Final Drainage Report

Meadowbrook Park
El Paso County, Colorado

Prepared for:
Danny Mientka
Meadowbrook Development, LLC.
90 South Cascade Avenue
Suite 1500
Colorado Springs, Colorado 80903

Prepared by:
Kimley-Horn and Associates, Inc.
2 North Nevada Ave
Suite 300
Colorado Springs, CO 80903
(719) 284-7272
Contact: John Heiberger, P.E.

Project #: 096956009

Prepared: October 9, 2020

The Meadowbrook Drainage Report will be reviewed for acceptance during the Site Development Stage of this Project.

Kimley»Horn

CERTIFICATION

ENGINEERS STATEMENT

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

SIGNATURE (Affix Seal): _____

Colorado P.E. No. 50096 Date

DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

_____

Business Name

_____

By:

_____

Title:

_____

Address:

EL PASO COUNTY STATEMENT

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code, as amended.

_____ _____

Jennifer Irving, P.E. Date
County Engineer/ECM Administrator

Conditions:

TABLE OF CONTENTS

INTRODUCTION

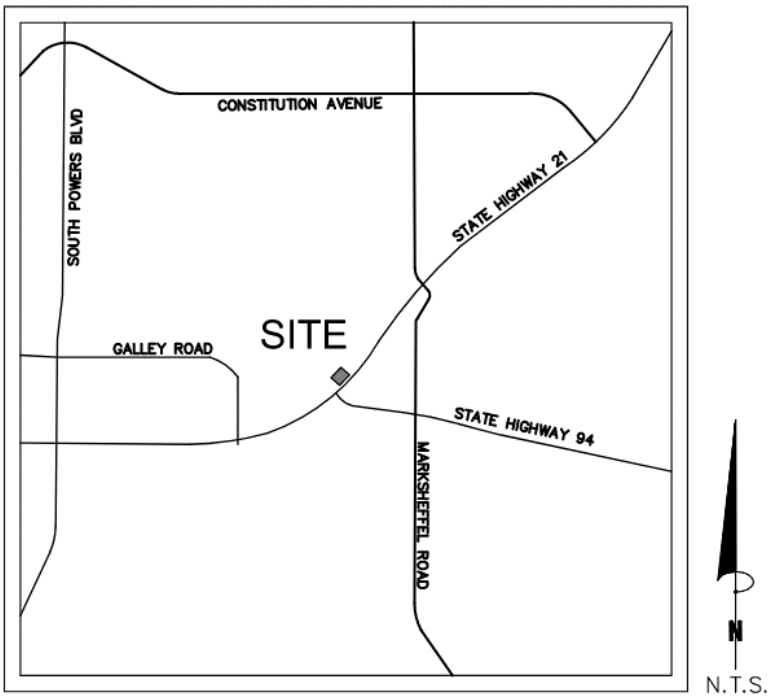
PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to provide the hydrologic and hydraulic calculations and to document and finalize the drainage design methodology in support of the proposed Meadowbrook Park development ("the Project") for Meadowbrook Development LLC. The Project is located within the jurisdictional limits of El Paso County ("the County"). Thus, the guidelines for the hydrologic and hydraulic design components were based on the criteria outlined by the County.

LOCATION

The Project is located northwest of the Meadowbrook Parkway and US Highway 24 intersection in El Paso County, Colorado. More specifically, the Project is made up of Tract A within the 94/24 Business Park Filing No. 1 plat within the southeast quarter of Section 8, Township 14 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado. The site is bounded by Meadowbrook Parkway to the west, a commercial development to the north, US Highway 24 to the east, and a commercial development to the south. A vicinity map has been provided in the Appendix of this report.

VICINITY MAP



VICINITY MAP
N.T.S

DESCTIPTION OF PROPERTY

The Project is located on approximately 8 acres of undeveloped land with limited vegetation and grass cover. The site currently does not provide stormwater quality or detention and there are no known major drainage ways or irrigation facilities on the site. The site generally drains from the east to west with slopes ranging from 2% to 4:1 with the steeper slopes along the east side of the site adjacent to US Highway 24. There is an existing storm grate inlet located in the southwest corner of the site that captures a majority of the onsite runoff.

NRCS soil data is available for the Site (See Appendix) and the onsite soils are USCS Hydrologic Soil Group A. Group A soils have higher infiltration rates compared to other soil groups and are generally made up of well drained sands or gravelly sands. A Soils and Geology Study has also been prepared for the site by Rocky Mountain Group dated August 26, 2020 and is attached in the Appendix of this report for reference.

The site is located outside the 100-year floodplain as noted on the FEMA FIRM Map No. 08041C0752G revised on December 7, 2018 (See Appendix). The site is also within the East Fork Sand Creek watershed.

ALTA and topographic field survey was completed for the Project by Clark Land Surveying Inc. dated November 14, 2018 and is the basis for design for the drainage improvements (See Appendix).

PROJECT CHARACTERISTICS

The Project is a proposed single family development that will include 70 lots. The project will include the construction of private streets, sidewalks, driveways, hardscape/landscape, and associated utility infrastructure required to serve each lot. Stormwater quaility and detention is required for the site and will be accomplished with the construction of an Extended Detetion Basin that will be located in the southeast corner of the site. As part of the utility infrastructure improvements, a proposed storm sewer system will be constructed to collect runoff. Stormwater will be conveyed via overland flow across the lots, within the curb and gutter of the proposed streets before being captured in proposed storm inlets. The storm sewer system will then convey runoff into the Extended Detention Basin before being discharged offsite.

DRAINAGE DESIGN CRITERIA

REGULATIONS

There are no provisions selected or deviations from the El Paso County Drainage Criteria Manual for the proposed development.

DEVELOPMENT DESIGN CRITERIA REFERENCE AND CONSTRAINTS

The proposed storm facilities follow the El Paso County Drainage Criteria Manual (the “CRITERIA”) and the Mile High Flood District Urban Storm Drainage Criteria Manual (the “MANUAL”). Site drainage is not significantly impacted by such constraints as utilities or existing development. Further detail regarding onsite drainage patterns is provided in the Proposed Drainage Conditions Section.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per chapter 6 of the CRITERIA. Table 6-2 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 6-6 of the CRITERIA by calculating weighted impervious values for each specific site basin. The detention storage requirement was calculated using Full Spectrum Detention methods as specified in the CRITERIA and MANUAL. The detention basin's outlet structure was designed to release the Water Quality Capture Volume (WQCV) in 40 hours. Based upon this approach, we feel that the drainage design provided for the Site is conservative and in keeping with the zoning and historic drainage concept for the area.

HYDRAULIC CRITERIA

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using FIRM panels by FEMA and information provided in the CRITERIA. Hydraulic calculations were computed using StormCAD for the proposed storm sewer system. Results of the hydraulic calculations are summarized in the Appendix.

VARIANCES FROM CRITERIA

There are no proposed variances from the El Paso County Drainage Criteria Manual for the proposed development.

EXISTING DRAINAGE CONDITIONS

EXISTING CONDITIONS SUB-BASIN DESCRIPTION

The existing runoff generally drains from east to west and is collected by an existing storm sewer inlet located in the southwest corner of the site. The runoff is then conveyed via storm sewer through the neighboring site to the southwest before discharging into the County storm sewer system within Meadowbrook Parkway.

The existing drainage is divided into two sub-basins, Basin EX-A and Basin OS-A. Basin EX-A is approximately 8.01 acres that is made up of the entire site limits. Basin OS-A is approximately 1.64 acres, within the CDOT right of way of US Highway 24, made up of the area in between the eastern site boundary line and the edge of pavement for US Highway 24. The runoff generated by Basin OS-A is conveyed onto and through the site before being captured in the existing storm inlet located in the southwest corner of the site.

The weighted imperviousness for Basin EX-A with existing conditions is 2% and the runoff for the 5-year and 100-year storm events are 2.19 cfs and 16.07 cfs respectively. The weighted imperviousness for Basin OS-A with existing conditions is 2% and the runoff for the 5-year and 100-year storm events are 0.48 cfs and 3.50 cfs respectively. An existing conditions

PROPOSED DRAINAGE CONDITIONS

PROPOSED CONDITIONS SUB-BASIN DESCRIPTION

The developed runoff from the Project will generally be collected by means of a private storm sewer system with inlets located in the private streets within each delineated sub-basin area. The runoff collected form each basin will be conveyed to an Extended Detention Basin located in the southeast corner of the site. The controlled stormwater, released from the outlet structure within the basin, will be conveyed through a proposed storm sewer that ties into the existing inlet in the southwest corner of the site. The stormwater will then be conveyed through the adjacent property to the south within an existing storm sewer, located within a drainage easement, before ultimately discharging into an existing curb inlet within Meadowbrook Parkway.

The property has been divided into fifteen sub-basins, A through N and OS-A. Sub-basins A through N make up the Project site area and sub-basin OS-A is the portion of the CDOT right of way that drains into the site. Currently, there is not a CDOT stormwater quality and detention facility that captures and treats this area. For that reason, Sub-basin OS-A is collected in a grass swale and is conveyed into the Project's Extended Detection Basin. The runoff from this offsite area was included in the stormwater quality and detention calculations to ensure appropriate sizing.

The weighted imperviousness of the Site area (Sub-basins A through K) with proposed conditions is 37.2%. Cumulative runoff for the 5-year and 100-year storm events are 16.10 cfs and 39.70 cfs, respectively. The weighted imperviousness of the offsite area (Sub-basin OS-A) with proposed conditions is 0.00%. Cumulative runoff for the 5-year and 100-year storm events are 0.48 cfs and 3.50 cfs, respectively.

Sub-Basin A

Sub-basin A consists of approximately 2.26 acres and is the area along the eastern property line, north of the Extended Detention Basin, and captures a majority of the runoff from the lots on the east side of Celeste Heights. The runoff is collected in swales along the back of the lots and is conveyed directly into a grass lined swale that conveys runoff to the Extended Detention Basin down a riprap rundown into a trickle channel. Developed runoff during the 5-year and 100-year events are 1.86 cfs and 6.16 cfs respectively.

Sub-Basin B

Sub-basin B consists of approximately 0.04 acres and is the area in between the Extended Detention Basin and the back of lots on the east side of Celeste Heights just north of Solom Grove. The runoff is collected in CDOT Type C grate inlet and conveyed via storm sewer into the Extended Detention Basin. Developed runoff during the 5-year and 100-year events are 0.01 cfs and 0.11 cfs respectively.

Sub-Basin C

Sub-basin C consists of approximately 1.50 acres and is made up of a majority of the Solum Grove runoff and the lots adjacent to Solum Grove. The lots on the south side of Tenebris Point are also included within this sub-basin. The runoff from the lots drains into the Solum Grove and is conveyed in the curb and gutter before being collected by a 10-foot Type R inlet. Developed runoff during the 5-year and 100-year events are 3.57 cfs and 7.69 cfs respectively.

Sub-Basin D

Sub-basin D consists of approximately 0.27 acres and consists of three lots and a portion of Celeste Heights between Solum Grove and Tenebris Point. The runoff from the lots drains into the Celeste Heights and is conveyed in the curb and gutter before being collected a 5-foot curb Type R inlet. Developed runoff during the 5-year and 100-year events are 0.55 cfs and 1.25 cfs respectively.

Sub-Basin E

Sub-basin E consists of approximately 1.18 acres and consists of Tenebris Point runoff and the lots adjacent to Tenebris Point and the tract behind the associated lots. The runoff from the lots drains into the Tenebris Point and is conveyed in the curb and gutter before being collected by a 10-foot curb Type R inlet. Developed runoff during the 5-year and 100-year events are 2.47 cfs and 5.66 cfs respectively.

Sub-Basin F

Sub-basin F consists of approximately 0.41 acres and consists of the southern half of the Celeste Heights from Tenebris Piont to Lux Point and the adjacent driveway sections. The runoff runs along Celeste Heights and is conveyed in the curb and gutter before being collected by a 5-foot curb inlet. Developed runoff during the 5-year and 100-year events are 1.42 cfs and 2.54 cfs respectively.

Sub-Basin G

Sub-basin G consists of approximately 0.10 acres and consists of the wester half of Nova View. The runoff from the lots drains into Nova View and is conveyed in the curb and gutter before being collected by a 5-foot curb Type R inlet. Developed runoff during the 5-year and 100-year events are 0.44 cfs and 0.80 cfs respectively.

Sub-Basin H

Sub-basin H consists of approximately 0.92 acres and consists of the eastern half of Nova View, the adjacent tract, and the northern half of Celeste Heights from Nova View to Lux Point. The runoff from the lots drains into Celeste Heights and Nova View and is conveyed in the curb and gutter before being collected by a 5-foot curb Type R inlet. Developed runoff during the 5-year and 100-year events are 1.94 cfs and 4.51 cfs respectively.

Sub-Basin I

Sub-basin I consists of approximately 0.83 acres and consists of Lux Point and the adjacent driveways to the west and entire lots to the east. The runoff from the lots drains into Lux Point and is conveyed in the curb and gutter before being collected by a 5-foot curb Type R inlet. Developed runoff during the 5-year and 100-year events are 1.86 cfs and 4.39 cfs respectively.

Sub-Basin J

Sub-basin J consists of approximately 0.28 acres and consists of the northern half of Celeste Heights east of Lux Point. It also included the driveways directly adjacent to the north. The runoff from the lots drains into Celeste Heights and is conveyed in the curb and gutter before

being collected by a 5-foot curb Type R inlet. Developed runoff during the 5-year and 100-year events are 0.75 cfs and 1.62 cfs respectively.

Sub-Basin K

Sub-basin K consists of approximately 0.22 acres and consists of the southern half of Celeste Heights east of Lux Point. It also included the driveways directly adjacent to the south. The runoff from the lots drains into Celeste Heights and is conveyed in the curb and gutter before being collected by a 5-foot curb Type R inlet. Developed runoff during the 5-year and 100-year events are 0.75 cfs and 1.49 cfs respectively.

Driveway Flow

The runoff from the driveway leading to the property from Meadowbrook Parkway does not need to be treated in the water quality ponds on site due to the El Paso County Drainage Criteria Manual section I.7.1.C.1 which states “100% of the applicable development site is captured, except the County may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the County must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street)”

EMERGENCY OVERFLOW ROUTING

Emergency overflow routing consists of flows following the proposed drainage pattern of northeast to southwest along the proposed roadways. Once the flows reach the southwest portion of the site, they will overtop the proposed curb and gutter and flow into Meadowbrook Parkway.

DETENTION REQUIREMENTS

The water quality capture volume and 100 year detention volume is required to be detained on-site. This is accomplished through the proposed Extended Detention Basin on the southeast corner of the Site. The Extended Detention Basin was sized per UDFCD criteria and the water quality and detention calculations are provided in the Appendix of this report. The proposed Extended Detention Basin will be maintained by the Owner.

Four-Step Process

The four-step process per the MANUAL provides guidance and requirements for the selection of siting of structural Best Management Practices (BMPs) for new development and significant redevelopment.

Step 1: Employ Runoff Reduction Practices
Currently the site is developed land with surrounding vacant land. Development of the site will increase current runoff conditions due to increased imperviousness values. However, implementation of landscaping throughout the site, the proposed storm sewer infrastructure, and the proposed Extended Detention Basin will help slow runoff and encourage infiltration.

Step 2: Provide Water Quality Capture Volume (WQCV)

The water quality capture volume will be detained using two proposed private water quality detention basins with water quality outlet structures located in the southeast portion of the property. The outfall pipes from the water quality outlet structures will control the release of stormwater to less than historic rates.

Step 3: Stabilize Drainageways
There are no current drainageways conveyed through this property. No changes in stabilization are anticipated.

Step 4: Consider need for Industrial and Commercial BMPs
Erosion control features for the final stages of the Project will be designed to reduce contamination. Source control BMPs will include the use of, inlet protection, silt fences, concrete washout areas, stockpile management, and stabilized staging areas. The Grading and Erosion Control Plans will be submitted as a separate construction document set.

Detention and Water Quality Design

Each water quality detention basin is designed with an outlet structure that is fitted with a restrictor plate to release the WQCV in a 40-hour time period per the MANUAL.

Calculations included in the Appendix provide details regarding the private water quality and detention basins design. The calculations include determination of the storage volumes required for full spectrum detention for the WQCV and 100 year detention and allowable release rates.

Overall, 0.140 acre-feet of water quality storage volume is required, and 0.671 acre-feet of detention volume is required for the proposed Extended Detention Basin. The total area contributing to the Extended Detention Basin consists of 9.65 acres (37.2% imperviousness).

