.11	70.73	103.59
	1:30:00	7.23	22.49	12.92	19.25	26.17	39.01	48.78	60.37	88.16
	1:35:00	6.63	20.51	11.86	17.55	23.15	33.68	41.88	51.23	74.57
	1:40:00	6.04	18.11	10.80	15.49	20.31	28.73	35.48	42.78	62.09
	1:45:00	5.45	15.61	9.75	13.36	17.75	24.15	29.60	35.04	50.69
	1:50:00	4.97	13.52	8.89	11.57	15.63	20.00	24.31	28.18	40.70
	1:55:00	4.44	12.23	7.93	10.46	14.24	16.60	20.07	22.69	33.08
	2:00:00	3.94	11.30	7.05	9.67	13.08	14.65	17.64	19.39	28.42
	2:05:00	3.31	9.65	5.92	8.26	11.12	12.16	14.60	15.76	23.16
	2:10:00	2.68	7.76	4.79	6.64	8.95	9.56	11.44	12.10	17.80
	2:15:00	2.13	6.14	3.82	5.25	7.09	7.39	8.83	9.12	13.42
	2:20:00	1.70	4.87	3.04	4.17	5.62	5.78	6.87	6.88	10.11
	2:25:00	1.35	3.86	2.41	3.30	4.41	4.49	5.31	5.16	7.57
	2:30:00	1.06	3.02	1.90	2.58	3.42	3.47	4.09	3.89	5.70
	2:35:00	0.83	2.32	1.49	1.99	2.61	2.66	3.12	2.99	4.35
	2:40:00	0.65	1.77	1.16	1.52	1.98	2.02	2.37	2.28	3.31
	2:45:00	0.50	1.35	0.90	1.16	1.52	1.55	1.81	1.77	2.57
	2:50:00	0.38	1.02	0.68	0.87	1.17	1.20	1.39	1.37	1.98
	2:55:00	0.28	0.74	0.50	0.64	0.86	0.89	1.04	1.02	1.47
	3:00:00	0.19	0.52	0.35	0.44	0.60	0.63	0.73	0.72	1.03
	3:05:00	0.12	0.34	0.22	0.29	0.39	0.42	0.48	0.47	0.67
	3:10:00	0.07	0.21	0.13	0.18	0.22	0.25	0.28	0.28	0.39
	3:15:00	0.03	0.10	0.06	0.09	0.10	0.12	0.14	0.13	0.18
	3:20:00	0.01	0.04	0.02	0.03	0.03	0.04	0.04	0.04	0.05
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PROJECT: **Compark South**
CODE: CLCPKC3
DESIGN BY: Michael McGuire
DATE: 2/27/2020
REV. :

DETENTION POND FOREBAY A VOLUME

Detention Pond Forebay

FOREBAY OUTLET ELEVATION = 5790.10

WQCV (in)	V (ACRE-FT)	V (FT^3)	Forebay at 3% (FT^3)	Forebay Area at 2.5'$_{DEPTH}$
0.182	1.581	68,889.51	2,066.69	826.67

WQCV Designed from Urban Drainage Criteria Manual Volume 3 (Pgs 3-5 through 3-9)

WQCV=a(0.91i^3-1.19i^2+0.78i)

a=1.0 40-hr drain time

V=(WQCV/12)A

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%203%20Calculating%20the%20WQCV%20and%20Volume%20Reduction.pdf

Forbay Sizing Designed from Urban Drainage Criteria Manual Volume 3 (Pg EDB-12 table EDB-4)

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%204%20Treatment%20BMPs.pdf

Ground Coverage

Weighted I (%):	**41.00%**
Total Acerage:	**104.00**

Forebay A Outlet Weir

Project Description

Solve For	Crest Length

Input Data

Discharge	3.71	ft³/s	2% Undetained 100 Yr Runoff
Headwater Elevation	2.50	ft	
Crest Elevation	0.00	ft	
Tailwater Elevation	0.00	ft	
Weir Coefficient	3.00	US	
Number Of Contractions	0		

Results

Crest Length	0.31	ft	Use 0.33'
Headwater Height Above Crest	2.50	ft	
Tailwater Height Above Crest	0.00	ft	
Flow Area	0.78	ft²	
Velocity	4.74	ft/s	
Wetted Perimeter	5.31	ft	
Top Width	0.31	ft	

PROJECT: **Compark South**
CODE: CLCPKC3
DESIGN BY: Michael McGuire
DATE: 2/27/2020
REV. :

DETENTION POND FOREBAY B VOLUME

Detention Pond Forebay

FOREBAY OUTLET ELEVATION =5789.72

WQCV (in)	V (ACRE-FT)	V (FT^3)	Forebay at 2% (FT^3)	Forebay Area at 2.0'$_{DEPTH}$
0.217	0.843	36,710.93	734.22	293.69

WQCV Designed from Urban Drainage Criteria Manual Volume 3 (Pgs 3-5 through 3-9)

WQCV=a(0.91i^3-1.19i^2+0.78i)

a=1.0 40-hr drain time

V=(WQCV/12)A

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%203%20Calculating%20the%20WQCV%20and%20Volume%20Reduction.pdf

Forbay Sizing Designed from Urban Drainage Criteria Manual Volume 3 (Pg EDB-12 table EDB-4)

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%204%20Treatment%20BMPs.pdf

Ground Coverage

Weighted I (%):	**54.00%**
Total Acerage:	**46.50**

Forebay B Weir

Project Description

Solve For	Crest Length

Input Data

Discharge	1.58	ft³/s	2% Undetained 100 yr Runoff
Headwater Elevation	2.00	ft	
Crest Elevation	0.00	ft	
Tailwater Elevation	0.00	ft	
Weir Coefficient	3.00	US	
Number Of Contractions	0		

Results

Crest Length	0.19	ft	Use 3" Minimum
Headwater Height Above Crest	2.00	ft	
Tailwater Height Above Crest	0.00	ft	
Flow Area	0.37	ft²	
Velocity	4.24	ft/s	
Wetted Perimeter	4.19	ft	
Top Width	0.19	ft	

Appendix D

COMPARK VILLAGE SOUTH - 2 YR STORM

FlexTable: Conduit Table

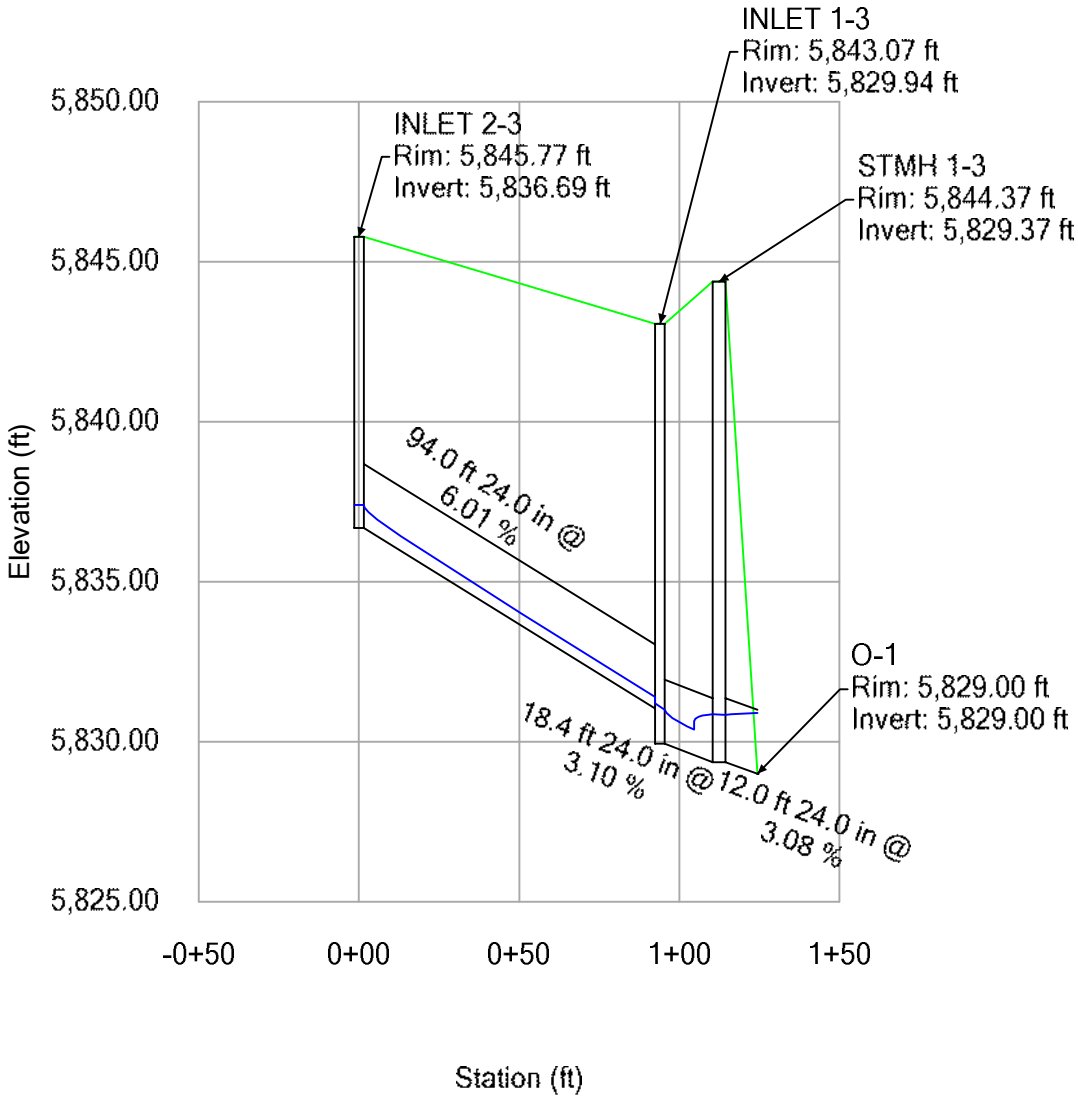
Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
STMH 6-4	5,834.91	INLET 6-4	5,832.53	120.0	1.98	Circle	36.0	0.013	8.50	8.25	5,835.83	5,833.14
INLET 6-4	5,832.33	STMH 5-4	5,827.71	278.0	1.66	Circle	36.0	0.013	9.60	8.03	5,833.31	5,828.39
FES 2-5	5,834.54	INLET 8-5	5,834.00	7.7	7.01	Circle	24.0	0.013	4.10	10.91	5,835.25	5,834.45
INLET 5-4	5,829.34	STMH 5-4	5,828.83	52.0	0.99	Circle	18.0	0.013	3.40	5.28	5,830.05	5,829.42
INLET 3-4	5,825.42	STMH 4-4	5,825.23	20.0	0.95	Circle	18.0	0.013	3.90	5.40	5,826.18	5,825.89
INLET 1-4	5,823.04	STMH 2-4	5,821.92	65.0	1.72	Circle	18.0	0.013	2.30	5.79	5,823.61	5,822.33
INLET 4-4	5,825.42	STMH 4-4	5,825.23	20.0	0.95	Circle	18.0	0.013	0.90	3.57	5,825.77	5,825.53
INLET 2-6	5,814.55	INLET 1-6	5,814.15	80.0	0.50	Circle	18.0	0.013	2.90	3.94	5,815.20	5,814.96
INLET 2-3	5,836.69	INLET 1-3	5,831.04	94.0	6.01	Circle	24.0	0.013	4.20	10.40	5,837.41	5,831.41
FES 2-4	5,842.00	STMH 6-4	5,835.11	221.0	3.12	Circle	36.0	0.013	8.50	9.68	5,842.92	5,835.66
STMH 5-4	5,827.41	STMH 4-4	5,822.96	163.0	2.73	Circle	36.0	0.013	14.00	10.69	5,828.60	5,823.68
INLET 4-5	5,812.96	STMH 2-5A	5,812.27	19.0	3.63	Circle	18.0	0.013	2.40	7.64	5,813.55	5,813.63
INLET 5-5	5,813.90	STMH 2-5	5,811.47	49.0	4.96	Circle	18.0	0.013	3.30	9.35	5,814.59	5,813.40
STMH 4-4	5,822.16	STMH 3-4	5,821.56	79.0	0.76	Circle	36.0	0.013	18.80	7.34	5,823.55	5,822.99
STMH 3-4	5,821.46	STMH 2-4	5,820.65	76.0	1.07	Circle	36.0	0.013	21.30	8.59	5,822.94	5,821.82
INLET 2-4	5,822.07	STMH 3-4	5,821.56	56.0	0.91	Circle	18.0	0.013	2.50	4.71	5,822.96	5,822.97
STMH 1-6	5,806.20	FES1-6	5,806.00	40.0	0.50	Circle	24.0	0.013	0.00	0.00	5,806.20	5,806.00
INLET 8-5	5,833.51	INLET 7-5	5,827.49	173.0	3.48	Circle	24.0	0.013	4.10	8.52	5,834.22	5,827.91
INLET 4-5A	5,821.14	STMH 2-5E	5,820.90	20.0	1.20	Circle	18.0	0.013	4.10	5.96	5,821.92	5,821.91
INLET 5-5A	5,821.14	STMH 2-5E	5,820.90	20.0	1.20	Circle	18.0	0.013	4.20	6.00	5,821.93	5,821.91
STMH 2-5	5,811.37	INLET 3-5	5,810.99	16.0	2.38	Circle	42.0	0.013	36.10	13.13	5,813.23	5,812.45
INLET 7-5	5,827.14	STMH 4-5	5,822.27	104.6	4.66	Circle	24.0	0.013	4.30	9.57	5,827.87	5,823.07
STMH 4-5	5,822.27	INLET 6-5	5,821.44	23.0	3.61	Circle	24.0	0.013	4.30	8.75	5,823.00	5,822.20
STMH 2-5A	5,812.17	STMH 2-5	5,811.47	50.0	1.40	Circle	36.0	0.013	20.00	9.32	5,813.60	5,813.41
STMH 2-5B	5,815.51	STMH 2-5A	5,812.17	241.0	1.39	Circle	30.0	0.013	17.60	9.06	5,816.93	5,813.65
STMH 1-4	5,818.23	FES 1-4	5,818.00	46.0	0.50	Circle	36.0	0.013	0.00	0.00	5,818.23	5,818.00
INLET 1-3	5,829.94	STMH 1-3	5,829.37	18.4	3.10	Circle	24.0	0.013	8.90	10.21	5,831.00	5,830.87
STMH 1-3	5,829.37	O-1	5,829.00	12.0	3.08	Circle	24.0	0.013	8.90	10.19	5,830.85	5,830.90
INLET 5-4A	5,829.26	STMH 5-4	5,828.83	43.0	1.00	Circle	18.0	0.013	1.00	3.75	5,829.63	5,829.14
STMH 2-5E	5,820.80	STMH 2-5D	5,820.12	44.0	1.55	Circle	24.0	0.013	8.30	7.79	5,821.83	5,821.42
STMH 2-5D	5,820.12	STMH 2-5C	5,819.49	45.0	1.40	Circle	24.0	0.013	11.80	8.25	5,821.35	5,820.86
STMH 2-5C	5,819.49	STMH 2-5B	5,815.51	289.0	1.38	Circle	30.0	0.013	15.20	8.69	5,820.81	5,816.97
INLET 4-5B	5,819.70	STMH 2-5C	5,819.52	18.0	1.00	Circle	18.0	0.013	3.40	5.30	5,820.85	5,820.85
INLET 5-5B	5,828.30	STMH 2-5D	5,820.22	293.0	2.76	Circle	18.0	0.013	3.50	7.71	5,829.01	5,821.43
INLET 4-5C	5,815.79	STMH 2-5B	5,815.61	18.0	1.00	Circle	18.0	0.013	2.40	4.82	5,816.96	5,816.96
INLET 6-5	5,821.14	STMH 3-5A	5,812.67	247.0	3.43	Circle	30.0	0.013	8.20	10.12	5,822.09	5,813.92
STMH 3-5A	5,812.67	STMH 2-5	5,811.37	48.0	2.71	Circle	30.0	0.013	12.80	10.58	5,813.87	5,813.31
INLET 6-5A	5,812.86	STMH 3-5A	5,812.67	19.0	1.00	Circle	18.0	0.013	2.60	4.93	5,813.90	5,813.91
INLET 6-5B	5,812.86	STMH 3-5A	5,812.67	19.0	1.00	Circle	18.0	0.013	2.00	4.58	5,813.90	5,813.90
INLET 1-6	5,814.05	DIVERSION - STMH 8-12	5,813.06	16.0	6.19	Circle	24.0	0.013	5.80	11.56	5,814.90	5,813.57
STMH 1-12	5,820.16	STMH 2-12	5,819.90	52.0	0.50	Circle	30.0	0.013	23.60	6.58	5,822.55	5,822.40
STMH 2-12	5,819.80	STMH 3-12	5,818.95	168.0	0.51	Circle	30.0	0.013	23.60	6.62	5,821.51	5,820.65
STMH 3-12	5,818.85	STMH 4-12	5,817.87	196.0	0.50	Circle	30.0	0.013	23.60	6.58	5,820.56	5,819.57
STMH 4-12	5,817.77	STMH 5-12	5,816.76	202.0	0.50	Circle	30.0	0.013	23.60	6.58	5,819.48	5,818.41
STMH 5-12	5,816.66	STMH 6-12	5,808.94	286.0	2.70	Circle	30.0	0.013	23.60	12.51	5,818.31	5,811.37
STMH 7-12	5,812.68	STMH 6-12	5,812.33	70.0	0.50	Circle	18.0	0.013	5.80	4.65	5,813.68	5,813.26
INLET 2-5	5,808.00	STMH 10-12	5,807.36	27.0	2.37	Circle	24.0	0.013	7.90	8.97	5,809.29	5,809.36
STMH 10-12	5,807.36	INLET 1-5	5,808.34	67.9	-1.44	Circle	24.0	0.013	4.90	6.56	5,809.28	5,809.36

FlexTable: Conduit Table

Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
STMH 6-12	5,808.84	STMH 9-12	5,807.59	249.0	0.50	Circle	42.0	0.013	29.40	7.05	5,810.51	5,809.35
STMH 9-12	5,807.49	STMH 10-12	5,806.11	275.0	0.50	Circle	48.0	0.013	29.40	7.01	5,809.30	5,809.36
STMH 10-12	5,806.01	STMH 11-12	5,805.48	108.0	0.49	Circle	48.0	0.013	42.20	7.66	5,809.34	5,809.29
MH 14-12	5,790.84	FES 1-5	5,790.00	126.0	0.67	Circle	60.0	0.013	83.21	10.17	5,793.87	5,794.00
STMH 12-12	5,795.80	MH 13-12	5,792.31	233.0	1.50	Circle	60.0	0.013	83.21	13.66	5,798.39	5,795.44
MH 13-12	5,792.21	MH 14-12	5,790.94	255.0	0.50	Circle	60.0	0.013	83.21	9.13	5,794.80	5,794.31
STMH 2-4	5,820.42	STMH 1-12	5,820.26	32.0	0.50	Circle	30.0	0.013	23.60	0.00	5,823.64	5,823.53
DIVERSION - STMH 8-12	5,812.96	STMH 7-12	5,812.78	35.0	0.51	Circle	18.0	0.013	5.80	0.00	5,814.67	5,814.56
STMH 11-12	5,805.38	STMH 11A-12	5,802.37	114.0	2.64	Circle	60.0	0.013	82.20	16.69	5,807.95	5,804.97
STMH 11A-12	5,802.27	STMH 12-12	5,795.90	318.0	2.00	Circle	60.0	0.013	82.20	15.11	5,804.84	5,799.74
STMH 2-4	5,820.42	STMH 1-4	5,818.85	60.0	2.61	Circle	36.0	0.013	0.00	0.00	5,820.42	5,818.85
DIVERSION - STMH 8-12	5,812.96	STMH 1-6	5,806.30	116.0	5.74	Circle	24.0	0.013	0.00	0.00	5,812.96	5,806.30
INLET 3-5	5,810.89	MH-1-5A	5,808.93	105.5	1.86	Circle	48.0	0.013	40.00	12.24	5,812.78	5,810.21
MH-1-5A	5,808.83	STMH 11-12	5,805.47	95.1	3.53	Circle	48.0	0.013	40.00	15.40	5,810.72	5,809.29
OUTLET STRUCTURE	5,787.19	O-2	5,785.30	127.9	1.48	Circle	36.0	0.013	0.90	3.80	5,787.48	5,785.52
CB-13	5,792.34	FOREBAY B	5,790.35	32.3	6.16	Circle	30.0	0.013	36.30	19.00	5,794.38	5,792.68

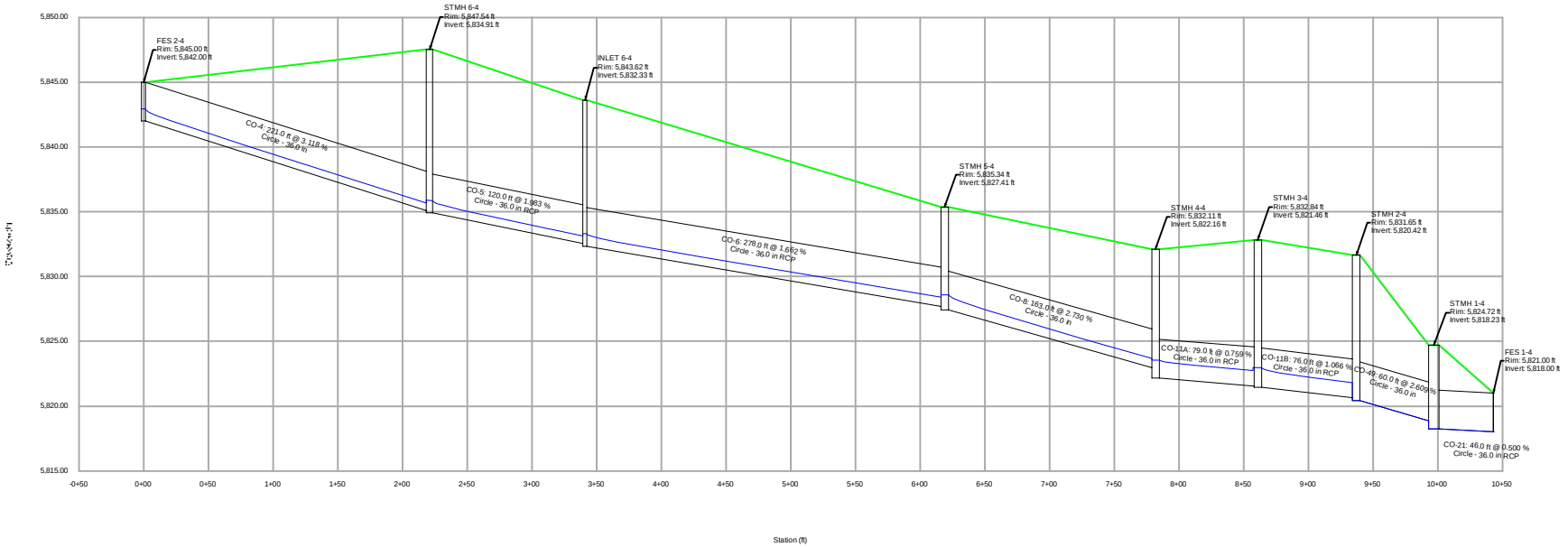
Profile Report

Engineering Profile - Profile - Storm Line 03 (Compark Village South StormCAD [2 year].stsw)



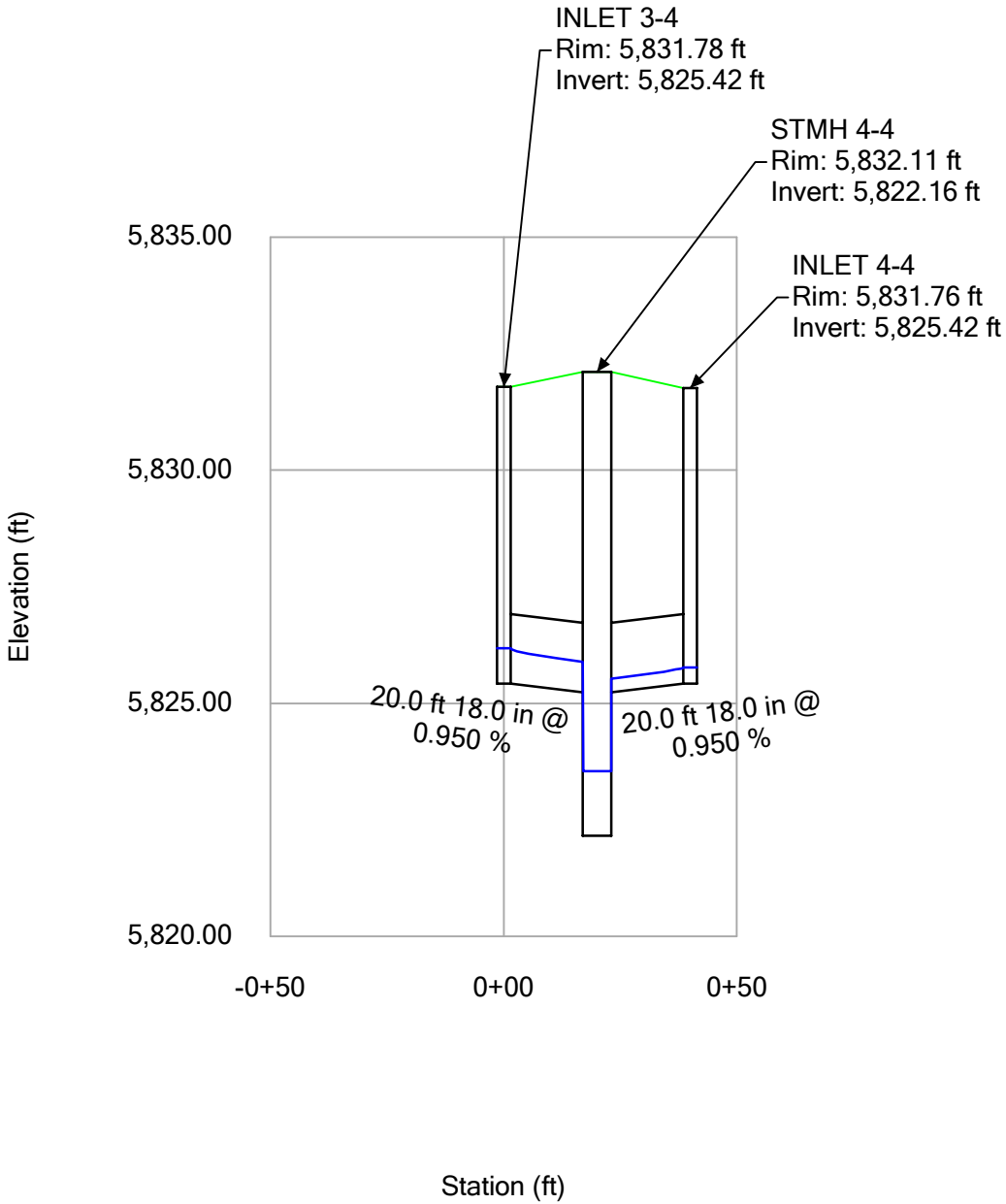
Profile Report

Engineering Profile - Profile - Storm Line 04 (Compark Village South StormCAD [2 year].stsw)



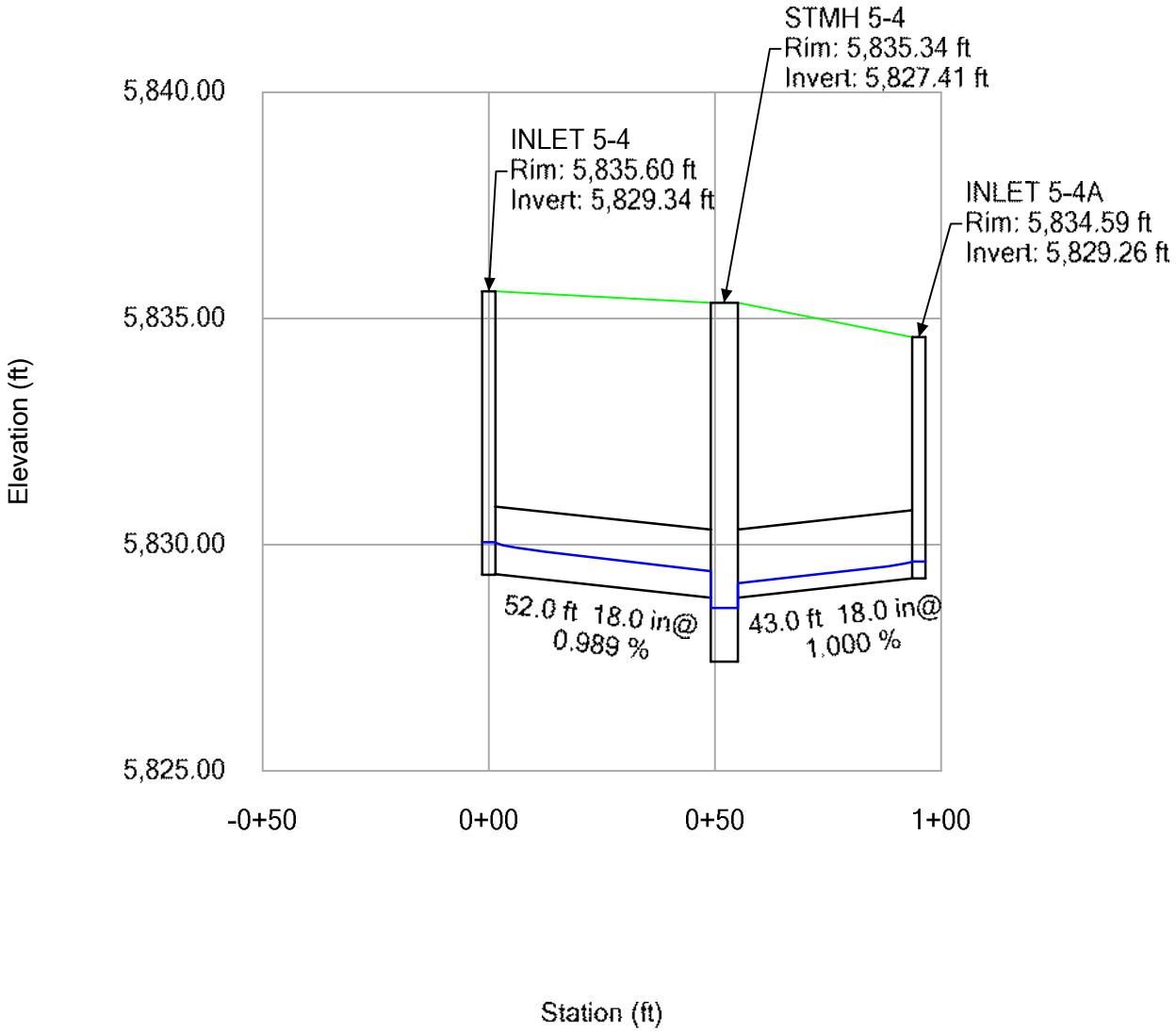
Profile Report

Engineering Profile - Profile - Storm Line 04A (Compark Village South StormCAD [2 year].stsw)



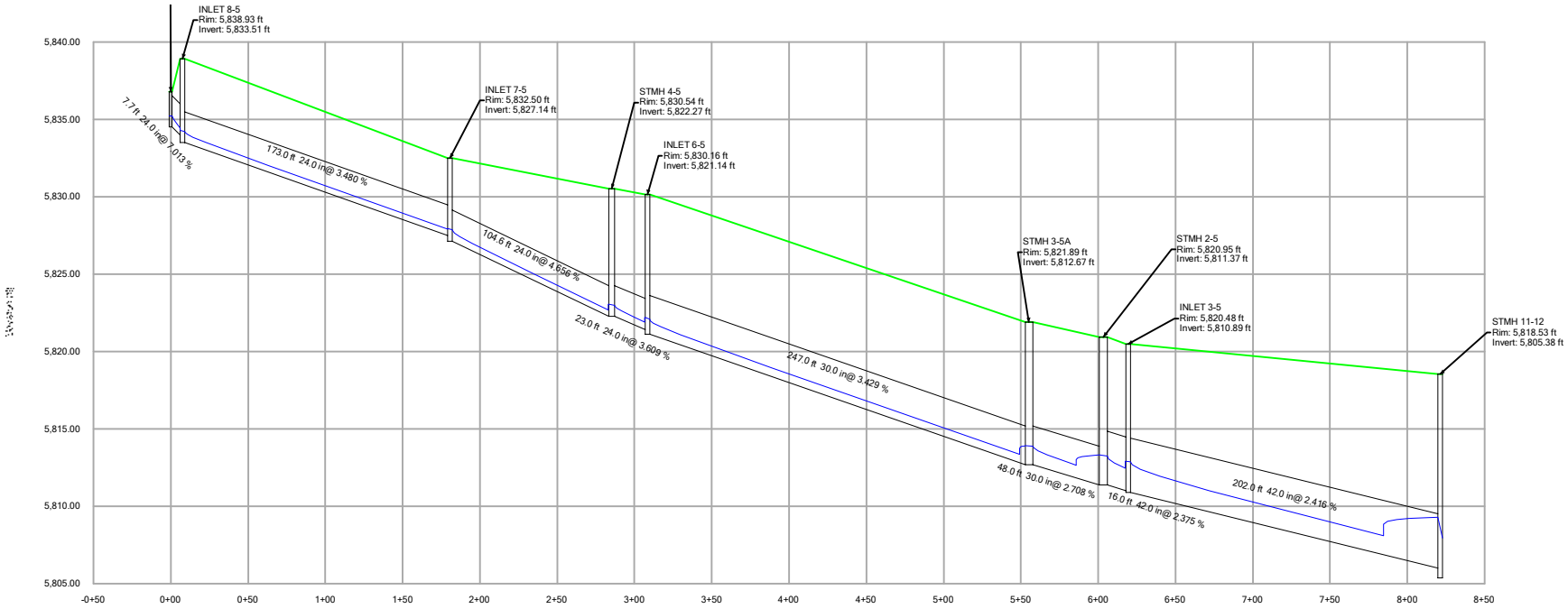
Profile Report

Engineering Profile - Profile - Storm Line 04B (Compark Village South StormCAD [2 year].stsw)



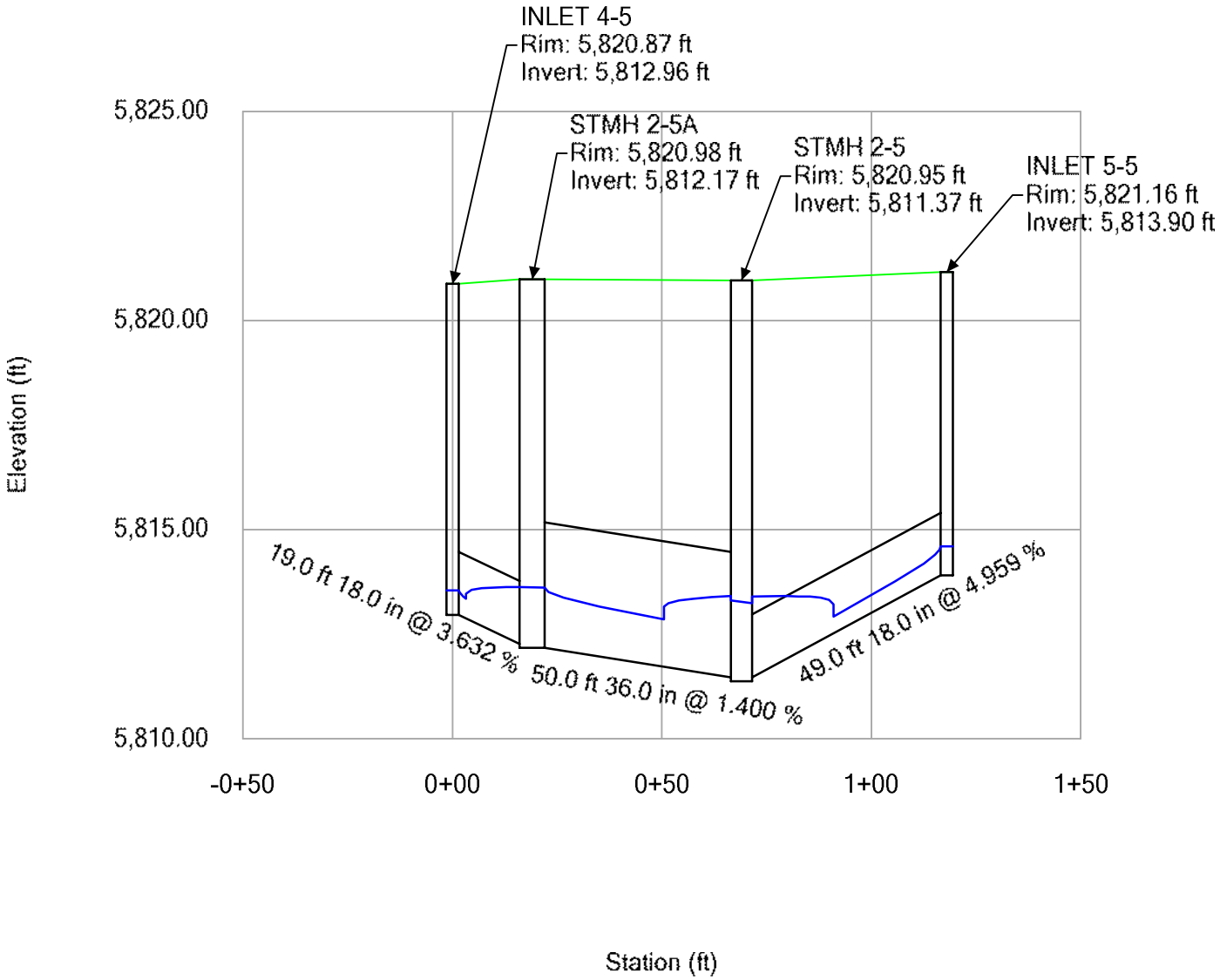
Profile Report

Engineering Profile - Profile - Storm Line 05 (Compark Village South StormCAD [2 year].stsw)

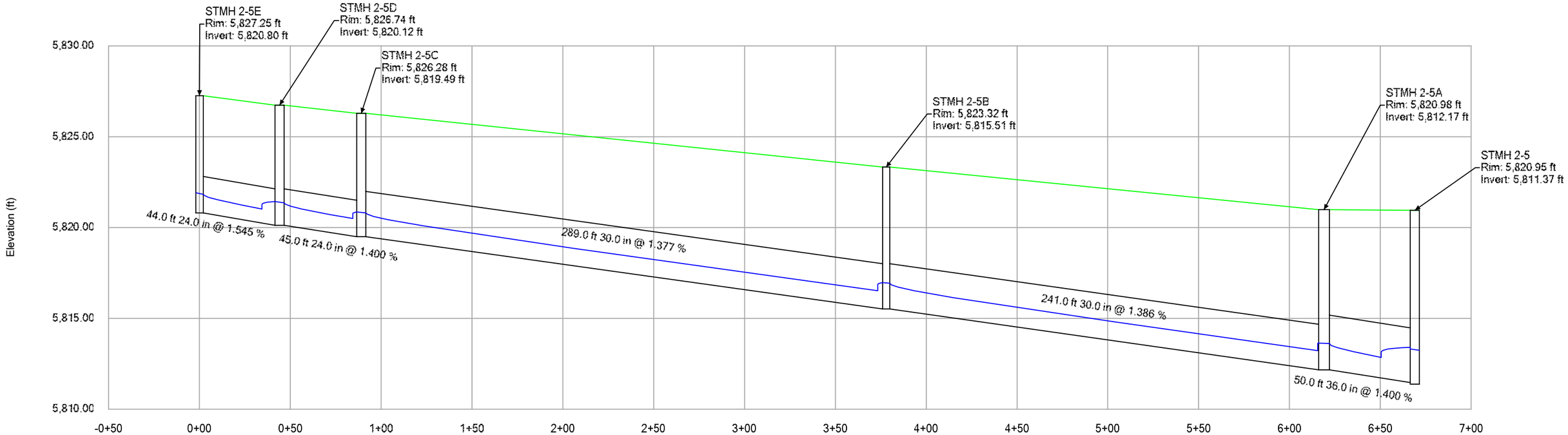


Profile Report

Engineering Profile - Profile - Storm Line 05B (Compark Village South StormCAD [2 year].stsw)

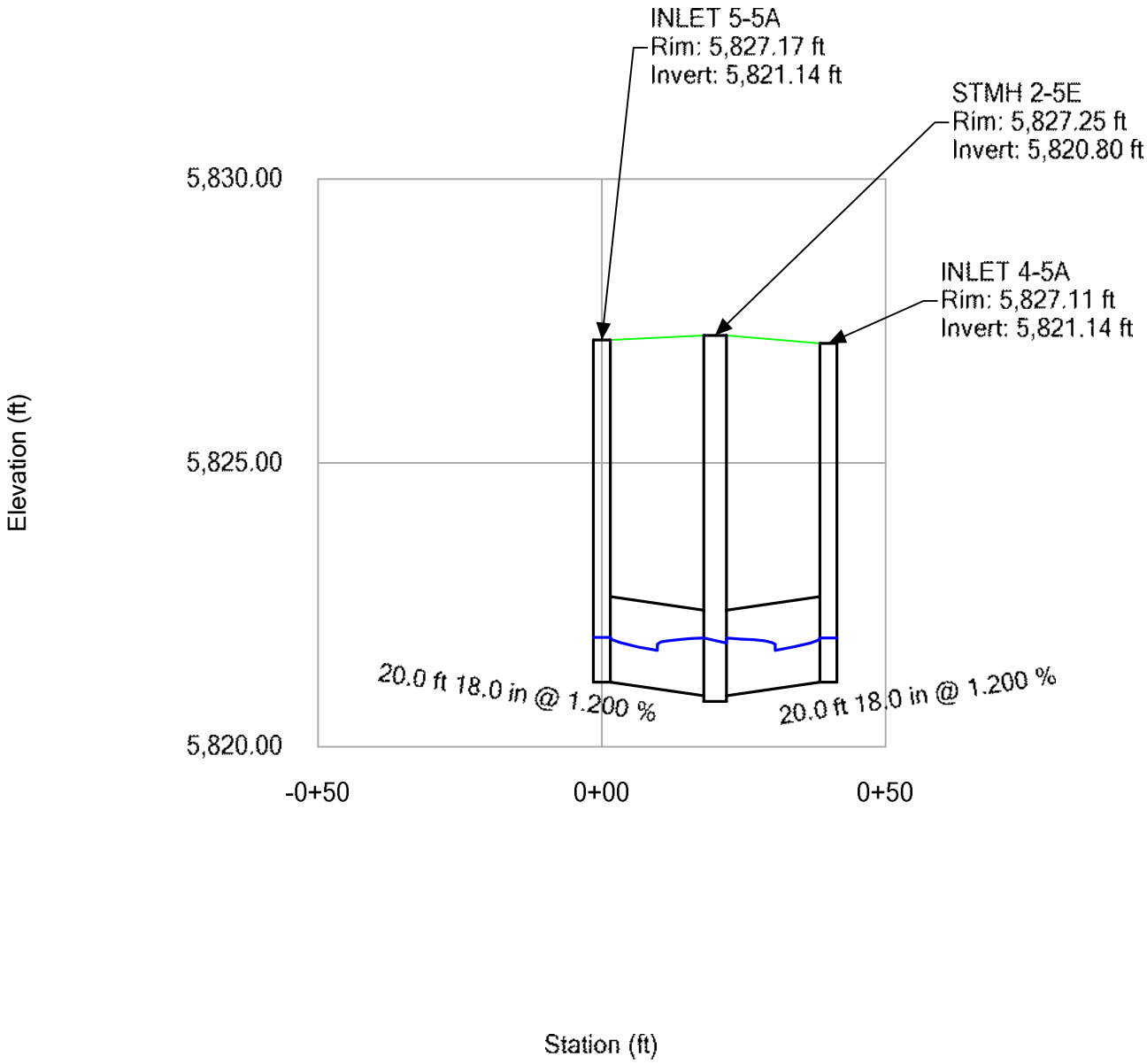


Profile Report
Engineering Profile - Profile - Storm Line 05C (Compark Village South StormCAD [2 year].stsw)



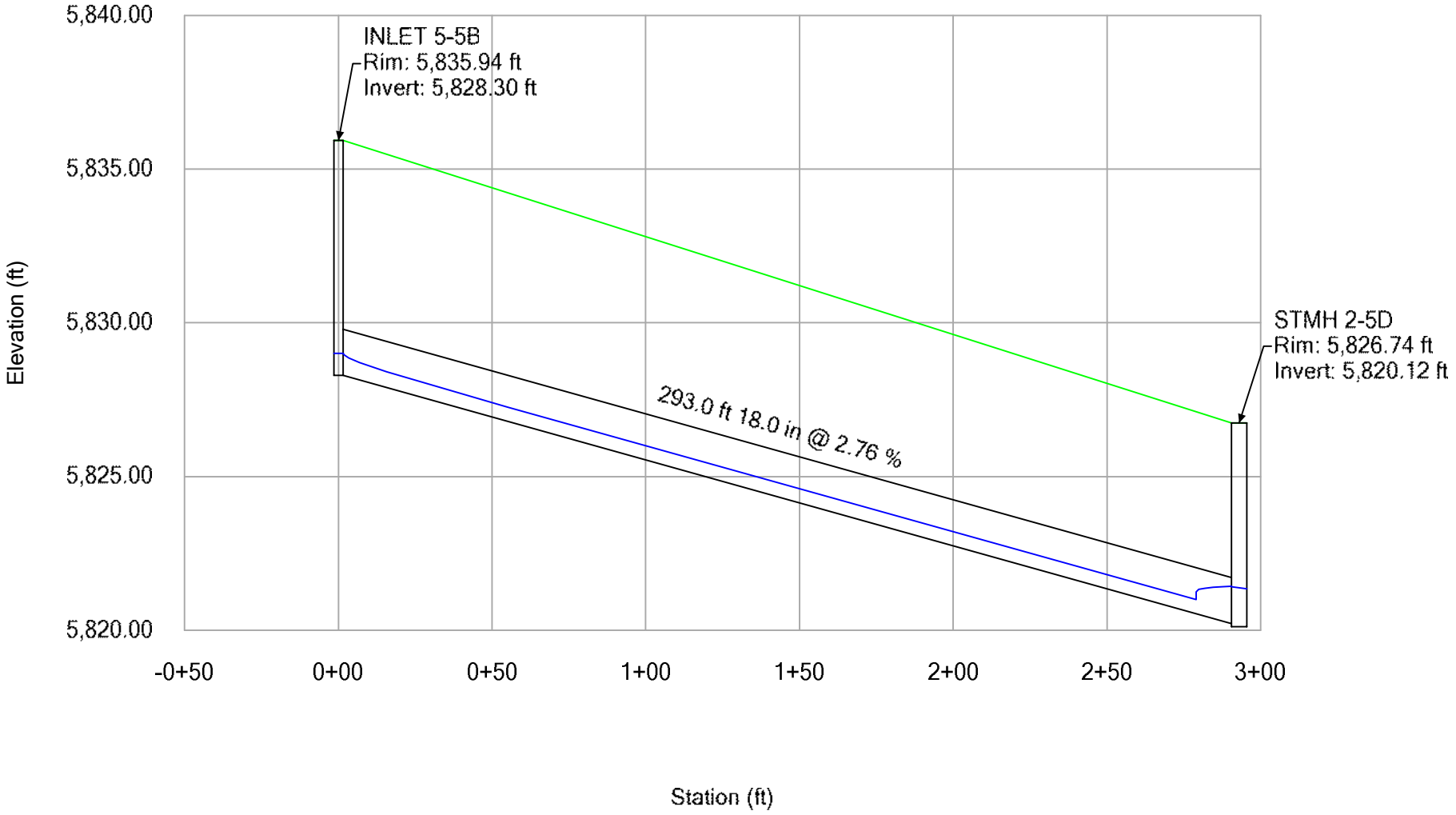
Profile Report

Engineering Profile - Profile - Storm Line 05D (Compark Village South StormCAD [2 year].stsw)



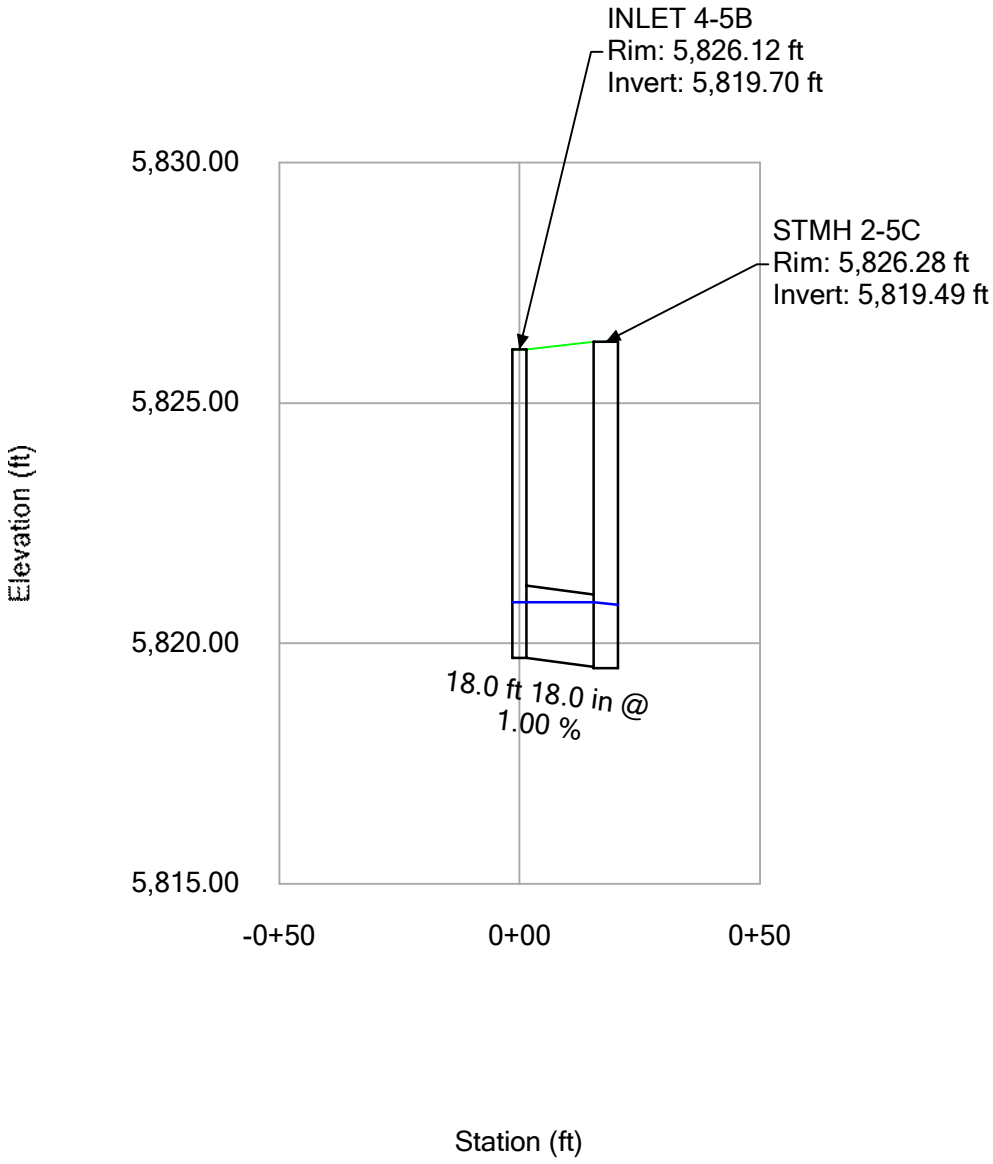
Profile Report

Engineering Profile - Profile - Storm Line 05E (Compark Village South StormCAD [2 year].stsw)



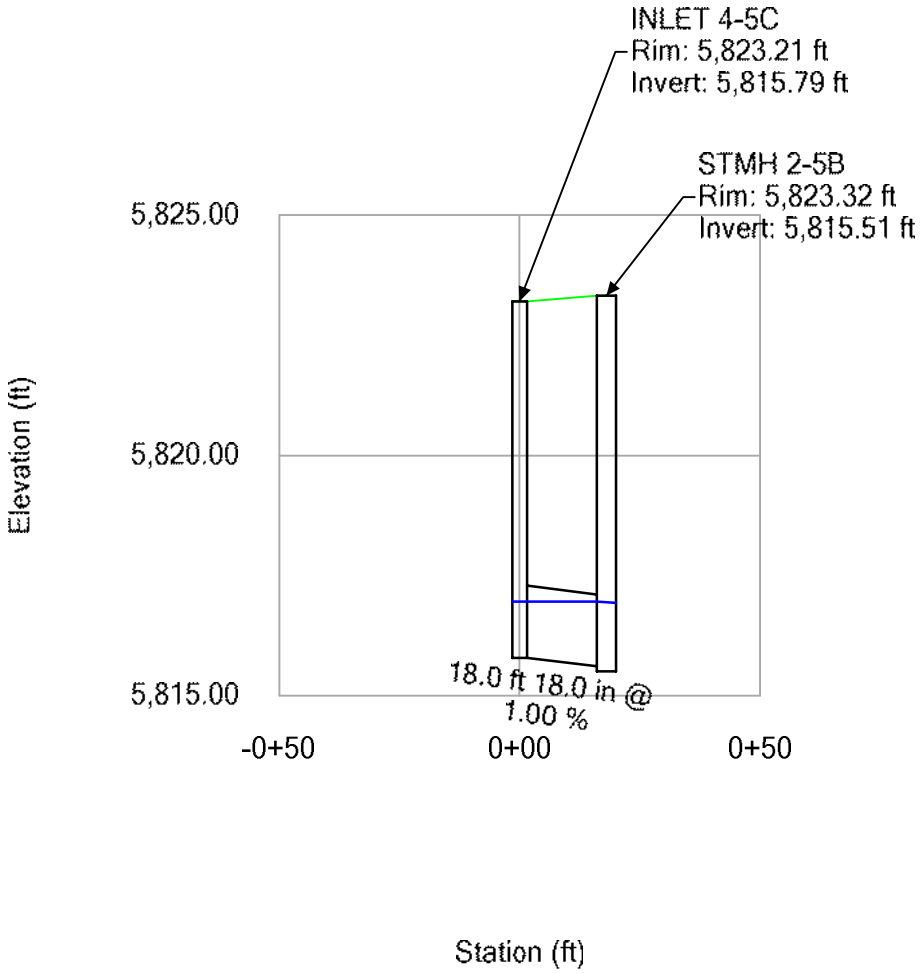
Profile Report

Engineering Profile - Profile - Storm Line 05F (Compark Village South StormCAD [2 year].stsw)



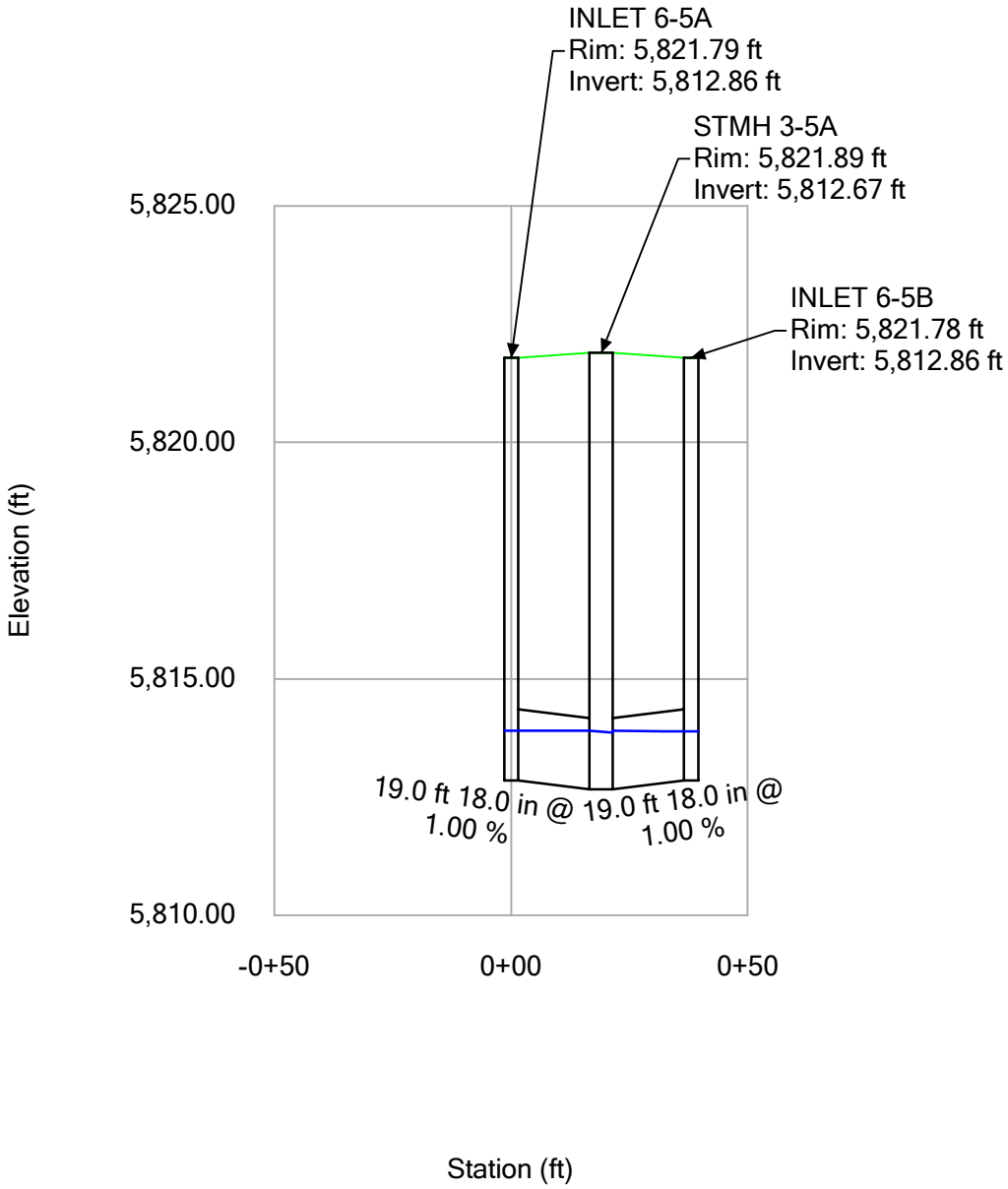
Profile Report

Engineering Profile - Profile - Storm Line 05G (Compark Village South StormCAD [2 year].stsw)



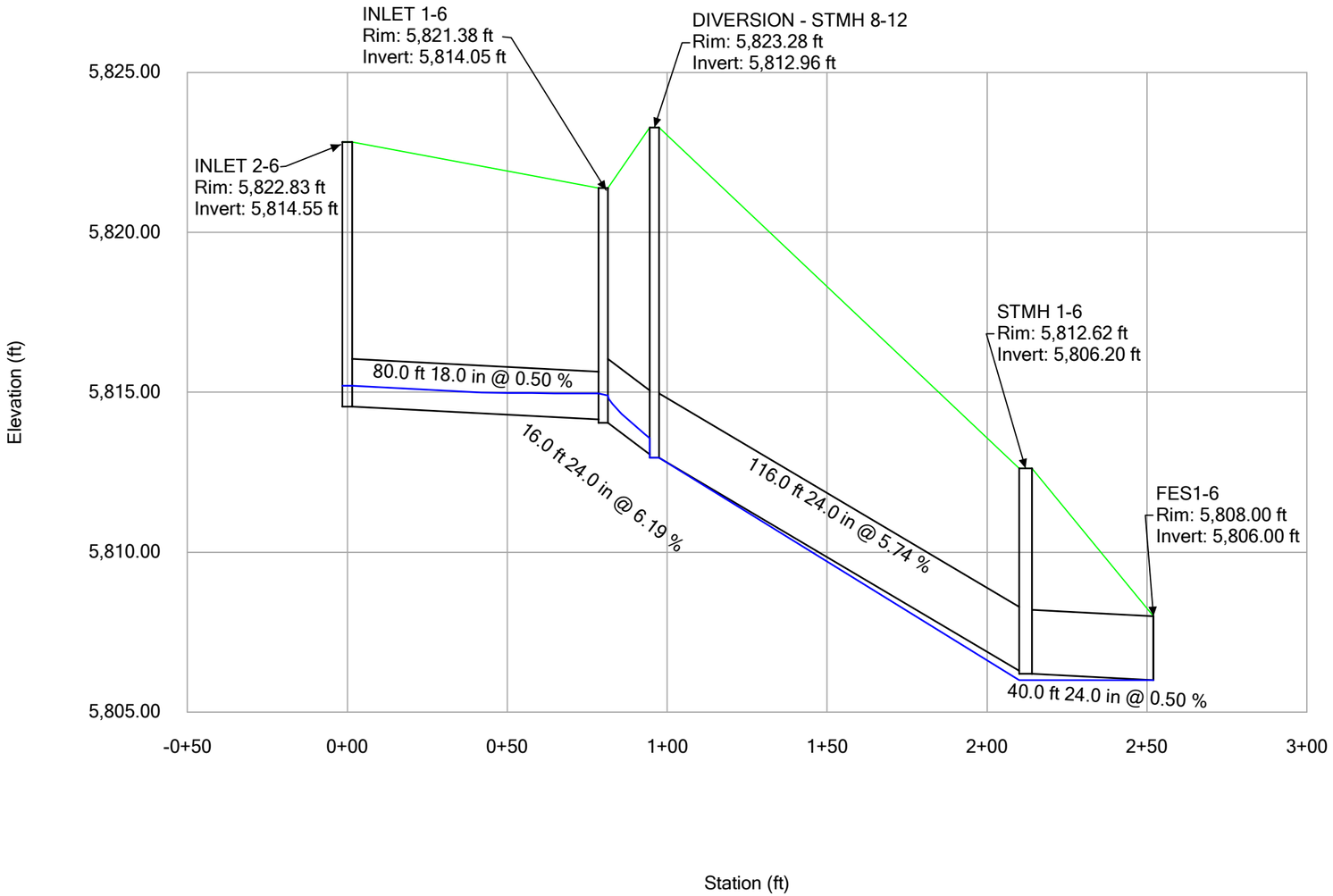
Profile Report

Engineering Profile - Profile - Storm Line 05H (Compark Village South StormCAD [2 year].stsw)

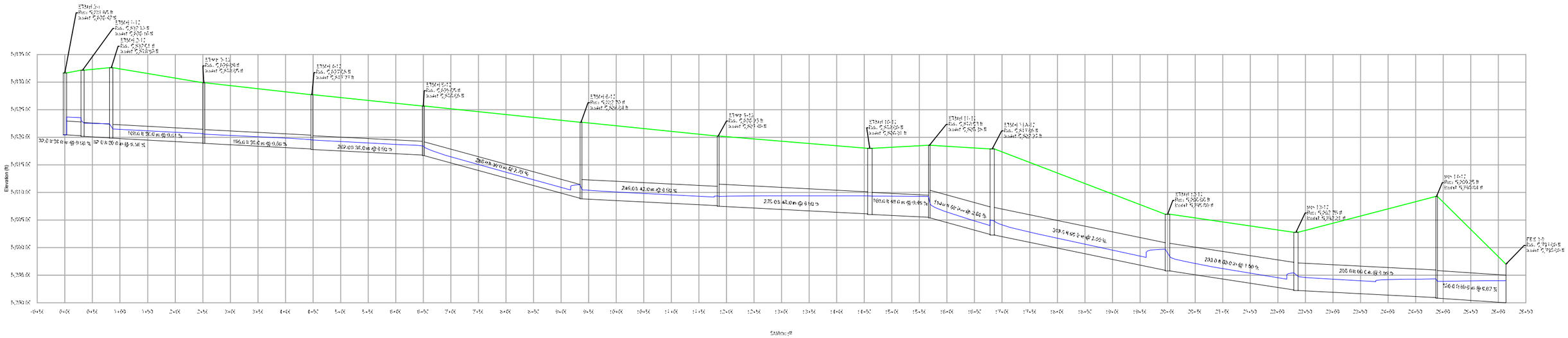


Profile Report

Engineering Profile - Profile - Storm Line 06 (Compark Village South StormCAD [2 year].stsw)

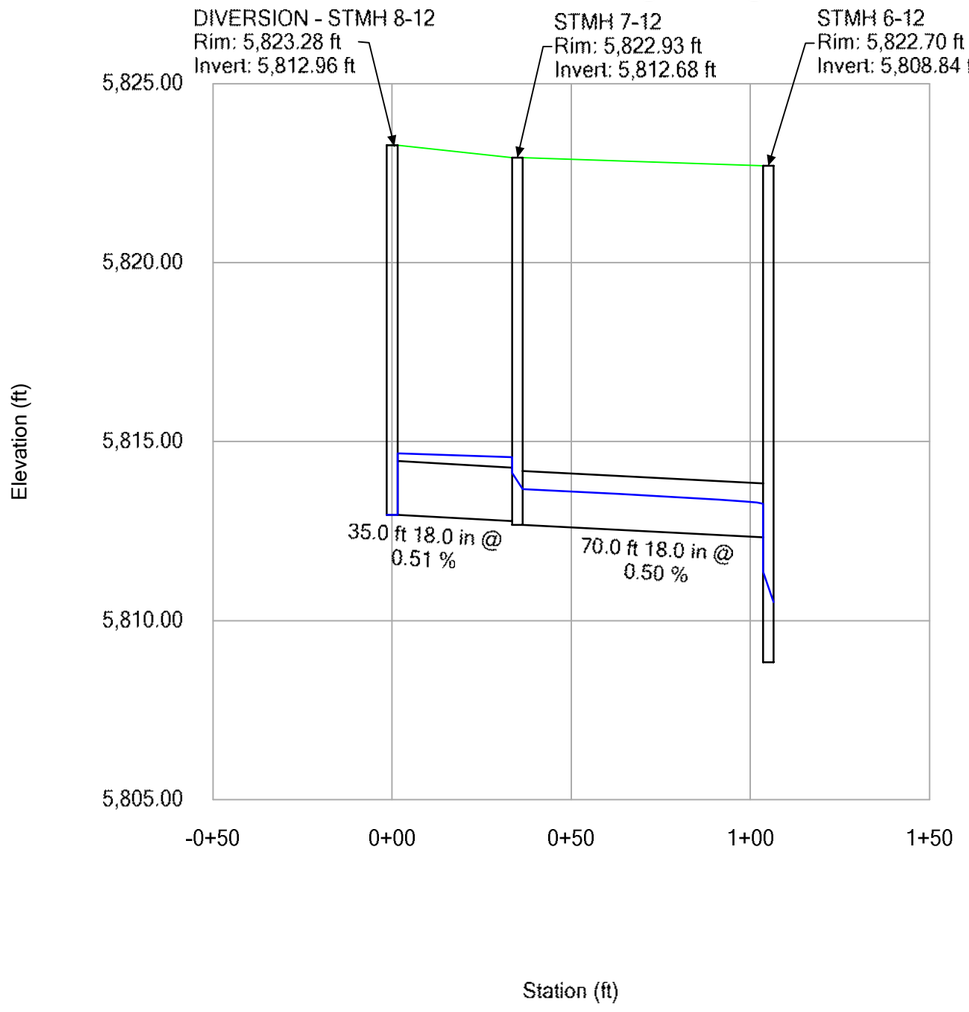


Profile Report
Engineering Profile - Profile - Storm Line 12 (Compark Village South StormCAD [2 year].stsw)



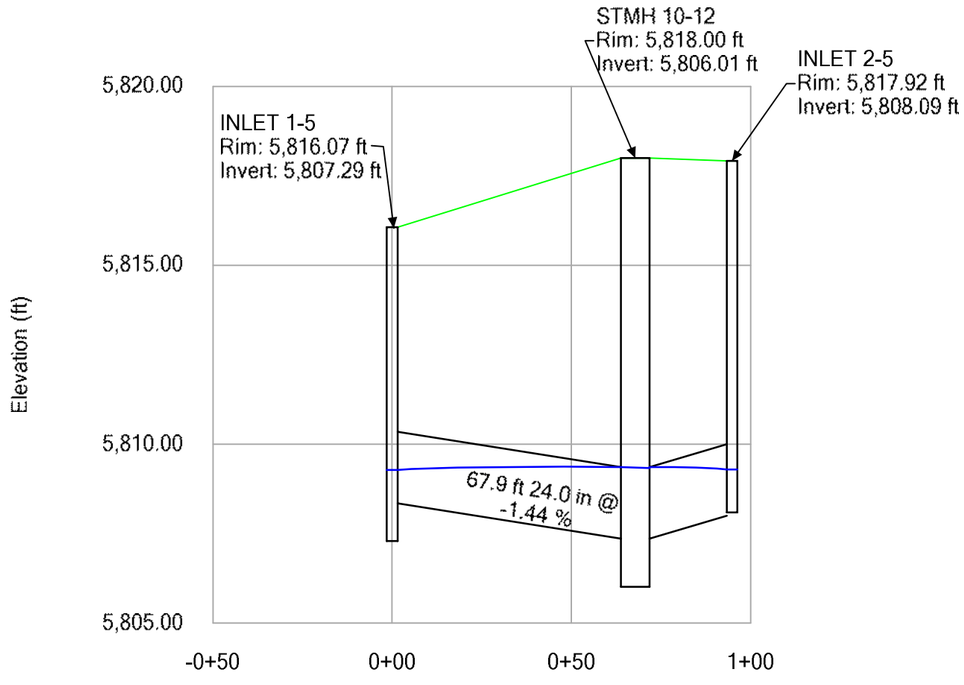
Profile Report

Engineering Profile - Profile - Storm Line 12A (Compark Village South StormCAD [2 year].stsw)



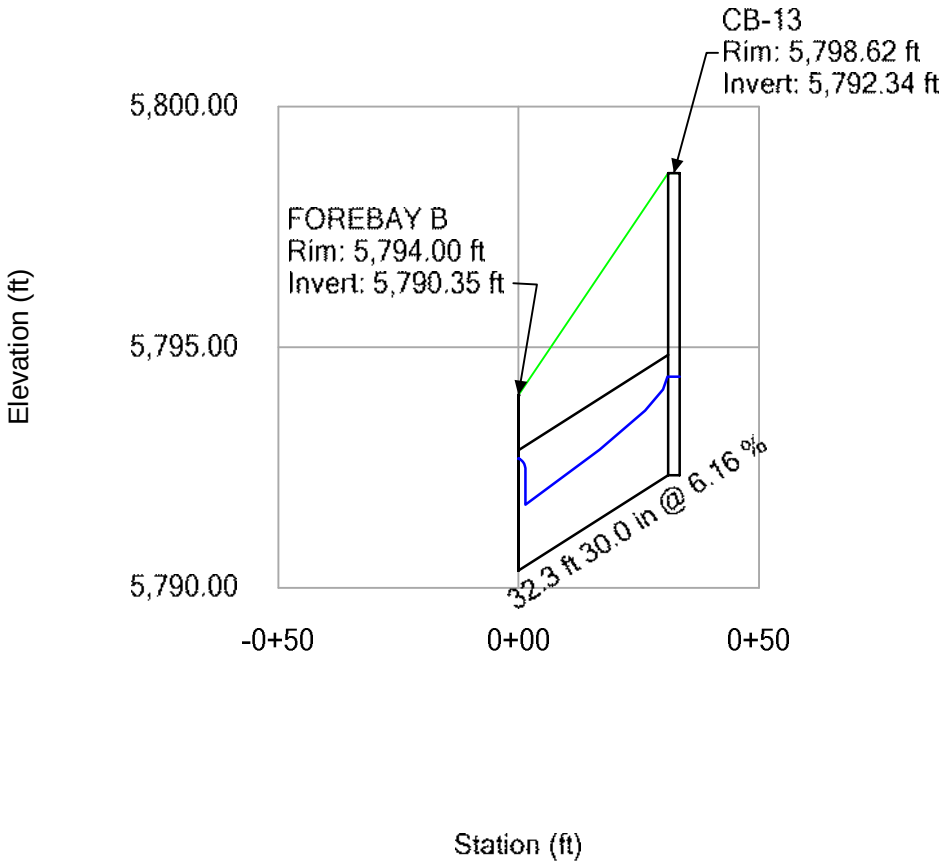
Profile Report

Engineering Profile - Profile - Storm Line 12B (Compark Village South StormCAD [2 year].stsw)



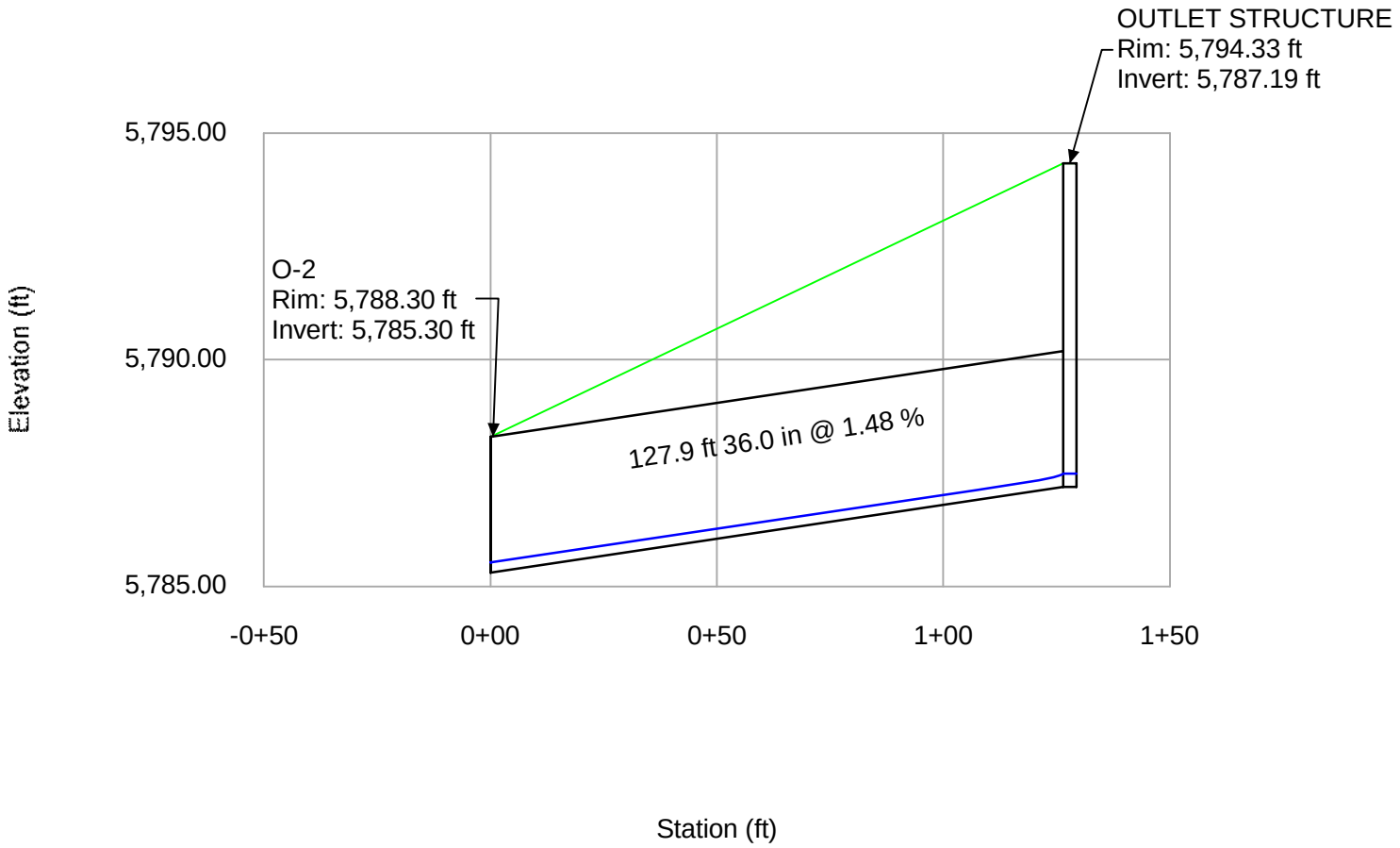
Profile Report

Engineering Profile - Profile - inlet to pond (Compark Village South StormCAD [2 year].stsw)



Profile Report

Engineering Profile - Profile - OUTLET (Compark Village South StormCAD [2 year].stsw)



COMPARK VILLAGE SOUTH - 5 YR STORM

FlexTable: Conduit Table

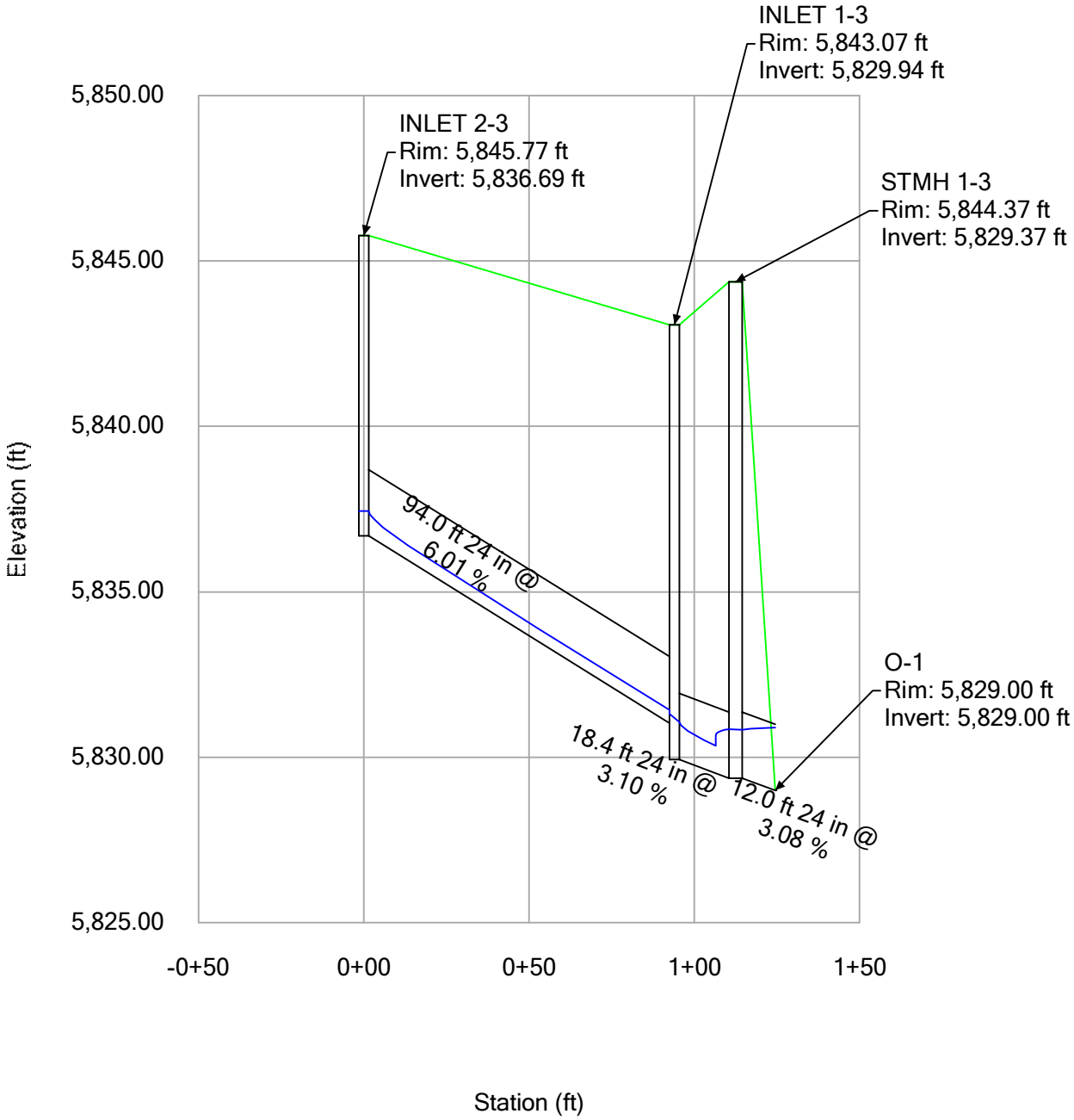
Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
STMH 6-4	5,834.91	INLET 6-4	5,832.53	120.0	1.98	Circle	36	0.013	8.50	8.25	5,835.83	5,833.14
INLET 6-4	5,832.33	STMH 5-4	5,827.71	278.0	1.66	Circle	36	0.013	9.60	8.03	5,833.31	5,828.39
FES 2-5	5,834.54	INLET 8-5	5,834.00	7.7	7.01	Circle	24	0.013	4.10	10.91	5,835.25	5,834.45
INLET 5-4	5,829.34	STMH 5-4	5,828.83	52.0	0.99	Circle	18	0.013	3.60	5.37	5,830.07	5,829.44
INLET 3-4	5,825.42	STMH 4-4	5,825.23	20.0	0.95	Circle	18	0.013	4.00	5.44	5,826.19	5,825.89
INLET 1-4	5,823.04	STMH 2-4	5,821.92	65.0	1.72	Circle	18	0.013	2.40	5.86	5,823.63	5,822.34
INLET 4-4	5,825.42	STMH 4-4	5,825.23	20.0	0.95	Circle	18	0.013	0.90	3.57	5,825.77	5,825.53
INLET 2-6	5,814.55	INLET 1-6	5,814.15	80.0	0.50	Circle	18	0.013	3.00	3.98	5,815.21	5,814.96
INLET 2-3	5,836.69	INLET 1-3	5,831.04	94.0	6.01	Circle	24	0.013	4.50	10.62	5,837.44	5,831.43
FES 2-4	5,842.00	STMH 6-4	5,835.11	221.0	3.12	Circle	36	0.013	8.50	9.68	5,842.92	5,835.66
STMH 5-4	5,827.41	STMH 4-4	5,822.96	163.0	2.73	Circle	36	0.013	14.30	10.75	5,828.61	5,823.69
INLET 4-5	5,812.96	STMH 2-5A	5,812.27	19.0	3.63	Circle	18	0.013	2.50	7.73	5,813.56	5,813.65
INLET 5-5	5,813.90	STMH 2-5	5,811.47	49.0	4.96	Circle	18	0.013	3.40	9.43	5,814.60	5,813.44
STMH 4-4	5,822.16	STMH 3-4	5,821.56	79.0	0.76	Circle	36	0.013	19.20	7.38	5,823.56	5,823.01
STMH 3-4	5,821.46	STMH 2-4	5,820.65	76.0	1.07	Circle	36	0.013	21.80	8.64	5,822.96	5,821.84
INLET 2-4	5,822.07	STMH 3-4	5,821.56	56.0	0.91	Circle	18	0.013	2.60	4.76	5,822.98	5,822.99
STMH 1-6	5,806.20	FES1-6	5,806.00	40.0	0.50	Circle	24	0.013	0.20	1.75	5,806.50	5,806.50
INLET 8-5	5,833.51	INLET 7-5	5,827.49	173.0	3.48	Circle	24	0.013	4.10	8.52	5,834.22	5,827.91
INLET 4-5A	5,821.14	STMH 2-5E	5,820.90	20.0	1.20	Circle	18	0.013	4.30	6.04	5,821.94	5,821.93
INLET 5-5A	5,821.14	STMH 2-5E	5,820.90	20.0	1.20	Circle	18	0.013	4.30	6.04	5,821.94	5,821.93
STMH 2-5	5,811.37	INLET 3-5	5,810.99	16.0	2.38	Circle	42	0.013	37.30	13.25	5,813.27	5,812.47
INLET 7-5	5,827.14	STMH 4-5	5,822.27	104.6	4.66	Circle	24	0.013	4.30	9.57	5,827.87	5,823.07
STMH 4-5	5,822.27	INLET 6-5	5,821.44	23.0	3.61	Circle	24	0.013	4.30	8.75	5,823.00	5,822.22
STMH 2-5A	5,812.17	STMH 2-5	5,811.47	50.0	1.40	Circle	36	0.013	20.60	9.39	5,813.63	5,813.44
STMH 2-5B	5,815.51	STMH 2-5A	5,812.17	241.0	1.39	Circle	30	0.013	18.10	9.13	5,816.95	5,813.67
STMH 2-4	5,820.42	STMH 1-4	5,818.85	60.0	2.61	Circle	36	0.013	0.60	4.09	5,820.65	5,819.01
STMH 1-4	5,818.23	FES 1-4	5,818.00	46.0	0.50	Circle	36	0.013	0.60	2.30	5,818.70	5,818.70
INLET 1-3	5,829.94	STMH 1-3	5,829.37	18.4	3.10	Circle	24	0.013	10.00	10.55	5,831.07	5,830.85
STMH 1-3	5,829.37	O-1	5,829.00	12.0	3.08	Circle	24	0.013	10.00	10.53	5,830.83	5,830.90
INLET 5-4A	5,829.26	STMH 5-4	5,828.83	43.0	1.00	Circle	18	0.013	1.10	3.85	5,829.65	5,829.16
STMH 2-5E	5,820.80	STMH 2-5D	5,820.12	44.0	1.55	Circle	24	0.013	8.60	7.86	5,821.85	5,821.44
STMH 2-5D	5,820.12	STMH 2-5C	5,819.49	45.0	1.40	Circle	24	0.013	12.10	8.31	5,821.37	5,820.88
STMH 2-5C	5,819.49	STMH 2-5B	5,815.51	289.0	1.38	Circle	30	0.013	15.60	8.75	5,820.82	5,816.99
INLET 4-5B	5,819.70	STMH 2-5C	5,819.52	18.0	1.00	Circle	18	0.013	3.50	5.35	5,820.87	5,820.87
INLET 5-5B	5,828.30	STMH 2-5D	5,820.22	293.0	2.76	Circle	18	0.013	3.50	7.71	5,829.01	5,821.44
INLET 4-5C	5,815.79	STMH 2-5B	5,815.61	18.0	1.00	Circle	18	0.013	2.50	4.88	5,816.99	5,816.98
INLET 6-5	5,821.14	STMH 3-5A	5,812.67	247.0	3.43	Circle	30	0.013	8.50	10.23	5,822.11	5,813.94
STMH 3-5A	5,812.67	STMH 2-5	5,811.37	48.0	2.71	Circle	30	0.013	13.30	10.69	5,813.90	5,813.34
INLET 6-5A	5,812.86	STMH 3-5A	5,812.67	19.0	1.00	Circle	18	0.013	2.70	4.98	5,813.93	5,813.93
INLET 6-5B	5,812.86	STMH 3-5A	5,812.67	19.0	1.00	Circle	18	0.013	2.10	4.64	5,813.92	5,813.93
STMH 1-12	5,820.16	STMH 2-12	5,819.90	52.0	0.50	Circle	30	0.013	23.60	6.58	5,822.55	5,822.40
STMH 2-12	5,819.80	STMH 3-12	5,818.95	168.0	0.51	Circle	30	0.013	23.60	6.62	5,821.51	5,820.65
STMH 3-12	5,818.85	STMH 4-12	5,817.87	196.0	0.50	Circle	30	0.013	23.60	6.58	5,820.56	5,819.57
STMH 4-12	5,817.77	STMH 5-12	5,816.76	202.0	0.50	Circle	30	0.013	23.60	6.58	5,819.48	5,818.41
STMH 5-12	5,816.66	STMH 6-12	5,808.94	286.0	2.70	Circle	30	0.013	23.60	12.51	5,818.31	5,811.37
STMH 6-12	5,808.84	STMH 9-12	5,807.59	249.0	0.50	Circle	42	0.013	29.40	7.05	5,810.51	5,809.72
INLET 2-5	5,808.58	STMH 10-12	5,808.11	24.0	1.96	Circle	24	0.013	8.20	8.46	5,809.60	5,809.68
STMH 10-12	5,806.11	INLET 1-5	5,808.34	66.0	-3.38	Circle	24	0.013	5.10	8.98	5,809.68	5,809.68
STMH 9-12	5,807.49	STMH 10-12	5,806.11	275.0	0.50	Circle	48	0.013	29.40	7.01	5,809.68	5,809.68