Outlet Requirements

The water quality standards established by the CRITERIA in section 13.5.10 are met by the proposed water quality detention basins. The water quality outlet structures were designed per the specifications in section 13.5.10 of the CRITERIA. The structures meet the micro-pool requirement that it be integrated into the design of the structure with an additional initial surcharge volume. The orifice plates of the structures were designed based on section 13.4.2.2 of the CRITERIA. The orifice plates will allow the Water Quality Capture Volume to be drained from the structure in 40 hours. The calculations for the design of the water quality outlet structure are presented in the Appendix.

Channel Design and Soil Erodibility

A proposed concrete lined trickle channel within the basin was designed per the MANUAL. A forebay structure is located at the upstream entrance to the basin. This forebay structure was designed per the MANUAL. The surrounding protection is designed as Type L riprap. Calculations detailing the design and dimensions of the trickle channel and forebay structure are included in the Appendix.

Emergency Spillway Path

The emergency overflow from the pond is designed to spill into Solum Grove and run north towards Meadowbrook Parkway. Once the flows reach the southwest portion of the site, they will overtop the proposed curb and gutter and flow into Meadowbrook Parkway.

EROSION CONTROL PLAN

Erosion Control Plans will be submitted separately as a standalone construction document.

FLOODPLAIN STATEMENT

The Flood Insurance Rate Maps (FIRM) 08041C0752G effective date December 7, 2018, by FEMA, indicates this parcel of land is located in Zone X, an area of minimal flood hazard.

MAINTENANCE AND OPERATIONS

It is our recommendation that the Extended Detention Basin maintenance cycles consist of twice per year inspections (spring and fall), evaluation of sedimentation within the basins, and removal of sediment if levels exceed two inches deep or if discharge is otherwise deemed insufficient. This satisfies the maintenance and access requirement set by the CRITERIA.

SUMMARY

COMPLIANCE WITH STANDARDS

The drainage design presented within this report for Meadowbrook Park, conforms to the El Paso County Drainage Criteria Manual and the Urban Drainage and Flood Control District Manual. Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments. The proposed developed flows entering the Extended Detention Basin are greater than the existing ultimate outfall of the site due to the greater imperviousness of the site, however the implementation of the drainage basins will disperse the flow of an extended period of time therefore decreasing the ultimate outfall.

REFERENCES

1. City of Colorado Springs Drainage Criteria Manual, May 2014.

2. El Paso County Drainage Criteria Manual, Vol. 1 and 2, October 1994.

3. Urban Drainage and Flood Control District Drainage Criteria Manual (UDFCDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.

4. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0459G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

APPENDIX

SOILS MAP AND FEMA FIRM PANEL

NOTES TO USERS

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

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

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

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

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

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

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

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

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

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

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

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

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

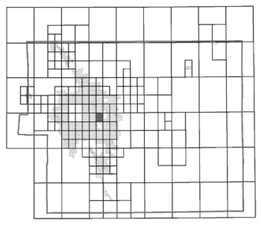
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

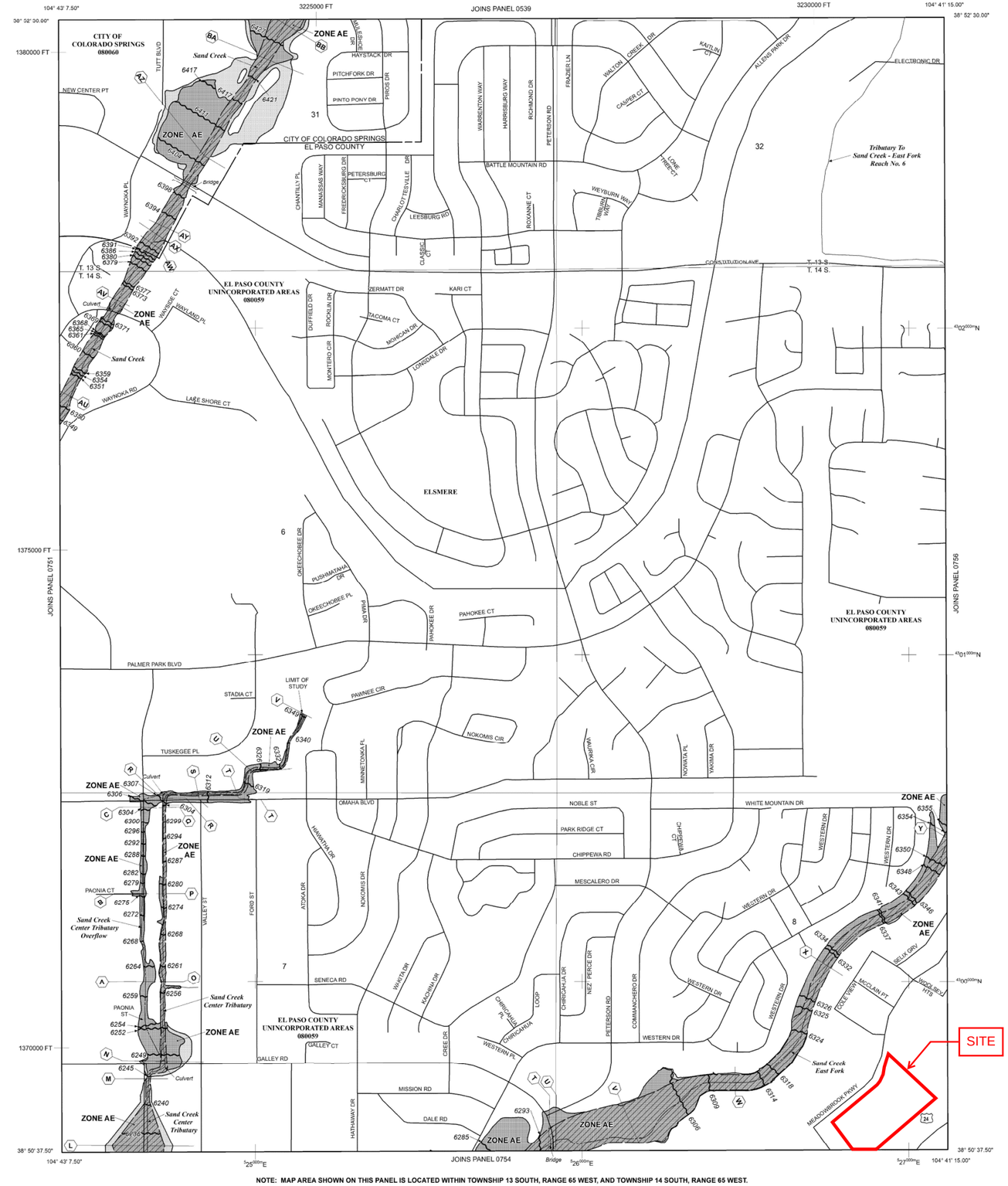
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST, AND TOWNSHIP 14 SOUTH, RANGE 65 WEST.

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0752G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 752 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0752	G
EL PASO COUNTY	080059	0752	G

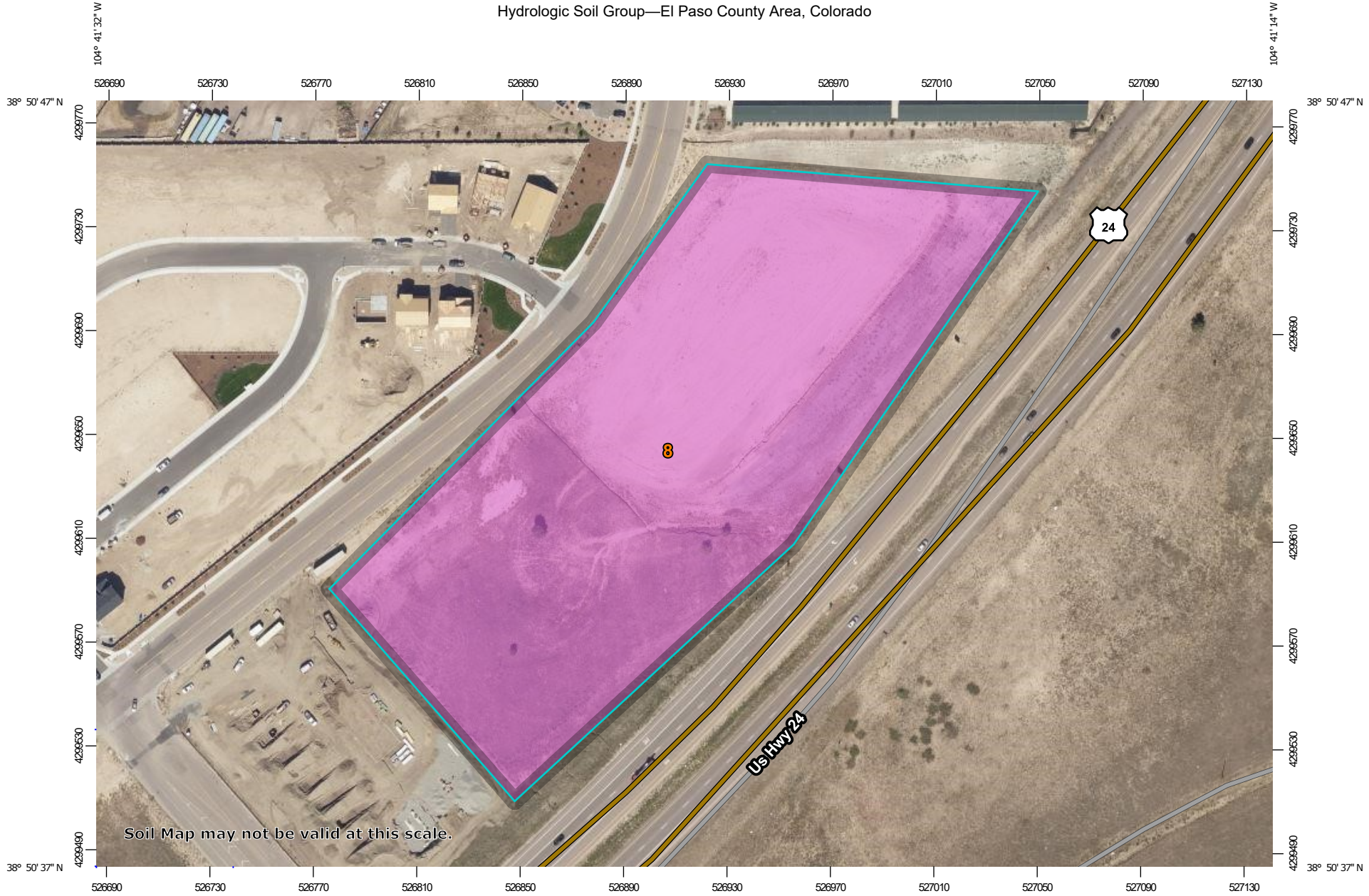
Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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

MAP NUMBER 08041C0752G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency



Map Scale: 1:2,080 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, 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: Aug 19, 2018—Sep 23, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	7.4	100.0%
Totals for Area of Interest			**7.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EXISTING HYDROLOGIC CALCULATIONS

Weighted Imperviousness Calculations (Existing Conditions)

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF C2	ROOF C5	ROOF C10	ROOF C100	LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE C2	LANDSCAPE C5	LANDSCAPE C10	LANDSCAPE C100	PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT C2	PAVEMENT C5	PAVEMENT C10	PAVEMENT C100	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS C2	WEIGHTED COEFFICIENTS C5	WEIGHTED COEFFICIENTS C10	WEIGHTED COEFFICIENTS C100
EX-A	348,976	8.01	0	90%	0.71	0.73	0.75	0.81	348,976	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
OS-A	71,542	1.64	0	90%	0.71	0.73	0.75	0.81	71,542	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
TOTAL	420,518	9.65	0	90%	0.71	0.73	0.75	0.81	420,518	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35

Meadowbrook Park - Drainage Report
Existing Runoff Calculations
Time of Concentration

Watercourse Coefficient

					Forest & Meadow	2.50		Short Grass Pasture & Lawns	7.00			Grassed Waterway	15.00			
					Fallow or Cultivation	5.00		Nearly Bare Ground	10.00			Paved Area & Shallow Gutter	20.00			
	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	EX-A	348,976	8.01	0.08	300	10.0%	15.0	805	2.0%	15.00	2.1	6.3	21.3	1105	16.1	16.1
15	OS-A	71,542	1.64	0.08	70	3.0%	10.8	655	2.5%	15.00	2.4	4.6	15.4	725	14.0	14.0

Meadowbrook Park - Drainage Report
Existing Runoff Calculations
(Rational Method Procedure)

Design Storm *5 Year*

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	NOTES
1	EX-A	8.01	0.08	16.1	0.64	3.41	2.19					
15	OS-A	1.64	0.08	14.0	0.13	3.62	0.48					

Meadowbrook Park - Drainage Report
Existing Runoff Calculations
(Rational Method Procedure)

Design Storm *100 Year*

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX-A	8.01	0.35	16.1	2.80	5.73	16.07					
2	OS-A	1.64	0.35	14.0	0.57	6.08	3.50					

SUMMARY - EXISTING RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX-A	8.01	2.19	16.07		
2	OS-A	1.64	0.48	3.50		
TOTAL		9.65	2.66	19.57		

PROPOSED HYDROLOGIC CALCULATIONS

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF C2	ROOF C5	ROOF C10	ROOF C100	LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE C2	LANDSCAPE C5	LANDSCAPE C10	LANDSCAPE C100	PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT C2	PAVEMENT C5	PAVEMENT C10	PAVEMENT C100	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS C2	WEIGHTED COEFFICIENTS C5	WEIGHTED COEFFICIENTS C10	WEIGHTED COEFFICIENTS C100
A	98,249	2.26	23,046	90%	0.71	0.73	0.75	0.81	75,203	0%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	21.1%	0.18	0.23	0.29	0.46
B	1,941	0.04	0	90%	0.71	0.73	0.75	0.81	1,941	0%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	0.0%	0.02	0.08	0.15	0.35
C	65,497	1.50	20,533	90%	0.71	0.73	0.75	0.81	25,589	0%	0.02	0.08	0.15	0.35	19,375	100%	0.89	0.90	0.92	0.96	57.8%	0.49	0.53	0.57	0.67
D	11,566	0.27	2,937	90%	0.71	0.73	0.75	0.81	5,328	0%	0.02	0.08	0.15	0.35	3,301	100%	0.89	0.90	0.92	0.96	51.4%	0.44	0.48	0.52	0.64
E	51,302	1.18	9,415	90%	0.71	0.73	0.75	0.81	25,507	0%	0.02	0.08	0.15	0.35	16,380	100%	0.89	0.90	0.92	0.96	48.4%	0.42	0.46	0.51	0.63
F	17,805	0.41	0	90%	0.71	0.73	0.75	0.81	0	0%	0.02	0.08	0.15	0.35	14,232	100%	0.89	0.90	0.92	0.96	79.9%	0.71	0.72	0.74	0.77
G	4,229	0.10	0	90%	0.71	0.73	0.75	0.81	79	0%	0.02	0.08	0.15	0.35	4,150	100%	0.89	0.90	0.92	0.96	98.1%	0.87	0.88	0.91	0.95
H	40,090	0.92	9,058	90%	0.71	0.73	0.75	0.81	20,365	0%	0.02	0.08	0.15	0.35	10,667	100%	0.89	0.90	0.92	0.96	46.9%	0.41	0.45	0.49	0.62
I	36,348	0.83	5,852	90%	0.71	0.73	0.75	0.81	19,612	0%	0.02	0.08	0.15	0.35	10,884	100%	0.89	0.90	0.92	0.96	44.4%	0.39	0.43	0.48	0.61
J	12,368	0.28	0	90%	0.71	0.73	0.75	0.81	5,491	0%	0.02	0.08	0.15	0.35	6,877	100%	0.89	0.90	0.92	0.96	55.6%	0.50	0.54	0.58	0.69
K	9,574	0.22	0	90%	0.71	0.73	0.75	0.81	2,803	0%	0.02	0.08	0.15	0.35	6,771	100%	0.89	0.90	0.92	0.96	70.7%	0.64	0.66	0.69	0.78
OS-A	71,542	1.64	0	90%	0.71	0.73	0.75	0.81	71,542	0%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	0.0%	0.02	0.08	0.15	0.35
TOTAL	420,511	9.65	70,841	90%	0.71	0.73	0.75	0.81	253,460	0%	0.02	0.08	0.15	0.35	92,637	100%	0.89	0.90	0.92	0.96	37.2%	0.33	0.37	0.42	0.56