FlexTable: Conduit Table

Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
STMH 10-12	5,806.01	STMH 11-12	5,805.48	108.0	0.49	Circle	48	0.013	42.70	7.68	5,809.39	5,809.34
STMH 7-12	5,812.68	STMH 6-12	5,812.33	71.0	0.49	Circle	18	0.013	5.80	4.62	5,813.68	5,813.26
STMH 12-12	5,795.80	STMH 13-12	5,792.31	233.0	1.50	Circle	60	0.013	85.11	13.74	5,798.42	5,794.96
STMH 14-12	5,790.84	FES 1-5	5,790.00	126.0	0.67	Circle	60	0.013	85.11	10.23	5,793.46	5,793.65
STMH 13-12	5,792.21	STMH 14-12	5,790.94	255.0	0.50	Circle	60	0.013	85.11	9.18	5,794.83	5,793.59
STMH 2-4	5,820.42	STMH 1-12	5,820.26	32.0	0.50	Circle	30	0.013	23.60	0.00	5,823.64	5,823.53
INLET 1-6	5,814.05	DIVERSION - STMH 8-12	5,813.06	16.0	6.19	Circle	24	0.013	6.00	11.67	5,814.92	5,813.58
DIVERSION - STMH 8-12	5,812.96	STMH 1-6	5,806.30	116.0	5.74	Circle	24	0.013	0.20	4.10	5,813.11	5,806.50
DIVERSION - STMH 8-12	5,812.96	STMH 7-12	5,812.78	35.0	0.51	Circle	18	0.013	5.80	0.00	5,814.67	5,814.56
STMH 11-12	5,805.38	STMH 11A-12	5,802.37	117.0	2.57	Circle	60	0.013	84.10	16.64	5,807.98	5,805.00
STMH 11A-12	5,802.27	STMH 12-12	5,795.90	318.0	2.00	Circle	60	0.013	84.10	15.21	5,804.87	5,799.79
INLET 3-5	5,810.89	MH-1-5A	5,808.93	105.5	1.86	Circle	48	0.013	41.40	12.36	5,812.81	5,810.24
MH-1-5A	5,808.83	STMH 11-12	5,805.47	95.1	3.53	Circle	48	0.013	41.40	15.55	5,810.75	5,809.34

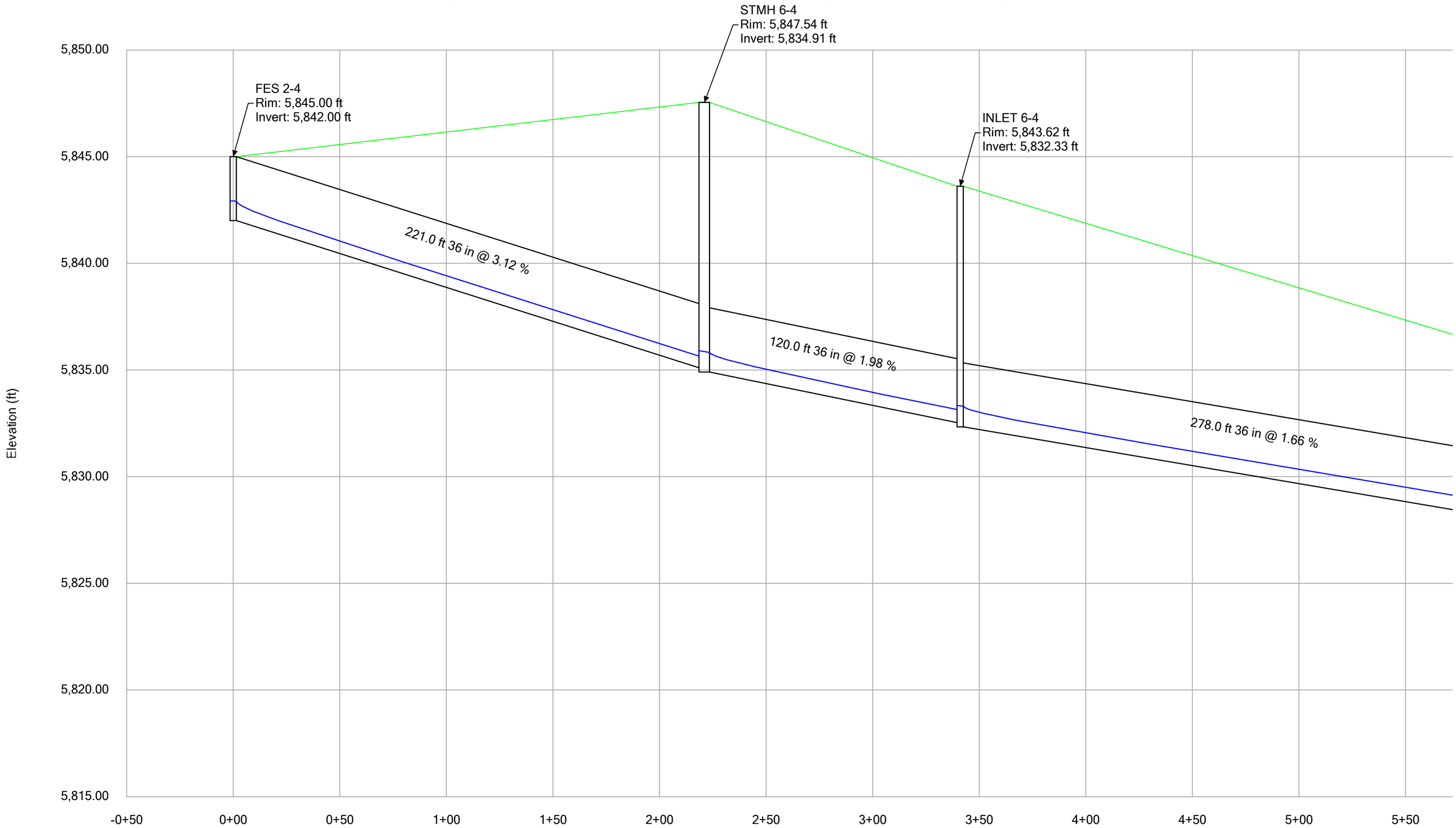
Profile Report

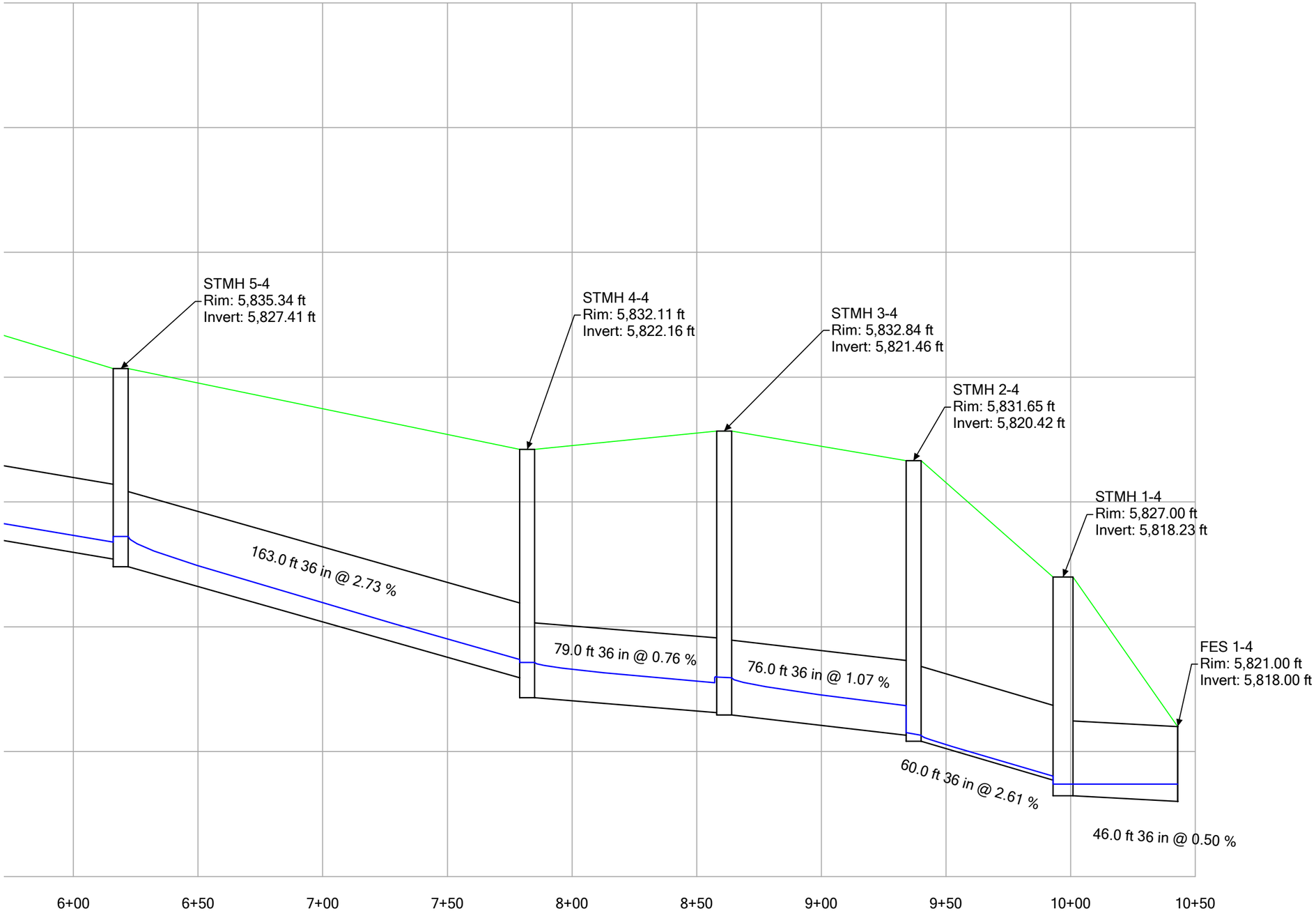
Engineering Profile - Profile - Storm Line 03 (Compark Village South StormCAD [5 year].stsw)



Profile Report

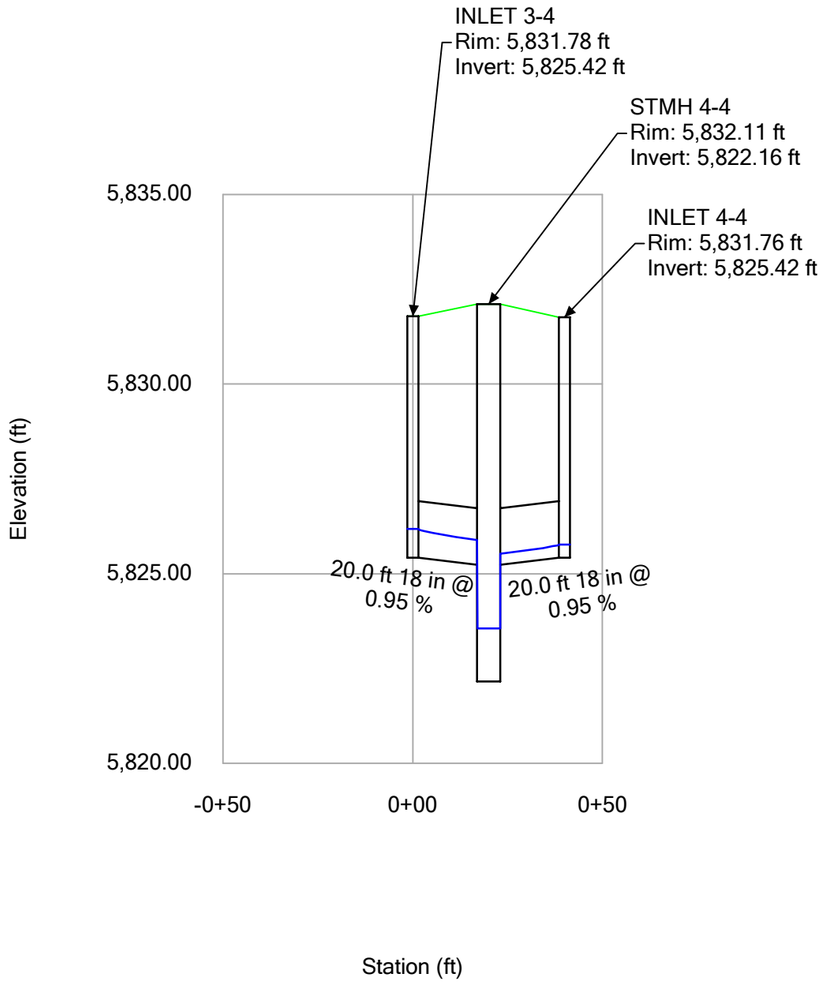
Engineering Profile - Profile - Storm Line 04 (Compark Village South StormCAD [5 year].stsw)




STMH 5-4
Rim: 5,835.34 ft
Invert: 5,827.41 ft
STMH 4-4
Rim: 5,832.11 ft
Invert: 5,822.16 ft
STMH 3-4
Rim: 5,832.84 ft
Invert: 5,821.46 ft
STMH 2-4
Rim: 5,831.65 ft
Invert: 5,820.42 ft
STMH 1-4
Rim: 5,827.00 ft
Invert: 5,818.23 ft
FES 1-4
Rim: 5,821.00 ft
Invert: 5,818.00 ft
163.0 ft 36 in @ 2.73 %
79.0 ft 36 in @ 0.76 %
76.0 ft 36 in @ 1.07 %
60.0 ft 36 in @ 2.61 %
46.0 ft 36 in @ 0.50 %
6+00
6+50
7+00
7+50
8+00
8+50
9+00
9+50
10+00
10+50

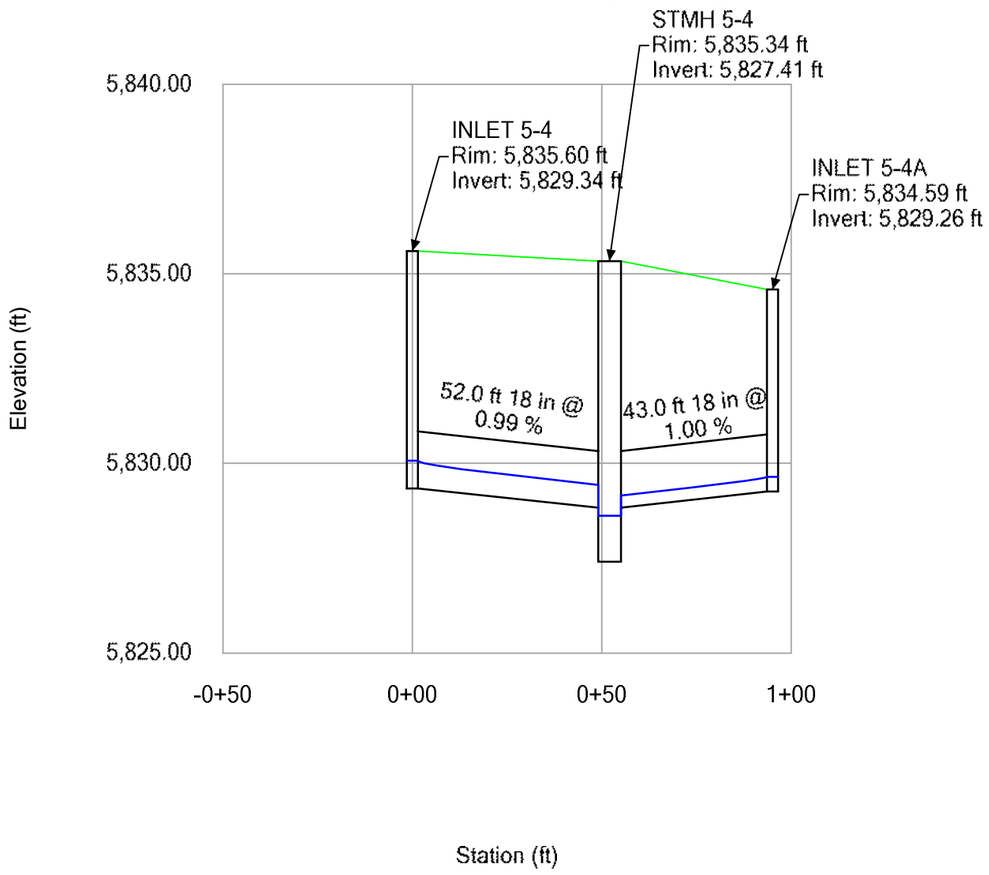
Profile Report

Engineering Profile - Profile - Storm Line 04A (Compark Village South StormCAD [5 year].stsw)



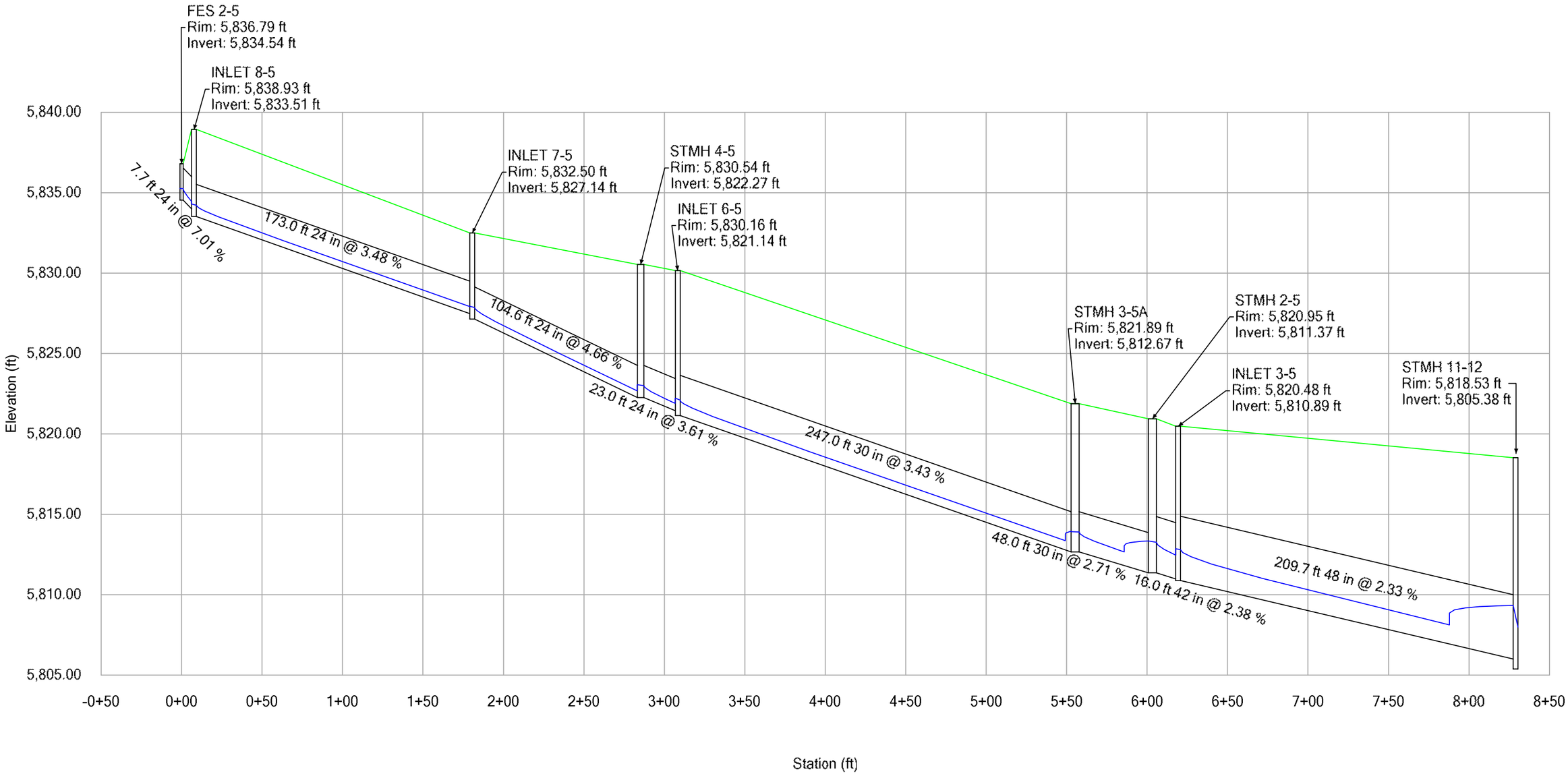
Profile Report

Engineering Profile - Profile - Storm Line 04B (Compark Village South StormCAD [5 year].stsw)



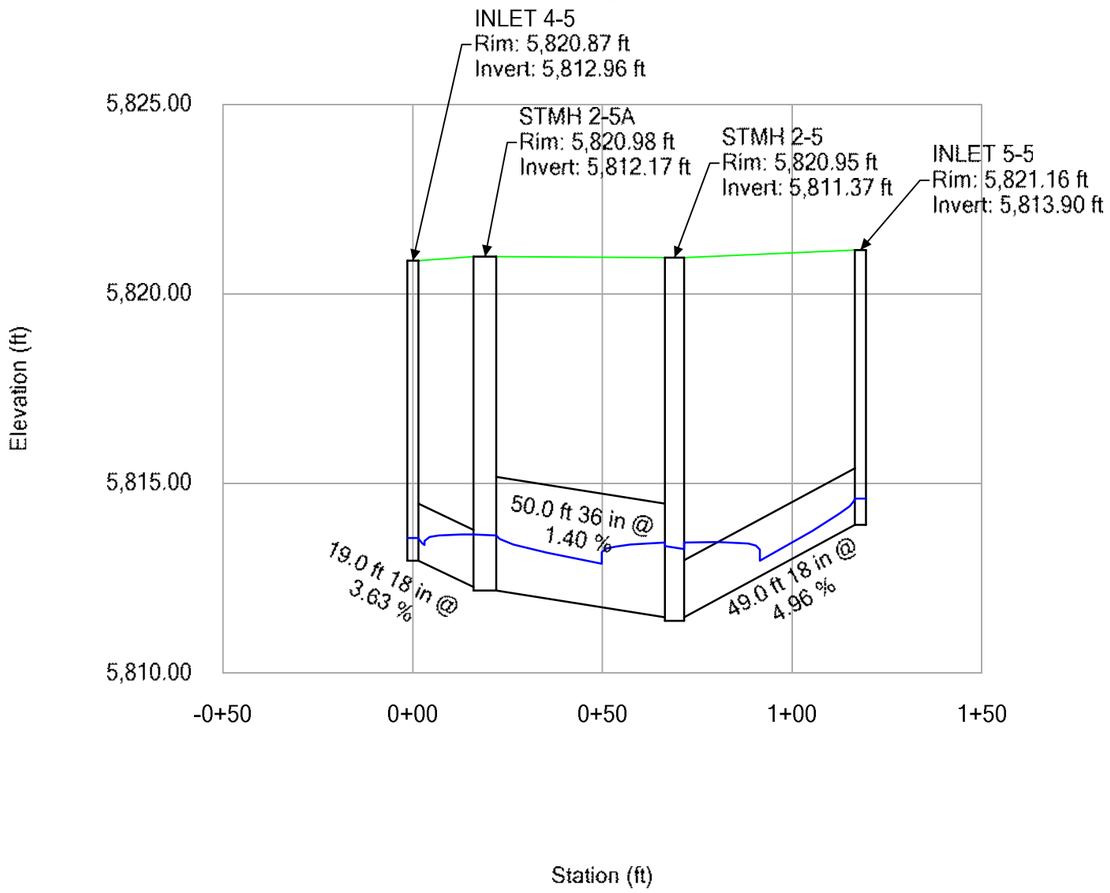
Profile Report

Engineering Profile - Profile - Storm Line 05 (Compark Village South StormCAD [5 year].stsw)



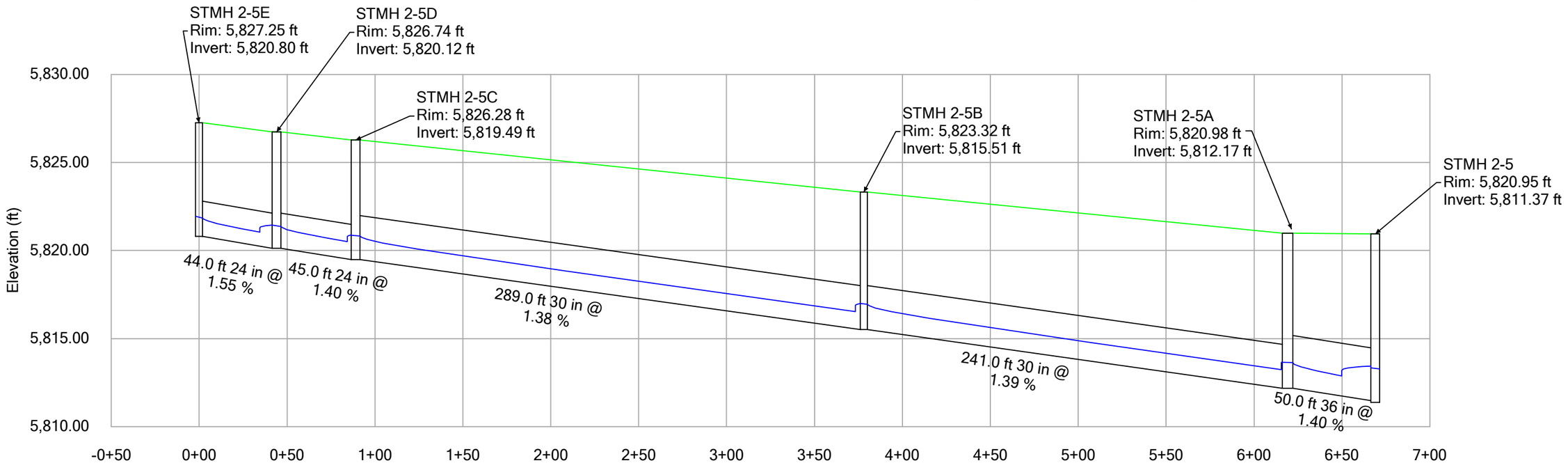
Profile Report

Engineering Profile - Profile - Storm Line 05B (Compark Village South StormCAD [5 year].stsw)



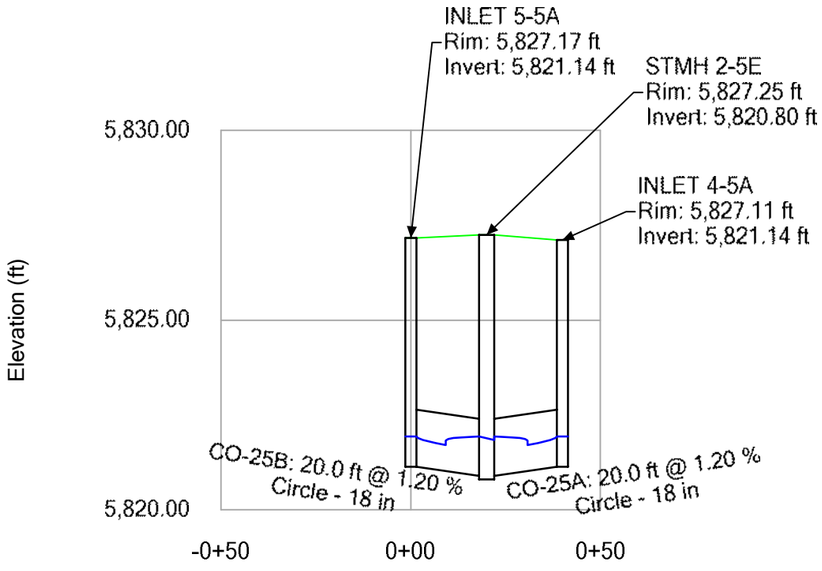
Profile Report

Engineering Profile - Profile - Storm Line 05C (Compark Village South StormCAD [5 year].stsw)



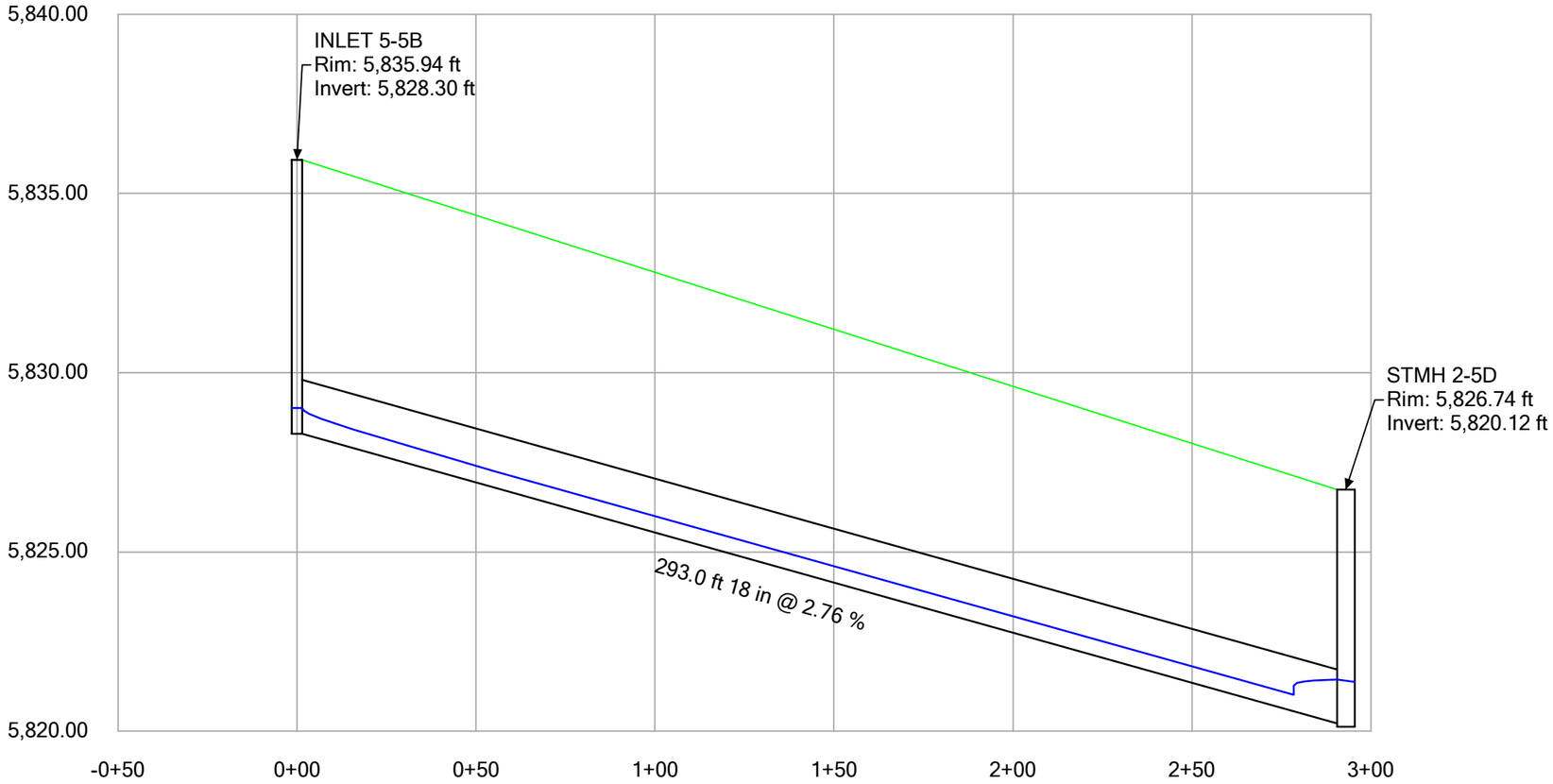
Profile Report

Engineering Profile - Profile - Storm Line 05D (Compark Village South StormCAD [5 year].stsw)



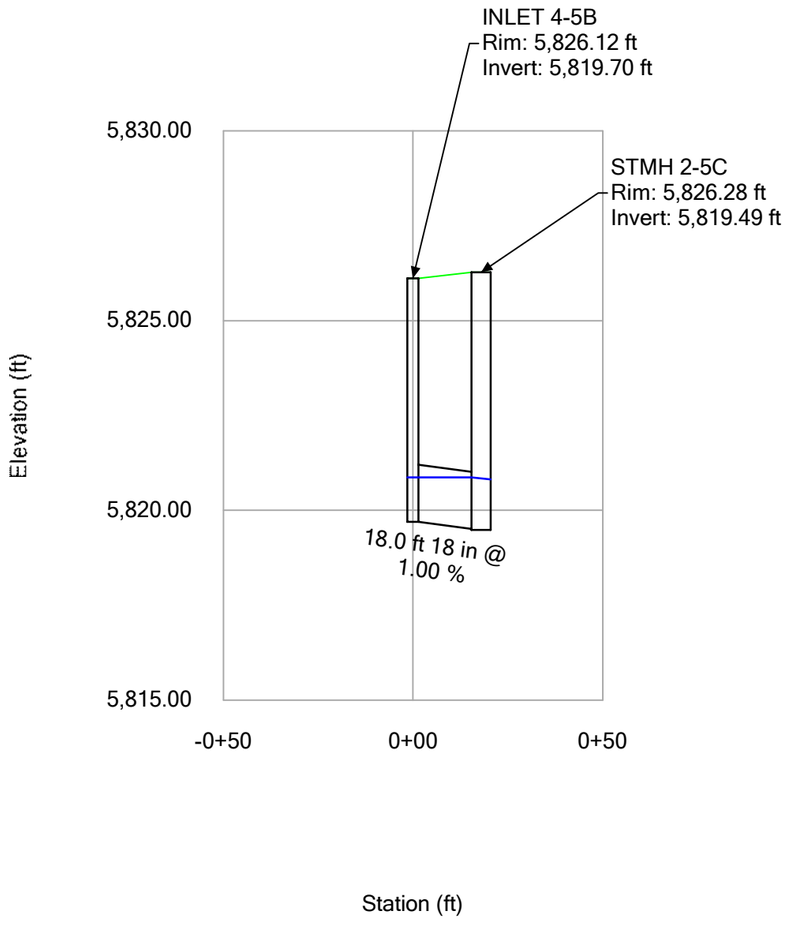
Profile Report

Engineering Profile - Profile - Storm Line 05E (Compark Village South StormCAD [5 year].stsw)



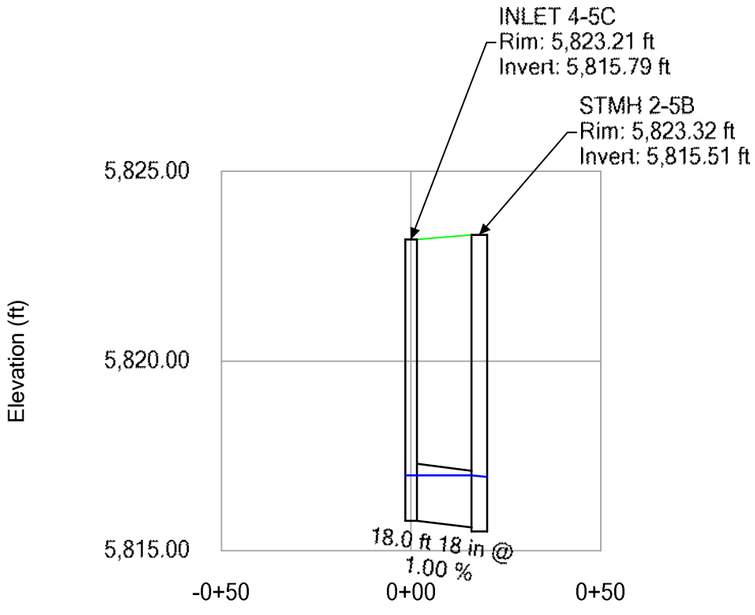
Profile Report

Engineering Profile - Profile - Storm Line 05F (Compark Village South StormCAD [5 year].stsw)



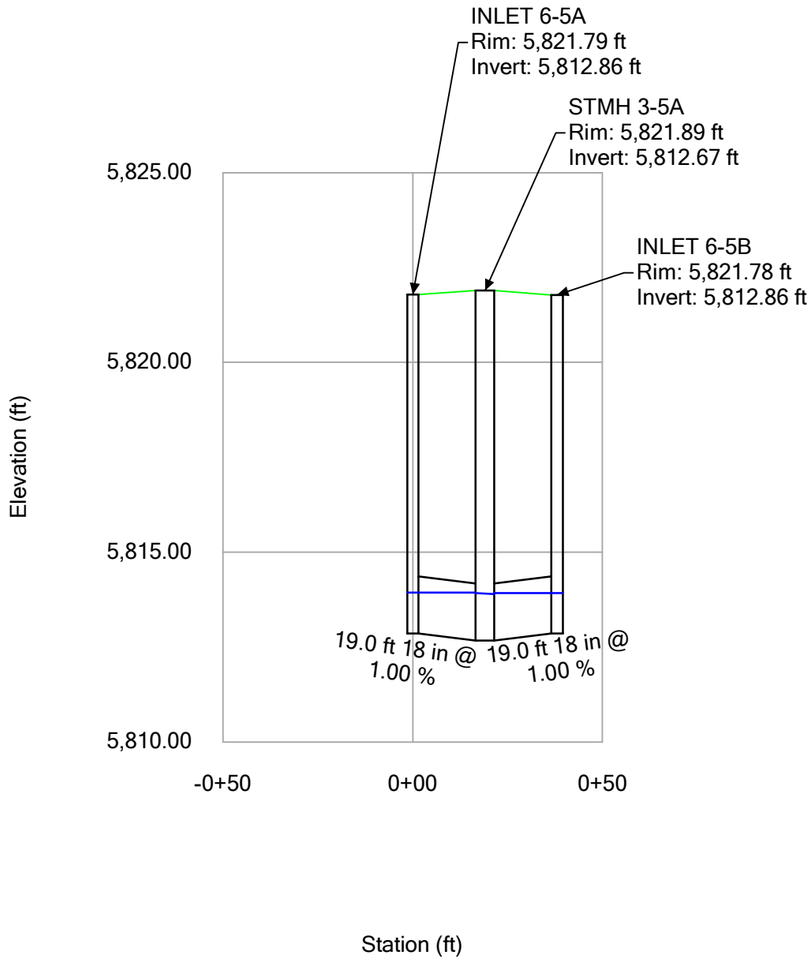
Profile Report

Engineering Profile - Profile - Storm Line 05G (Compark Village South StormCAD [5 year].stsw)



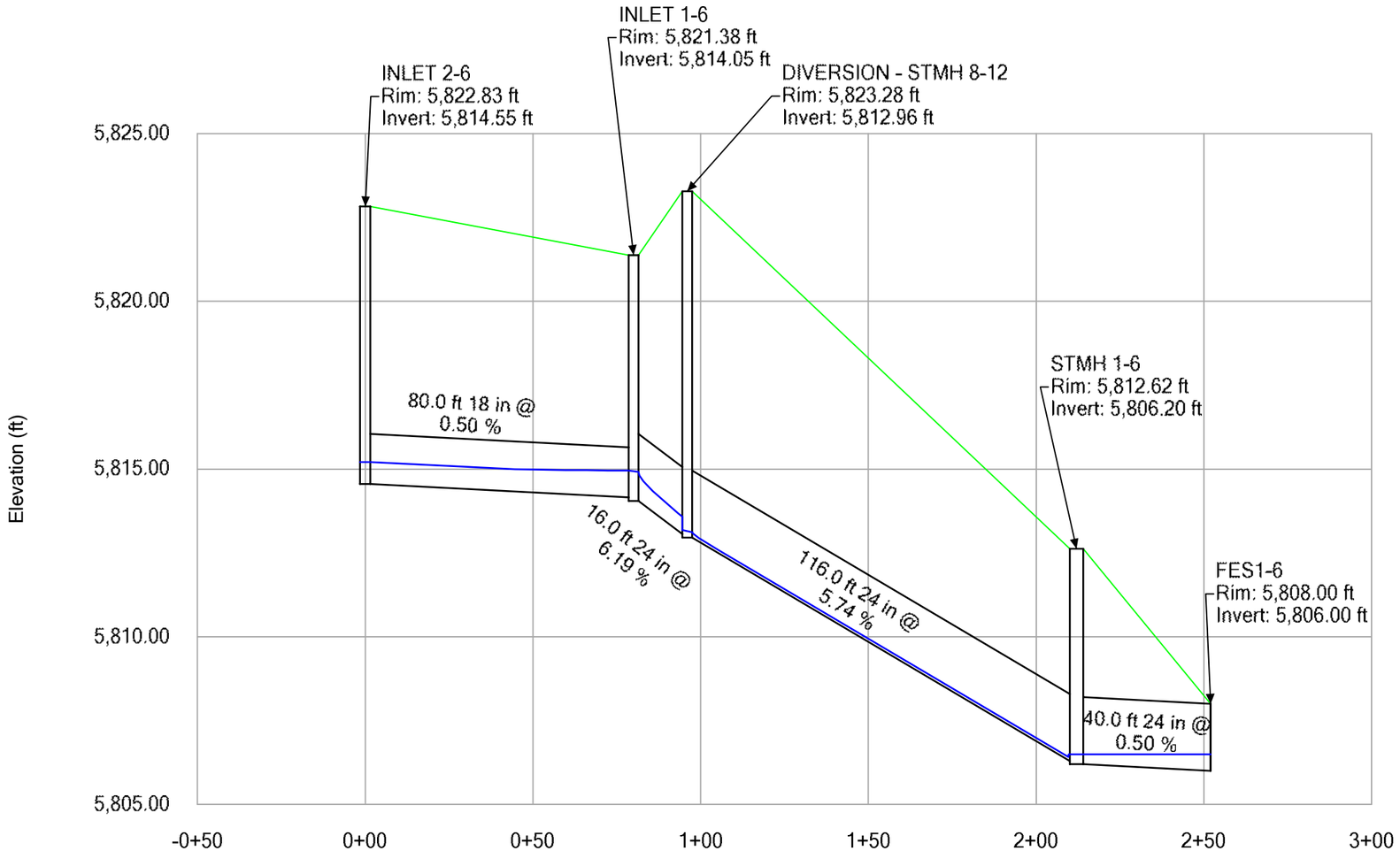
Profile Report

Engineering Profile - Profile - Storm Line 05H (Compark Village South StormCAD [5 year].stsw)



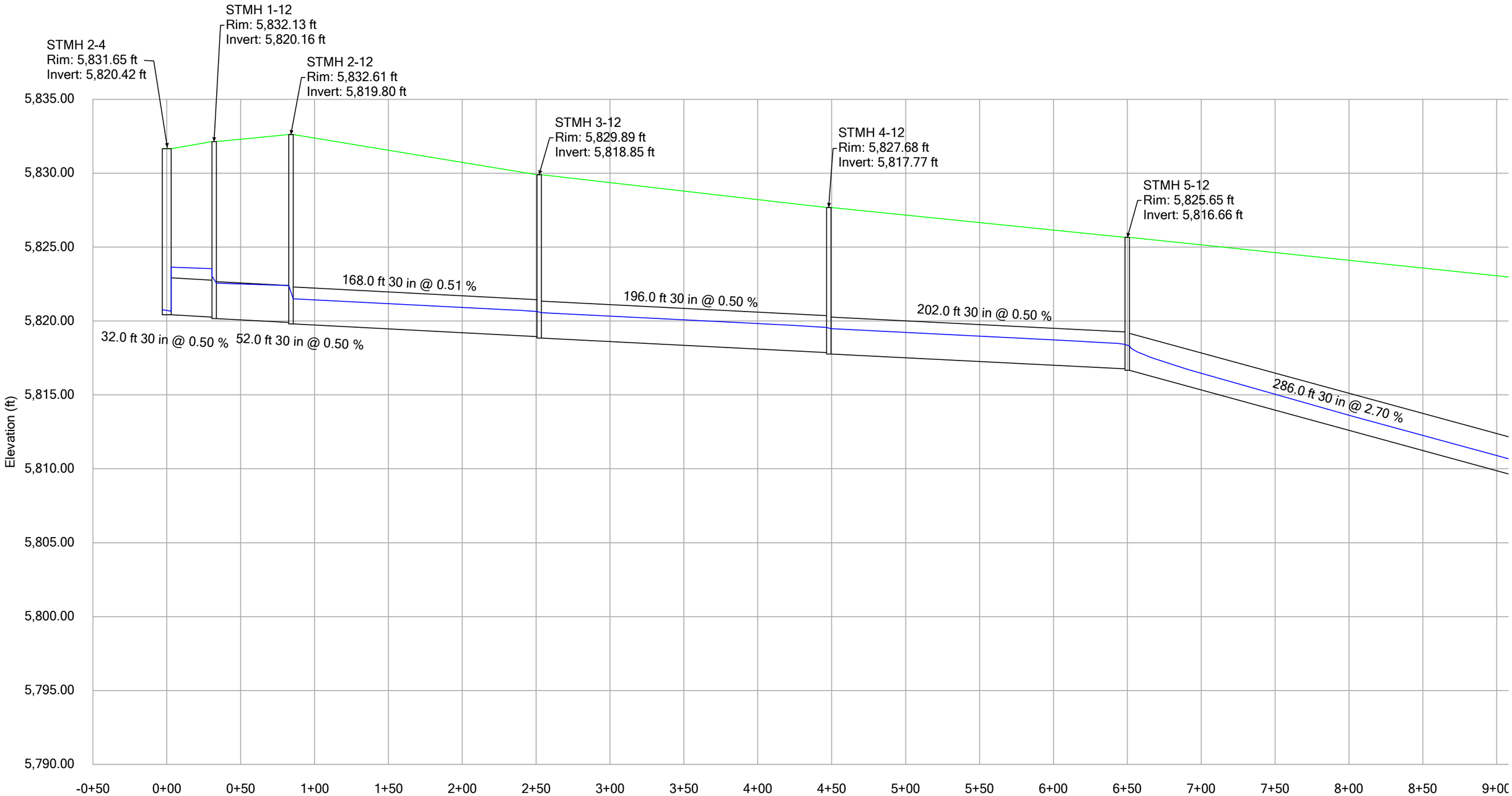
Profile Report

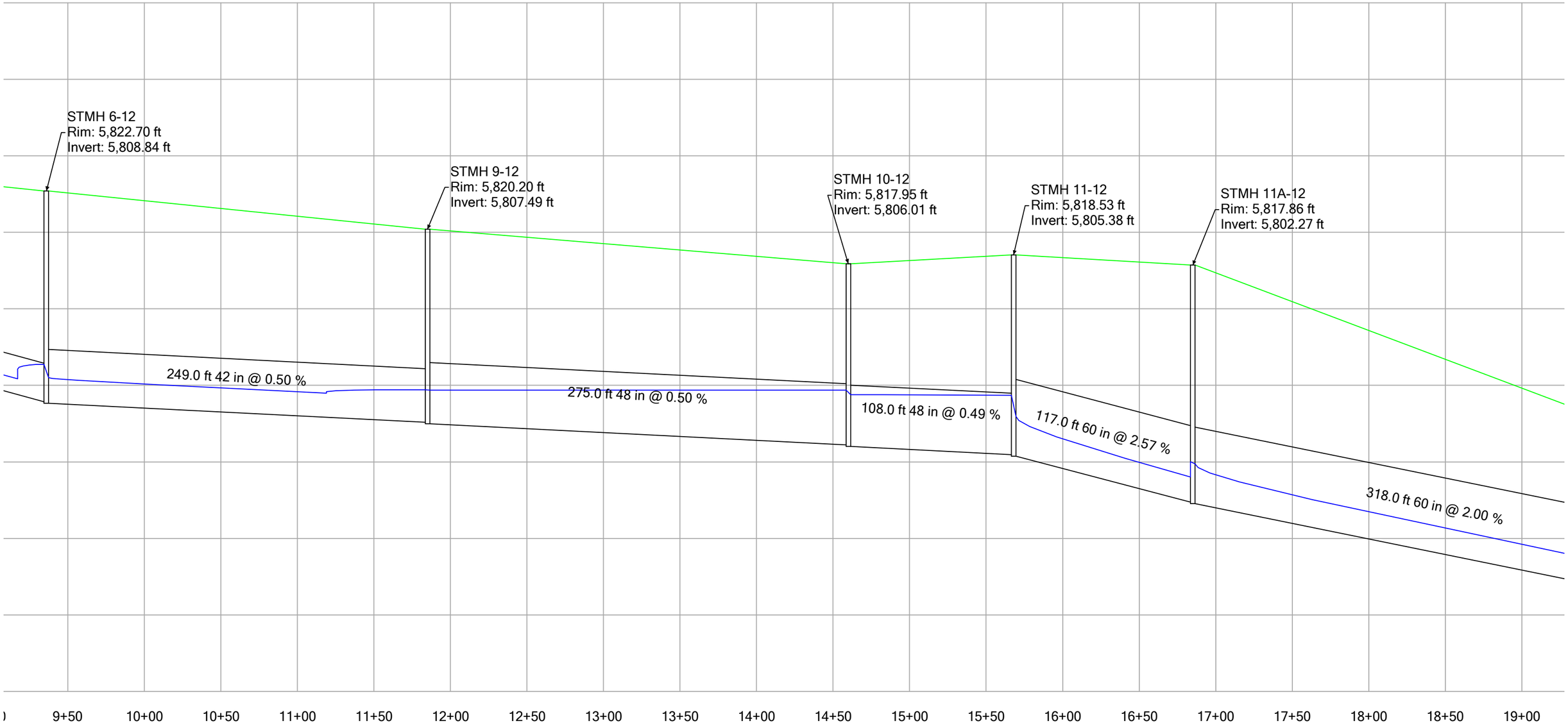
Engineering Profile - Profile - Storm Line 06 (Compark Village South StormCAD [5 year].stsw)

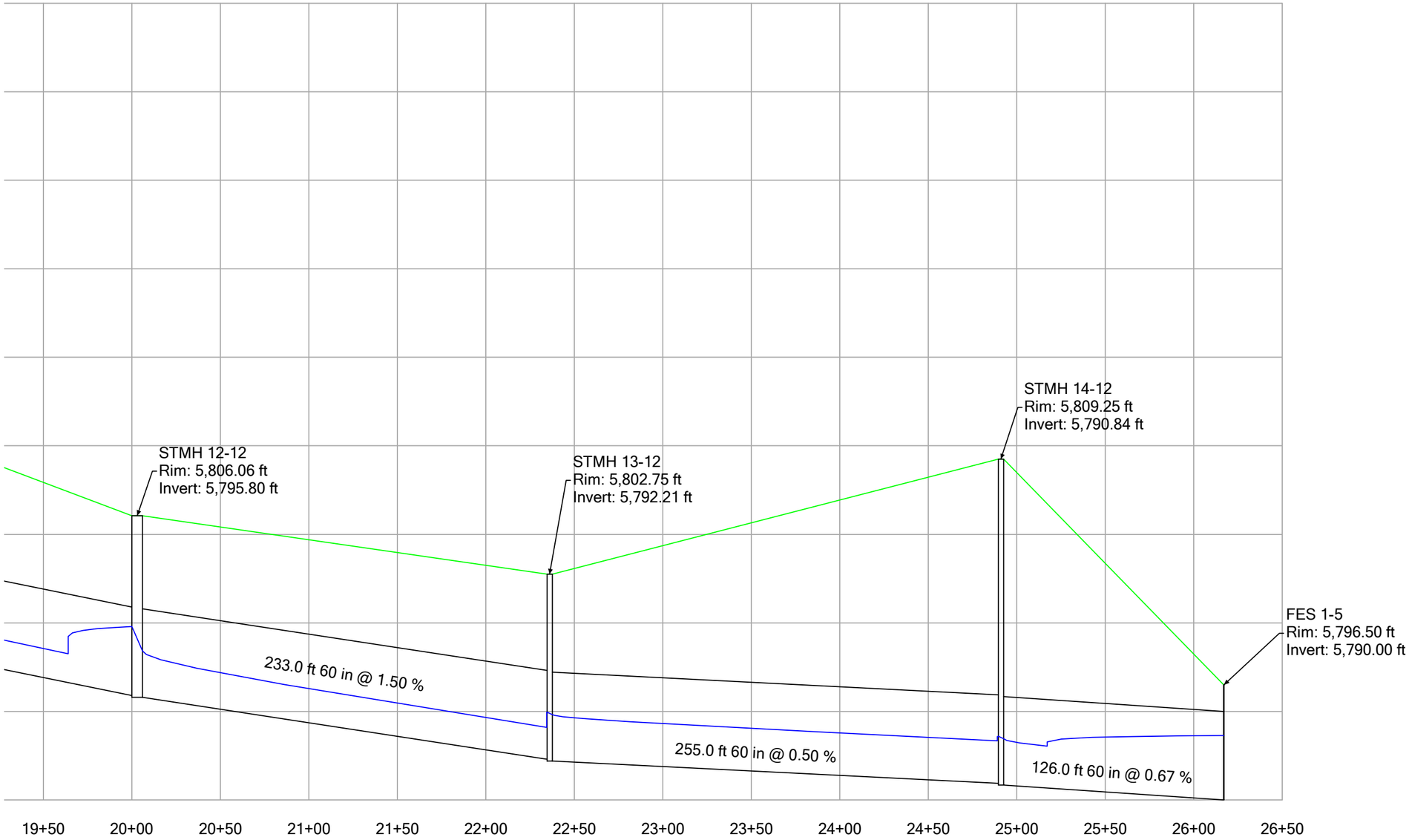


Profile Report

Engineering Profile - Profile - Storm Line 12 (Compark Village South StormCAD [5 year].stsw)

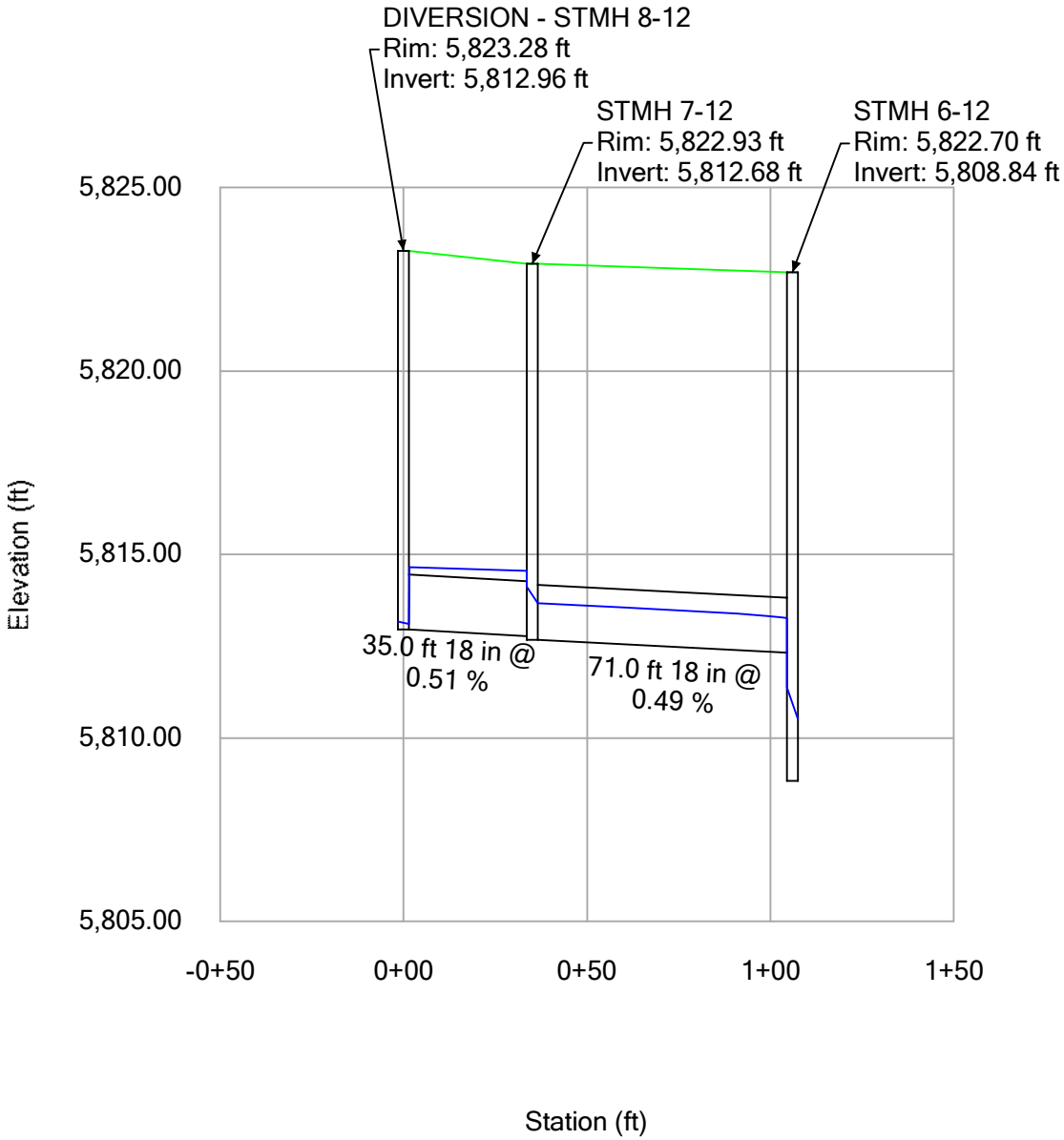



STMH 6-12
Rim: 5,822.70 ft
Invert: 5,808.84 ft
STMH 9-12
Rim: 5,820.20 ft
Invert: 5,807.49 ft
STMH 10-12
Rim: 5,817.95 ft
Invert: 5,806.01 ft
STMH 11-12
Rim: 5,818.53 ft
Invert: 5,805.38 ft
STMH 11A-12
Rim: 5,817.86 ft
Invert: 5,802.27 ft
249.0 ft 42 in @ 0.50 %
275.0 ft 48 in @ 0.50 %
108.0 ft 48 in @ 0.49 %
117.0 ft 60 in @ 2.57 %
318.0 ft 60 in @ 2.00 %
9+50
10+00
10+50
11+00
11+50
12+00
12+50
13+00
13+50
14+00
14+50
15+00
15+50
16+00
16+50
17+00
17+50
18+00
18+50
19+00
Station (ft)


STMH 12-12
Rim: 5,806.06 ft
Invert: 5,795.80 ft
STMH 13-12
Rim: 5,802.75 ft
Invert: 5,792.21 ft
STMH 14-12
Rim: 5,809.25 ft
Invert: 5,790.84 ft
FES 1-5
Rim: 5,796.50 ft
Invert: 5,790.00 ft
233.0 ft 60 in @ 1.50 %
255.0 ft 60 in @ 0.50 %
126.0 ft 60 in @ 0.67 %
19+50
20+00
20+50
21+00
21+50
22+00
22+50
23+00
23+50
24+00
24+50
25+00
25+50
26+00
26+50

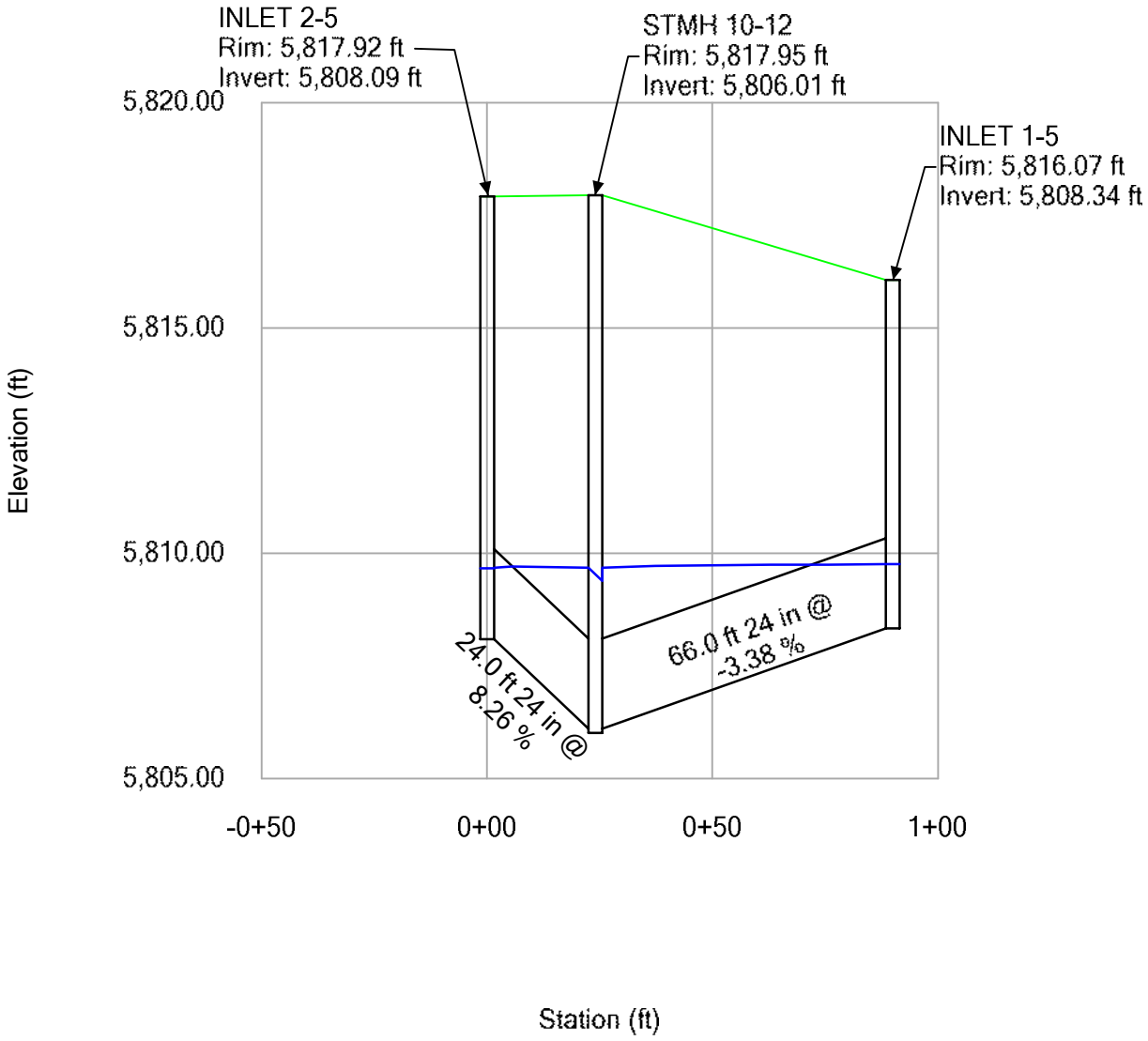
Profile Report

Engineering Profile - Profile - Storm Line 12A (Compark Village South StormCAD [5 year].stsw)



Profile Report

Engineering Profile - Profile - Storm Line 12B (Compark Village South StormCAD [5 year].stsw)



FlexTable: Conduit Table

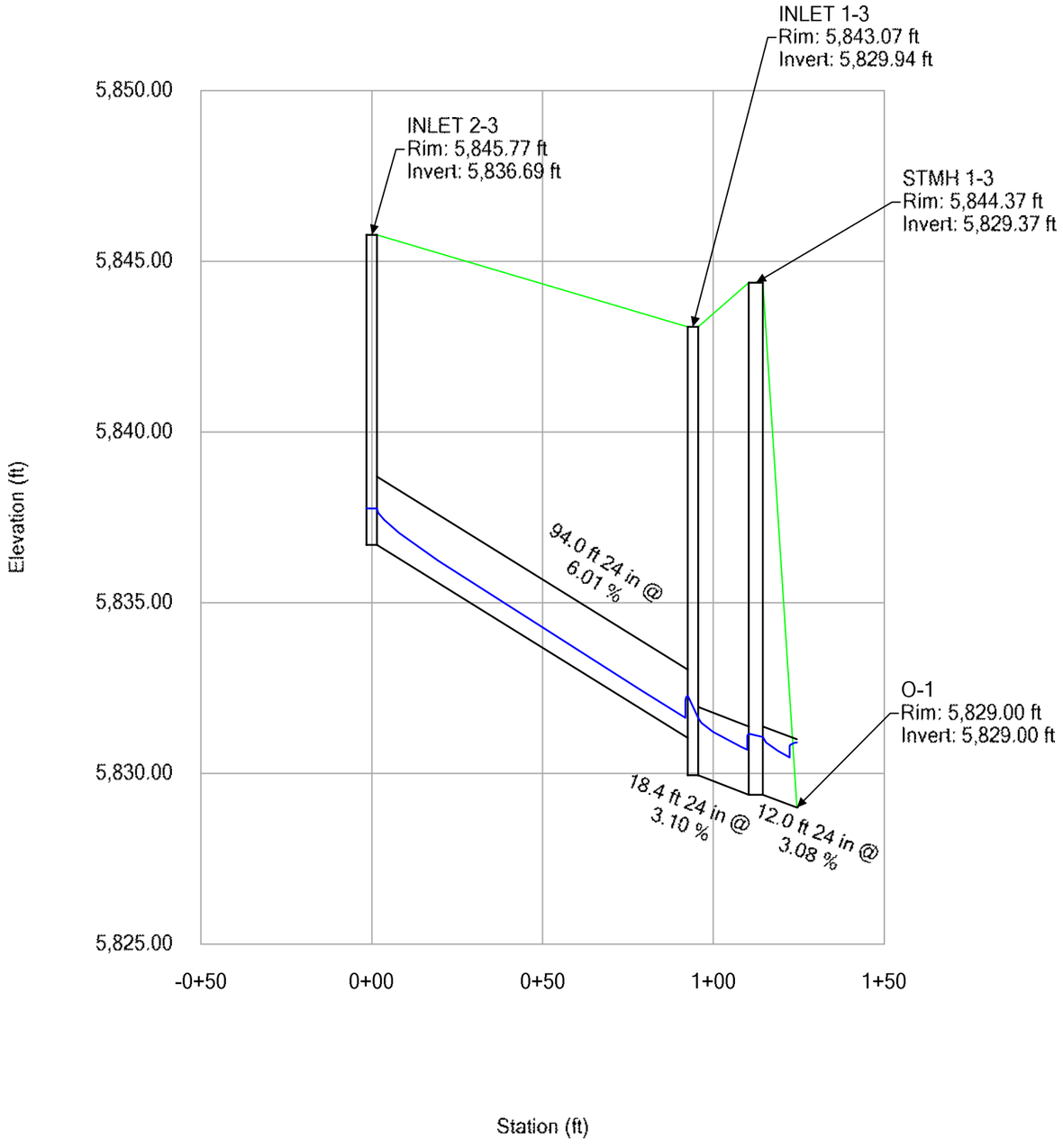
Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
STMH 6-4	5,834.91	INLET 6-4	5,832.53	120.0	1.98	Circle	36	0.013	47.81	13.34	5,837.16	5,834.11
INLET 6-4	5,832.33	STMH 5-4	5,827.71	278.0	1.66	Circle	36	0.013	51.31	12.70	5,834.66	5,829.38
FES 2-5	5,834.54	INLET 8-5	5,834.00	7.7	7.01	Circle	24	0.013	24.64	18.14	5,836.29	5,835.76
INLET 5-4	5,829.34	STMH 5-4	5,828.83	52.0	0.99	Circle	18	0.013	9.80	6.72	5,830.55	5,829.98
INLET 3-4	5,825.42	STMH 4-4	5,825.23	20.0	0.95	Circle	18	0.013	11.20	6.34	5,828.21	5,827.98
INLET 1-4	5,823.04	DIVERSION - STMH 2-4	5,821.92	65.0	1.72	Circle	18	0.013	7.70	4.36	5,825.66	5,825.31
INLET 4-4	5,825.42	STMH 4-4	5,825.23	20.0	0.95	Circle	18	0.013	2.40	1.36	5,827.99	5,827.98
INLET 2-6	5,814.55	INLET 1-6	5,814.15	80.0	0.50	Circle	18	0.013	8.10	4.58	5,816.12	5,815.65
INLET 2-3	5,836.69	INLET 1-3	5,831.04	94.0	6.01	Circle	24	0.013	9.00	12.99	5,837.76	5,832.27
FES 2-4	5,842.00	STMH 6-4	5,835.11	221.0	3.12	Circle	36	0.013	47.81	15.79	5,844.25	5,837.57
STMH 5-4	5,827.41	STMH 4-4	5,822.96	163.0	2.73	Circle	36	0.013	63.33	16.13	5,829.97	5,827.98
INLET 4-5	5,812.96	STMH 2-5A	5,812.27	19.0	3.63	Circle	18	0.013	8.90	5.04	5,815.78	5,815.64
INLET 5-5	5,813.90	STMH 2-5	5,811.47	49.0	4.96	Circle	18	0.013	9.10	5.15	5,815.90	5,815.53
STMH 4-4	5,822.16	STMH 3-4	5,821.56	79.0	0.76	Circle	36	0.013	76.93	10.88	5,827.98	5,826.93
STMH 3-4	5,821.46	DIVERSION - STMH 2-4	5,820.65	76.0	1.07	Circle	36	0.013	84.93	12.02	5,826.54	5,825.31
INLET 2-4	5,822.07	STMH 3-4	5,821.56	56.0	0.91	Circle	18	0.013	8.00	4.53	5,827.03	5,826.71
INLET 8-5	5,833.51	INLET 7-5	5,827.49	173.0	3.48	Circle	24	0.013	24.64	13.95	5,835.26	5,830.99
INLET 4-5A	5,821.14	STMH 2-5E	5,820.90	20.0	1.20	Circle	18	0.013	10.20	5.77	5,823.36	5,823.17
INLET 5-5A	5,821.14	STMH 2-5E	5,820.90	20.0	1.20	Circle	18	0.013	10.62	6.01	5,823.38	5,823.18
STMH 2-5	5,811.37	INLET 3-5	5,810.99	16.0	2.38	Circle	42	0.013	123.06	17.88	5,814.71	5,814.57
INLET 7-5	5,827.14	STMH 4-5	5,822.27	104.6	4.66	Circle	24	0.013	34.84	11.09	5,829.88	5,827.40
STMH 4-5	5,822.27	INLET 6-5	5,821.44	23.0	3.61	Circle	24	0.013	34.84	11.09	5,826.05	5,825.51
STMH 2-5A	5,812.17	STMH 2-5	5,811.47	50.0	1.40	Circle	36	0.013	48.02	6.79	5,815.56	5,815.30
STMH 2-5B	5,815.51	STMH 2-5A	5,812.17	241.0	1.39	Circle	30	0.013	39.12	10.95	5,817.62	5,815.66
DIVERSION - STMH 2-4	5,820.42	STMH 1-4	5,818.85	72.0	2.17	Circle	36	0.013	69.03	15.06	5,823.06	5,820.88
STMH 1-4	5,818.23	FES 1-4	5,818.00	28.0	0.82	Circle	36	0.013	69.03	9.77	5,821.05	5,820.64
INLET 1-3	5,829.94	STMH 1-3	5,829.37	18.4	3.10	Circle	24	0.013	22.50	13.06	5,831.63	5,831.16
STMH 1-3	5,829.37	O-1	5,829.00	12.0	3.08	Circle	24	0.013	22.50	13.04	5,831.06	5,830.90
INLET 5-4A	5,829.26	STMH 5-4	5,828.83	43.0	1.00	Circle	18	0.013	2.22	4.71	5,829.92	5,829.97
STMH 2-5E	5,820.80	STMH 2-5D	5,820.12	44.0	1.55	Circle	24	0.013	20.82	6.63	5,822.95	5,822.58
STMH 2-5D	5,820.12	STMH 2-5C	5,819.49	45.0	1.40	Circle	24	0.013	28.32	9.01	5,822.34	5,821.64
STMH 2-5C	5,819.49	STMH 2-5B	5,815.51	289.0	1.38	Circle	30	0.013	35.22	10.71	5,821.51	5,817.73
INLET 4-5B	5,819.70	STMH 2-5C	5,819.52	18.0	1.00	Circle	18	0.013	6.90	3.90	5,821.69	5,821.62
INLET 5-5B	5,828.30	STMH 2-5D	5,820.22	293.0	2.76	Circle	18	0.013	7.50	9.49	5,829.36	5,822.56
INLET 4-5C	5,815.79	STMH 2-5B	5,815.61	18.0	1.00	Circle	18	0.013	3.90	2.21	5,817.71	5,817.68
INLET 6-5	5,821.14	STMH 3-5A	5,812.67	247.0	3.43	Circle	30	0.013	54.44	11.09	5,824.34	5,819.99
STMH 3-5A	5,812.67	STMH 2-5	5,811.37	48.0	2.71	Circle	30	0.013	65.94	13.43	5,816.29	5,815.04
INLET 6-5A	5,812.86	STMH 3-5A	5,812.67	19.0	1.00	Circle	18	0.013	6.20	3.51	5,820.05	5,819.99
INLET 6-5B	5,812.86	STMH 3-5A	5,812.67	19.0	1.00	Circle	18	0.013	5.30	3.00	5,820.04	5,819.99
DIVERSION - STMH 2-4	5,820.42	STMH 1-12	5,820.26	32.0	0.49	Circle	30	0.013	23.60	0.00	5,823.64	5,823.53
STMH 1-12	5,820.16	STMH 2-12	5,819.90	52.0	0.50	Circle	30	0.013	23.60	6.58	5,822.55	5,822.40
STMH 2-12	5,819.80	STMH 3-12	5,818.95	168.0	0.51	Circle	30	0.013	23.60	6.62	5,821.51	5,820.65
STMH 3-12	5,818.85	STMH 4-12	5,817.87	196.0	0.50	Circle	30	0.013	23.60	6.58	5,820.56	5,819.52
STMH 4-12	5,817.77	STMH 5-12	5,816.66	202.0	0.55	Circle	30	0.013	23.60	6.84	5,819.42	5,818.41
STMH 5-12	5,816.66	STMH 6-12	5,808.94	286.0	2.70	Circle	30	0.013	23.60	12.51	5,818.31	5,813.17
STMH 6-12	5,812.33	STMH 7-12	5,812.68	71.0	-0.49	Circle	18	0.013	5.80	4.62	5,813.68	5,813.26

FlexTable: Conduit Table

Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
INLET 1-6	5,814.05	DIVERSION - STMH 8-12	5,813.06	16.0	6.19	Circle	24	0.013	15.40	15.27	5,815.46	5,813.98
STMH 6-12	5,808.84	STMH 9-12	5,807.59	249.0	0.50	Circle	42	0.013	29.40	3.06	5,812.98	5,812.77
INLET 2-5	5,808.45	STMH 10-12	5,806.11	24.0	9.75	Circle	24	0.013	23.50	7.48	5,812.90	5,812.64
STMH 10-12	5,806.11	INLET 1-5	5,808.34	66.0	-3.38	Circle	24	0.013	15.10	4.81	5,812.94	5,812.64
STMH 9-12	5,807.49	STMH 10-12	5,806.11	275.0	0.50	Circle	48	0.013	29.40	2.34	5,812.76	5,812.64
STMH 10-12	5,806.01	STMH 11-12	5,805.50	103.0	0.50	Circle	48	0.013	68.00	5.41	5,812.62	5,812.39
STMH 13-12	5,792.21	STMH 14-12	5,790.94	255.0	0.50	Circle	60	0.013	185.43	9.44	5,798.76	5,797.47
STMH 14-12	5,790.84	FES 1-5	5,790.21	126.0	0.50	Circle	60	0.013	185.43	9.44	5,797.29	5,796.65
STMH 12-12	5,795.80	STMH 13-12	5,792.31	233.0	1.50	Circle	60	0.013	185.43	16.85	5,799.70	5,798.94
DIVERSION - STMH 8-12	5,812.96	STMH 7-12	5,812.78	35.0	0.51	Circle	18	0.013	5.80	0.00	5,814.67	5,814.56
STMH 11-12	5,805.38	STMH 11A-12	5,802.37	117.0	2.57	Circle	60	0.013	204.96	21.17	5,809.46	5,806.46
STMH 11A-12	5,802.27	STMH 12-12	5,795.90	318.0	2.00	Circle	60	0.013	204.96	19.27	5,806.35	5,802.31
DIVERSION - STMH 8-12	5,812.96	STMH-8A	5,806.30	116.0	5.74	Circle	24	0.013	9.60	13.01	5,814.07	5,808.33
STMH-8A	5,806.20	FES1-6	5,806.00	40.0	0.50	Circle	24	0.013	9.60	3.06	5,808.33	5,808.26
INLET 3-5	5,810.89	MH-1-5A	5,808.93	105.5	1.86	Circle	48	0.013	136.96	16.85	5,814.37	5,813.25
MH-1-5A	5,808.93	STMH 11-12	5,805.47	95.1	3.64	Circle	48	0.013	136.96	10.90	5,813.25	5,812.39
OUTLET STRUCTURE	5,787.19	O-2	5,785.30	127.9	1.48	Circle	36	0.013	57.30	12.44	5,789.64	5,787.21
CB-12	5,792.34	FOREBAY B	5,790.35	32.3	6.16	Circle	30	0.013	33.00	6.72	5,796.88	5,796.67

Profile Report

Engineering Profile - Profile - Storm Line 03 (Compark Village South StormCAD [100 year].stsw)



Profile Report

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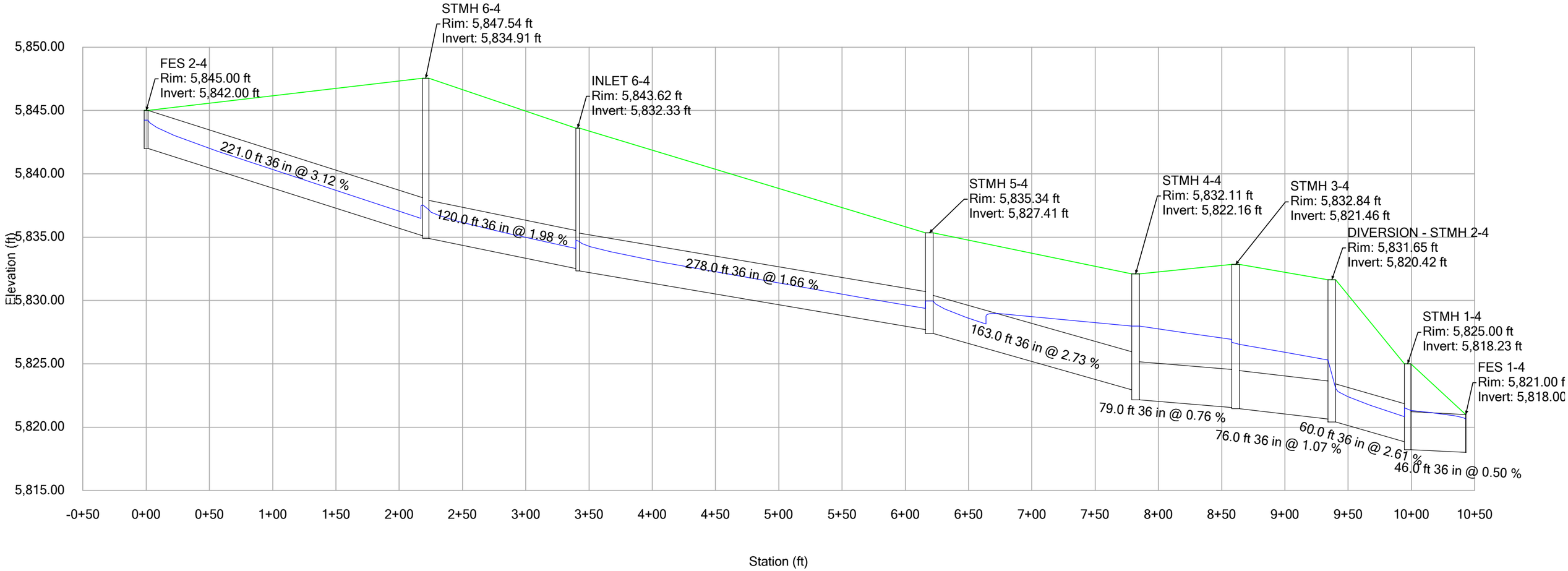

Profile Report

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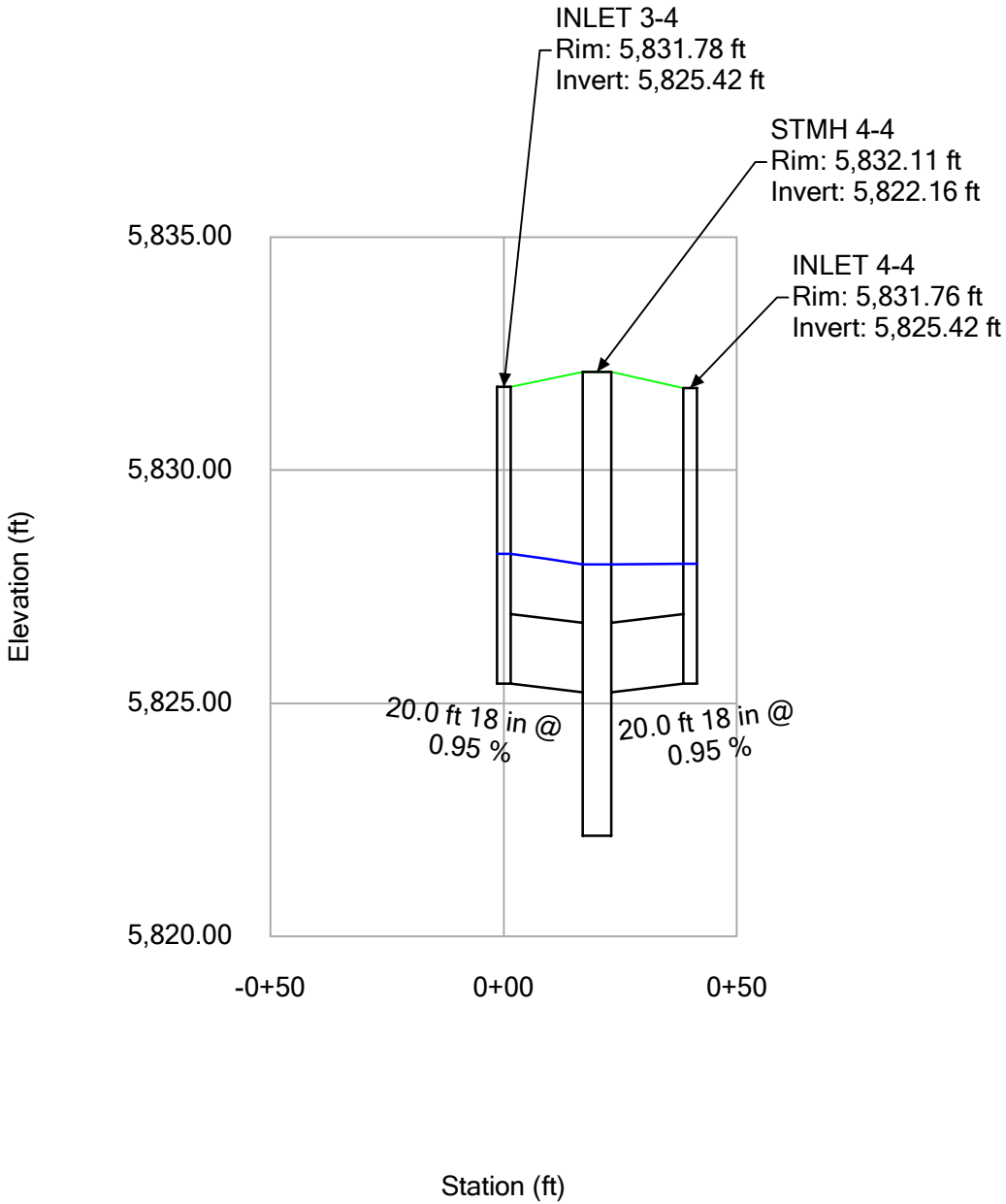