Meadowbrook Park - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

					Forest & Meadow	2.50		Short Grass Pasture & Lawns	7.00				Grassed Waterway	15.00	
					Fallow or Cultivation	5.00		Nearly Bare Ground	10.00				Paved Area & Shallow Gutter	20.00	
	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	A	98,249	2.26	0.23	190	15.0%	8.9	655	2.3%	7.00	1.1	10.4	19.3	845	14.7	14.7
2	B	1,941	0.04	0.08	115	1.0%	20.0	0	0.0%	0.00	0.0	0.0	20.0	115	10.6	10.6
3	C	65,497	1.50	0.53	45	2.3%	5.3	293	1.0%	20.00	2.0	2.4	7.7	338	11.9	7.7
4	D	11,566	0.27	0.48	47	1.0%	7.8	146	2.5%	20.00	3.2	0.8	8.6	193	11.1	8.6
5	E	51,302	1.18	0.46	50	2.0%	6.6	230	4.0%	20.00	4.0	1.0	7.6	280	11.6	7.6
6	F	17,805	0.41	0.72	75	3.0%	4.2	400	2.5%	20.00	3.2	2.1	6.3	475	12.6	6.3
7	G	4,229	0.10	0.88	6	2.0%	0.8	150	2.0%	20.00	2.8	0.9	5.0	156	10.9	5.0
8	H	40,090	0.92	0.45	25	2.3%	4.5	340	1.7%	20.00	2.6	2.2	6.7	365	12.0	6.7
9	I	36,348	0.83	0.43	65	20.0%	3.6	230	2.0%	20.00	2.8	1.4	5.0	295	11.6	5.0
10	J	12,368	0.28	0.54	125	10.0%	5.4	100	2.8%	20.00	3.3	0.5	5.9	225	11.3	5.9
11	K	9,574	0.22	0.66	70	5.0%	3.9	160	2.8%	20.00	3.3	0.8	5.0	230	11.3	5.0
12	OS-A	71,542	1.64	0.08	70	3.0%	10.8	655	2.5%	15.00	2.4	4.6	15.4	725	14.0	14.0

Meadowbrook Park - Drainage Report
Proposed Runoff Calculations
(Rational Method Procedure)

Design Storm 5 Year

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	A	2.26	0.23	14.7	0.52	3.55	1.86					
2	B	0.04	0.08	10.6	0.00	4.04	0.01					
3	C	1.50	0.53	7.7	0.79	4.51	3.57					
4	D	0.27	0.48	8.6	0.13	4.36	0.55					
5	E	1.18	0.46	7.6	0.54	4.55	2.47					
6	F	0.41	0.72	6.3	0.29	4.82	1.42					
7	G	0.10	0.88	5.0	0.09	5.17	0.44					
8	H	0.92	0.45	6.7	0.41	4.74	1.94					
9	I	0.83	0.43	5.0	0.36	5.17	1.86					
10	J	0.28	0.54	5.9	0.15	4.92	0.75					
11	K	0.22	0.66	5.0	0.15	5.17	0.75					
12	OS-A	1.64	0.08	14.0	0.13	3.62	0.48					

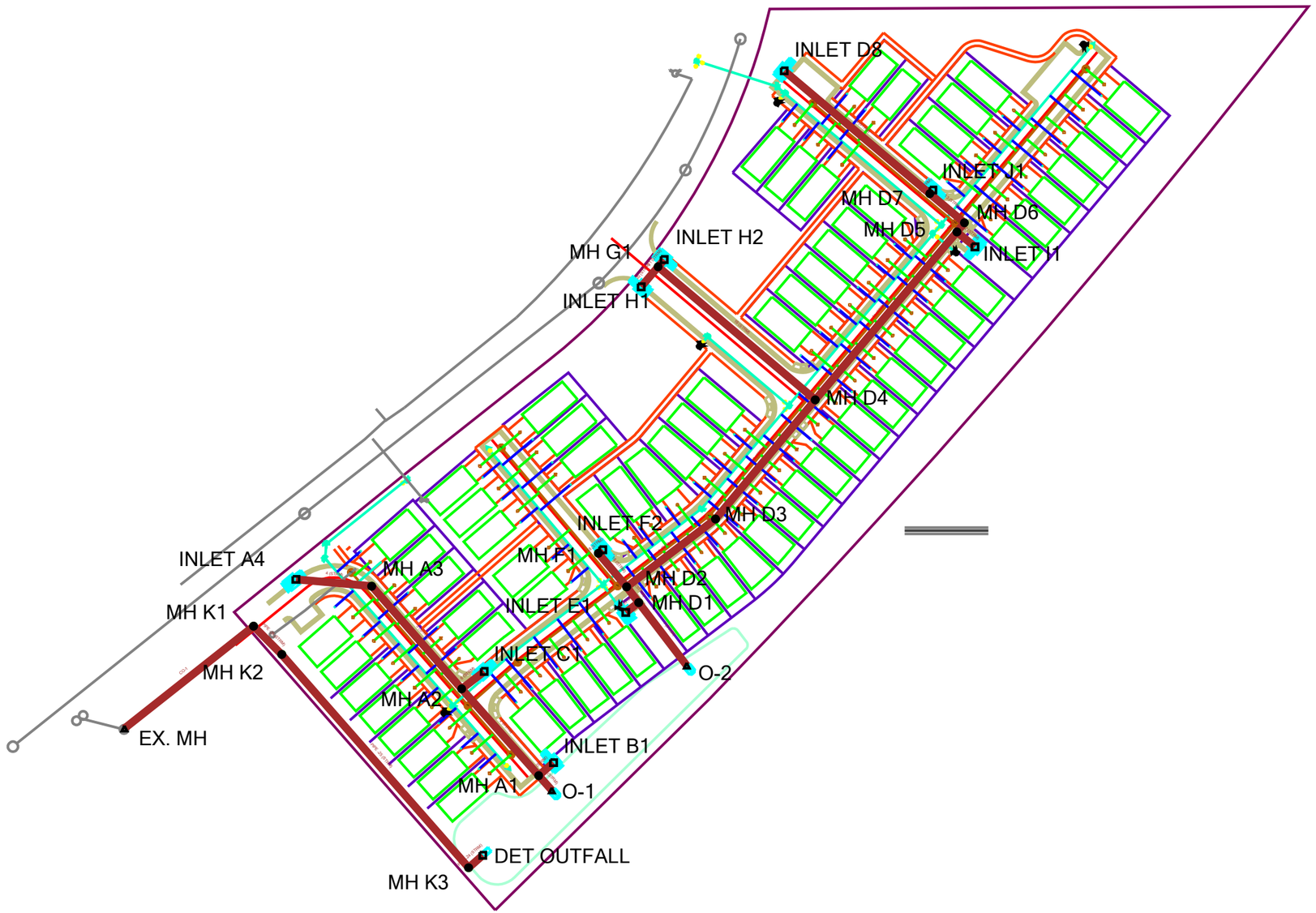
Meadowbrook Park - Drainage Report
Proposed Runoff Calculations *Design Storm* *100 Year*
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	A	2.26	0.46	14.7	1.03	5.96	6.16					
2	B	0.04	0.35	10.6	0.02	6.79	0.11					
3	C	1.50	0.67	7.7	1.01	7.58	7.69					
4	D	0.27	0.64	8.6	0.17	7.32	1.25					
5	E	1.18	0.63	7.6	0.74	7.64	5.66					
6	F	0.41	0.77	6.3	0.31	8.09	2.54					
7	G	0.10	0.95	5.0	0.09	8.68	0.80					
8	H	0.92	0.62	6.7	0.57	7.95	4.51					
9	I	0.83	0.61	5.0	0.51	8.68	4.39					
10	J	0.28	0.69	5.9	0.20	8.26	1.62					
11	K	0.22	0.78	5.0	0.17	8.68	1.49					
12	OS-A	1.64	0.35	14.0	0.57	6.08	3.50					

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	A	2.26	1.86	6.16		
2	B	0.04	0.01	0.11		
3	C	1.50	3.57	7.69		
4	D	0.27	0.55	1.25		
5	E	1.18	2.47	5.66		
6	F	0.41	1.42	2.54		
7	G	0.10	0.44	0.80		
8	H	0.92	1.94	4.51		
9	I	0.83	1.86	4.39		
10	J	0.28	0.75	1.62		
11	K	0.22	0.75	1.49		
12	OS-A	1.64	0.48	3.50		
TOTAL		9.65	16.10	39.70		

HYDRAULIC CALCULATIONS

MEADOWBROOK
PLAN VIEW



MEADOWBROOK

5 YEAR CATCH BASIN TABLE

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Known) (cfs)	Elevation (Invert Out) (ft)	Length (ft)	Width (ft)	Inlet Type	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Inlet Location
DET OUTFALL	6,323.90	6,323.90	6,317.75	0.20	6,317.75	3.00	3.00	Full Capture	6,317.92	6,317.92	Standard	0.050	In Sag
INLET A4	6,323.95	6,323.95	6,320.74	0.00	6,320.74	9.00	3.00	Full Capture	6,320.74	6,320.74	Standard	0.000	In Sag
INLET B1	6,322.57	6,322.57	6,319.07	0.00	6,319.07	3.00	3.00	Full Capture	6,319.07	6,319.07	Standard	0.000	In Sag
INLET C1	6,322.98	6,322.98	6,319.77	0.00	6,319.77	3.00	5.00	Full Capture	6,319.77	6,319.77	Standard	0.000	In Sag
INLET D8	6,335.01	6,334.26	6,330.31	1.86	6,330.31	5.00	3.00	Full Capture	6,330.83	6,330.82	Standard	0.050	In Sag
INLET E1	6,324.83	6,324.08	6,321.33	1.42	6,321.33	3.00	5.00	Full Capture	6,322.94	6,322.93	Standard	0.050	In Sag
INLET F2	6,324.91	6,324.16	6,321.18	2.47	6,321.18	5.00	3.00	Full Capture	6,322.98	6,322.98	Standard	0.050	In Sag
INLET H1	6,329.78	6,329.03	6,326.58	0.44	6,326.58	5.00	3.00	Full Capture	6,327.16	6,327.16	Standard	0.050	In Sag
INLET H2	6,329.70	6,328.95	6,326.50	1.94	6,326.50	5.00	3.00	Full Capture	6,327.17	6,327.16	Standard	0.050	In Sag
INLET I1	6,336.15	6,335.40	6,328.72	0.75	6,328.72	5.00	3.00	Full Capture	6,329.38	6,329.38	Standard	0.050	In Sag
INLET J1	6,336.33	6,335.58	6,329.42	0.75	6,329.42	5.00	3.00	Full Capture	6,330.05	6,330.05	Standard	0.050	On Grade

MEADOWBROOK

5 YEAR CONDUIT TABLE

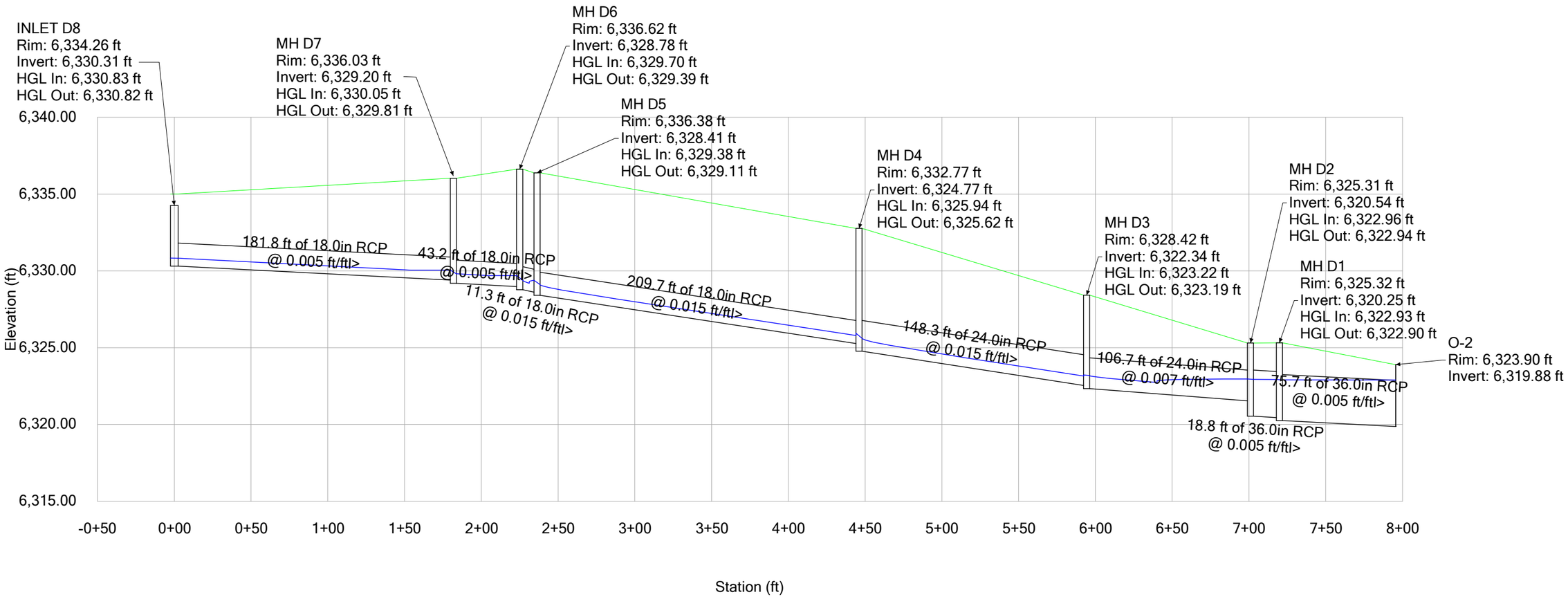
Label	Stop Node	Start Node	Invert (Stop) (ft)	Invert (Start) (ft)	Slope (Calculated) (ft/ft)	Length (User Defined) (ft)	Section Type	Diameter (in)	Manning's n	Velocity (ft/s)	Depth (Out) (ft)	Flow (cfs)	Capacity (Full Flow) (cfs)
1 (STRM)	O-1	MH A1	6,318.78	6,318.88	0.005	18.8	Circle	18.0	0.013	0.00	0.00	0.00	7.43
2 (STRM)	MH A1	MH A2	6,318.98	6,319.53	0.005	110.7	Circle	18.0	0.013	0.00	0.00	0.00	7.43
3 (STRM)	MH A2	MH A3	6,319.63	6,320.28	0.005	130.3	Circle	18.0	0.013	0.00	0.00	0.00	7.43
4 (STRM)	MH A3	INLET A4	6,320.38	6,320.74	0.005	72.7	Circle	18.0	0.013	0.00	0.00	0.00	7.41
5 (STRM)	MH A1	INLET B1	6,318.98	6,319.07	0.005	18.8	Circle	18.0	0.013	0.00	0.00	0.00	7.43
6 (STRM)	MH A2	INLET C1	6,319.63	6,319.77	0.005	27.2	Circle	18.0	0.013	0.00	0.00	0.00	7.43
7 (STRM)	O-2	MH D1	6,319.87	6,320.25	0.005	75.7	Circle	36.0	0.013	5.25	3.02	9.63	47.25
8 (STRM)	MH D1	MH D2	6,320.45	6,320.54	0.005	18.8	Circle	36.0	0.013	4.93	2.48	8.21	46.10
9 (STRM)	MH D2	MH D3	6,321.54	6,322.34	0.007	106.7	Circle	24.0	0.013	5.41	1.42	5.74	19.59
10 (STRM)	MH D3	MH D4	6,322.54	6,324.77	0.015	148.3	Circle	24.0	0.013	6.96	0.62	5.74	27.74
11 (STRM)	MH D4	MH D5	6,325.27	6,328.41	0.015	209.7	Circle	18.0	0.013	6.12	0.52	3.36	12.85
12 (STRM)	MH D5	MH D6	6,328.61	6,328.78	0.015	11.3	Circle	18.0	0.013	5.71	0.77	2.61	12.88
13 (STRM)	MH D6	MH D7	6,328.98	6,329.20	0.005	43.2	Circle	18.0	0.013	3.86	0.72	2.61	7.50
14 (STRM)	MH D7	INLET D8	6,329.40	6,330.31	0.005	181.8	Circle	18.0	0.013	3.50	0.65	1.86	7.43
15 (STRM)	MH D1	INLET E1	6,321.25	6,321.33	0.005	15.6	Circle	24.0	0.013	3.18	1.68	1.42	16.22
16 (STRM)	MH D2	MH F1	6,320.74	6,320.95	0.005	41.9	Circle	24.0	0.013	0.79	2.22	2.47	16.01
18 (STRM)	MH F1	INLET F2	6,321.15	6,321.18	0.005	5.3	Circle	24.0	0.013	3.67	1.83	2.47	15.88
19 (STRM)	MH D4	MH G1	6,325.27	6,326.25	0.005	196.6	Circle	18.0	0.013	3.74	0.67	2.38	7.42
20 (STRM)	MH G1	INLET H1	6,326.45	6,326.58	0.005	25.0	Circle	18.0	0.013	2.33	0.71	0.44	7.57
21 (STRM)	MH G1	INLET H2	6,326.45	6,326.50	0.005	9.0	Circle	18.0	0.013	3.57	0.71	1.94	7.51
22 (STRM)	MH D5	INLET I1	6,328.61	6,328.72	0.005	22.3	Circle	18.0	0.013	2.68	0.77	0.75	7.37
23 (STRM)	MH D7	INLET J1	6,329.40	6,329.42	0.005	4.5	Circle	18.0	0.013	2.76	0.65	0.75	7.67
CO-1	EX. MH	MH K1	6,313.67	6,314.30	0.004	158.1	Circle	30.0	0.013	1.57	0.14	0.20	26.08
PIPE -24 (STRM)	MH K3	DET OUTFALL	6,317.66	6,317.75	0.005	18.0	Circle	18.0	0.013	1.82	0.16	0.20	7.43
PIPE -25 (STRM)	MH K2	MH K3	6,316.11	6,317.46	0.005	270.8	Circle	18.0	0.013	1.82	0.16	0.20	7.42
PIPE -26 (STRM)	MH K1	MH K2	6,315.72	6,315.91	0.005	38.1	Circle	18.0	0.013	1.82	0.16	0.20	7.42

MEADOWBROOK

5 YEAR MANHOLE TABLE

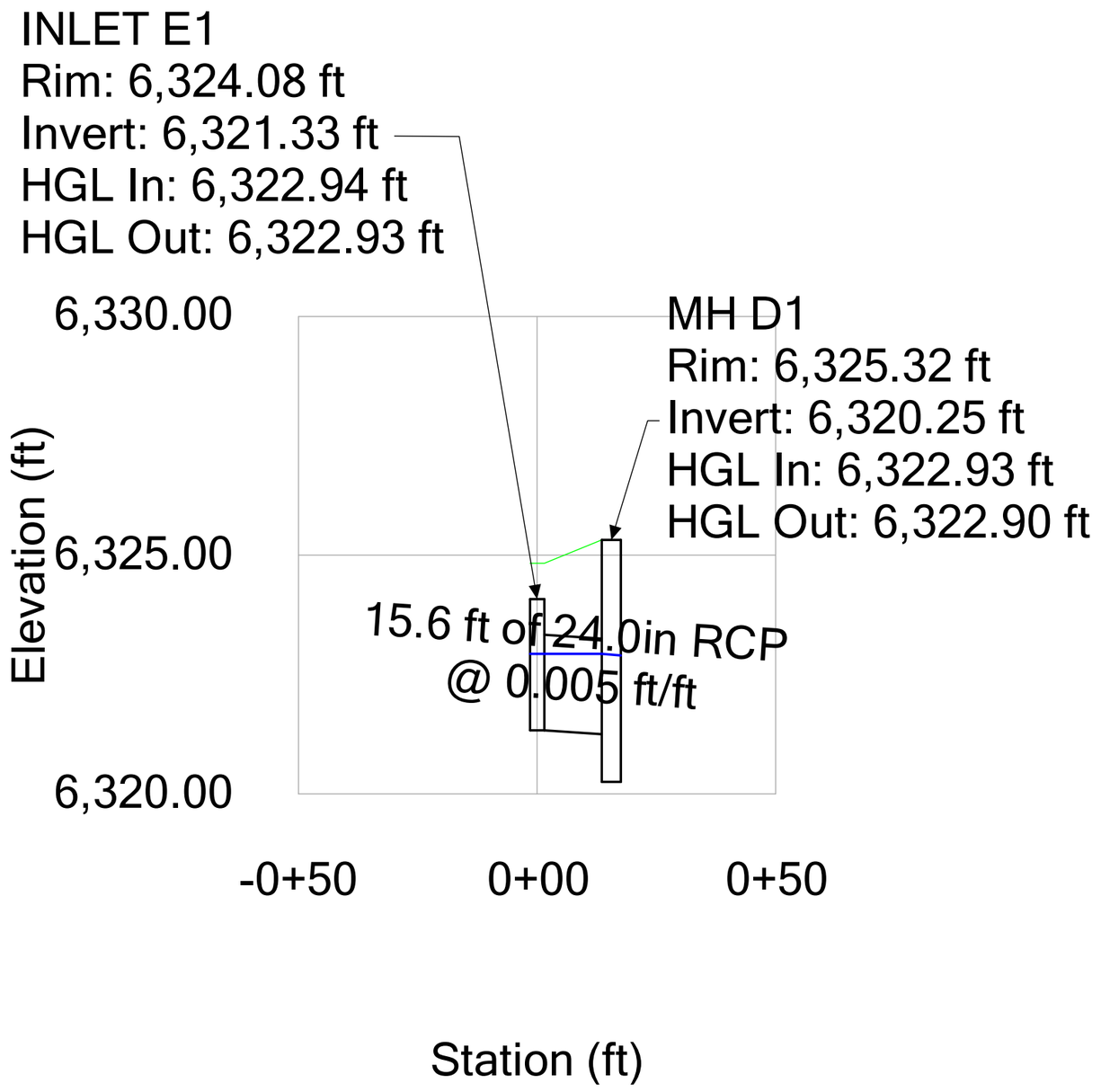
Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Elevation (Invert Out) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss Method	Headloss Coefficient (Standard)
6,336.62	6,336.62	6,328.78	6,328.78	2.61	6,329.39	6,329.70	Standard	1.320
6,336.38	6,336.38	6,328.41	6,328.41	3.36	6,329.11	6,329.38	Standard	1.020
6,336.03	6,336.03	6,329.20	6,329.20	2.61	6,329.81	6,330.05	Standard	1.020
6,332.77	6,332.77	6,324.77	6,324.77	5.74	6,325.62	6,325.94	Standard	1.020
6,329.37	6,329.37	6,326.25	6,326.25	2.38	6,326.83	6,327.16	Standard	1.520
6,328.42	6,328.42	6,322.34	6,322.34	5.74	6,323.19	6,323.22	Standard	0.100
6,325.32	6,325.32	6,320.25	6,320.25	9.63	6,322.90	6,322.93	Standard	1.020
6,325.31	6,325.31	6,320.54	6,320.54	8.21	6,322.94	6,322.96	Standard	1.020
6,324.65	6,324.65	6,320.95	6,320.95	2.47	6,322.97	6,322.98	Standard	1.320
6,323.59	6,323.59	6,317.47	6,317.46	0.20	6,317.63	6,317.70	Standard	1.320
6,322.49	6,322.49	6,320.28	6,320.28	0.00	6,320.28	6,320.28	Standard	0.000
6,322.14	6,322.14	6,318.88	6,318.88	0.00	6,318.88	6,318.88	Standard	0.000
6,321.79	6,321.79	6,315.92	6,315.91	0.20	6,316.08	6,316.08	Standard	0.100
6,321.74	6,321.74	6,319.53	6,319.53	0.00	6,319.53	6,319.53	Standard	0.000
6,320.68	6,320.68	6,314.51	6,314.30	0.20	6,314.46	6,314.51	Standard	1.320