Profile Report

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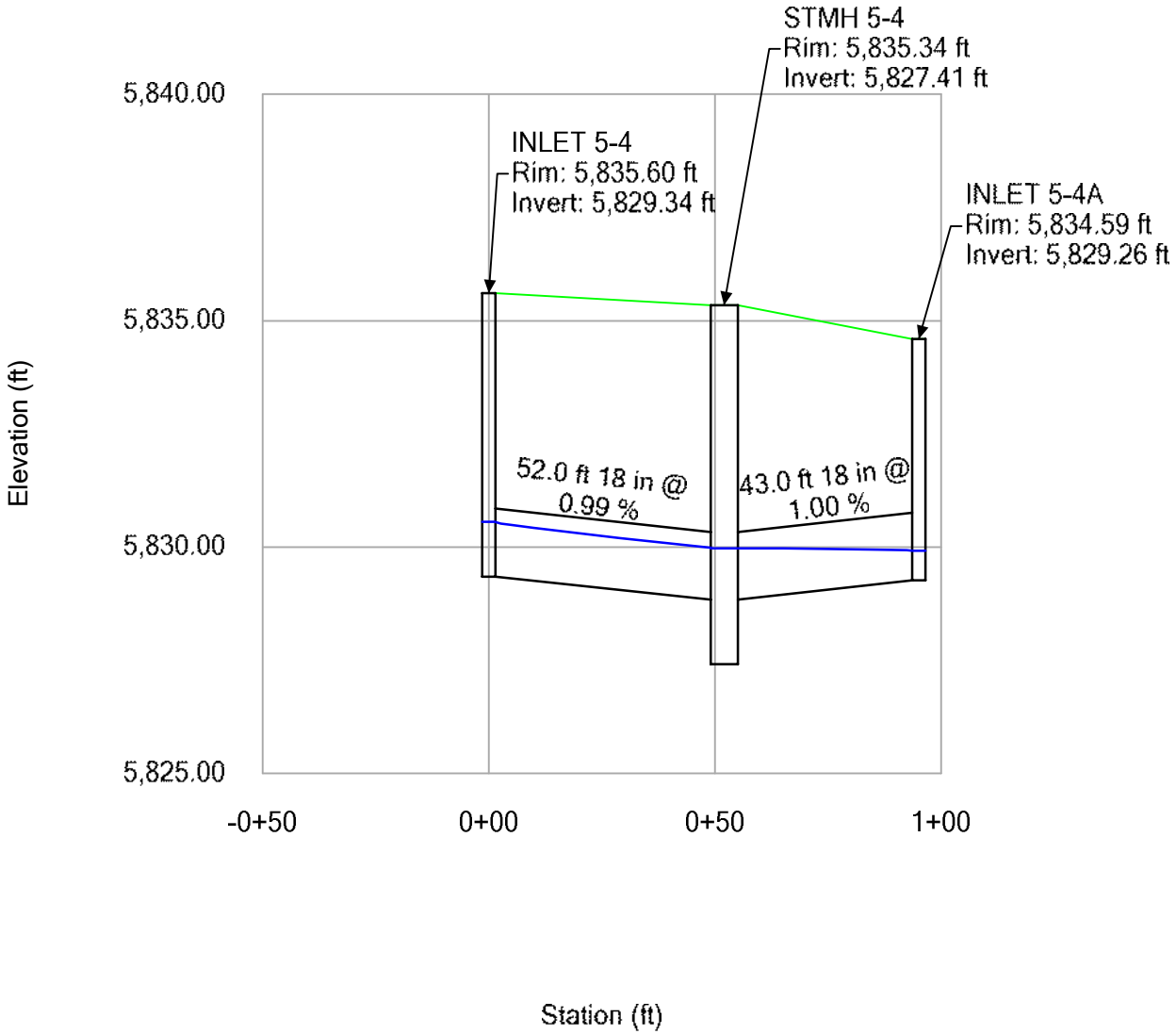

Profile Report

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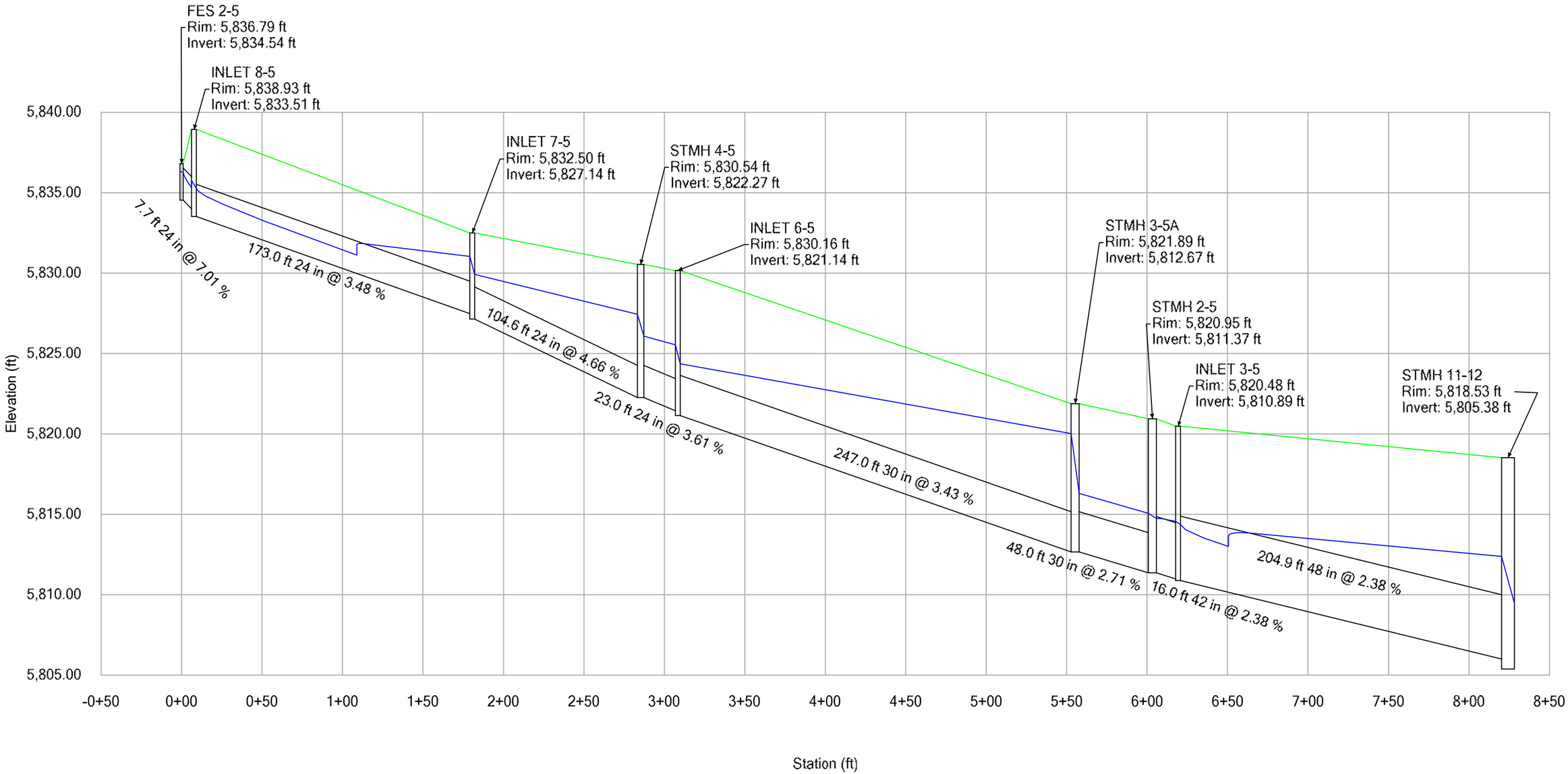

Profile Report

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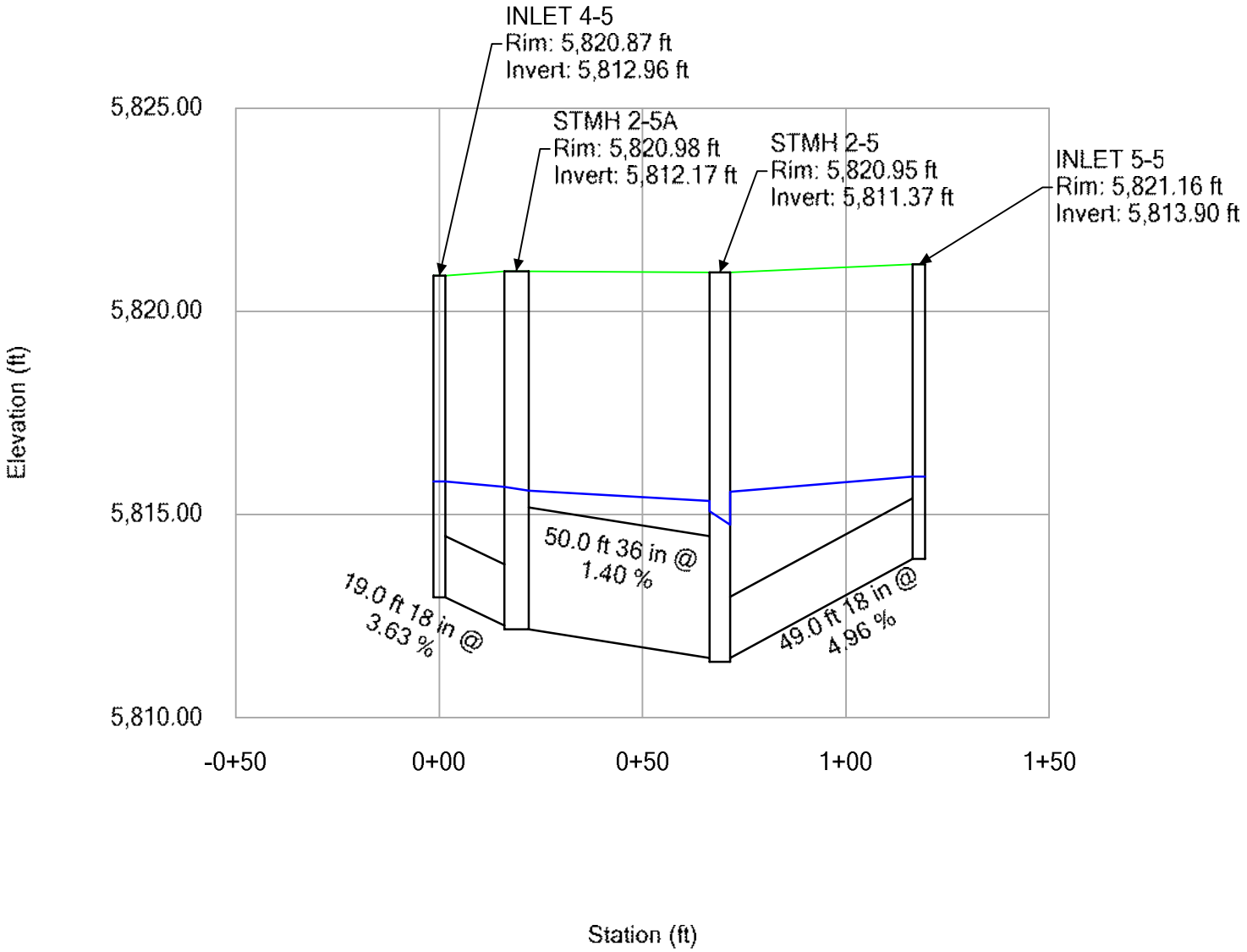

Profile Report

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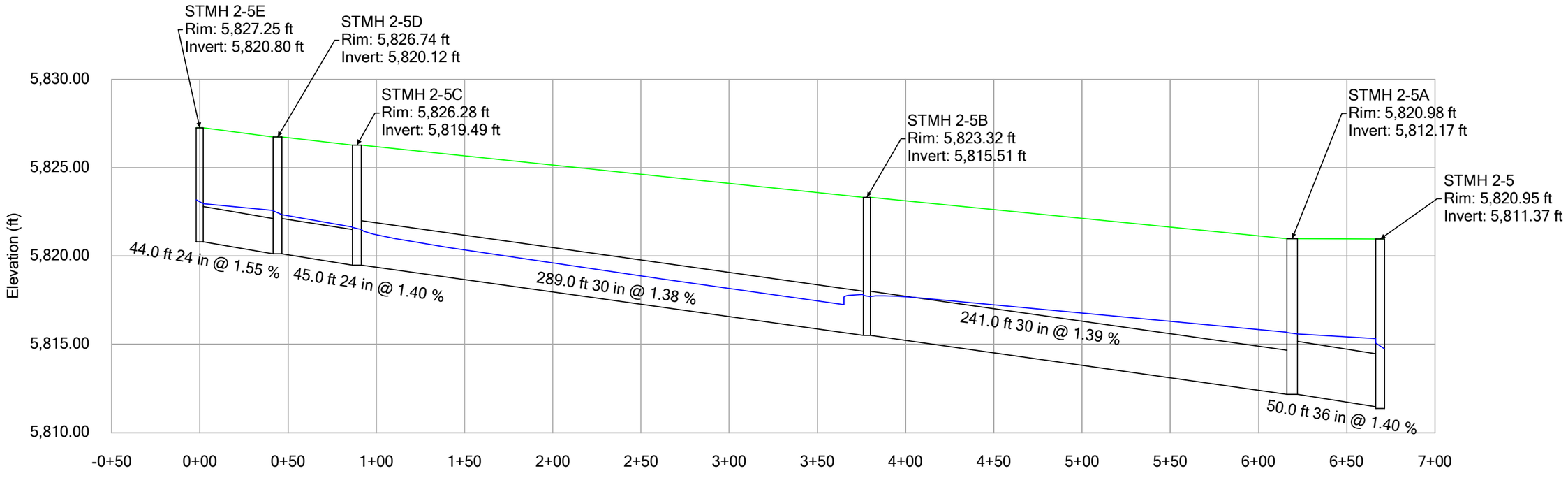

Profile Report

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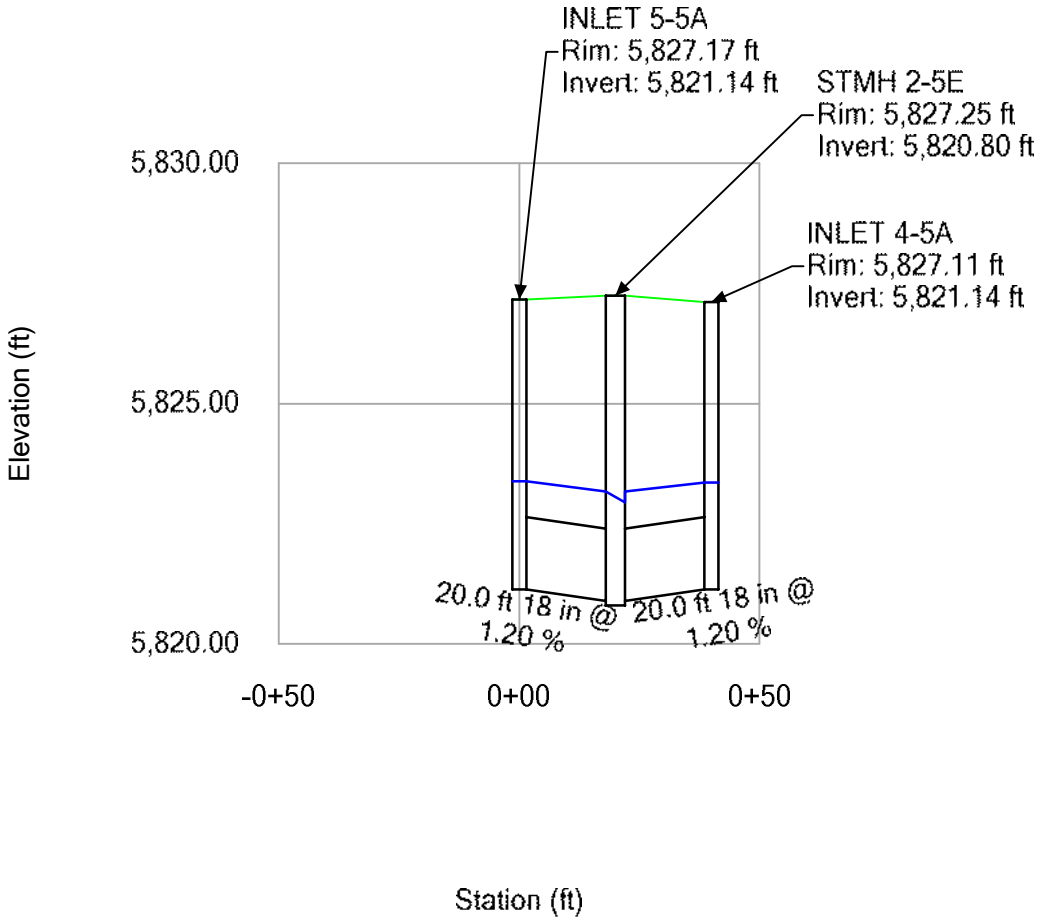

Profile Report

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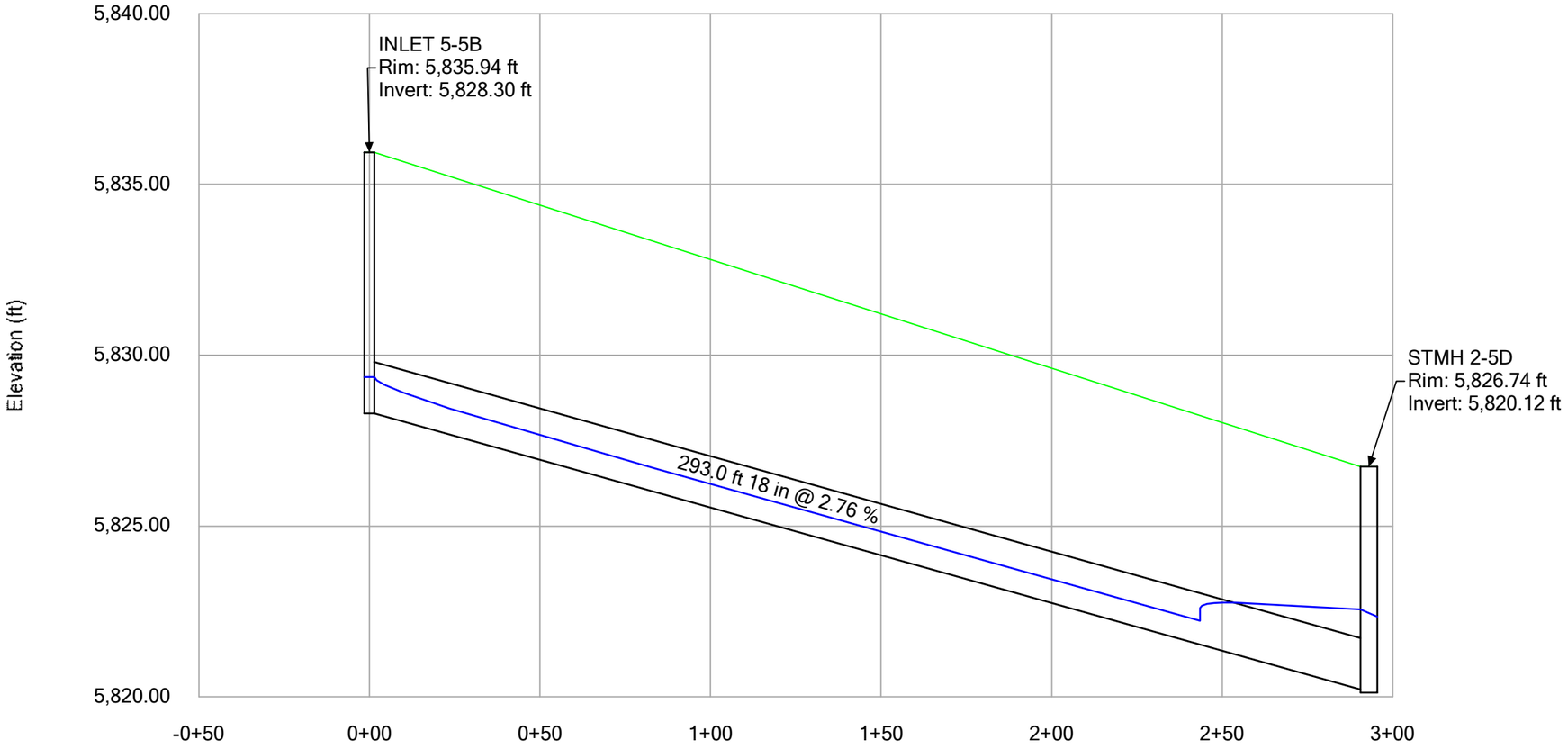

Profile Report

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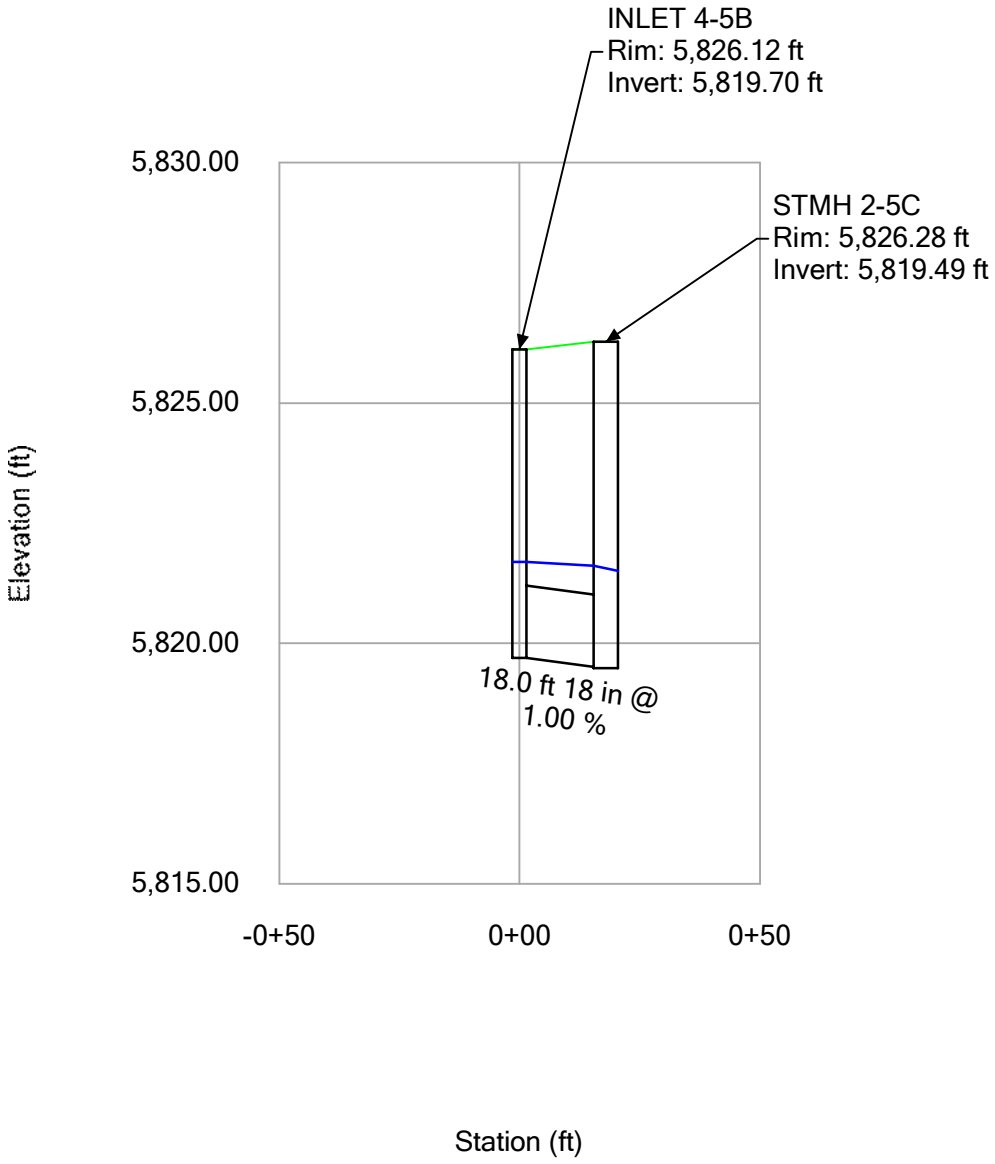

Profile Report

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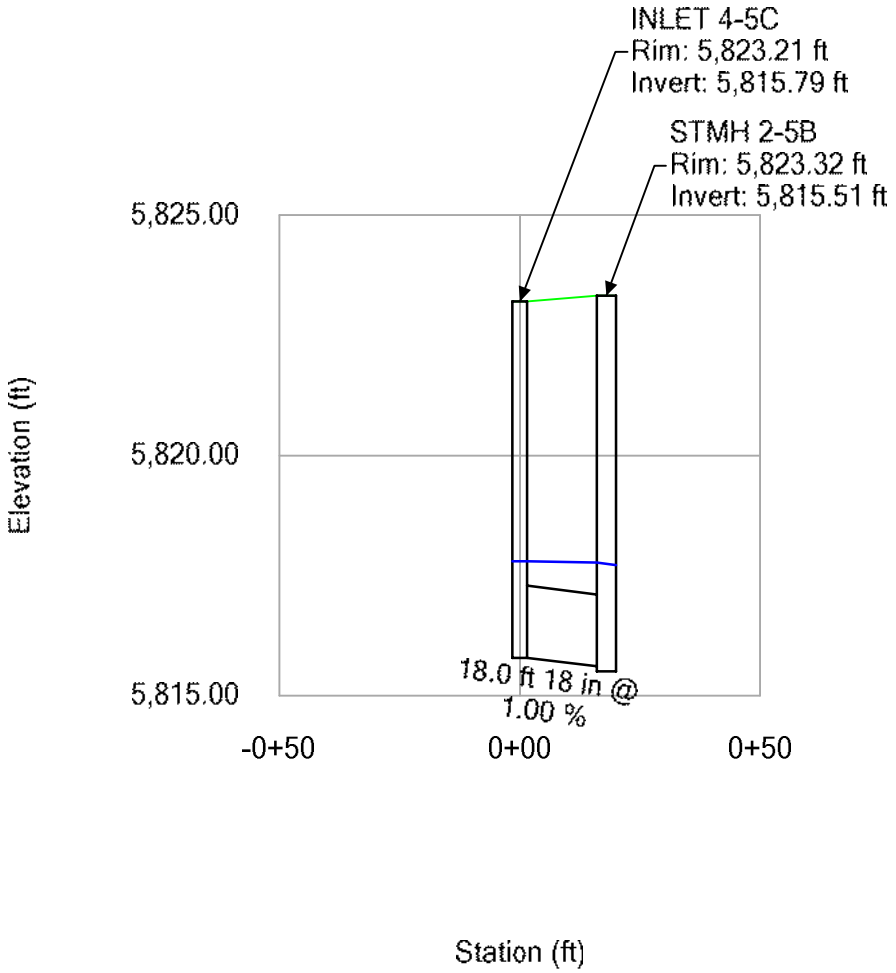

Profile Report

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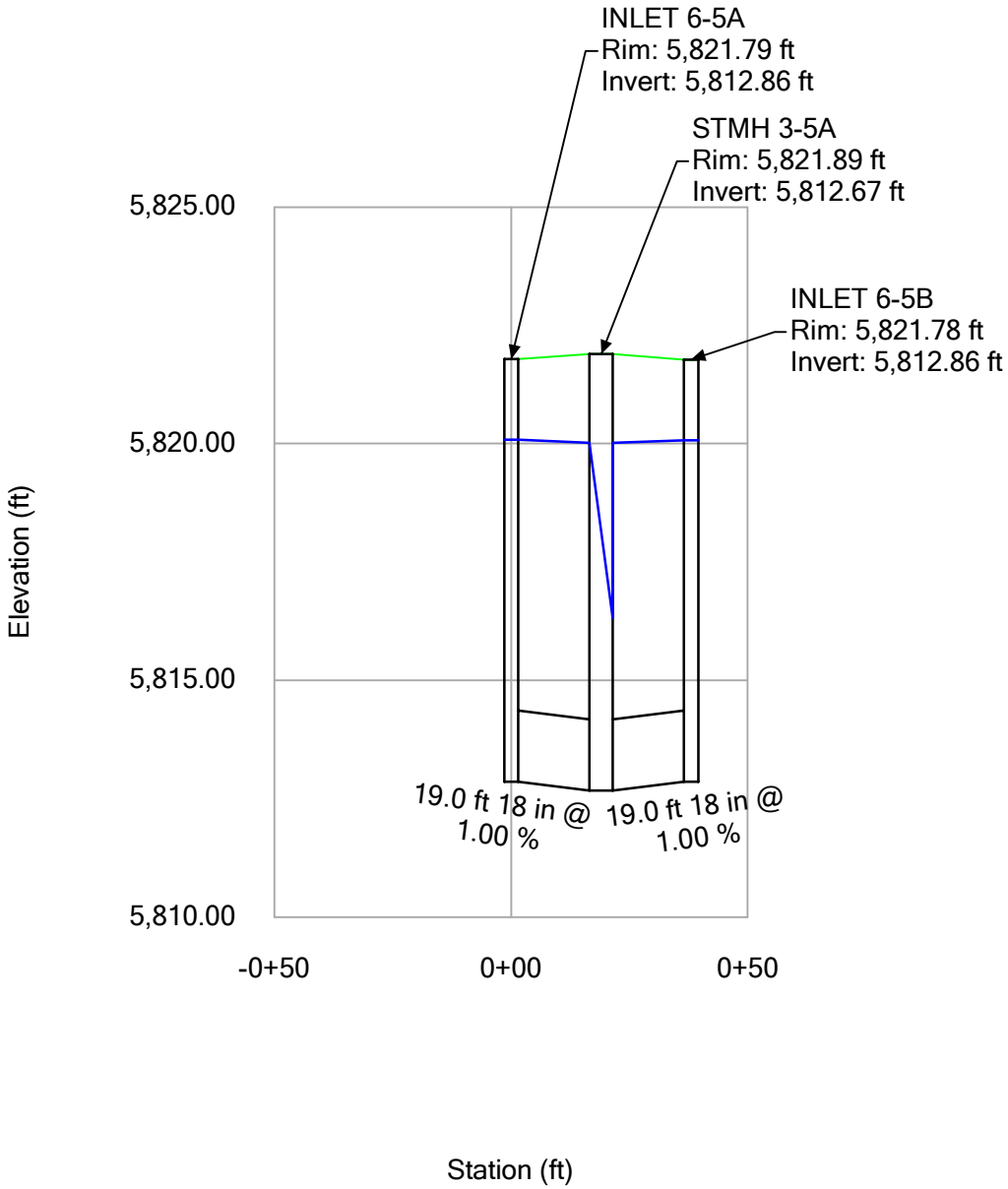

Profile Report

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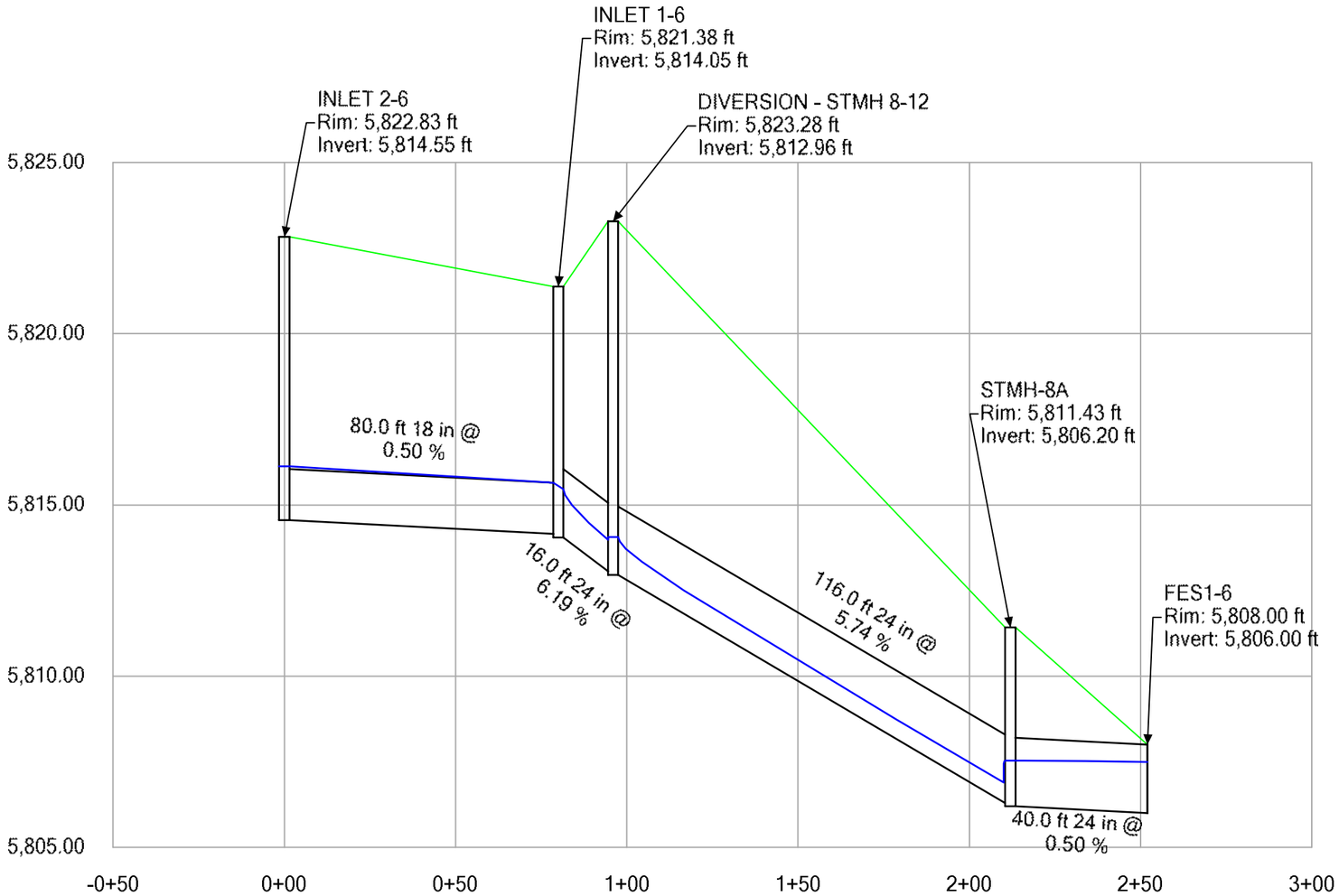
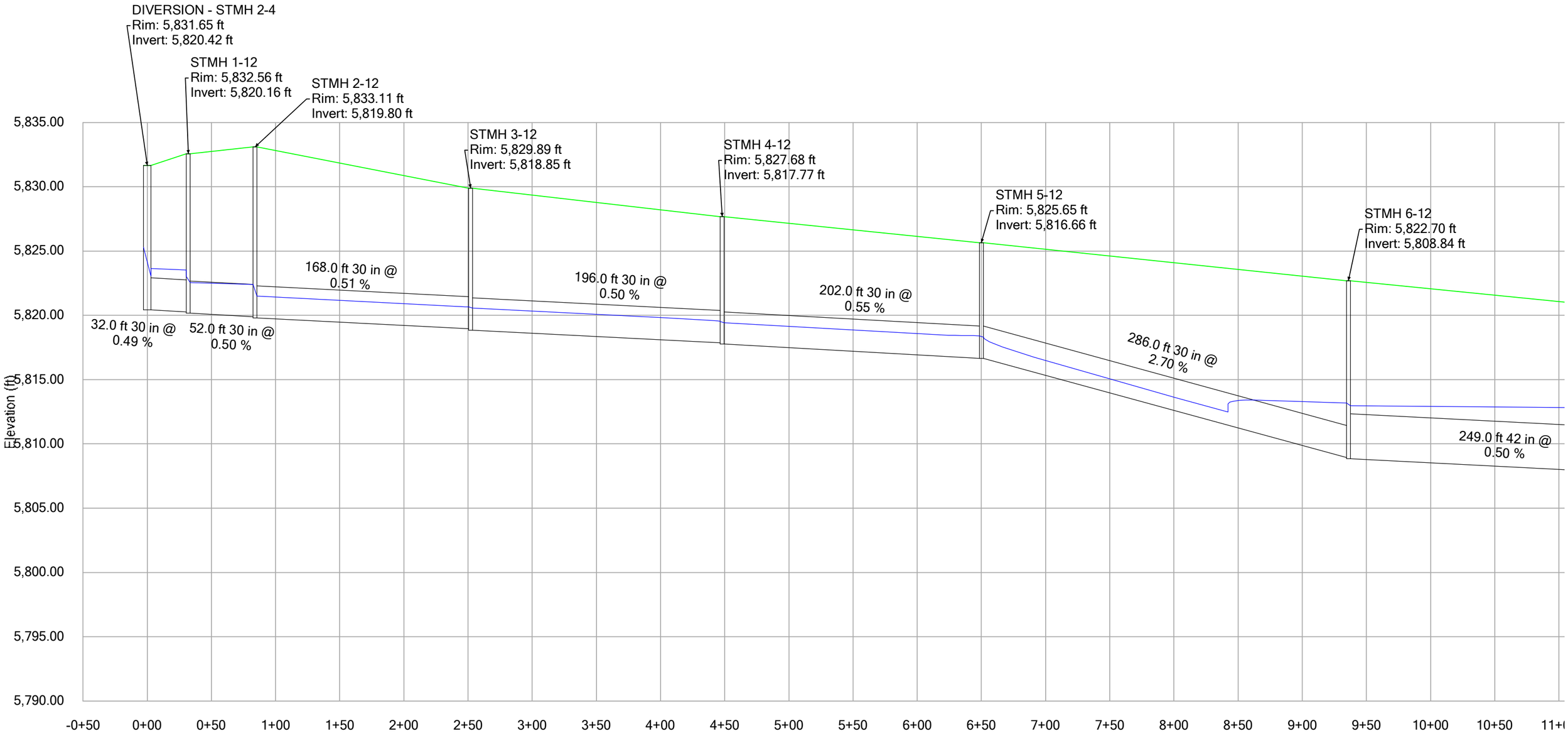
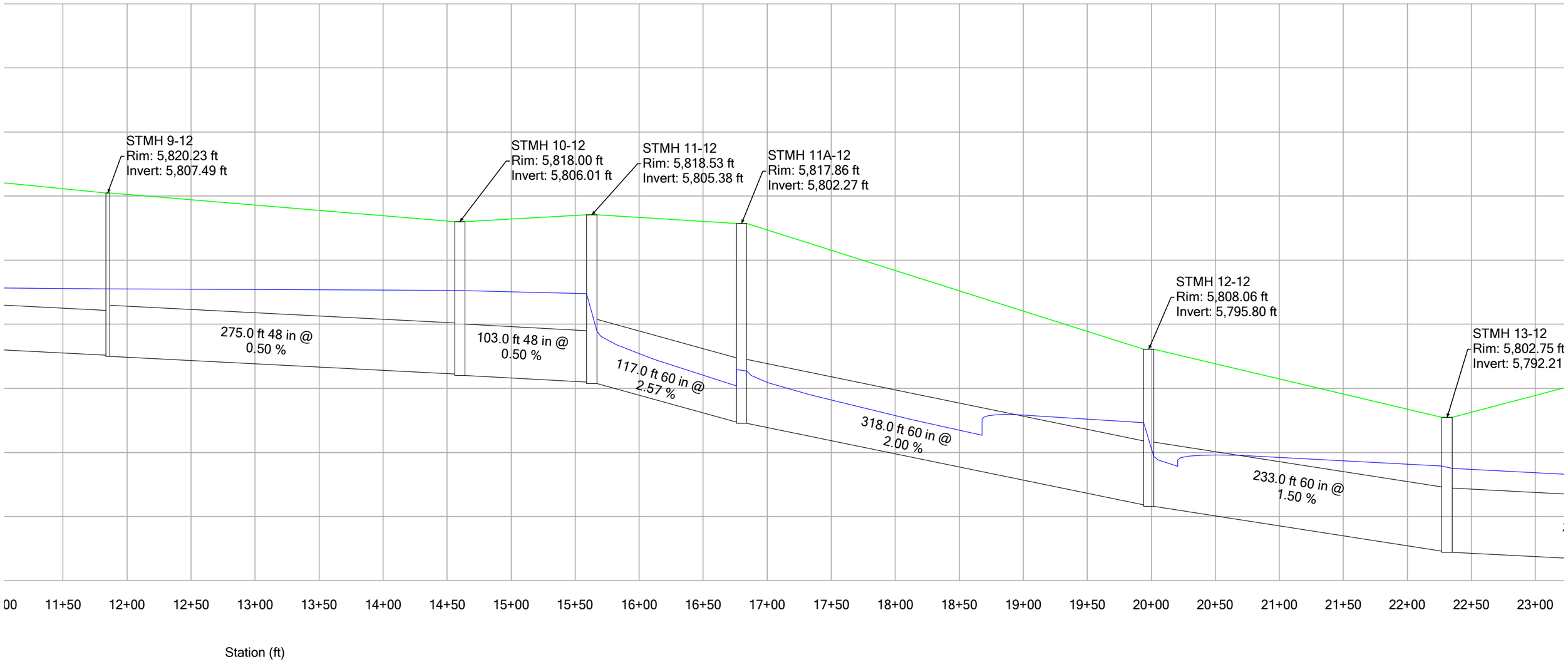


Profile Report

Engineering Profile - Profile - Storm Line 12 (Compark Village South StormCAD [100 year].stsw)




STMH 9-12
Rim: 5,820.23 ft
Invert: 5,807.49 ft
STMH 10-12
Rim: 5,818.00 ft
Invert: 5,806.01 ft
STMH 11-12
Rim: 5,818.53 ft
Invert: 5,805.38 ft
STMH 11A-12
Rim: 5,817.86 ft
Invert: 5,802.27 ft
STMH 12-12
Rim: 5,808.06 ft
Invert: 5,795.80 ft
STMH 13-12
Rim: 5,802.75 ft
Invert: 5,792.21
275.0 ft 48 in @ 0.50 %
103.0 ft 48 in @ 0.50 %
117.0 ft 60 in @ 2.57 %
318.0 ft 60 in @ 2.00 %
233.0 ft 60 in @ 1.50 %
00
11+50
12+00
12+50
13+00
13+50
14+00
14+50
15+00
15+50
16+00
16+50
17+00
17+50
18+00
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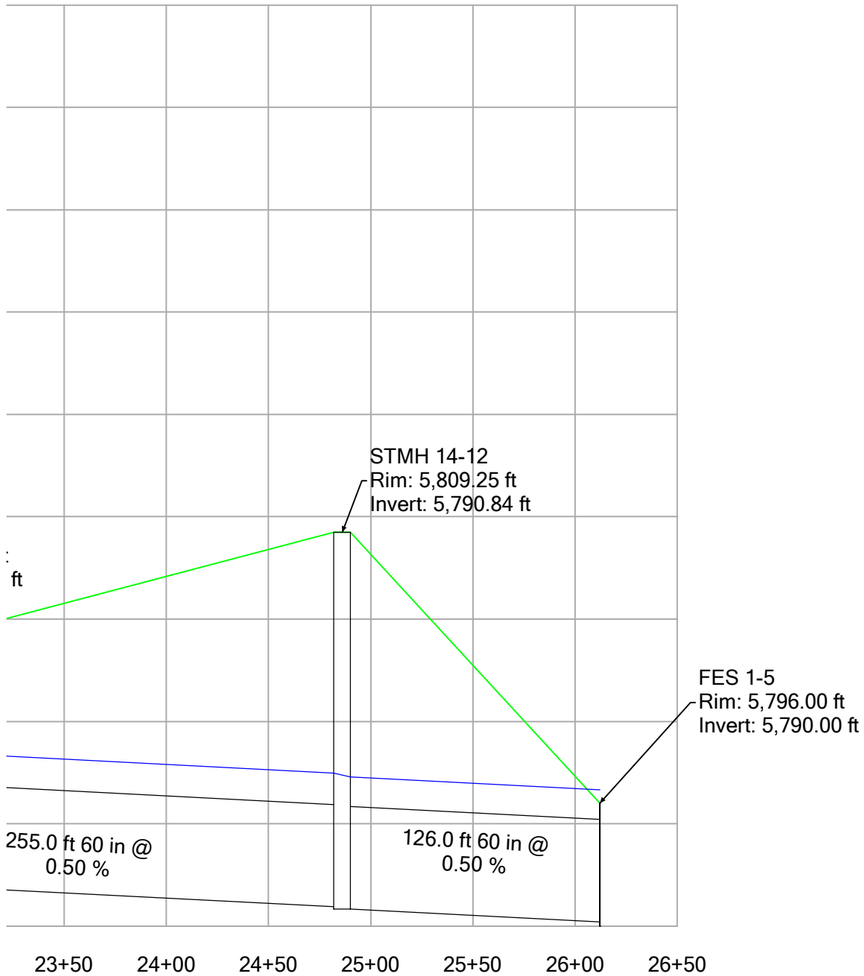
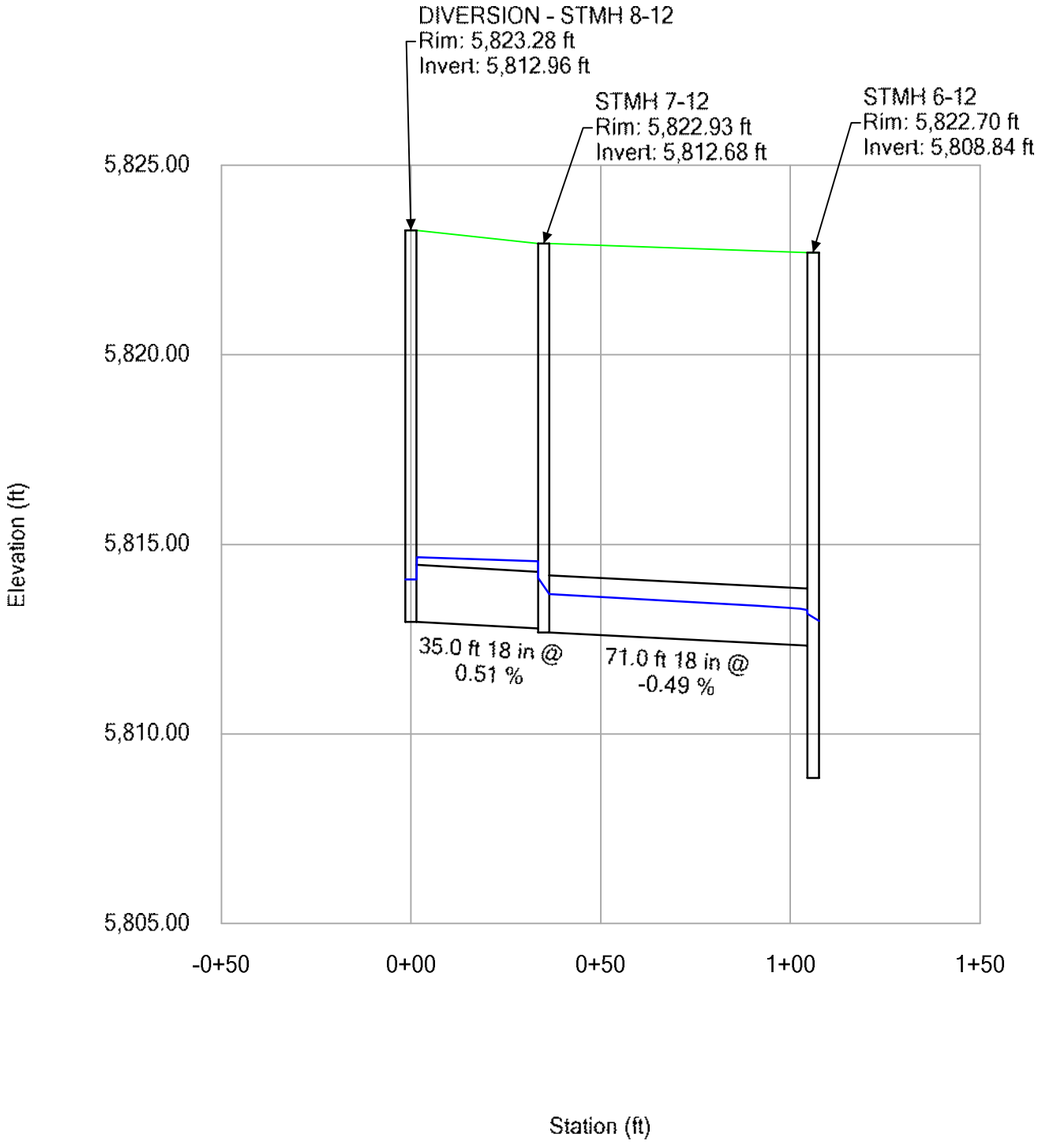
22+00
22+50
23+00
Station (ft)


STMH 14-12
Rim: 5,809.25 ft
Invert: 5,790.84 ft
ft
FES 1-5
Rim: 5,796.00 ft
Invert: 5,790.00 ft
255.0 ft 60 in @
0.50 %
126.0 ft 60 in @
0.50 %
23+50
24+00
24+50
25+00
25+50
26+00
26+50

Profile Report

Engineering Profile - Profile - Storm Line 12A (Compark Village South StormCAD [100 year].stsw)



Profile Report

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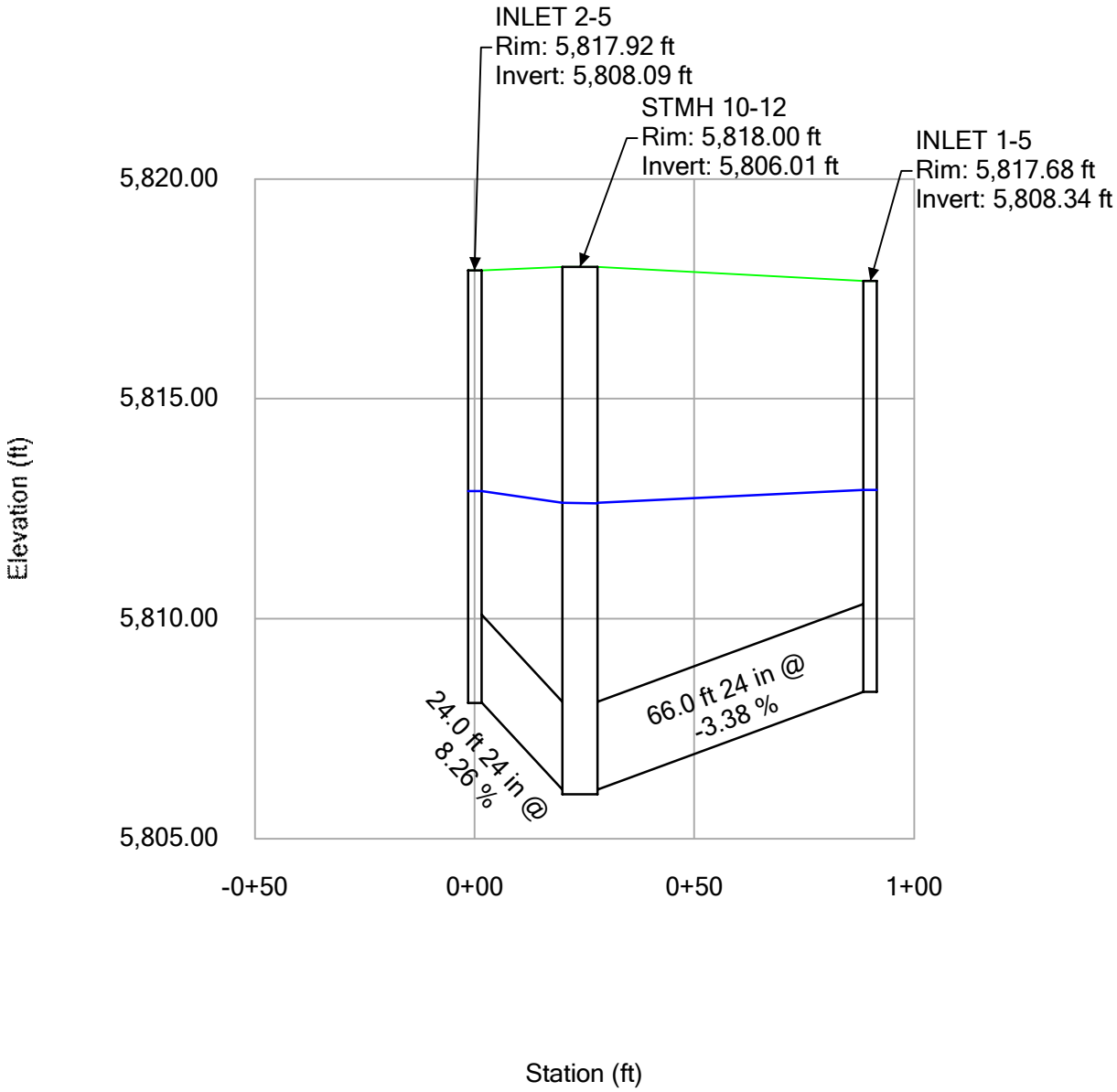
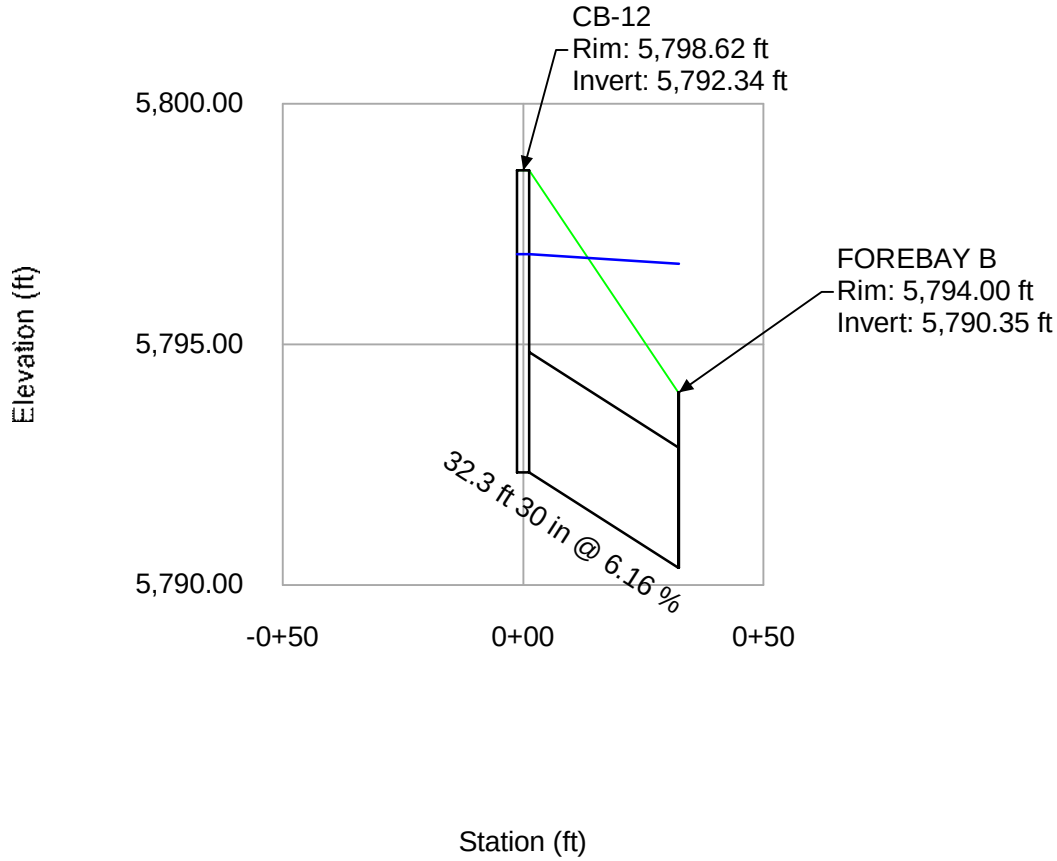


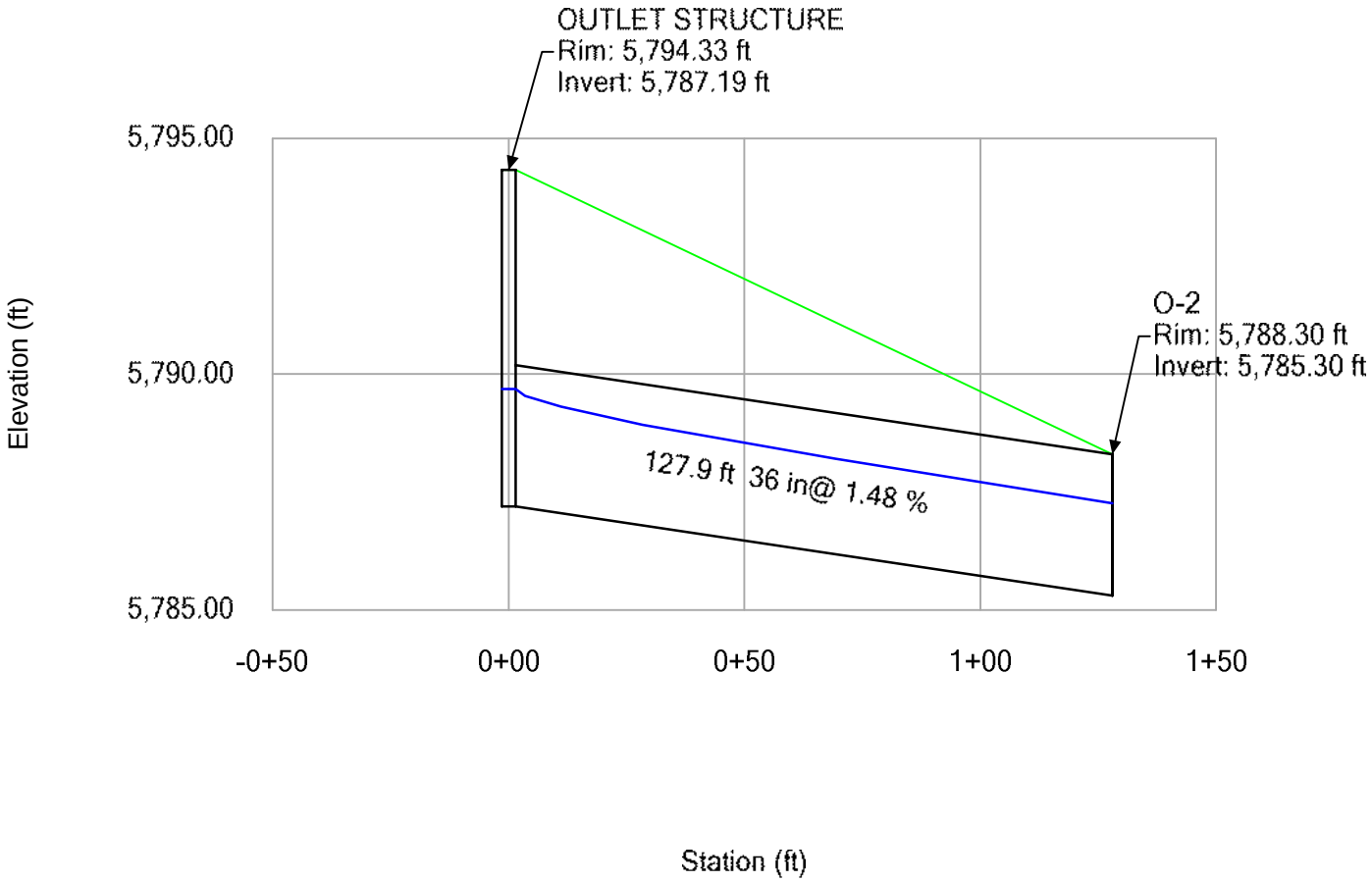
Profile Report

Engineering Profile - Profile -CB 12 to Det Basin (Compark Village South StormCAD [100 year].stsw)



Profile Report

Engineering Profile - Profile - Det Basin Outfall (Compark Village South StormCAD [100 year].stsw)



Appendix E

Job Name.: Compark Village South- Filing 1
Proj. No.: CLCPKC 3
Crew: MM
Sheet(s): 1 / 1 Date: 3/3/20

Manhard CONSULTING
7600 E. Orchard Rd. Ste. 150-N
Greenwood Village, CO 80111
303-708-0500

See UDFCD Figure 9-38 Riprap Sizing Graph

Outfall 1 - FES 1-4

Q_{100} = 69.03 cfs D = 3.0' Y_T = 1.7' → Based on Respec 60% GAT Design flow depths

$\frac{Q_{100}}{D^{1.5}} = \frac{69.03}{3.0^{1.5}} = 13.3$ $\frac{Y_T}{D} = \frac{1.7}{3.0} = 0.57$

Figure 9-38 → Type L Required

Town of Parker - Type M minimum

Outfall 2 - FES 1-6

Q_{100} = 9.60 cfs D = 2.0' Y_T = 1.5' → Based on Respec 60% GAT Design Flow Depths

$\frac{Q_{100}}{D^{1.5}} = \frac{9.60}{2.0^{1.5}} = 3.4$ $\frac{Y_T}{D} = \frac{1.5}{2.0} = 0.75$

Figure 9-38 → Type L Required

Town of Parker - Type M minimum

Outfall 3 - FES 1-10

Q_{100} = 59.3 cfs D = 3.0' Y_T = 1.0'

$\frac{Q_{100}}{D^{1.5}} = \frac{59.3}{3.0^{1.5}} = 11.4$ $\frac{Y_T}{D} = \frac{1.0}{3.0'} = 0.33$

Figure 9-38 → Type M required

$$H_a = \frac{(H + Y_n)}{2}$$ Equation 9-19

Where the maximum value of H_a shall not exceed H, and:

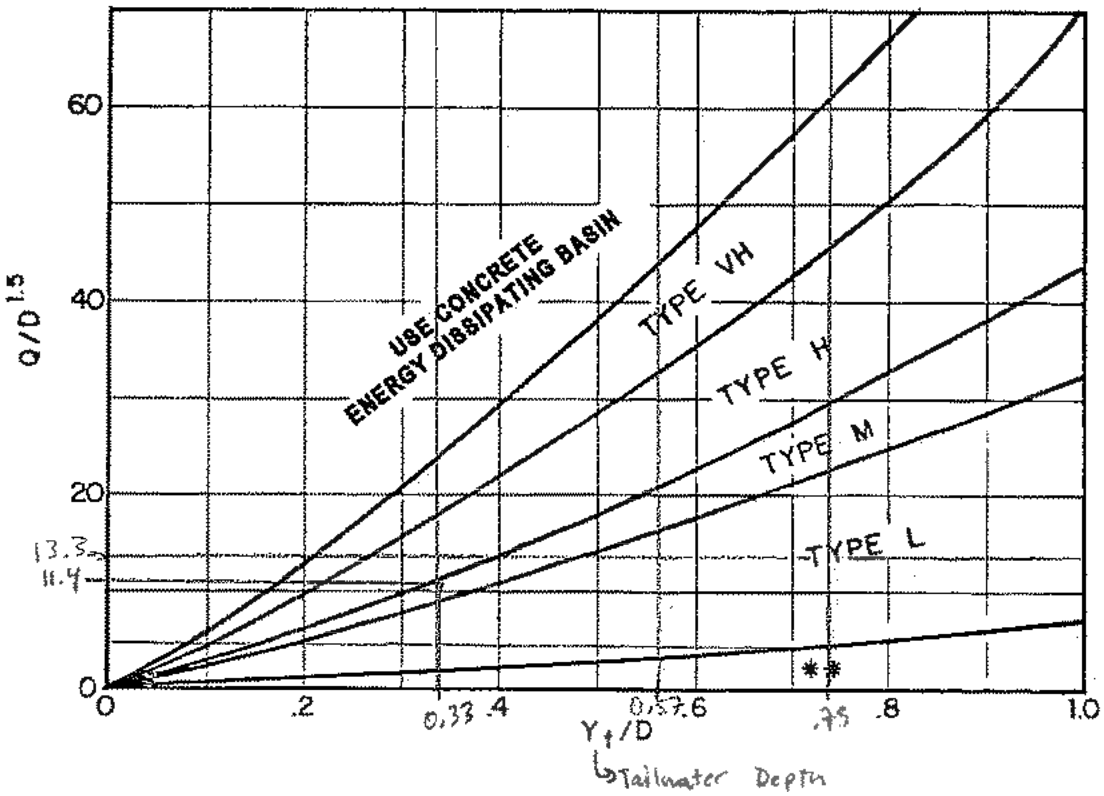
D_a = parameter to use in place of D in Figure 9-38 when flow is supercritical (ft)

D_r = diameter of circular culvert (ft)

H_a = parameter to use in place of H in Figure 9-39 when flow is supercritical (ft)

H = height of rectangular culvert (ft)

Y_n = normal depth of supercritical flow in the culvert (ft)



Use D_a instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

Final Drainage Report

Compark Village South, Filing No. 1
Parker, Colorado

P.N. CLCPKC3

Prepared for:
470 Compark, LLC
1001 Bannock Street, Suite 240
Denver, CO 80204

Prepared By:

8008 E Arapahoe Ct, Suite 110
Centennial, Colorado 80112
Contact: Rick Moore, P.E.
303-708-0500

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016
Revised December 20, 2016
Revised October 27, 2017

This final drainage report for the Compark South 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.

Prepared by:

_____

Amie S. Drucker, P.E.
Registered Professional Engineer
State of Colorado No. 49038

Reviewed by:

_____

Ricky J Moore, P.E.
Registered Professional Engineer
State of Colorado No. 30877

Initially Submitted November 20, 2015
Revised April 11, 2016
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Revised December 20, 2016
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USDA NRSC Soils Information Summary

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Initially Submitted November 20, 2015
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Revised December 20, 2016
Revised October 27, 2017

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I. GENERAL LOCATION AND DESCRIPTION

A. Scope

This project is part of the Compark Village South development. The purpose of this report is to demonstrate the feasibility of the proposed storm drainage system planned to control the overall Green Acres Tributary drainage basins associated with the project. Drainage criteria are in accordance with the *Town of Parker Storm Drainage and Environmental Criteria Manual and Urban Drainage and Flood Control District*.

B. Location

Compark Village South lies within Section 6, Township 6 South, Range 66 West of the Sixth Principal Meridian, Town of Parker, Colorado. General project area boundaries include Highway E-470 to the north, Grand View Estates to the south, an undeveloped parcel to the west (Cordillera Corp property), and Compark 190, LLC property to the east (see vicinity map in Maps section at the end of this report). The project will include a new main access road, Belford Avenue, running east-west connecting South Peoria Street to South Chambers Road.

C. Description of Property

The Compark South Development Site consists of approximately 150 acres, and is mostly vacant with ground cover consisting of native grasses and shrubs. There are currently 2 residences on the south side of the property, which will be removed. Onsite soils consist mainly of Newlin gravelly sandy loams and Fondis clay loam. These dominant soils are classified as hydrologic group B and C soils, respectively. The site is approximately 77% Hydrologic Soil Group “B” and 23% HSG “C”. Refer to Appendix B of this report for excerpts of the SCS soil survey summary.

D. Floodplain Information

Compark Village South is located within two major drainage basins. Happy Canyon Creek is a major drainage basin that has a regulatory 100-year

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floodplain. Firm Map No's 08035C0062G and 08035C0066G, Effective date: March 16, 2016 reflect a Zone AE and Zone X floodplain across the eastern edge of the site. Green Acres Tributary is a sub-basin tributary to Happy Canyon Creek. Firm Map No. 08035C0062G, Effective date: March 16, 2016 reflects a Zone A non-detailed study floodplain over a portion of the Green Acres Tributary. Refer to Appendix C for FIRMETTE copies of the FIRM Map. A Floodplain Development Permit from the Town of Parker will be required for any construction within the documented floodplains on the property.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

Approximately 70 percent (+/- 105 ac) of this project lies within the Green Acres Tributary drainage basin. The remaining 30 percent (+/- 45 ac) of the site lies directly within the Happy Canyon Creek drainage basin, as studied as a part of the Happy Canyon Creek basin by the Urban Drainage and Flood Control District under the following studies:

- UDFCD – Outfall System Planning – Happy Canyon Creek Watershed within Douglas County, prepared by Kiowa Consultants, June 1993. Urban Drainage in conjunction with sponsor partners Town of Parker and Douglas County are planning on updating the Happy Canyon Creek OSP.

- Green Acres Tributary is a part of the Happy Canyon Creek watershed. The upstream area of the Green Acres Tributary contains several existing and proposed development projects that contain features for which drainage studies have been prepared. All current upstream drainage features are part of the Meridian Office Park, Filings 4 & 5 (reference 5) master drainage analysis.

- Happy Canyon Creek Major Drainageway Plan, prepared by Muller Engineering Company, March 2014.

- Amendment to Happy Canyon Creek Major Drainageway Plan, March 2014, prepared by Manhard Consulting, February 2016.

B. Basin Description

The overall drainage basin including the proposed site is divided into six sub-area basins, A, B, C, D, E, and F (See the Map Section at the end of this report). Basins A through E make up the Green Acres Tributary Basin and Basin F comprises the direct flow area tributary to Happy Canyon Creek. The drainage basin is divided into twelve sub-areas within the Happy Canyon Creek MDP. Sub-basins H100, H110, H115, H-120, H130, H140, H145, H150, H160, H170 and H180 drain to the Green Acres Tributary and sub-basin A370 drains directly to Happy Canyon Creek. Refer to the drainage maps included at the rear of this report for the spatial relationship of these drainage basins.

Basin A (H100, H110, H115, H120 & H130)

Basin A is comprised of approximately 370 acres of the Meridian Development area and directs surface drainage within Green Acres Tributary to a regional pond on the Meridian site, adjacent to Peoria Street.

Basin B (H140, H145, H150 & Portion of H160)

Basin B consists of approximately 310 acres of undeveloped land between Peoria Street and the site's western boundary. Green Acres Tributary (natural drainage channel) bisects this basin and intercepts surface runoff. It is assumed that any development within this 310-acre basin will provide corresponding water quality measures and detention storage for the major and minor storm events. Construction of a regional detention pond immediately upstream of the site is recommended in the UDFCD 2014 Major Drainageway Plan for Happy Canyon Creek (Airport 320 Pond).

Basin C (Portions of H170 & H180)

Basin C includes approximately 88 acres of existing Grand View Estates – a large rural residential lot development, which is tributary to Green Acres Tributary. These large lots have an approximate impervious value of 15%.

Natural drainage swales exist onsite that historically drain across the Compark Village South site to Green Acres Tributary. The existing surface runoff from Basin C will be intercepted by the proposed on-site storm drainage infrastructure and routed across Basin D to Green Acres Tributary.

Basin D (Portions of H160, H170 & H180)

Basin D includes approximately 100 acres of the site that drains directly into the Green Acres Tributary. Basin D comprises a majority of the proposed site development area. This basin will have an approximate improved site impervious value of 60%. Onsite flows will be combined with the discharge from Basins A, B, and C. A new regional pond is proposed on site for water quality and to attenuate stormwater peaks from basins C and D. This regional pond is referenced as the E-470 Pond in the UDFCD 2014 MDP.

Green Acres Tributary will intercept upstream flows from Basins A and B and will combine with future developed flows from Basins C and D. These combined flows will be routed through the proposed onsite regional detention pond and discharged through an existing drainage conveyance structure (12-ft by 10-ft RCBC) underneath C-470. Green Acres Tributary continues downstream through improved drainage channels and roadway crossing structures to converge with Happy Canyon Creek near Jordan Road within Arapahoe County. Note: The Arapahoe County portion of Green Acres Tributary is an unimproved channel segment.

A more detailed breakdown and analysis of these basins can be found on the Drainage Basin Map in Appendix H.

Basin E (Portion of H185)

Basin E is a small remnant basin within Green Acres Tributary basin that has been cutoff by the development of E-470 Tollway. Basin E is currently comprised of approximately 52 acres and includes a small portion of improved E-470 roadway and a larger portion of undeveloped property. E-470 construction provided a 48” diameter storm sewer system to collect and direct this basin area runoff under E-470. These basin flows merge back into Green Acres Tributary on the north side of E-470.

A small portion of the proposed site (+/- 10-acres) is impacted by existing topography and a natural drainage swale that directs offsite surface runoff across the very northwest corner of the site to the existing E-470 storm sewer entrance structure which is a multi-grate type D inlet.

Basin F (Portions of A360 & A370)

Basin F includes the remaining 45 acres of the site that drains directly into Happy Canyon Creek. The runoff from the developed portion of this basin will be treated by a proposed local water quality/detention pond prior to discharging into Happy Canyon Creek. This basin will have a low density and an approximate composite impervious value of 34%.

III. DRAINAGE CHANNELS

A. Happy Canyon Creek

Happy Canyon Creek is a major basin that is tributary to Cherry Creek. The portion of Happy Canyon Creek thalweg that extends through the proposed site is a natural sandy bottom channel. The thalweg has an existing natural meander bend located near the southwest corner of the site. No apparent head cutting exists within this channel reach. The active channel is a dry stream bed that experiences active flows during wet seasonal conditions.

As discussed earlier, a Zone AE and Zone X floodplain exist along Happy Canyon Creek. It is anticipated that bank stabilization will be required along the outer edges of the existing meander bends. No major channel improvements are contemplated for Happy Canyon Creek, except the future construction of a roadway bridge crossing needed for Belford Avenue and possible installation of grade control structures. This bridge structure will likely span the existing floodplain. Floodplain mitigation is anticipated through the thalweg. Felsburg Holt & Ullevig (FHU) has been contracted to perform the proposed bridge design and floodplain mitigation. All proposed improvements to Happy Canyon Creek will be addressed in a separate drainage report.

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Revised October 27, 2017

UDFCD and the Town of Parker have sponsored an update to the existing Happy Canyon Creek Outfall Systems Plan (OSP) and the 2014 Happy Canyon Creek Major Drainageway Plan (MDP). Any recommendations to channel upgrades to this reach of Happy Canyon Creek need to meet the recommendations of the OSP and 2014 MDP. Channel design and the Happy Canyon Creek bridge design must be reviewed and approved by UDFCD prior to the approval of associated drawings.

Note: All channel improvement design and construction shall meet the minimum requirements of the UDFCD maintenance eligibility program.

B. Green Acres Tributary

Green Acres Tributary is a sizeable drainage basin (approximately 920 ac as noted above) within the Happy Canyon Creek drainage basin. The portion of Green Acres Tributary thalweg that extends through the site begins at an existing 12-ft. x 10-ft. RCBC structure at E-470 and extends southwest upstream through the site to the southwest corner. This channel receives intermittent seasonal flows and is normally a dry stream bed. A small pocket of wetlands exists within the channel near the upper reach of the channel. The on-site wetland areas were determined to be isolated and non-jurisdictional. A current wetland determination prepared by ERO Resource Corporation has been submitted to the US Army Corps of Engineers for review and approval.

As discussed earlier, a Zone A non-detailed floodplain exists over a portion of the lower reach of the Green Acres Tributary channel near the E-470 box culvert. Channel improvements will be needed to stabilize the existing channel bed and allow for on-stream detention/water quality storage. Several roadway crossing structures will be required to provide access to future developed sites and to provide a channel crossing for Belford Avenue. As currently planned, the Green Acres Tributary will be realigned throughout the site. Significant channel drop occurs across the site. Some of this drop will be provided through the roadway crossing structures and the remaining drop will require stable drop structures strategically placed to minimize the difference in elevation between the proposed channel and the adjacent parcels to be developed.

Floodplain mitigation will be required to map the final floodplain through the site and mitigate the existing Zone A floodplain. A CLOMR has been obtained for the proposed improvements and a LOMR will be required after construction to complete this floodplain mitigation. See Appendix B

IV. DRAINAGE DESIGN CRITERIA

A. Regulations

The regulations, guidelines, and drainage design criteria to be used are those contained within the *Town of Parker Storm Drainage Design and Environmental Criteria* and the *Urban Storm Drainage Criteria Manual*. The general drainage concept is to construct a regional pond to provide detention for that portion of Green Acres Tributary basin downstream of the western limits of the proposed site and Grand View Estates. In addition, detention/water quality ponds will be required for all areas not treated by the proposed regional detention pond. Hydrodynamic separator water quality structures will be installed to treat runoff from developed areas prior to the runoff entering the Green Acres Tributary upstream of the proposed full spectrum regional detention pond.

B. Hydrologic Criteria

The Colorado Unit Hydrograph Procedure (CUHP) will be used in the runoff calculations of the site's historic and developed flows. The initial storm will be based on a five-year storm frequency. The major storm discharge will be calculated for the 100-year storm frequency. The pond outfall storm sewer will be designed for the 100-year storm. The Town of Parker intensity-frequency-duration curves will be used to determine the flows for each of the basins (refer to Appendix A). The final required volumes of the sediment and detention ponds will be determined using the *Town of Parker Storm Drainage Design and Environmental Criteria*. Allowable release rates for the regional detention pond will be based on release rates contained in the Happy Canyon Creek Major Drainageway Plan, March 2014.

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Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016
Revised December 20, 2016
Revised October 27, 2017

Future sizing of planned regional and sub-regional detention pond facilities shall follow the recommendations of UDFCD Outfall Systems Plan (OSP) and the 2014 Major Drainageway Plan for the Happy Canyon/Green Acres Tributary.

Based on the existing Grand View Estates Subdivision and the assumed imperviousness for the proposed site, preliminary sizing for the on-site regional detention was completed. Through the CLOMR process, the proposed detention pond was upsized from that required to meet Town of Parker/2014 MDP requirements to one sized to attenuate the proposed runoff from future development utilizing the hydrologic model contained in the 1993 OSP.

The proposed on-site regional water quality/detention pond will include a 5' deep permanent pool. An upstream water feature pond will also include a 5' permanent pool. The upstream pond is labeled as a water feature since its volume is not included in the calculations to meet the Town of Parker/UDFCD water quality/detention requirements. The proposed ponds will be online with the Green Acres Tributary. The proposed detention pond will discharge via an outlet structure to the existing 12'x10' RCBC beneath Highway E-470. This is in accordance with predeveloped conditions

The proposed regional pond (HCC MDP Basin GA350) planned within Basin D will be required to contain a combined storage for water quality and detention volume for the major storm event. The proposed pond will meet the recommendations of the UDFCD OSP and Major Drainageway Plan updates.

Model	100 yr Inflow to Det Pond	100 yr Outflow from Det Pond
1993 OSP Hydrology	2014 cfs	1394 cfs
Amended 2014 MDP Hydrology	588 cfs	570 cfs

The water quality/detention pond(s) in Basin F will be required to contain the combined total storage for water quality and detention volume for the major storm event. Detention/Water Quality shall be designed to meet the minimum requirements of the UDFCD OSP and the Town of Parker requirements.

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The Green Acres Tributary will be designed to carry the initial storm, 5 yr frequency, in the low flow channel and the major storm, 100 yr frequency, within its top of bank. A gravel maintenance path will follow the channel at an elevation at least 12" above the 100 yr water surface elevation. The channel will be seeded with riparian seed. Slopes of the channel were minimized to obtain a velocity less than 6 ft/s to discourage erosion of the channel. The USACOE HEC-RAS model was run to determine the 100 yr water surface limits and the velocities within the channel and over the proposed sculpted concrete drop structures. The channel will flow through a 28'x11' arch culvert under the proposed Belford Avenue. The channel will consist of a 10' wide x 2.5' deep concrete channel and 10' concrete maintenance trail through the culvert. The trail will slope at 2% toward the channel and will have a 6" curb to separate it from the drainage channel. The curb will contain curb cuts to allow runoff to enter the channel. From the results of the HEC-RAS model, the trail under Belford Avenue will be inundated during 5 yr frequency storms and greater. The GAT maintenance trail for the rest of the project is located at least 12" above the 100 yr storm elevation of the channel.

The proposed sculpted concrete drop structures have been strategically placed at proposed road crossings, i.e. Belford Avenue and two future road crossings and the inflow points into the proposed ponds. Two HEC-RAS models were created. One for the current proposed condition including the Belford Avenue arch culvert and one for the future condition including two 20'x6' box culverts for future road crossings. The associated upstream sculpted concrete drops and downstream concrete drop outfalls for the proposed and future road crossings will be installed with the Green Acres Tributary, Compark Village South Filing No. 1 project. The velocities across the proposed sculpted concrete drop structures were analyzed to ensure that they will not exceed the erosive velocity for concrete, i.e. 13 ft/s, as this will be the limiting material of the structures. The maximum velocity for the convex drops into the proposed ponds is 7 ft/s, but the average was 4.5 ft/s. This is well below the erosive velocity for concrete.

C. Variance from Criteria

Because the proposed regional detention pond is a wet pond, UDFCD has indicated it is not eligible for full maintenance eligibility. They indicated it is eligible for maintenance of the proposed outlet structure, forebays and maintenance trail. They also indicated the proposed water feature pond is not eligible for maintenance.

The Town of Parker Storm Drainage and Environmental Criteria Manual, section 2.4.2.2 “requires all major drainage facilities located outside of street rights-of-way be eligible for UDFCD’s maintenance program as a pre-condition of approval”. A variance from this requirement has been granted by the Town. See Appendix C.

V. ENVIRONMENTAL PROTECTION CRITERIA

A. General

Site drainage improvements are intended to minimize the impact to the environment.

B. Construction BMP Plan

Construction BMPs shall be placed during the appropriate construction phases to minimize soil erosion and the movement of sediment offsite. Construction BMPs shall be placed in two phases (Phase A and Phase B). The intent of the Phase A BMPs are to fulfill water quality objectives during the overlot and roadway rough grading phase of the project. Once Phase A rough grading and earthmoving is completed, Phase B BMP placement will commence. Phase B includes fine grading, utility construction, and street construction. Construction Plans will contain all appropriate Stormwater Management Details. In addition, a Stormwater Management Plan will be prepared to meet the town of Parker, State of Colorado, and Environmental Protection Agency criteria.

VI. CONCLUSION

This final drainage report complies with all major standards of the Town of Parker and the Urban Drainage Flood Control District. This overall plan for the site's drainage design is effective and economical for controlling damage due to excess storm runoff and minimizing erosive discharges. This plan is intended to integrate into the future basin planning efforts by UDFCD, Douglas County and the Town of Parker when the Happy Canyon Creek Outfall System Planning study is updated.