MEADOWBROOK
5 YEAR STORM LINE D



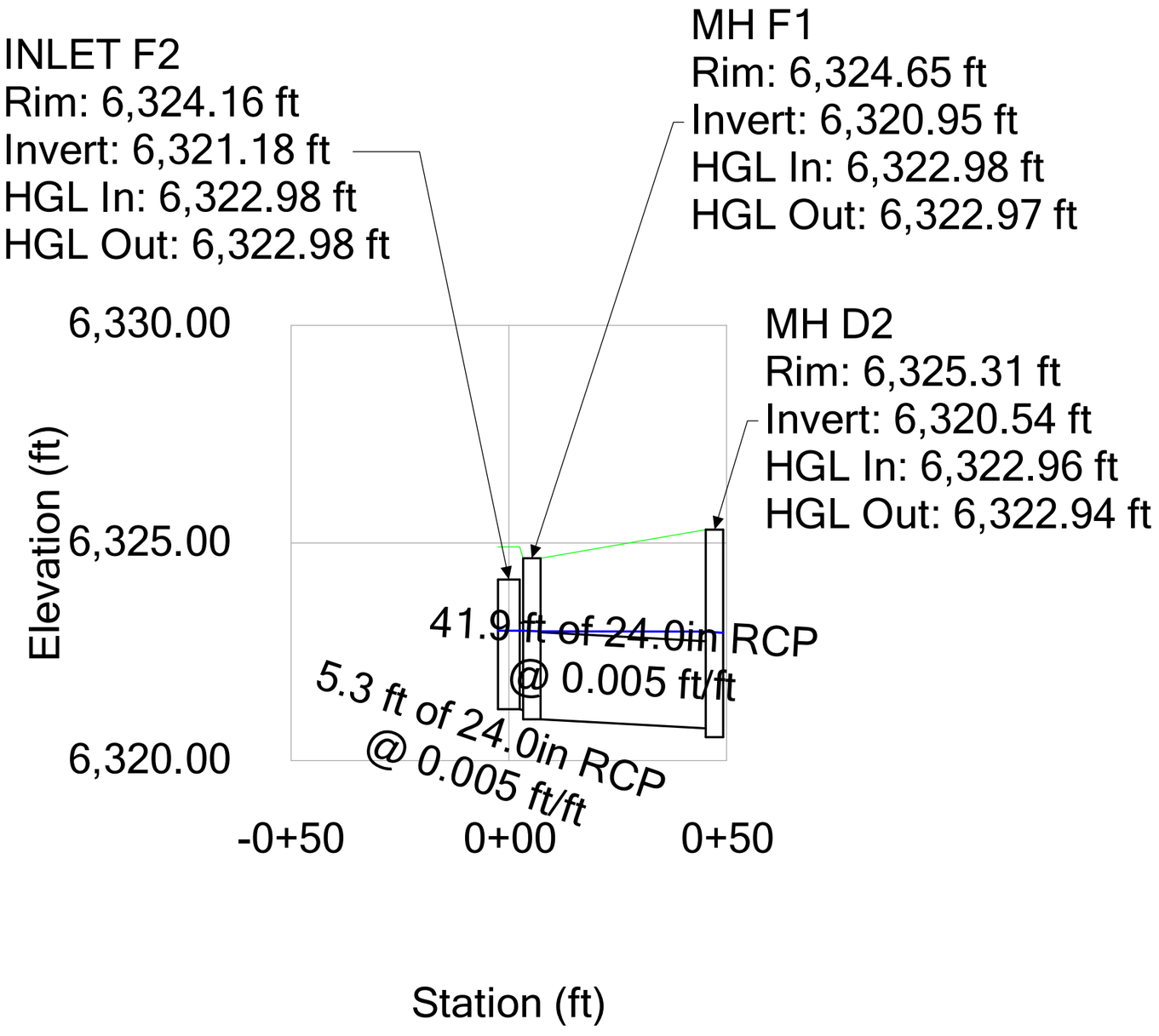
MEADOWBROOK

5 YEAR STORM LINE E



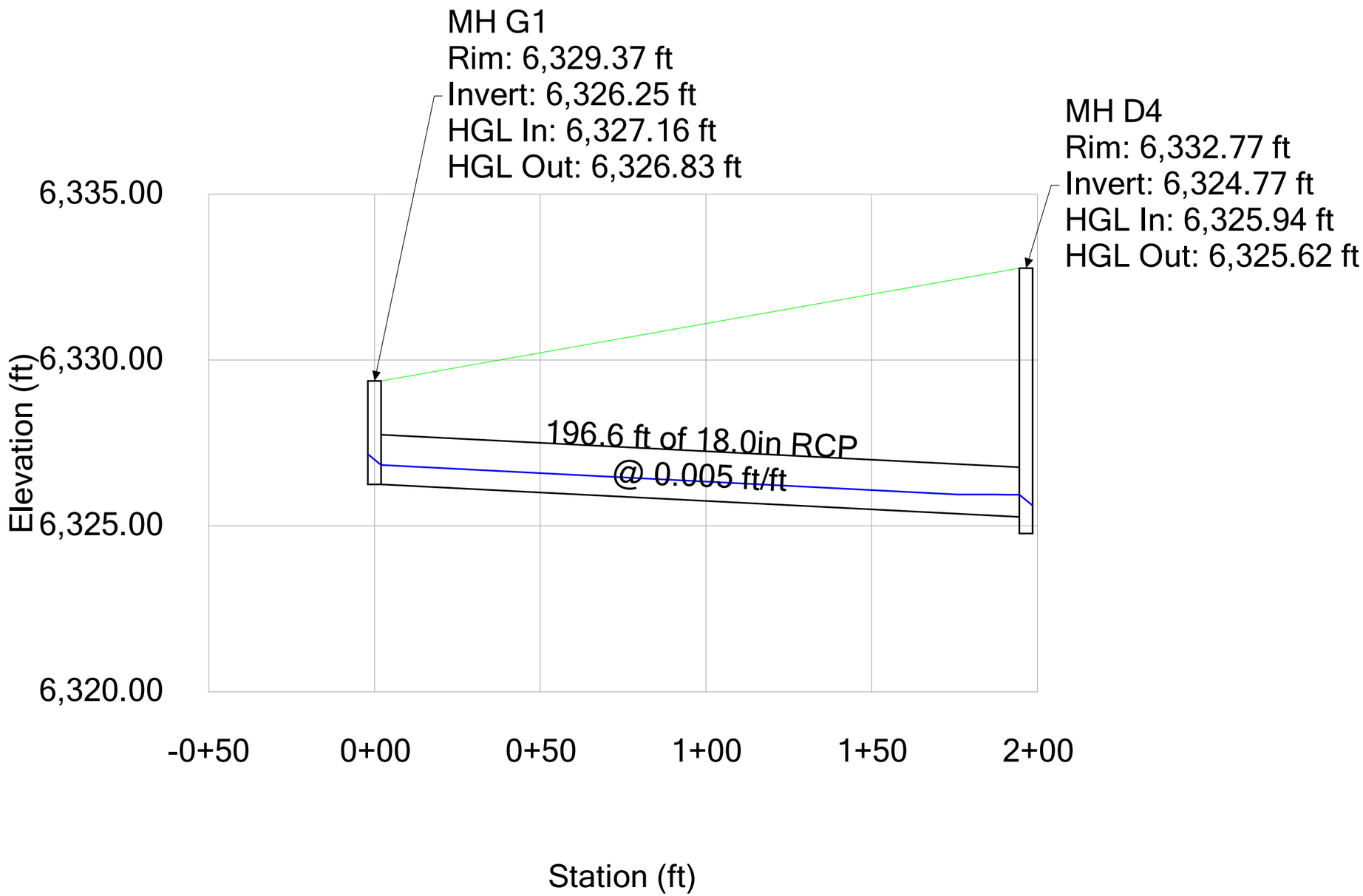
MEADOWBROOK

5 YEAR STORM LINE F



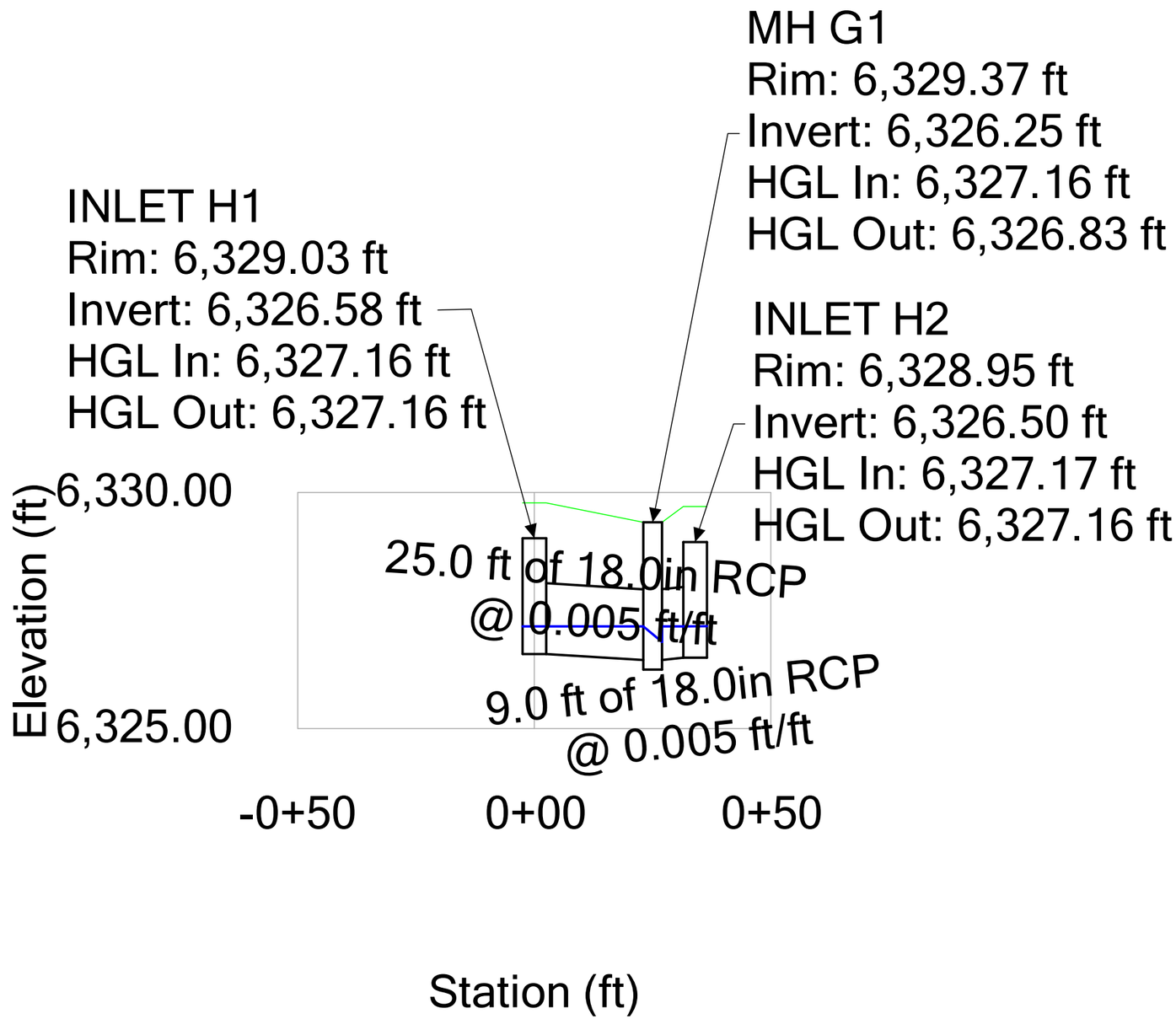
MEADOWBROOK

5 YEAR STORM LINE G



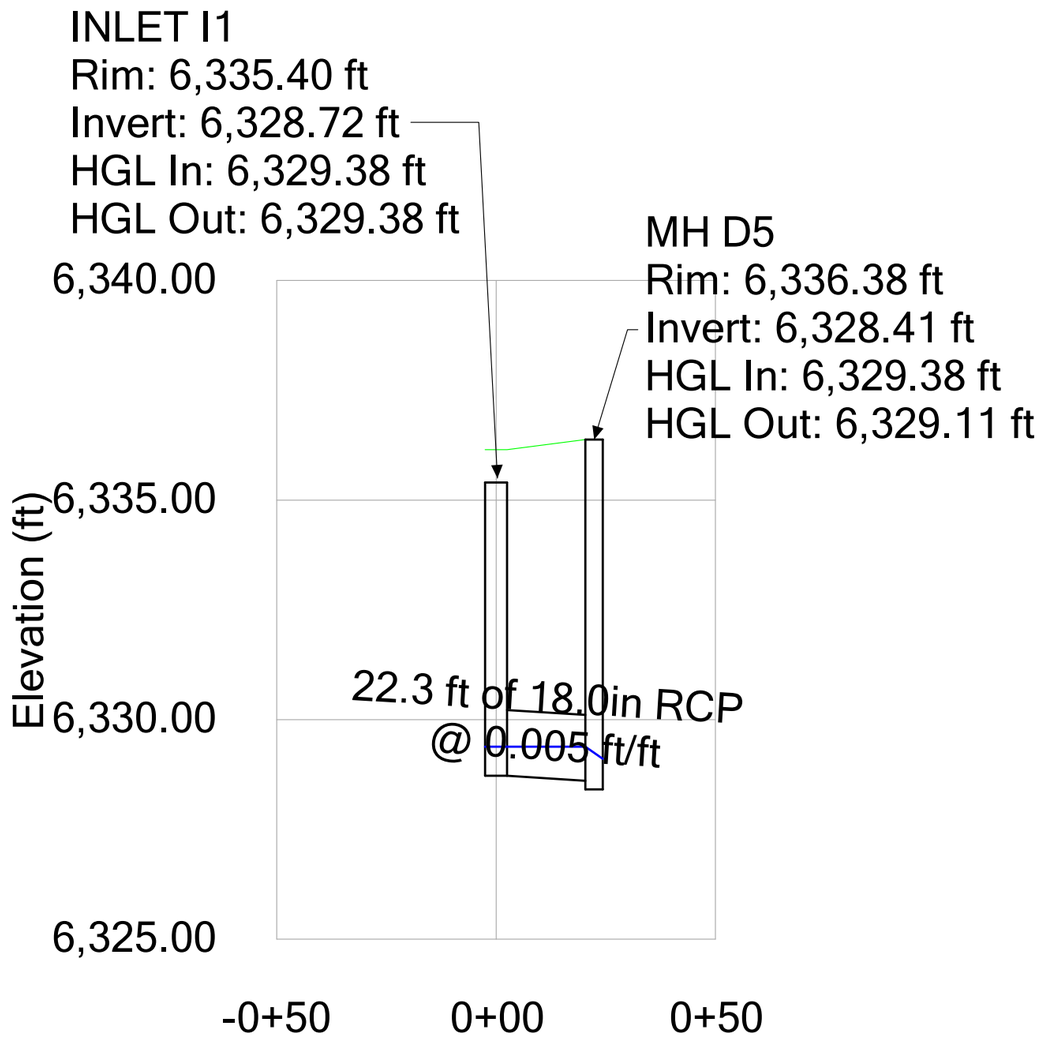
MEADOWBROOK

5 YEAR STORM LINE H



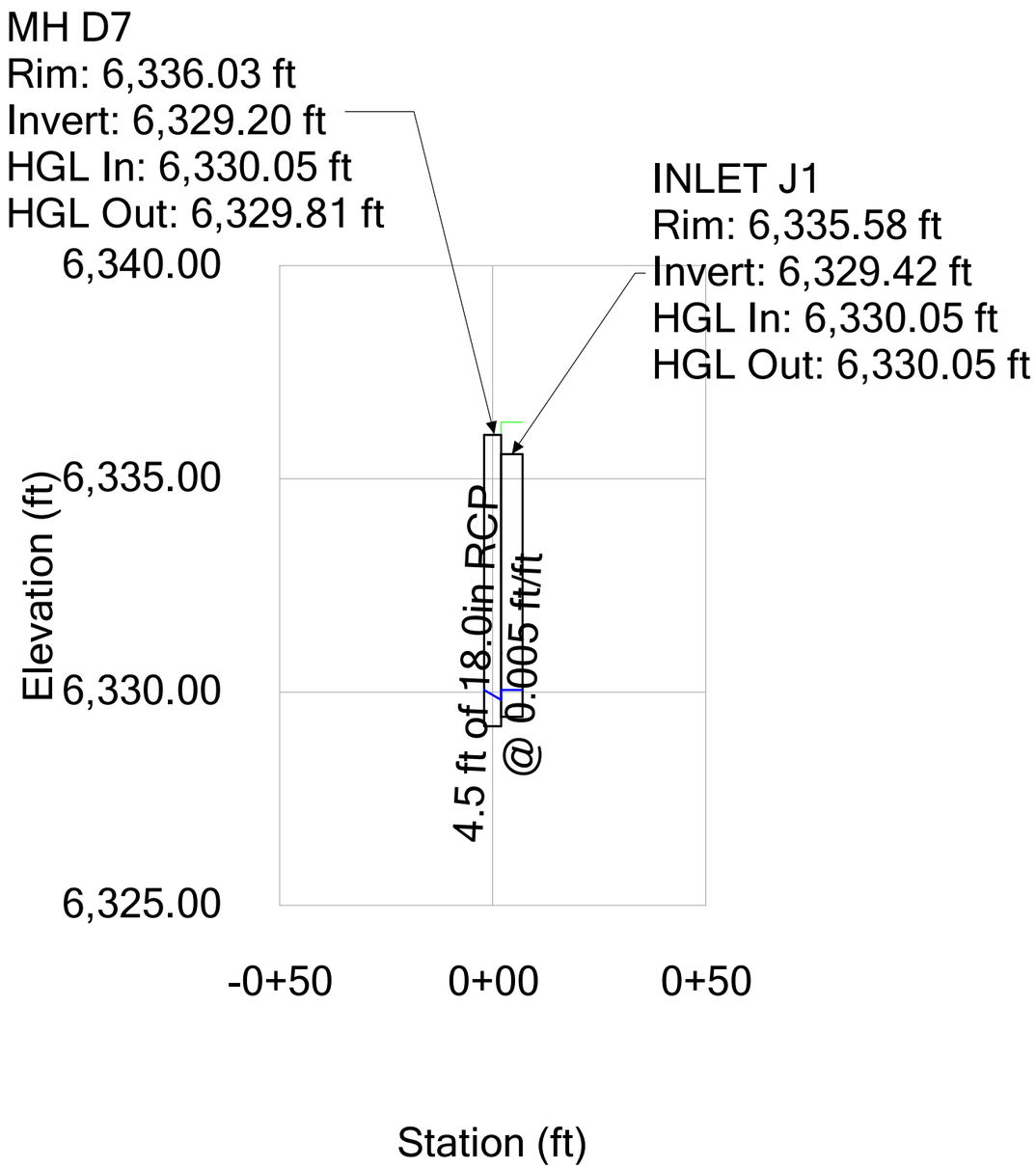
MEADOWBROOK

5 YEAR STORM LINE I

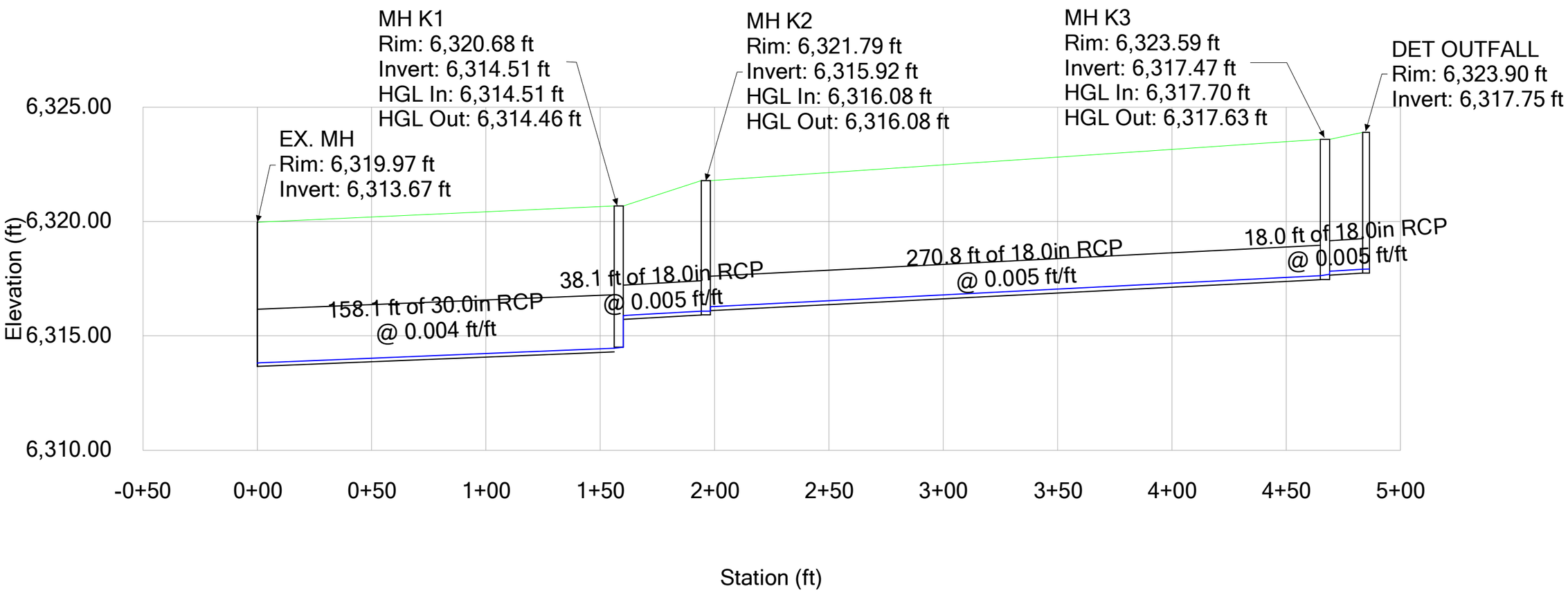


MEADOWBROOK

5 YEAR STORM LINE J



MEADOWBROOK
5 YEAR STORM LINE K



MEADOWBROOK

100 YEAR CATCH BASIN TABLE

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Known) (cfs)	Elevation (Invert Out) (ft)	Length (ft)	Width (ft)	Inlet Type	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Inlet Location
DET OUTFALL	6,323.90	6,323.90	6,317.75	6.80	6,317.75	3.00	3.00	Full Capture	6,319.13	6,319.11	Standard	0.050	In Sag
INLET A4	6,323.95	6,323.95	6,320.74	0.00	6,320.74	9.00	3.00	Full Capture	6,320.74	6,320.74	Standard	0.000	In Sag
INLET B1	6,322.57	6,322.57	6,319.07	0.00	6,319.07	3.00	3.00	Full Capture	6,319.07	6,319.07	Standard	0.000	In Sag
INLET C1	6,322.98	6,322.98	6,319.77	0.00	6,319.77	3.00	5.00	Full Capture	6,319.77	6,319.77	Standard	0.000	In Sag
INLET D8	6,335.01	6,334.26	6,330.31	4.39	6,330.31	5.00	3.00	Full Capture	6,331.15	6,331.14	Standard	0.050	In Sag
INLET E1	6,324.83	6,324.08	6,321.33	2.54	6,321.33	3.00	5.00	Full Capture	6,323.10	6,323.10	Standard	0.050	In Sag
INLET F2	6,324.91	6,324.16	6,321.18	5.66	6,321.18	5.00	3.00	Full Capture	6,323.34	6,323.33	Standard	0.050	In Sag
INLET H1	6,329.78	6,329.03	6,326.58	0.80	6,326.58	5.00	3.00	Full Capture	6,327.68	6,327.68	Standard	0.050	In Sag
INLET H2	6,329.70	6,328.95	6,326.50	4.51	6,326.50	5.00	3.00	Full Capture	6,327.70	6,327.69	Standard	0.050	In Sag
INLET I1	6,336.15	6,335.40	6,328.72	1.49	6,328.72	5.00	3.00	Full Capture	6,329.97	6,329.97	Standard	0.050	In Sag
INLET J1	6,336.33	6,335.58	6,329.42	1.62	6,329.42	5.00	3.00	Full Capture	6,330.64	6,330.64	Standard	0.050	On Grade

MEADOWBROOK

100 YEAR CONDUIT TABLE

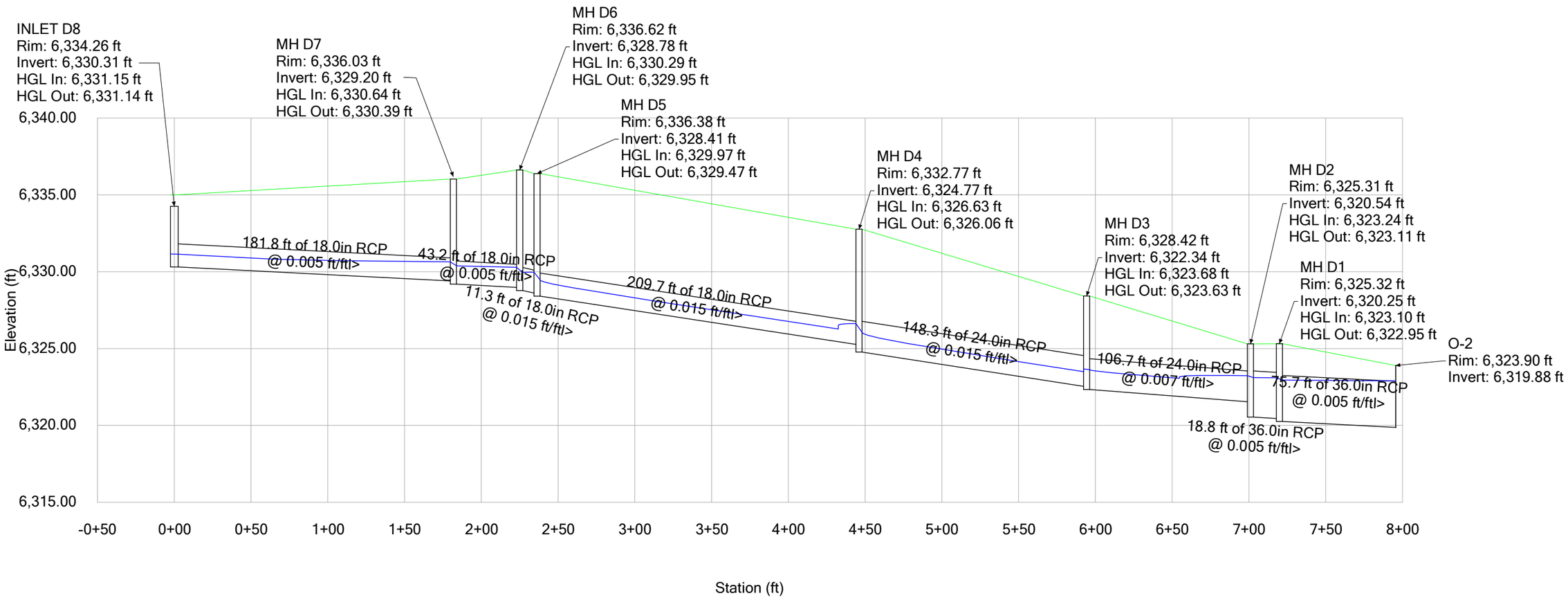
Label	Stop Node	Start Node	Invert (Stop) (ft)	Invert (Start) (ft)	Slope (Calculated) (ft/ft)	Length (User Defined) (ft)	Section Type	Diameter (in)	Manning's n	Velocity (ft/s)	Depth (Out) (ft)	Flow (cfs)	Capacity (Full Flow) (cfs)
1 (STRM)	O-1	MH A1	6,318.78	6,318.88	0.005	18.8	Circle	18.0	0.013	0.00	0.00	0.00	7.43
2 (STRM)	MH A1	MH A2	6,318.98	6,319.53	0.005	110.7	Circle	18.0	0.013	0.00	0.00	0.00	7.43
3 (STRM)	MH A2	MH A3	6,319.63	6,320.28	0.005	130.3	Circle	18.0	0.013	0.00	0.00	0.00	7.43
4 (STRM)	MH A3	INLET A4	6,320.38	6,320.74	0.005	72.7	Circle	18.0	0.013	0.00	0.00	0.00	7.41
5 (STRM)	MH A1	INLET B1	6,318.98	6,319.07	0.005	18.8	Circle	18.0	0.013	0.00	0.00	0.00	7.43
6 (STRM)	MH A2	INLET C1	6,319.63	6,319.77	0.005	27.2	Circle	18.0	0.013	0.00	0.00	0.00	7.43
7 (STRM)	O-2	MH D1	6,319.87	6,320.25	0.005	75.7	Circle	36.0	0.013	6.49	3.02	21.01	47.25
8 (STRM)	MH D1	MH D2	6,320.45	6,320.54	0.005	18.8	Circle	36.0	0.013	6.16	2.65	18.47	46.10
9 (STRM)	MH D2	MH D3	6,321.54	6,322.34	0.007	106.7	Circle	24.0	0.013	6.65	1.70	12.81	19.59
10 (STRM)	MH D3	MH D4	6,322.54	6,324.77	0.015	148.3	Circle	24.0	0.013	8.66	0.95	12.81	27.74
11 (STRM)	MH D4	MH D5	6,325.27	6,328.41	0.015	209.7	Circle	18.0	0.013	7.55	1.36	7.50	12.85
12 (STRM)	MH D5	MH D6	6,328.61	6,328.78	0.015	11.3	Circle	18.0	0.013	7.17	1.36	6.01	12.88
13 (STRM)	MH D6	MH D7	6,328.98	6,329.20	0.005	43.2	Circle	18.0	0.013	4.71	1.31	6.01	7.50
14 (STRM)	MH D7	INLET D8	6,329.40	6,330.31	0.005	181.8	Circle	18.0	0.013	4.38	1.24	4.39	7.43
15 (STRM)	MH D1	INLET E1	6,321.25	6,321.33	0.005	15.6	Circle	24.0	0.013	3.76	1.85	2.54	16.22
16 (STRM)	MH D2	MH F1	6,320.74	6,320.95	0.005	41.9	Circle	24.0	0.013	1.80	2.50	5.66	16.01
18 (STRM)	MH F1	INLET F2	6,321.15	6,321.18	0.005	5.3	Circle	24.0	0.013	1.80	2.18	5.66	15.88
19 (STRM)	MH D4	MH G1	6,325.27	6,326.25	0.005	196.6	Circle	18.0	0.013	4.56	1.36	5.31	7.42
20 (STRM)	MH G1	INLET H1	6,326.45	6,326.58	0.005	25.0	Circle	18.0	0.013	2.78	1.23	0.80	7.57
21 (STRM)	MH G1	INLET H2	6,326.45	6,326.50	0.005	9.0	Circle	18.0	0.013	4.44	1.23	4.51	7.51
22 (STRM)	MH D5	INLET I1	6,328.61	6,328.72	0.005	22.3	Circle	18.0	0.013	3.27	1.36	1.49	7.37
23 (STRM)	MH D7	INLET J1	6,329.40	6,329.42	0.005	4.5	Circle	18.0	0.013	3.44	1.24	1.62	7.67
CO-1	EX. MH	MH K1	6,313.67	6,314.30	0.004	158.1	Circle	30.0	0.013	4.47	0.86	6.80	26.08
PIPE -24 (STRM)	MH K3	DET OUTFALL	6,317.66	6,317.75	0.005	18.0	Circle	18.0	0.013	4.77	1.40	6.80	7.43
PIPE -25 (STRM)	MH K2	MH K3	6,316.11	6,317.46	0.005	270.8	Circle	18.0	0.013	4.76	1.01	6.80	7.42
PIPE -26 (STRM)	MH K1	MH K2	6,315.72	6,315.91	0.005	38.1	Circle	18.0	0.013	4.76	1.01	6.80	7.42

MEADOWBROOK

100 YEAR MANHOLE TABLE

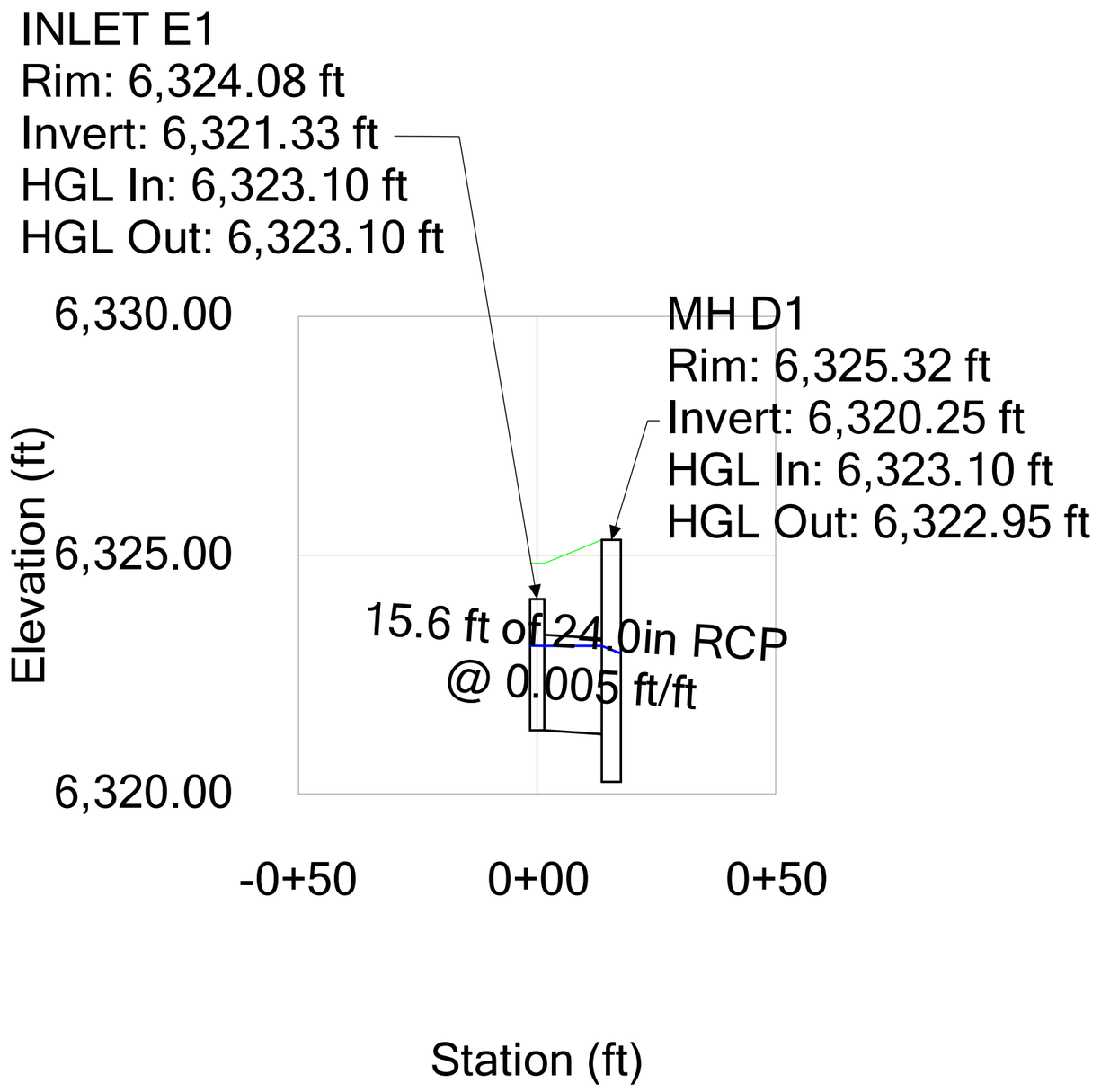
Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Elevation (Invert Out) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss Method	Headloss Coefficient (Standard)
6,336.62	6,336.62	6,328.78	6,328.78	6.01	6,329.95	6,330.29	Standard	1.320
6,336.38	6,336.38	6,328.41	6,328.41	7.50	6,329.47	6,329.97	Standard	1.020
6,336.03	6,336.03	6,329.20	6,329.20	6.01	6,330.39	6,330.64	Standard	1.020
6,332.77	6,332.77	6,324.77	6,324.77	12.81	6,326.06	6,326.63	Standard	1.020
6,329.37	6,329.37	6,326.25	6,326.25	5.31	6,327.19	6,327.68	Standard	1.520
6,328.42	6,328.42	6,322.34	6,322.34	12.81	6,323.63	6,323.68	Standard	0.100
6,325.32	6,325.32	6,320.25	6,320.25	21.01	6,322.95	6,323.10	Standard	1.020
6,325.31	6,325.31	6,320.54	6,320.54	18.47	6,323.11	6,323.24	Standard	1.020
6,324.65	6,324.65	6,320.95	6,320.95	5.66	6,323.26	6,323.33	Standard	1.320
6,323.59	6,323.59	6,317.47	6,317.46	6.80	6,318.59	6,319.06	Standard	1.320
6,322.49	6,322.49	6,320.28	6,320.28	0.00	6,320.28	6,320.28	Standard	0.000
6,322.14	6,322.14	6,318.88	6,318.88	0.00	6,318.88	6,318.88	Standard	0.000
6,321.79	6,321.79	6,315.92	6,315.91	6.80	6,317.02	6,317.06	Standard	0.100
6,321.74	6,321.74	6,319.53	6,319.53	0.00	6,319.53	6,319.53	Standard	0.000
6,320.68	6,320.68	6,314.51	6,314.30	6.80	6,315.18	6,315.58	Standard	1.320