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APPENDIX D

Excerpts from Happy Canyon Major Drainageways Plan

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Revised October 21, 2016

HappyCanyonMDP_ConceptualDesign_FINAL-03-14.pdf - Adobe Reader
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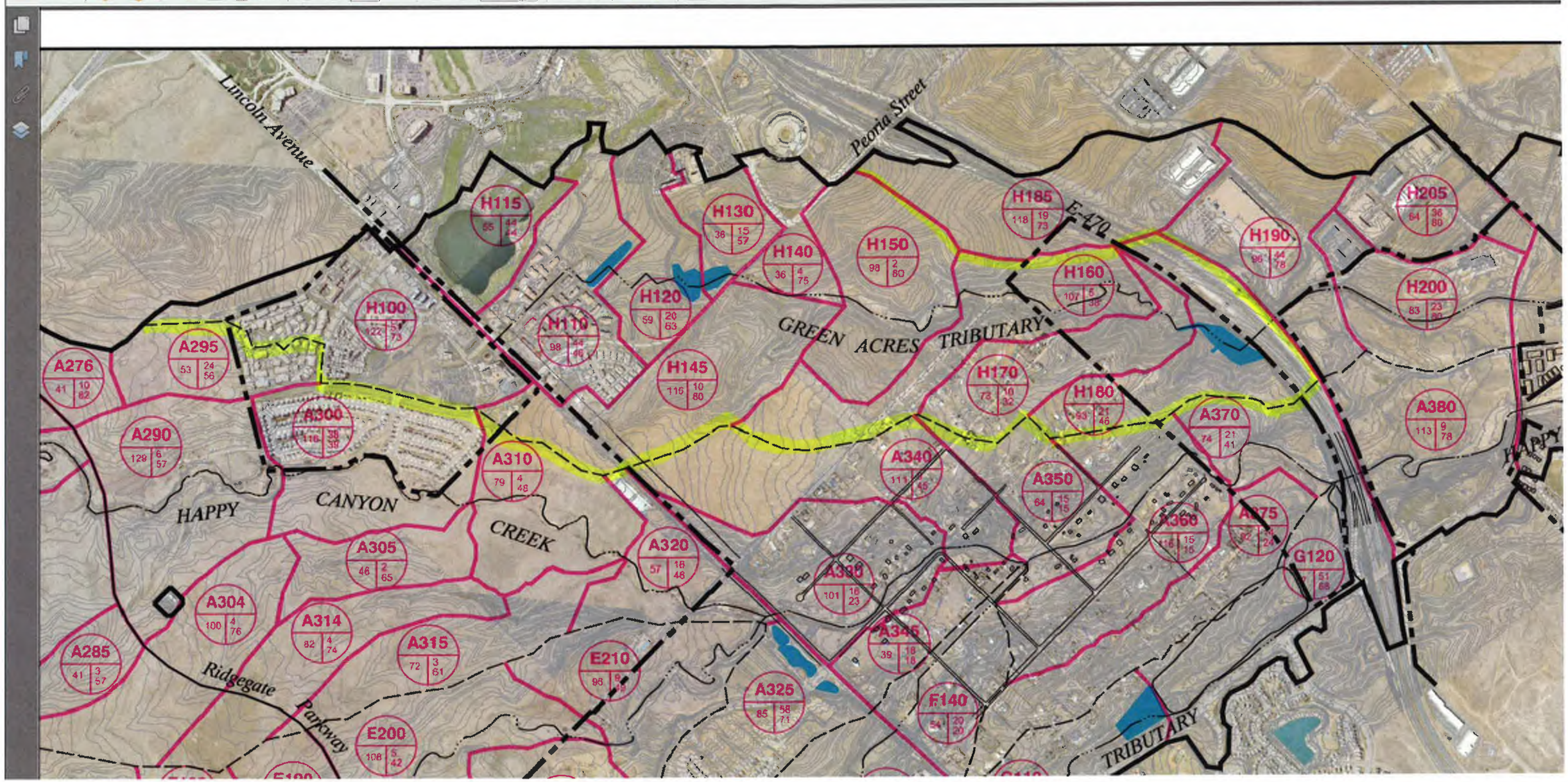
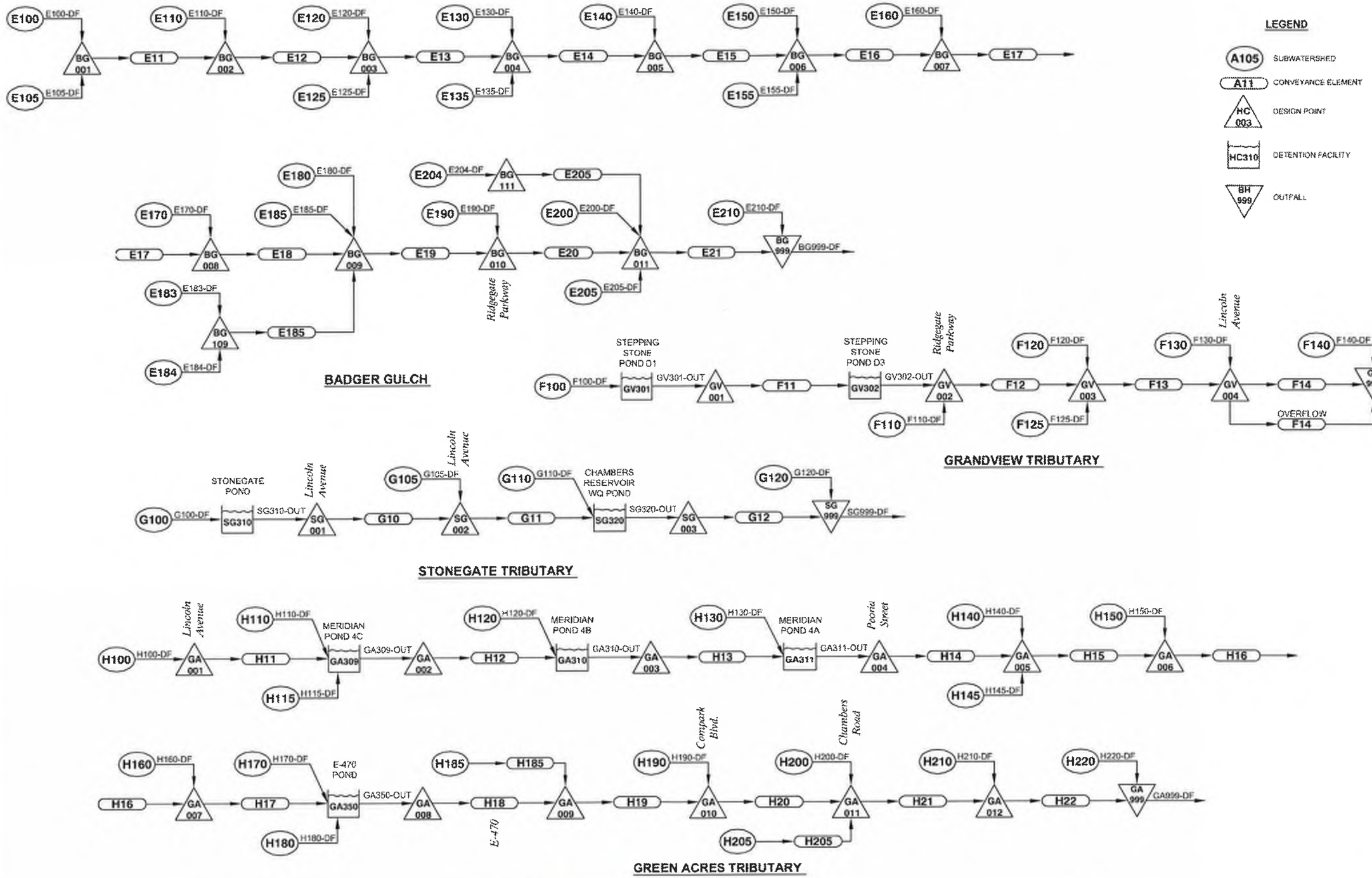




MULLER ENGINEERING CO., INC.
CONSULTING ENGINEERS
777 SOUTH WADSWORTH BLVD. # 130
LAKEWOOD, CO 80226
PROJECT NO. 12-010.01
(303) 988-6998

DESIGN MDC
DRAWN JHK
CHECK JTW

HAPPY CANYON CREEK
MAJOR DRAINAGEWAY PLAN

SWMM SCHEMATIC
LOWER TRIBUTARIES

DATE: JULY 2013
FIGURE NO. B-5

	Area		Dist to Centroid		Length		Length-Weighted Slope	Weighted % Impervious		Depression Storage		Infiltration			Corresponding Basin IDs - 1993 OSP
								Existing	Future	Pervious	Impervious	Initial Rate	Decay Coeff.	Final Rate	
Subwatershed ID	acres	sq mi	ft	mi	ft	mi	ft/ft	%	%	watershed in	watershed in	in/hr	1/second	in/hr	
E204	42	0.06605	1067	0.202	2541	0.481	0.0294	2.0	71.6	0.5	0.1	3	0.0018	0.5	94
E205	100	0.15620	1948	0.369	4214	0.798	0.0320	35.2	52.8	0.5	0.1	3.15	0.0018	0.51	94
E210	96	0.14956	2674	0.507	5765	1.092	0.0159	9.2	49.3	0.5	0.1	3.825	0.0018	0.555	98
Grandview Tributary															
F100	93	0.14511	800	0.152	2700	0.511	0.0308	2.0	56.8	0.5	0.1	3	0.0018	0.5	100
F110	105	0.16378	880	0.167	2240	0.424	0.0234	6.5	52.5	0.5	0.1	3	0.0018	0.5	100,101,103
F120	124	0.19354	1990	0.377	3526	0.668	0.0282	38.3	55.6	0.5	0.1	3.075	0.0018	0.505	101,102,103
F125	70	0.10874	1339	0.254	3288	0.623	0.0252	2.0	50.0	0.5	0.1	3.675	0.0018	0.545	101,103,104
F130	107	0.16717	1518	0.287	3294	0.624	0.0217	4.7	51.4	0.5	0.1	3.675	0.0018	0.545	104
F140	54	0.08509	2009	0.380	4129	0.782	0.0215	19.6	19.6	0.5	0.1	4.05	0.0018	0.57	105
Stonegate Tributary															
G100	112	0.17554	3093	0.586	6705	1.270	0.0154	2.0	50.0	0.5	0.1	3.075	0.0018	0.505	107
G105	43	0.06657	1219	0.231	3081	0.584	0.0194	50.0	50.0	0.5	0.1	3.825	0.0018	0.555	107
G110	73	0.11451	1596	0.302	3413	0.646	0.0227	22.8	22.8	0.5	0.1	4.05	0.0018	0.57	108,111
G120	87	0.13633	2412	0.457	4933	0.934	0.0215	50.5	68.3	0.5	0.1	4.5	0.0018	0.6	111
Green Acres Tributary															
H100	122	0.19127	1349	0.255	5346	1.013	0.0122	51.2	72.6	0.5	0.1	3	0.0018	0.5	119,67,121
H110	98	0.15386	557	0.105	1981	0.375	0.0186	44.4	46.4	0.5	0.1	3	0.0018	0.5	120,124
H115	55	0.08578	691	0.131	1531	0.290	0.0131	44.4	44.4	0.5	0.1	3	0.0018	0.5	119,120
H120	59	0.09167	1533	0.290	2500	0.473	0.0165	19.5	63.0	0.5	0.1	3	0.0018	0.5	120,123
H130	36	0.05656	810	0.153	2112	0.400	0.0172	15.2	56.9	0.5	0.1	3	0.0018	0.5	123,124
H140	36	0.05631	1750	0.331	3054	0.578	0.0235	3.5	75.0	0.5	0.1	3.375	0.0018	0.525	123,124,125
H145	116	0.18173	2457	0.465	5742	1.088	0.0167	10.2	79.6	0.5	0.1	3.075	0.0018	0.505	68,124
H150	98	0.15282	637	0.121	2590	0.491	0.0323	2.0	80.0	0.5	0.1	3.6	0.0018	0.54	125
H160	107	0.16661	3461	0.655	6975	1.321	0.0172	5.2	37.7	0.5	0.1	3.675	0.0018	0.545	125,129
H170	73	0.11465	1902	0.360	4331	0.820	0.0214	10.0	32.3	0.5	0.1	3.75	0.0018	0.55	128
H180	93	0.14542	1094	0.207	3929	0.744	0.0191	21.1	45.7	0.5	0.1	3.75	0.0018	0.55	131
H185	118	0.18474	1850	0.350	5098	0.966	0.0219	19.0	73.3	0.5	0.1	3	0.0018	0.5	130,132
H190	96	0.15048	561	0.106	2865	0.543	0.0348	43.8	77.6	0.5	0.1	3.375	0.0018	0.525	132,133
H200	83	0.12951	1236	0.234	3650	0.691	0.0189	23.4	80.0	0.5	0.1	3.9	0.0018	0.56	132,133,114,134
H205	64	0.10061	820	0.155	1900	0.360	0.0349	35.8	80.0	0.5	0.1	3.75	0.0018	0.55	132,133,134
H210	120	0.18689	1520	0.288	3320	0.629	0.0222	4.9	78.6	0.5	0.1	3.8	0.00169	0.59	133,115,134,135
H220	50	0.07869	1530	0.290	2490	0.472	0.0269	4.4	64.0	0.5	0.1	3.55	0.00158	0.61	135,116

Storage Curve			Outlet Curve	
Elevation (ft)	Stage (ft)	Area (sq ft)	Stage (ft)	Discharge (cfs)
Chambers Reservoir WQ Pond (SWMM element SG320)				
5837.2	0	0	0.0	0
5838	0.8	334	0.8	0.4
5840	2.8	47285	2.8	2.2
5840.3	3.1	51599	3.1	2.5
5842	4.8	88359	4.8	3.7
5844	6.8	110216	6.8	64.7
5846	8.8	124039	8.8	75.1
5848	10.8	137906	10.8	2671
5849	11.8	145138	11.8	4890
Stonegate Pond (SWMM element SG310)				
5886.3	0	260	0.0	0.00
5887	1	4340	0.7	0.13
5888	2	9086	1.7	0.40
5889	3	24864	2.7	0.75
5890	4	52193	3.7	1.18
5891	5	77199	4.7	1.66
5892	5.7	94517	5.7	2.20
5893	6.7	105201	6.7	7.05
5894	7.7	112546	7.7	32.5
5895	8.7	120451	8.7	41.8
5896	9.7	127914	9.7	43.9
5897	10.7	135421	10.7	45.8
5898	11.7	147109	11.7	47.7
5899	12.7	160614	12.7	49.5
E-470 Pond (SWMM element GA350)				
5782	0	200	0	103
5784	2	21000	2	291
5786	4	58900	4	531
5788	6	115100	6	813
5790	8	192300	8	1134
5792	10	269600	10	1467

Storage Curve			Outlet Curve	
Elevation (ft)	Stage (ft)	Area (sq ft)	Stage (ft)	Discharge (cfs)
Meridian Pond 4A (SWMM element GA311)				
5888.5	0	11333	0.0	0.0
5889	0.5	15901	0.5	0.0
5890	1.5	34312	1.5	0.11
5891	2.5	52329	2.5	0.51
5892	3.5	64920	3.5	1.06
5893	4.5	70257	4.5	1.73
5894	5.5	75559	5.5	58.1
5895	6.5	79701	6.5	219
5896	7.5	83843	7.5	290
5897	8.5	87985	8.5	337
Meridian Pond 4B (SWMM element GA310)				
5891.5	0	0	0.0	0.0
5892	0.5	348	0.5	3.26
5893	1.5	5730	1.5	16.9
5894	2.5	24126	2.5	36.5
5895	3.5	53961	3.5	60.4
5896	4.5	92234	4.5	75.7
5897	5.5	126509	5.5	118
5898	6.5	146888	6.5	147
5899	7.5	153323	7.5	161
5900	8.5	159889	8.5	173
5901	9.5	166733	9.5	185
5902	10.5	173678	10.5	197
5903	11.5	180632	11.5	207
5904	12.5	187664	12.5	217
5905	13.5	194696	13.5	452
5906	14.5	201728	14.5	677
Meridian Pond 4C (SWMM element GA309)				
5917	0	10	0	0.00
5918	1	2120	1	9.22
5919	2	15960	2	26.1
5920	3	33760	3	55.3
5921	4	42906	4	94.6
5922	5	51523	5	160
5923	6	60321	6	258
5924	7	78033	7	268
5925	8	184401	8	278
5926	9	190000	9	437
5927	10	195600	10	711

Storage Curve			Outlet Curve	
Elevation (ft)	Stage (ft)	Area (sq ft)	Stage (ft)	Discharge (cfs)
Stepping Stone Pond D1 (SWMM element GV301)				
6007.5	0	10	0.0	0.0
6008	0.5	2672	0.5	1.3
6009	1.5	13483	1.5	13.20
6010	2.5	27296	2.5	30.90
6011	3.5	44579	3.5	52.20
6012	4.5	66756	4.5	71.20
6013	5.5	76808	5.5	86.4
6014	6.5	86899	6.5	99
6015	7.5	96990	7.5	151
6016	8.5	107081	8.5	484
Stepping Stone Pond D3 (SWMM element GV302)				
5973.5	0	76487	0.0	0.0
5974	0.5	114069	0.5	0.21
5975	1.5	122270	1.5	0.5
5976	2.5	131136	2.5	13.7
5977	3.5	138533	3.5	87.0
5978	4.5	147406	4.5	193.8
5979	5.5	157864	5.5	207
5980	6.5	167217	6.5	220
5981	7.5	176570	7.5	390
5982	8.5	185923	8.5	915
5983	9.5	195276	9.5	1677

SWMM Node	Station (ft)	Channel Reach	Landmark	Design Storm	EXISTING DEVELOPMENT 500-YR (cfs)	100-YR (cfs)	50-YR (cfs)	25-YR (cfs)	10-YR (cfs)	5-YR (cfs)	2-YR (cfs)	FUTURE DEVELOPMENT 500-YR (cfs)	100-YR (cfs)	50-YR (cfs)	25-YR (cfs)	10-YR (cfs)	5-YR (cfs)	2-YR (cfs)
HC124				2-hr	75	52	38	28	13	7	0.8	154	119	101	85	59	50	31
HC123				2-hr	116	82	61	45	20	11	1.4	235	183	155	131	93	78	49
HC122				2-hr	54	38	29	21	9	5	0.5	99	76	63	52	35	28	16
HC119				2-hr	195	136	101	74	31	16	1.0	276	200	157	122	66	45	18
HC117				2-hr	294	205	155	114	49	25	1.5	328	231	177	133	62	36	6
HC116				2-hr	141	99	75	56	25	13	0.8	173	124	96	74	37	24	6
HC104				2-hr	417	304	244	193	115	82	36	417	304	244	193	115	82	36
HC103				2-hr	371	279	231	187	126	97	52	371	279	231	187	126	97	52
GREEN ACRES TRIBUTARY																		
GA999	70000		Confluence w/ Happy Canyon	2-hr	1249	882	667	507	253	165	69	1874	1446	1182	986	669	545	317
GA012	71400			2-hr	1193	844	640	488	257	169	70	1780	1377	1125	940	640	521	304
GA011	73700		Chambers Road	2-hr	1041	740	563	434	240	166	73	1543	1199	979	819	559	454	265
GA010	76300		Compark Boulevard	2-hr	819	580	431	332	191	158	64	1253	976	800	667	454	367	213
GA009	77200		E-470 (D/S)	2-hr	703	495	368	293	187	176	86	1106	861	710	589	396	320	200
GA008	77700		E-470 (U/S) / E-470 Pond Outflow	2-hr	594	420	332	269	171	141	70	891	688	567	470	319	249	144
GA350	77700		E-470 Pond Inflow	2-hr	600	422	332	270	171	115	47	961	725	586	479	319	250	144
GA007	79200			2-hr	481	355	287	240	159	110	46	680	522	430	357	287	229	118
GA006	82600		NW Corner of Grandview Estates (approx.)	2-hr	423	320	265	228	158	114	50	592	457	383	322	267	218	115
GA005	84600			2-hr	378	288	247	217	157	115	51	475	385	335	297	241	201	111
GA004	86000		Peoria Street / Meridian Pond 4A Outflow	2-hr	303	212	193	176	137	106	50	332	224	207	193	164	141	81
GA311	86000		Meridian Pond 4A Inflow	2-hr	326	213	194	178	139	111	65	383	226	208	194	166	143	87
GA003	86600		Meridian Pond 4B Outflow	2-hr	308	201	182	165	132	106	63	357	212	195	178	151	132	80
GA310	86600		Meridian Pond 4B Inflow	2-hr	580	420	324	303	203	155	79	617	477	366	335	256	204	112
GA002	87000		Mt Belford Avenue / Meridian Pond 4C Outflow	2-hr	519	361	276	264	182	141	74	559	394	301	271	212	169	92
GA309	87000		Meridian Pond 4C Inflow	2-hr	662	499	410	334	215	169	91	709	540	450	371	249	202	115
GA001	89600		Lincoln Avenue	2-hr	261	197	162	133	87	69	39	299	232	196	165	116	98	61
STONEGATE TRIBUTARY																		
SG999	90000		Confluence w/ Happy Canyon	2-hr	186	131	98	75	46	36	22	201	143	110	92	62	51	32
SG003	94500		Chambers Reservoir WQ Pond Outflow	2-hr	74	65	50	36	16	4	3	127	69	61	42	18	6	3
SG320	94500		Chambers Reservoir WQ Pond Inflow	2-hr	191	139	109	86	47	33	17	191	140	109	86	47	34	17
SG002	97500		Lincoln Avenue	2-hr	85	64	52	43	27	21	12	96	66	53	44	28	22	13
SG001	97300		Stonegate Pond Outflow	2-hr	35	21	9	4	2	1.0	0.2	45	41	35	26	11	5	2
SG310	97300		Stonegate Pond Inflow	2-hr	89	62	45	33	15	7	0.5	167	126	103	84	54	43	23
GRANDVIEW TRIBUTARY																		
GV999	110000		Confluence w/ Happy Canyon	2-hr	602	394	277	215	123	76	30	846	629	482	374	221	163	96
GV004	112900		Lincoln Avenue	2-hr	561	364	269	207	104	68	27	811	604	463	359	214	169	93
GV003	116500		Meridian Filing No. 7 / Sierra Ridge Boundary	2-hr	448	290	209	165	94	68	32	620	475	365	284	173	129	74
GV002	120100		Main Street / Stepping Stone Pond D3 Outflow	2-hr	194	133	90	58	9	0	0	219	198	169	136	85	60	13
GV302	120100		Stepping Stone Pond D3 Inflow	2-hr	286	210	165	127	61	35	5	431	337	287	241	166	136	80
GV001	121200		Stepping Stone Pond D1 Outflow	2-hr	97	78	64	51	25	14	1	200	119	94	84	65	57	36
GV301	121200		Stepping Stone Pond D1 Inflow	2-hr	182	128	98	73	33	18	1	327	249	208	172	119	96	55

NOTES:
1. THIS DRAWING IS FOR MASTER PLANNING PURPOSES AND REPRESENTS PRELIMINARY AND CONCEPTUAL ENGINEERING. ALTERNATIVES TO THIS OUTFALL SYSTEM WILL BE CONSIDERED BY LOCAL AGENCIES AND THE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT PROVIDED THE ALTERNATIVE OFFERS AN EQUIVALENT MEAT OF THE PLAN, INCLUDING HYDRAULIC CAPACITY, WATER QUALITY, STREAM STABILITY AND NATURAL WATERWAY FEATURES. THE ALTERNATIVE MUST COMPLY WITH ALL REQUIREMENTS OF THE LOCAL JURISDICTION AND THE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT. IN ADDITION, THERE MAY BE STATE AND FEDERAL REQUIREMENTS THAT WILL NEED TO BE CONSIDERED AND MET. THIS DRAWING DOES NOT PROVIDE A FINAL DESIGN AND SHALL NOT BE USED FOR CONSTRUCTION PURPOSES.
2. LOCAL CITIES, TOWNS, AND COUNTIES MANAGE AND REGULATE ALL LAND USE CHANGE, DEVELOPMENT AND REDEVELOPMENT ACTIVITIES WITHIN AND ADJACENT TO THE 100-YEAR FLOODPLAINS IN ORDER TO PREVENT, TO A MAXIMUM EXTENT POSSIBLE, FUTURE FLOOD DAMAGES TO BUILDINGS AND STRUCTURES FROM THE 100-YEAR FLOOD AND TO MINIMIZE DAMAGES FROM LARGER FLOODS. THE RECOMMENDATIONS OF THE PLAN PROVIDE A SET OF OPTIONS SUBSCRIBED TO BY CITIES, TOWNS AND COUNTIES IN CARRYING OUT THEIR FLOODPLAIN MANAGEMENT AND REGULATORY RESPONSIBILITIES AND OBLIGATIONS.
3. MANY ACTIVITIES THAT OCCUR IN OR AFFECT DITCHES, DRAINAGES, CREEKS, PONDS OR WETLANDS REQUIRE A SECTION 404 PERMIT AUTHORIZATION FROM THE US ARMY CORPS OF ENGINEERS. DURING PRELIMINARY DESIGN AND PRIOR TO FINAL DESIGN OR STARTING WORK, CONTACT THE CORPS' DENVER REGULATORY OFFICE AT 303-979-4120 FOR APPROPRIATE PERMIT AUTHORITY TO AVOID COMPROMISING AND DELAYING THE COMPLETION OF THE PROJECT.
E-470
5810
5800
5790
Green Acres Tributary
FULL SPECTRUM OUTLET STRUCTURE
PROPOSED MAINTENANCE ACCESS/RECREATIONAL TRAIL
PROPOSED 100-YEAR WATER SURFACE
N
HYDRAULIC INFORMATION
EXTENDED DETENTION
100-YR
VOL. A.F.
11
18
WS EL.
5786.5
5791
RELEASE RATE, CFS
25
333
MULLER ENGINEERING CO., INC.
HAPPY CANYON CREEK
MAJOR DRAINAGEWAY PLAN
CONCEPTUAL DESIGN
E-470 POND PLAN
MARCH 2014
C-4

APPENDIX E

Basin Hydrology & SWMM Update

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016

Basin Hydrology & SWMM Update

A copy of the CUHP and SWMM models associated with the latest Happy Canyon Creek Major Drainageway Plan was obtained from UDFCD. This model was run unedited as a calibration model. The results represented the values shown in the 2014 MDP, prepared by Muller Engineering Company, Inc.

The MDP model included a regional detention pond in the area of the existing natural low area just upstream of the existing 12'x10' RCBC that conveys the Green Acres Tributary under E-470. This model was edited to include the stage/storage pairs obtained from a current topographic survey of existing conditions in this area. Key nodes were compared with the original model. This data can be seen in the attached table.

The model was then revised to include the sizing proposed in the Manhard Consulting design of the regional detention pond. The differences between the inflows at the key nodes were not significant when compared with the original model utilized for the Happy Canyon Creek MDP.

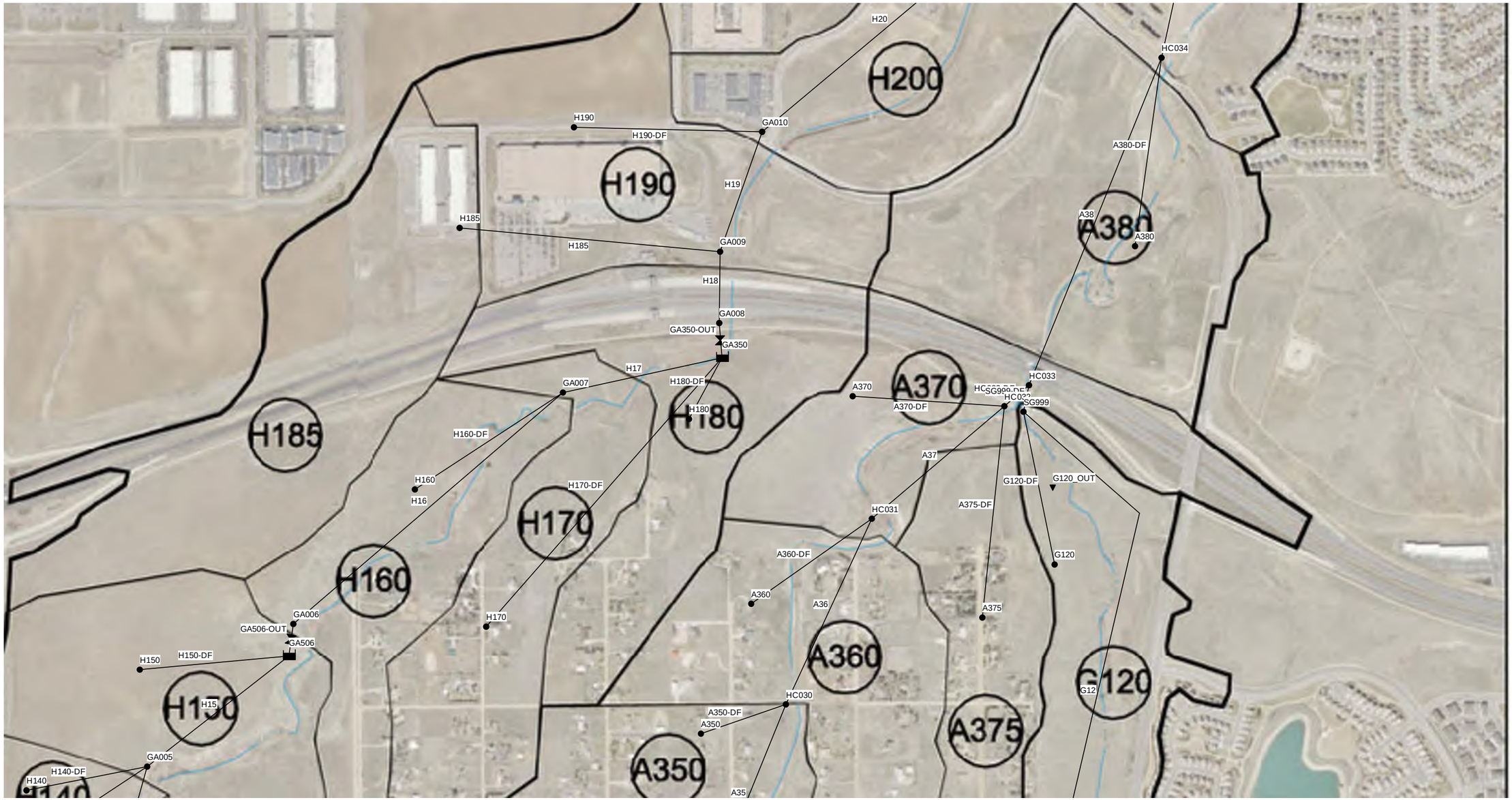
Given the details of the proposed development of Compark South, Manhard Consulting prepared a more detailed delineation of the sub-basin areas in this area. Some of the existing sub-basins included in the 2014 Happy Canyon MDP were also revised per more detailed information currently available. These revised drainage basins were input into the original MDP model as a calibration between the proposed Manhard model and the original MDP model. A comparison of the node inflows at key nodes within the model can be seen in the attached table.

As stated before, Manhard Consulting has re-delineated some of the drainage basins for Green Acres Tributary to better reflect the new development and more accurately evaluate the hydrology for the area. Basin H150 has been expanded to include portions of basin H160 and basin A340 from the 2014 MDP model. Basin H160 was reduced in size and split into two basins, creating a new basin (H161) to coincide with the residential development to the south of Belford Ave. H170 and 180 were split into two basins, creating two new basins (H171 and H181), also to coincide with the residential development to the south of Belford Ave. The northern portions of the original 2014 MDP basins H160, H170, and H180 were combined and now make up a new basin, H182, which includes the detention pond just south of E-470. An even further north portion of the original 2014 MDP basin H180, which includes a stretch of E-470, was combined with a small portion of the 2014 MDP basin A190 to form the new basin H183. Originally, most of this area was shown to be routed through the detention pond to the south of E-470, but based on as-built information obtained from E-470 Public Highway Authority we believe this area actually discharges, undetained, to Green Acres Tributary, just to the north of the box culvert that runs under E-470. Original MDP basins H185 and H190 were each split into two basins, creating two new basins (H186 and H191, respectively).

Once the drainage area basins were revised and the model seemed to represent the original MDP model, the proposed Manhard regional detention pond design criteria and the proposed design of the Green Acres Tributary channel were entered into the model while retaining the original routing of the MDP model. These results can be seen in the attached table. Another model was then run with a new routing network to more accurately show the designed flow paths given the new basin delineation and proposed infrastructure. This model also adds of a portion of Basin A340 (originally tributary to Happy Canyon Creek) to Basin H150. We believe this area will actually be tributary to the Green Acres Tributary. The main difference between the routing of the Manhard model and the MDP model is that basin H183 runoff is routed straight to Node GA010. In the MDP model a large portion of this drainage basin was shown draining to the E-470 pond. However, the portion north of E-470 will not drain south under E-470 to the pond. A final model was run to show the effects of a hypothetical regional detention pond before node GA010 to detain runoff from Basins H185, H186 and H190.

From the attached comparison of model results, it can be concluded that the proposed regional detention pond will meet the recommendations included in the 2014 Happy Canyon Major Drainageway Plan.

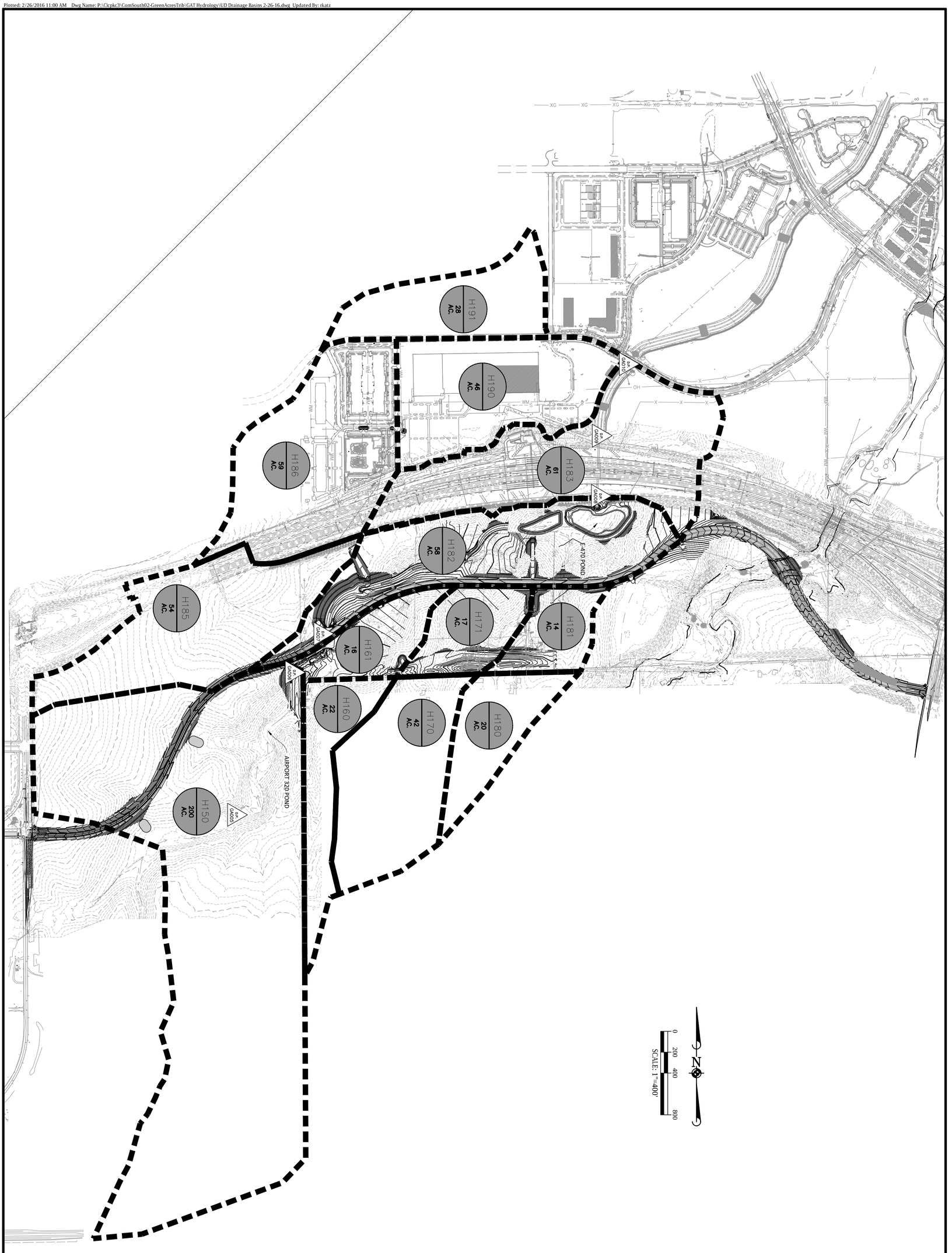
HAPPY CANYON CREEK MDP & FHAD



COMPARK VILLAGE SOUTH

01/01/2005 00:01:00

Plotted: 2/26/2016 11:00 AM Dwg Name: P:\Clcpkc3\ComSouth02-GreenAcresTrib\GAT Hydrology\UD Drainage Basins 2-26-16.dwg Updated By: rkatz



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SHEET 1 OF 1
CLCPKC3

DATE: 11-20-15
PROJ. MGR.: RAK
PROJ. ENGR.: RAK
DES. BY:

PROFESSIONAL ENGINEER
COLORADO REGISTERED
RICHARD T. KATZ
30877

COMPARK SOUTH

TOWN OF PARKER, CO

SWMM Model Drainage Area Map

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Civil Engineers • Surveyors • Water Resource Engineers • Water & Wastewater Engineers
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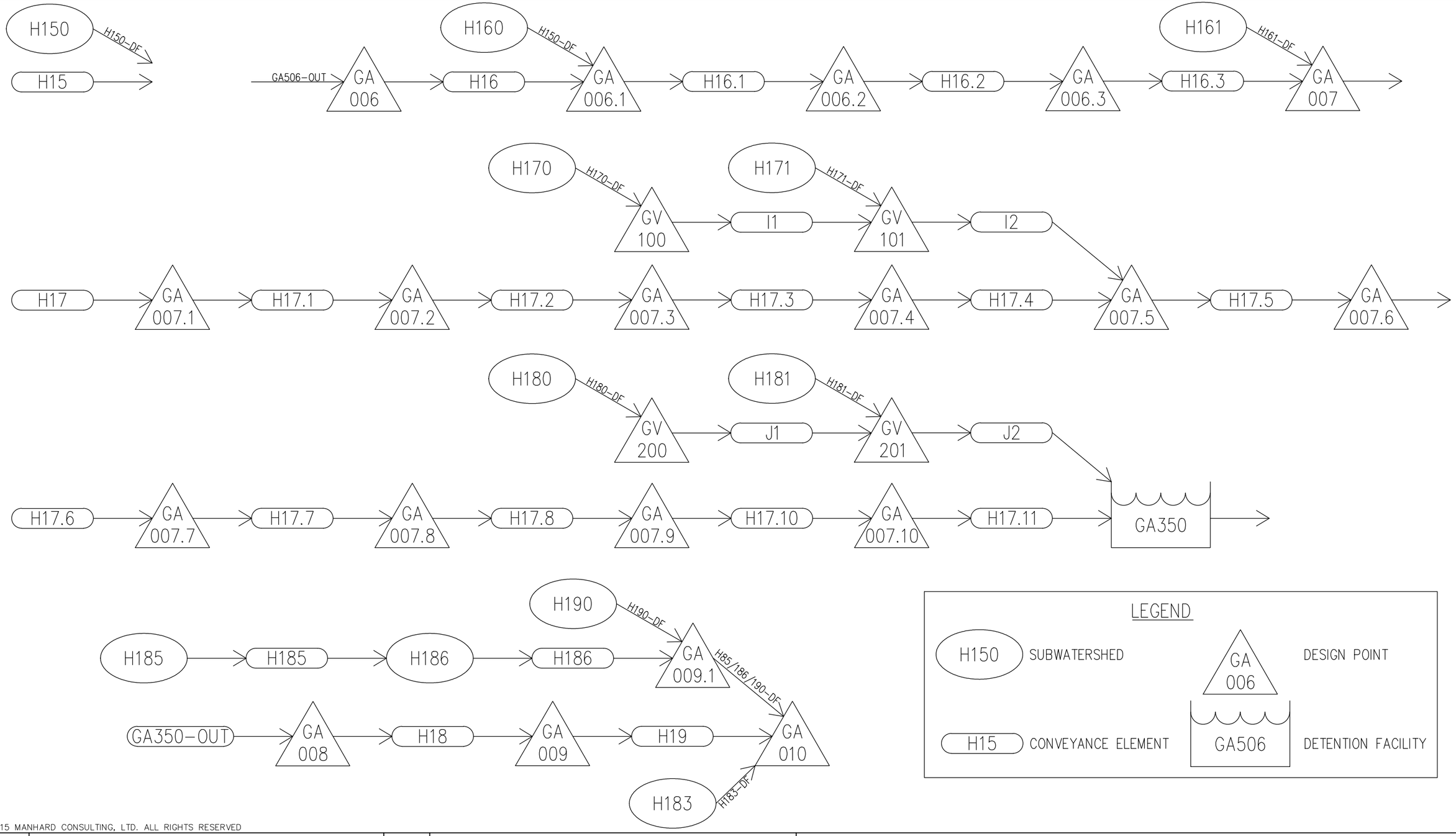
DATE	REVISIONS	DRAWN BY

E-470 Natural Ex. Det Basin
Stage - Discharge

Elevation (ft)	H (ft)	L (ft)	Q_w (cfs)	HW (ft)	TW (ft)	Q_{cul} (cfs)	Q_{rel} (cfs)	Area (sf)	Vol. (AF)
5782.5	0	26	0.0	5782.5	5772.0	0.0	0.0	0	0.00
5783	0.5	26	34.0	5783	5774.1	185.5	34.0	936	0.00
5784	1.5	26	143.3	5784	5774.3	280.0	143.3	9,967	0.11
5785	2.5	28.4	336.8	5785	5774.6	384.4	336.8	24,707	0.50
5786	3.5	30.7	603.1	5786	5775.0	500.0	500.0	41,715	1.25
5787	4.5	32.9	942.2	5787	5775.3	626.3	626.3	68,834	2.51
5788	5.5	35.2	1362.1	5788	5775.6	760.0	760.0	99,020	4.42
5789	6.5	37.4	1859.4	5789	5775.9	902.9	902.9	132,636	7.07
5790	7.5	39.7	2446.3	5790	5776.3	1051.7	1051.7	166,976	10.50
5791	8.5	41.9	3115.0	5791	5776.6	1210.0	1210.0	206,888	14.76
5792	9.5	41.9	3680.6	5792	5776.8	1376.7	1376.7	243,993	19.93
5793	10.5	41.9	-	5793	5777.0	1508.0	1508.0	284,008	25.98
5794	11.5			5794	5777.1	1620.0	1620.0	315,488	32.86
5795	12.5			5795	5777.2	1730.0	1730.0	348,125	40.48
5796	13.5			5796	5777.4	1840.0	1840.0	381,674	48.85

E-470 Proposed Regional FS Pond
Lower Pond Stage - Discharge

Elevation (ft)	WQ H (ft)	Q (cfs) WQ Plate	Q_w H (ft)	Q_w (cfs) 100' Weir @ 5788.5	Q_{BC} H (ft)	Q (cfs) 22.5'x4' RCBC @ 5782.5	Q_{EX} H (ft)	Q (cfs) 12'x10' EX RCBC @5779.78	Q_{rel} (cfs)	Area (sf)	Vol. (AF)	
5786	0.0	0.7			3.5		6.22		0.7	102,775.14	0.00	
5786.5	0.5	1.3			4.0		6.72		1.3	114,436.35	1.25	
5787	1.0	1.9			4.5		7.22		1.9	126,508.10	2.63	
5787.5	1.5	2.5			5.0		7.72		2.5	134,817.54	4.13	
5788	2.0	2.9			5.5		8.22		2.9	143,301.36	5.72	EURV
5788.5	2.5	3.2	0	0.0	6.0	715	8.72	866.2	3.2	150,562.37	7.41	V=7.7 ac-ft
5789	3.0	3.5	0.5	106.1	6.5	770	9.22	942.2	109.6	157,942.05	9.18	El 5788.5
5789.5	3.5	3.8	1	300.0	7.0	825	9.72	1019.4	303.8	167,505.63	11.05	
5790	4.0	4.1	1.5	551.1	7.5	880	10.22	1100.0	555.2	177,254.82	13.03	100 yr
5790.5	4.5	4.3	2	848.5	8.0	936	10.72	1180.7	852.8	185,058.87	15.11	V=13.1 ac-ft
5791	5.0	4.6	2.5	1185.9	8.5	993	11.22	1263.8	993.0	192,974.20	17.28	El 5790.0
5791.5	5.5	4.8	3	1558.9	9.0	1049	11.72	1350.0	1049.0	201,292.94	19.54	
5792	6.0	5.0	3.5	1964.4	9.5	1106	12.22	1414.1	1106.0	209,727.89	21.90	
5792.5	6.5	5.2	4	2400.0	10.0	1163	12.72	1468.1	1163.0	260,781.31	24.59	
5793	7.0	5.4	4.5	2863.8	10.5	1220	13.22	1526.3	1220.0	315,416.45	27.89	
5793.5	7.5	5.6	5	3354.1	11.0	1278	13.72	1595.7	1278.0	323,554.61	31.56	
5794	8.0	5.8	5.5	3869.6	11.5	1333	14.22	1666.2	1333.0	331,761.59	35.32	
5794.5	8.5	6.0	6	4409.1	12.0	1385	14.72	1733.8	1385.0	338,525.13	39.17	
5795	9.0	6.1	6.5	4971.5	12.5	1431	15.22	1800.0	1431.0	345,334.02	43.09	
5795.5	9.5	6.3	7	5556.1	13.0	1475	15.72	1861.0	1475.0	350,826.56	47.09	
5796	10.0	6.5	7.5	6161.9	13.5	1519	16.22	1921.43	1519.0	356,348.00	51.15	



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DATE	REVISIONS	DRAWN BY

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Construction Managers • Environmental Scientists • Landscape Architects • Planners

AMENDMENT TO "HAPPY CANYON CREEK MAJOR DRAINAGEWAY PLAN, MARCH 2014"

COMPARK SOUTH - PARKER, CO

SWMM SCHEMATIC LOWER TRIBUTARIES

DRAWN BY:	DATE:	SCALE:	CODE:
RAK	4/20/2016	N/A	CLCPKC3

	2014 MDP Basin Delineation		2015 MCL Basin Delineation		Historical Design Flows	
Node ID	UDFCD Original MDP Model, Future Development Includes Construction of Airport 320 Regional Det Pond		MCL Model with New MCL Designed E-470 Pond, Airport 320 Pond (by others), Channels, and Storm Sewer. Basins Rerouted to Accurately Show Flow Paths		LOMR By Others	Downstream Channel Design Plans By Others
	Q_{5yr} Inflow (cfs)	Q_{100yr} Inflow (cfs)	Q_{5yr} Inflow (cfs)	Q_{100yr} Inflow (cfs)		
GA007	240.5	460.1	254.9	485.0		
GA350 (E-470 Pond)	242.4	543.2	267.6	587.9		
GA008 (Pond Outflow)	196.3	533.2	256.2	570.0		
GA009	198.2	602.0	256.1	569.9	724.0	1500.0
GA010	197.8	620.1	395.3	872.6	1189.0	1720.0
HC036	997.0	6737.4	978.0	6736.4		
HC999	992.7	6721.8	974.1	6721.3		

APPENDIX G

Regional Detention/Water Quality Pond Design

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project: Compark South

Basin ID: H160, H170, H180, H161, H171, H181 & H182

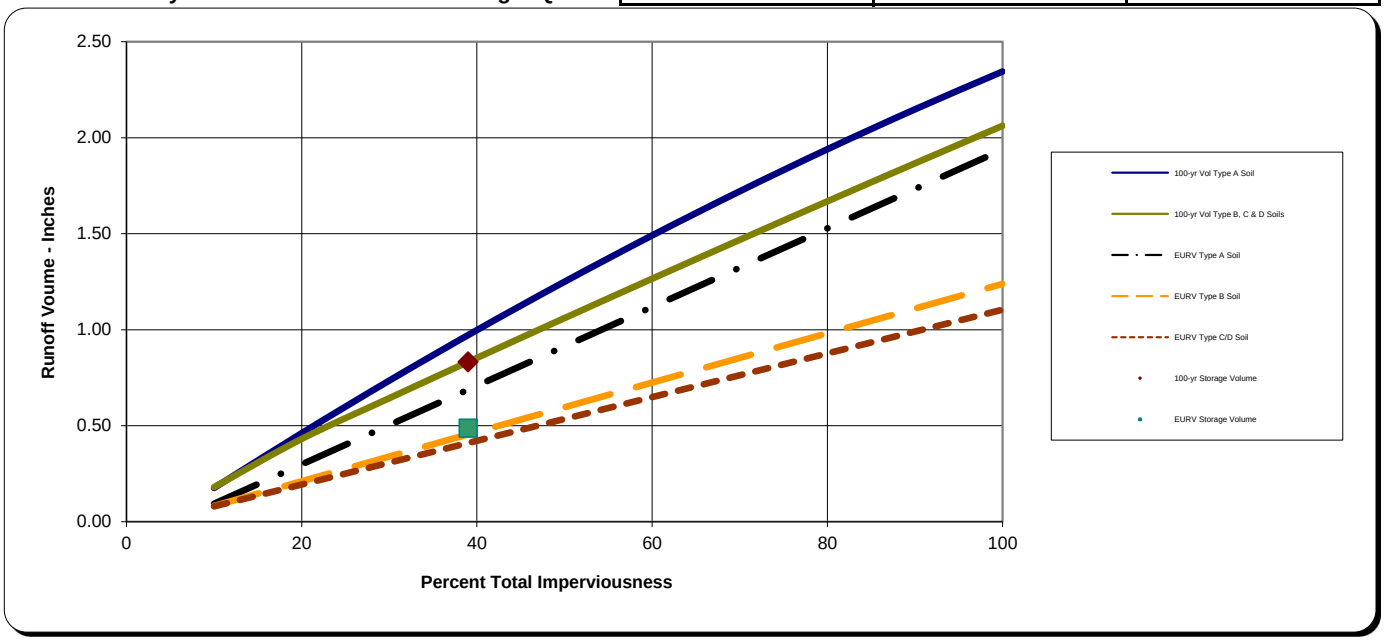
* User input data shown in blue.

Area of Watershed (acres)	189.00	
Subwatershed Imperviousness	39.0%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	0
Effective Imperviousness[1]	39.0%	

Hydrologic Soil Type	**Percentage of Area**	**Area (acres)**
Type A	0.0%	0.0
Type B	75.0%	141.8
Type C or D	25.0%	47.3

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		**Decay Coefficient--α**
Initial--f_i	**Final--fo**	
4.125	0.6	0.0018

	Detention Volumes [2,5]		
	(watershed inches)	**(acre-feet)**	**Maximum Allowable Release Rate, cfs[3]**
Excess Urban Runoff Volume[4]	0.49	7.69	Design Oulet to Empty EURV in 72 Hours
100-year Detention Volume Including WQCV [5]	0.83	13.11	167.74



Notes:

1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).

2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.

3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.

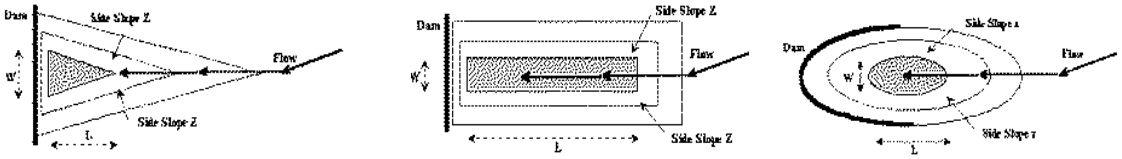
4) EURV approximates the difference between developed and pre-developed runoff volume.

5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project:

Basin ID:



Design Information (Input):

Width of Basin Bottom, W =		ft
Length of Basin Bottom, L =		ft
Dam Side-slope (H:V), Z_d =		ft/ft

Check Basin Shape

Right Triangle		OR…
Isosceles Triangle		OR…
Rectangle		OR…
Circle / Ellipse		OR…
Irregular		(Use Overide values in cells G32:G52)

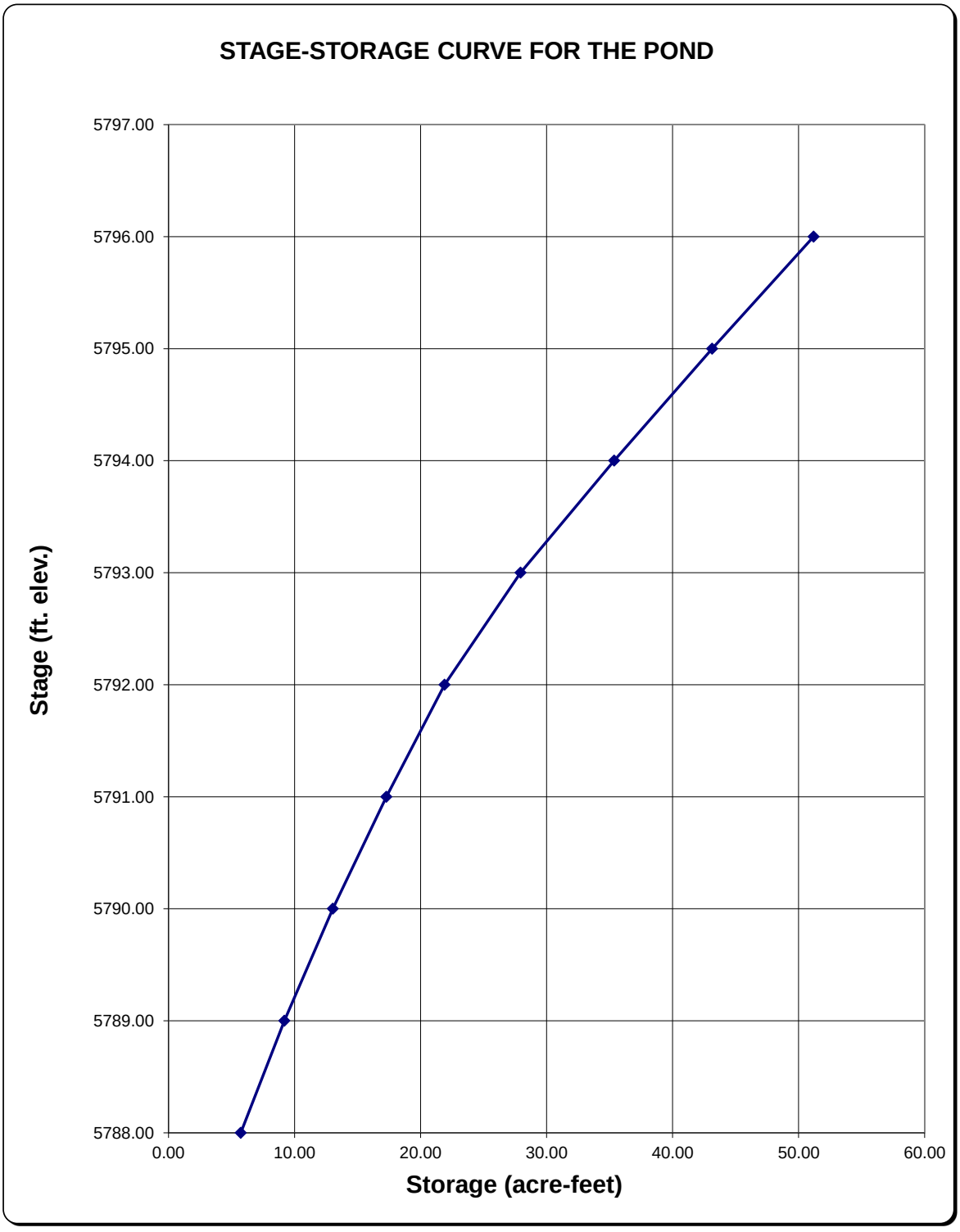
Stage-Storage Relationship:

	MINOR	MAJOR	
Storage Requirement from Sheet 'Modified FAA':			acre-ft.
Storage Requirement from Sheet 'Hydrograph':			acre-ft.
Storage Requirement from Sheet 'Full-Spectrum':	7.69	13.11	acre-ft.

Labels for WQCV, Minor, & Major Storage Stages (input)	Water Surface Elevation ft (input)	Side Slope (H:V) ft/ft Below El. (input)	Basin Width at Stage ft (output)	Basin Length at Stage ft (output)	Surface Area at Stage ft^2 (output)	Surface Area at Stage ft^2 User Overide (output)	Volume Below Stage ft^3 (output)	Surface Area at Stage acres (output)	Volume Below Stage acre-ft (output)	Target Volumes for WQCV, Minor, & Major Storage Volumes (for goal seek)
	5786.00					102,775.14		2.359	0.000	
	5787.00		0.00	0.00		126,508.10	114,642	2.904	2.632	
	5788.00		0.00	0.00		143,301.36	249,546	3.290	5.729	
	5789.00		0.00	0.00		157,942.05	400,168	3.626	9.187	EURV 7.69 Ac-ft
	5790.00		0.00	0.00		177,254.82	567,766	4.069	13.034	5788.5
	5791.00		0.00	0.00		192,974.20	752,881	4.430	17.284	100 yr 13.11 Ac-ft
	5792.00		0.00	0.00		209,727.89	954,232	4.815	21.906	5790.0
	5793.00		0.00	0.00		315,416.45	1,216,804	7.241	27.934	
	5794.00		0.00	0.00		331,761.59	1,540,393	7.616	35.363	
	5795.00		0.00	0.00		345,334.02	1,878,941	7.928	43.135	
	5796.00		0.00	0.00		356,347.91	2,229,782	8.181	51.189	
							#N/A		#N/A	
							#N/A		#N/A	
							#N/A		#N/A

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project:
Basin ID:



STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Project: Compark South

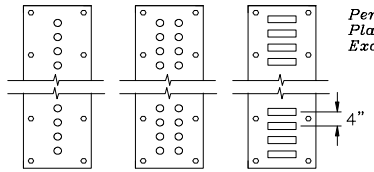
Basin ID: Regional Detention Pond

WQCV Design Volume (Input):

Catchment Imperviousness, I_a =	39.0	percent		
Catchment Area, A =	189.00	acres	Diameter of holes, D =	inches
Depth at WQCV outlet above lowest perforation, H =	3	feet	Number of holes per row, N =	
Vertical distance between rows, h =	6.00	inches	**OR**	
Number of rows, NL =	6.00			
Orifice discharge coefficient, C_o =	0.65		Height of slot, H =	2.00 inches
Slope of Basin Trickle Channel, S =	0.010	ft / ft	Width of slot, W =	4.69 inches
Time to Drain the Pond =	56	hours		

Watershed Design Information (Input):

Percent Soil Type A =	0	%
Percent Soil Type B =	75	%
Percent Soil Type C/D =	25	%



Perforated Plate Examples

Outlet Design Information (Output):

Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	0.488	watershed inches
	N/A	
Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	**7.686**	**acre-feet**
Outlet area per row, Ao =	9.37	square inches
Total opening area at each row based on user-input above, Ao =	9.37	square inches
Total opening area at each row based on user-input above, Ao =	0.065	square feet

3

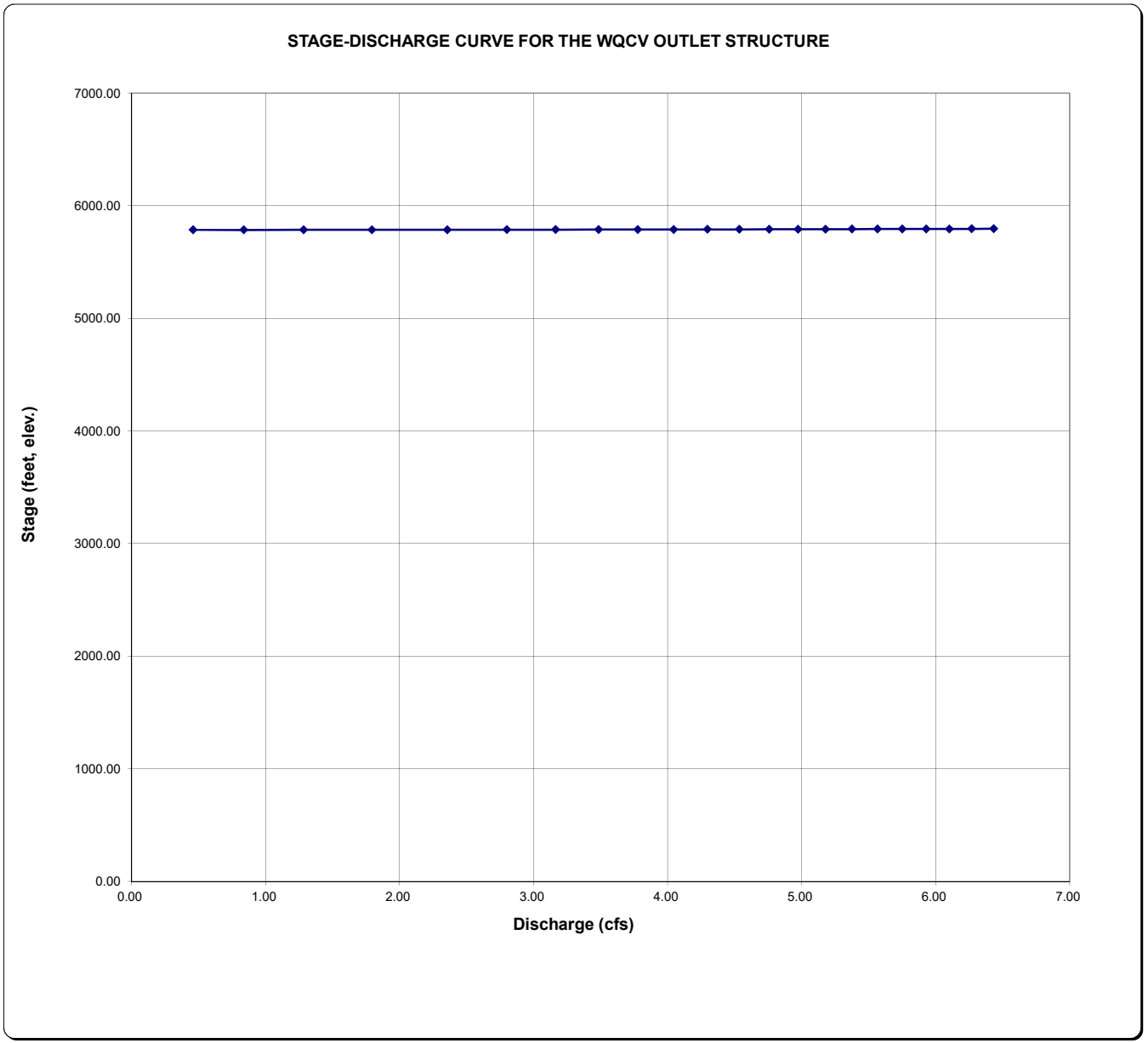
	Central Elevations of Rows of Holes in feet																							
	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	Row 9	Row 10	Row 11	Row 12	Row 13	Row 14	Row 15	Row 16	Row 17	Row 18	Row 19	Row 20	Row 21	Row 22	Row 23	Row 23	Σ
	5785.26	5785.76	5786.26	5786.76	5787.26	5787.76																			Flow
	Collection Capacity for Each Row of Holes in cfs																								
5786.00	0.2921	0.1663	0.0000	0.0000	0.0000	0.0000																			**0.46**
5786.50	0.3781	0.2921	0.1663	0.0000	0.0000	0.0000																			**0.84**
5787.00	0.4479	0.3781	0.2921	0.1663	0.0000	0.0000																			**1.28**
5787.50	0.5082	0.4479	0.3781	0.2921	0.1663	0.0000																			**1.79**
5788.00	0.5620	0.5082	0.4479	0.3781	0.2921	0.1663																			**2.35**
5788.50	0.6111	0.5620	0.5082	0.4479	0.3781	0.2921																			**2.80**
5789.00	0.6566	0.6111	0.5620	0.5082	0.4479	0.3781																			**3.16**
5789.50	0.6991	0.6566	0.6111	0.5620	0.5082	0.4479																			**3.48**
5790.00	0.7392	0.6991	0.6566	0.6111	0.5620	0.5082																			**3.78**
5790.50	0.7772	0.7392	0.6991	0.6566	0.6111	0.5620																			**4.05**
5791.00	0.8134	0.7772	0.7392	0.6991	0.6566	0.6111																			**4.30**
5791.50	0.8481	0.8134	0.7772	0.7392	0.6991	0.6566																			**4.53**
5792.00	0.8815	0.8481	0.8134	0.7772	0.7392	0.6991																			**4.76**
5792.50	0.9136	0.8815	0.8481	0.8134	0.7772	0.7392																			**4.97**
5793.00	0.9446	0.9136	0.8815	0.8481	0.8134	0.7772																			**5.18**
5793.50	0.9746	0.9446	0.9136	0.8815	0.8481	0.8134																			**5.38**
5794.00	1.0038	0.9746	0.9446	0.9136	0.8815	0.8481																			**5.57**
5794.50	1.0321	1.0038	0.9746	0.9446	0.9136	0.8815																			**5.75**
5795.00	1.0596	1.0321	1.0038	0.9746	0.9446	0.9136																			**5.93**
5795.50	1.0865	1.0596	1.0321	1.0038	0.9746	0.9446																			**6.10**
5796.00	1.1127	1.0865	1.0596	1.0321	1.0038	0.9746																			**6.27**
5796.50	1.1383	1.1127	1.0865	1.0596	1.0321	1.0038																			**6.43**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	Override Area Row 1	Override Area Row 2	Override Area Row 3	Override Area Row 4	Override Area Row 5	Override Area Row 6	Override Area Row 7	Override Area Row 8	Override Area Row 9	Override Area Row 10	Override Area Row 11	Override Area Row 12	Override Area Row 13	Override Area Row 14	Override Area Row 15	Override Area Row 16	Override Area Row 17	Override Area Row 18	Override Area Row 19	Override Area Row 20	Override Area Row 21	Override Area Row 22	Override Area Row 23	Override Area Row 24	

STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Worksheet Protected

Project: Compark South

Basin ID: Regional Detention Pond



10-27-17

E-470 Proposed Regional FS Pond
Stage - Discharge

Elevation (ft)	WQ H (ft)	Q (cfs) WQ Plate	Q_w H (ft)	Q_w (cfs) 100' Weir @ 5788.5	Q_{BC} H (ft)	Q (cfs) 22.5'x4' RCBC @ 5782.5	Q_{EX} H (ft)	Q (cfs) 12'x10' EX RCBC @5779.78	Q_{rel} (cfs)	Area (sf)	Vol. (AF)	
5786	0.0	0.5			3.5		6.22		0.5	111,087.00	0.00	
5786.5	0.5	0.8			4.0		6.72		0.8	118,694.26	1.32	
5787	1.0	1.3			4.5		7.22		1.3	126,518.00	2.73	
5787.5	1.5	1.8			5.0		7.72		1.8	133,385.52	4.22	
5788	2.0	2.4			5.5		8.22		2.4	141,197.00	5.79	EURV
5788.5	2.5	2.8	0	0.0	6.0	715	8.72	866.2	2.8	148,707.56	7.46	V=7.7 ac-ft
5789	3.0	3.2	0.5	106.1	6.5	770	9.22	942.2	109.2	157,103.00	9.21	El 5788.6
5789.5	3.5	3.5	1	300.0	7.0	825	9.72	1019.4	303.5	164,821.25	11.06	
5790	4.0	3.8	1.5	551.1	7.5	880	10.22	1100.0	554.9	172,431.00	12.99	100 yr
5790.5	4.5	4.1	2	848.5	8.0	936	10.72	1180.7	852.6	180,490.57	15.02	V=13.1 ac-ft
5791	5.0	4.3	2.5	1185.9	8.5	993	11.22	1263.8	993.0	188,759.86	17.14	El 5790.0
5791.5	5.5	4.5	3	1558.9	9.0	1049	11.72	1350.0	1049.0	199,155.55	19.36	
5792	6.0	4.8	3.5	1964.4	9.5	1106	12.22	1414.1	1106.0	205,339.26	21.69	
5792.5	6.5	5.0	4	2400.0	10.0	1163	12.72	1468.1	1163.0	262,273.17	24.36	
5793	7.0	5.2	4.5	2863.8	10.5	1220	13.22	1526.3	1220.0	309,867.44	27.64	Lower + Upper
5793.5	7.5	5.4	5	3354.1	11.0	1278	13.72	1595.7	1278.0	323,290.02	31.28	Pond Areas
5794	8.0	5.6	5.5	3869.6	11.5	1333	14.22	1666.2	1333.0	327,216.11	35.01	
5794.5	8.5	5.8	6	4409.1	12.0	1385	14.72	1733.8	1385.0	335,236.57	38.81	
5795	9.0	5.9	6.5	4971.5	12.5	1431	15.22	1800.0	1431.0	340,543.22	42.69	
5795.5	9.5	6.1	7	5556.1	13.0	1475	15.72	1861.0	1475.0	350,435.00	46.66	
5796	10.0	6.3	7.5	6161.9	13.5	1519	16.22	1921.43	1519.0	357,156.00	50.72	

APPENDIX H

State Engineer's Office Exemption

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016

From: Schoolmeesters - DNR, Ryan
To: Amie S. Drucker
Cc: John Hunyadi - DNR; Jeremy Franz - DNR
Subject: Jurisdictional Determination for Compark Village Detention Dam
Date: Monday, March 21, 2016 11:39:14 AM

Hi Amie,
Thank you for taking the pro-active step and contacting our office for a determination on the regulatory status of the proposed Compark Village Detention Pond dam pursuant to the State Engineer's regulation of water impoundment structures under CRS 37-87-105. We understand that the proposed lake will be owned and operated by 470 Compark, LLC.
According to your letter dated March 14, 2016, the facility is situated within the SW quarter of Section 6, Township 6 South, Range 66 West of the 6th P.M. in Parker, Colorado. It lies within Water Division 1, Water District 8. The information provided in your letter indicates that the existing structure will have a jurisdictional height of 9 feet and impounds a reservoir of 22.2 acre-feet that covers 3.4 surface acres.
Based on a review of the information provided in the aforementioned letter, we conclude that the Compark Village Detention Dam classifies as a Non-Jurisdictional size structure with a Low Hazard Class. As a Low Hazard, Non-jurisdictional size structure, our office is not required to review and approve the plans and specifications for improvements to the structure. The dam has been assigned DAMID: 080454. Please reference this damid in any future correspondence.
We sincerely appreciate that you contacted this office for a ruling on the regulatory status of this structure. Feel free to contact me at (303) 866-3581 x8284 if you have any questions or comments regarding the information presented herein or any other dam safety related topics.
Regards,
Ryan
--
Ryan Schoolmeesters, PE
Dam Safety Engineer
Dam Safety Branch
P 303.866.3581 x8284 / C 303.842.1424
1313 Sherman Street, Room 818, Denver, CO 80203
Ryan.Schoolmeesters@state.co.us / www.water.state.co.us

Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Compark Village South Regional Detention Pond

Facility Location & Jurisdiction: 39 33' 19"N, 104 49' 12"W, Town of Parker, CO

User Input: Watershed Characteristics

Watershed Slope =	0.035	ft/ft
Watershed Length =	5300	ft
Watershed Area =	189.00	acres
Watershed Imperviousness =	39.0%	percent
Percentage Hydrologic Soil Group A =		percent
Percentage Hydrologic Soil Group B =	75.0%	percent
Percentage Hydrologic Soil Groups C/D =	25.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): Parker - Parker Town Court

WQCV Treatment Method = Extended Detention

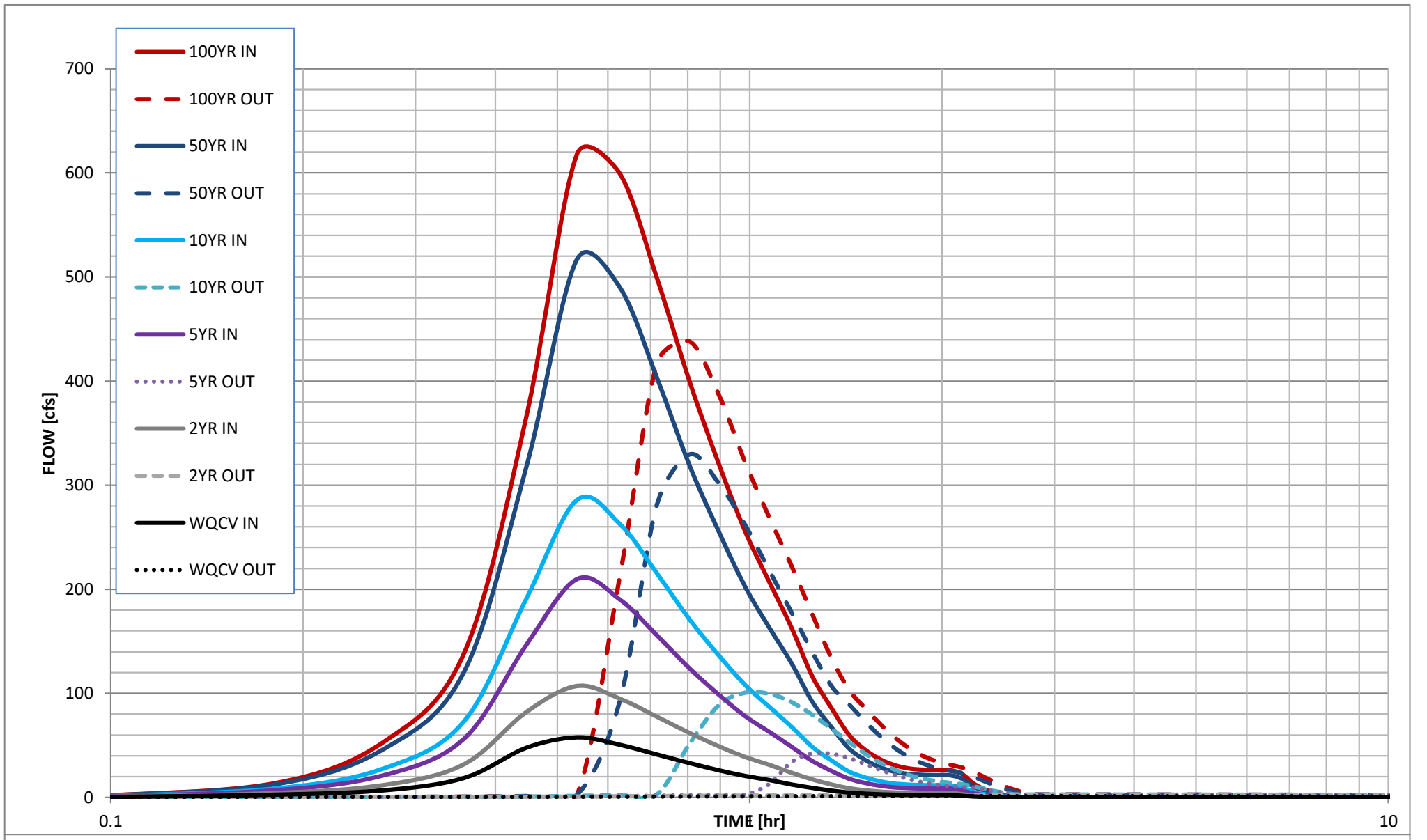
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	111,087.00	0.00	0.5
0.50	118,694.26	0.50	0.8
1.00	126,518.00	1.00	1.3
1.50	133,385.52	1.50	1.8
2.00	141,197.00	2.00	2.4
2.50	148,707.56	2.50	2.8
3.00	157,103.00	3.00	109.2
3.50	164,821.25	3.50	303.5
4.00	172,431.00	4.00	554.9
4.50	180,490.57	4.50	852.6
5.00	188,759.86	5.00	993.0
5.50	199,155.55	5.50	1049.0
6.00	205,339.26	6.00	1106.0
6.50	262,273.17	6.50	1163.0
7.00	309,867.44	7.00	1220.0
7.50	323,290.02	7.50	1278.0
8.00	327,216.11	8.00	1333.0
8.50	335,236.57	8.50	1385.0
9.00	340,543.22	9.00	1431.0
9.50	350,435.00	9.50	1475.0
10.00	357,156.00	10.00	1519.0

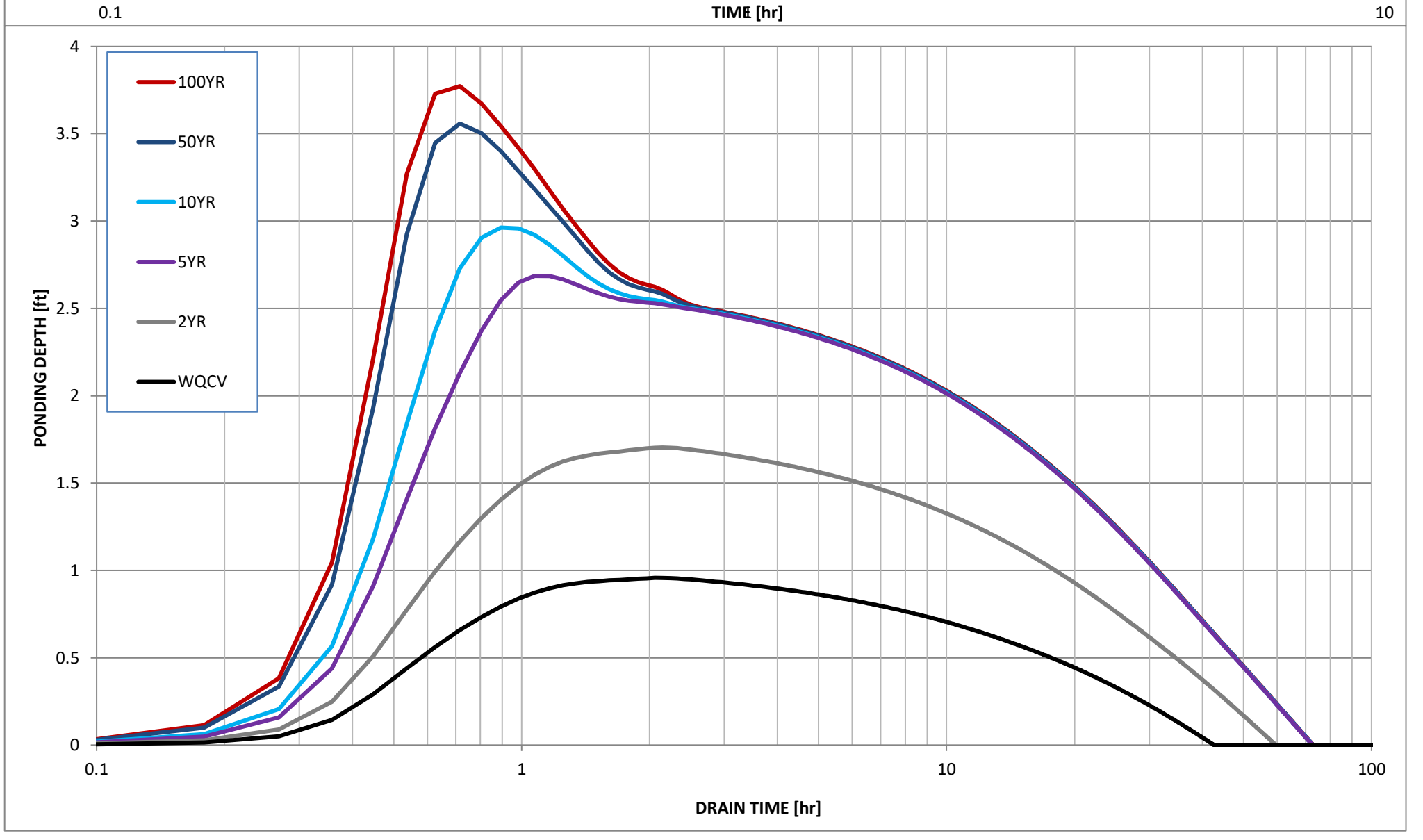
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	0.96	1.40	1.65	2.30	2.61	in
Calculated Runoff Volume =	2.791	5.148	10.081	13.762	25.157	30.847	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	2.790	5.142	10.076	13.759	25.153	30.840	acre-ft
Time to Drain 97% of Inflow Volume =	40.7	56.0	**65.8**	63.6	57.3	54.3	hours
Time to Drain 99% of Inflow Volume =	42.0	58.4	70.3	69.5	67.2	**66.0**	hours
Maximum Ponding Depth =	0.96	1.70	2.69	2.96	3.56	3.77	ft
Maximum Ponded Area =	2.89	3.13	3.48	3.59	3.80	**3.88**	acres
Maximum Volume Stored =	2.597	4.830	8.073	9.069	11.277	12.096	acre-ft

Stormwater Detention and Infiltration Design Data Sheet

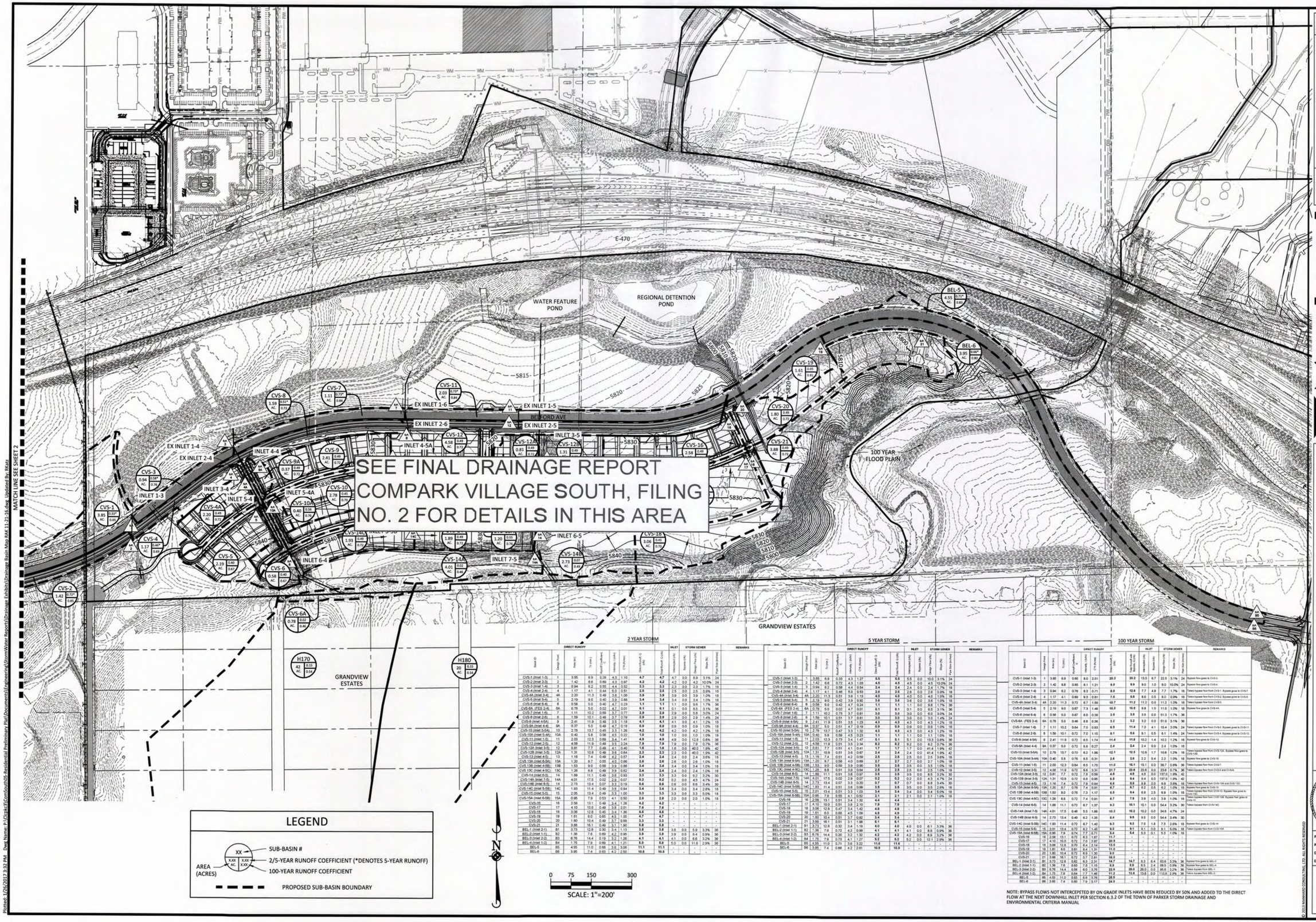




APPENDIX I

Storm Sewer Design

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016
Revised December 20, 2016



2 YEAR STORM

Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient C	Intensity I (in/hr)	CA (Acres)	Check Runoff Q (cfs)	Inlet/Runoff Q (cfs)	Bypass (cfs)	Spread (Top of Curb)	Depth (Top of Curb)	Inlet Size (inches)	Inlet/Runoff Q (cfs)	Bypass (cfs)	Spread (Top of Curb)	Depth (Top of Curb)	Inlet Size (inches)	REMARKS
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.28	4.3	1.10	4.7	4.7	0.0	8.9	3.1%	24						
CVS-2 (Inlet 2-3)	2	1.42	8.6	0.65	4.3	0.97	4.2	4.2	0.0	4.2	10.0%	24						
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.55	4.4	0.52	2.3	2.3	0.0	2.3	1.7%	18						
CVS-4 (Inlet 1-3)	4	1.17	4.1	0.44	5.0	0.51	2.5	2.5	0.0	2.5	0.9%	18						
CVS-4A (Inlet 3-4)	4A	2.20	11.3	0.49	3.6	1.06	3.9	3.9	0.0	3.9	1.0%	18						
CVS-5 (Inlet 5-4)	5	2.19	9.0	0.40	3.8	0.86	3.4	3.4	0.0	3.4	1.0%	18						
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.40	4.7	0.23	1.1	1.1	0.0	3.6	1.7%	36						
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.2	0.01	0.1	0.1	0.0	0.5	3.1%	36						
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.59	3.7	0.77	2.9	2.9	0.0	5.8	3.0%	24						
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.49	3.7	0.78	2.9	2.9	0.0	2.9	1.4%	24						
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.49	3.5	1.18	4.1	4.1	0.0	4.1	1.2%	18						
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.49	4.7	0.18	0.9	0.9	0.0	0.9	1.0%	18						
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.45	3.3	1.26	4.2	4.2	0.0	4.2	1.0%	18						
CVS-10A (Inlet 5-4A)	10A	0.40	5.8	0.56	4.5	0.22	1.0	1.0	0.0	1.0	1.0%	18						
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.61	3.4	1.41	4.9	4.9	0.0	12.0	0.8%	30						
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.49	3.5	2.24	7.9	7.9	0.0	7.9	0.7%	36						
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.49	4.1	0.40	1.6	1.6	0.0	3.5	1.9%	42						
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.49	3.6	0.64	2.3	2.3	0.0	40.0	1.9%	42						
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.49	4.2	0.57	2.4	2.4	0.0	2.4	0.6%	18						
CVS-13A (Inlet 6-5A)	13A	1.20	8.7	0.55	4.0	0.66	2.6	2.6	0.0	2.6	1.0%	18						
CVS-13B (Inlet 4-5B)	13B	1.53	9.0	0.58	3.9	0.86	3.4	3.4	0.0	3.4	1.0%	18						
CVS-13C (Inlet 4-5C)	13C	1.26	8.8	0.49	3.9	0.62	2.4	2.4	0.0	2.4	1.0%	18						
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.49	3.6	0.93	3.3	3.3	0.0	8.2	3.2%	30						
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	0.2	0.2	0.0	4.3	4.7%	24						
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.07	3.3	0.19	0.6	0.6	0.0	8.6	3.4%	30						
CVS-14C (Inlet 5-5B)	14C	1.93	11.4	0.49	3.6	0.84	3.4	3.4	0.0	3.4	2.8%	18						
CVS-15 (Inlet 5-5)	15	2.05	13.4	0.49	3.3	1.00	3.3	3.3	0.0	3.3	5.0%	18						
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.53	4.1	0.50	2.0	2.0	0.0	2.0	1.0%	18						
CVS-16	16	2.58	13.1	0.49	3.3	1.26	4.2	-	-	-	-	-						
CVS-17	17	4.10	10.0	0.49	3.8	2.01	7.6	-	-	-	-	-						
CVS-18	18	3.06	12.8	0.45	3.4	1.36	4.6	-	-	-	-	-						
CVS-19	19	1.61	6.0	0.65	4.5	1.05	4.7	-	-	-	-	-						
CVS-20	20	1.80	10.4	0.49	3.7	0.88	3.3	-	-	-	-	-						
CVS-21	21	3.88	18.1	0.49	3.1	1.90	5.8	-	-	-	-	-						
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.30	3.4	1.13	3.8	3.8	0.0	5.9	3.3%	36						
BEL-2 (Inlet 1-1)	B2	1.36	7.6	0.69	4.2	0.95	3.9	3.9	0.0	8.4	0.9%	36						
BEL-3 (Inlet 2-2)	B3	6.78	14.4	0.19	3.2	1.26	4.1	4.1	0.0	8.6	3.2%	36						
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.64	4.2	1.21	5.1	5.0	0.0	11.6	2.9%	36						
BEL-5	B5	4.55	11.0	0.68	3.6	3.08	11.1	11.1	-	-	-	-						
BEL-6	B6	3.95	7.4	0.65	4.2	2.50	10.6	10.6	-	-	-	-						

5 YEAR STORM

Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient C	Intensity I (in/hr)	CA (Acres)	Check Runoff Q (cfs)	Inlet/Runoff Q (cfs)	Bypass (cfs)	Spread (Top of Curb)	Depth (Top of Curb)	Inlet Size (inches)	Inlet/Runoff Q (cfs)	Bypass (cfs)	Spread (Top of Curb)	Depth (Top of Curb)	Inlet Size (inches)	REMARKS
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.33	4.3	1.27	5.5	5.5	0.0	10.0	3.1%	24						
CVS-2 (Inlet 2-3)	2	1.42	8.6	0.72	4.3	1.09	4.5	4.5	0.0	4.5	10.0%	24						
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.58	4.4	0.54	2.4	2.4	0.0	2.4	1.7%	18						
CVS-4 (Inlet 1-3)	4	1.17	4.1	0.46	5.0	0.53	2.6	2.6	0.0	2.6	0.9%	18						
CVS-4A (Inlet 3-4)	4A	2.20	11.3	0.51	3.6	1.13	4.0	4.0	0.0	4.0	1.0%	18						
CVS-5 (Inlet 5-4)	5	2.19	9.0	0.42	3.8	0.92	3.6	3.6	0.0	3.6	1.0%	18						
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.42	4.7	0.24	1.1	1.1	0.0	3.6	1.7%	36						
CVS-6A (FES 2-4)	6A	0.78	5.0	0.07	4.2	0.03	0.1	0.1	0.0	0.5	3.1%	36						
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.73	3.7	0.81	3.0	3.0	0.0	6.0	3.0%	24						
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.61	3.7	0.81	3.0	3.0	0.0	3.0	1.4%	24						
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.61	3.5	1.23	4.3	4.3	0.0	4.3	1.2%	18						
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.72	4.7	0.19	0.9	0.9	0.0	0.9	1.0%	18						
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.57	3.3	1.31	4.3	4.3	0.0	4.3	1.0%	18						
CVS-10A (Inlet 5-4A)	10A	0.40	5.8	0.59	4.5	0.23	1.1	1.1	0.0	1.1	1.0%	18						
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.73	3.4	1.47	5.1	5.1	0.0	13.3	0.8%	30						
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.61	3.5	2.34	8.2	8.2	0.0	8.2	0.7%	36						
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.61	4.1	0.41	1.7	1.7	0.0	41.4	1.9%	42						
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.61	3.6	0.67	2.4	2.4	0.0	41.4	1.9%	42						
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.61	4.2	0.59	2.5	2.5	0.0	2.5	0.6%	18						
CVS-13A (Inlet 6-5A)	13A	1.20	8.7	0.56	4.0	0.69	2.7	2.7	0.0	2.7	1.0%	18						
CVS-13B (Inlet 4-5B)	13B	1.53	9.0	0.59	3.9	0.90	3.5	3.5	0.0	3.5	1.0%	18						
CVS-13C (Inlet 4-5C)	13C	1.26	8.8	0.61	3.9	0.64	2.5	2.5	0.0	2.5	1.0%	18						
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.61	3.6	0.97	3.5	3.5	0.0	8.5	3.2%	30						
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	0.2	0.2	0.0	4.3	4.7%	24						
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.07	3.3	0.20	0.7	0.7	0.0	8.8	3.4%	30						
CVS-14C (Inlet 5-5B)	14C	1.93	11.4	0.51	3.6	0.88	3.4	3.4	0.0	3.4	2.8%	18						
CVS-15 (Inlet 5-5)	15	2.05	13.4	0.61	3.3	1.03	3.4	3.4	0.0	3.4	5.0%	18						
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.65	4.1	0.52	2.1	2.1	0.0	2.1	1.0%	18						
CVS-16	16	2.58	13.1	0.51	3.4	1.32	4.4	-	-	-	-	-						
CVS-17	17	4.10	10.0	0.51	3.8	2.10	7.9	-	-	-	-	-						
CVS-18	18	3.06	12.8	0.47	3.4	1.42	4.8	-	-	-	-	-						
CVS-19	19	1.61	6.0	0.68	4.5	1.09	4.9	-	-	-	-	-						
CVS-20	20	1.80	10.4	0.51	3.7	0.92	3.4	-	-	-	-	-						
CVS-21	21	3.88	18.1	0.51	3.1	1.98	6.1	-	-	-	-	-						
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.32	3.4	1.18	4.0	4.0	0.0	6.1	3.3%	36						
BEL-2 (Inlet 1-1)	B2	1.36	7.6	0.72	4.2	0.99	4.1	4.1	0.0	8.8	0.9%	36						
BEL-3 (Inlet 2-2)	B3	6.78	14.4	0.20	3.2	1.32	4.2	4.2	0.0	8.9	3.2%	36						
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.67	4.2	1.26	5.3	5.2	0.0	12.1	2.9%	36						
BEL-5	B5	4.55	11.0	0.71	3.6	3.22	11.6	11.6	-	-	-	-						
BEL-6	B6	3.95	7.4	0.68	4.2	2.61	10.9	10.9	-	-	-	-						

100 YEAR STORM

Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient C	Intensity I (in/hr)	CA (Acres)	Check Runoff Q (cfs)	Total Runoff with Inlet Efficiency (cfs)	Inlet/Runoff Q (cfs)	Bypass (cfs)	Spread (Top of Curb)	Depth (Top of Curb)	Inlet Size (inches)	REMARKS
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.65	8.0	2.51	20.2	20.2	19.5	0.7	22.5	3.1%	24	Bypass flow goes to CVS-3
CVS-2 (Inlet 2-3)	2	1.42	8.6	0.85	8.0	1.21	9.9	9.9	9.0	1.0	9.0	10.0%	24	Bypass flow goes to CVS-4
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.76	8.3	0.71	8.9	12.6	7.7	4.8	7.7	1.7%	18	Takes bypass flow from CVS-1. Bypass goes to CVS-7
CVS-4 (Inlet 1-3)	4	1.17	4.1	0.69	9.3	0.81	7.5	8.5	6.0	0.5	8.0	0.9%	18	Takes bypass flow from CVS-2. Bypass goes to CVS-9
CVS-4A (Inlet 3-4)	4A	2.20	11.3	0.72	8.7	1.59	10.7	11.2	11.2	0.0	11.2	1.0%	18	Takes bypass flow from CVS-5
CVS-5 (Inlet 5-4)	5	2.19	9.0	0.67	7.3	1.46	10.0	10.8	9.8	1.0	11.0	1.0%	18	Bypass flow goes to CVS-4A
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.67	8.8	0.39	3.5	3.5	0.0	51.3	1.7%	36		
CVS-6A (FES 2-4)	6A	0.78	5.0	0.46	8.8	0.36	3.2	3.2	0.0	51.9	3.1%	36		
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.84	7.0	0.93	6.5	11.4	7.3	4.1	15.4	3.0%	24	Takes bypass flow from CVS-8. Bypass goes to CVS-11
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.72	7.0	1.15	8.1	8.1	8.5	0.5	8.1	1.4%	24	Takes bypass flow from CVS-9. Bypass goes to CVS-12
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.72	6.5	1.74	11.4	11.8	10.2	1.4	10.2	1.2%	18	Bypass flow goes to CVS-10
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.72	8.8	0.27	2.4	2.4	2.4	0.0	2.4	1.0%	18	
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.70	6.2	1.96	12.1	12.3	10.8	1.7	10.8	1.2%	18	Takes bypass flow from CVS-13A. Bypass flow goes to CVS-13B
CVS-10A (Inlet 5-4A)	10A	0.40	5.8	0.76	8.5	0.31	2.6	2.2	0.4	2.2	1.0%	18	Bypass flow goes to CVS-10	
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.84	6.5	1.72	11.0	15.1	0.0	38.7	0.8%	30	Takes bypass flow from CVS-3	
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.72	6.6	3.31	21.7	23.8	23.8	0.0	23.8	0.7%	36	Takes bypass flow from CVS-6 and CVS-6.
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.72	7.8	0.58	4.5	4.5	4.5	0.0	137.6	1.9%	42	
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.72	6.8	0.65	4.4	6.4	6.4	0.0	6.4	1.9%	42	Takes bypass flow from CVS-13 and CVS-13C
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.72	7.9	0.64	4.5	8.9	8.9	0.0	8.9	3.8%	18	Takes bypass flow from CVS-13A and CVS-13C
CVS-13A (Inlet 6-5A)	13A	1.20	8.7	0.79	7.4	0.71	4.7	6.2	5.5	0.7	6.2	1.0%	18	Takes bypass flow from CVS-13C. Bypass flow goes to CVS-13
CVS-13B (Inlet 4-5B)	13B	1.53	9.0	0.76	7.5	0.86	6.5	6.9	2.5	4.5	6.9	2.5%	18	Takes bypass flow from CVS-13B. Bypass flow goes to CVS-13
CVS-13C (Inlet 4-5C)	13C	1.26	8.8	0.72	7.4	0.91	6.7	7.9	3.9	4.0	3.9	1.0%	18	
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.72	6.7	1.37	9.2	10.1	0.0	54.4	3.2%	30	Takes bypass flow from CVS-14C	
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.46	5.5	1.86	10.2	10.2	0.0	34.8	4.7%	24		
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.49	6.2	1.35	8.4	9.5	9.5	0.0	54.4	3.4%	30	
CVS-14C (Inlet 5-5B)	14C	1.93	11.4	0.72	6.7	1.40	9.3	9.3	7.5	1.8	7.5	2.8%	18	Bypass flow goes to CVS-14
CVS-15 (Inlet 5-5)	15	2.05	13.4	0.72	6.2	1.45	9.0	9.1	9.1	0.0	9.1	5.0%	18	Bypass flow goes to CVS-15A
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.74	7.7	0.71	5.4	6.4	5.3	0.1	5.3	1.0%	18	
CVS-16	16	2.58	13.1	0.72	6.3	1.67	11.7	-	-	-	-	-		
CVS-17	17	4.10	10.0	0.72	7.0	2.87	20.9	-	-	-	-	-		
CVS-18	18	3.06	12.8	0.70	6.4	3.14	13.6	-	-	-	-	-		
CVS-19	19	1.61	6.0	0.81	8.4	1.31	11.0	-	-	-	-	-		
CVS-20	20	1.80	10.4	0.72	6.8	1.30	9.0	-	-	-	-	-		
CVS-21	21	3.88	18.1	0.72	5.7	2.81	16.0	-	-	-	-	-		
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.62	6.3	2.31	14.7	8.3	6.4	65.6	3.3%	36	Bypass flow goes to BEL-3	
BEL-2 (Inlet 1-1)	B2	1.36	7.6	0.83	7.8	1.15	8.9	8.9	8.5	2.4	69.5	0.9%	36	Bypass flow goes to BEL-4
BEL-3 (Inlet 2-2)	B3	6.78	14.4	0.56	6.0	3.76	22.4	28.6	28.0	0.6	95.6	3.2%	36	Takes bypass from BEL-1
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.84	7.7	1.46	11.2	13.8	0.0	110.8	2.9%	36	Takes bypass from BEL-2	
BEL-5	B5	4.55	11.0	0.82	6.6	3.76	24.8	-	-	-	-	-		
BEL-6	B6	3.95	7.4	0.80	7.9	3.17	24.9	-	-	-	-	-		

NOTE: BYPASS FLOWS NOT INTERCEPTED BY ON GRADE INLETS HAVE BEEN REDUCED BY 50% AND ADDED TO THE DIRECT FLOW AT THE NEXT DOWNHILL INLET PER SECTION 6.3.2 OF THE TOWN OF PARKER STORM DRAINAGE AND ENVIRONMENTAL CRITERIA MANUAL

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DATE	REVISIONS	DRAWN BY
A 11/21/2016	REVISED PER TOWN COMMENTS	RAK

COMPARK SOUTH
TOWN OF PARKER, CO
PROPOSED DRAINAGE AREA MAP

COLORADO REGISTERED PROFESSIONAL ENGINEER 30877 11-30-17

PROJ. MGR.: RLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 1 OF 3
CLCPKC3

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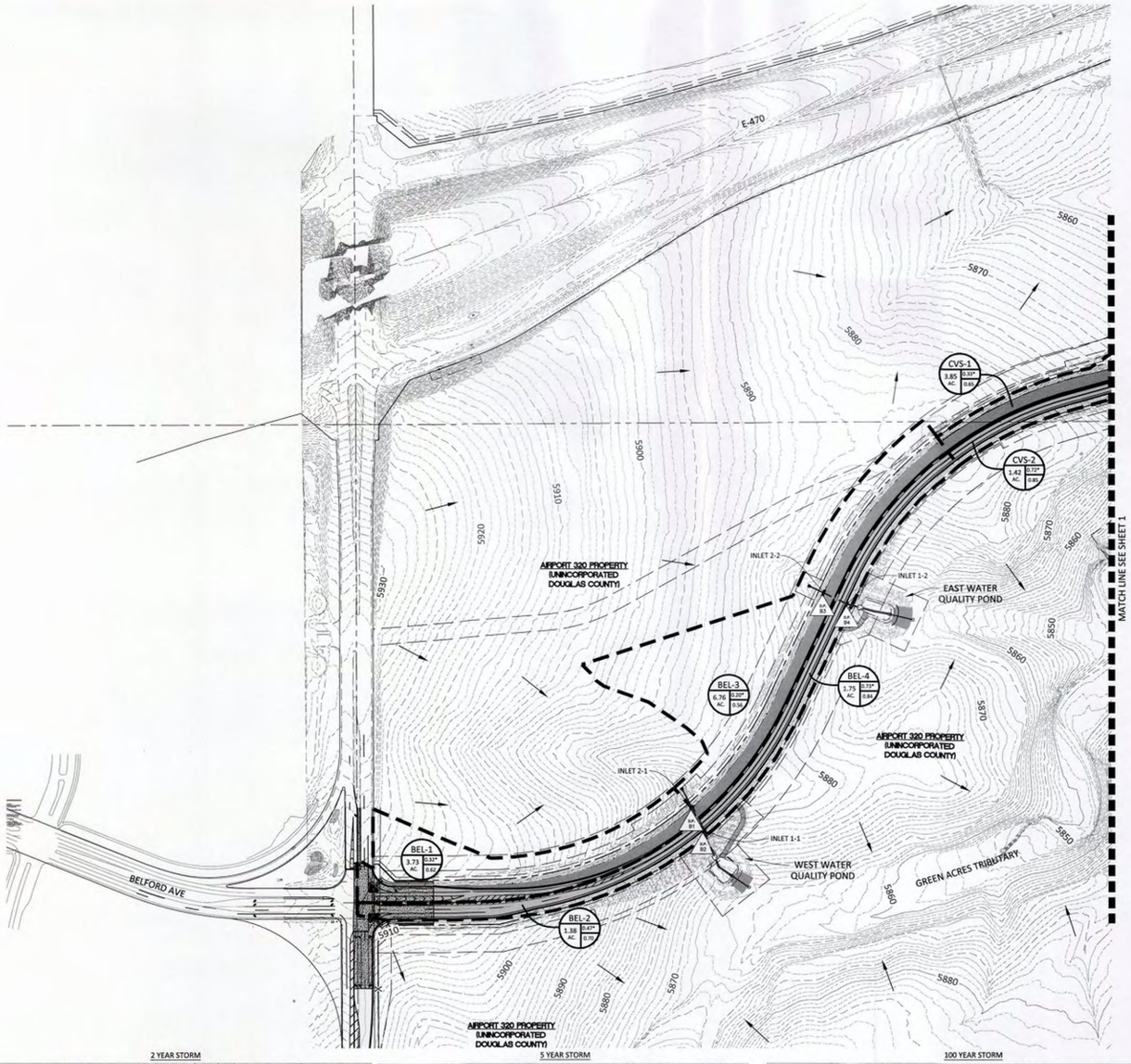
Plotted: 7/20/2017 3:32 PM Dwg Name: P:\Projects\Comparks\Residential Preliminary Plat\Documents\Engineering\Storm\Water Reports\Drainage Exhibits\Drainage Basin Map RAK 11-21-16.dwg Updated By: RKatz



LEGEND

- XX — SUB-BASIN #
- AREA (ACRES): X.XX AC. — X.XX X.XX — 2/5-YEAR RUNOFF COEFFICIENT (*DENOTES 5-YEAR RUNOFF); 100-YEAR RUNOFF COEFFICIENT
- PROPOSED SUB-BASIN BOUNDARY

2 YEAR STORM

	DIRECT RUNOFF								INLET	STORM SEWER				REMARKS
Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	Interception (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.28	4.3	1.10	4.7	4.7	0.0	0.0	8.9	3.1%	24	
CVS-2 (Inlet 2-3)	2	1.42	6.6	0.69	4.3	0.97	4.2	4.2	0.0	4.2	10.0%	24		
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.55	4.4	0.52	2.3	2.3	0.0	2.3	1.7%	18		
CVS-4 (Inlet 2-4)	4	1.17	4.1	0.44	5.0	0.51	2.5	2.5	0.0	2.5	0.9%	18		
CVS-4A (Inlet 3-4)	4A	2.20	11.3	0.49	3.6	1.08	3.9	3.9	3.9	0.0	4.0	1.0%	18	
CVS-5 (Inlet 5-4)	5	2.19	9.0	0.40	3.9	0.86	3.4	3.4	3.4	0.0	3.4	1.0%	18	
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.40	4.7	0.23	1.1	1.1	1.1	0.0	0.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	0.1	0.1	0.0	0.0	0.5	3.1%	36	
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.69	3.7	0.77	2.9	2.9	2.9	0.0	5.8	3.0%	24	
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.46	3.7	0.78	2.9	2.9	2.9	0.0	2.9	1.4%	24	
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.49	3.5	1.18	4.1	4.1	4.0	0.1	4.1	1.2%	18	
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.49	4.7	0.18	0.9	0.9	0.0	0.0	0.9	1.0%	18	
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.45	3.3	1.26	4.2	4.2	0.0	4.2	1.2%	18		
CVS-10A (Inlet 5-4A)	10A	0.46	5.8	0.56	4.5	0.22	1.0	1.0	1.0	0.0	1.0	1.0%	18	
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.69	3.4	1.41	4.9	4.9	4.9	0.0	12.8	0.8%	36	
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.46	3.5	1.24	7.9	7.9	7.9	0.0	7.9	0.7%	36	
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.49	4.1	0.40	1.6	1.6	1.6	0.0	40.0	1.9%	42	
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.49	3.6	0.64	2.3	2.3	2.3	0.0	40.0	1.9%	42	
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.49	4.2	0.57	2.4	2.4	2.4	0.0	2.4	3.6%	18	
CVS 13A (Inlet 6-5A)	13A	1.20	8.7	0.55	4.0	0.66	2.6	2.6	2.6	0.0	2.6	1.0%	15	
CVS 13B (Inlet 4-6B)	13B	1.53	9.0	0.56	3.9	0.66	3.4	3.4	3.4	0.0	2.6	1.0%	15	
CVS 13C (Inlet 4-5C)	13C	1.26	8.8	0.49	3.9	0.62	2.4	2.4	2.4	0.0	2.4	1.0%	18	
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.49	3.6	0.93	3.3	3.3	3.3	0.0	8.2	3.2%	30	
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	0.2	0.2	0.2	0.0	4.3	4.7%	24	
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.07	3.3	0.19	0.6	0.6	0.0	0.6	3.4%	30		
CVS-14C (Inlet 5-5B)	14C	1.89	11.4	0.49	3.5	0.94	3.3	3.3	3.3	0.0	3.5	2.8%	18	
CVS-15 (Inlet 5-5)	15	2.05	13.4	0.49	3.3	1.00	3.3	3.3	3.3	0.0	3.3	5.0%	18	
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.53	4.1	0.50	2.0	2.0	2.0	0.0	2.0	1.0%	18	
CVS-16	16	2.58	13.1	0.49	3.4	1.26	4.2	4.2	-	-	-	-	-	
CVS-17	17	4.10	10.5	0.49	3.8	1.01	7.6	7.6	-	-	-	-	-	
CVS-18	18	3.06	12.8	0.45	3.4	1.36	4.6	4.6	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.65	4.5	1.05	4.7	4.7	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.49	3.7	0.88	3.3	3.3	-	-	-	-	-	
CVS-21	21	3.88	18.1	0.49	3.1	1.90	5.8	5.8	-	-	-	-	-	
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.30	3.4	1.13	3.8	3.8	0.0	0.0	5.9	3.3%	36	
BEL-2 (Inlet 1-1)	B2	1.38	7.6	0.72	4.2	0.99	4.1	4.1	0.0	0.0	6.4	0.9%	36	
BEL-3 (Inlet 2-2)	B3	6.76	14.4	0.20	3.2	1.32	4.2	4.2	0.0	4.2	0.0	6.9	3.2%	36
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.69	4.1	1.21	5.0	5.0	0.0	11.6	2.9%	36		
BEL-5	B5	4.55	11.0	0.68	3.6	3.08	11.1	11.1	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.63	4.2	2.50	10.5	10.5	-	-	-	-	-	

5 YEAR STORM

	DIRECT RUNOFF								INLET	STORM SEWER				REMARKS
Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	Interception (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.33	4.3	1.27	5.5	5.5	0.0	10.0	3.1%	24		
CVS-2 (Inlet 2-3)	2	1.42	6.6	0.72	4.3	1.03	4.5	4.5	0.0	4.5	10.0%	24		
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.58	4.4	0.54	2.4	2.4	0.0	2.4	1.7%	18		
CVS-4 (Inlet 2-4)	4	1.17	4.1	0.46	5.0	0.53	2.6	2.6	0.0	2.6	0.9%	18		
CVS-4A (Inlet 3-4)	4A	2.20	11.3	0.51	3.6	1.13	4.0	4.0	0.0	4.0	1.0%	18		
CVS-5 (Inlet 5-4)	5	2.19	9.0	0.42	3.9	0.92	3.6	3.6	3.6	0.0	3.6	1.0%	18	
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.42	4.7	0.24	1.1	1.1	1.1	0.0	0.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	0.1	0.1	0.0	0.0	0.5	3.1%	36	
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.72	3.7	0.81	3.0	3.0	3.0	0.0	6.0	3.0%	24	
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.48	3.7	0.81	3.0	3.0	3.0	0.0	3.0	1.4%	24	
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.51	3.5	1.23	4.3	4.3	4.3	0.0	4.3	1.2%	18	
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.51	4.7	0.19	0.9	0.9	0.0	0.0	0.9	1.0%	18	
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.47	3.3	1.32	4.3	4.3	0.0	4.3	1.2%	18		
CVS-10A (Inlet 5-4A)	10A	0.46	5.8	0.59	4.5	0.23	1.1	1.1	1.1	0.0	1.1	1.0%	18	
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.73	3.4	1.47	5.1	5.1	0.0	13.3	0.8%	36		
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.51	3.5	2.34	8.2	8.2	0.0	8.2	0.7%	36		
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.51	4.1	0.41	1.7	1.7	1.7	0.0	41.4	1.9%	42	
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.51	3.6	0.67	2.4	2.4	2.4	0.0	41.4	1.9%	42	
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.51	4.2	0.59	2.5	2.5	2.5	0.0	2.5	3.6%	18	
CVS 13A (Inlet 6-5A)	13A	1.20	8.7	0.58	4.0	0.69	2.7	2.7	2.7	0.0	2.7	1.0%	15	
CVS 13B (Inlet 4-6B)	13B	1.53	9.0	0.59	3.9	0.90	3.5	3.5	3.5	0.0	3.5	1.0%	15	
CVS 13C (Inlet 4-5C)	13C	1.26	8.8	0.51	3.9	0.64	2.5	2.5	2.5	0.0	2.5	1.0%	18	
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.51	3.6	0.97	3.5	3.5	3.5	0.0	8.5	3.2%	30	
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	0.2	0.2	0.2	0.0	4.3	4.7%	24	
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.07	3.3	0.20	0.7	0.7	0.0	0.7	3.4%	30		
CVS-14C (Inlet 5-5B)	14C	1.89	11.4	0.51	3.5	0.99	3.5	3.5	3.5	0.0	3.5	2.8%	18	
CVS-15 (Inlet 5-5)	15	2.05	13.4	0.51	3.3	1.03	3.4	3.4	3.4	0.0	3.4	5.0%	18	
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.55	4.1	0.52	2.1	2.1	2.1	0.0	2.1	1.0%	18	
CVS-16	16	2.58	13.1	0.51	3.4	1.32	4.4	-	-	-	-	-	-	
CVS-17	17	4.10	10.5	0.51	3.8	2.10	7.9	-	-	-	-	-	-	
CVS-18	18	3.06	12.8	0.47	3.4	1.42	4.8	-	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.68	4.5	1.09	4.9	-	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.51	3.7	0.92	3.4	-	-	-	-	-	-	
CVS-21	21	3.88	18.1	0.51	3.1	1.98	6.1	-	-	-	-	-	-	
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.32	3.4	1.18	4.0	4.0	0.0	0.1	3.3%	36		
BEL-2 (Inlet 1-1)	B2	1.38	7.6	0.72	4.2	0.99	4.1	4.1	0.0	0.0	8.8	0.9%	36	
BEL-3 (Inlet 2-2)	B3	6.76	14.4	0.20	3.2	1.32	4.2	4.2	0.0	4.2	0.0	6.9	3.2%	36
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.73	4.1	1.27	5.2	5.2	0.0	12.1	2.9%	36		
BEL-5	B5	4.55	11.0	0.71	3.6	3.23	11.6	11.6	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.66	4.2	2.61	10.9	10.9	-	-	-	-	-	

100 YEAR STORM

	DIRECT RUNOFF								INLET	STORM SEWER				REMARKS
Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	Interception (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.85	8.0	2.51	20.2	20.2	13.5	6.7	22.5	3.1%	24	Bypass flow goes to CVS-3.
CVS-2 (Inlet 2-3)	2	1.42	6.6	0.85	8.1	1.21	9.9	9.9	9.0	1.0	9.0	10.0%	24	Bypass flow goes to CVS-4.
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.76	8.3	0.71	5.9	12.4	7.7	4.9	7.7	1.7%	18	Takes bypass flow from CVS-1. Bypass goes to CVS-7
CVS-4 (Inlet 2-4)	4	1.17	4.1	0.69	9.3	0.83	7.7	10.3	7.7	2.6	8.6	0.9%	18	Takes bypass flow from CVS-2. Bypass goes to CVS-8
CVS-4A (Inlet 3-4)	4A	2.20	11.3	0.72	6.7	1.59	10.7	11.2	11.2	0.0	11.2	1.0%	18	Takes bypass flow from CVS-5.
CVS-5 (Inlet 5-4)	5	2.19	9.0	0.67	7.3	1.48	10.8	10.8	9.8	1.0	11.0	1.0%	18	Bypass flow goes to CVS-4A.
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.67	8.8	0.39	3.8	3.8	3.5	0.0	51.3	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.46	8.8	0.36	3.2	3.2	3.2	0.0	51.0	3.1%	36	
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.84	7.0	0.93	6.5	11.4	7.3	4.1	15.4	3.0%	24	Takes bypass flow from CVS-3. Bypass goes to CVS-11
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.72	7.0	1.15	8.1	8.6	8.1	0.5	8.1	1.4%	24	Takes bypass flow from CVS-4. Bypass goes to CVS-12
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.72	6.5	1.74	11.4	11.6	10.2	1.4	10.2	1.2%	18	Bypass flow goes to CVS-12
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.72	8.8	0.27	2.4	2.4	2.4	0.0	2.4	1.0%	18	
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.70	6.2	1.96	13.1	13.3	10.8	1.7	10.8	1.2%	18	Takes bypass flow from CVS-10A. Bypass flow goes to CVS-12B
CVS-10A (Inlet 5-4A)	10A	0.46	5.8	0.76	8.5	0.31	2.6	2.6	2.2	0.4	2.2	1.0%	18	Bypass flow goes to CVS-10
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.84	6.5	1.70	11.0	15.1	15.1	0.0	38.7	0.8%	36	Takes bypass flow from CVS-7.
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.72	6.5	3.31	21.7	23.4	23.4	0.0	23.4	0.7%	36	Takes bypass flow from CVS-8 and CVS-9.
CVS-12A (Inlet 3-5)	12A	1.31	10.8	0.72	6.8	0.95	6.5	9.4	9.4	0.0	137.0	1.9%	42	
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.72	7.8	0.84	6.6	8.9	8.9	0.0	8.9	3.6%	18	Takes bypass flow from CVS-13A and CVS 13C.
CVS 13A (Inlet 6-5A)	13A	1.20	8.7	0.76	7.4	0.91	6.7	6.7	6.2	0.5	6.2	1.0%	15	Bypass flow goes to CVS-13
CVS 13B (Inlet 4-6B)	13B	1.53	9.0	0.78	7.3	1.17	8.6	8.6	8.6	0.0	8.6	2.5	6.9	1.0% 15 Takes bypass flow from CVS-14. Bypass flow goes to CVS-13C.
CVS 13C (Inlet 4-5C)	13C	1.26	8.8	0.72	7.4	0.91	6.7	7.9	3.9	4.0	3.9	1.0%	18	Takes bypass flow from CVS 13B. Bypass flow goes to CVS-13C
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.72	6.7	1.37	9.2	10.1	10.1	0.0	54.4	3.2%	30	Takes bypass from CVS-14C
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.46	5.5	1.86	10.2	10.2	10.2	0.0	34.8	4.7%	24	
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.49	6.2	1.35	8.4	9.5	9.5	0.0	54.4	3.4%	30	
CVS-14C (Inlet 5-5B)	14C	1.89	11.4	0.72	6.7	1.40	9.3	9.3	7.5	1.8	7.5	2.8%	18	Bypass flow goes to CVS-14
CVS-15 (Inlet 5-5)	15	2.01	13.4	0.72	6.2	1.45	9.0	9.1	9.1	0.0	9.1	5.0%	18	Takes bypass flow from CVS-15A
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.74	7.7	0.71	5.4	5.4	5.3	0.1	5.3	1.0%	18	
CVS-16	16	2.58	13.1	0.72	6.3	1.67	11.7	-	-	-	-	-	-	
CVS-17	17	4.10	10.5	0.72	7.0	2.87	20.9	-	-	-	-	-	-	
CVS-18	18	3.06	12.8	0.70	6.4	2.14	13.6	-	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.81	8.4	1.31	11.0	-	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.72	6.9	1.30	9.0	-	-	-	-	-	-	
CVS-21	21	3.88	18.1	0.72	5.7	2.91	16.6	-	-	-	-	-	-	
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.62	6.3	2.31	14.7	14.7	6.3	8.4	43.6	3.3%	36	Bypass flow goes to BEL-5
BEL-2 (Inlet 1-1)	B2	1.38	7.6	0.83	7.8	1.15	8.9	8.9	6.5	2.4	69.5	0.9%	36	Bypass flow goes to BEL-4
BEL-3 (Inlet 2-2)	B3	6.76	14.4	0.56	6.0	3.78	22.6	29.0	28.0	0.0	95.6	3.2%	36	Takes bypass from BEL-1
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.84	7.7	1.46	11.2	13.6	13.6	0.0	110.8	2.9%	36	Takes bypass from BEL-2
BEL-5	B5	4.55	11.0	0.83	6.8	3.76	28.5	-	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.80	7.9	3.17	34.9	-	-	-	-	-	-	

NOTE: BYPASS FLOWS NOT INTERCEPETED BY ON GRADE INLETS HAVE BEEN REDUCED BY 50% AND ADDED TO THE DIRECT FLOW AT THE NEXT DOWNHILL INLET PER SECTION 6.3.2 OF THE TOWN OF PARKER STORM DRAINAGE AND ENVIRONMENTAL CRITERIA MANUAL

N

0 75 150 300

SCALE: 1"=200'

DATE	REVISIONS	DRAWN BY
11/21/2016	REVISED PER TOWN COMMENTS	RAK

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COMPARK SOUTH

TOWN OF PARKER, CO

PROPOSED DRAINAGE AREA MAP

COLORADO REGISTERED PROFESSIONAL ENGINEER
BRADY R. WOOTEN
30877
1-26-17

PROJ. MGR.: RLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 2 OF 3

CLCPKC3

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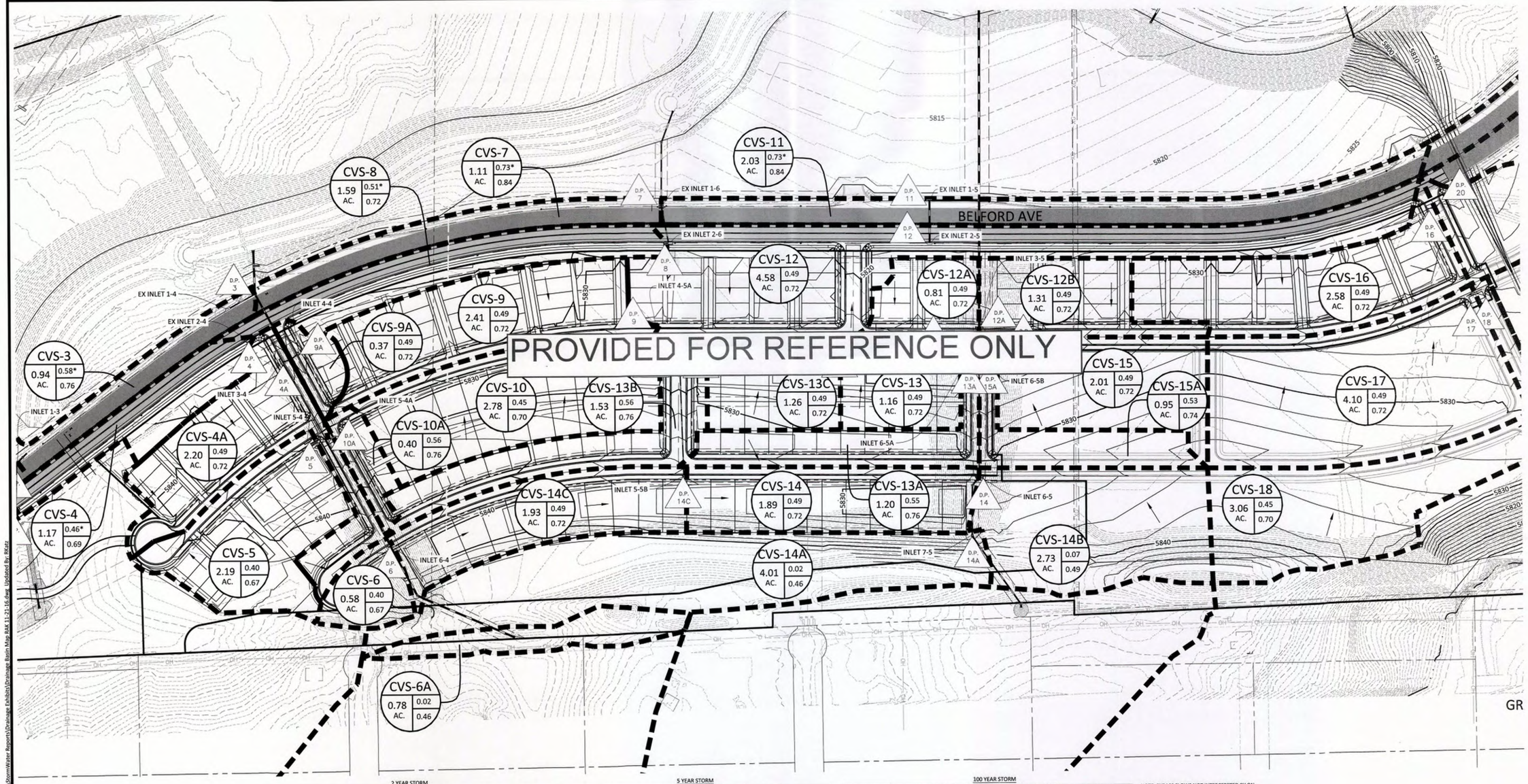
Plotted: 1/26/2017 3:28 PM Dwg Name: P:\Clpkc3\Com\South\05-Residential Preliminary Plat\Documents\Engineering\StormWater Reports\Drainage Exhibits\Drainage Basin Map RAK 11-21-16.dwg Updated By: RKatz



2 YEAR STORM

Basin ID	DIRECT RUNOFF Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CfA (Acres)	Direct Runoff, Q (cfs)	INLET Intercepted (cfs)	Bypass (cfs)	STORM SEWER Design Flow (cfs)	Slope (%)	Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.28	4.3	1.10	4.7	4.7	0.0	8.9	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	6.6	0.69	4.3	0.97	4.2	4.2	0.0	4.2	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.1	0.55	4.4	0.52	2.3	2.3	0.0	2.3	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	4.1	0.44	5.0	0.51	2.5	2.5	0.0	2.5	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.49	3.6	1.08	3.9	3.9	0.0	3.9	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.42	3.9	0.85	3.4	3.4	0.0	3.4	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.40	4.7	0.23	1.1	1.1	0.0	9.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.02	0.1	0.1	0.0	8.5	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.89	3.7	0.77	2.9	2.9	0.0	5.8	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.49	3.7	0.78	2.9	2.9	0.0	2.9	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.49	3.5	1.18	4.1	4.1	0.0	4.1	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.49	4.7	0.18	0.9	0.9	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.45	3.3	1.26	4.2	4.2	0.0	4.2	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.0	0.56	4.5	0.22	1.0	1.0	0.0	1.0	1.0%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.69	3.4	1.41	4.9	4.9	0.0	12.8	0.8%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.49	3.5	2.24	7.9	7.9	0.0	7.9	1.0%	36	
CVS-12A (inlet 3-5)	12A	0.81	7.7	0.49	4.1	0.40	1.6	1.6	0.0	40.0	1.9%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.49	3.6	0.64	2.3	2.3	0.0	40.0	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.49	4.2	0.57	2.4	2.4	0.0	2.4	3.6%	18	
CVS 13A (inlet 6-5A)	13A	1.20	9.7	0.55	4.0	0.66	2.6	2.6	0.0	2.6	1.0%	18	
CVS 13B (inlet 4-5B)	13B	1.53	9.0	0.56	3.9	0.86	3.4	3.4	0.0	3.4	1.0%	24	
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.49	3.9	0.62	2.4	2.4	0.0	2.4	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.49	3.6	0.93	3.3	3.3	0.0	8.2	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	0.2	0.2	0.0	4.3	4.7%	24	
CVS-14B (inlet 6-5B)	14	2.73	13.4	0.07	3.3	0.19	0.6	0.6	0.0	8.6	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.49	3.5	0.94	3.4	3.4	0.0	3.4	2.8%	18	
CVS-15 (inlet 5-5)	15	2.05	13.4	0.49	3.3	1.00	3.3	3.3	0.0	3.3	5.0%	18	
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.53	4.1	0.50	2.0	2.0	0.0	2.0	1.0%	18	
CVS-16	16	2.58	13.1	0.49	3.4	1.26	4.2	4.2	-	-	-	-	
CVS-17	17	4.10	10.0	0.49	3.8	2.01	7.6	7.6	-	-	-	-	
CVS-18	18	3.06	12.8	0.45	3.4	1.36	4.6	4.6	-	-	-	-	
CVS-19	19	1.61	6.0	0.65	4.5	1.05	4.7	4.7	-	-	-	-	
CVS-20	20	1.80	10.4	0.49	3.7	0.98	3.3	3.3	-	-	-	-	
CVS-21	21	3.88	16.1	0.49	3.1	1.90	5.8	5.8	-	-	-	-	
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.30	3.4	1.13	3.8	3.8	0.0	5.9	3.3%	36	
BEL-2 (inlet 1-1)	B2	1.36	7.6	0.69	4.2	0.95	3.9	3.9	0.0	8.4	0.9%	36	
BEL-3 (inlet 1-2)	B3	6.78	14.4	0.19	3.2	1.26	4.1	4.1	0.0	8.6	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.69	4.1	1.21	5.0	5.0	0.0	11.6	2.9%	36	
BEL-5	B5	4.55	11.0	0.68	3.6	3.08	11.1	11.1	-	-	-	-	
BEL-6	B6	3.95	7.4	0.63	4.2	2.50	10.6	10.6	-	-	-	-	

5 YEAR STORM

Basin ID	DIRECT RUNOFF Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	CfA (Acres)	Direct Runoff, Q (cfs)	INLET Intercepted (cfs)	Bypass (cfs)	STORM SEWER Design Flow (cfs)	Slope (%)	Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.33	4.3	1.27	5.5	5.5	0.0	10.0	3.1%	24	
CVS-2 (inlet 2-3)	2	1.42	6.6	0.72	4.3	1.03	4.5	4.5	0.0	4.5	10.0%	24	
CVS-3 (inlet 1-4)	3	0.94	6.1	0.59	4.4	0.53	2.4	2.4	0.0	2.4	1.7%	18	
CVS-4 (inlet 2-4)	4	1.17	4.1	0.49	5.0	0.53	2.6	2.6	0.0	2.6	0.9%	18	
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.51	3.6	1.13	4.0	4.0	0.0	4.0	1.0%	18	
CVS-5 (inlet 5-4)	5	2.19	9.0	0.47	3.9	0.90	3.6	3.6	0.0	3.6	1.0%	18	
CVS-6 (inlet 6-4)	6	0.58	5.0	0.42	4.7	0.24	1.1	1.1	0.0	0.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.46	4.7	0.36	1.7	1.7	0.0	9.1	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.84	3.7	0.93	3.5	3.5	0.0	5.9	3.0%	24	
CVS-8 (inlet 2-6)	8	1.59	10.1	0.72	3.7	1.18	4.3	4.3	0.0	4.3	1.4%	24	
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.72	3.5	1.73	6.0	6.0	0.0	6.0	1.2%	18	
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.72	4.7	0.19	0.9	0.9	0.0	0.9	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.70	3.3	1.32	4.3	4.3	0.0	4.3	1.2%	18	
CVS-10A (inlet 5-4A)	10A	0.40	5.0	0.74	4.5	0.23	1.1	1.1	0.0	1.1	1.0%	18	
CVS-11 (inlet 1-5)	11	2.03	12.3	0.73	3.4	1.47	5.1	5.1	0.0	13.3	0.8%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.72	3.5	2.34	8.2	8.2	0.0	8.2	1.0%	36	
CVS-12A (inlet 3-5)	12	0.81	7.7	0.51	4.1	0.41	1.7	1.7	0.0	41.4	1.9%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.51	3.6	0.67	2.4	2.4	0.0	41.4	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.51	4.2	0.59	2.5	2.5	0.0	2.5	3.6%	18	
CVS 13A (inlet 6-5A)	13A	1.20	9.7	0.58	4.0	0.69	2.7	2.7	0.0	2.7	1.0%	18	
CVS 13B (inlet 4-5B)	13B	1.53	9.0	0.59	3.9	0.90	3.5	3.5	0.0	3.5	1.0%	18	
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.51	3.9	0.64	2.5	2.5	0.0	2.5	1.0%	18	
CVS-14 (inlet 6-5)	14	1.89	11.1	0.51	3.6	0.97	3.5	3.5	0.0	8.5	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	0.2	0.2	0.0	4.5	4.7%	24	
CVS-14B (inlet 6-5B)	14	2.73	13.4	0.07	3.3	0.20	0.7	0.7	0.0	8.8	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.51	3.5	0.99	3.5	3.5	0.0	3.5	2.8%	18	
CVS-15 (inlet 5-5)	15	2.01	13.4	0.51	3.3	1.03	3.4	3.4	0.0	3.4	5.0%	18	
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.55	4.1	0.52	2.1	2.1	2.1	0.0	2.1	1.0%	18
CVS-16	16	2.58	13.1	0.51	3.4	1.32	4.4	-	-	-	-	-	
CVS-17	17	4.10	10.0	0.51	3.8	2.10	7.9	-	-	-	-	-	
CVS-18	18	3.06	12.8	0.47	3.4	1.42	4.8	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.68	4.5	1.09	4.9	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.51	3.7	1.02	3.4	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.51	3.1	1.98	6.1	-	-	-	-	-	
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.32	3.4	1.18	4.0	4.0	0.0	6.1	3.3%	36	
BEL-2 (inlet 1-1)	B2	1.36	7.6	0.72	4.2	0.99	4.1	4.1	0.0	8.8	0.9%	36	
BEL-3 (inlet 1-2)	B3	6.78	14.4	0.20	3.2	1.32	4.2	4.2	0.0	8.9	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.73	4.1	1.27	5.2	5.2	0.0	12.1	2.9%	36	
BEL-5	B5	4.55	11.0	0.71	3.6	3.22	11.6	11.6	-	-	-	-	
BEL-6	B6	3.95	7.4	0.66	4.2	2.61	10.9	10.9	-	-	-	-	

100 YEAR STORM

Basin ID	DIRECT RUNOFF Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	CfA (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Bypass, Q (cfs)	INLET Intercepted (cfs)	Bypass (cfs)	STORM SEWER Design Flow (cfs)	Slope (%)	Pipe Size (inches)	REMARKS
CVS-1 (inlet 1-3)	1	3.85	6.9	0.65	2.51	9.6	20.2	13.5	6.7	22.5	3.1%	24	Bypass flow goes to CVS-3.
CVS-2 (inlet 2-3)	2	1.42	6.6	0.85	1.21	9.9	9.9	9.0	1.0	9.0	10.0%	24	Bypass flow goes to CVS-4.
CVS-3 (inlet 1-4)	3	0.94	6.2	0.78	0.73	6.9	12.4	7.7	4.9	7.7	1.7%	18	Takes bypass flow from CVS-1. Bypass goes to CVS-7.
CVS-4 (inlet 2-4)	4	1.17	4.1	0.69	0.81	7.5	8.5	8.0	0.5	8.0	0.9%	18	Takes bypass flow from CVS-2. Bypass goes to CVS-8.
CVS-4A (inlet 3-4)	4A	2.20	11.3	0.72	1.59	10.7	11.2	11.2	0.0	11.2	1.0%	18	Takes bypass flow from CVS-5.
CVS-5 (inlet 5-4)	5	2.19	9.0	0.67	1.46	10.0	10.8	9.8	1.0	11.0	1.0%	18	Bypass flow goes to CVS-4A.
CVS-6 (inlet 6-4)	6	0.58	5.0	0.67	0.38	3.6	3.6	3.0	0.6	51.3	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.46	0.36	3.2	3.2	3.2	0.0	51.0	3.1%	36	
CVS-7 (inlet 1-6)	7	1.11	10.2	0.84	0.93	6.5	11.4	7.3	4.1	15.4	3.0%	24	Takes bypass flow from CVS-3. Bypass goes to CVS-11.
CVS-8 (inlet 2-6)	8	1.59	10.1	0.72	1.15	8.1	8.6	8.1	0.5	8.1	1.4%	24	Takes bypass flow from CVS-4. Bypass goes to CVS-12.
CVS-9 (inlet 4-5A)	9	2.41	11.9	0.72	1.74	11.4	11.6	10.2	1.4	10.2	1.2%	18	Bypass flow goes to CVS-12.
CVS-9A (inlet 4-4)	9A	0.37	5.0	0.72	0.8	2.7	2.4	2.4	0.0	2.4	1.0%	18	
CVS-10 (inlet 5-5A)	10	2.78	13.7	0.70	6.2	1.96	12.1	12.3	10.6	1.7	10.6	1.2%	18	Takes bypass flow from CVS-10A. Bypass flow goes to CVS-19B.
CVS-10A (inlet 5-4A)	10A	0.40	5.6	0.76	8.5	0.31	2.6	2.3	0.4	2.2	1.0%	18	Bypass flow goes to CVS-10.
CVS-11 (inlet 1-5)	11	2.03	12.3	0.84	6.5	1.70	11.0	15.1	15.1	0.0	38.7	0.8%	36	
CVS-12 (inlet 2-5)	12	4.58	11.9	0.72	6.6	3.31	21.7	23.6	23.6	0.0	23.6	0.7%	36	Takes bypass flow from CVS-9 and CVS-9.
CVS-12A (inlet 3-5)	12	0.81	7.7	0.72	7.8	0.59	4.6	4.5	0.0	137.0	1.9%	42	
CVS-12B (inlet 3-5)	12A	1.31	10.8	0.72	6.8	0.90	6.5	9.4	9.4	0.0	137.0	1.9%	42	
CVS-13 (inlet 4-5)	13	1.16	7.4	0.72	7.9	0.84	6.6	8.9	8.9	0.0	8.9	3.6%	18	Takes bypass flow from CVS-13A and CVS 13C.
CVS 13A (inlet 6-5A)	13A	1.20	9.7	0.78	7.4	0.91	6.7	8.2	8.2	0.5	8.2	1.0%	18	Takes bypass flow from CVS-13.
CVS 13B (inlet 4-5B)	13B	1.53	9.0	0.76	7.3	1.17	8.5	9.4	6.9	2.5	6.9	1.0%	18	Takes bypass flow from CVS-13B. Bypass flow goes to CVS-13.
CVS 13C (inlet 4-5C)	13C	1.26	8.8	0.72	7.4	0.91	6.7	7.9	3.9	4.0	3.9	1.0%	18	Takes bypass flow from CVS-13C. Bypass flow goes to CVS-14.
CVS-14 (inlet 6-5)	14	1.89	11.1	0.72	6.7	1.37	9.2	10.1	10.1	0.0	34.4	3.2%	30	
CVS-14A (inlet 7-5)	14A	4.01	17.5	0.48	5.5	1.86	15.3	10.2	10.2	0.0	34.8	4.7%	24	
CVS-14B (inlet 6-5)	14	2.73	13.4	0.49	6.2	1.35	9.4	9.5	9.5	0.0	54.4	3.4%	30	
CVS-14C (inlet 5-5B)	14C	1.93	11.4	0.72	6.7	1.40	9.3	9.3	7.5	1.8	7.5	2.8%	18	Takes bypass flow from CVS-14.
CVS-15 (inlet 5-5)	15	2.01	13.4	0.72	6.2	1.45	9.0	9.1	8.1	0.0	9.1	5.0%	18	Takes bypass flow from CVS-15A
CVS-15A (inlet 6-5B)	15A	0.95	7.9	0.77	7.2	0.74	5.3	5.4	5.3	0.1	5.3	1.0%	18	
CVS-16	16	2.58	13.1	0.72	6.3	1.67	10.5	-	-	-	-	-		
CVS-17	17	4.10	10.0	0.72	7.0	2.87	20.3	-	-	-	-	-		
CVS-18	18	3.06	12.8	0.70	6.4	2.14	13.8	-	-	-	-	-		
CVS-19	19	1.61	6.0	0.81	8.4	1.35	11.3	-	-	-	-	-		
CVS-20	20	1.80	10.4	0.72	6.9	1.30	9.0	-	-	-	-	-		
CVS-21	21	3.88	16.1	0.72	5.7	2.81	16.0	-	-	-	-	-		
BEL-1 (inlet 2-1)	B1	3.73	12.8	0.62	6.3	2.31	14.7	14.7	8.3	6.4	63.6	3.3%	36	Bypass flow goes to BEL-4.
BEL-2 (inlet 1-1)	B2	1.36	7.6	0.83	7.9	1.19	9.9	9.9	9.0	0.9	69.5	0.9%	36	Bypass flow goes to BEL-1.
BEL-3 (inlet 1-2)	B3	6.78	14.4	0.56	6.0	3.76	22.6	29.0	29.0	0.0	95.6	3.2%	36	
BEL-4 (inlet 1-2)	B4	1.75	7.9	0.84	7.7	1.48	11.2	13.6	13.6	0.0	110.6	2.9%	36	
BEL-5	B5	4.55	11.0	0.83	6.8	3.78	25.5	-	-	-	-	-		
BEL-6	B6	3.95	7.4	0.80	7.9	3.17	24.9	-	-	-	-	-		

NOTE: BYPASS FLOWS NOT INTERCEPETED BY ON GRADE INLETS HAVE BEEN REDUCED BY 50% AND ADDED TO THE DIRECT FLOW AT THE NEXT DOWNHILL INLET PER SECTION 6.3.2 OF THE TOWN OF PARKER STORM DRAINAGE AND ENVIRONMENTAL CRITERIA MANUAL

LEGEND

- XX — SUB-BASIN #
- X.XX AC. | X.XX X.XX — 2/5-YEAR RUNOFF COEFFICIENT (*DENOTES 5-YEAR RUNOFF); 100-YEAR RUNOFF COEFFICIENT
- AREA (ACRES)
- PROPOSED SUB-BASIN BOUNDARY

DATE	REVISIONS	DRAWN BY
A 11/21/2016	REVISED PER TOWN COMMENTS	RAK

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COMPARK SOUTH
TOWN OF PARKER, CO

PROPOSED DRAINAGE AREA MAP - FILING NO. 2

COLORADO REGISTERED PROFESSIONAL ENGINEER — JERRY L. MOORE — 30877 — 1-26-17

PROJ. MGR.: KLB
PROJ. ASSOC.: ASD
DRAWN BY: RAK
DATE: 6-30-16

SHEET 3 OF 3
CLCPKC3

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Plotted: 1/26/2017 3:26 PM Dwg Name: P:\Clcpkc3\ComSouth05\Residential Preliminary\Plot\Documents\Engineering\Storm\Water Reports\Drainage Exhibits\Drainage Basin Map BAK 11-21-16.dwg Updated By: RKatz

Compark South

TOWN OF PARKER, COLORADO
PROPOSED IMPERVIOUSNESS CALCULATIONS
6/9/2016

CVS-1

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	1.18	1.18
Landscape	2%	2.67	0.05
	Total Area:	3.85	

Percentage Imperviousness: **32.0%**
C_2 (Table 6-4, Type C Soil): **0.28**
C_5 (Table 6-4, Type C Soil): **0.33**
C_{100} (Table 6-4, Type C Soil): **0.65**

CVS-2

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	1.09	1.09
Landscape	2%	0.33	0.01
	Total Area:	1.42	

Percentage Imperviousness: **77.0%**
C_2 (Table 6-4, Type C Soil): **0.69**
C_5 (Table 6-4, Type C Soil): **0.72**
C_{100} (Table 6-4, Type C Soil): **0.85**

CVS-3

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.57	0.57
Landscape	2%	0.37	0.01
	Total Area:	0.94	

Percentage Imperviousness: **62.0%**
C_2 (Table 6-4, Type B Soil): **0.55**
C_5 (Table 6-4, Type B Soil): **0.58**
C_{100} (Table 6-4, Type B Soil): **0.76**

CVS-4

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.56	0.56
Landscape	2%	0.61	0.01
	Total Area:	1.17	

Percentage Imperviousness: **49.0%**
C_2 (Table 6-4, Type B Soil): **0.44**
C_5 (Table 6-4, Type B Soil): **0.46**
C_{100} (Table 6-4, Type B Soil): **0.69**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

CVS-4A

Percentage Imperviousness*:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-5

Percentage Imperviousness*:	**45.0%**
C_2 (Table 6-4, Type B Soil):	**0.40**
C_5 (Table 6-4, Type B Soil):	**0.42**
C_{100} (Table 6-4, Type B Soil):	**0.67**

CVS-6

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.28	0.28
Landscape	2%	0.37	0.01
	Total Area:	0.65	

Percentage Imperviousness:	**45.0%**
C_2 (Table 6-4, Type B Soil):	**0.40**
C_5 (Table 6-4, Type B Soil):	**0.42**
C_{100} (Table 6-4, Type B Soil):	**0.67**

CVS-6A

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.00	0.00
Landscape	2%	0.78	0.02
	Total Area:	0.78	

Percentage Imperviousness:	**2.0%**
C_2 (Table 6-4, Type B Soil):	**0.02**
C_5 (Table 6-4, Type B Soil):	**0.02**
C_{100} (Table 6-4, Type B Soil):	**0.46**

CVS-7

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.86	0.86
Landscape	2%	0.25	0.01
	Total Area:	1.11	

Percentage Imperviousness:	**78.0%**
C_2 (Table 6-4, Type B Soil):	**0.69**
C_5 (Table 6-4, Type B Soil):	**0.73**
C_{100} (Table 6-4, Type B Soil):	**0.84**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

CVS-8

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.86	0.86
Landscape	2%	0.73	0.01
	Total Area:	1.59	

Percentage Imperviousness: **55.0%**
C_2 (Table 6-4, Type B Soil): **0.49**
C_5 (Table 6-4, Type B Soil): **0.51**
C_{100} (Table 6-4, Type B Soil): **0.72**

CVS-9

Percentage Imperviousness*: **55.0%**
C_2 (Table 6-4, Type B Soil): **0.49**
C_5 (Table 6-4, Type B Soil): **0.51**
C_{100} (Table 6-4, Type B Soil): **0.72**

CVS-9A

Percentage Imperviousness*: **55.0%**
C_2 (Table 6-4, Type B Soil): **0.49**
C_5 (Table 6-4, Type B Soil): **0.51**
C_{100} (Table 6-4, Type B Soil): **0.72**

CVS-10

Percentage Imperviousness*: **51.0%**
C_2 (Table 6-4, Type B Soil): **0.45**
C_5 (Table 6-4, Type B Soil): **0.47**
C_{100} (Table 6-4, Type B Soil): **0.70**

CVS-10A

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.25	0.25
Landscape	2%	0.15	0.00
	Total Area:	0.40	

Percentage Imperviousness: **63.0%**
C_2 (Table 6-4, Type B Soil): **0.56**
C_5 (Table 6-4, Type B Soil): **0.59**
C_{100} (Table 6-4, Type B Soil): **0.76**

CVS-11

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	2.08	2.08
Landscape	2%	1.39	0.03
	Total Area:	3.47	

Percentage Imperviousness: **78.0%**
C_2 (Table 6-4, Type B Soil): **0.69**
C_5 (Table 6-4, Type B Soil): **0.73**
C_{100} (Table 6-4, Type B Soil): **0.84**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

CVS-12

Percentage Imperviousness*:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-12A

Percentage Imperviousness*:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-12B

Percentage Imperviousness*:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-13

Percentage Imperviousness*:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-13A

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.76	0.76
Landscape	2%	0.48	0.01
	Total Area:	1.24	

Percentage Imperviousness:	**62.0%**
C_2 (Table 6-4, Type B Soil):	**0.55**
C_5 (Table 6-4, Type B Soil):	**0.58**
C_{100} (Table 6-4, Type B Soil):	**0.76**

CVS-13B

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.79	0.79
Landscape	2%	0.48	0.01
	Total Area:	1.27	

Percentage Imperviousness:	**63.0%**
C_2 (Table 6-4, Type B Soil):	**0.56**
C_5 (Table 6-4, Type B Soil):	**0.59**
C_{100} (Table 6-4, Type B Soil):	**0.76**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

CVS-13C

Percentage Imperviousness*:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-14

Percentage Imperviousness:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-14A

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.00	0.00
Landscape	2%	4.12	0.08
	Total Area:	4.12	

Percentage Imperviousness:	**2.0%**
C_2 (Table 6-4, Type B Soil):	**0.02**
C_5 (Table 6-4, Type B Soil):	**0.02**
C_{100} (Table 6-4, Type B Soil):	**0.46**

CVS-14B

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.18	0.18
Landscape	2%	2.55	0.05
	Total Area:	2.73	

Percentage Imperviousness:	**8.0%**
C_2 (Table 6-4, Type B Soil):	**0.07**
C_5 (Table 6-4, Type B Soil):	**0.07**
C_{100} (Table 6-4, Type B Soil):	**0.49**

CVS-14C

Percentage Imperviousness:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

CVS-15

Percentage Imperviousness*:	**55.0%**
C_2 (Table 6-4, Type B Soil):	**0.49**
C_5 (Table 6-4, Type B Soil):	**0.51**
C_{100} (Table 6-4, Type B Soil):	**0.72**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

CVS-15A

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.55	0.55
Landscape	2%	0.40	0.01
	Total Area:	0.95	

Percentage Imperviousness: **59.0%**
C_2 (Table 6-4, Type B Soil): **0.53**
C_5 (Table 6-4, Type B Soil): **0.55**
C_{100} (Table 6-4, Type B Soil): **0.74**

CVS-16

Percentage Imperviousness*: **55.0%**
C_2 (Table 6-4, Type B Soil): **0.49**
C_5 (Table 6-4, Type B Soil): **0.51**
C_{100} (Table 6-4, Type B Soil): **0.72**

CVS-17

Percentage Imperviousness*: **55.0%**
C_2 (Table 6-4, Type B Soil): **0.49**
C_5 (Table 6-4, Type B Soil): **0.51**
C_{100} (Table 6-4, Type B Soil): **0.72**

CVS-18

Percentage Imperviousness*: **50.0%**
C_2 (Table 6-4, Type B Soil): **0.45**
C_5 (Table 6-4, Type B Soil): **0.47**
C_{100} (Table 6-4, Type B Soil): **0.70**

CVS-19

Percentage Imperviousness*: **73.0%**
C_2 (Table 6-4, Type B Soil): **0.65**
C_5 (Table 6-4, Type B Soil): **0.68**
C_{100} (Table 6-4, Type B Soil): **0.81**

CVS-20

Percentage Imperviousness*: **55.0%**
C_2 (Table 6-4, Type B Soil): **0.49**
C_5 (Table 6-4, Type B Soil): **0.51**
C_{100} (Table 6-4, Type B Soil): **0.72**

CVS-21

Percentage Imperviousness*: **55.0%**
C_2 (Table 6-4, Type B Soil): **0.49**
C_5 (Table 6-4, Type B Soil): **0.51**
C_{100} (Table 6-4, Type B Soil): **0.72**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

BEL-1

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	1.23	1.23
Landscape	2%	2.50	0.05
	Total Area:	3.73	

Percentage Imperviousness: **34.0%**
C_2 (Table 6-4, Type B Soil): **0.30**
C_5 (Table 6-4, Type B Soil): **0.32**
C_{100} (Table 6-4, Type B Soil): **0.62**

BEL-2

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	0.68	0.68
Landscape	2%	0.70	0.01
	Total Area:	1.38	

Percentage Imperviousness: **77.0%**
C_2 (Table 6-4, Type B Soil): **0.69**
C_5 (Table 6-4, Type B Soil): **0.72**
C_{100} (Table 6-4, Type B Soil): **0.83**

BEL-3

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	1.34	1.34
Landscape	2%	5.42	0.11
	Total Area:	6.76	

Percentage Imperviousness: **21.0%**
C_2 (Table 6-4, Type B Soil): **0.19**
C_5 (Table 6-4, Type B Soil): **0.20**
C_{100} (Table 6-4, Type B Soil): **0.56**

BEL-4

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	1.36	1.36
Landscape	2%	0.39	0.01
	Total Area:	1.75	

Percentage Imperviousness: **78.0%**
C_2 (Table 6-4, Type B Soil): **0.69**
C_5 (Table 6-4, Type B Soil): **0.73**
C_{100} (Table 6-4, Type B Soil): **0.84**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

BEL-5

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	3.43	3.43
Landscape	2%	1.12	0.02
	Total Area:	4.55	

Percentage Imperviousness: **76.0%**
C_2 (Table 6-4, Type B Soil): **0.68**
C_5 (Table 6-4, Type B Soil): **0.71**
C_{100} (Table 6-4, Type B Soil): **0.83**

BEL-6

Land Use	Imperviousness (UDFCD Table 6-3)	Total Area (Acres)	Impervious Area (Acres)
Pavement/Hardscape	100%	2.77	2.77
Landscape	2%	1.18	0.02
	Total Area:	3.95	

Percentage Imperviousness: **71.0%**
C_2 (Table 6-4, Type B Soil): **0.63**
C_5 (Table 6-4, Type B Soil): **0.66**
C_{100} (Table 6-4, Type B Soil): **0.80**

*Note: Impervous percentages were determined using Figures 3-3, 3-4, 3-5 from Volume 3 of the Urban Storm Drainage Critera Manual.

PROPOSED DRAINAGE BASINS
STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

PROJECT: **COMPARK VILLAGE SOUTH, FILINGS 1 & 2** CLCPKC3

CALCULATED BY: RAK DATE: November 18, 2016 Manning's n-value =0.013 2-YEAR
REVISED BY: DATE:

DIRECT RUNOFF									INLET	STORM SEWER				REMARKS
Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	C*A (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	Intercepted (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.28	4.3	1.10	**4.7**	**4.7**	4.7	0.0	8.9	3.1%	24	
CVS-2 (Inlet 2-3)	2	1.42	6.6	0.69	4.3	0.97	**4.2**	**4.2**	4.2	0.0	4.2	10.0%	24	
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.55	4.4	0.52	**2.3**	**2.3**	2.3	0.0	2.3	1.7%	18	
CVS-4 (Inlet 2-4)	4	1.17	4.1	0.44	5.0	0.51	**2.5**	**2.5**	2.5	0.0	2.5	0.9%	18	
CVS-4A (Inlet 3-4)	4A	1.76	11.3	0.49	3.6	0.86	**3.1**	**3.1**	3.1	0.0	2.9	1.0%	18	
CVS-5 (Inlet 5-4)	5	2.63	9.0	0.40	3.9	1.05	**4.1**	**4.1**	4.1	0.0	4.1	1.0%	18	
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.40	4.7	0.23	**1.1**	**1.1**	1.1	0.0	9.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	**0.1**	0.1	0.0	8.5	3.1%	36	
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.69	3.7	0.77	**2.9**	**2.9**	2.9	0.0	5.8	3.0%	24	
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.49	3.7	0.78	**2.9**	**2.9**	2.9	0.0	2.9	1.4%	24	
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.49	3.5	1.18	**4.1**	**4.1**	4.1	0.0	4.1	1.2%	18	
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.49	4.7	0.18	**0.9**	**0.9**	0.9	0.0	0.9	1.0%	18	
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.45	3.3	1.26	**4.2**	**4.2**	4.2	0.0	4.2	1.2%	18	
CVS-10A (Inlet 5-4A)	10A	0.40	5.8	0.56	4.5	0.22	**1.0**	**1.0**	1.0	0.0	1.0	1.0%	18	
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.69	3.4	1.41	**4.9**	**4.9**	4.9	0.0	12.8	0.8%	36	
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.49	3.5	2.24	**7.9**	**7.9**	7.9	0.0	7.9	0.7%	36	
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.49	4.1	0.40	**1.6**	**1.6**	1.6	0.0	40.0	1.9%	42	
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.49	3.6	0.64	**2.3**	**2.3**	2.3	0.0	40.0	1.9%	42	
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.49	4.2	0.57	**2.4**	**2.4**	2.4	0.0	2.4	3.6%	18	
CVS 13A (Inlet 6-5A)	13A	1.20	8.7	0.55	4.0	0.66	**2.6**	**2.6**	2.6	0.0	2.6	1.0%	18	
CVS 13B (Inlet 4-5B)	13B	1.53	9.0	0.56	3.9	0.86	**3.4**	**3.4**	3.4	0.0	3.4	1.0%	18	
CVS 13C (Inlet 4-5C)	13C	1.26	8.8	0.49	3.9	0.62	**2.4**	**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.49	3.6	0.93	**3.3**	**3.3**	3.3	0.0	8.2	3.2%	30	
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.2	0.0	4.3	4.7%	24	
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.07	3.3	0.19	**0.6**	**0.6**	0.6	0.0	8.6	3.4%	30	
CVS-14C (Inlet 5-5B)	14C	1.93	11.4	0.49	3.6	0.94	**3.4**	**3.4**	3.4	0.0	3.4	2.8%	18	
CVS-15 (Inlet 5-5)	15	2.05	13.4	0.49	3.3	1.00	**3.3**	**3.3**	3.3	0.0	3.3	5.0%	18	
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.53	4.1	0.50	**2.0**	**2.0**	2.0	0.0	2.0	1.0%	18	
CVS-16	16	2.58	13.1	0.49	3.4	1.26	**4.2**	**4.2**	-	-	-	-	-	
CVS-17	17	4.10	10.0	0.49	3.8	2.01	**7.6**	**7.6**	-	-	-	-	-	
CVS-18	18	3.06	12.8	0.45	3.4	1.36	**4.6**	**4.6**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.65	4.5	1.05	**4.7**	**4.7**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.49	3.7	0.88	**3.3**	**3.3**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.49	3.1	1.90	**5.8**	**5.8**	-	-	-	-	-	
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.30	3.4	1.13	**3.8**	**3.8**	3.8	0.0	5.9	3.3%	36	
BEL-2 (Inlet 1-1)	B2	1.38	7.6	0.69	4.2	0.95	**3.9**	**3.9**	3.9	0.0	8.4	0.9%	36	
BEL-3 (Inlet 2-2)	B3	6.76	14.4	0.19	3.2	1.26	**4.1**	**4.1**	4.1	0.0	6.6	3.2%	36	
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.69	4.1	1.21	**5.0**	**5.0**	5.0	0.0	11.6	2.9%	36	
BEL-5	B5	4.55	11.0	0.68	3.6	3.08	**11.1**	**11.1**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.63	4.2	2.50	**10.5**	**10.5**	-	-	-	-	-	

PROPOSED DRAINAGE BASINS
STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

PROJECT: **COMPARK VILLAGE SOUTH, FILINGS 1 & 2** CLCPKC3

CALCULATED BY: RAK DATE: November 18, 2016 Manning's n-value =0.013 5-YEAR
REVISED BY: DATE:

		DIRECT RUNOFF							INLET		STORM SEWER			REMARKS
Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	C*A (Acres)	Direct Runoff, Q (cfs)	Total Runoff, Q (cfs)	Intercepted (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.33	4.3	1.27	**5.5**	**5.5**	5.5	0.0	10.0	3.1%	24	
CVS-2 (Inlet 2-3)	2	1.42	6.6	0.72	4.3	1.03	**4.5**	**4.5**	4.5	0.0	4.5	10.0%	24	
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.58	4.4	0.54	**2.4**	**2.4**	2.4	0.0	2.4	1.7%	18	
CVS-4 (Inlet 2-4)	4	1.17	4.1	0.46	5.0	0.53	**2.6**	**2.6**	2.6	0.0	2.6	0.9%	18	
CVS-4A (Inlet 3-4)	4A	1.76	11.3	0.51	3.6	0.90	**3.2**	**3.2**	3.2	0.0	3.1	1.0%	18	
CVS-5 (Inlet 5-4)	5	2.63	9.0	0.42	3.9	1.10	**4.3**	**4.3**	4.3	0.0	4.3	1.0%	18	
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.42	4.7	0.24	**1.1**	**1.1**	1.1	0.0	9.6	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.02	4.7	0.01	**0.1**	**0.1**	0.1	0.0	8.5	3.1%	36	
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.73	3.7	0.81	**3.0**	**3.0**	3.0	0.0	6.0	3.0%	24	
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.51	3.7	0.81	**3.0**	**3.0**	3.0	0.0	3.0	1.4%	24	
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.51	3.5	1.23	**4.3**	**4.3**	4.3	0.0	4.3	1.2%	18	
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.51	4.7	0.19	**0.9**	**0.9**	0.9	0.0	0.9	1.0%	18	
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.47	3.3	1.32	**4.3**	**4.3**	4.3	0.0	4.3	1.2%	18	
CVS-10A (Inlet 5-4A)	10A	0.40	5.8	0.59	4.5	0.23	**1.1**	**1.1**	1.1	0.0	1.1	1.0%	18	
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.73	3.4	1.47	**5.1**	**5.1**	5.1	0.0	13.3	0.8%	36	
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.51	3.5	2.34	**8.2**	**8.2**	8.2	0.0	8.2	0.7%	36	
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.51	4.1	0.41	**1.7**	**1.7**	1.7	0.0	41.4	1.9%	42	
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.51	3.6	0.67	**2.4**	**2.4**	2.4	0.0	41.4	1.9%	42	
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.51	4.2	0.59	**2.5**	**2.5**	2.5	0.0	2.5	3.6%	18	
CVS 13A (Inlet 6-5A)	13A	1.20	8.7	0.58	4.0	0.69	**2.7**	**2.7**	2.7	0.0	2.7	1.0%	18	
CVS 13B (Inlet 4-5B)	13B	1.53	9.0	0.59	3.9	0.90	**3.5**	**3.5**	3.5	0.0	3.5	1.0%	18	
CVS 13C (Inlet 4-5C)	13C	1.26	8.8	0.51	3.9	0.64	**2.5**	**2.5**	2.5	0.0	2.5	1.0%	18	
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.51	3.6	0.97	**3.5**	**3.5**	3.5	0.0	8.5	3.2%	30	
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.02	2.9	0.07	**0.2**	**0.2**	0.2	0.0	4.3	4.7%	24	
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.07	3.3	0.20	**0.7**	**0.7**	0.7	0.0	8.8	3.4%	30	
CVS-14C (Inlet 5-5B)	14C	1.93	11.4	0.51	3.6	0.99	**3.5**	**3.5**	3.5	0.0	3.5	2.8%	18	
CVS-15 (Inlet 5-5)	15	2.01	13.4	0.51	3.3	1.03	**3.4**	**3.4**	3.4	0.0	3.4	5.0%	18	
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.55	4.1	0.52	**2.1**	**2.1**	2.1	0.0	2.1	1.0%	18	
CVS-16	16	2.58	13.1	0.51	3.4	1.32	**4.4**	**4.4**	-	-	-	-	-	
CVS-17	17	4.10	10.0	0.51	3.8	2.10	**7.9**	**7.9**	-	-	-	-	-	
CVS-18	18	3.06	12.8	0.47	3.4	1.42	**4.8**	**4.8**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.68	4.5	1.09	**4.9**	**4.9**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.51	3.7	0.92	**3.4**	**3.4**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.51	3.1	1.98	**6.1**	**6.1**	-	-	-	-	-	
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.32	3.4	1.18	**4.0**	**4.0**	4.0	0.0	6.1	3.3%	36	
BEL-2 (Inlet 1-1)	B2	1.38	7.6	0.72	4.2	0.99	**4.1**	**4.1**	4.1	0.0	8.8	0.9%	36	
BEL-3 (Inlet 2-2)	B3	6.76	14.4	0.20	3.2	1.32	**4.2**	**4.2**	4.2	0.0	6.9	3.2%	36	
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.73	4.1	1.27	**5.2**	**5.2**	5.2	0.0	12.1	2.9%	36	
BEL-5	B5	4.55	11.0	0.71	3.6	3.22	**11.6**	**11.6**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.66	4.2	2.61	**10.9**	**10.9**	-	-	-	-	-	

PROPOSED DRAINAGE BASINS
STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

PROJECT: **COMPARK VILLAGE SOUTH, FILINGS 1 & 2** CLCPKC3

CALCULATED BY: RAK DATE: November 18, 2016 Manning's n-value =0.013 100-YEAR

REVISED BY: DATE:

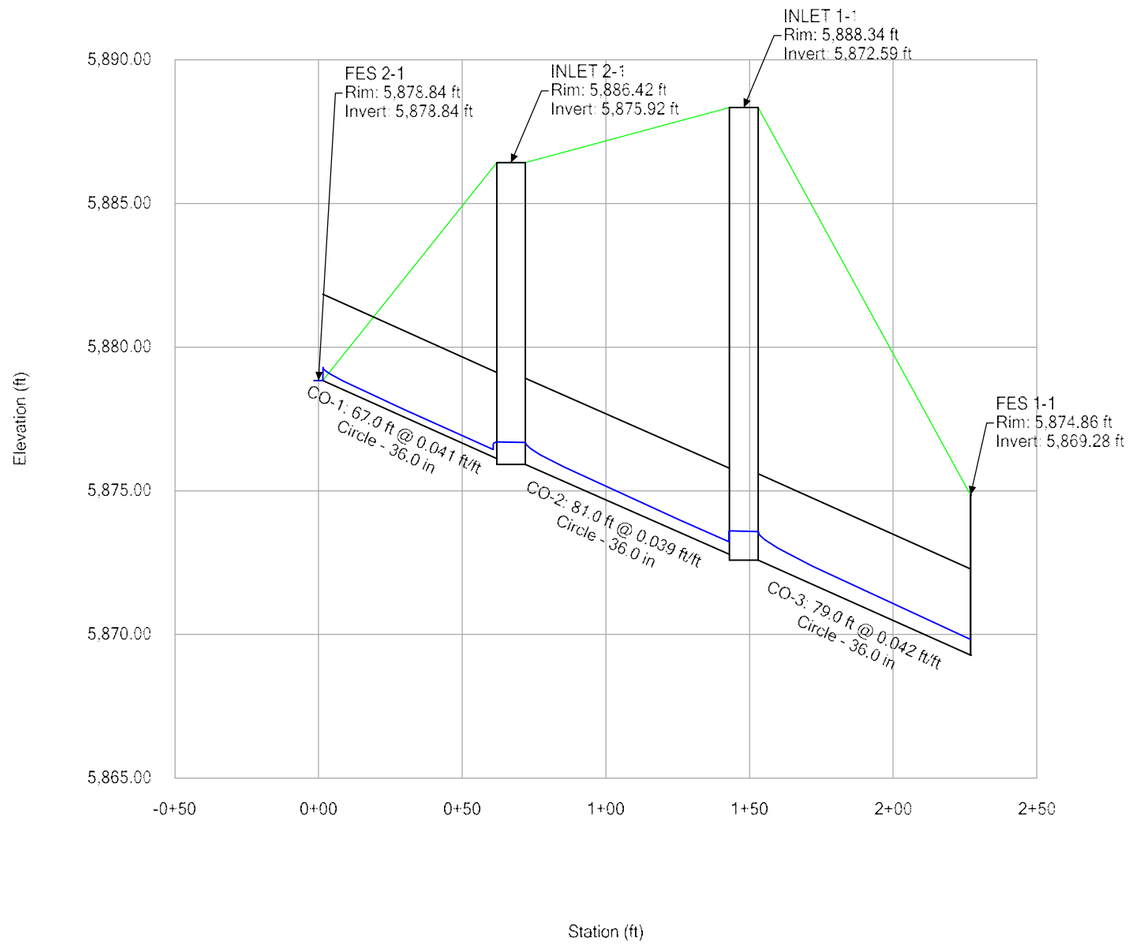
		DIRECT RUNOFF							INLET		STORM SEWER			REMARKS
Basin ID	Design Point	Area (ac)	Tc (min.)	Runoff Coefficient, C	Intensity, I (in/hr)	C*A (Acres)	Direct Runoff, Q (cfs)	Total Runoff with Bypass, Q (cfs)	Intercepted (cfs)	Bypass (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	
CVS-1 (Inlet 1-3)	1	3.85	6.9	0.65	8.0	2.51	**20.2**	**20.2**	13.5	6.7	22.5	3.1%	24	Bypass flow goes to CVS-3.
CVS-2 (Inlet 2-3)	2	1.42	6.6	0.85	8.1	1.21	**9.9**	**9.9**	9.0	1.0	9.0	10.0%	24	Bypass flow goes to CVS-4.
CVS-3 (Inlet 1-4)	3	0.94	6.2	0.76	8.3	0.71	**5.9**	**12.6**	7.7	4.9	7.7	1.7%	18	Takes bypass flow from CVS-1. Bypass goes to CVS-7.
CVS-4 (Inlet 2-4)	4	1.17	4.1	0.69	9.3	0.81	**7.5**	**8.5**	8.0	0.5	8.0	0.9%	18	Takes bypass flow from CVS-2. Bypass goes to CVS-8.
CVS-4A (Inlet 3-4)	4A	1.76	11.3	0.72	6.7	1.27	**8.5**	**9.5**	9.5	0.0	9.6	1.0%	18	Takes bypass flow from CVS-5.
CVS-5 (Inlet 5-4)	5	2.63	9.0	0.67	7.3	1.77	**13.0**	**13.0**	11.0	2.0	11.0	1.0%	18	Bypass flow goes to CVS-4A.
CVS-6 (Inlet 6-4)	6	0.58	5.0	0.67	8.8	0.39	**3.5**	**3.5**	3.5	0.0	51.3	1.7%	36	
CVS-6A (FES 2-4)	6A	0.78	5.0	0.46	8.8	0.36	**3.2**	**3.2**	3.2	0.0	51.0	3.1%	36	
CVS-7 (Inlet 1-6)	7	1.11	10.2	0.84	7.0	0.93	**6.5**	**11.4**	7.3	4.1	15.4	3.0%	24	Takes bypass flow from CVS-3. Bypass goes to CVS-11.
CVS-8 (Inlet 2-6)	8	1.59	10.1	0.72	7.0	1.15	**8.1**	**8.6**	8.1	0.5	8.1	1.4%	24	Takes bypass flow from CVS-4. Bypass goes to CVS-12.
CVS-9 (Inlet 4-5A)	9	2.41	11.9	0.72	6.5	1.74	**11.4**	**11.6**	10.2	1.4	10.2	1.2%	18	Bypass flow goes to CVS-12.
CVS-9A (Inlet 4-4)	9A	0.37	5.0	0.72	8.8	0.27	**2.4**	**2.4**	2.4	0.0	2.4	1.0%	18	
CVS-10 (Inlet 5-5A)	10	2.78	13.7	0.70	6.2	1.96	**12.1**	**12.3**	10.6	1.7	10.6	1.2%	18	Takes bypass flow from CVS-10A. Bypass flow goes to CVS-13B.
CVS-10A (Inlet 5-4A)	10A	0.40	5.8	0.76	8.5	0.31	**2.6**	**2.6**	2.2	0.4	2.2	1.0%	18	Bypass flow goes to CVS-10
CVS-11 (Inlet 1-5)	11	2.03	12.3	0.84	6.5	1.70	**11.0**	**15.1**	15.1	0.0	38.7	0.8%	36	Takes bypass flow from CVS-7.
CVS-12 (Inlet 2-5)	12	4.58	11.9	0.72	6.6	3.31	**21.7**	**23.6**	23.6	0.0	23.6	0.7%	36	Takes bypass flow from CVS-8 and CVS-9.
CVS-12A (Inlet 3-5)	12	0.81	7.7	0.72	7.8	0.59	**4.5**	**4.5**	4.5	0.0	137.0	1.9%	42	
CVS-12B (Inlet 3-5)	12A	1.31	10.8	0.72	6.8	0.95	**6.5**	**9.4**	9.4	0.0	137.0	1.9%	42	
CVS-13 (Inlet 4-5)	13	1.16	7.4	0.72	7.9	0.84	**6.6**	**8.9**	8.9	0.0	8.9	3.6%	18	Takes bypass flow from CVS-13A and CVS 13C.
CVS 13A (Inlet 6-5A)	13A	1.20	8.7	0.76	7.4	0.91	**6.7**	**6.7**	6.2	0.5	6.2	1.0%	18	Bypass flow goes to CVS-13
CVS 13B (Inlet 4-5B)	13B	1.53	9.0	0.76	7.3	1.17	**8.5**	**9.4**	6.9	2.5	6.9	1.0%	18	Takes bypass flow from CVS-10. Bypass flow goes to CVS-13C.
CVS 13C (Inlet 4-5C)	13C	1.26	8.8	0.72	7.4	0.91	**6.7**	**7.9**	3.9	4.0	3.9	1.0%	18	Takes bypass flow from CVS 13B. Bypass flwo goes to CVS-13
CVS-14 (Inlet 6-5)	14	1.89	11.1	0.72	6.7	1.37	**9.2**	**10.1**	10.1	0.0	54.4	3.2%	30	Takes bypass from CVS-14C
CVS-14A (Inlet 7-5)	14A	4.01	17.5	0.46	5.5	1.86	**10.2**	**10.2**	10.2	0.0	34.8	4.7%	24	
CVS-14B (Inlet 6-5)	14	2.73	13.4	0.49	6.2	1.35	**8.4**	**9.5**	9.5	0.0	54.4	3.4%	30	
CVS-14C (Inlet 5-5B)	14C	1.93	11.4	0.72	6.7	1.40	**9.3**	**9.3**	7.5	1.8	7.5	2.8%	18	Bypass flow goes to CVS-14
CVS-15 (Inlet 5-5)	15	2.01	13.4	0.72	6.2	1.45	**9.0**	**9.1**	9.1	0.0	9.1	5.0%	18	Takes bypass flow from CVS-15A
CVS-15A (Inlet 6-5B)	15A	0.95	7.9	0.74	7.7	0.71	**5.4**	**5.4**	5.3	0.1	5.3	1.0%	18	
CVS-16	16	2.58	13.1	0.72	6.3	1.87	**11.7**	**-**	-	-	-	-	-	
CVS-17	17	4.10	10.0	0.72	7.0	2.97	**20.9**	**-**	-	-	-	-	-	
CVS-18	18	3.06	12.8	0.70	6.4	2.14	**13.6**	**-**	-	-	-	-	-	
CVS-19	19	1.61	6.0	0.81	8.4	1.31	**11.0**	**-**	-	-	-	-	-	
CVS-20	20	1.80	10.4	0.72	6.9	1.30	**9.0**	**-**	-	-	-	-	-	
CVS-21	21	3.88	16.1	0.72	5.7	2.81	**16.0**	**-**	-	-	-	-	-	
BEL-1 (Inlet 2-1)	B1	3.73	12.8	0.62	6.3	2.31	**14.7**	**14.7**	8.3	6.4	63.6	3.3%	36	Bypass flow goes to BEL-3.
BEL-2 (Inlet 1-1)	B2	1.38	7.6	0.83	7.8	1.15	**8.9**	**8.9**	6.5	2.4	69.5	0.9%	36	Bypass flow goes to BEL-4.
BEL-3 (Inlet 2-2)	B3	6.76	14.4	0.56	6.0	3.76	**22.6**	**29.0**	29.0	0.0	95.6	3.2%	36	Takes bypass from BEL-1.
BEL-4 (Inlet 1-2)	B4	1.75	7.9	0.84	7.7	1.46	**11.2**	**13.6**	13.6	0.0	110.8	2.9%	36	Takes bypass from BEL-2.
BEL-5	B5	4.55	11.0	0.83	6.8	3.76	**25.5**	**-**	-	-	-	-	-	
BEL-6	B6	3.95	7.4	0.80	7.9	3.17	**24.9**	**-**	-	-	-	-	-	

FlexTable: Conduit Table

Start Node	Stop Node	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	System Fixed Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
STMH 6-4	INLET 6-4	120.0	0.020	36.0	8.50	8.25	5,835.83	5,833.14	5,836.16	5,834.20
INLET 6-4	STMH 5-4	278.0	0.017	36.0	9.60	8.03	5,833.31	5,828.39	5,833.67	5,829.39
FES 2-5	INLET 8-5	7.7	0.070	24.0	4.10	10.91	5,835.25	5,834.45	5,835.51	5,835.38
INLET 5-4	STMH 5-4	52.0	0.010	18.0	3.40	5.28	5,830.05	5,829.42	5,830.32	5,829.85
INLET 3-4	STMH 4-4	20.0	0.010	18.0	3.90	5.40	5,826.18	5,825.89	5,826.47	5,826.31
INLET 1-4	STMH 2-4	65.0	0.017	18.0	2.30	5.79	5,823.61	5,822.33	5,823.83	5,822.85
INLET 4-4	STMH 4-4	20.0	0.010	18.0	0.90	3.57	5,825.77	5,825.53	5,825.90	5,825.73
INLET 2-6	INLET 1-6	80.0	0.014	24.0	2.90	5.56	5,813.62	5,812.63	5,813.84	5,812.76
INLET 2-5	INLET 1-5	90.0	0.007	36.0	7.90	5.50	5,808.98	5,808.73	5,809.30	5,808.86
INLET 1-5	STMH 1-5	103.0	0.008	36.0	12.80	6.59	5,808.60	5,808.70	5,808.89	5,808.78
STMH 1-5	FES 1-5	446.0	0.029	42.0	53.81	15.71	5,808.11	5,794.35	5,809.11	5,798.18
INLET 2-3	INLET 1-3	94.0	0.101	24.0	4.20	12.50	5,841.28	5,831.37	5,841.54	5,833.80
FES 2-4	STMH 6-4	221.0	0.031	36.0	8.50	9.68	5,842.92	5,835.66	5,843.25	5,837.11
STMH 5-4	STMH 4-4	163.0	0.027	36.0	14.00	10.69	5,828.60	5,823.68	5,829.05	5,825.46
INLET 4-5	STMH 2-5A	19.0	0.036	18.0	2.40	7.64	5,813.55	5,813.63	5,813.76	5,813.66
INLET 5-5	STMH 2-5	49.0	0.050	18.0	3.30	9.35	5,814.59	5,813.40	5,814.86	5,813.45
STMH 4-4	STMH 3-4	79.0	0.008	36.0	18.80	7.34	5,823.55	5,822.99	5,824.08	5,823.49
STMH 3-4	STMH 2-4	76.0	0.011	36.0	21.30	8.59	5,822.94	5,822.16	5,823.52	5,822.71
INLET 2-4	STMH 3-4	56.0	0.009	18.0	2.50	4.71	5,822.96	5,822.97	5,823.04	5,823.00
INLET 1-6	STMH 1-6	133.0	0.010	24.0	5.80	6.09	5,812.57	5,811.04	5,812.89	5,811.61
STMH 1-6	FES1-6	50.0	0.005	24.0	5.80	4.68	5,811.10	5,810.83	5,811.42	5,811.17
INLET 8-5	INLET 7-5	173.0	0.035	24.0	4.10	8.52	5,834.22	5,827.91	5,834.48	5,829.04
INLET 4-5A	STMH 2-5E	20.0	0.012	18.0	4.10	5.96	5,821.92	5,821.91	5,822.22	5,822.07
INLET 5-5A	STMH 2-5E	20.0	0.012	18.0	4.20	6.00	5,821.93	5,821.91	5,822.24	5,822.08
STMH 2-5	INLET 3-5	16.0	0.024	42.0	36.10	13.13	5,813.23	5,812.92	5,813.98	5,813.60
INLET 3-5	STMH 1-5	266.0	0.018	42.0	40.00	12.31	5,812.86	5,808.20	5,813.66	5,808.82
INLET 7-5	STMH 4-5	104.6	0.047	24.0	4.30	9.57	5,827.87	5,823.07	5,828.14	5,823.28
STMH 4-5	INLET 6-5	23.0	0.036	24.0	4.30	8.75	5,823.00	5,822.20	5,823.27	5,822.44
STMH 2-5A	STMH 2-5	50.0	0.014	36.0	20.00	9.32	5,813.60	5,813.41	5,814.16	5,813.67
STMH 2-5B	STMH 2-5A	241.0	0.014	30.0	17.60	9.06	5,816.93	5,813.65	5,817.51	5,814.18
STMH 2-4	STMH 1-4	60.0	0.026	36.0	23.60	12.21	5,821.98	5,819.88	5,822.60	5,821.76
STMH 1-4	FES 1-4	33.0	0.026	36.0	23.60	12.15	5,820.42	5,820.00	5,821.04	5,820.35
INLET 1-3	STMH 1-3	18.4	0.031	24.0	8.90	10.21	5,831.00	5,830.87	5,831.43	5,831.06
STMH 1-3	O-1	12.0	0.031	24.0	8.90	10.19	5,830.85	5,830.90	5,831.05	5,831.03
INLET 5-4A	STMH 5-4	43.0	0.010	18.0	1.00	3.75	5,829.63	5,829.14	5,829.77	5,829.36
STMH 2-5E	STMH 2-5D	44.0	0.015	24.0	8.30	7.79	5,821.83	5,821.42	5,822.23	5,821.65
STMH 2-5D	STMH 2-5C	45.0	0.014	24.0	11.80	8.25	5,821.35	5,820.86	5,821.88	5,821.27
STMH 2-5C	STMH 2-5B	289.0	0.014	30.0	15.20	8.69	5,820.81	5,816.97	5,821.33	5,817.38
INLET 4-5B	STMH 2-5C	18.0	0.010	18.0	3.40	5.30	5,820.85	5,820.85	5,820.94	5,820.92
INLET 5-5B	STMH 2-5D	293.0	0.028	18.0	3.50	7.71	5,829.01	5,821.43	5,829.29	5,821.51
INLET 4-5C	STMH 2-5B	18.0	0.010	18.0	2.40	4.82	5,816.96	5,816.96	5,817.00	5,816.99
INLET 6-5	STMH 3-5A	247.0	0.034	30.0	8.20	10.12	5,822.09	5,813.92	5,822.45	5,814.09
STMH 3-5A	STMH 2-5	48.0	0.027	30.0	12.80	10.58	5,813.87	5,813.31	5,814.34	5,813.46
INLET 6-5A	STMH 3-5A	19.0	0.010	18.0	2.60	4.93	5,813.90	5,813.91	5,813.97	5,813.95
INLET 6-5B	STMH 3-5A	19.0	0.010	18.0	2.00	4.58	5,813.90	5,813.90	5,813.93	5,813.93

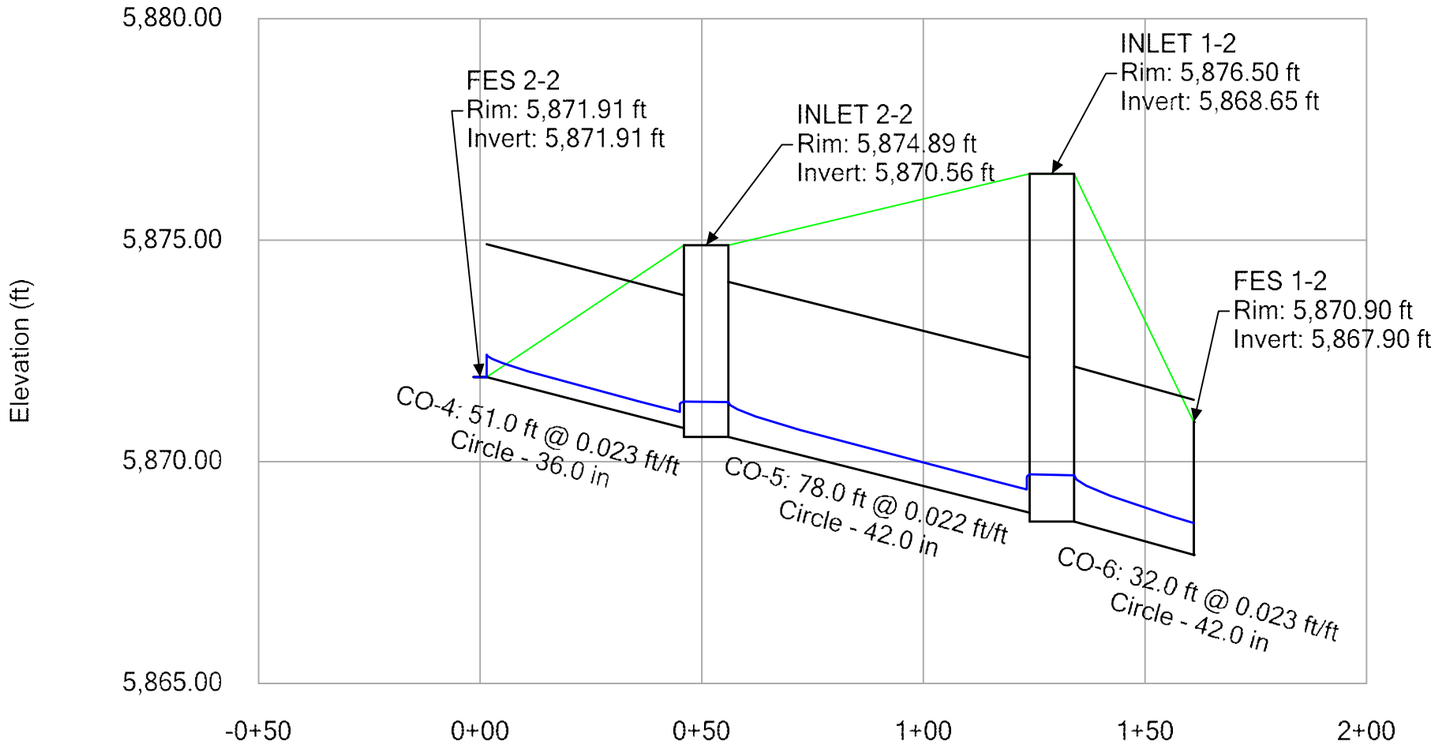
Profile Report

Engineering Profile - Profile - Storm Line 1 (Belford Ave StormCAD [2 year].stsw)



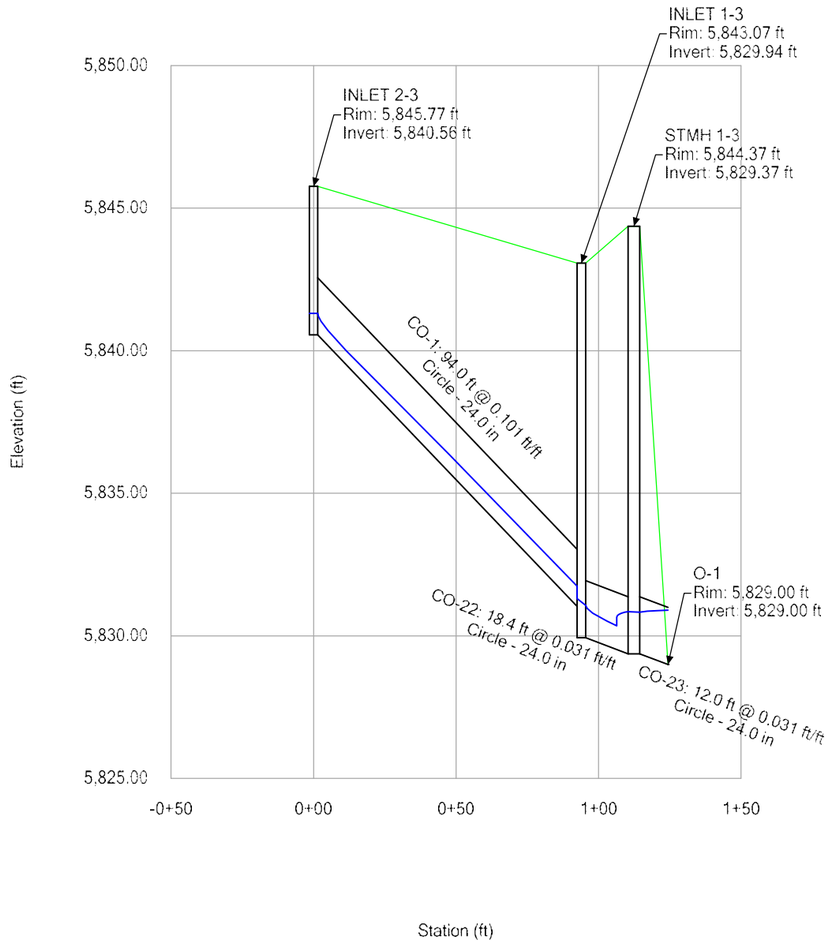
Profile Report

Engineering Profile - Profile - Storm Line 2 (Belford Ave StormCAD [2 year].stsw)

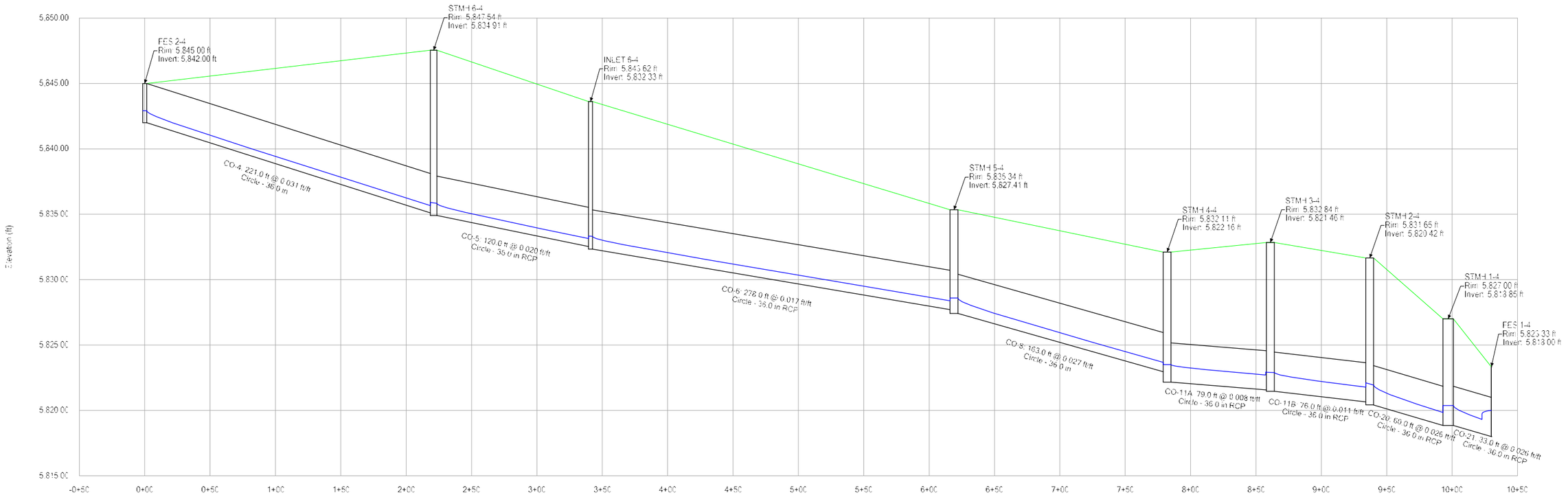


Profile Report

Engineering Profile - Profile - Storm Line 3 (Compark Village South StormCAD [2 year].stsw)

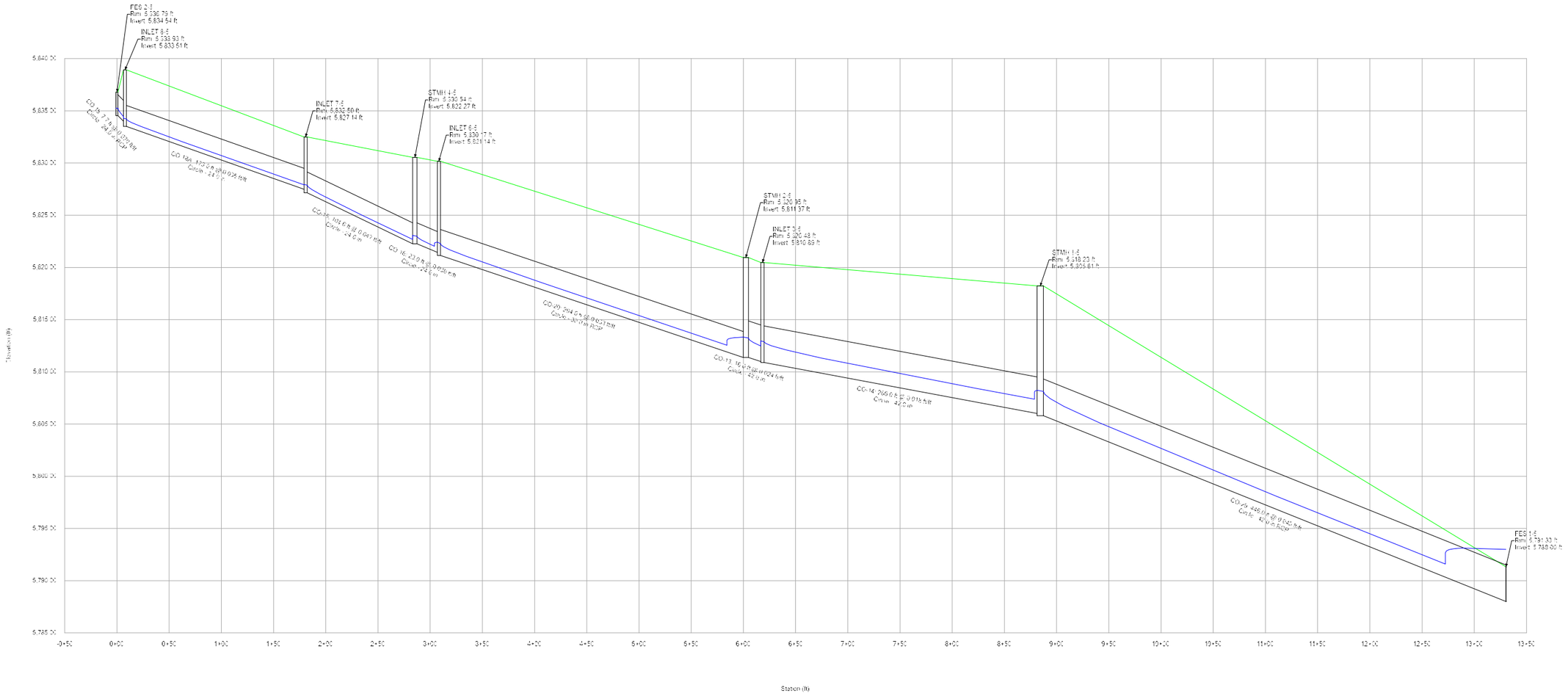


Profile Report
Engineering Profile - Profile - Storm Line 4 (Compark Village South StormCAD [2 year].stsw)



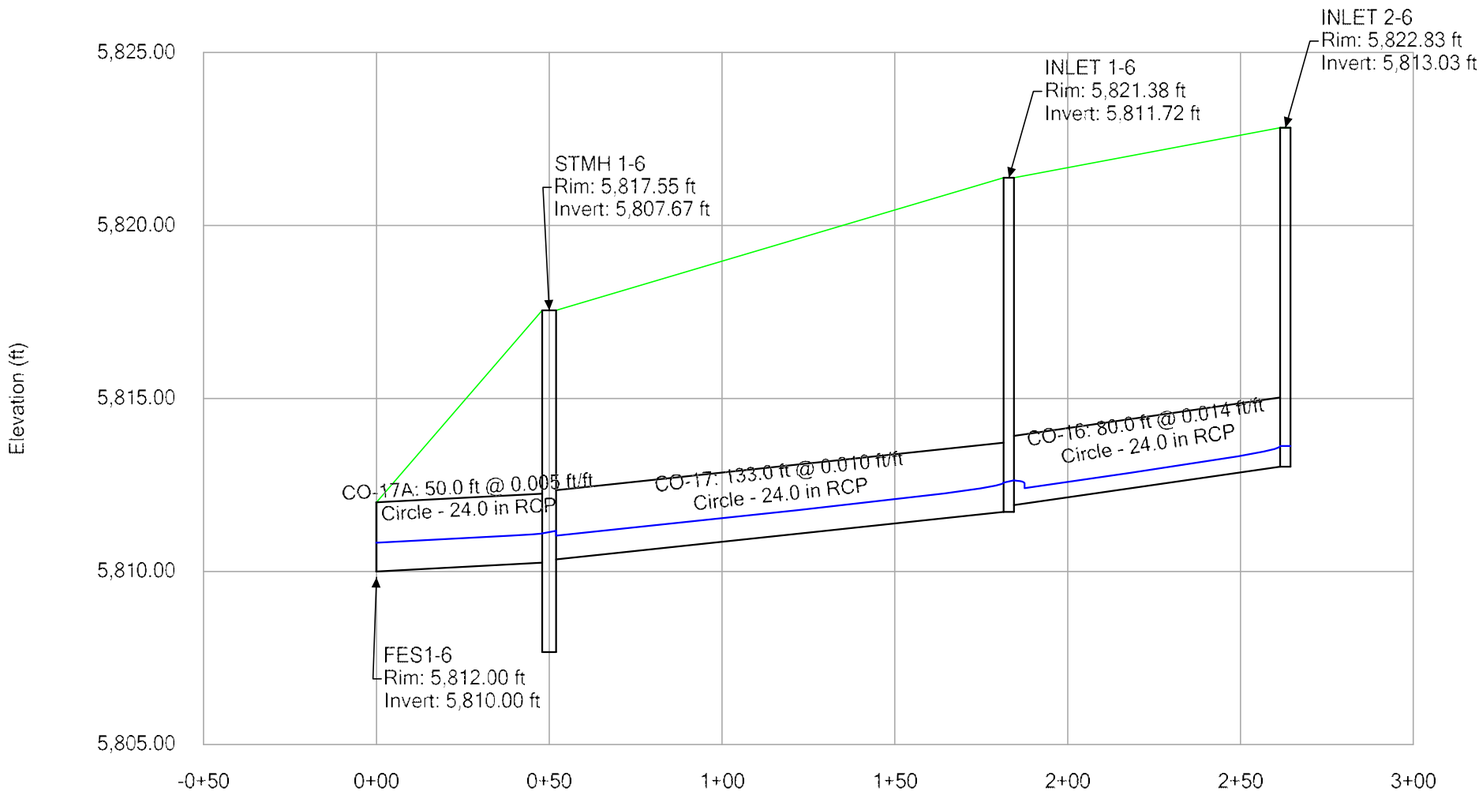
Profile Report

Engineering Profile - Profile - Storm Line 5 (Compark Village South StormCAD [2 year].stsw)



Profile Report

Engineering Profile - Profile - Storm Line 6 (Compark Village South StormCAD [2 year].stsw)

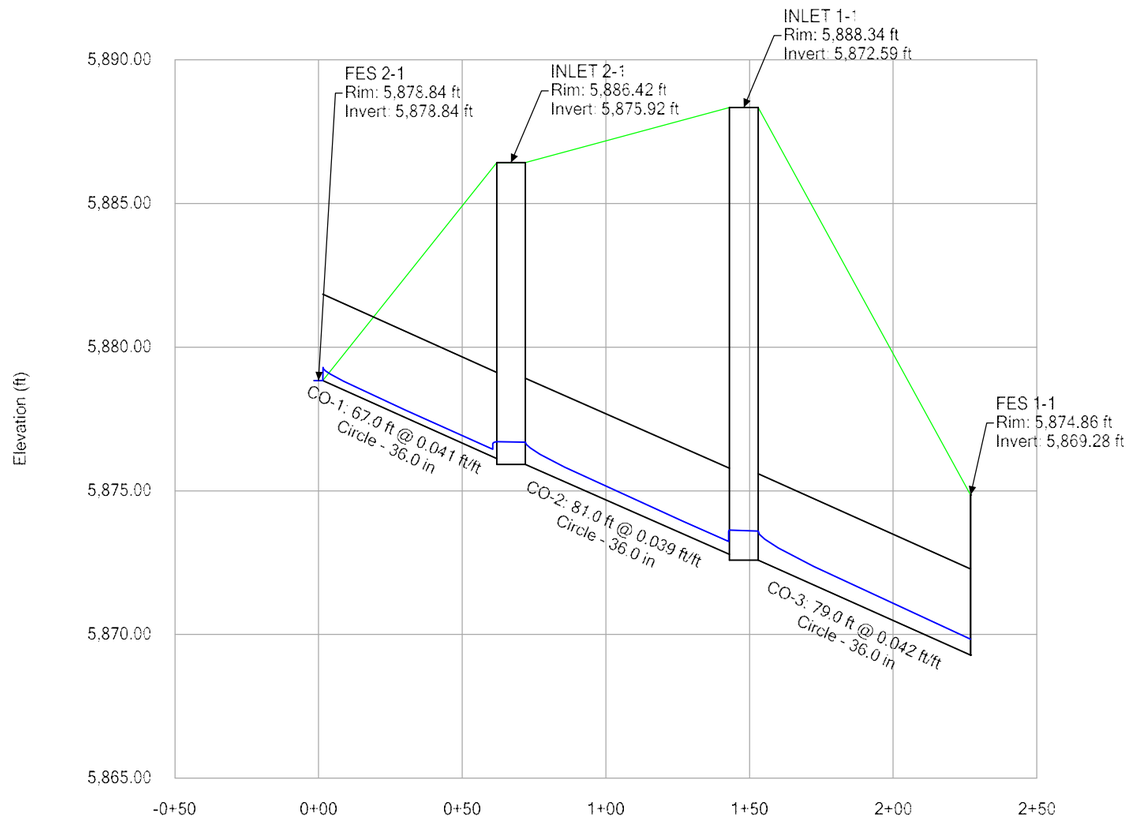


FlexTable: Conduit Table

Start Node	Stop Node	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	System Fixed Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
STMH 6-4	INLET 6-4	120.0	0.020	36.0	8.50	8.25	5,835.83	5,833.14	5,836.16	5,834.20
INLET 6-4	STMH 5-4	278.0	0.017	36.0	9.60	8.03	5,833.31	5,828.39	5,833.67	5,829.39
FES 2-5	INLET 8-5	7.7	0.070	24.0	4.10	10.91	5,835.25	5,834.45	5,835.51	5,835.38
INLET 5-4	STMH 5-4	52.0	0.010	18.0	3.60	5.37	5,830.07	5,829.44	5,830.35	5,829.88
INLET 3-4	STMH 4-4	20.0	0.010	18.0	4.00	5.44	5,826.19	5,825.89	5,826.49	5,826.33
INLET 1-4	STMH 2-4	65.0	0.017	18.0	2.40	5.86	5,823.63	5,822.34	5,823.84	5,822.88
INLET 4-4	STMH 4-4	20.0	0.010	18.0	0.90	3.57	5,825.77	5,825.53	5,825.90	5,825.73
INLET 2-6	INLET 1-6	80.0	0.014	24.0	3.00	5.61	5,813.63	5,812.65	5,813.85	5,812.78
INLET 2-5	INLET 1-5	90.0	0.007	36.0	8.20	5.56	5,809.00	5,808.81	5,809.32	5,808.93
INLET 1-5	STMH 1-5	103.0	0.008	36.0	13.30	6.66	5,808.68	5,808.76	5,808.95	5,808.85
STMH 1-5	FES 1-5	446.0	0.029	42.0	55.71	15.85	5,808.15	5,794.38	5,809.18	5,798.28
INLET 2-3	INLET 1-3	94.0	0.101	24.0	4.50	12.77	5,841.31	5,831.38	5,841.58	5,833.91
FES 2-4	STMH 6-4	221.0	0.031	36.0	8.50	9.68	5,842.92	5,835.66	5,843.25	5,837.11
STMH 5-4	STMH 4-4	163.0	0.027	36.0	14.30	10.75	5,828.61	5,823.69	5,829.07	5,825.49
INLET 4-5	STMH 2-5A	19.0	0.036	18.0	2.50	7.73	5,813.56	5,813.65	5,813.78	5,813.69
INLET 5-5	STMH 2-5	49.0	0.050	18.0	3.40	9.43	5,814.60	5,813.44	5,814.87	5,813.50
STMH 4-4	STMH 3-4	79.0	0.008	36.0	19.20	7.38	5,823.56	5,823.01	5,824.11	5,823.51
STMH 3-4	STMH 2-4	76.0	0.011	36.0	21.80	8.64	5,822.96	5,822.19	5,823.55	5,822.74
INLET 2-4	STMH 3-4	56.0	0.009	18.0	2.60	4.76	5,822.98	5,822.99	5,823.07	5,823.02
INLET 1-6	STMH 1-6	133.0	0.010	24.0	6.00	6.15	5,812.59	5,811.05	5,812.92	5,811.64
STMH 1-6	FES1-6	50.0	0.005	24.0	6.00	4.73	5,811.12	5,810.85	5,811.45	5,811.20
INLET 8-5	INLET 7-5	173.0	0.035	24.0	4.10	8.52	5,834.22	5,827.91	5,834.48	5,829.04
INLET 4-5A	STMH 2-5E	20.0	0.012	18.0	4.30	6.04	5,821.94	5,821.93	5,822.25	5,822.10
INLET 5-5A	STMH 2-5E	20.0	0.012	18.0	4.30	6.04	5,821.94	5,821.93	5,822.25	5,822.10
STMH 2-5	INLET 3-5	16.0	0.024	42.0	37.30	13.25	5,813.27	5,812.96	5,814.03	5,813.65
INLET 3-5	STMH 1-5	266.0	0.018	42.0	41.40	12.42	5,812.89	5,808.25	5,813.71	5,808.88
INLET 7-5	STMH 4-5	104.6	0.047	24.0	4.30	9.57	5,827.87	5,823.07	5,828.14	5,823.28
STMH 4-5	INLET 6-5	23.0	0.036	24.0	4.30	8.75	5,823.00	5,822.22	5,823.27	5,822.44
STMH 2-5A	STMH 2-5	50.0	0.014	36.0	20.60	9.39	5,813.63	5,813.44	5,814.20	5,813.71
STMH 2-5B	STMH 2-5A	241.0	0.014	30.0	18.10	9.13	5,816.95	5,813.67	5,817.54	5,814.21
STMH 2-4	STMH 1-4	60.0	0.026	36.0	24.20	12.30	5,822.00	5,819.89	5,822.63	5,821.80
STMH 1-4	FES 1-4	33.0	0.026	36.0	24.20	12.24	5,820.44	5,820.00	5,821.07	5,820.36
INLET 1-3	STMH 1-3	18.4	0.031	24.0	10.00	10.55	5,831.07	5,830.85	5,831.53	5,831.10
STMH 1-3	O-1	12.0	0.031	24.0	10.00	10.53	5,830.83	5,830.90	5,831.09	5,831.06
INLET 5-4A	STMH 5-4	43.0	0.010	18.0	1.10	3.85	5,829.65	5,829.16	5,829.79	5,829.39
STMH 2-5E	STMH 2-5D	44.0	0.015	24.0	8.60	7.86	5,821.85	5,821.44	5,822.26	5,821.68
STMH 2-5D	STMH 2-5C	45.0	0.014	24.0	12.10	8.31	5,821.37	5,820.88	5,821.90	5,821.30
STMH 2-5C	STMH 2-5B	289.0	0.014	30.0	15.60	8.75	5,820.82	5,816.99	5,821.36	5,817.40
INLET 4-5B	STMH 2-5C	18.0	0.010	18.0	3.50	5.35	5,820.87	5,820.87	5,820.96	5,820.94
INLET 5-5B	STMH 2-5D	293.0	0.028	18.0	3.50	7.71	5,829.01	5,821.44	5,829.29	5,821.52
INLET 4-5C	STMH 2-5B	18.0	0.010	18.0	2.50	4.88	5,816.99	5,816.98	5,817.03	5,817.02
INLET 6-5	STMH 3-5A	247.0	0.034	30.0	8.50	10.23	5,822.11	5,813.94	5,822.47	5,814.12
STMH 3-5A	STMH 2-5	48.0	0.027	30.0	13.30	10.69	5,813.90	5,813.34	5,814.38	5,813.50
INLET 6-5A	STMH 3-5A	19.0	0.010	18.0	2.70	4.98	5,813.93	5,813.93	5,813.99	5,813.98
INLET 6-5B	STMH 3-5A	19.0	0.010	18.0	2.10	4.64	5,813.92	5,813.93	5,813.96	5,813.95

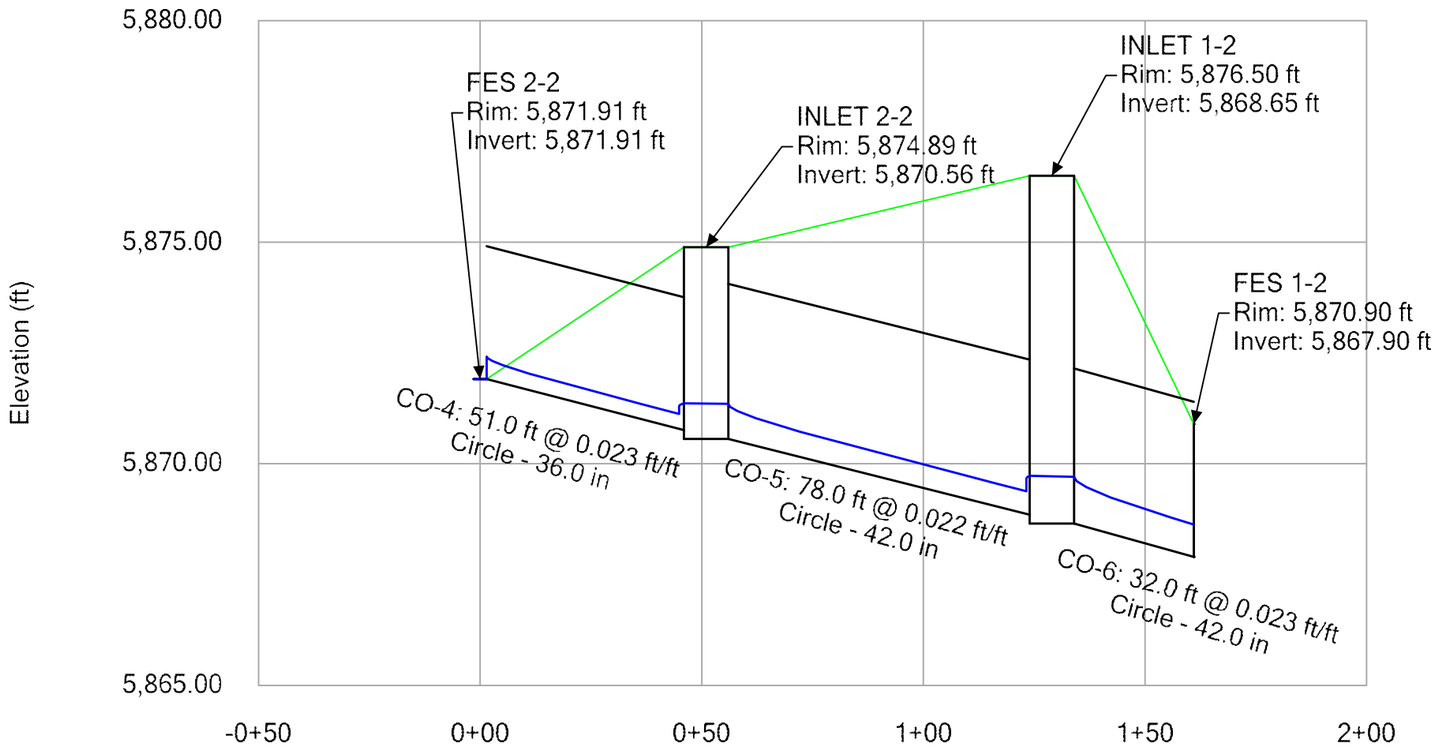
Profile Report

Engineering Profile - Profile - Storm Line 1 (Belford Ave StormCAD [5 year].stsw)



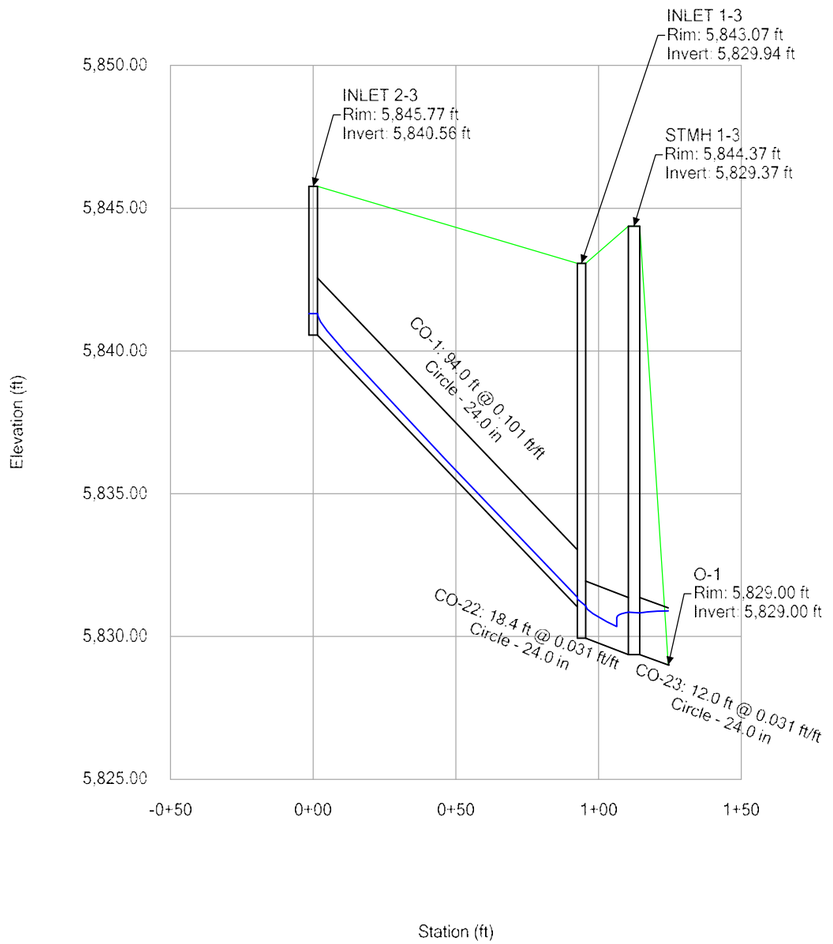
Profile Report

Engineering Profile - Profile - Storm Line 2 (Belford Ave StormCAD [5 year].stsw)

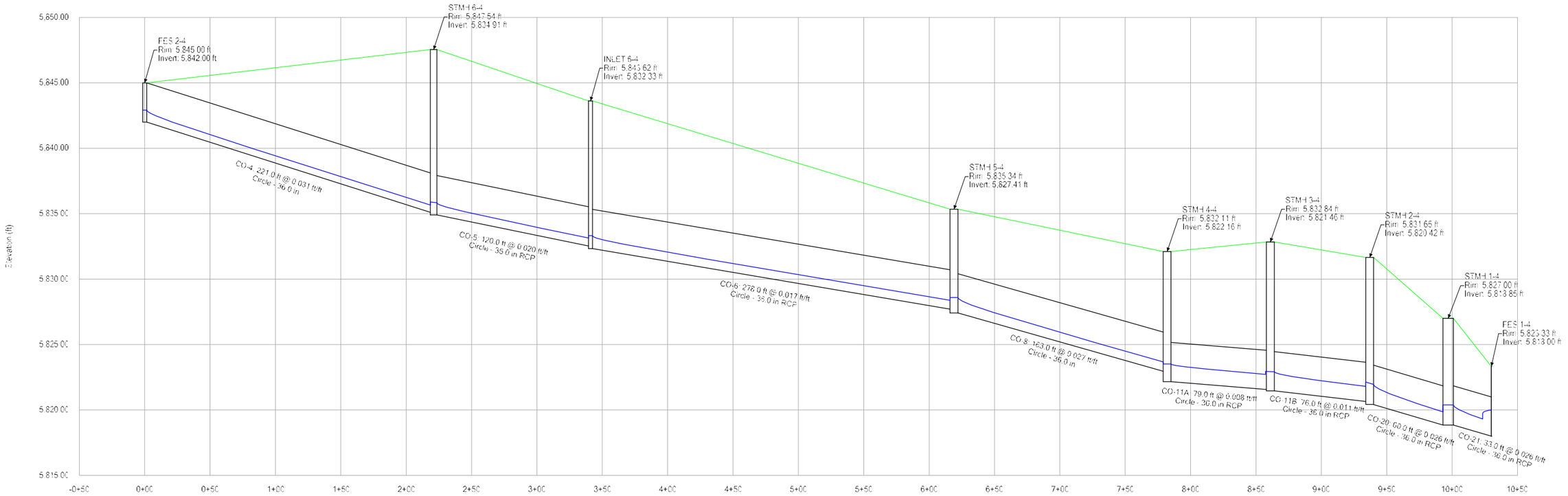


Profile Report

Engineering Profile - Profile - Storm Line 3 (Compark Village South StormCAD [5 year].stsw)

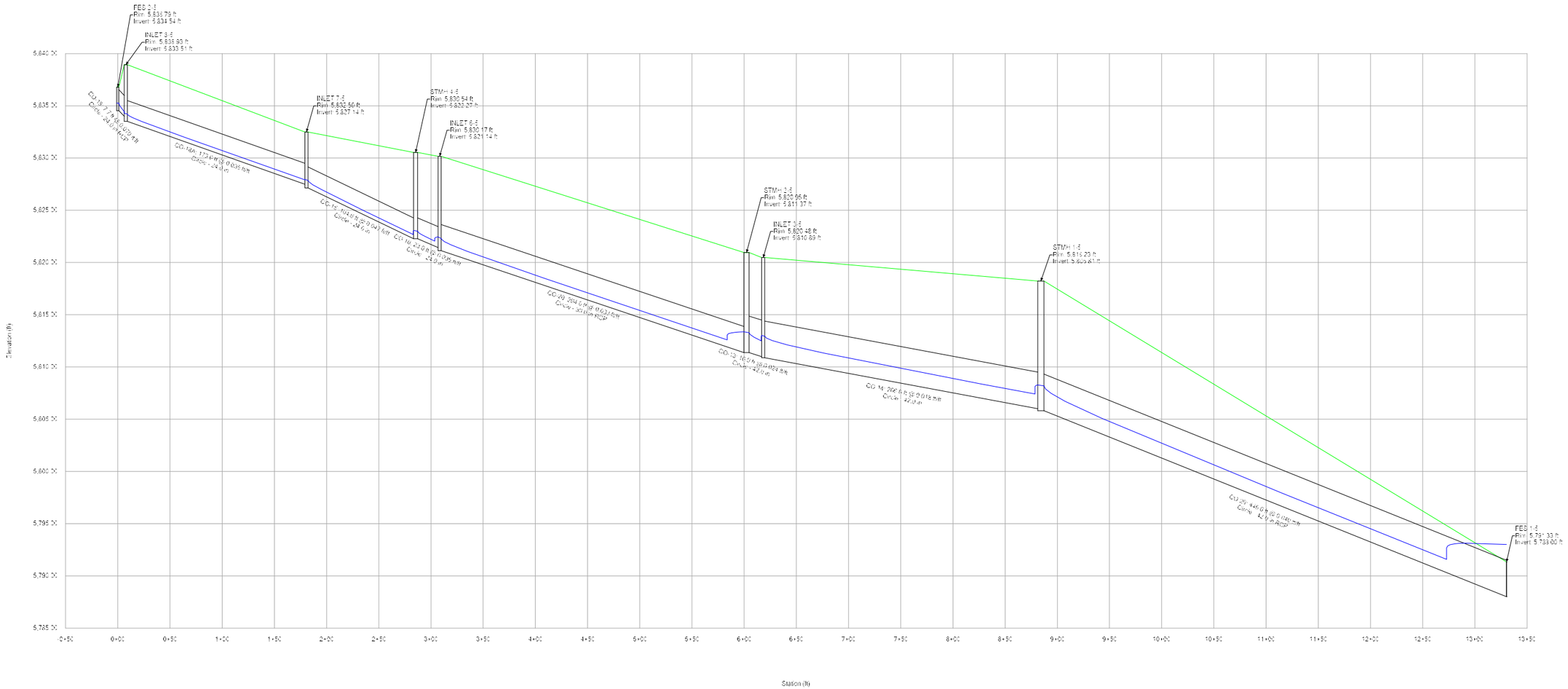


Profile Report
Engineering Profile - Profile - Storm Line 4 (Compark Village South StormCAD [5 year].stsw)



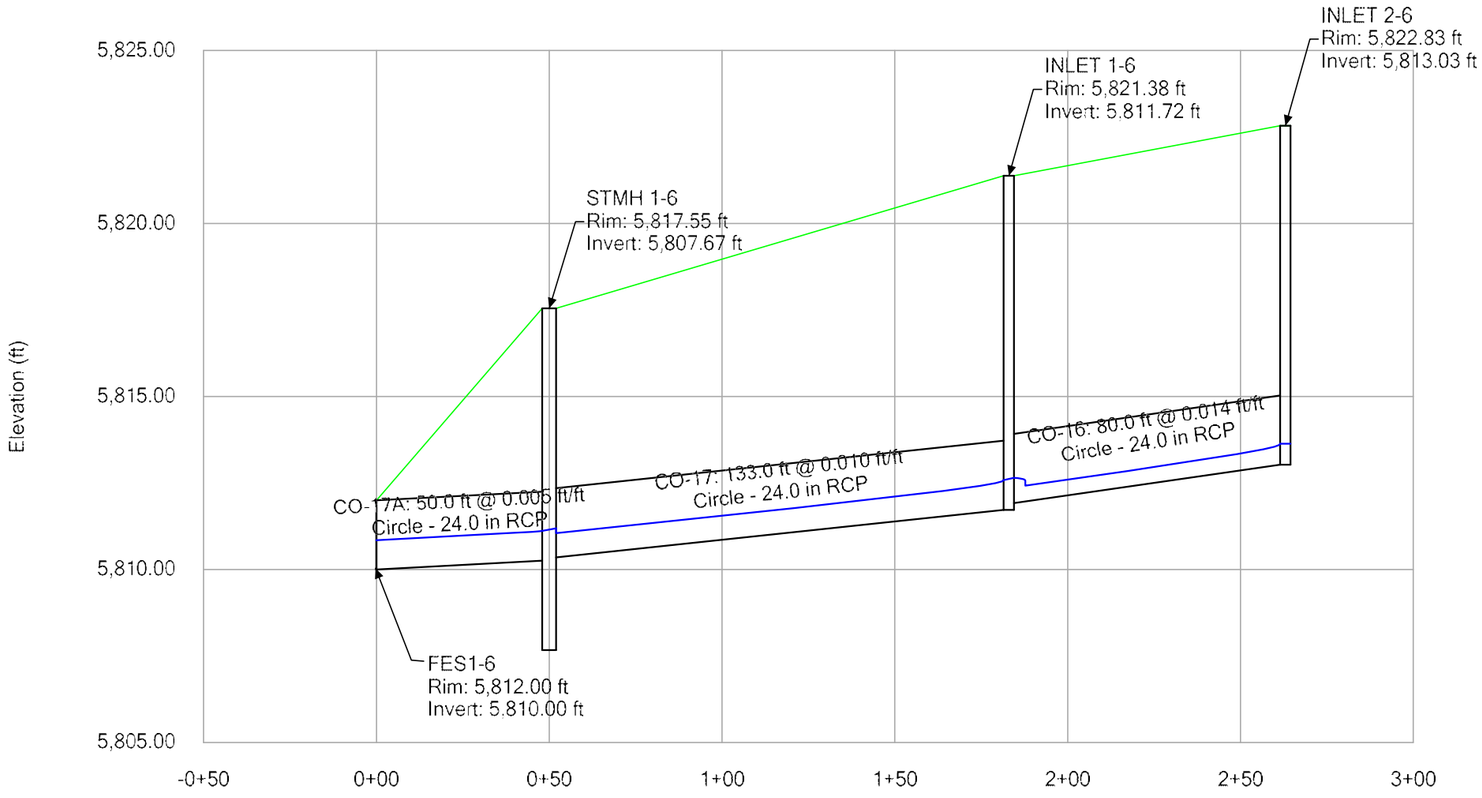
Profile Report

Engineering Profile - Profile - Storm Line 5 (Compark Village South StormCAD [5 year].stsw)



Profile Report

Engineering Profile - Profile - Storm Line 6 (Compark Village South StormCAD [5 year].stsw)

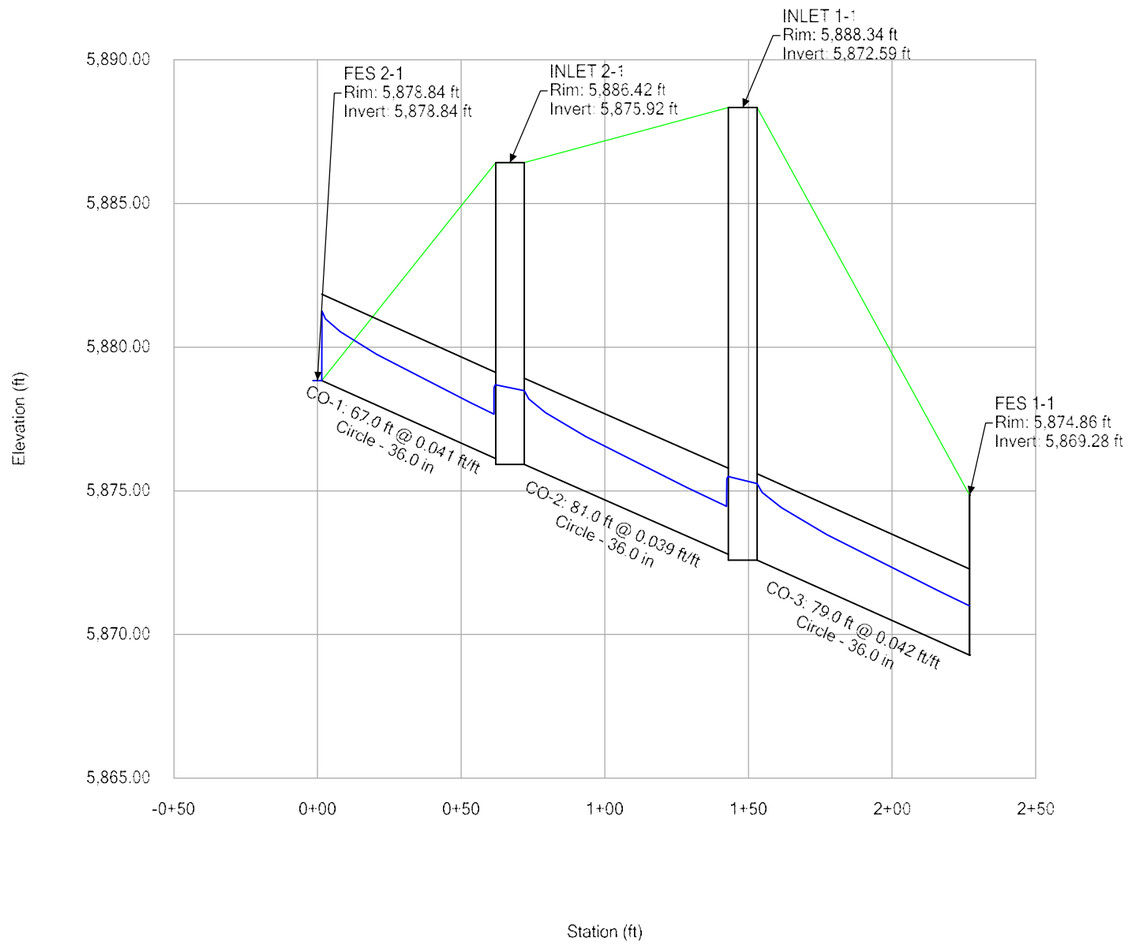


FlexTable: Conduit Table

Start Node	Stop Node	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	System Fixed Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
STMH 6-4	INLET 6-4	120.0	0.020	36.0	47.81	13.34	5,837.16	5,834.11	5,838.26	5,836.61
INLET 6-4	STMH 5-4	278.0	0.017	36.0	51.31	12.70	5,834.66	5,829.38	5,835.84	5,831.88
FES 2-5	INLET 8-5	7.7	0.070	24.0	24.64	18.14	5,836.29	5,835.76	5,837.40	5,836.86
INLET 5-4	STMH 5-4	52.0	0.010	18.0	9.80	6.72	5,830.55	5,829.98	5,831.19	5,830.69
INLET 3-4	STMH 4-4	20.0	0.010	18.0	11.20	6.34	5,827.28	5,827.06	5,827.91	5,827.68
INLET 1-4	STMH 2-4	65.0	0.017	18.0	7.70	4.36	5,825.49	5,825.14	5,825.78	5,825.44
INLET 4-4	STMH 4-4	20.0	0.010	18.0	2.40	1.36	5,827.07	5,827.06	5,827.10	5,827.09
INLET 2-6	INLET 1-6	80.0	0.014	24.0	8.10	7.44	5,814.04	5,813.30	5,814.44	5,813.49
INLET 2-5	INLET 1-5	90.0	0.007	36.0	23.50	3.32	5,813.28	5,813.17	5,813.45	5,813.34
INLET 1-5	STMH 1-5	103.0	0.008	36.0	38.60	5.46	5,812.66	5,812.31	5,813.12	5,812.77
STMH 1-5	FES 1-5	446.0	0.029	42.0	156.03	20.10	5,809.21	5,795.64	5,813.36	5,801.90
INLET 2-3	INLET 1-3	94.0	0.101	24.0	9.00	15.64	5,841.63	5,832.27	5,842.06	5,832.58
FES 2-4	STMH 6-4	221.0	0.031	36.0	47.81	15.79	5,844.25	5,837.57	5,845.35	5,838.49
STMH 5-4	STMH 4-4	163.0	0.027	36.0	63.33	16.13	5,829.97	5,827.06	5,831.48	5,828.30
INLET 4-5	STMH 2-5A	19.0	0.036	18.0	8.90	5.04	5,816.29	5,816.15	5,816.68	5,816.55
INLET 5-5	STMH 2-5	49.0	0.050	18.0	9.10	5.15	5,816.41	5,816.04	5,816.82	5,816.46
STMH 4-4	STMH 3-4	79.0	0.008	36.0	76.93	10.88	5,827.06	5,826.01	5,828.90	5,827.85
STMH 3-4	STMH 2-4	76.0	0.011	36.0	84.93	12.02	5,825.66	5,824.43	5,827.90	5,826.67
INLET 2-4	STMH 3-4	56.0	0.009	18.0	8.00	4.53	5,826.14	5,825.81	5,826.46	5,826.13
INLET 1-6	STMH 1-6	133.0	0.010	24.0	15.40	7.83	5,813.13	5,811.97	5,813.79	5,812.46
STMH 1-6	FES1-6	50.0	0.005	24.0	15.40	5.80	5,811.80	5,811.42	5,812.34	5,812.07
INLET 8-5	INLET 7-5	173.0	0.035	24.0	24.64	13.95	5,835.26	5,829.98	5,836.37	5,830.94
INLET 4-5A	STMH 2-5E	20.0	0.012	18.0	10.20	5.77	5,823.36	5,823.17	5,823.87	5,823.69
INLET 5-5A	STMH 2-5E	20.0	0.012	18.0	10.62	6.01	5,823.38	5,823.18	5,823.94	5,823.74
STMH 2-5	INLET 3-5	16.0	0.024	42.0	123.06	12.79	5,815.19	5,814.95	5,817.73	5,817.49
INLET 3-5	STMH 1-5	266.0	0.018	42.0	136.96	14.24	5,814.59	5,809.66	5,817.74	5,812.81
INLET 7-5	STMH 4-5	104.6	0.047	24.0	34.84	16.88	5,829.06	5,826.17	5,831.02	5,828.08
STMH 4-5	INLET 6-5	23.0	0.036	24.0	34.84	11.09	5,825.05	5,824.51	5,826.97	5,826.42
STMH 2-5A	STMH 2-5	50.0	0.014	36.0	48.02	6.79	5,816.06	5,815.80	5,816.78	5,816.52
STMH 2-5B	STMH 2-5A	241.0	0.014	30.0	39.12	7.97	5,818.36	5,816.17	5,819.35	5,817.16
STMH 2-4	STMH 1-4	60.0	0.026	36.0	92.63	17.14	5,823.28	5,821.23	5,826.04	5,824.92
STMH 1-4	FES 1-4	33.0	0.026	36.0	92.63	17.04	5,821.71	5,820.49	5,824.47	5,823.88
INLET 1-3	STMH 1-3	18.4	0.031	24.0	22.50	13.06	5,831.63	5,831.16	5,832.61	5,832.05
STMH 1-3	O-1	12.0	0.031	24.0	22.50	13.04	5,831.06	5,830.90	5,832.04	5,831.73
INLET 5-4A	STMH 5-4	43.0	0.010	18.0	2.22	4.71	5,829.92	5,829.97	5,830.06	5,830.01
STMH 2-5E	STMH 2-5D	44.0	0.015	24.0	20.82	6.63	5,822.95	5,822.58	5,823.63	5,823.26
STMH 2-5D	STMH 2-5C	45.0	0.014	24.0	28.32	9.01	5,822.34	5,821.64	5,823.60	5,822.90
STMH 2-5C	STMH 2-5B	289.0	0.014	30.0	35.22	10.71	5,821.51	5,818.47	5,822.58	5,819.27
INLET 4-5B	STMH 2-5C	18.0	0.010	18.0	6.90	3.90	5,821.69	5,821.62	5,821.93	5,821.85
INLET 5-5B	STMH 2-5D	293.0	0.028	18.0	7.50	9.49	5,829.36	5,822.56	5,829.85	5,822.84
INLET 4-5C	STMH 2-5B	18.0	0.010	18.0	3.90	2.21	5,818.45	5,818.42	5,818.52	5,818.50
INLET 6-5	STMH 3-5A	247.0	0.034	30.0	54.44	16.83	5,823.49	5,817.26	5,825.50	5,819.17
STMH 3-5A	STMH 2-5	48.0	0.027	30.0	65.94	13.43	5,816.77	5,815.53	5,819.58	5,818.34
INLET 6-5A	STMH 3-5A	19.0	0.010	18.0	6.20	3.51	5,817.05	5,816.98	5,817.24	5,817.17
INLET 6-5B	STMH 3-5A	19.0	0.010	18.0	5.30	3.00	5,817.01	5,816.96	5,817.15	5,817.10

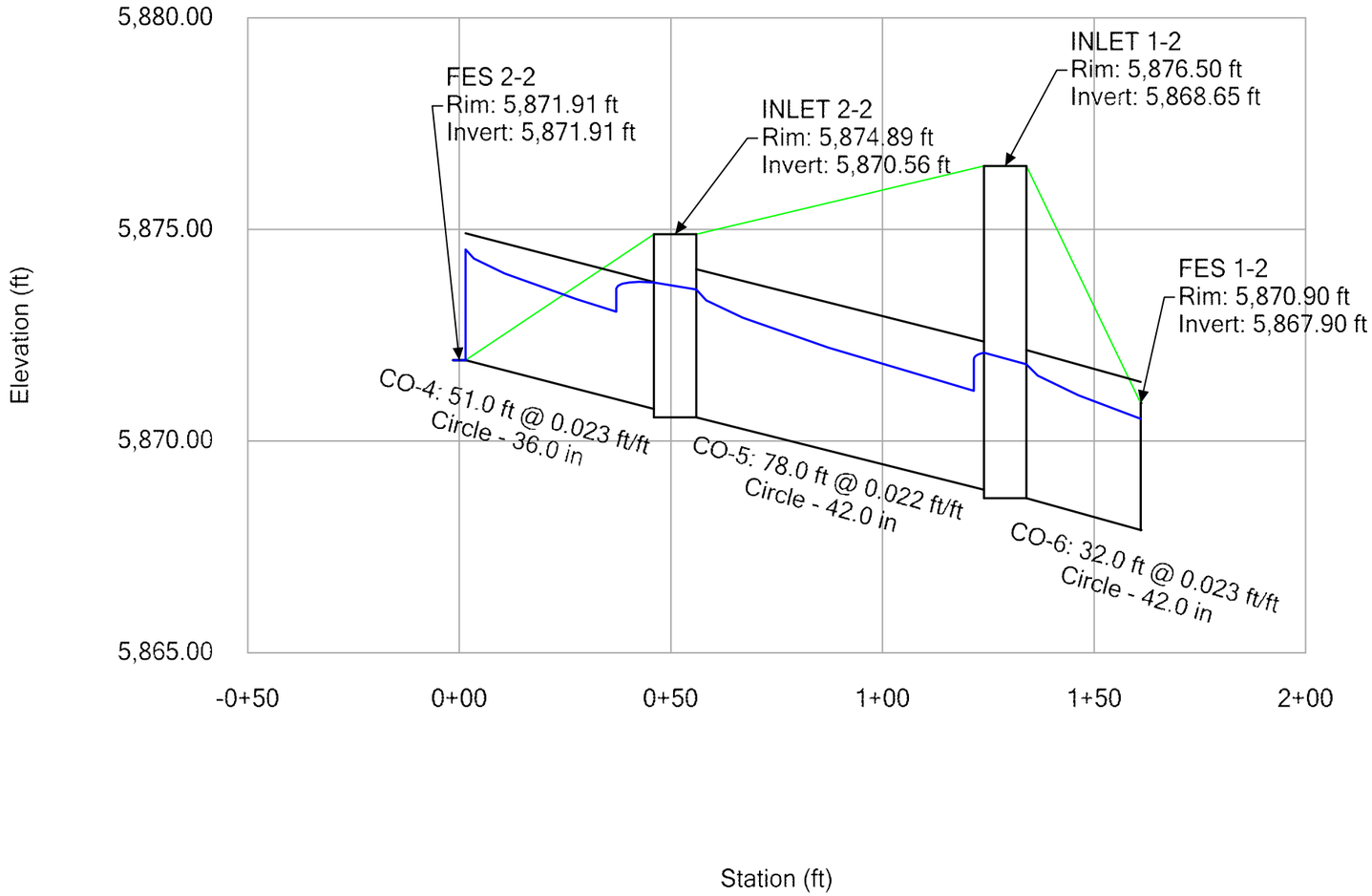
Profile Report

Engineering Profile - Profile - Storm Line 1 (Belford Ave StormCAD [100 year].stsw)



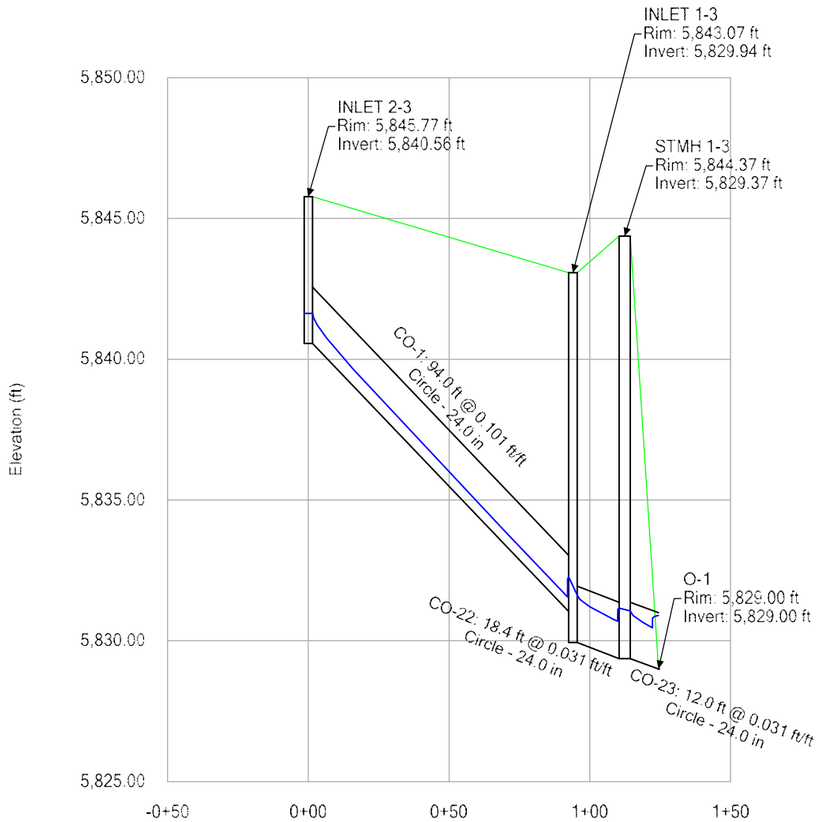
Profile Report

Engineering Profile - Profile - Storm Line 2 (Belford Ave StormCAD [100 year].stsw)

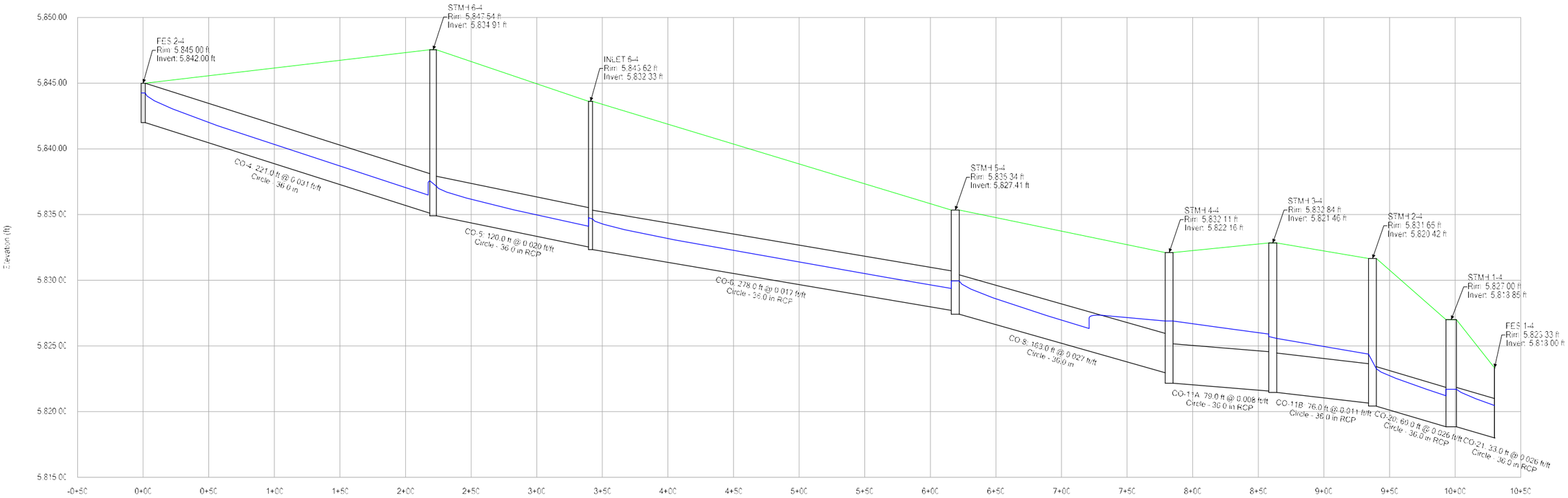


Profile Report

Engineering Profile - Profile - Storm Line 3 (Compark Village South StormCAD [100 year].stsw)

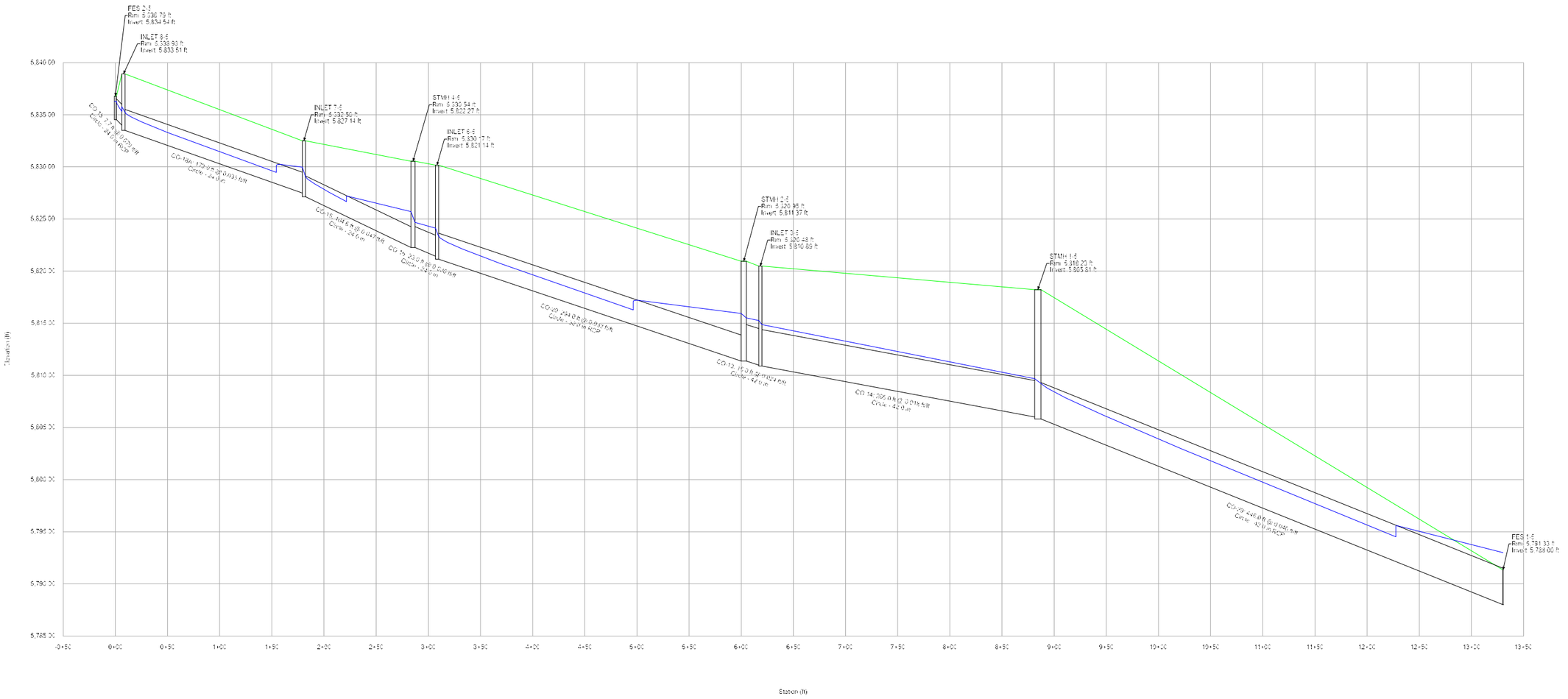


Profile Report
Engineering Profile - Profile - Storm Line 4 (Compark Village South StormCAD [100 year].stsw)



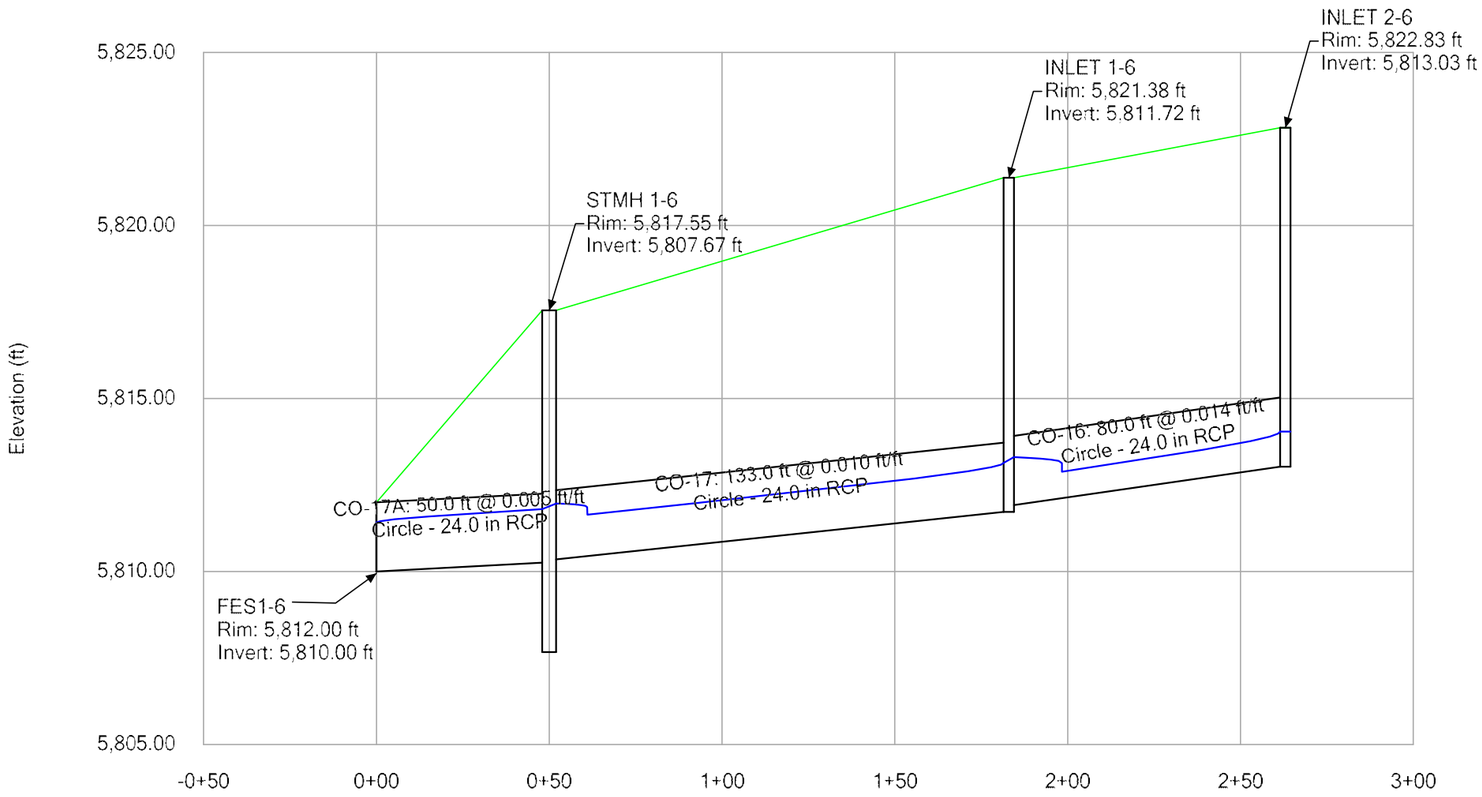
Profile Report

Engineering Profile - Profile - Storm Line 5 (Compark Village South StormCAD [100 year].stsw)



Profile Report

Engineering Profile - Profile - Storm Line 6 (Compark Village South StormCAD [100 year].stsw)



MANHARD CONSULTING LTD.

Engineers
Surveyors
Planners

PROJECT Comark Village South
DATE 6/15/16
BY ASD
SHEET 1 OF 1

ASSUME 95% IMPERVIOUS FOR FUTURE COMMERCIAL DEV.

$T_c = 5$ min
$C_{100} = 0.87$

DRAINAGE SYSTEM 8

DA = 6.4 ac Q_{100} = 46 cfs TW Det Pond = 5790

INV @ INFLOW = 5789.0

FOR 36" RCP, @ Q = 46 cfs HW = 5793.0 H = 4'

NOW Q_{100} = 21 cfs HW = 5791.5, H = 2.5'

DRAINAGE SYSTEM 9

DA = 3.2 ac Q_{100} = 23 cfs
+ 9.8 cfs Filing 2 East
33 cfs TW Det Pond = 5790

INV @ INFLOW = 5790.5

FOR 30" RCP @ Q = 33 cfs HW = 5794.0, H = 3.5'

Now Q_{100} = 10.3 cfs + 10 cfs = 20.3 cfs
Filing 2

HW = 5793.0, H = 2.5'

Culvert Calculator Report
CVS Drainage System 8 FUTURE

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	5,800.00	ft	Headwater Depth/Height	1.26	
Computed Headwater Elev	5,792.79	ft	Discharge	46.00	cfs
Inlet Control HW Elev.	5,792.63	ft	Tailwater Elevation	5,790.00	ft
Outlet Control HW Elev.	5,792.79	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	5,789.00	ft	Downstream Invert	5,781.00	ft
Length	162.00	ft	Constructed Slope	0.049383	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	9.00	ft
Slope Type	N/A		Normal Depth	1.15	ft
Flow Regime	N/A		Critical Depth	2.21	ft
Velocity Downstream	6.51	ft/s	Critical Slope	0.005971	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	5,792.79	ft	Upstream Velocity Head	1.06	ft
Ke	0.50		Entrance Loss	0.53	ft

Inlet Control Properties					
Inlet Control HW Elev.	5,792.63	ft	Flow Control	Transition	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
CVS Drainage System 8 CURRENT

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	5,800.00	ft	Headwater Depth/Height	0.78	
Computed Headwater Elev	5,791.34	ft	Discharge	21.00	cfs
Inlet Control HW Elev.	5,791.06	ft	Tailwater Elevation	5,790.00	ft
Outlet Control HW Elev.	5,791.34	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	5,789.00	ft	Downstream Invert	5,781.00	ft
Length	162.00	ft	Constructed Slope	0.049383	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	9.00	ft
Slope Type	N/A		Normal Depth	0.76	ft
Flow Regime	N/A		Critical Depth	1.47	ft
Velocity Downstream	2.97	ft/s	Critical Slope	0.004227	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	5,791.34	ft	Upstream Velocity Head	0.58	ft
Ke	0.50		Entrance Loss	0.29	ft

Inlet Control Properties					
Inlet Control HW Elev.	5,791.06	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
CVS Drainage System 9 FUTURE

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	5,800.00	ft	Headwater Depth/Height	1.38	
Computed Headwater Elev	5,793.95	ft	Discharge	33.00	cfs
Inlet Control HW Elev.	5,793.89	ft	Tailwater Elevation	5,790.00	ft
Outlet Control HW Elev.	5,793.95	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	5,790.50	ft	Downstream Invert	5,781.00	ft
Length	144.00	ft	Constructed Slope	0.065972	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	9.00	ft
Slope Type	N/A		Normal Depth	0.96	ft
Flow Regime	N/A		Critical Depth	1.96	ft
Velocity Downstream	6.72	ft/s	Critical Slope	0.007095	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	5,793.95	ft	Upstream Velocity Head	1.00	ft
Ke	0.50		Entrance Loss	0.50	ft

Inlet Control Properties					
Inlet Control HW Elev.	5,793.89	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	4.9	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
CVS Drainage System 9 CURRENT

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	5,800.00	ft	Headwater Depth/Height	1.00	
Computed Headwater Elev	5,793.00	ft	Discharge	20.30	cfs
Inlet Control HW Elev.	5,792.76	ft	Tailwater Elevation	5,790.00	ft
Outlet Control HW Elev.	5,793.00	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	5,790.50	ft	Downstream Invert	5,781.00	ft
Length	144.00	ft	Constructed Slope	0.065972	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	9.00	ft
Slope Type	N/A		Normal Depth	0.74	ft
Flow Regime	N/A		Critical Depth	1.53	ft
Velocity Downstream	4.14	ft/s	Critical Slope	0.005109	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

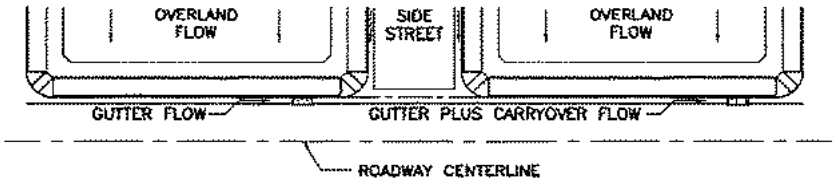
Outlet Control Properties					
Outlet Control HW Elev.	5,793.00	ft	Upstream Velocity Head	0.65	ft
Ke	0.50		Entrance Loss	0.32	ft

Inlet Control Properties					
Inlet Control HW Elev.	5,792.76	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	4.9	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 1-1



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.1	8.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

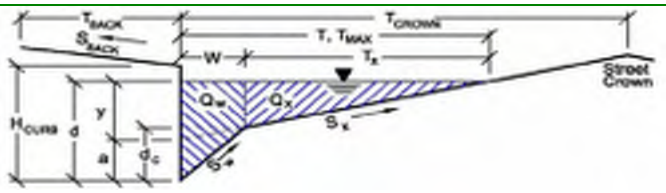
	Minor Storm	Major Storm	
Design Storm Return Period, T_t =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.1	8.9	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 1-1



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.019	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**23.4**	**207.0**	**cfs**

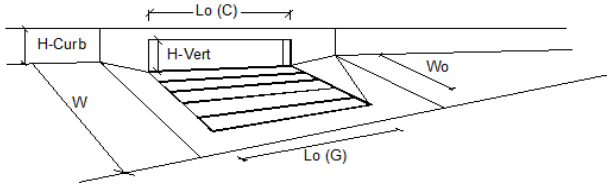
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 1-1



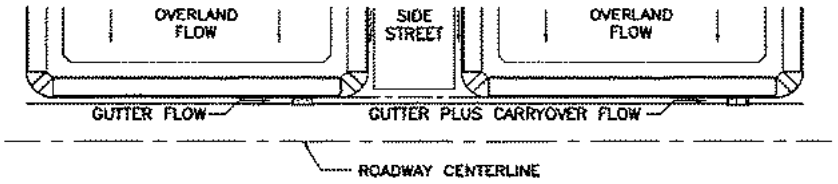
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.98**	**6.47**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**2.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**73**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 1-2



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	5.2	11.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

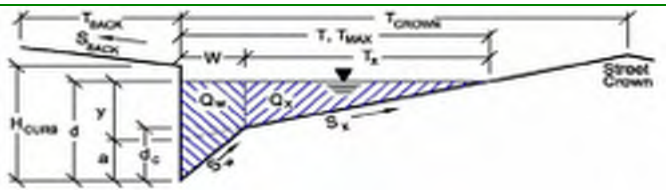
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**2.4**	**cfs**
Total Design Peak Flow, Q =	**5.2**	**13.6**	**cfs**

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 1-2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

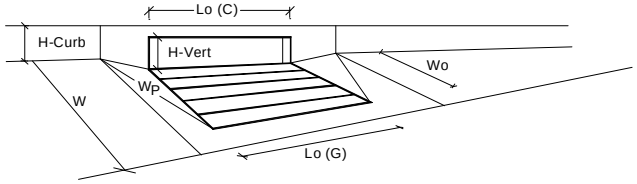
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 1-2

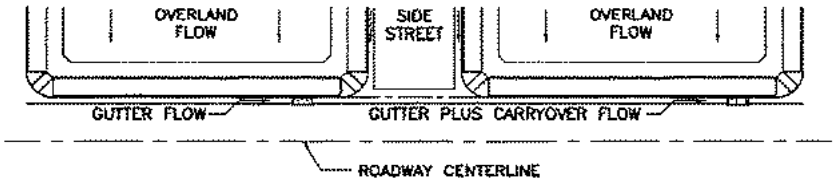


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	10.4	inches
				☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.5**	**23.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.2	13.6	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 1-3



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	5.5	20.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

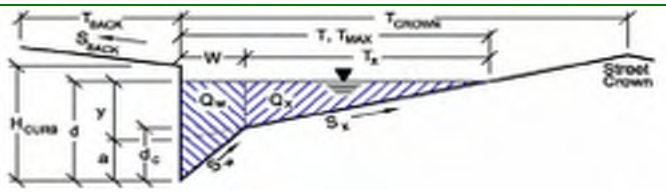
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	5.5	20.2	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 1-3



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.019	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**23.4**	**207.0**	**cfs**

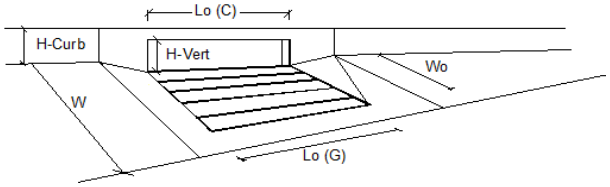
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 1-3



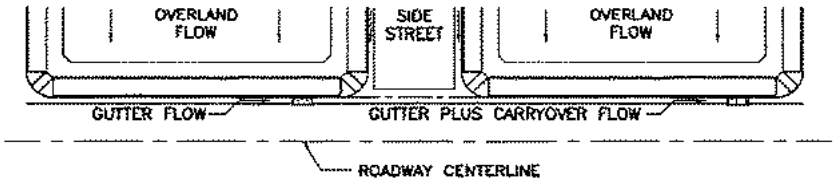
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.50**	**13.47**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**67**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 1-4



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	2.4	5.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

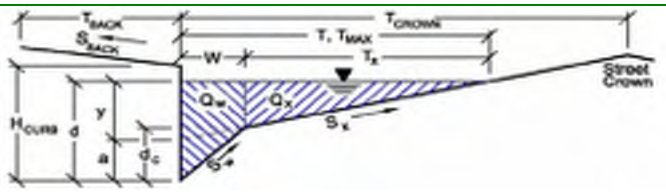
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	6.7	cfs
Total Design Peak Flow, Q =	2.4	12.6	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 1-4



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.019	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**23.4**	**207.0**	**cfs**

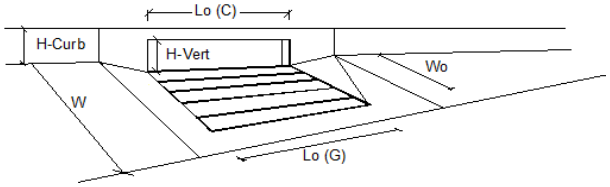
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 1-4



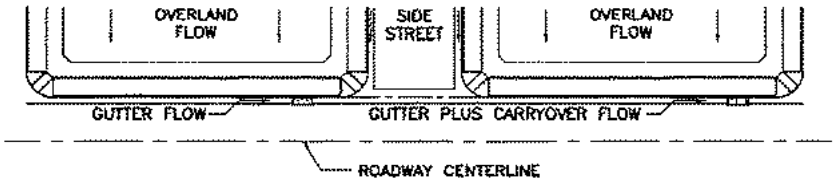
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.40**	**7.70**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**4.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**61**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 1-5



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	5.1	11.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

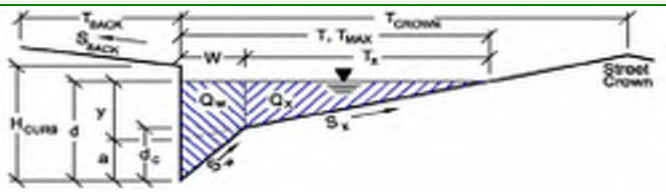
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	4.1	cfs
Total Design Peak Flow, Q =	5.1	15.1	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 1-5



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

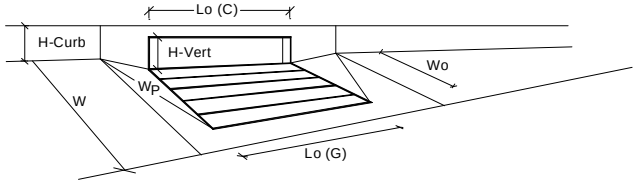
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 1-5

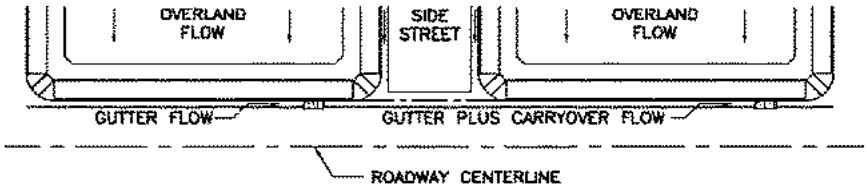


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	10.4	inches
				☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.5**	**23.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.1	15.1	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 1-6



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.0	6.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

Geographic Information: (Enter data in the blue cells):

FILL IN THE SECTIONS BELOW. <---

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

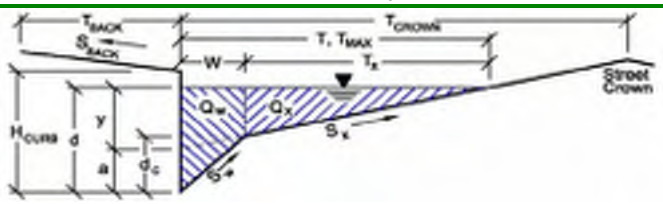
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	4.9	cfs
Total Design Peak Flow, Q =	3.0	11.4	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 1-6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**16.8**	**171.1**	**cfs**

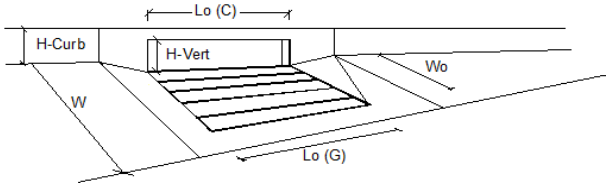
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 1-6



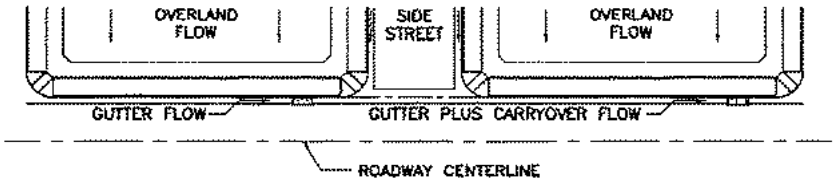
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.00**	**7.28**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**4.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**64**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 2-1



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.0	14.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

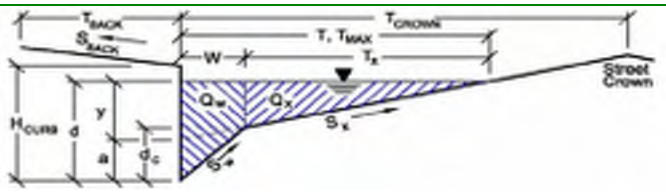
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.0	14.7	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 2-1



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.019	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**23.4**	**207.0**	**cfs**

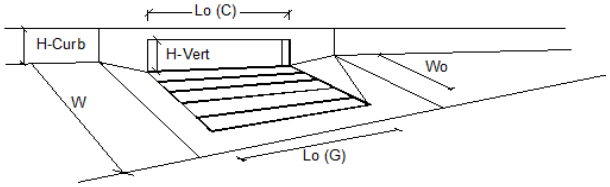
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 2-1



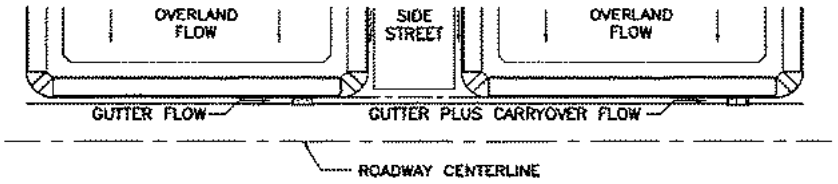
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.90**	**8.29**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**6.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**98**	**56**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 2-2



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.2	22.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

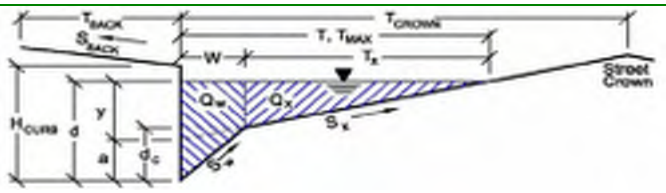
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.1**	**6.4**	**cfs**
Total Design Peak Flow, Q =	**4.3**	**29.0**	**cfs**

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 2-2



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

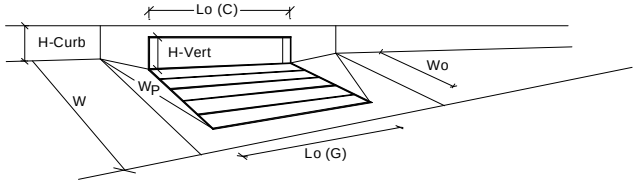
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 2-2

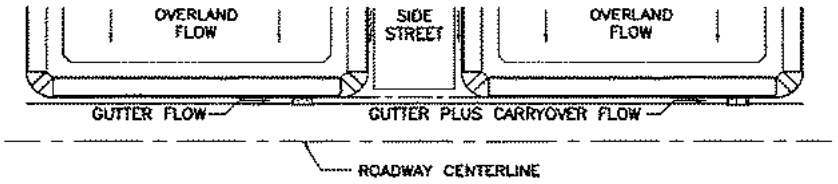


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	10.4	inches
				☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**13.5**	**36.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.3	29.0	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 2-3



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.5	9.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

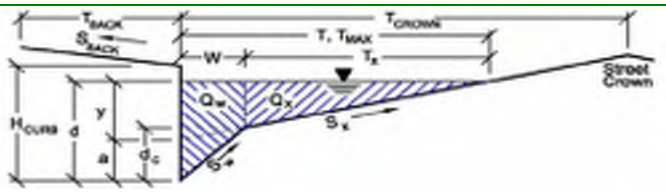
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.5	9.9	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 2-3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**20.8**	**225.6**	**cfs**

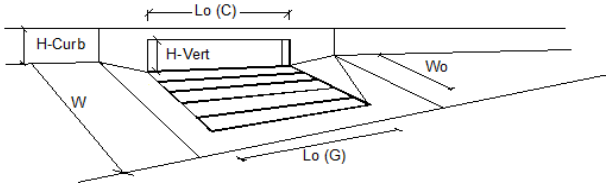
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 2-3



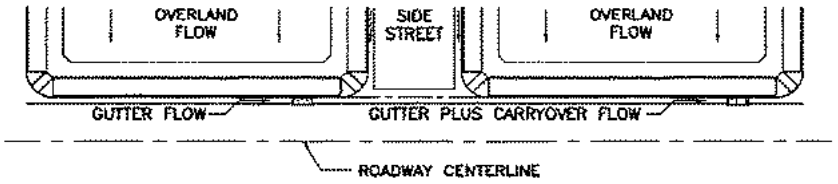
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.50**	**8.95**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**90**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 2-4



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	2.6	7.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

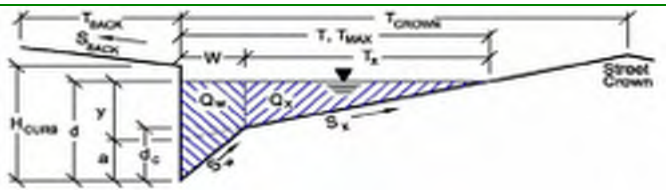
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**1.0**	**cfs**
Total Design Peak Flow, Q =	**2.6**	**8.5**	**cfs**

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 2-4



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**20.8**	**204.4**	**cfs**

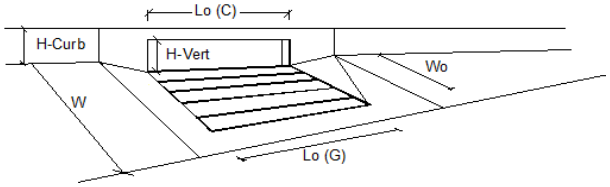
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 2-4



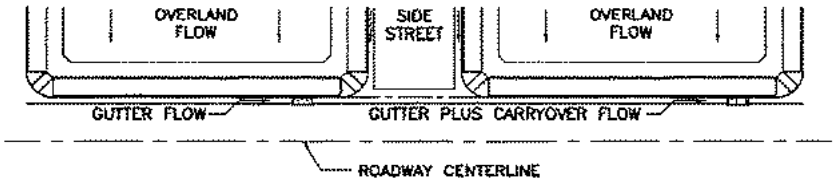
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.60**	**8.05**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**95**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 2-5



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	7.7	21.3	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

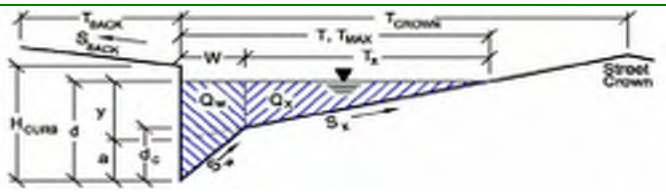
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**2.3**	**cfs**
Total Design Peak Flow, Q =	**7.7**	**23.6**	**cfs**

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 2-5



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	10.2	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

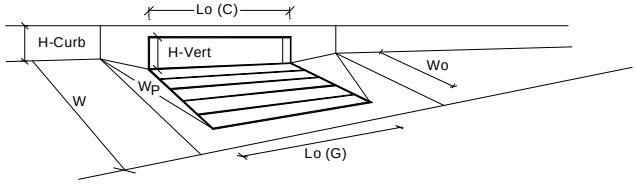
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 2-5

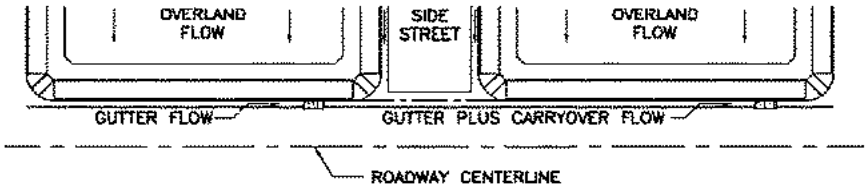


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	12.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.7	23.6	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 2-6



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.0	8.1	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

Geographic Information: (Enter data in the blue cells):

FILL IN THE SECTIONS BELOW. <---

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

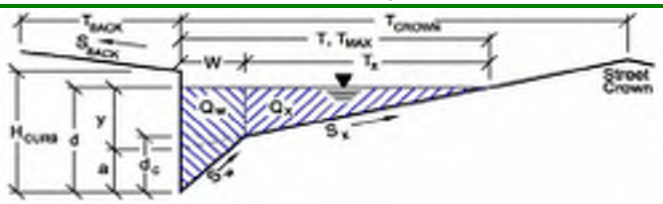
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.5	cfs
Total Design Peak Flow, Q =	3.0	8.6	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 2-6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	37.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.005	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	37.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**12.0**	**118.0**	**cfs**

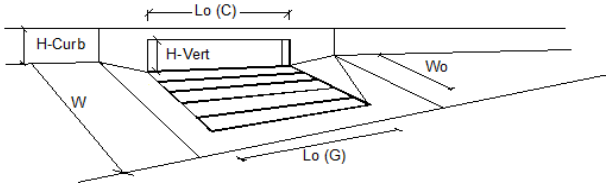
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 2-6



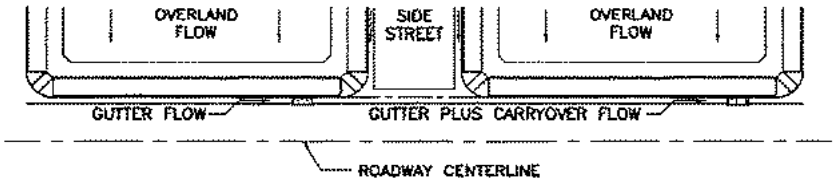
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.00**	**8.06**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**94**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 3-4



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	2.9	8.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

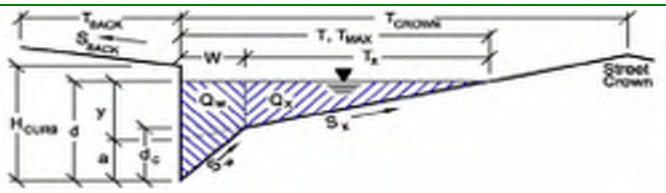
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**2.4**	**cfs**
Total Design Peak Flow, Q =	**2.9**	**11.0**	**cfs**

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 3-4



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

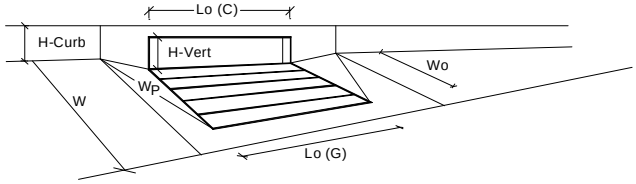
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 3-4

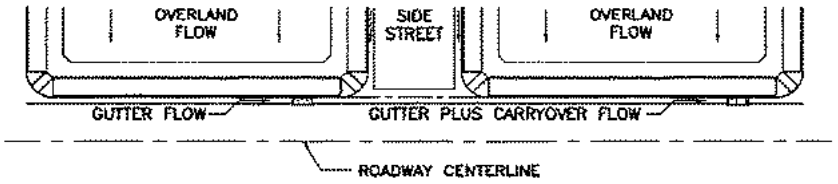


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	12.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.9	11.0	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 3-5



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.9	13.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

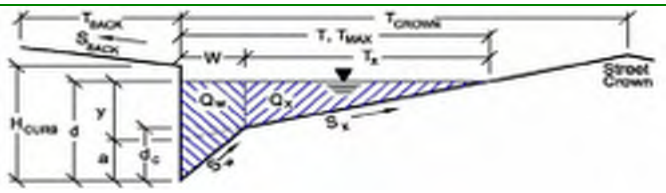
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.9	13.6	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 3-5



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

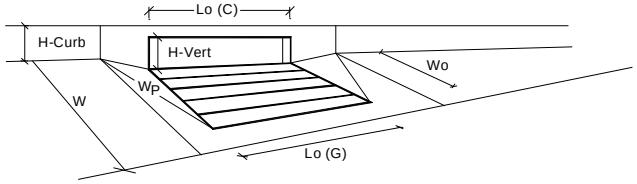
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 3-5

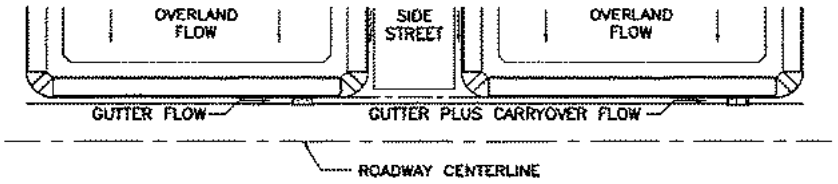


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	12.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.9	13.6	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 4-4



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	0.9	2.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

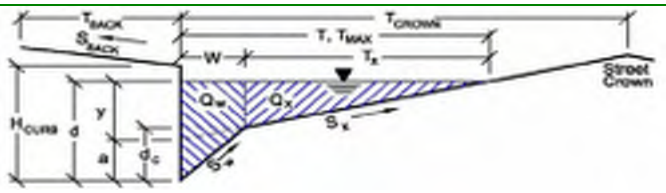
	Minor Storm	Major Storm	
Design Storm Return Period, T_t =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	0.9	2.4	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 4-4



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

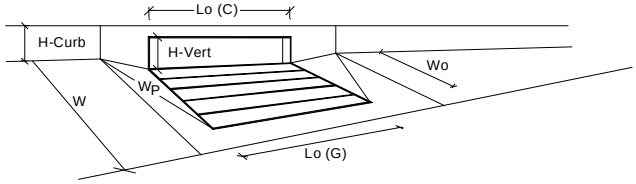
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 4-4

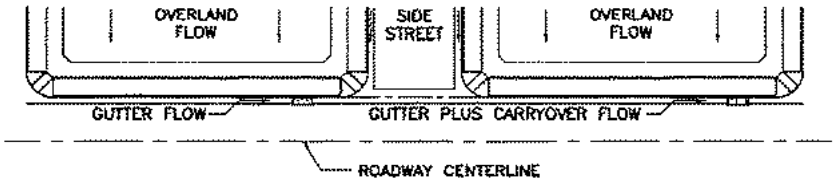


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.4	5.6	inches
				☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.1**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.9	2.4	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 4-5



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	9.6	26.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

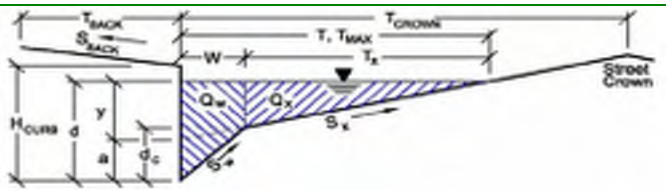
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	10.6	cfs
Total Design Peak Flow, Q =	9.6	37.2	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 4-5



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

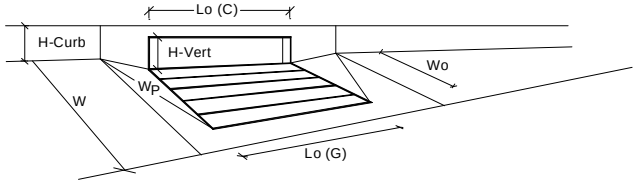
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 4-5

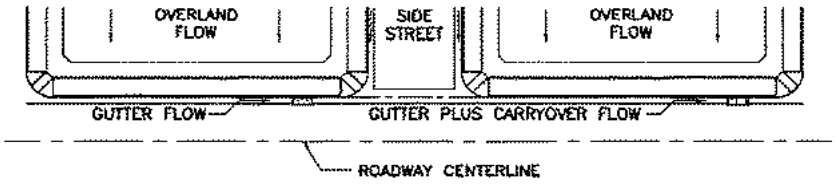


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	12.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.2**	**39.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	9.6	37.2	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 5-4



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.1	13.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

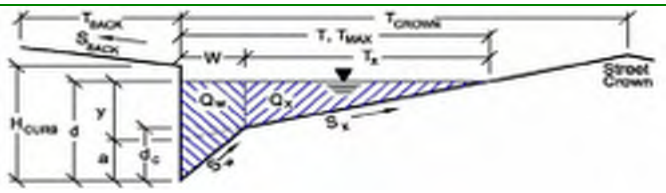
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.1	13.0	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 5-4



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**16.4**	**137.5**	**cfs**

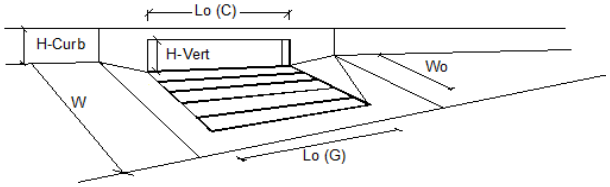
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 5-4



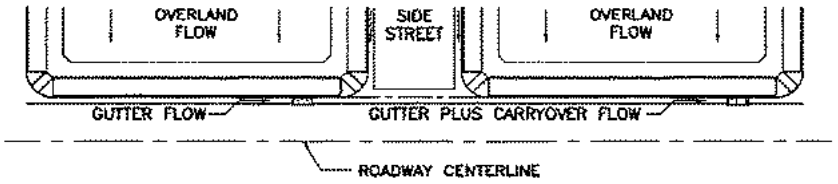
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.10**	**10.59**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**81**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 5-5



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	5.5	15.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

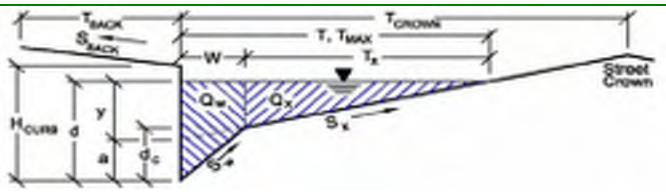
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**6.4**	**cfs**
Total Design Peak Flow, Q =	**5.5**	**21.6**	**cfs**

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 5-5



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

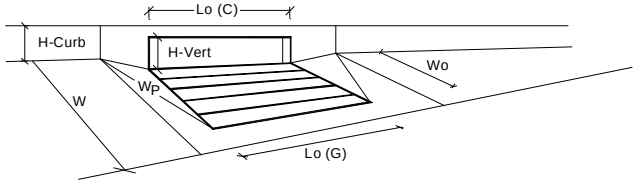
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 5-5

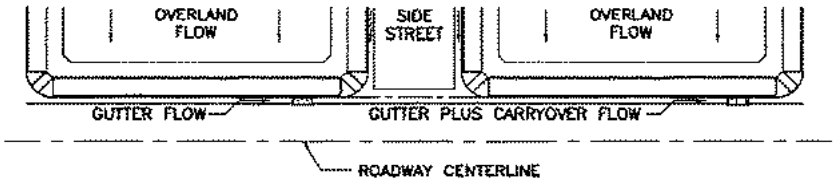


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	12.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.5	21.6	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 6-4



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	1.1	3.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

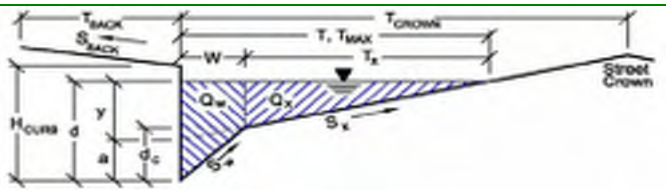
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**1.1**	**3.5**	**cfs**

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 6-4



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.006	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.4**	**86.9**	**cfs**

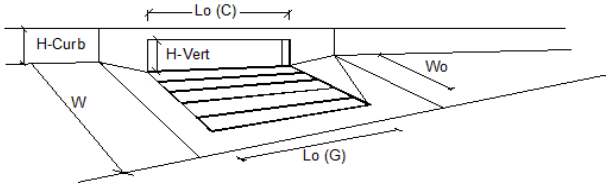
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET ON A CONTINUOUS GRADE

Project: COMPARK SOUTH

Inlet ID: INLET 6-4



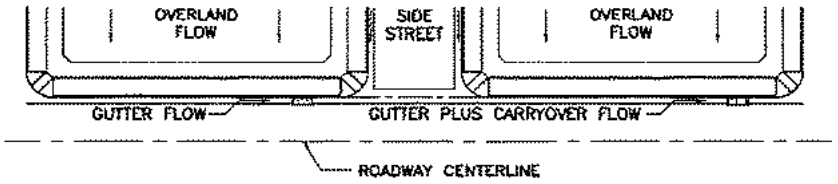
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.10**	**3.47**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**99**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 6-5



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	7.6	23.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

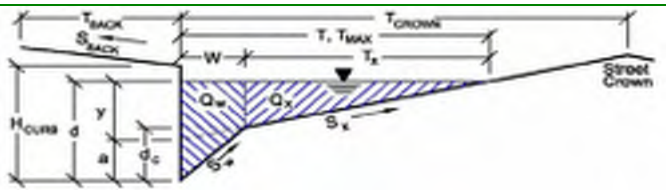
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	7.6	23.5	cfs

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

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

Project: COMPARK SOUTH

Inlet ID: INLET 6-5



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

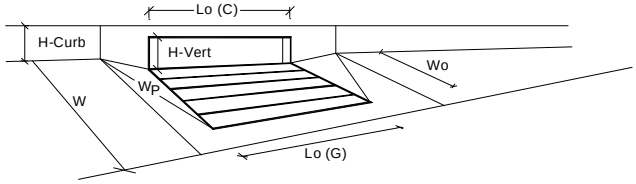
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = COMPARK SOUTH

Inlet ID = INLET 6-5

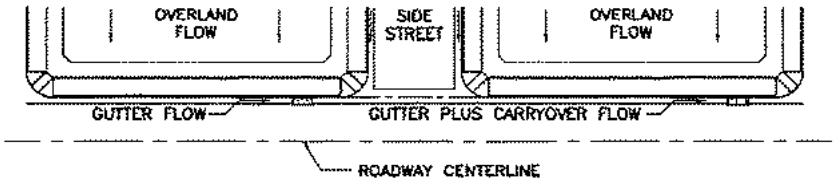


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	5.6	inches
				☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.1**	**11.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	7.6	23.5	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 7-4



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	0.1	3.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR... FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

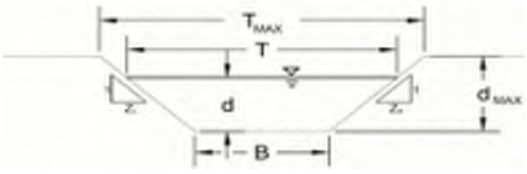
Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	0.1	3.2	cfs

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

COMPARK SOUTH

INLET 7-4



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

	NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	B	
	Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
	Channel Invert Slope	S_O =	0.0100	ft/ft
	Bottom Width	B =	5.00	ft
Warning 01	Left Side Slope	Z1 =	0.02	ft/ft
Warning 01	Right Side Slope	Z2 =	0.02	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	12.00	12.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.00	1.50	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	1.88	4.99	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	1.00	1.50	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.10	3.20	cfs
Water Depth	d =	0.15	1.32	feet

Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

COMPARK SOUTH

INLET 7-4

Inlet Design Information (Input)

Type of Inlet — Inlet Type = CDOT Type C

Angle of Inclined Grade (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grade	W =	3.00	feet
Length of Grade	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grade	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.96	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

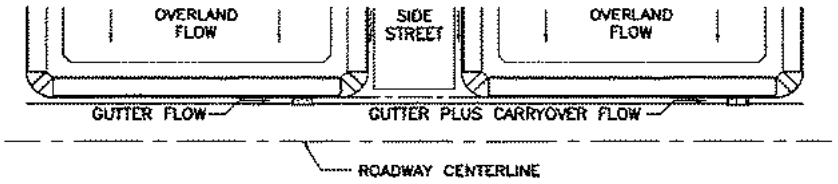
		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.15	1.32	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.12**	**18.59**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (> Q PEAK)	**Bypassed Flow, Q_b =**	**0.00**	**0.00**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

Warning 01: Sideslope steepness exceeds USDCM Volume I recommendation.
Warning 02: Depth (d) exceeds USDCM Volume I recommendation.

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: COMPARK SOUTH
Inlet ID: INLET 7-5



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	0.2	9.8	cfs

<--- FILL IN THIS SECTION OR...

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

Geographic Information: (Enter data in the blue cells):

FILL IN THE SECTIONS BELOW. <---

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

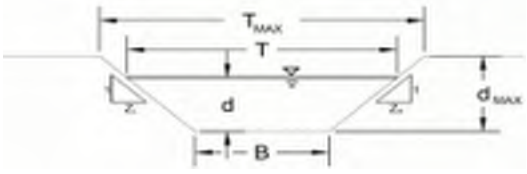
Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	0.2	9.8	cfs

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

COMPARK SOUTH

INLET 7-5



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

	NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E =	C	
	Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
	Channel Invert Slope	S_O =	0.0100	ft/ft
	Bottom Width	B =	2.00	ft
Warning 01	Left Side Slope	Z1 =	0.20	ft/ft
Warning 01	Right Side Slope	Z2 =	0.20	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	12.00	12.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.00	2.10	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	1.02	10.51	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	1.00	2.10	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.20	9.80	cfs
Water Depth	d =	0.54	2.04	feet

Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

COMPARK SOUTH

INLET 7-5

Inlet Design Information (Input)

Type of Inlet — Inlet Type = CDOT Type C

Angle of Inclined Grade (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grade	W =	3.00	feet
Length of Grade	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grade	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.96	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.54	2.04	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.23**	**23.09**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (> Q PEAK)	**Bypassed Flow, Q_b =**	**0.00**	**0.00**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

Warning 01: Sideslope steepness exceeds USDCM Volume I recommendation.
Warning 02: Depth (d) exceeds USDCM Volume I recommendation.

APPENDIX J

Miscellaneous Drainage Improvement Design

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016

Belford Avenue Water Quality Basin Design

Two full spectrum water quality/detention basins were designed to treat the runoff from the portions of Belford Avenue that will not be directed to the proposed regional detention/water quality pond proposed adjacent to E-470. The ponds are located at low points of the proposed Belford Avenue that correspond to existing low areas. The ponds were designed to treat the runoff from the entire drainage area intercepted by the ponds including the undeveloped land which historically drains to these low areas.

Sizing calculations are attached.

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project: Compark South

Basin ID: Belford Ave Water Quality Pond - West

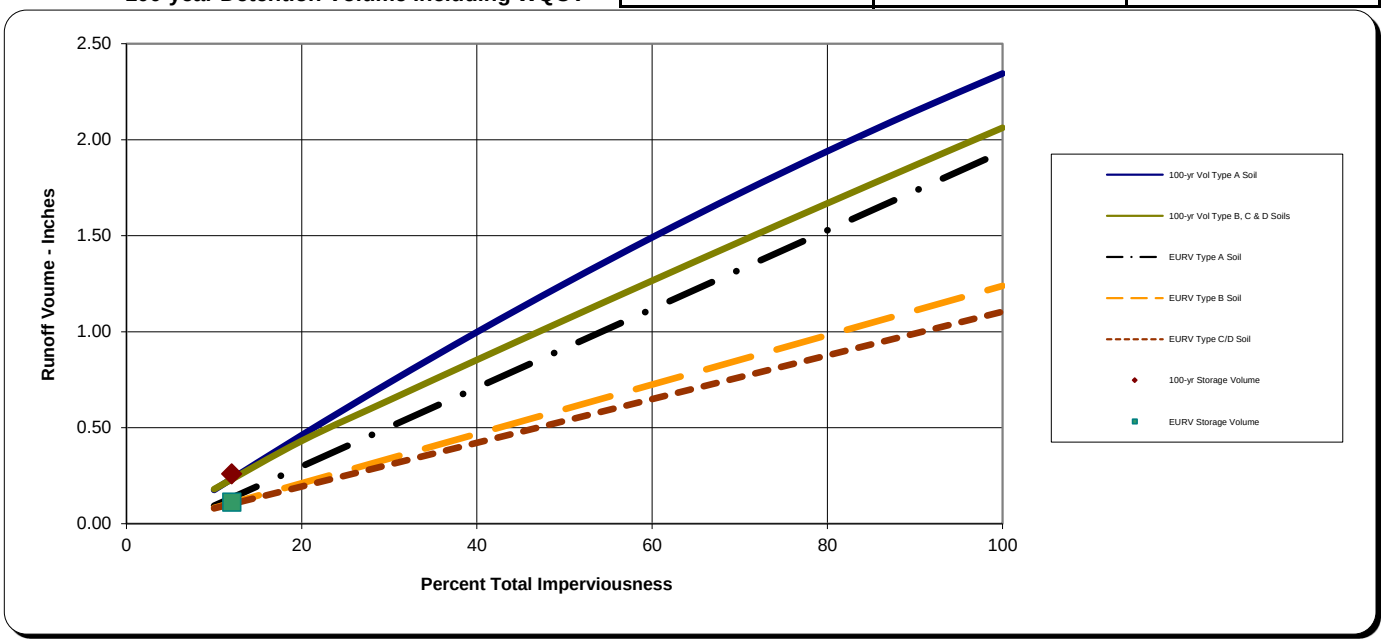
* User input data shown in blue.

Area of Watershed (acres)	17.50	
Subwatershed Imperviousness	12.0%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	0
Effective Imperviousness[1]	12.0%	

Hydrologic Soil Type	**Percentage of Area**	**Area (acres)**
Type A		0.0
Type B		0.0
Type C or D	100.0%	17.5

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		**Decay Coefficient--α**
Initial--f_i	**Final--fo**	
3	0.5	0.0018

	Detention Volumes [2,5]		
	(watershed inches)	**(acre-feet)**	**Maximum Allowable Release Rate, cfs[3]**
Excess Urban Runoff Volume[4]	0.11	0.16	Design Oulet to Empty EURV in 72 Hours
100-year Detention Volume Including WQCV [5]	0.26	0.38	17.50



Notes:

1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).

2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.

3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.

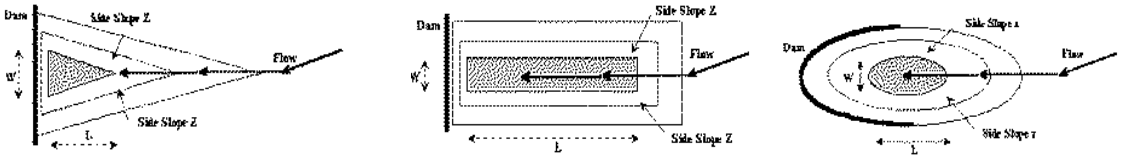
4) EURV approximates the difference between developed and pre-developed runoff volume.

5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project: Compark South

Basin ID: Belford Ave Water Quality Pond - West



Design Information (Input):

Width of Basin Bottom, W =		ft
Length of Basin Bottom, L =		ft
Dam Side-slope (H:V), Z_d =		ft/ft

Check Basin Shape

Right Triangle		OR…
Isosceles Triangle		OR…
Rectangle		OR…
Circle / Ellipse		OR…
Irregular		(Use Overide values in cells G32:G52)

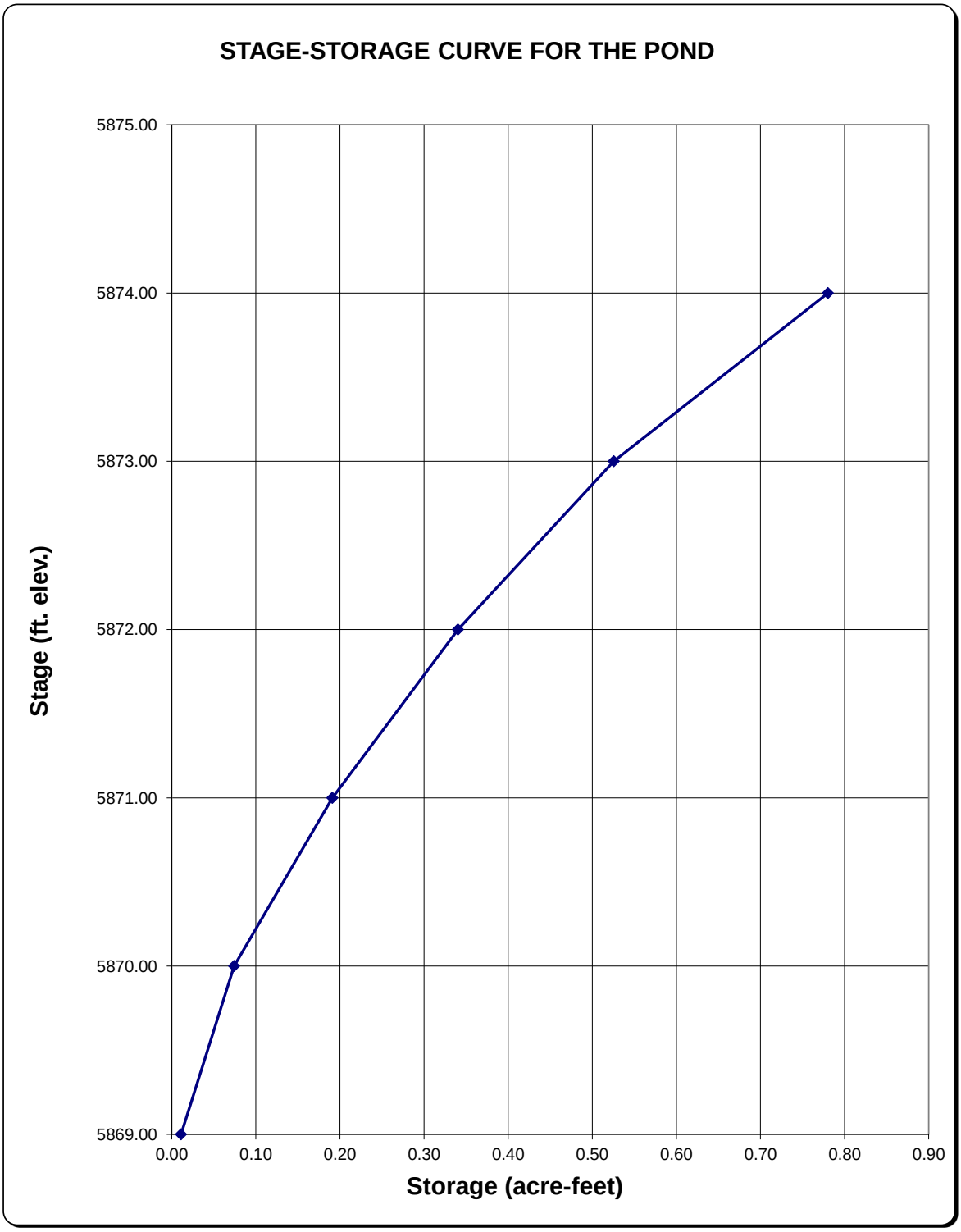
Stage-Storage Relationship:

	MINOR	MAJOR	
Storage Requirement from Sheet 'Modified FAA':			acre-ft.
Storage Requirement from Sheet 'Hydrograph':			acre-ft.
Storage Requirement from Sheet 'Full-Spectrum':	0.16	0.38	acre-ft.

Labels for WQCV, Minor, & Major Storage Stages (input)	Water Surface Elevation ft (input)	Side Slope (H:V) ft/ft Below El. (input)	Basin Width at Stage ft (output)	Basin Length at Stage ft (output)	Surface Area at Stage ft^2 (output)	Surface Area at Stage ft^2 User Overide	Volume Below Stage ft^3 (output)	Surface Area at Stage acres (output)	Volume Below Stage acre-ft (output)	Target Volumes for WQCV, Minor, & Major Storage Volumes (for goal seek)
	5867.65					0		0.000	0.000	
	5868.17		0.00	0.00		0	0	0.000	0.000	
	5869.00		0.00	0.00		1,150	477	0.026	0.011	
EURV - 5870.69	5870.00		0.00	0.00		4,356	3,230	0.100	0.074	
	5871.00		0.00	0.00		5,816	8,316	0.134	0.191	
	5872.00		0.00	0.00		7,203	14,826	0.165	0.340	
	5873.00		0.00	0.00		8,945	22,900	0.205	0.526	
	5874.00		0.00	0.00		13,234	33,989	0.304	0.780	
							#N/A		#N/A	
							#N/A		#N/A	
							#N/A		#N/A

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project:
Basin ID:



STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Project: Compark South

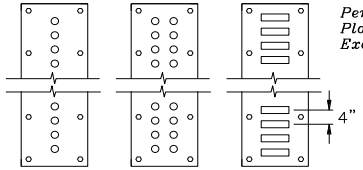
Basin ID: Belford Ave Water Quality Pond - West

WQCV Design Volume (Input):

Catchment Imperviousness, I_a =	12.0	percent		
Catchment Area, A =	17.50	acres	Diameter of holes, D =	0.563 inches
Depth at WQCV outlet above lowest perforation, H =	2	feet	Number of holes per row, N =	1
Vertical distance between rows, h =	4.00	inches	**OR**	
Number of rows, NL =	6.00			
Orifice discharge coefficient, C_o =	0.60		Height of slot, H =	inches
Slope of Basin Trickle Channel, S =	0.005	ft / ft	Width of slot, W =	inches
Time to Drain the Pond =	72	hours		

Watershed Design Information (Input):

Percent Soil Type A =		%
Percent Soil Type B =		%
Percent Soil Type C/D =	100	%



Perforated Plate Examples

Outlet Design Information (Output):

Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	0.113	watershed inches
	N/A	
Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	**0.165**	**acre-feet**
Outlet area per row, Ao =	0.27	square inches
Total opening area at each row based on user-input above, Ao =	0.25	square inches
Total opening area at each row based on user-input above, Ao =	0.002	square feet

3

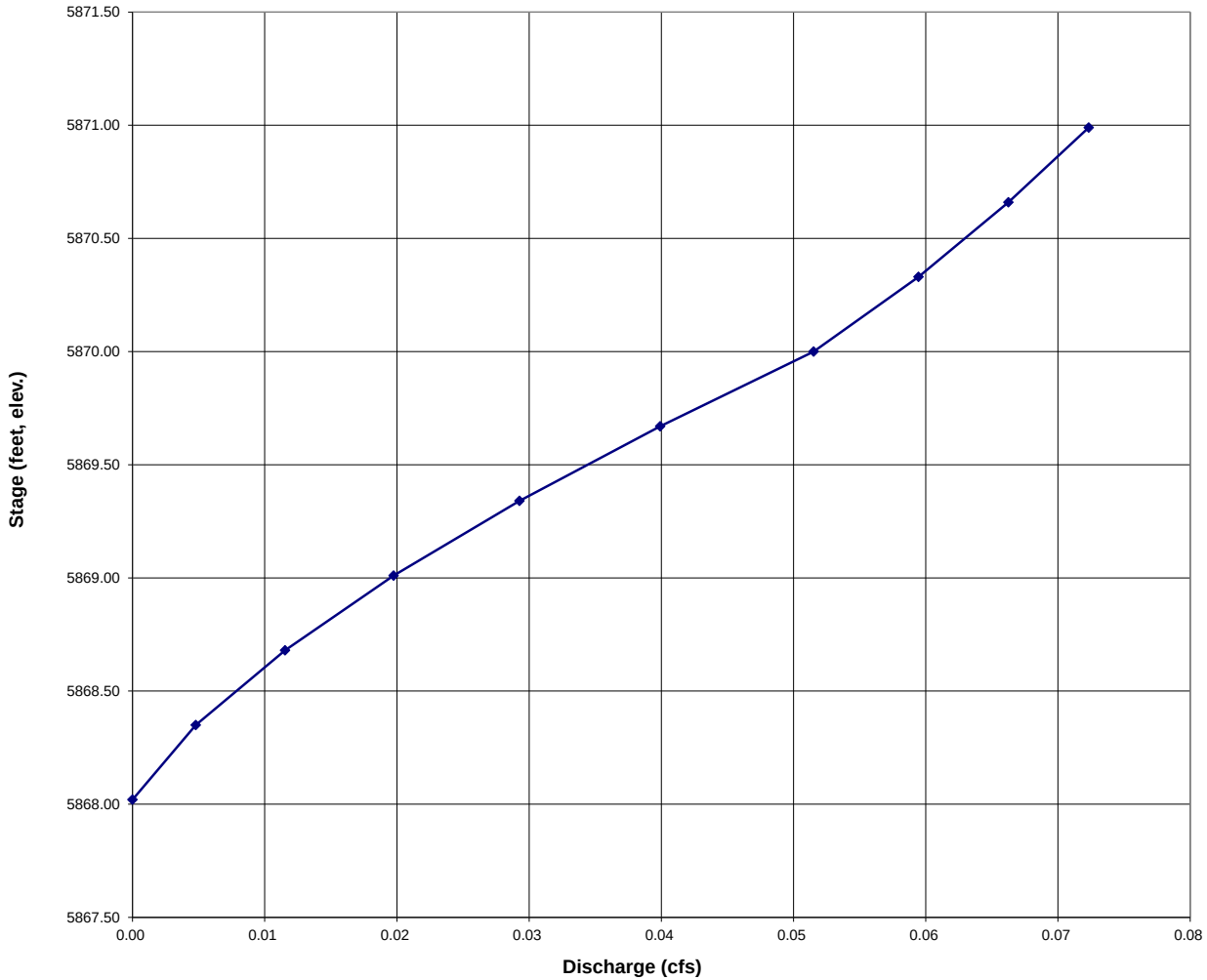
	Central Elevations of Rows of Holes in feet																							Σ Flow
	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	Row 9	Row 10	Row 11	Row 12	Row 13	Row 14	Row 15	Row 16	Row 17	Row 18	Row 19	Row 20	Row 21	Row 22	Row 23	Row 23	
	5868.02	5868.35	5868.69	5869.02	5869.35	5869.69																			
	Collection Capacity for Each Row of Holes in cfs																								
5868.02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000																			**0.00**
5868.35	0.0048	0.0000	0.0000	0.0000	0.0000	0.0000																			**0.00**
5868.68	0.0068	0.0048	0.0000	0.0000	0.0000	0.0000																			**0.01**
5869.01	0.0083	0.0068	0.0047	0.0000	0.0000	0.0000																			**0.02**
5869.34	0.0096	0.0083	0.0067	0.0047	0.0000	0.0000																			**0.03**
5869.67	0.0107	0.0096	0.0082	0.0067	0.0047	0.0000																			**0.04**
5870.00	0.0117	0.0107	0.0095	0.0082	0.0067	0.0046																			**0.05**
5870.33	0.0127	0.0117	0.0107	0.0095	0.0082	0.0067																			**0.06**
5870.66	0.0135	0.0127	0.0117	0.0107	0.0095	0.0082																			**0.07**
5870.99	0.0143	0.0135	0.0126	0.0117	0.0107	0.0095																			**0.07**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A																			**#N/A**
	Override Area Row 1	Override Area Row 2	Override Area Row 3	Override Area Row 4	Override Area Row 5	Override Area Row 6	Override Area Row 7	Override Area Row 8	Override Area Row 9	Override Area Row 10	Override Area Row 11	Override Area Row 12	Override Area Row 13	Override Area Row 14	Override Area Row 15	Override Area Row 16	Override Area Row 17	Override Area Row 18	Override Area Row 19	Override Area Row 20	Override Area Row 21	Override Area Row 22	Override Area Row 23	Override Area Row 24	

STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Worksheet Protected

Project: Compark South

Basin ID: Belford Ave Water Quality Pond - West



PROJECT: **Compark South**
CODE: CLCPKC3
DESIGN BY: Rick Katz
DATE: 3/8/2016
REV. :

GAT-1 FOREBAY VOLUME

Detention Pond Forebay

FOREBAY OUTLET ELEVATION = 6372.82

WQCV (in)	V (ACRE-FT)	V (FT^3)	Forebay at 2% (FT^3)	Forebay Area at 1.5'$_{DEPTH}$
0.078	0.114	4,957.27	99.15	66.10

WQCV Designed from Urban Drainage Criteria Manual Volume 3 (Pgs 3-5 through 3-9)

WQCV=a(0.91i^3-1.19i^2+0.78i)

a=1.0 40-hr drain time

V=(WQCV/12)A

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%203%20Calculating%20the%20WQCV%20and%20Volume%20Reduction.pdf

Forbay Sizing Designed from Urban Drainage Criteria Manual Volume 3 (Pg EDB-12 table EDB-4)

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%204%20Treatment%20BMPs.pdf

Ground Coverage

Weighted I (%):	**12.00%**
Total Acerage:	**17.50**

PROJECT: **Compark South**
CODE: CLCPKC3
DESIGN BY: Rick Katz
DATE: 3/8/2016
REV. :

GAT-1 INITIAL SURCHARGE AREA VOLUME

Detention Pond Forebay
INITIAL SURCHARGE AREA OUTLET ELEVATION =

WQCV (in)	V (ACRE-FT)	V (FT^3)	Intial Surcharge at 0.3% (FT^3)	Initial Surcharge Area at 0.5'$_{DEPTH}$ (FT^2)
0.078	0.114	4,957.27	14.87	29.74
				6x5

WQCV Designed from Urban Drainage Criteria Manual Volume 3 (Pgs 3-5 through 3-9)
WQCV=a(0.91i^3-1.19i^2+0.78i)
a=1.0 40-hr drain time
V=(WQCV/12)A
http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%203%20Calculating%20the%20WQCV%20and%20Volume%20Reduction.pdf

Forbay Sizing Designed from Urban Drainage Criteria Manual Volume 3 (Pg EDB-12 table EDB-4)
http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%204%20Treatment%20BMPs.pdf

Ground Coverage

Weighted I (%):	**12.00%**
Total Acerage:	**17.50**

West Forebay Outlet Weir

Project Description

Solve For	Crest Length

Input Data

Discharge		1.39	ft³/s
Headwater Elevation		1.50	ft
Crest Elevation		0.00	ft
Tailwater Elevation		0.00	ft
Weir Coefficient		0.00	US
Number Of Contractions	0		

Results

Crest Length	0.23	ft
Headwater Height Above Crest	1.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.34	ft²
Velocity	4.08	ft/s
Wetted Perimeter	3.23	ft
Top Width	0.23	ft

GAT -1 Overflow Weir

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.069	
Channel Slope	0.00500	ft/ft
Normal Depth	2.31	ft
Left Side Slope	0.25	ft/ft (H:V)
Right Side Slope	0.25	ft/ft (H:V)
Bottom Width	25.00	ft

Results

Discharge	142.11	ft^3/s
Flow Area	59.08	ft^2
Wetted Perimeter	29.76	ft
Hydraulic Radius	1.99	ft
Top Width	26.16	ft
Critical Depth	1.00	ft
Critical Slope	0.07538	ft/ft
Velocity	2.41	ft/s
Velocity Head	0.09	ft
Specific Energy	2.40	ft
Froude Number	0.28	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.31	ft
Critical Depth	1.00	ft
Channel Slope	0.00500	ft/ft

GAT -1 Overflow Weir

GVF Output Data

Critical Slope	0.07538	ft/ft

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project: Compark South

Basin ID: Belford Ave Water Quality Pond - East

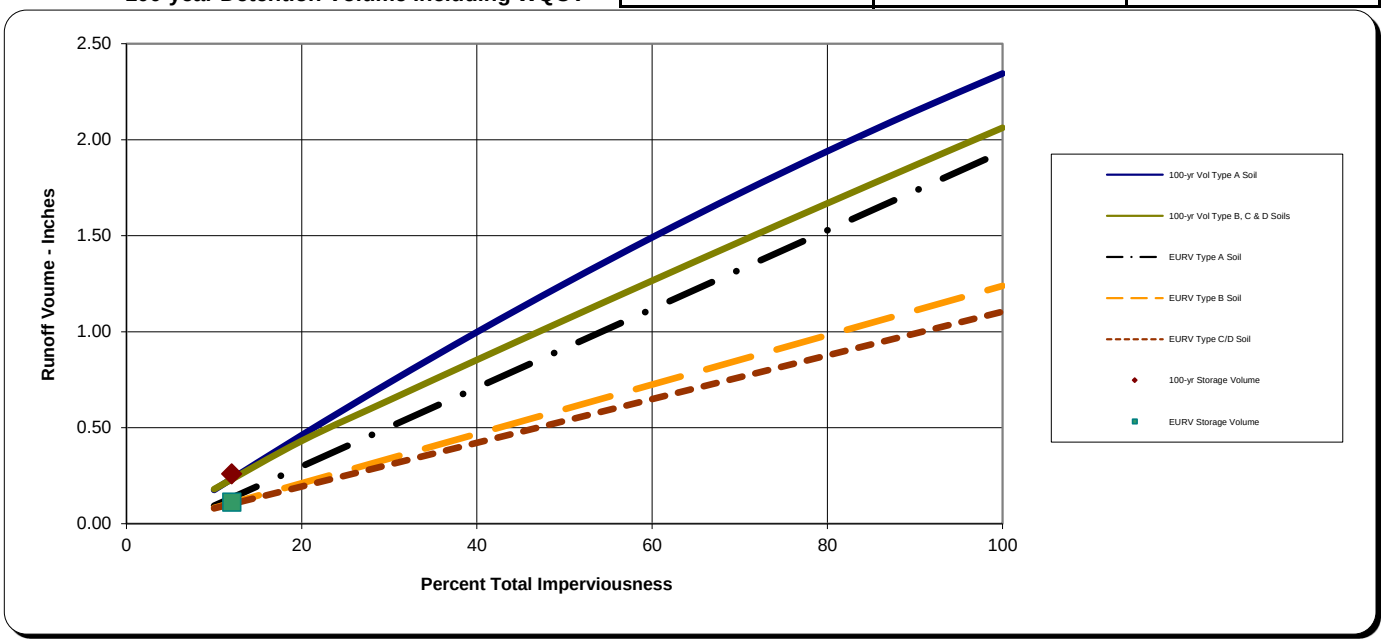
* User input data shown in blue.

Area of Watershed (acres)	24.00	
Subwatershed Imperviousness	12.0%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	0
Effective Imperviousness[1]	12.0%	

Hydrologic Soil Type	**Percentage of Area**	**Area (acres)**
Type A		0.0
Type B		0.0
Type C or D	100.0%	24.0

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		**Decay Coefficient--α**
Initial--f_i	**Final--fo**	
3	0.5	0.0018

	Detention Volumes [2,5]		
	(watershed inches)	**(acre-feet)**	**Maximum Allowable Release Rate, cfs[3]**
Excess Urban Runoff Volume[4]	0.11	0.23	Design Oulet to Empty EURV in 72 Hours
100-year Detention Volume Including WQCV [5]	0.26	0.52	24.00



Notes:

1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).

2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.

3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.

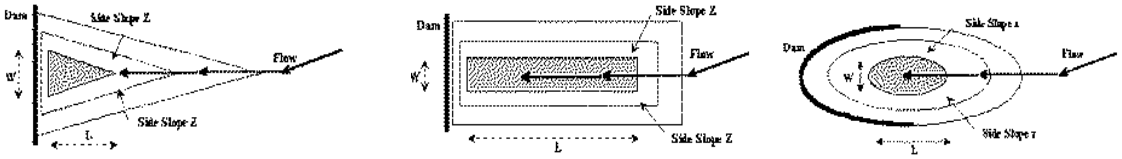
4) EURV approximates the difference between developed and pre-developed runoff volume.

5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project: Compark South

Basin ID: Belford Ave Water Quality Pond - East



Design Information (Input):

Width of Basin Bottom, W =		ft
Length of Basin Bottom, L =		ft
Dam Side-slope (H:V), Z_d =		ft/ft

Check Basin Shape

Right Triangle		OR…
Isosceles Triangle		OR…
Rectangle		OR…
Circle / Ellipse		OR…
Irregular		(Use Overide values in cells G32:G52)

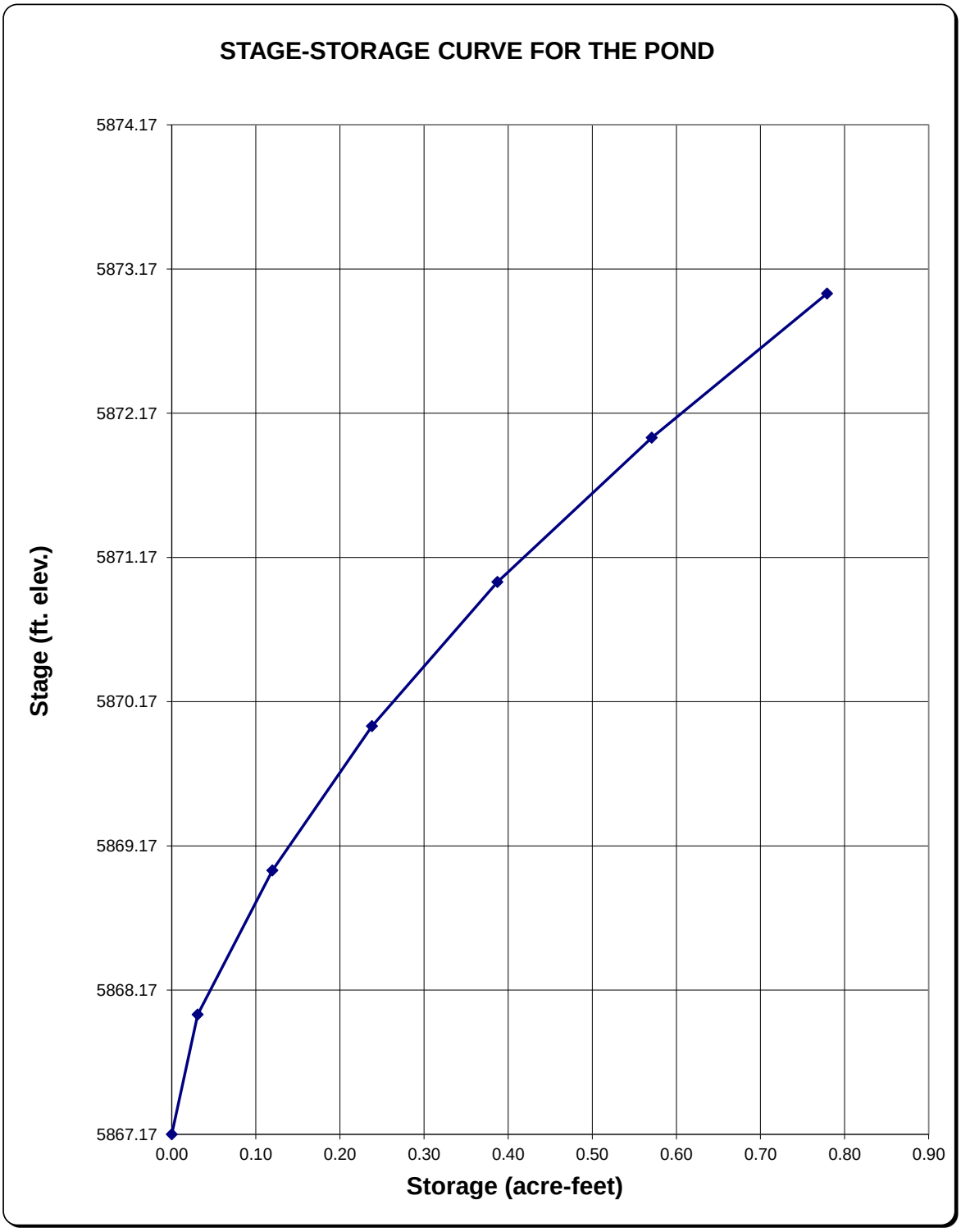
Stage-Storage Relationship:

	MINOR	MAJOR	
Storage Requirement from Sheet 'Modified FAA':			acre-ft.
Storage Requirement from Sheet 'Hydrograph':			acre-ft.
Storage Requirement from Sheet 'Full-Spectrum':	0.23	0.52	acre-ft.

Labels for WQCV, Minor, & Major Storage Stages (input)	Water Surface Elevation ft (input)	Side Slope (H:V) ft/ft Below El. (input)	Basin Width at Stage ft (output)	Basin Length at Stage ft (output)	Surface Area at Stage ft^2 (output)	Surface Area at Stage ft^2 User Overide	Volume Below Stage ft^3 (output)	Surface Area at Stage acres (output)	Volume Below Stage acre-ft (output)	Target Volumes for WQCV, Minor, & Major Storage Volumes (for goal seek)
	5867.17					0		0.000	0.000	
	5868.00		0.00	0.00		3,237	1,343	0.074	0.031	
	5869.00		0.00	0.00		4,510	5,217	0.104	0.120	
EURV - 5870.00	5870.00		0.00	0.00		5,790	10,367	0.133	0.238	
	5871.00		0.00	0.00		7,214	16,869	0.166	0.387	
	5872.00		0.00	0.00		8,767	24,859	0.201	0.571	
	5873.00		0.00	0.00		9,395	33,940	0.216	0.779	
							#N/A		#N/A	
							#N/A		#N/A	
							#N/A		#N/A

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project:
Basin ID:



STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Project: Compark South

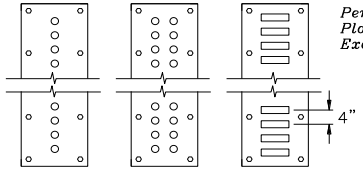
Basin ID: Belford Ave Water Quality Pond - East

WQCV Design Volume (Input):

Catchment Imperviousness, I_a =	24.0	percent		
Catchment Area, A =	12.00	acres	Diameter of holes, D =	0.781 inches
Depth at WQCV outlet above lowest perforation, H =	1	feet	Number of holes per row, N =	1
Vertical distance between rows, h =	4.00	inches	**OR**	
Number of rows, NL =	3.00			
Orifice discharge coefficient, C_o =	0.60		Height of slot, H =	inches
Slope of Basin Trickle Channel, S =	0.005	ft / ft	Width of slot, W =	inches
Time to Drain the Pond =	72	hours		

Watershed Design Information (Input):

Percent Soil Type A =		%
Percent Soil Type B =		%
Percent Soil Type C/D =	100	%



Perforated Plate Examples

Outlet Design Information (Output):

Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	0.113	watershed inches
	N/A	
Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	**0.226**	**acre-feet**
Outlet area per row, Ao =	0.48	square inches
Total opening area at each row based on user-input above, Ao =	0.48	square inches
Total opening area at each row based on user-input above, Ao =	0.003	square feet

3

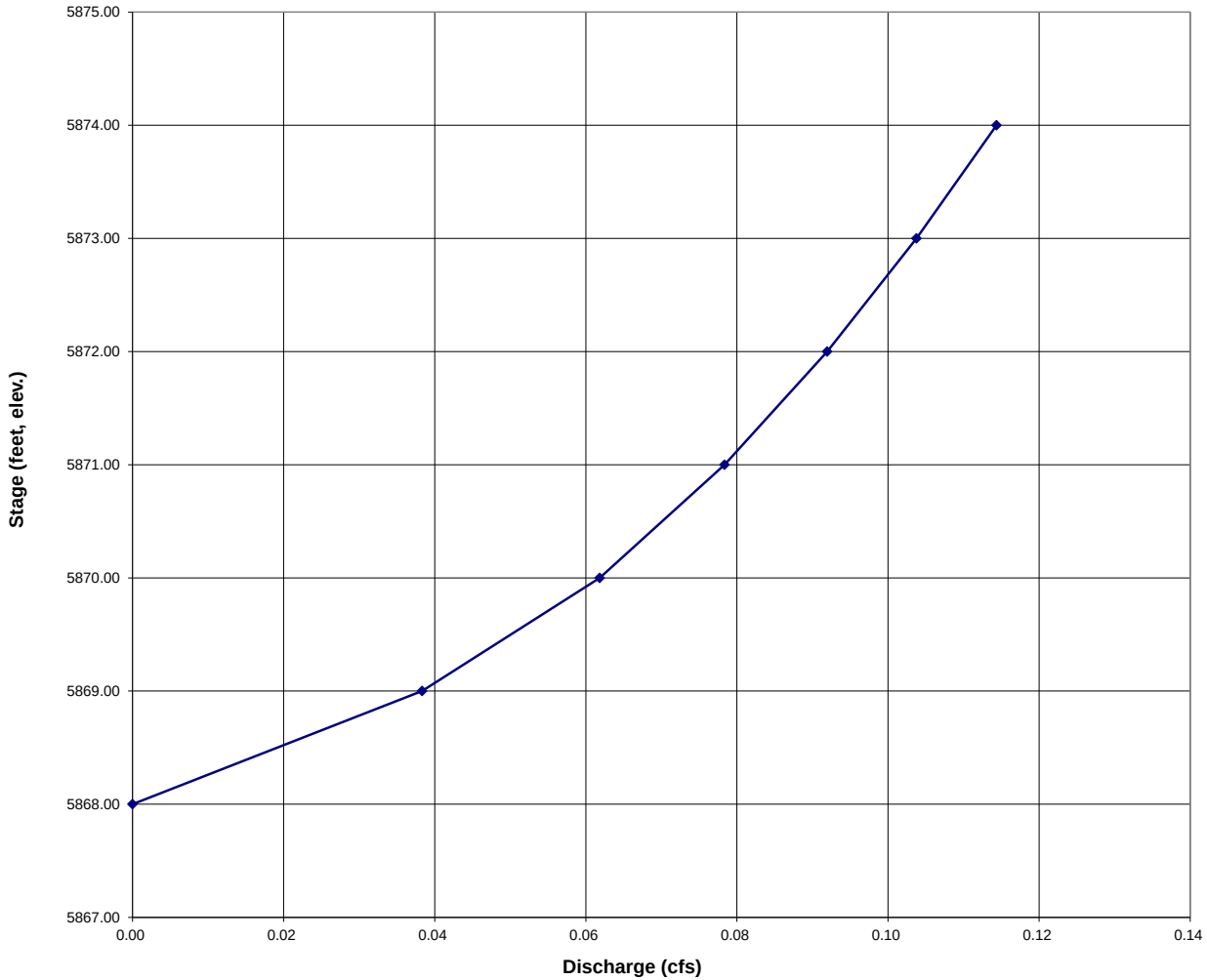
	Central Elevations of Rows of Holes in feet																								Σ Flow
	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	Row 9	Row 10	Row 11	Row 12	Row 13	Row 14	Row 15	Row 16	Row 17	Row 18	Row 19	Row 20	Row 21	Row 22	Row 23	Row 23	
	5868.00	5868.33	5868.67																						
	Collection Capacity for Each Row of Holes in cfs																								
5868.00	0.0000	0.0000	0.0000																						0.00
5869.00	0.0160	0.0131	0.0092																						0.04
5870.00	0.0227	0.0207	0.0185																						0.06
5871.00	0.0277	0.0262	0.0245																						0.08
5872.00	0.0320	0.0307	0.0292																						0.09
5873.00	0.0358	0.0346	0.0333																						0.10
5874.00	0.0392	0.0381	0.0370																						0.11
	#N/A	#N/A	#N/A																						#N/A

STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Worksheet Protected

Project: Compark South

Basin ID: Belford Ave Water Quality Pond - East



PROJECT: **Compark South**
CODE: CLCPKC3
DESIGN BY: Rick Katz
DATE: 3/8/2016
REV. :

GAT-2 FOREBAY VOLUME

Detention Pond Forebay

FOREBAY OUTLET ELEVATION = 6372.82

WQCV (in)	V (ACRE-FT)	V (FT^3)	Forebay at 2% (FT^3)	Forebay Area at 1.5'$_{DEPTH}$
0.078	0.156	6,798.54	135.97	90.65

WQCV Designed from Urban Drainage Criteria Manual Volume 3 (Pgs 3-5 through 3-9)

WQCV=a(0.91i^3-1.19i^2+0.78i)

a=1.0 40-hr drain time

V=(WQCV/12)A

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%203%20Calculating%20the%20WQCV%20and%20Volume%20Reduction.pdf

Forbay Sizing Designed from Urban Drainage Criteria Manual Volume 3 (Pg EDB-12 table EDB-4)

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%204%20Treatment%20BMPs.pdf

Ground Coverage

Weighted I (%):	**12.00%**
Total Acerage:	**24.00**

PROJECT: **Compark South**
CODE: CLCPKC3
DESIGN BY: Rick Katz
DATE: 3/8/2016
REV. :

GAT-2 INITIAL SURCHARGE AREA VOLUME

Detention Pond Forebay

INITIAL SURCHARGE AREA OUTLET ELEVATION =

WQCV (in)	V (ACRE-FT)	V (FT^3)	Forebay at 0.3% (FT^3)	Forebay Area at 0.5'$_{DEPTH}$ (FT^2)
0.078	0.156	6,798.54	20.40	40.79

WQCV Designed from Urban Drainage Criteria Manual Volume 3 (Pgs 3-5 through 3-9)

WQCV=a(0.91i^3-1.19i^2+0.78i)

a=1.0 40-hr drain time

V=(WQCV/12)A

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%203%20Calculating%20the%20WQCV%20and%20Volume%20Reduction.pdf

Forbay Sizing Designed from Urban Drainage Criteria Manual Volume 3 (Pg EDB-12 table EDB-4)

http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/Chapter%204%20Treatment%20BMPs.pdf

Ground Coverage

Weighted I (%):	**12.00%**
Total Acerage:	**24.00**

East Forebay Outlet Weir

Project Description

Solve For	Crest Length

Input Data

Discharge	2.17	ft³/s
Headwater Elevation	1.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.33	US
Number Of Contractions	0	

Results

Crest Length	0.35	ft
Headwater Height Above Crest	1.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.53	ft²
Velocity	4.08	ft/s
Wetted Perimeter	3.35	ft
Top Width	0.35	ft

GAT-2 Overflow Weir

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.069	
Channel Slope	0.00500	ft/ft
Normal Depth	2.00	ft
Left Side Slope	0.25	ft/ft (H:V)
Right Side Slope	0.25	ft/ft (H:V)
Bottom Width	35.00	ft

Results

Discharge	160.86	ft^3/s
Flow Area	71.00	ft^2
Wetted Perimeter	39.12	ft
Hydraulic Radius	1.81	ft
Top Width	36.00	ft
Critical Depth	0.87	ft
Critical Slope	0.07663	ft/ft
Velocity	2.27	ft/s
Velocity Head	0.08	ft
Specific Energy	2.08	ft
Froude Number	0.28	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.00	ft
Critical Depth	0.87	ft
Channel Slope	0.00500	ft/ft

GAT-2 Overflow Weir

GVF Output Data

Critical Slope	0.07663	ft/ft

PROPOSED FIRST STREET ROADSIDE SWALE SIZING CALCULATIONS (West Side of Road)

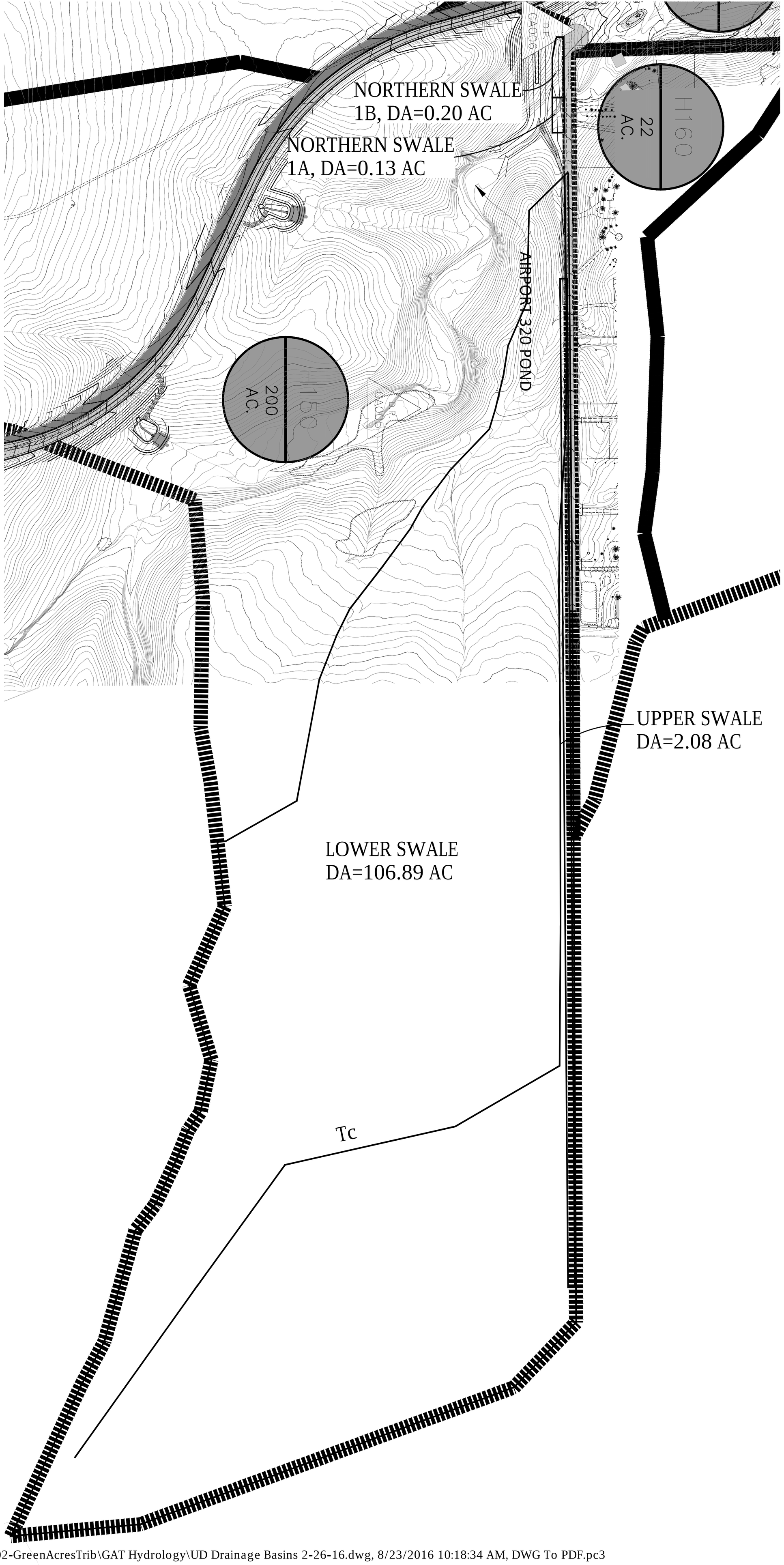
1. There are three parts to the roadside swale. The upper reach (southernmost section Sta 10+79.6-22+34)) is smaller and collecting mostly the road runoff. The lower reach (Sta 22+34-26+50) is the larger section to the north and collects a much larger drainage area. The northern most portion of the swale (Sta 27+50-29+27.5 and Sta 29+27.5-31+44.6) is the smallest drainage area and only includes the grassed area between the proposed berm adjacent to Green Acres Tributary and the edge of pavement of First Street.
2. The roadside swales were designed in accordance with Section 7.8, Rural Roadside Ditches of the Douglas County Storm Drainage Design and Technical Criteria Manual (DCSDDTCM).
    a. Minor storm within the channel
    b. Major storm at 6" depth at roadway crown
3. Drainage Areas are shown in attached sketch.
4. Runoff Calculations
    a. Drainage Area
        i. Upper = 2.08 Acres
        ii. Lower = 106.89 Acres
        iii. Northern 1A = 0.13 Acre
        iv. Northern 1B= 0.20 Acre
    b. Type B soil
    c. Tc
        i. Upper = 29 minutes
        ii. Lower = 40 minutes
        iii. Northern 1A & 1B = 10 minutes
    d. Rainfall Intensity (Zone 1) (Figure 6-2 from DCSDDTCM)
        i. Upper
            1. I100 = 4.1 in/hr
            2. I5 = 2.25 in/hr
        ii. Lower
            1. I100 = 3.5 in/hr
            2. I5 = 1.8 in/hr
        iii. Northern (1A & 1B)
            1. I100 = 7.0 in/hr
            2. I5 = 3.85 in/hr
    e. Undeveloped Coverage (Historical)
        i. Upper (50% Impervious)
            1. C100 = 0.70
            2. C5 = 0.53
        ii. Lower (2% Impervious) HSG B Soil — HSG A Soil
            1. C100 = 0.46 — C100 = 0.17
            2. C5 = 0.02 — C5 = 0.02
        iii. Northern (1A & 1B) (2% Impervious)
            1. C100=0.46
            2. C5 = 0.02

f. Developed Coverage
    i. Upper
        1. C100 = 0.70
        2. C5 = 0.53
    ii. Lower
        1. C100 = 0.51
        2. C5 = 0.3
    iii. Northern (1A & 1B)
        1. C100 = 0.46
        2. C5 = 0.02
g. Historic Runoff (Rational)
    i. Upper
        1. Q100 = 6.02 cfs
        2. Q5 = 2.5 cfs
    ii. Lower (HSG B Soil)
        1. Q100 = 172.09 cfs
        2. Q5 = 3.85 cfs

HSG A Soil
Q100 = 63.6 cfs
Q5 = 3.85 cfs

    iii. Northern 1A
        1. Q100 = 0.42 cfs
        2. Q5 = 0.01 cfs
    iv. Northern 1B
        1. Q100 = 0.64 cfs
        2. Q5 = 0.02 cfs
h. Developed Runoff (Rational)
    i. Upper
        1. Q100 = 6.02 cfs
        2. Q5 = 2.5 cfs
    ii. Lower
        1. Q100 = 190 cfs
        2. Q5 = 57.72 cfs
    iii. Northern 1A
        1. Q100 = 0.42 cfs
        2. Q5 = 0.01 cfs
    iv. Northern 1B
        1. Q100 = 0.64 cfs
        2. Q5 = 0.02 cfs

5. Channel Design
    a. The Flowmaster model was utilized to determine the velocity in the proposed swales (see attached)
    b. Channel Lining
        i. Upper = Grass Lined
        ii. Lower = Type M Rip Rap (d50 = 1')
        iii. Northern 1A & 1B = Grass Lined


NORTHERN SWALE
1B, DA=0.20 AC
NORTHERN SWALE
1A, DA=0.13 AC
H160
22
AC.
AIRPORT 320 POND
H160
200
AC.
UPPER SWALE
DA=2.08 AC
LOWER SWALE
DA=106.89 AC
Tc

First Street - Upper Channel Full Channel Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02400	ft/ft
Normal Depth	0.63	ft

Section Definitions

Station (ft)	Elevation (ft)
0+23	5878.38
0+32	5875.84
0+34	5875.21
0+36	5875.21
0+38	5875.84
0+50	5876.08
0+50	5876.58

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+23, 5878.38)	(0+32, 5875.84)	0.030
(0+32, 5875.84)	(0+36, 5875.21)	0.040
(0+36, 5875.21)	(0+38, 5875.84)	0.040
(0+38, 5875.84)	(0+50, 5876.08)	0.011
(0+50, 5876.08)	(0+50, 5876.58)	0.011

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	7.59	ft³/s
Elevation Range	5875.21 to 5878.38 ft	

$Q_{5yr} = 2.5$ cfs

First Street - Upper Channel Full Channel Capacity

Results

Flow Area		2.52	ft²
Wetted Perimeter		6.66	ft
Hydraulic Radius		0.38	ft
Top Width		6.50	ft
Normal Depth		0.63	ft
Critical Depth		0.58	ft
Critical Slope		0.03373	ft/ft
Velocity		3.01	ft/s
Velocity Head		0.14	ft
Specific Energy		0.77	ft
Froude Number		0.85	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.58	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.03373	ft/ft

First Street - Upper Channel 100 yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Discharge	6.02	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+23	5878.38
0+32	5875.84
0+34	5875.21
0+36	5875.21
0+38	5875.84
0+50	5876.08
0+50	5876.58

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+23, 5878.38)	(0+32, 5875.84)	0.030
(0+32, 5875.84)	(0+36, 5875.21)	0.040
(0+36, 5875.21)	(0+38, 5875.84)	0.040
(0+38, 5875.84)	(0+50, 5876.08)	0.011
(0+50, 5876.08)	(0+50, 5876.58)	0.011

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.57	ft
Elevation Range	5875.21 to 5878.38 ft	

Swale depth 0.63'

First Street - Upper Channel 100 yr Storm

Results

Flow Area		2.12	ft²
Wetted Perimeter		6.14	ft
Hydraulic Radius		0.35	ft
Top Width		6.00	ft
Normal Depth		0.57	ft
Critical Depth		0.52	ft
Critical Slope		0.03481	ft/ft
Velocity		2.84	ft/s
Velocity Head		0.12	ft
Specific Energy		0.69	ft
Froude Number		0.84	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.57	ft
Critical Depth	0.52	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.03481	ft/ft

First Street - Lower Channel Full Channel Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02400	ft/ft
Normal Depth	1.75	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	5854.00
0+08	5852.00
0+13	5850.25
0+15	5850.25
0+22	5852.00
0+34	5852.24
0+34	5852.74

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5854.00)	(0+08, 5852.00)	0.030
(0+08, 5852.00)	(0+15, 5850.25)	0.040
(0+15, 5850.25)	(0+22, 5852.00)	0.040
(0+22, 5852.00)	(0+34, 5852.24)	0.011
(0+34, 5852.24)	(0+34, 5852.74)	0.011

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	78.66	ft³/s	$Q_{5yr} = 57.72$ cfs
Elevation Range	5850.25 to 5854.00 ft		

First Street - Lower Channel Full Channel Capacity

Results

Flow Area		14.00	ft²
Wetted Perimeter		14.51	ft
Hydraulic Radius		0.96	ft
Top Width		14.00	ft
Normal Depth		1.75	ft
Critical Depth		1.74	ft
Critical Slope		0.02449	ft/ft
Velocity		5.62	ft/s
Velocity Head		0.49	ft
Specific Energy		2.24	ft
Froude Number		0.99	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.75	ft
Critical Depth	1.74	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.02449	ft/ft

First Street - Lower Channel 100 yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Discharge	190.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	5854.00
0+08	5852.00
0+13	5850.25
0+15	5850.25
0+22	5852.00
0+34	5852.24
0+34	5852.74

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5854.00)	(0+08, 5852.00)	0.030
(0+08, 5852.00)	(0+15, 5850.25)	0.040
(0+15, 5850.25)	(0+22, 5852.00)	0.040
(0+22, 5852.00)	(0+34, 5852.24)	0.011
(0+34, 5852.24)	(0+34, 5852.74)	0.011

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	2.27 ft	Swale depth 1.75', crown 0.25'
Elevation Range	5850.25 to 5854.00 ft	26" @ crown 0.1C.

First Street - Lower Channel 100 yr Storm

Results

Flow Area		26.52	ft²
Wetted Perimeter		28.93	ft
Hydraulic Radius		0.92	ft
Top Width		28.12	ft
Normal Depth		2.27	ft
Critical Depth		2.45	ft
Critical Slope		0.01357	ft/ft
Velocity		7.16	ft/s
Velocity Head		0.80	ft
Specific Energy		3.06	ft
Froude Number		1.30	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.27	ft
Critical Depth	2.45	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.01357	ft/ft

Northern First Street Swale Calcs

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.01360	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	0.64	ft³/s

Results

Normal Depth	0.31	ft
Flow Area	0.39	ft²
Wetted Perimeter	2.57	ft
Hydraulic Radius	0.15	ft
Top Width	2.50	ft
Critical Depth	0.28	ft
Critical Slope	0.02644	ft/ft
Velocity	1.64	ft/s
Velocity Head	0.04	ft
Specific Energy	0.35	ft
Froude Number	0.73	
Flow Type	Subcritical	

GVF Input Data

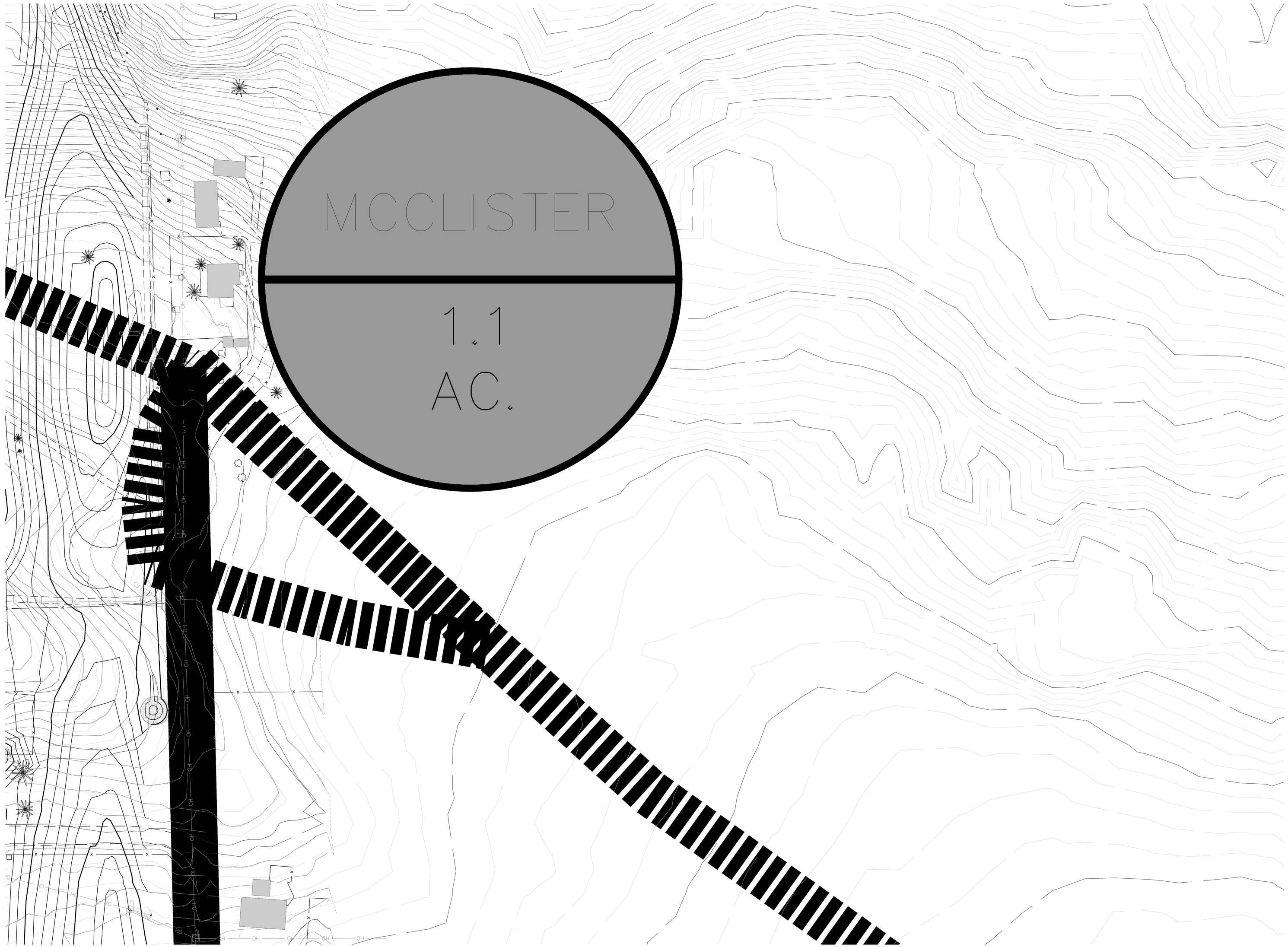
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.31	ft
Critical Depth	0.28	ft
Channel Slope	0.01360	ft/ft
Critical Slope	0.02644	ft/ft

McLISTER SWALE

The McLister property is located at the northwest corner of Drainage Basin H180. In order to keep storm water from flowing offsite, a swale has been designed to convey water from the McLister property into the proposed storm sewer system. Water is directed to a flared end structure, at which point it enters a storm line that serves Compark Village South, Filing No. 2 and Belford Ave. This storm water eventually outfalls into the E-470 Regional Pond.


MCCLISTER
1.1
AC.

COMPARK VILLAGE SOUTH TEMPORARY SWALES

There are two temporary swales that will be constructed as part of Drainage System 4 and Drainage System 5. These swales will convey the runoff from the culverts under the proposed berm along the southern property line to the proposed culverts under Belford Avenue. These swales will be replaced by an underground storm sewer system when the Compark Village South, Filing No. 2 project is developed.

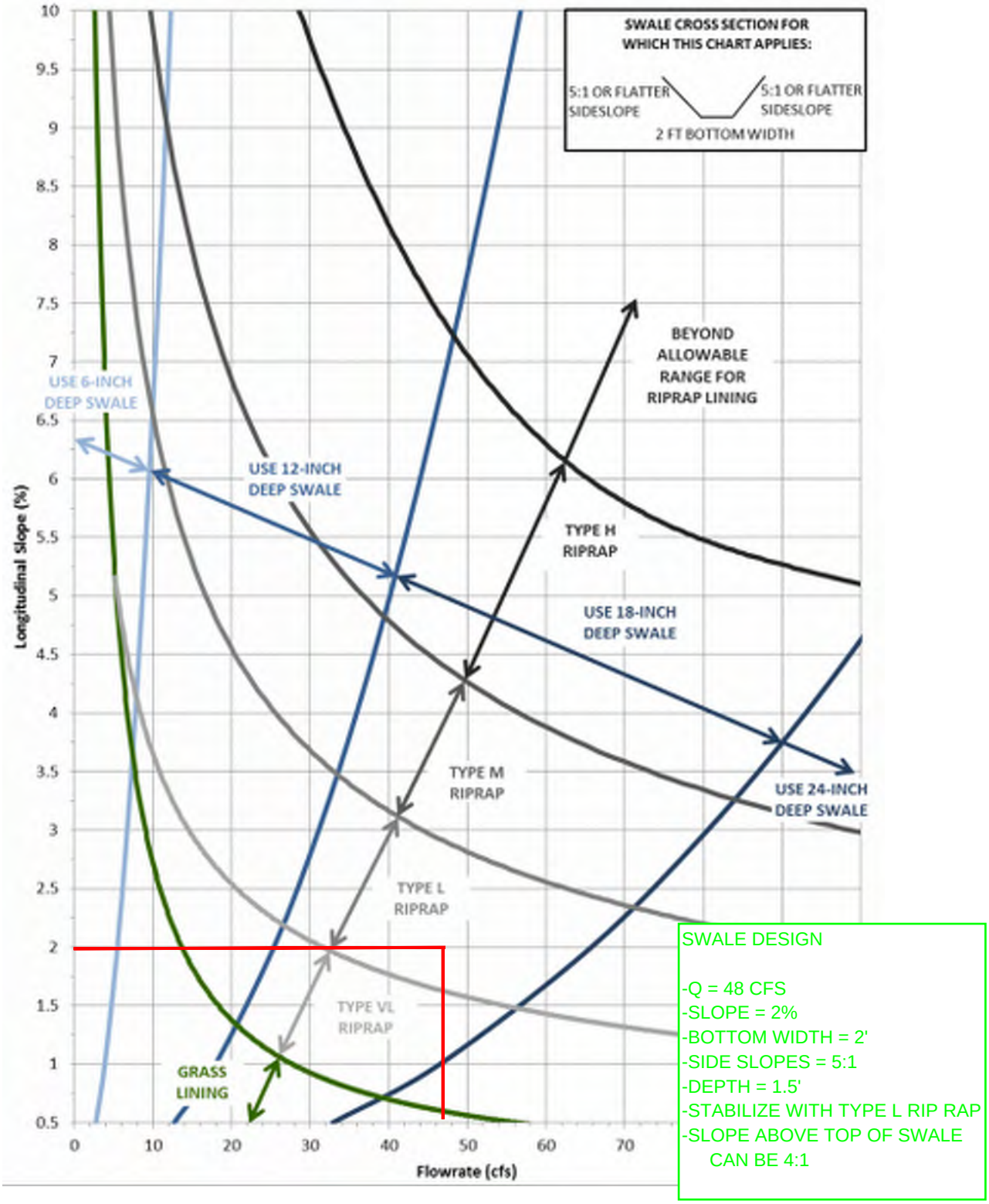


Figure 8-22. Swale stability chart; 2- to 4-foot bottom width and side slopes between 5:1 and 10:1 (Note: Riprap classifications refer to gradation for riprap used in soil riprap or void-filled riprap. See Figure 8-34 for gradations.) (Source: Muller Engineering Company)

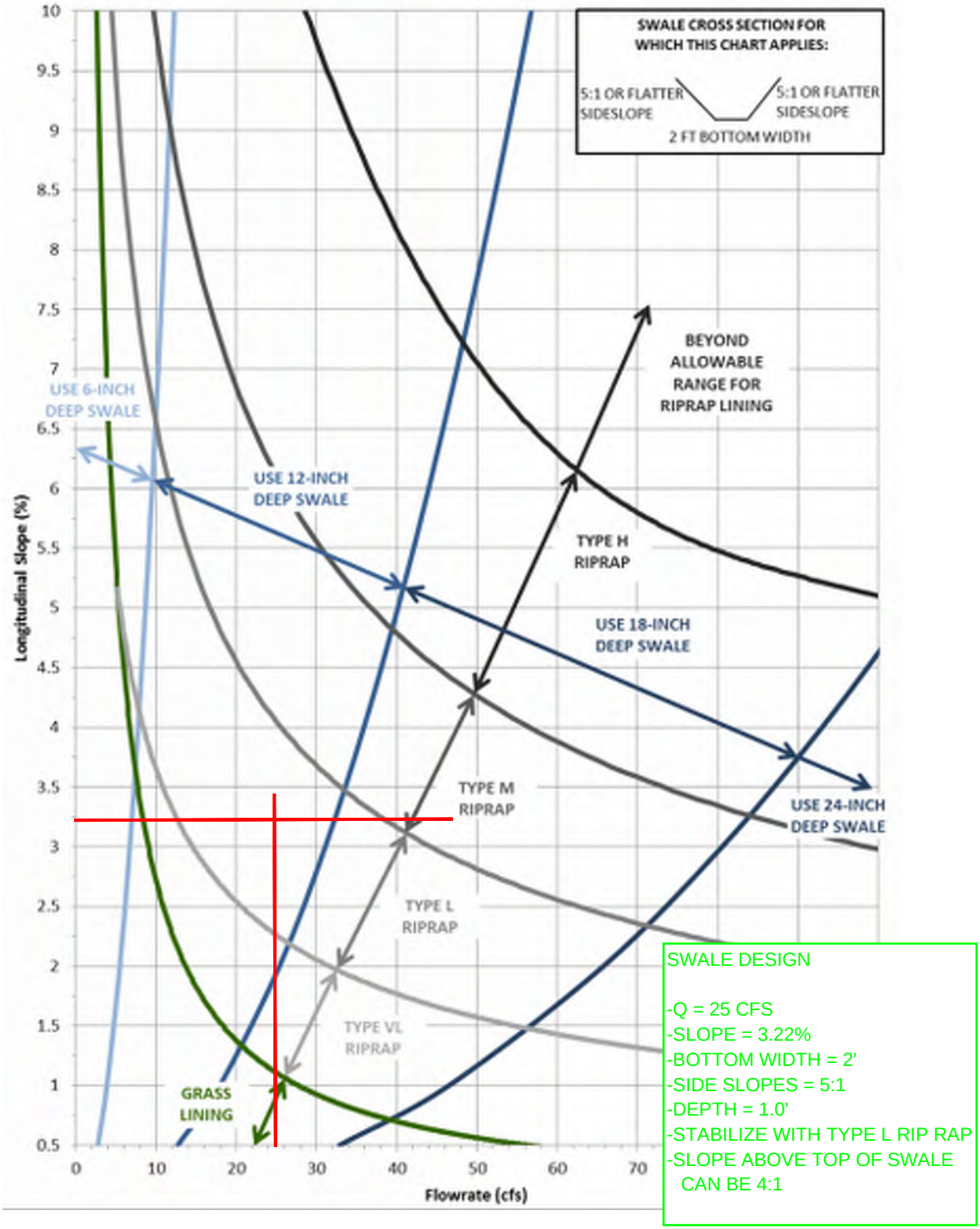


Figure 8-22. Swale stability chart; 2- to 4-foot bottom width and side slopes between 5:1 and 10:1
(Note: Riprap classifications refer to gradation for riprap used in soil riprap or void-filled riprap. See Figure 8-34 for gradations.) (Source: Muller Engineering Company)

BOTTOM OF BERM SWALE (NORTH SIDE)

A proposed swale will be constructed along the north side of the berm along the southern property line. This grassed swale will direct runoff eastward to a proposed flared end structure, at which point it enters a storm line that serves Compark Village South, Filing No. 2 and Belford Ave. This storm water eventually outfalls into the E-470 Regional Pond.

SWALE AT BASE OF BERM ALONG SOUTH PL

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.01000	ft/ft
Normal Depth	1.00	ft
Left Side Slope	0.20	ft/ft (H:V)
Right Side Slope	0.20	ft/ft (H:V)
Bottom Width	2.00	ft

Results

Discharge	7.27	ft^3/s
Flow Area	2.20	ft^2
Wetted Perimeter	4.04	ft
Hydraulic Radius	0.54	ft
Top Width	2.40	ft
Critical Depth	0.72	ft
Critical Slope	0.02605	ft/ft
Velocity	3.30	ft/s
Velocity Head	0.17	ft
Specific Energy	1.17	ft
Froude Number	0.61	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.72	ft
Channel Slope	0.01000	ft/ft

SWALE AT BASE OF BERM ALONG SOUTH PL

GVF Output Data

Critical Slope	0.02605	ft/ft

TEMPORARY SWALE EAST OF STREET E

A temporary proposed swale will be constructed along the east side of Street E. This grassed swale will direct runoff from the Compark Village South, Filing No. 2 rough grading northward to a proposed flared end structure, at which point it enters a storm line that directly discharges to the E-470 Regional Detention/Water Quality Pond. During future development of Belford Avenue, this swale will be replaced with an underground storm sewer system.

Temp Swale East of Street E - Top

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	0.20	ft/ft (H:V)
Right Side Slope	0.20	ft/ft (H:V)
Bottom Width	4.00	ft
Discharge	9.80	ft^3/s

Results

Normal Depth	0.79	ft
Flow Area	3.29	ft^2
Wetted Perimeter	5.62	ft
Hydraulic Radius	0.59	ft
Top Width	4.32	ft
Critical Depth	0.57	ft
Critical Slope	0.02837	ft/ft
Velocity	2.98	ft/s
Velocity Head	0.14	ft
Specific Energy	0.93	ft
Froude Number	0.60	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.79	ft
Critical Depth	0.57	ft
Channel Slope	0.01000	ft/ft

Temp Swale East of Street E - Top

GVF Output Data

Critical Slope	0.02837	ft/ft

Temp Swale East of Street E - Bottom

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.10000	ft/ft
Left Side Slope	0.20	ft/ft (H:V)
Right Side Slope	0.20	ft/ft (H:V)
Bottom Width	4.00	ft
Discharge	9.80	ft³/s

Results

Normal Depth	0.48	ft
Flow Area	1.95	ft²
Wetted Perimeter	4.97	ft
Hydraulic Radius	0.39	ft
Top Width	4.19	ft
Critical Depth	0.57	ft
Critical Slope	0.05791	ft/ft
Velocity	5.03	ft/s
Velocity Head	0.39	ft
Specific Energy	0.87	ft
Froude Number	1.30	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.48	ft
Critical Depth	0.57	ft
Channel Slope	0.10000	ft/ft

Temp Swale East of Street E - Bottom

GVF Output Data

Critical Slope	0.05791	ft/ft

APPENDIX K

Detention Pond Water Rights/Accounting Requirements

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016

BBA water consultants

BISHOP-BROGDEN ASSOCIATES, INC.

Christopher J. Sanchez
Jeffrey A. Clark
Daniel O. Niemela
Jonathan D. George
Michael A. Sayler
Charles E. Stanzione

May 18, 2016

Mr. Rick Moore
Senior Project Manager
Manhard Consulting
By email only: rmoore@manhard.com

RE: Green Acres Tributary Pond – Water Supply Plan and Compliance

Dear Rick:

The purpose of this letter is to describe the water supply plan and regulatory framework for the planned Green Acres tributary pond (the Pond). The Pond is a detention facility with a planned permanent pool of water and a recirculating pump system intended to create a flowing stream entering the pond. The Pond is located on an intermittent drainage tributary to Happy Canyon Creek, which is a tributary to Cherry Creek.

Water Supply Source

A water supply source for the pond is needed to maintain the water level in the pond and to replace evaporative losses. The planned water supply source is a potable water tap from a municipal provider. At a later date, the developer may opt to construct a water supply well and utilize a ground water source as the water supply instead of the potable tap.

Regulatory Framework

Given the planned recirculating pump operations in the Pond, the proposed pond does not fall under the allowable exemptions for detention facilities. According to South Platte Basin Reservoir Accounting Guidelines, the proposed detention pond / water feature is considered an on-stream reservoir and will need to follow specific accounting procedures to ensure that water is not stored out of priority and that senior water rights are not injured. Detailed accounting procedures will be required and will generally entail quantification of inflows, outflows, evaporative losses, daily stage readings, and storage that is owed to the river. We contacted the State Engineer's Office and learned that with the use of detailed accounting, it should be feasible to operate the pond without a water rights augmentation plan. However, the administrative classification of the pond will be

subject to the determination of the Division Engineer's Office, and it is possible that they may determine that an augmentation plan is needed. If that occurs, then the developer will pursue an augmentation plan, as needed. It is our opinion that an augmentation plan should not be needed for the pond as long as the Pond is operated in accordance with the South Platte Basin Reservoir Accounting Guidelines. Operation under the Reservoir Accounting Guidelines is adequate to ensure that other water rights will not be injured.

If you have questions or comments, please do not hesitate to call.

Very truly yours,

BISHOP-BROGDEN ASSOCIATES, INC.

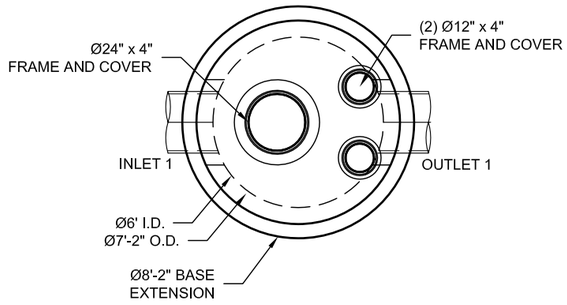
Christopher J. Sanchez, P.G.
Principal

CJS/jeb
cc: Mike Vickers - mvickers@mpvcompark.com
9822.00

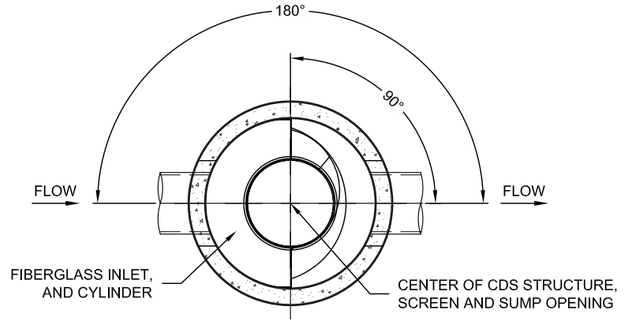
APPENDIX L

Water Quality Structures' Design

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016

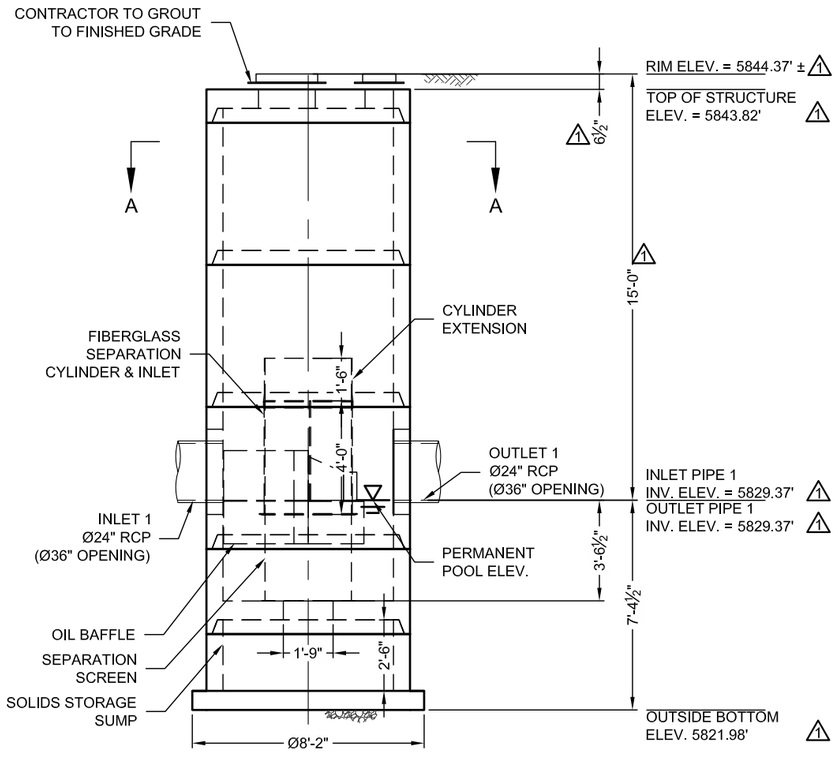


PLAN VIEW



SECTION A-A

● INTERNAL COMPONENTS TO BE INSTALLED BY CONTECH ON SITE



ELEVATION VIEW

MATERIAL LIST (PROVIDED BY CONTECH)

COUNT	DESCRIPTION	INSTALLED BY
1	FIBERGLASS INLET AND CYLINDER	CONTECH
1	2400 micron, 3' O.D. x 3.04' SEP. SCREEN	CONTECH
1	CYLINDER EXTENSION	CONTRACTOR
1	SEALANT FOR JOINTS (BY PRECASTER)	CONTRACTOR
1	Ø24" x 4" FRAME & COVER, EJ#41600389, OR EQUIV.	CONTRACTOR
2	Ø12" x 4" FRAME & COVER, EJ#41610201, OR EQUIV.	CONTRACTOR

SITE DESIGN DATA

WATER QUALITY FLOW RATE	0 CFS
PEAK FLOW RATE	29.2 CFS
RETURN PERIOD OF PEAK FLOW	100 YRS

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

1 STRUCTURE WEIGHT
APPROXIMATE HEAVIEST PICK = 10000 LBS.
STRUCTURE IS DELIVERED IN 6 PIECES

MAX FOOTPRINT = Ø8'-2"

CONTECH
CONTRACT
DRAWING

LPICO
LAYOUT 1A
3030-6-FGIS
1026 / FI72886

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MARK	DATE	REVISION DESCRIPTION	BY
1	7/28/16	IN/OUTLET & RIM ELEVATIONS	KJW

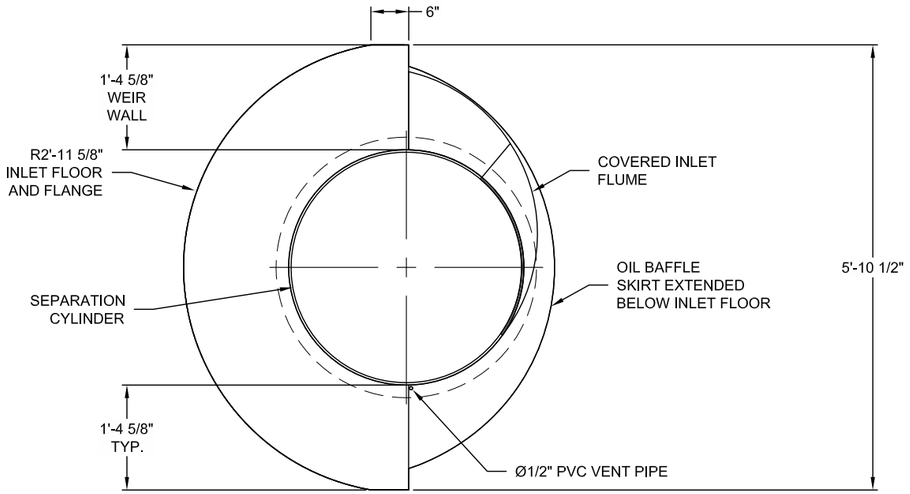
CDS3030-6-C - 542946-10
COMPARK SOUTH
PARKER, CO
for SYSTEM: STMH 1-3

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
2201 W. Royal Lane, Suite 280, Irving, TX 75063
972-580-2000 972-580-2039 FAX

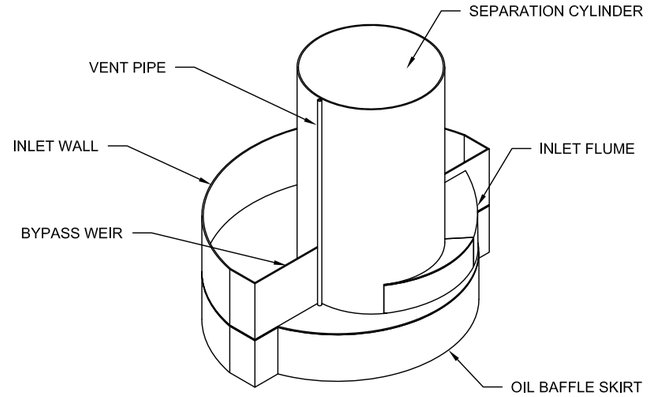
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 7,789,344;7,484,720;8,513,585;8,181,783; 8,641,331 AND/OR FOREIGN EQUIVALENTS. OTHER PATENTS PENDING.

DATE: 07/15/16	SCALE: 3/16" = 1'-0"
DESIGNED: JHR	DRAWN: KJW
CHECKED: XXX	APPROVED: ----
PROJECT No.: 542946	SEQUENCE No.: 10
SHEET: 1 OF 1	

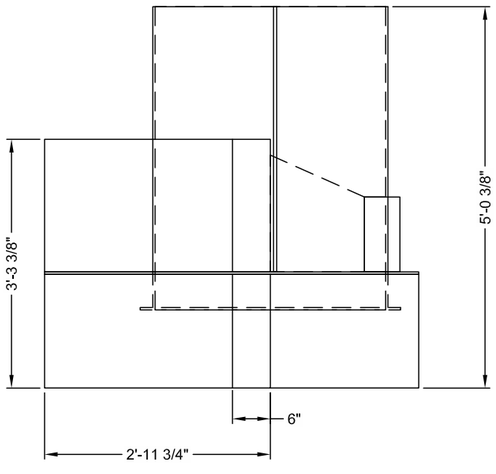
I:\MERLIN\PROJECTACTIVE\542900\542946\542946-10-CDS\DRAWINGS\PRE-542946-10-CDS3030-6 CONFAB.DWG 7/28/2016 11:35 AM



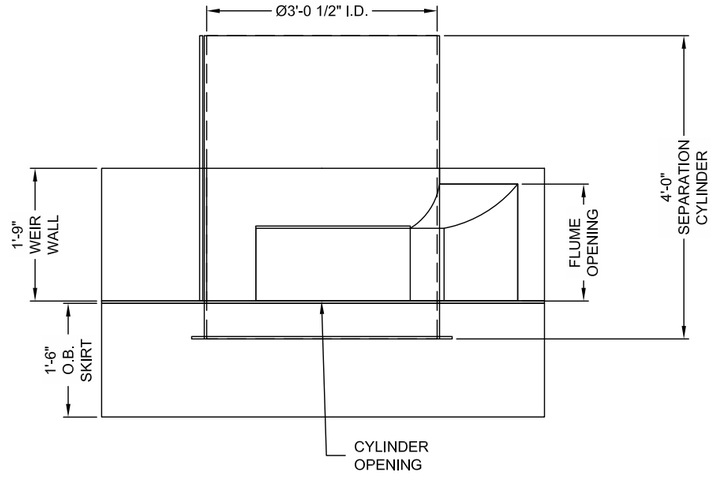
PLAN VIEW



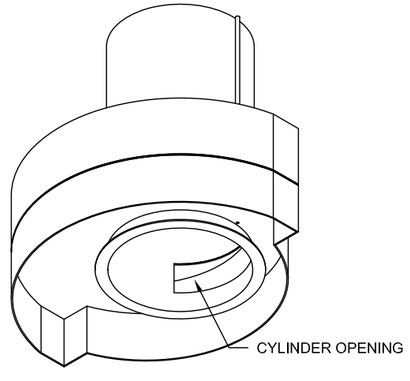
ASSEMBLY TOP VIEW
N.T.S.



ELEVATION VIEW



SIDE VIEW



ASSEMBLY BOTTOM VIEW
N.T.S.

CONTECH
FABRICATION
DRAWING

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MARK	DATE	REVISION DESCRIPTION	BY

CDS3030-6-C - 542946-10
COMPARK SOUTH
PARKER, CO
for SYSTEM: STMH 1-3

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
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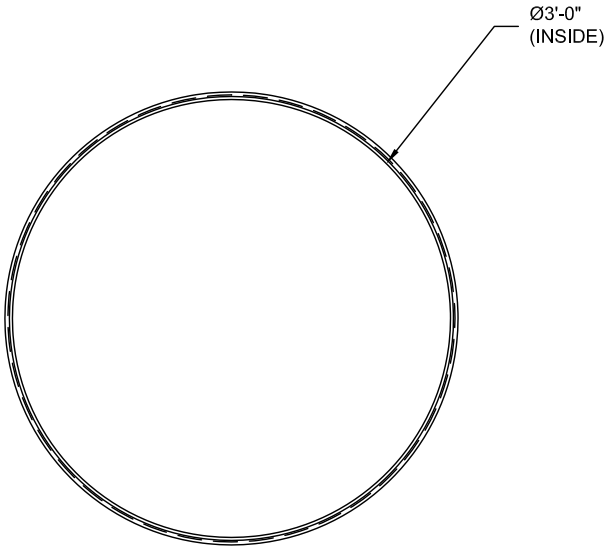
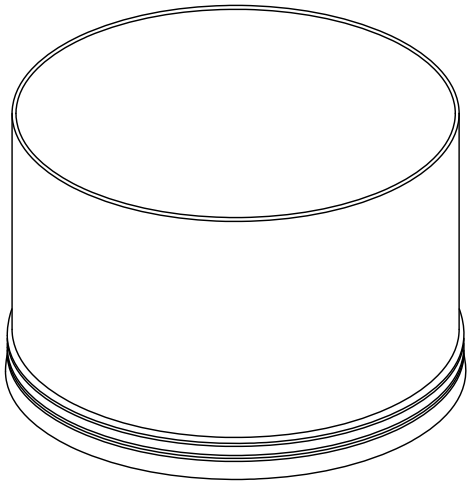
DATE:	SCALE:
07/15/16	1/2" = 1'-0"
DESIGNED: JHR	DRAWN: KJW
CHECKED: XXX	APPROVED: ----
PROJECT No.: 542946	SEQUENCE No.: 10
SHEET: 1 OF 1	

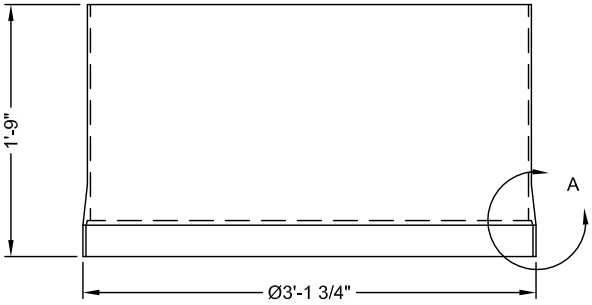
I:\MERLIN\PROJECTACTIVE\54290015429465429465429465



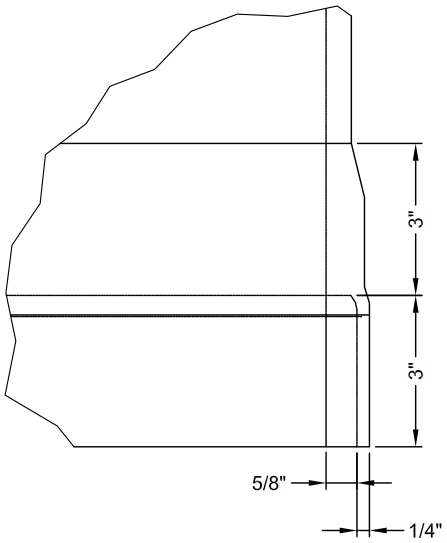
PLAN VIEW



ISOMETRIC VIEW



ELEVATION VIEW



DETAIL A
SCALE 3/16

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CDS3030-6-C - 542946-10, CYLINDER EXTENSION DETAILS
COMPARK SOUTH
PARKER, CO
for SYSTEM: WQ UNIT #1

DATE:07/15/16	SCALE: 3/4" = 1'-0"	PROJECT No.: 542946	SEQ. No.: 10	DRAWN: KJW	CHECKED: XXX

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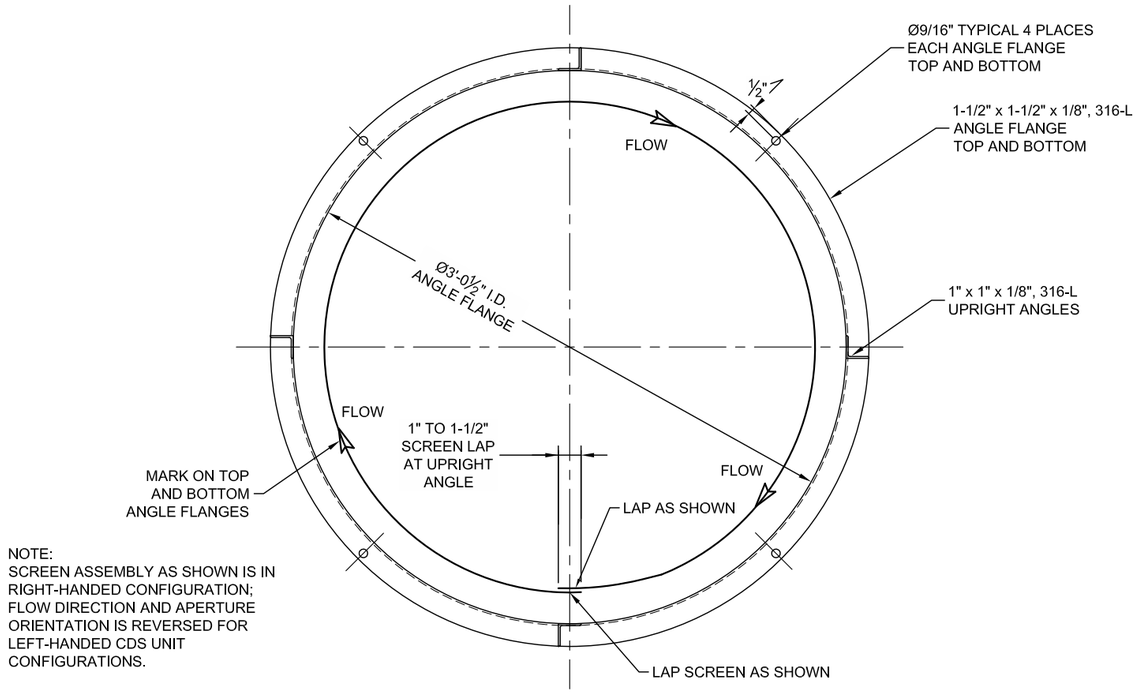
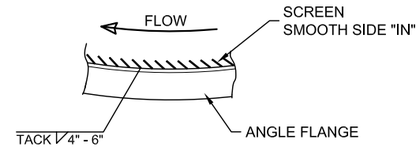
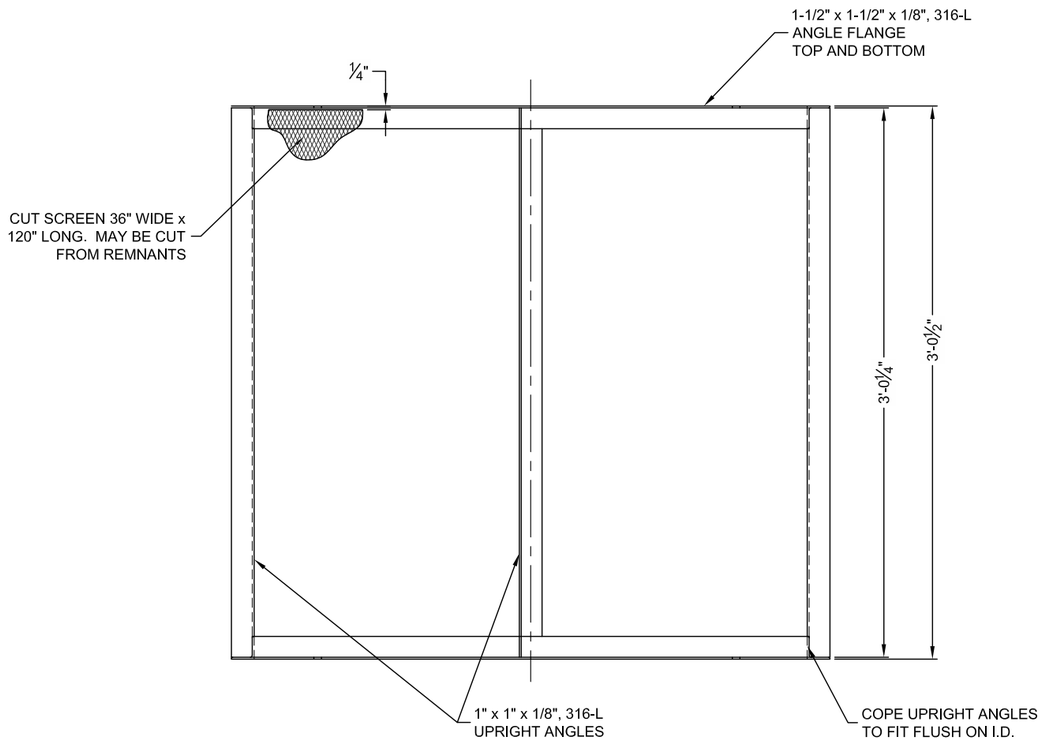


NOTE:
SCREEN ASSEMBLY AS SHOWN IS IN RIGHT-HANDED CONFIGURATION; FLOW DIRECTION AND APERTURE ORIENTATION IS REVERSED FOR LEFT-HANDED CDS UNIT CONFIGURATIONS.

PLAN VIEW



SCREEN DETAIL
TOP VIEW



ELEVATION VIEW

GENERAL NOTES:

1. ALL MATERIAL IS 316-L STAINLESS
2. SCREEN SHALL BE STAINLESS STEEL EXPANDED METAL CONFORMING TO ASTM 1267-01.
3. SCREEN APERTURE SIZE SHALL BE EITHER 4700 MICRON OR 2400 MICRON PER PROJECT ORDER.
4. TOP AND BOTTOM FLANGES MUST BE ROUND, FLAT, PARALLEL AND PLUM.
5. UPRIGHT ANGLES MUST BE PLUM AND SQUARE
6. STRAIGHTEN TOP AND BOTTOM FLANGES PRIOR TO ASSEMBLY OF FRAME.
7. FLATTEN ENDS OF SCREEN TO TOP AND BOTTOM ANGLE FLANGES PRIOR TO WELDING.
8. SCREEN IS TACK WELDED TO FRAME @ 4" CENTERS WITH SMOOTH SIDE ON INSIDE.
9. WIPE ANGLE FLANGES CLEAN AND PAINT:
   - CLOCKWISE END "GREEN" (RIGHT HAND FLOW).
   - COUNTER-CLOCKWISE END "RED" (LEFT HANDED FLOW).
10. FLANGE PAINTED GREEN ON TOP FOR RIGHT-HANDED CONFIGURATION.
11. FLANGE PAINTED RED ON TOP FOR LEFT-HANDED CONFIGURATION.
12. FABRICATOR TO SUPPLY THE FOLLOWING STAINLESS STEEL HARDWARE. SIZE AND QUANTITY OF ANCHORS AS INDICATED ON PROJECT ORDER.
    - FOR EACH 3/8" ANCHOR REQUIRED:
      (1) 3/8" X 2-3/4" ANCHOR
      (1) 3/8" NUT
      (1) 3/8" LOCKWASHER
      (1) 3/8" FLAT WASHER
    - FOR EACH 1/2" BOLT REQUIRED:
      (1) 1/2" X 1-1/2" BOLT
      (1) 1/2" NUT
      (1) 1/2" LOCKWASHER
      (2) 1/2" FLAT WASHERS

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MARK	DATE	REVISION DESCRIPTION	BY

CDS3030
SCREEN ASSEMBLY DETAILS

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
200 Enterprise Drive, Scarborough, ME 04074
877-897-8676 207-885-9830 207-885-9825 FAX

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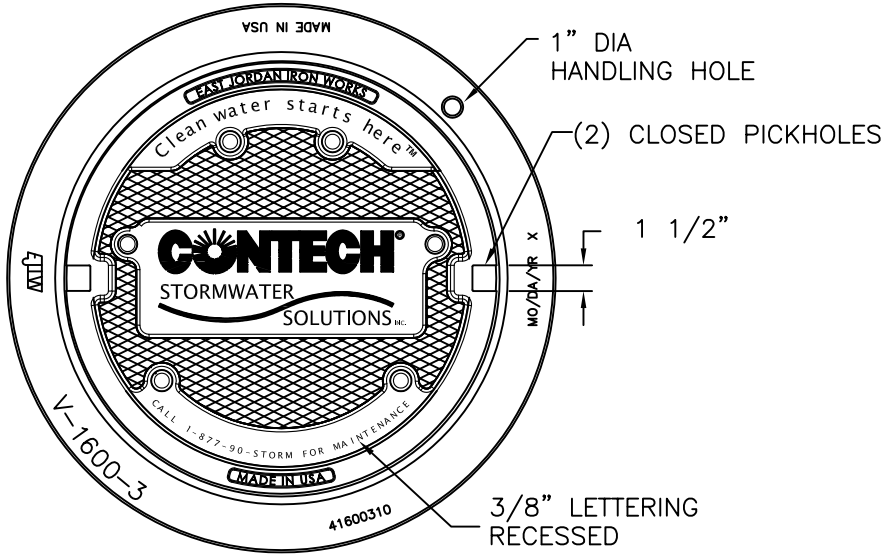

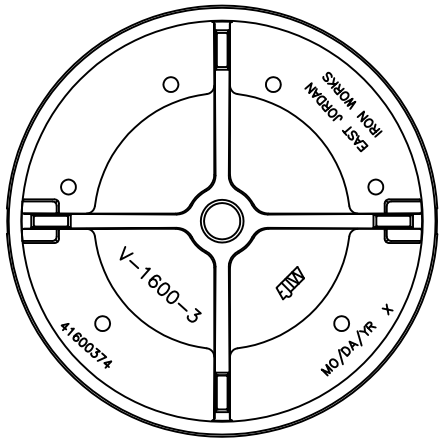

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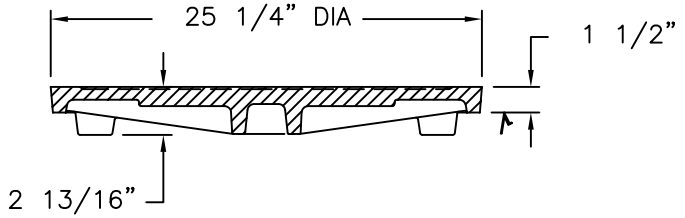
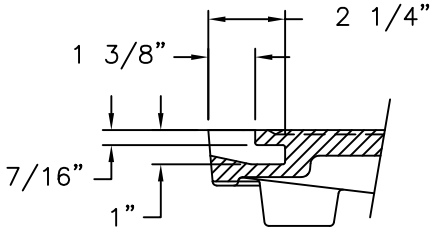
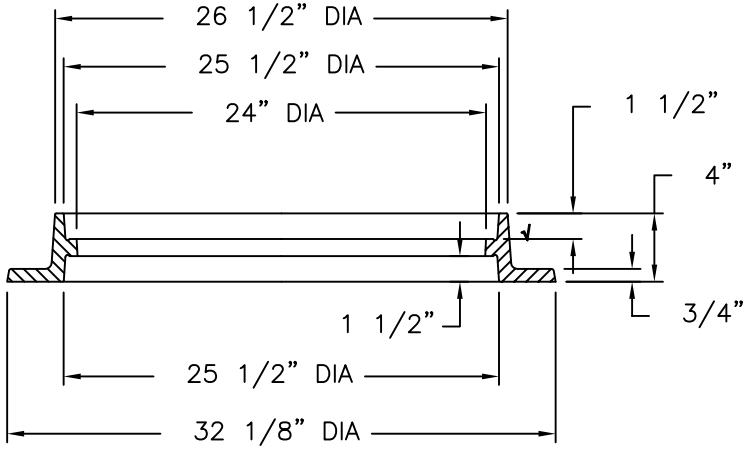


COVER SECTION



PICKHOLE DETAIL



RING SECTION

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EJIW EAST JORDAN IRON WORKS EST.1883

800-626-4653
www.ejiw.com
MADE IN USA

PRODUCT NUMBER
41600389

CATALOG NUMBER
V1600-3

REVERSIBLE RING & COVER ASSEMBLY

LOAD RATING
HEAVY DUTY HS-20

COATING
UNDIPPED

ESTIMATED WEIGHT
COVER: 135 LBS
RING: 120 LBS
UNIT: 255 LBS

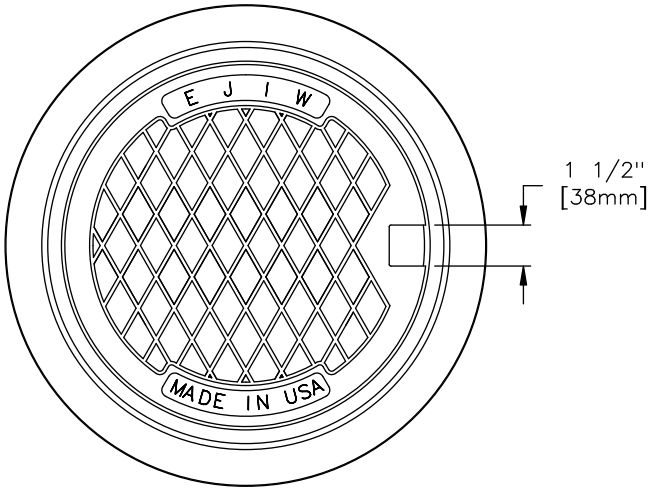
MATERIAL SPECIFICATION
RING – GRAY IRON ASTM A48 CL35B
COVER – GRAY IRON ASTM A48 CL35B

OPEN AREA
N/A

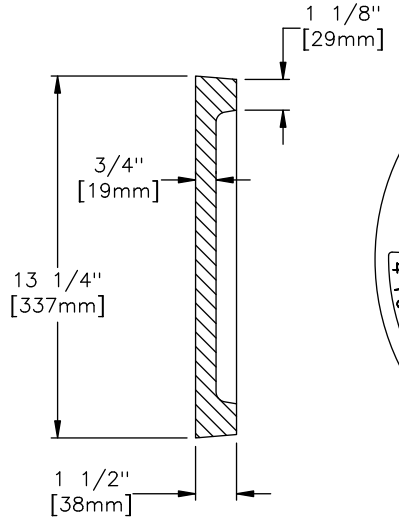
√DESIGNATES MACHINE SURFACE

DRAWN	DATE
DEW	05/02/08
LAST REVISED	DATE

REFERENCE INFORMATION
41600310
41600374



RING BOTTOM FLANGE



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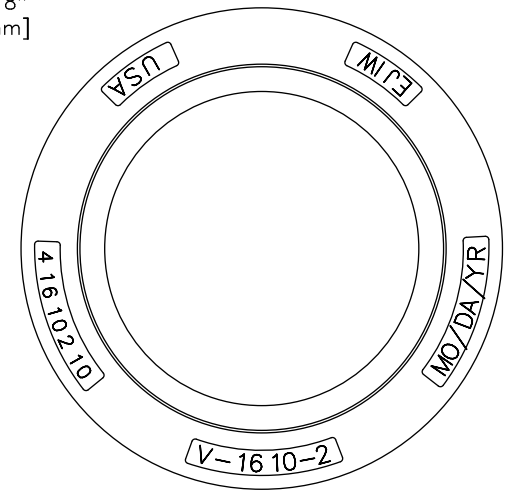
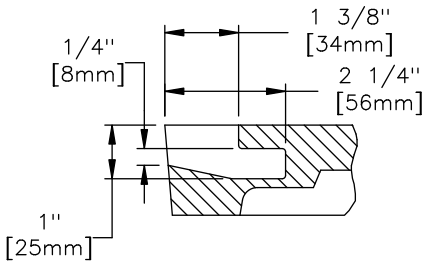
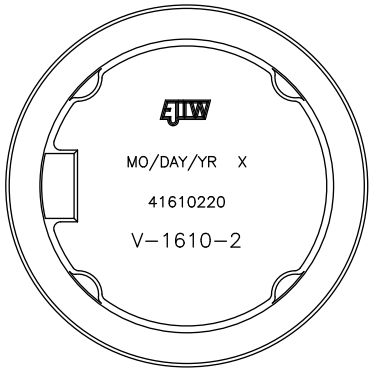


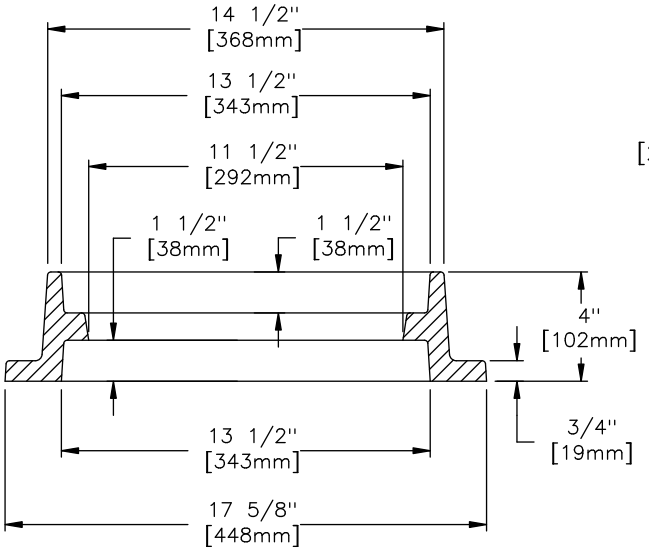
RING TOP FLANGE



PICKHOLE DETAIL



COVER BACK



RING SECTION

NOTE:
RING IS REVERSIBLE AND CAN BE INSTALLED AS A TOP FLANGE UNIT

EAST JORDAN IRON WORKS, INC.
P.O. BOX 439
EAST JORDAN, MI. 49727
1-800-874-4100
FAX 231-536-4458

DRAWN	DATE
DAL	06/12/03
APPROVED	DATE

ASSEMBLY

PRODUCT NO.

41610201

CATALOG NO.

V-1610-2

REF. SALES DRAWING
41610210
41610220

EST. WT.
COVER: 36 LBS 16kg
RING: 45 LBS 20kg
TOTAL: 81 LBS 37kg

OPEN AREA
N/A

MAT'L SPEC.
COVER – GRAY IRON
ASTM A48 CL35B
RING – GRAY IRON
ASTM A48 CL35B

LOAD RATING

HEAVY DUTY

INLINE
HYDRAULIC CALCULATIONS

COMPARK SOUTH
PARKER, CO
542946-10

DESIGN PARAMETERS

CDS Model No. =	CDS3030	
Design Treatment Flow =	**3.0**	cfs
Peak Design Flow =	29.20	cfs
Peak Design Return Interval =	100	year
Rim Elevation @ US Structure	5843.08	ft

DETAILED CALCULATIONS

TREATMENT FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = 5,830.16 ft (invert plus depth of flow at D/S outlet)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 7.48 fps

h_1 = 0.87 ft

$EGL_1 = EL_0 + h_1$

= 5831.03 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 12 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. =	24	in
S_{PIPE} =	0.0310	ft/ft
n =	0.013	

Flow Characteristics

d_F =	0.37	ft
A_F =	0.40	sf
P_W =	1.78	ft
R =	0.23	ft

Head Loss Through Downstream Pipe, h_2 (cont.'d)

S_{EGL} = 0.03112 ft / ft

h_2 = 0.3734 ft

EGL_2' = $EGL_1 + h_2$
= 5831.40 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 5830.16 ft

d_c = 0.61 ft

EGL_C = $EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$
= 5830.98 ft

Identify Controling EGL

Flow enters pipe at critical depth, EGLc controls.
EGL_2 = 5830.98 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

k = 0.20
V = Q / A
= 3.69 fps (area based on critical depth)

h_3 = 0.04 ft

EGL_3' = $EGL_2 + h_3$
= 5831.03 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,

k = 1.00
A_{Baffle} = **6.49** sf
V = Q / Abaffle
= 0.46 fps

h_4 = 0.0033 ft

EGL_4 = $EGL_3 + h_4$
= 5831.03 ft

Check Standard Weir Elevation

HL_{CDS} = 0.67 ft

EL_W' = $EGL_4 + HL_{CDS}$
= 5831.70 ft

H_W' = $EL_W' - EL_{CDS\ INV.}$
= 1.54 ft, or 18.46 in

Std. Weir Height = 21 in
Status **OK**

Use H_W = **21** in, or 1.75 ft

EL_W = $EL_{CDS\ INV.} + H_W$
= 5831.91 ft

PEAK CONVEYANCE FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = **5,830.90** ft (tailwater condition per engineer, 100-yr)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 13.89 fps

h_1 = 2.99 ft

$EGL_1 = EL_0 + h_1$

= 5833.89 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 12 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 24 in

S_{PIPE} = 0.0310 ft/ft

n = 0.013

Flow Characteristics

d_n = 1.27 ft

A_F = 2.10 sf

P_W = 3.69 ft

R = 0.57 ft

S_{EGL} = 0.0310 ft / ft

h_2 = 0.37 ft

$EGL_2' = EGL_1 + h_2$

= 5834.27 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 5830.16 ft

d_c = 1.91 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 5833.46 ft

Identify Controling EGL

Flow enters pipe at critical depth, EGLc controls.

EGL_2 = 5833.46 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

$k =$ 0.20

$V = Q / A_F$

$=$ 9.46 fps (area based on critical depth)

$h_3 =$ 0.28 ft

$EGL_3 = EGL_2 + h_3$

$=$ 5833.73 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,

$k =$ 0.00 (Skirted-baffle model)

$A_{Baffle} =$ 6.49 sf

$V = Q / A_{Baffle}$

$=$ 4.50 fps

$h_4 =$ 0.00 ft

$EGL_4 = EGL_3 + h_4$

$=$ 5833.73 ft

$HGL_4 = EGL_4 - [V_P^2 / (2*g)]$

$=$ 5832.35 ft

Head over Diversion Weir, h_5

Elevation of Weir

$EL_{Weir} =$ 5831.91 ft (established above)

Headloss for Free Discharge Condition

$h_{5a} = [Q / (C * L)]^{2/3}$

where,

$C =$ 3.1

$L =$ 3.00 ft

$h_{5a} =$ 2.14 ft

$EGL_{5a} = EL_{Weir} + h_{5a}$

$=$ 5834.05 ft

Headloss for Submerged Condition

$d_{Sub} =$ 0.44 ft (depth of submergence)

$h_{5b} =$ 1.76 ft (separate submerged weir calc.)

$EGL_{5b} = EGL_4 + h_{5b}$

$=$ 5835.50 ft

Identify EGL U/S of Weir

The discharge condition is Submerged, therefore

$EGL_5 =$ 5835.50 ft

Expansion Loss from U/S Pipe, h_6

$h_6 = k * [V^2 / (2*g)]$

where,

$k =$ 0.30

$V = Q / A_F$

$=$ 9.30 fps

$h_6 =$ 0.40 ft

$EGL_6 = EGL_5 + h_6$

$=$ 5835.90 ft

Head Loss Through Upstream Pipe, h_7

Friction Losses, h_7

$h_7 = S_{EGL} * L$

where,

$L =$ 18 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 24 in

$S_{PIPE} =$ 0.0310 ft/ft

$n =$ 0.013

Flow Characteristics

$d_n =$ 2.00 ft

$A_F =$ 3.14 sf

$P_W =$ 6.28 ft

$R =$ 0.50 ft

$S_{EGL} =$ 0.0166 ft / ft

$h_7 =$ 0.30 ft

$EGL_7' = EGL_6 + h_7$

$=$ 5836.20 ft

Check Entrance Condition for Critical Depth Control

$EL_{U/S\ Inv.} =$ 5830.72 ft

$d_c =$ 1.91 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

$=$ 5834.01 ft

Identify Controling EGL

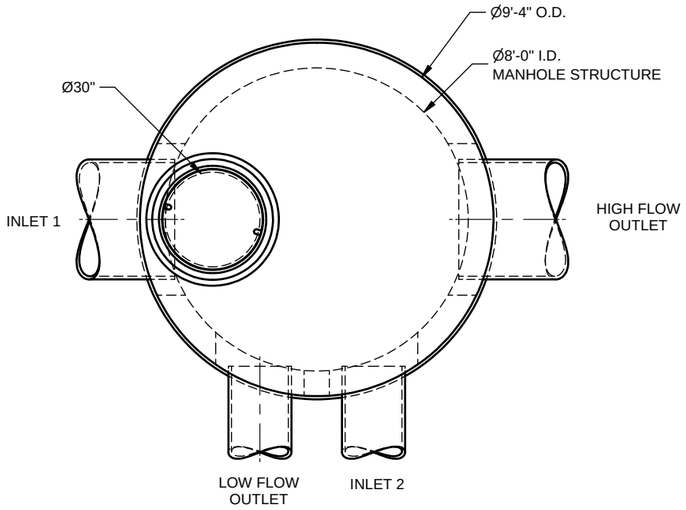
Friction based EGL controls.

$EGL_7 =$ 5836.20 ft

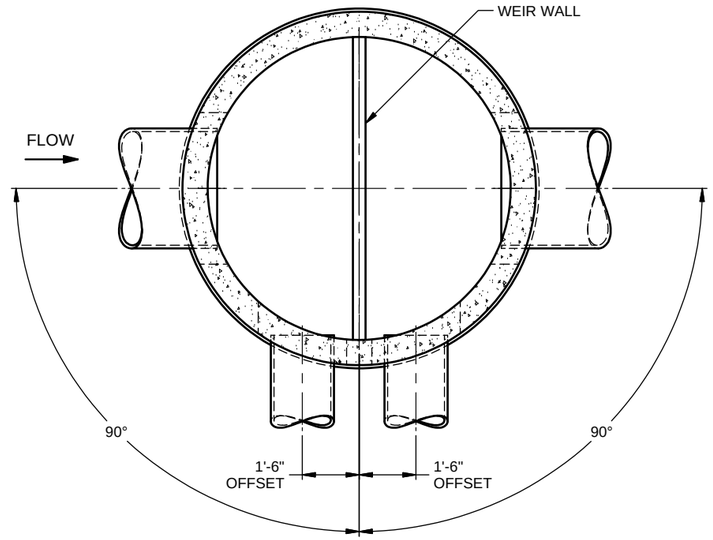
$HGL_7 = EGL_7 - [V^2 / (2*g)]$

$=$ 5834.85 ft

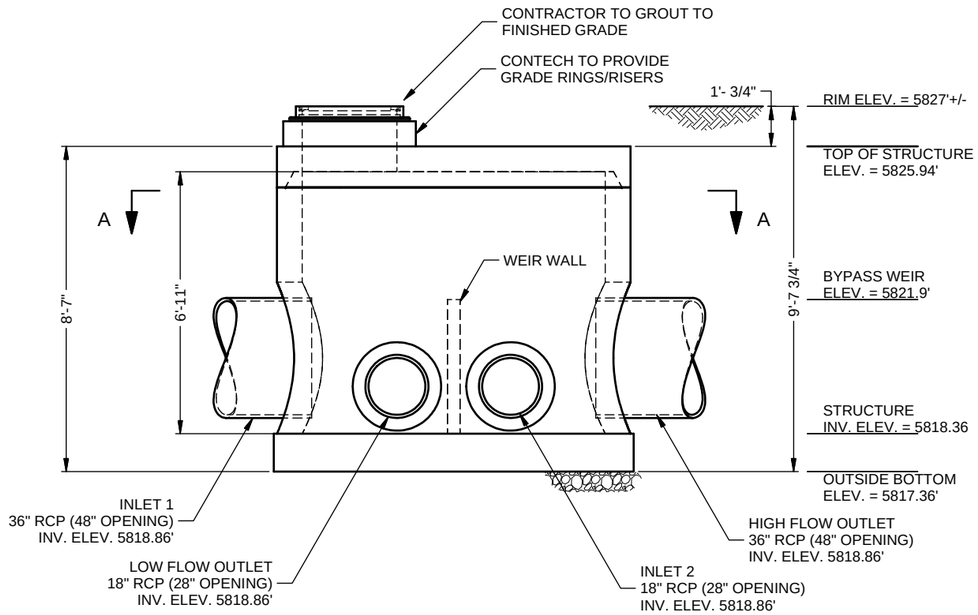
Freeboard = 8.23 ft (at first upstream structure)



PLAN VIEW



SECTION A-A



ELEVATION VIEW

MATERIAL LIST - PROVIDED BY CONTECH

COUNT	DESCRIPTION	INSTALLED BY
1	JOINT SEALANT (BY PRECASTER)	CONTRACTOR
1 PLACE	GRADE RINGS/RISERS	CONTRACTOR
1	Ø30" x 4" EJ #41600484, OR EQUIVALENT	CONTRACTOR

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com.
3. BYPASS STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 ASSUMING EARTH COVER OF 0' - 5', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
5. BYPASS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S).
E. CONTRACTOR TO INSTALL GRADE RINGS/RISERS OR BLOCK REQUIRED BETWEEN THE TOP OF THE STRUCTURE AND THE BASE OF THE MANHOLE FRAMES.

STRUCTURE WEIGHT
APPROXIMATE HEAVIEST PICK = 27000 LBS.
OF 2 PIECES

MAX FOOTPRINT = 9.5'

CONTECH
CONTRACT
DRAWING

LPICO
LAYOUT 1C

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NO.	DATE	REVISION DESCRIPTION	BY

DIVERSION BYPASS BPMH96 - 542946-40 COMPARK SOUTH PARKER, CO

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Drive, Suite 400, West Chester, OH
800-338-1122 513-645-7000 513-645-7846 FAX

DATE: 7/15/16	SCALE: NONE
DESIGNED: JHR	DRAWN: MLC
CHECKED:	APPROVED:
PROJECT NUMBER: 542946	
SHEET: 1 OF 1	

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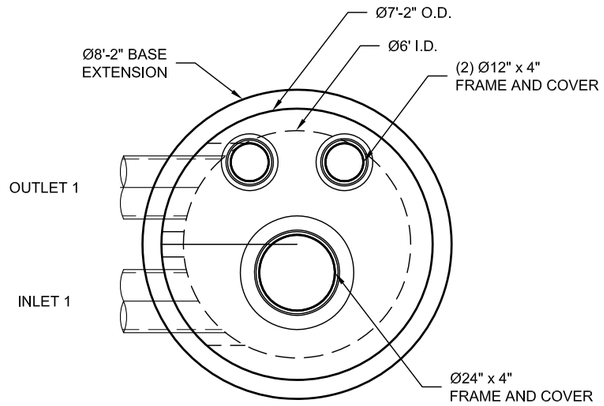
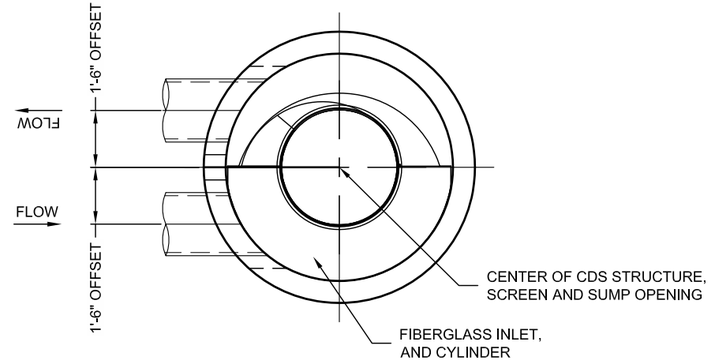
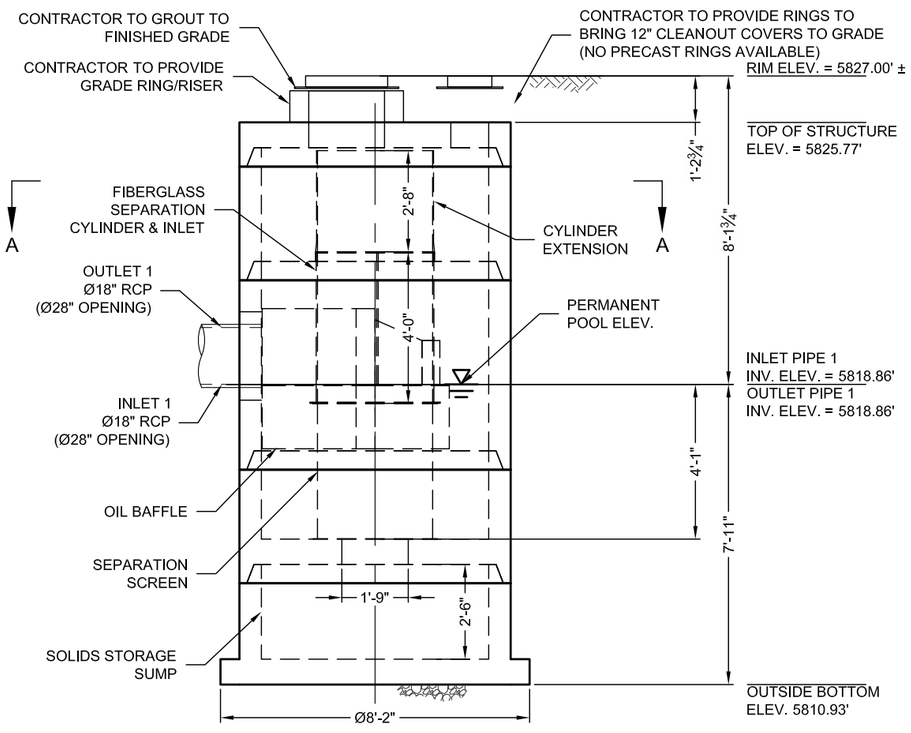


PLAN VIEW



SECTION A-A

• INTERNAL COMPONENTS TO BE INSTALLED BY CONTECH ON SITE



ELEVATION VIEW

MATERIAL LIST (PROVIDED BY CONTECH)

COUNT	DESCRIPTION	INSTALLED BY
1	FIBERGLASS INLET AND CYLINDER	CONTECH
1	2400 micron, 3' O.D. x 3.58' SEP. SCREEN	CONTECH
1	CYLINDER EXTENSION	CONTRACTOR
1	SEALANT FOR JOINTS (BY PRECASTER)	CONTRACTOR
1	Ø24" x 4" FRAME & COVER, EJ#41600389, OR EQUIV.	CONTRACTOR
2	Ø12" x 4" FRAME & COVER, EJ#41610201, OR EQUIV.	CONTRACTOR

SITE DESIGN DATA

WATER QUALITY FLOW RATE	0 CF
PEAK FLOW RATE	88 CF
RETURN PERIOD OF PEAK FLOW	100 YRS

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

STRUCTURE WEIGHT
APPROXIMATE HEAVIEST PICK = 10000 LBS.
STRUCTURE IS DELIVERED IN 5 PIECES

MAX FOOTPRINT = Ø8'-2"

CONTECH
CONTRACT
DRAWING

LPICO
LAYOUT 1A
3035-6-FGIS
1026 / FI72886

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MARK	DATE	REVISION DESCRIPTION	BY

CDS3035-6-C - 542946-20
COMPARK SOUTH
PARKER, CO
for SYSTEM: STMH 1-4A

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
503-240-3393 800-561-1271 FAX
800-548-4667

THE PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 4,788,046; 5,641,120; 5,811,068; 6,681,782; RELATED FOREIGN PATENTS, OR OTHERS PENDING WORLDWIDE.

DATE:	SCALE:
07/18/16	1/4" = 1'-0"
DESIGNED: JHR	DRAWN: MLC
CHECKED: XXX	APPROVED: ----
PROJECT No.: 542946	SEQUENCE No.: 20
SHEET: 1 OF 1	

\\AD.CONTECH-CPI.COM\ROOT\MER\INPROJECT\ACTIVE\542900\542946\542946-20-CDS\DRAWINGS\PRE-542946-20-CDS3035-6 CONFAB.DWG 8/16/2016 2:59 PM

OFFLINE CONCENTRIC CDS HYDRAULIC CALCULATIONS

Compark South

Parker, CO

542946

STMH 1-4

DESIGN PARAMETERS

CDS Model No. =	CDS3035-6	
Design Treatment Flow =	3.8	cfs
Peak Design Flow =	88	cfs
Peak Design Return Interval =	100	year
Rim Elev. @ CDS (diversion) =	5827.00	ft
Required FB @ CDS Unit =	1.00	ft
Rim Elev. @ 1st U/S Structure =	5825.81	ft
Reqd. FB @ 1st U/S Structure =	1.00	ft

HYDRAULIC RESULTS SUMMARY

Estimated FB at CDS Unit =	1.31	ft	(OK)
Est. FB at 1st U/S structure =	0.52	ft	(Flood Potential)

DETAILED CALCULATIONS

TREATMENT FLOW

Estimated HGL at Outfall

$EL_{D/S\ Inv.}$ = 5817.99 ft (based on CDS Invert unless provided)

$HGL_{D/S}$ = 5,818.37 ft (unless provided, $D/S_{INV} + d_{n\text{-}WQ}$)

Exit Loss from DownStream Pipe, h_1

$$h_1 = k * [V^2 / (2*g)]$$

where,

k = 0.40

V = Q / A_F

= 7.31 fps

h_1 = 0.33 ft

$EGL_1 = EL_0 + h_1$

= 5818.70 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$$h_2 = S_{EGL} * L$$

where,

$L_{D/S}$ = 33 ft

$$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$$

where,

D/S Pipe Characteristics

Dia. = 36 in

S_{PIPE} = 0.0261 ft/ft

n = 0.013

Flow Characteristics

d_F = 0.38 ft

A_F = 0.52 sf

P_W = 2.18 ft

R = 0.24 ft

S_{EGL} = 0.0275 ft / ft

h_2 = 0.91 ft

$EGL_2' = EGL_1 + h_2$

= 5819.61 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 5818.85 ft

d_c = 0.62 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 5819.67 ft

Identify Controling EGL

Flow enters pipe at critical depth, EGLc controls.

EGL_2 = 5819.67 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

k = 0.40

V = Q / A

= 3.59 fps (flow area based on critical depth)

h_3 = 0.08 ft

$EGL_3' = EGL_2 + h_3$

= 5819.75 ft

Check for CDS outlet control

$EL_{CDS\ Inv.}$ = 5818.85 ft

CDS I/O Diam. = 18.00 in

$L_{CDS\ out}$ = 5.00 ft

$L_{CDS\ in}$ = 5.00 ft

$d_{c\ (CDS\ out)}$ = 0.74 ft

$EGL_C = EL_{CDS\ Inv.} + d_{c\ (CDS\ Out)} + V_{dc}^2 / (2*g)$

= 5819.89 ft

Identify Controling EGL

The greater value controls

EGL_3 = 5819.89 ft

Determine CDS Weir Height

$HL_{CDS\ Op}$ = 2.00 ft

$V_{CDS\ out}$ = 2.91 ft (partial pipe)

$HL_{CDS\ out}$ = 0.012 ft

$V_{CDS\ in}$ = 2.15 ft (full pipe)

$HL_{CDS\ in}$ = 0.008 ft

$HL_{CDS\ I/O}$ = 2.02 ft

$EL_W' = EGL_3 + HL_{CDS\ Op} + HL_{CDS\ I/O}$

= 5821.91 ft

$H_W' = EL_W' - EL_{CDS\ Inv.}$

= 3.06 ft, or 36.7 in

Adjust for constructability

Use H_W = 36.5 in, or 3.04 ft

$EL_W = EL_{CDS\ Inv.} + H_W$

= 5821.89 ft

PEAK CONVEYANCE FLOW

Estimated HGL at Outfall

$HGL_{D/S}$ = 5,820.00 ft (water level at D/S outlet per engineer, 100-yr)

Exit Loss from D/S Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 0.40

V = Q / A_F

= 17.10 fps

h_1 = 1.82 ft

$EGL_1 = EL_0 + h_1$

= 5821.82 ft

Head Loss Through D/S Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L_{D/S}$

where,

$L_{D/S}$ = 33 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

D/S Pipe Characteristics

Dia. = 36 in

S_{PIPE} = 0.0261 ft/ft

n = 0.013

Flow Characteristics

d_n = 2.05 ft

A_F = 5.15 sf

P_W = 5.84 ft

R = 0.88 ft

S_{EGL} = 0.0263 ft / ft

h_2 = 0.87 ft

$EGL_2' = EGL_1 + h_2$

= 5822.68 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 5818.85 ft

d_c = 2.99 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 5824.25 ft

Identify Controling EGL

Cannot enter at less than minimum energy, EGLc controls.

EGL_2 = 5824.25 ft

Re-entry Loss into D/S Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

$k =$ 0.40

$V = Q / A_F$

$=$ 12.45 fps (area based on critical depth)

$h_3 =$ 0.96 ft

$EGL_3 = EGL_2 + h_3$

$=$ 5825.21 ft

$HGL_3 = EGL_3 - [(V_P/4)^2 / (2*g)]$

$=$ 5825.06 ft (velocity assumed 25% of pipe velocity)

Head over Diversion Weir, h_4

$EL_{Weir} =$ 5821.89 ft (established above)

$L_{Weir} =$ 8.00 ft

(weir is submerged)

Headloss for Free Discharge Condition

$h_{4a} = [Q / (C * L)]^{2/3}$

where,

$C =$ 3.43

$h_{4a} =$ 2.18 ft

$EGL_{4a} = EL_{Weir} + h_{4a}$

$=$ 5824.07 ft

Headloss for Submerged Condition

$d_{Sub} =$ 3.17 ft (depth of submergence)

$h_{4b} =$ 0.48 ft (separate submerged weir calc.)

$EGL_{4b} = EGL_3 + h_{4b}$

$=$ 5825.69 ft

Identify EGL U/S of Weir

The discharge condition is Submerged , therefore

$EGL_4 =$ 5825.69 ft

Expansion Loss from U/S Pipe, h_5

$h_5 = k * [V^2 / (2*g)]$

where,

$k =$ 0.40

$V = Q / A_F$

$=$ 12.45 fps

$h_5 =$ 0.96 ft

$EGL_5 = EGL_4 + h_5$

$=$ 5826.65 ft

Head Loss Through U/S Pipe, h_6

Friction Losses, h_6

$h_6 = S_{EGL} * L$

where,

$L_{U/S}$ = 60 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

U/S Pipe Characteristics

Dia. = 36 in

S_{PIPE} = 0.0261 ft/ft

n = 0.013

Flow Characteristics

d_n = 3.00 ft

A_F = 7.07 sf

P_W = 9.42 ft

R = 0.75 ft

S_{EGL} = 0.0173 ft / ft

h_6 = 1.04 ft

$EGL_6' = EGL_5 + h_6$

= 5827.69 ft

Check Entrance Condition for Critical Depth Control

$EL_{U/S\ Inv.}$ = 5820.42 ft (based on inv & slope unless provided)

d_c = 2.99 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 5825.82 ft

Identify Controling EGL

Friction based EGL controls.

EGL_6 = 5827.69 ft

$HGL_6 = EGL_6 - [V^2 / (2*g)]$

= 5825.29 ft

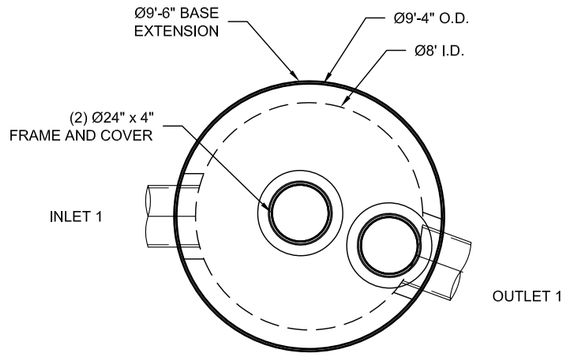
Headloss Across Diversion Structure During Peak Flow

$HL_{DW} = EGL_5 - EGL_2$

HL_{DW} = 2.40 ft

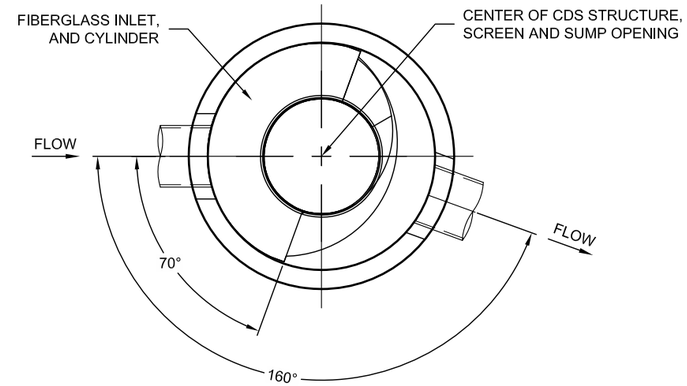
Freeboard at CDS Unit = 1.31 ft

FB at first U/S structure = 0.52 ft

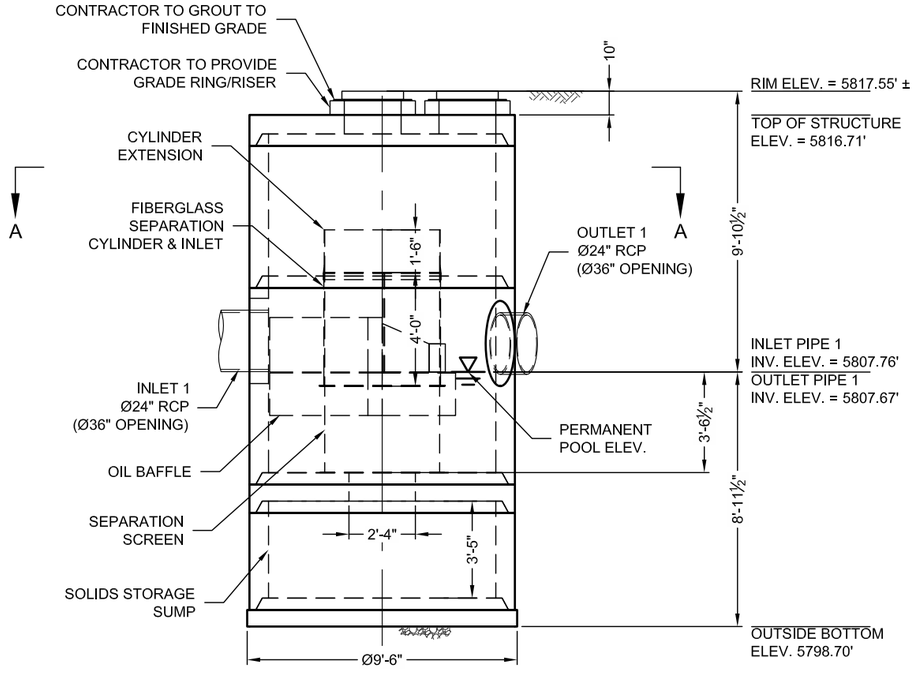


PLAN VIEW

• INTERNAL COMPONENTS TO BE INSTALLED BY CONTECH ON SITE



SECTION A-A



ELEVATION VIEW

MATERIAL LIST (PROVIDED BY CONTECH)

COUNT	DESCRIPTION	INSTALLED BY
1	FIBERGLASS INLET AND CYLINDER	CONTECH
1	2400 micron, 4' O.D. x 3.04' SEP. SCREEN	CONTECH
1	CYLINDER EXTENSION	CONTRACTOR
1	SEALANT FOR JOINTS (BY PRECASTER)	CONTRACTOR
2	Ø24" x 4" FRAME & COVER, EJ#41600389, OR EQUIV.	CONTRACTOR

SITE DESIGN DATA

WATER QUALITY FLOW RATE	0 CF
PEAK FLOW RATE	43.2 CF
RETURN PERIOD OF PEAK FLOW	100 YRS

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

STRUCTURE WEIGHT
APPROXIMATE HEAVIEST PICK = 20500 LBS.
STRUCTURE IS DELIVERED IN 5 PIECES

MAX FOOTPRINT = Ø9'-6"

CONTECH
CONTRACT
DRAWING

LPICO
LAYOUT 1C
4030-8-FGIS
1026 / FI72886

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MARK	DATE	REVISION DESCRIPTION	BY

CDS4030-8-C - 542946-30
COMPARK SOUTH
PARKER, CO
for SYSTEM: STMH 1-6

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

THIS PRODUCT MAY BE COVERED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,649,052; RELATED FOREIGN PATENTS, OR PATENTS PENDING.

DATE:	SCALE:
07/15/16	3/16" = 1'-0"
DESIGNED: JHR	DRAWN: MLC
CHECKED: XXX	APPROVED: ----
PROJECT No.: 542946	SEQUENCE No.: 30
SHEET: 1 OF 1	

\\AD.CONTECH-CPI.COM\ROOT\MERLIN\PROJECT\ACTIVE\542900\542946\542946-30-CDS\DRAWINGS\PRE-542946-30-CDS4030-8 CONFAB.DWG 8/16/2016 3:02 PM

INLINE HYDRAULIC CALCULATIONS

COMPARK SOUTH
PARKER, CO
542946-30

DESIGN PARAMETERS

CDS Model No. =	CDS4030	
Design Treatment Flow =	**4.5**	cfs
Peak Design Flow =	43.20	cfs
Peak Design Return Interval =	100	year
Rim Elevation @ US Structure	5821.38	ft

DETAILED CALCULATIONS

TREATMENT FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = 5,791.61 ft (invert plus depth of flow at D/S outlet)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 17.26 fps

h_1 = 4.63 ft

$EGL_1 = EL_0 + h_1$

= 5796.23 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 70 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. =	24	in
S_{PIPE} =	0.2370	ft/ft
n =	0.013	

Flow Characteristics

d_F =	0.28	ft
A_F =	0.26	sf
P_W =	1.52	ft
R =	0.17	ft

Head Loss Through Downstream Pipe, h_2 (cont.'d)

S_{EGL} = 0.23814 ft / ft

h_2 = 16.6701 ft

EGL_2' = $EGL_1 + h_2$
= 5812.90 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 5807.92 ft

d_c = 0.75 ft

EGL_C = $EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$
= 5808.94 ft

Identify Controling EGL

Flow enters pipe at critical depth, EGLc controls.
EGL_2 = 5808.94 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

k = 0.20
V = Q / A
= 4.19 fps (area based on critical depth)

h_3 = 0.05 ft

EGL_3' = $EGL_2 + h_3$
= 5809.00 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,

k = 1.00
A_{Baffle} = **8.80** sf
V = Q / Abaffle
= 0.51 fps

h_4 = 0.0041 ft

EGL_4 = $EGL_3 + h_4$
= 5809.00 ft

Check Standard Weir Elevation

HL_{CDS} = 0.67 ft

EL_W' = $EGL_4 + HL_{CDS}$
= 5809.67 ft

H_W' = $EL_W' - EL_{CDS\ INV.}$
= 1.75 ft, or 21.01 in

Std. Weir Height = 23 in
Status **OK**

Use H_W = **23** in, or 1.92 ft

EL_W = $EL_{CDS\ INV.} + H_W$
= 5809.84 ft

PEAK CONVEYANCE FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = **5,810.00** ft (tailwater condition per engineer, 100-yr)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 13.76 fps

h_1 = 2.94 ft

$EGL_1 = EL_0 + h_1$

= 5812.94 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 70 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 24 in

S_{PIPE} = 0.2370 ft/ft

n = 0.013

Flow Characteristics

d_n = 2.00 ft

A_F = 3.14 sf

P_W = 6.28 ft

R = 0.50 ft

S_{EGL} = 0.0363 ft / ft

h_2 = 2.54 ft

$EGL_2' = EGL_1 + h_2$

= 5815.48 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 5807.92 ft

d_c = 2.00 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 5813.18 ft

Identify Controling EGL

Friction based EGL controls.

EGL_2 = 5815.48 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

$k =$ 0.20

$V = Q / A_F$

$=$ 13.76 fps (area based on flow depth)

$h_3 =$ 0.59 ft

$EGL_3 = EGL_2 + h_3$

$=$ 5816.07 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,

$k =$ 0.00 (Skirted-baffle model)

$A_{Baffle} =$ 8.80 sf

$V = Q / A_{Baffle}$

$=$ 4.91 fps

$h_4 =$ 0.00 ft

$EGL_4 = EGL_3 + h_4$

$=$ 5816.07 ft

$HGL_4 = EGL_4 - [V_P^2 / (2*g)]$

$=$ 5813.13 ft

Head over Diversion Weir, h_5

Elevation of Weir

$EL_{Weir} =$ 5809.84 ft (established above)

Headloss for Free Discharge Condition

$h_{5a} = [Q / (C * L)]^{2/3}$

where,

$C =$ 3.1

$L =$ 4.00 ft

$h_{5a} =$ 2.30 ft

$EGL_{5a} = EL_{Weir} + h_{5a}$

$=$ 5812.14 ft

Headloss for Submerged Condition

$d_{Sub} =$ 3.29 ft (depth of submergence)

$h_{5b} =$ 0.40 ft (separate submerged weir calc.)

$EGL_{5b} = EGL_4 + h_{5b}$

$=$ 5816.47 ft

Identify EGL U/S of Weir

The discharge condition is Submerged, therefore

$EGL_5 =$ 5816.47 ft

Expansion Loss from U/S Pipe, h_6 7/26/2016

$h_6 = k * [V^2 / (2*g)]$

where,

$k =$ 0.30

$V = Q / A_F$

$=$ 13.76 fps

$h_6 =$ 0.88 ft

$EGL_6 = EGL_5 + h_6$

$=$ 5817.35 ft

Head Loss Through Upstream Pipe, h_7

Friction Losses, h_7

$h_7 = S_{EGL} * L$

where,

$L =$ 133 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 24 in

$S_{PIPE} =$ 0.0297 ft/ft

$n =$ 0.013

Flow Characteristics

$d_n =$ 2.00 ft

$A_F =$ 3.14 sf

$P_W =$ 6.28 ft

$R =$ 0.50 ft

$S_{EGL} =$ 0.0363 ft / ft

$h_7 =$ 4.83 ft

$EGL_7' = EGL_6 + h_7$

$=$ 5822.18 ft

Check Entrance Condition for Critical Depth Control

$EL_{U/S\ Inv.} =$ 5811.87 ft

$d_c =$ 2.00 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

$=$ 5817.13 ft

Identify Controling EGL

Friction based EGL controls.

$EGL_7 =$ 5822.18 ft

$HGL_7 = EGL_7 - [V^2 / (2*g)]$

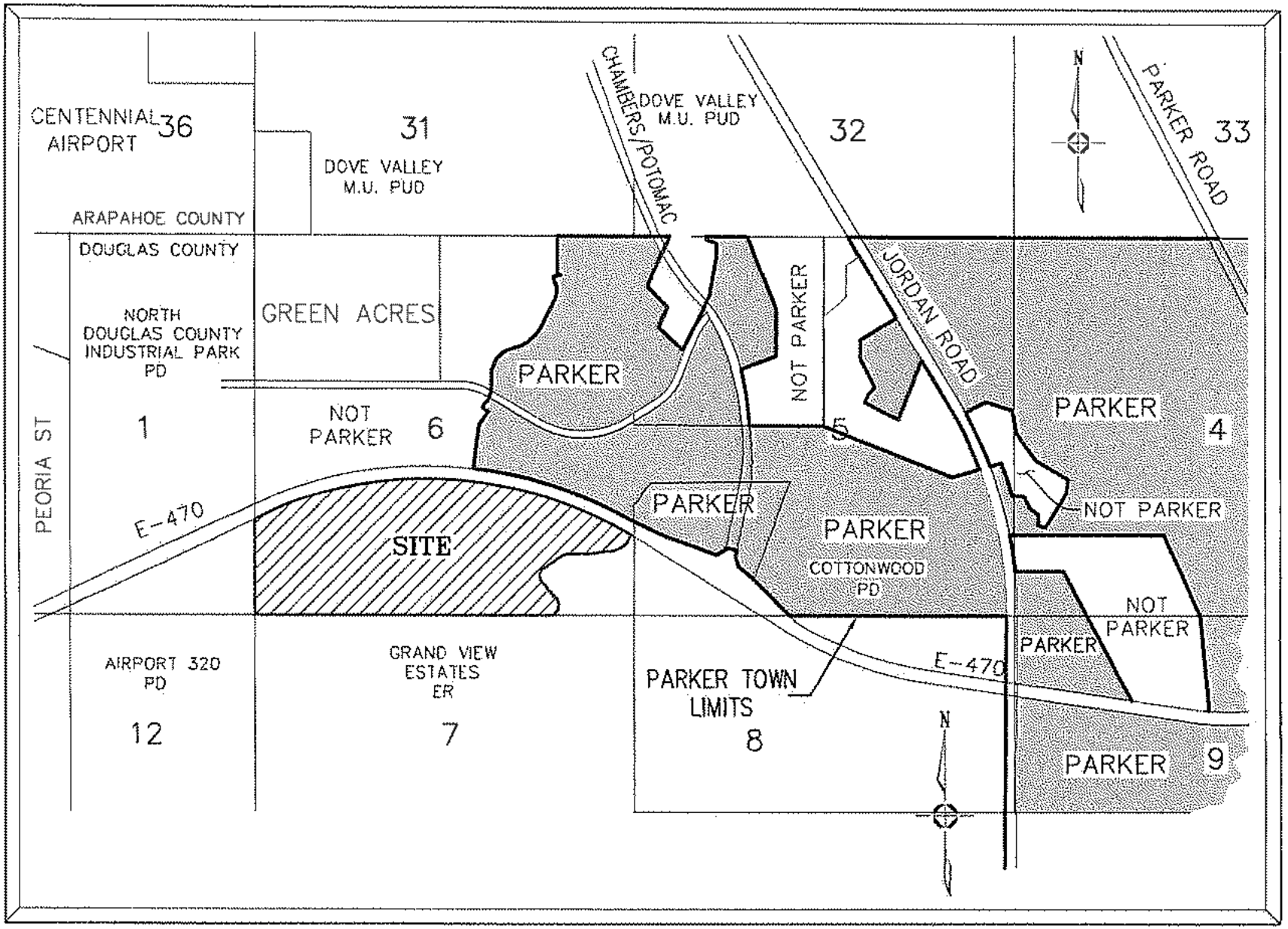
$=$ 5819.24 ft

Freeboard = 2.14 ft (at first upstream structure)

MAPS

Vicinity Map
Overall Basin Drainage Plan

Initially Submitted November 20, 2015
Revised April 11, 2016
Revised May 27, 2016
Revised October 21, 2016



VICINITY MAP

N.T.S.

IMPROVEMENTS TO GREEN ACRES TRIBUTARY

EXISTING CULVERT

PROPOSED REGIONAL POND

EXISTING 10'x17' BOX CULVERT

PROPOSED DETENTION / WATER QUALITY POND

E-470

COMPARK SOUTH

BASIN F +/- 45 ACRES

PROPOSED BRIDGE

BASIN E +/- 52 ACRES

BASIN D +/- 100 ACRES

60% IMP

20% IMP

SITE BOUNDARY

PROPOSED BOX CULVERT

PROPOSED ROADWAY RIGHT-OF-WAY APPROXIMATE LOCATION

TRIBUTARY

BASIN C +/- 88 ACRES

GREEN ACRES

BASIN B +/- 295 ACRES

GRANDVIEW ESTATES

Dogwood Blvd

FUTURE MERIDIAN REGIONAL POND

PEORIA STREET

Meridian

BASIN A +/- 345 ACRES

LINCOLN AVENUE

CHAMBERS ROAD

HAPPY CANYON CREEK

GRAPHIC SCALE

CARROLL & LANGE-MANHARD

A MANI-SAFKO CONSULTING COMPANY

CHAMBERS CROSSING

PARKER, COLORADO

GREEN ACRES TRIBUTARY DRAINAGE EXHIBIT

EXHIBIT 1

CLCPKC3 110482