MEADOWBROOK
100 YEAR STORM LINE D



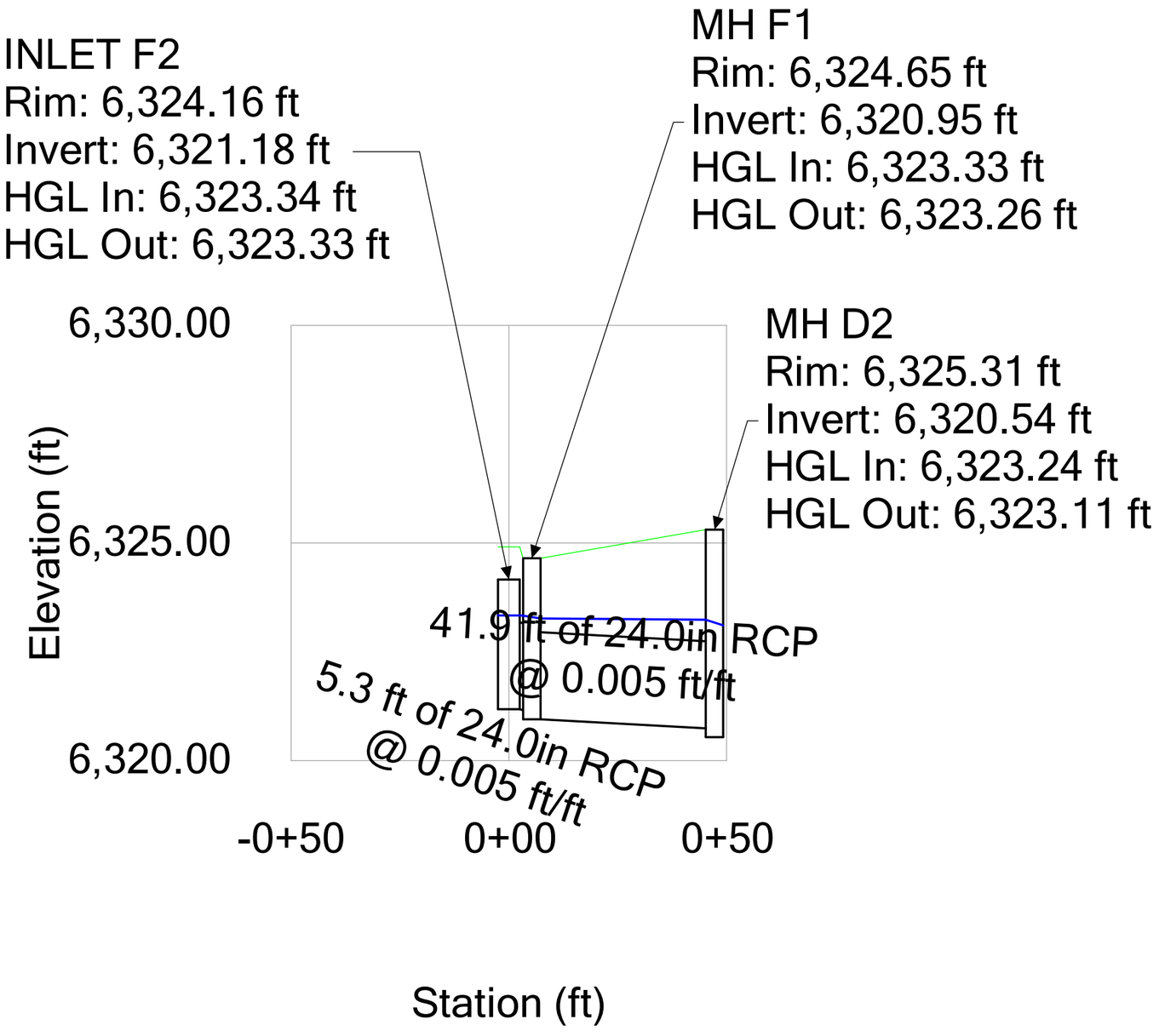
MEADOWBROOK

100 YEAR STORM LINE E



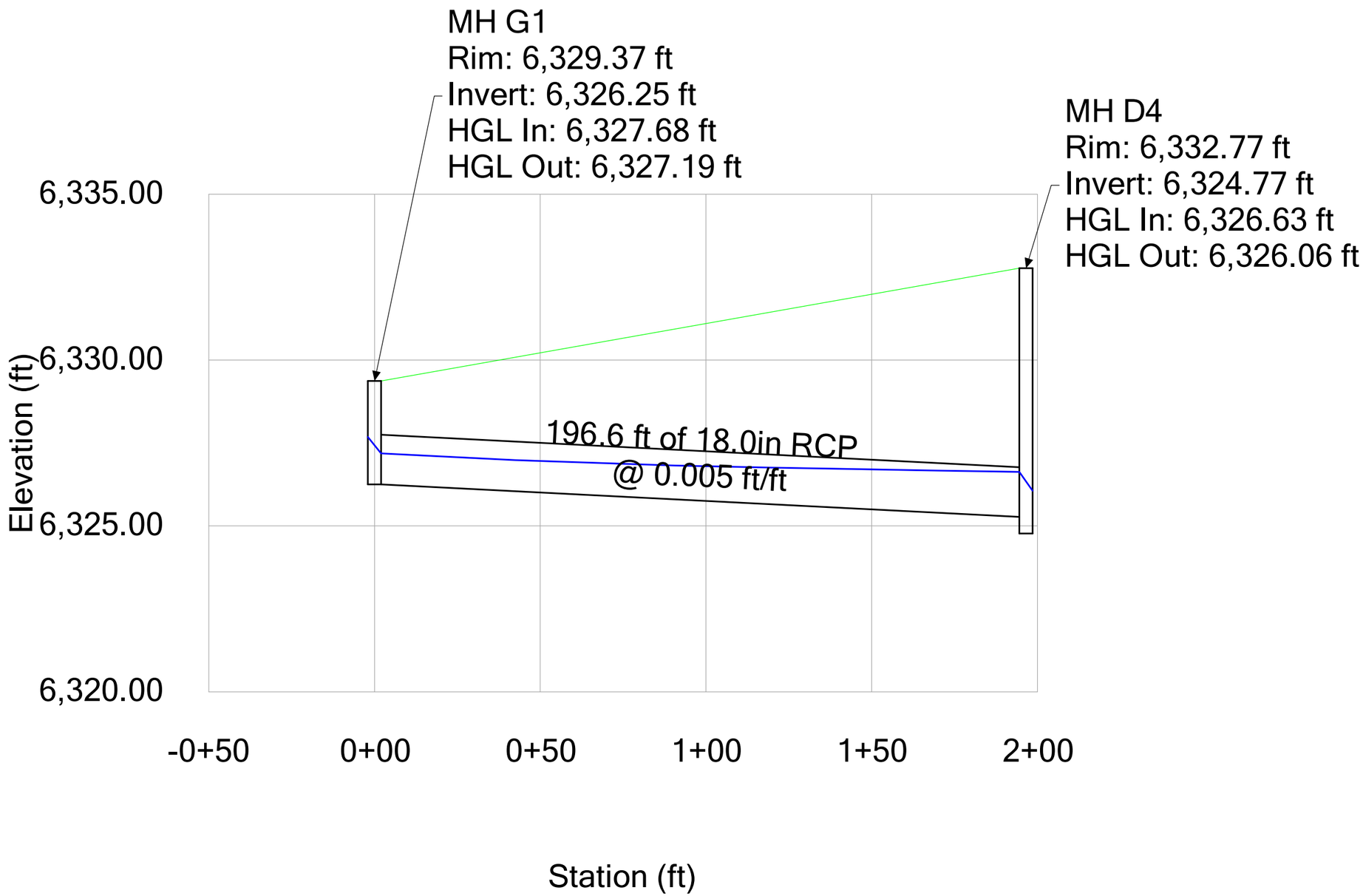
MEADOWBROOK

100 YEAR STORM LINE F



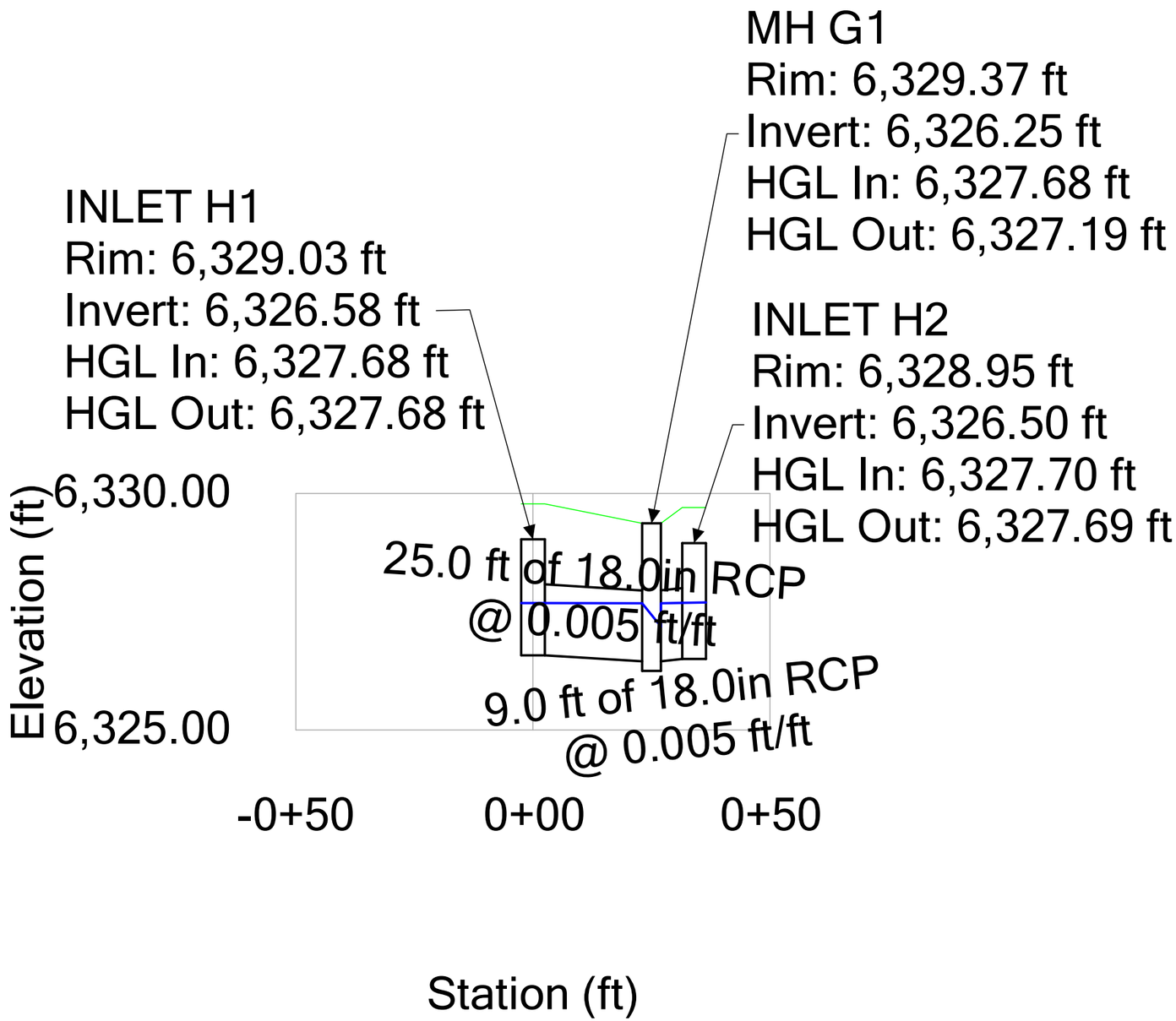
MEADOWBROOK

100 YEAR STORM LINE G



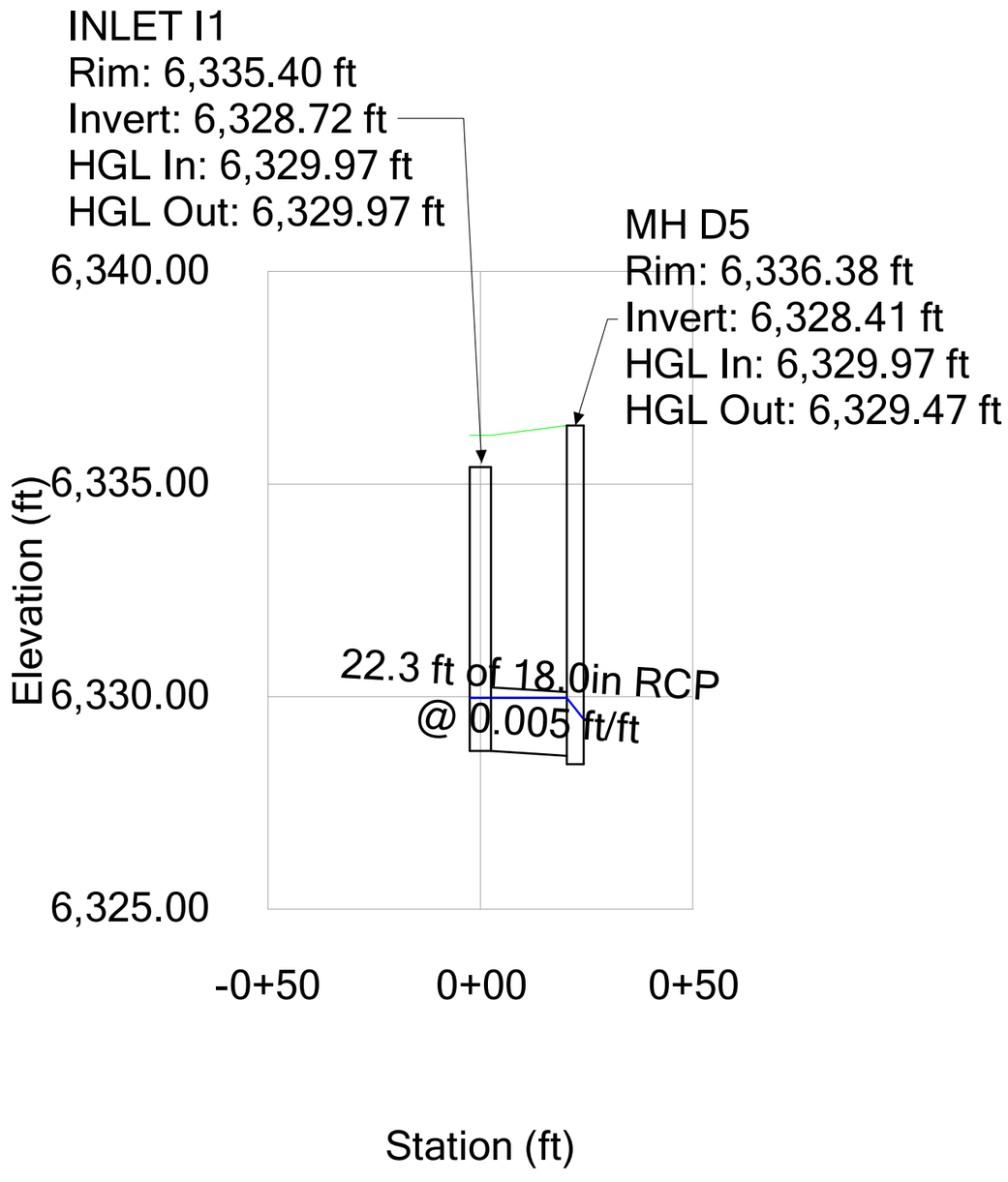
MEADOWBROOK

100 YEAR STORM LINE H



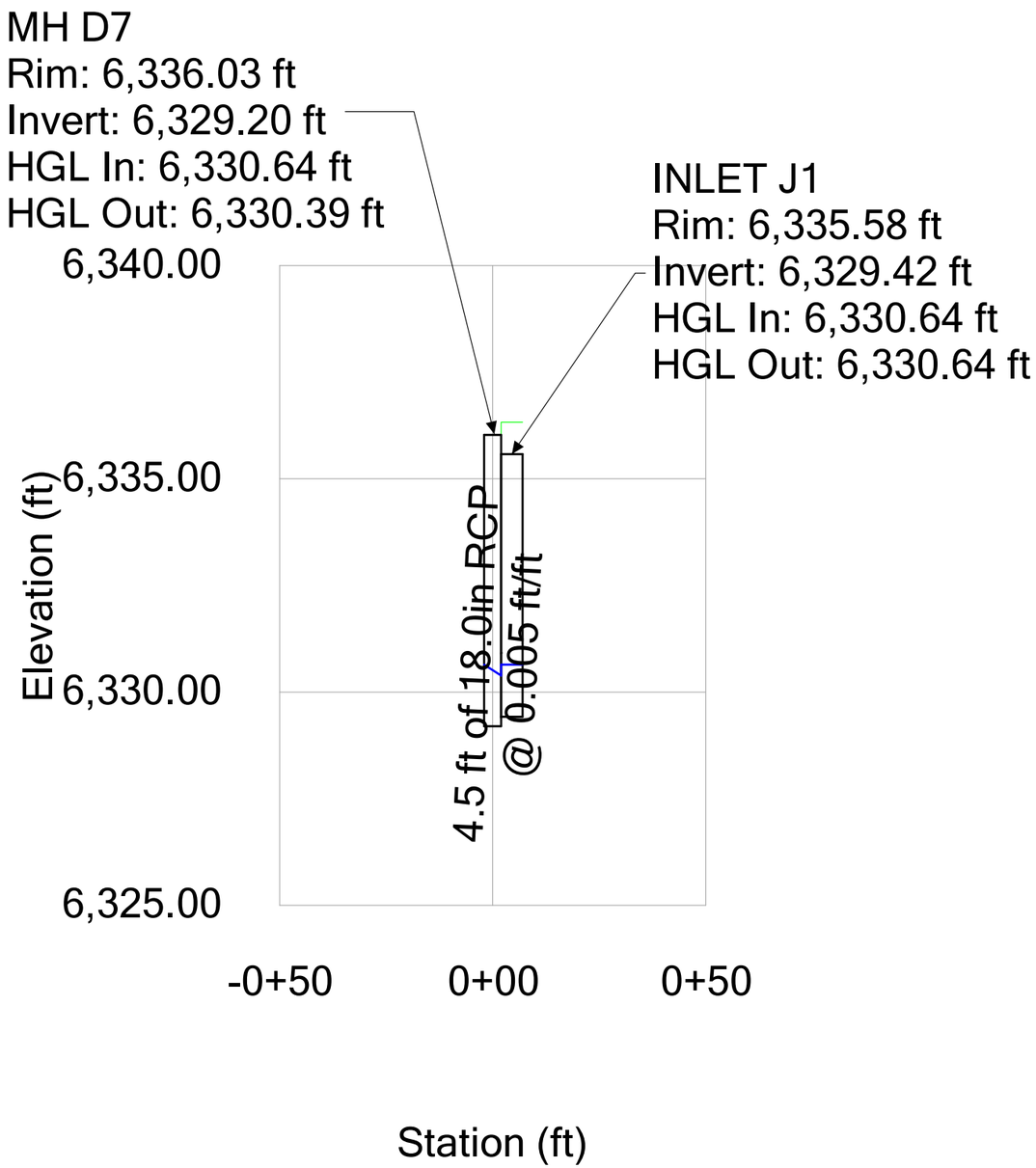
MEADOWBROOK

100 YEAR STORM LINE I

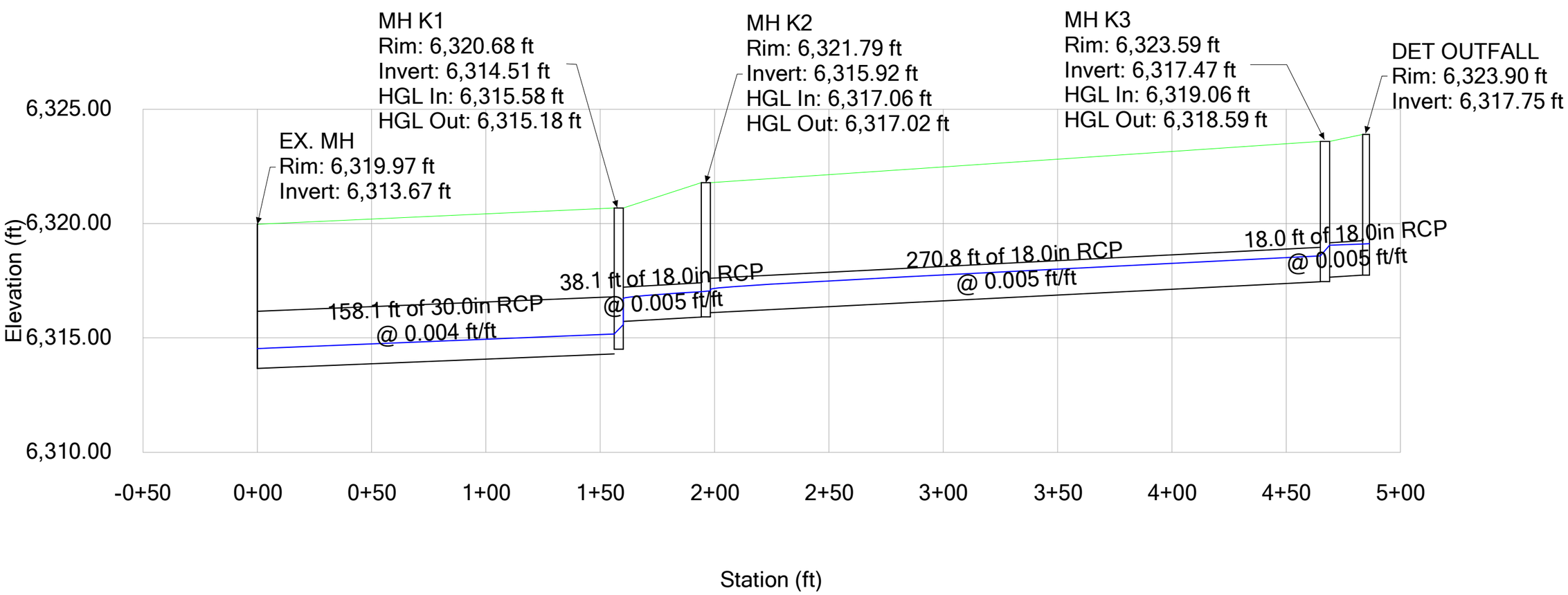


MEADOWBROOK

100 YEAR STORM LINE J



MEADOWBROOK
100 YEAR STORM LINE K

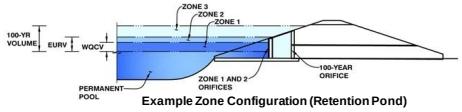


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Meadowbrook Park

Basin ID:



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	9.65	acres
Watershed Length =	1,090	ft
Watershed Length to Centroid =	350	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	37.80%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.140	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.389	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.283	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.382	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.461	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.621	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.774	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.977	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.412	acre-feet		inches
Approximate 2-yr Detention Volume =	0.247	acre-feet		
Approximate 5-yr Detention Volume =	0.328	acre-feet		
Approximate 10-yr Detention Volume =	0.405	acre-feet		
Approximate 25-yr Detention Volume =	0.504	acre-feet		
Approximate 50-yr Detention Volume =	0.573	acre-feet		
Approximate 100-yr Detention Volume =	0.671	acre-feet		

Define Zones and Basin Geometry

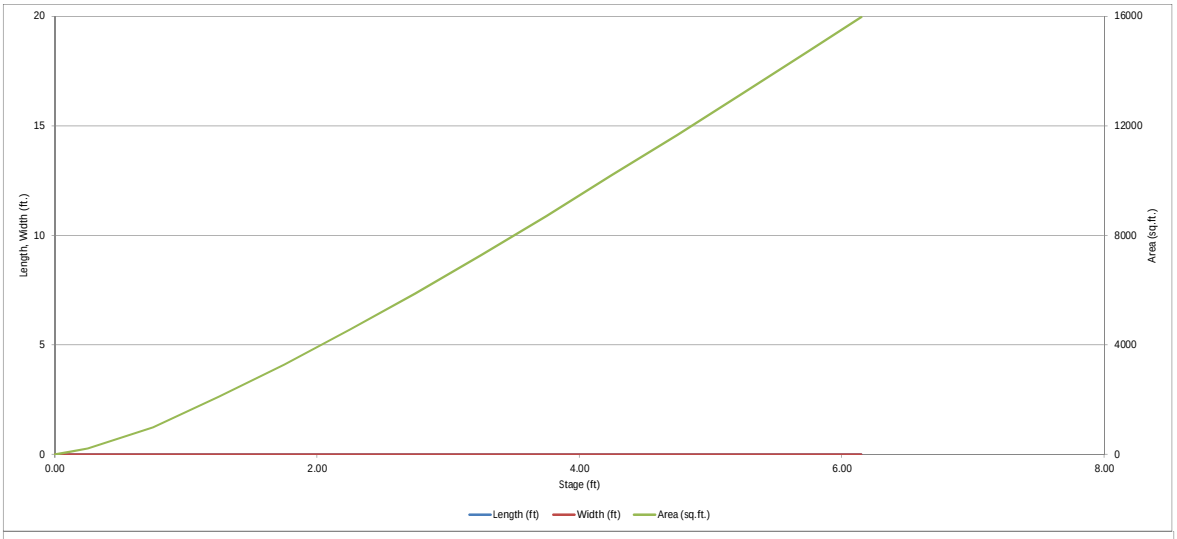
Zone 1 Volume (WQCV) =	0.140	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.249	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.282	acre-feet
Total Detention Basin Volume =	0.671	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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_{LW}) =	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

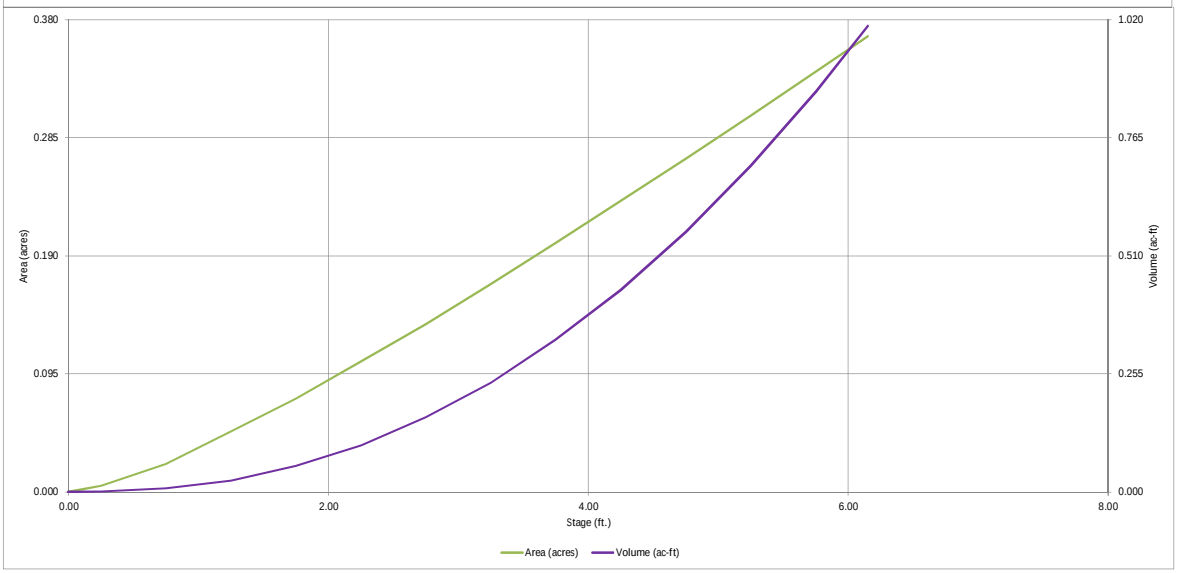
Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
6318	--	0.25	--	--	--	217	0.005	27	0.001
6318.5	--	0.75	--	--	--	982	0.023	327	0.008
6319	--	1.25	--	--	--	2,120	0.049	1,102	0.025
6319.5	--	1.75	--	--	--	3,269	0.075	2,450	0.056
6320	--	2.25	--	--	--	4,565	0.105	4,408	0.101
6320.5	--	2.75	--	--	--	5,867	0.135	7,016	0.161
6321	--	3.25	--	--	--	7,279	0.167	10,303	0.237
6321.5	--	3.75	--	--	--	8,714	0.200	14,301	0.328
6322	--	4.25	--	--	--	10,201	0.234	19,030	0.437
6322.5	--	4.75	--	--	--	11,681	0.268	24,500	0.562
6323	--	5.25	--	--	--	13,193	0.303	30,719	0.705
6323.5	--	5.75	--	--	--	14,735	0.338	37,701	0.865
6223.9	--	6.15	--	--	--	15,969	0.367	43,841	1.006

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



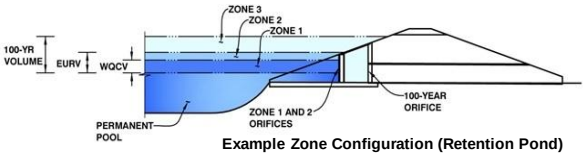


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Meadowbrook Park

Basin ID:



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.59	0.140	Orifice Plate
Zone 2 (EURV)	4.04	0.249	Orifice Plate
Zone 3 (100-year)	5.14	0.282	Weir&Pipe (Restrict)
Total (all zones)		0.671	

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 =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.04	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	16.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	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	1.35	2.69					
Orifice Area (sq. inches)	0.74	0.74	3.14					

	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 =	5.14	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.14	N/A	feet
Overflow Weir Front Edge Length =	9.00	N/A	feet	Overflow Weir Slope Length =	9.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	96.57	N/A	
Horiz. Length of Weir Sides =	9.00	N/A	feet	Overflow Grate Open Area w/o Debris =	56.70	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	28.35	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 =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.59	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.32	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.60		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.30	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.15	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.41	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	6.56	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.37	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.01	acre-ft

Calculated Parameters for Spillway

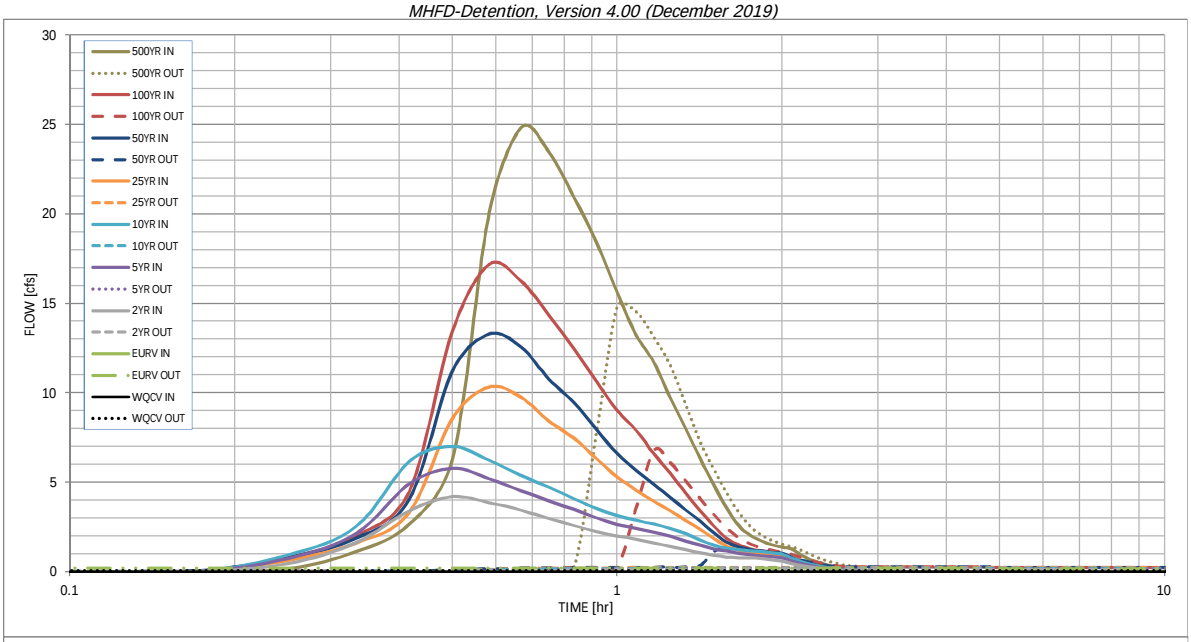
Routed Hydrograph Results

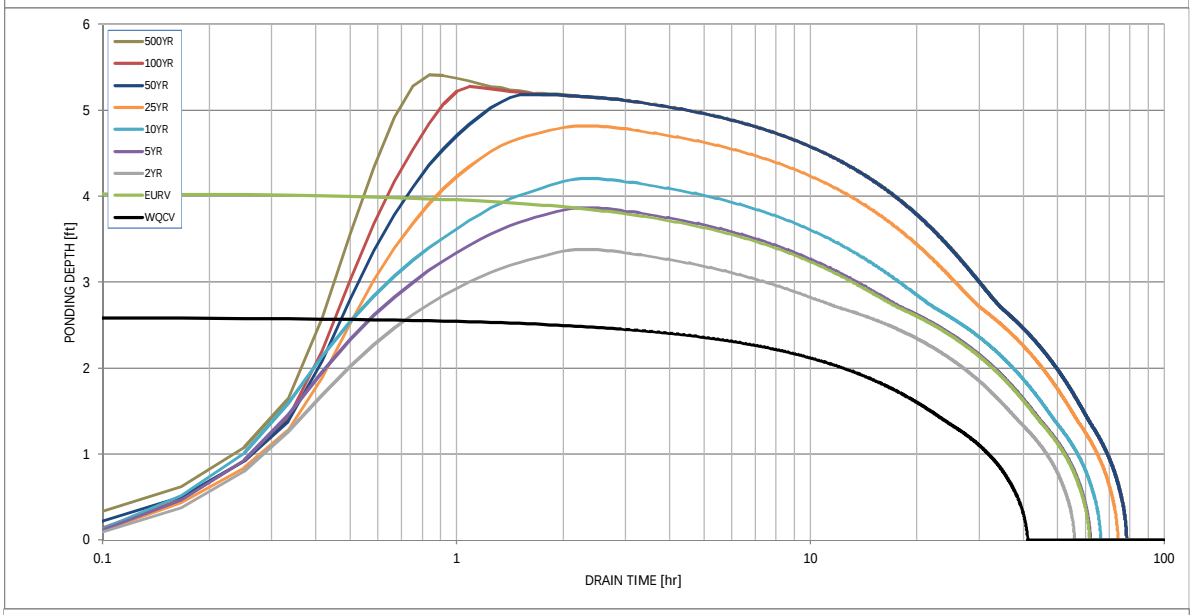
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

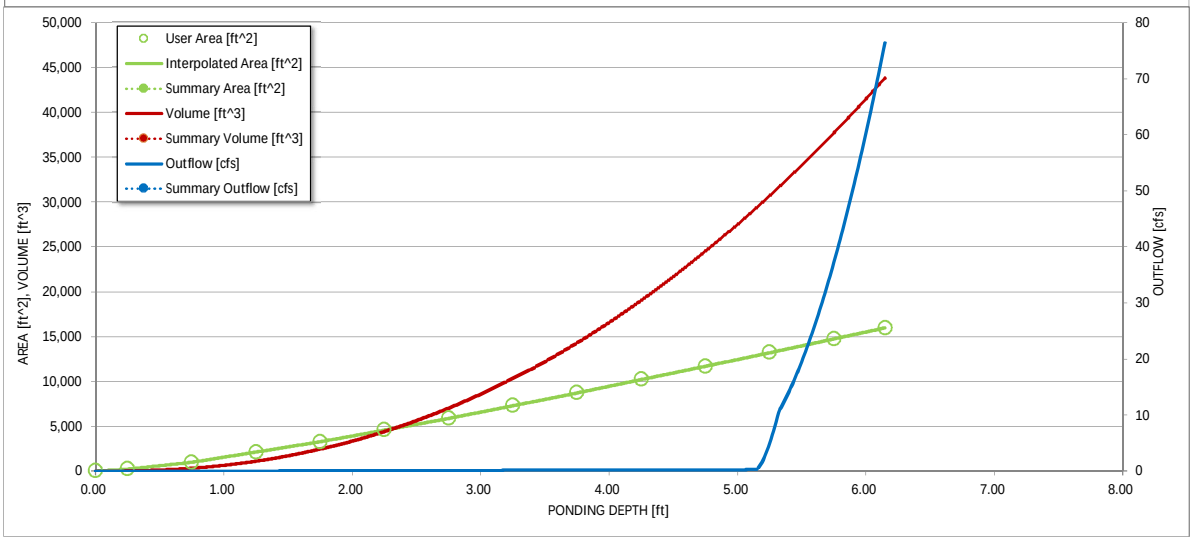
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.140	0.389	0.283	0.382	0.461	0.621	0.774	0.977	1.412
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.283	0.382	0.461	0.621	0.774	0.977	1.412
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.2	2.1	4.3	7.0	12.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.22	0.44	0.72	1.29
Peak Inflow Q (cfs) =	N/A	N/A	4.2	5.8	7.0	10.3	13.3	17.2	24.8
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.2	0.3	1.4	6.8	14.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	0.9	0.1	0.3	1.0	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.1
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	54	50	54	57	63	65	63	58
Time to Drain 99% of Inflow Volume (hours) =	40	58	53	59	62	69	73	72	70
Maximum Ponding Depth (ft) =	2.59	4.04	3.38	3.86	4.20	4.82	5.18	5.27	5.41
Area at Maximum Ponding Depth (acres) =	0.13	0.22	0.18	0.21	0.23	0.27	0.30	0.30	0.31
Maximum Volume Stored (acre-ft) =	0.140	0.389	0.257	0.351	0.425	0.579	0.684	0.711	0.755

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			

Figure 13-12c. Emergency Spillway Protection

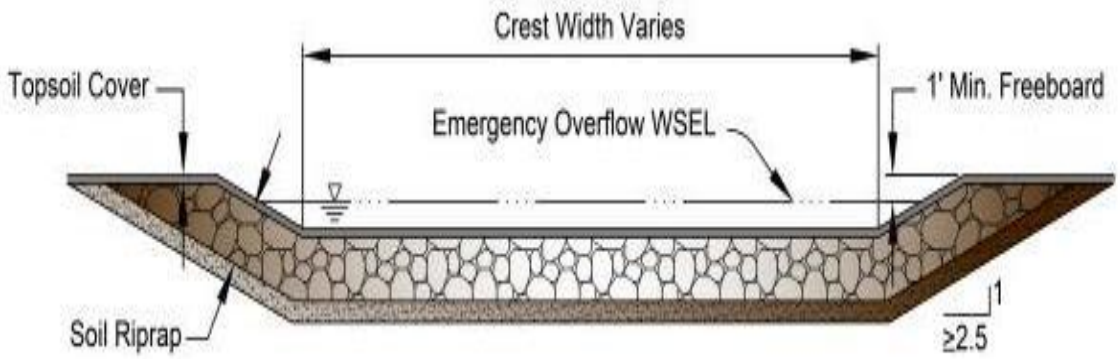
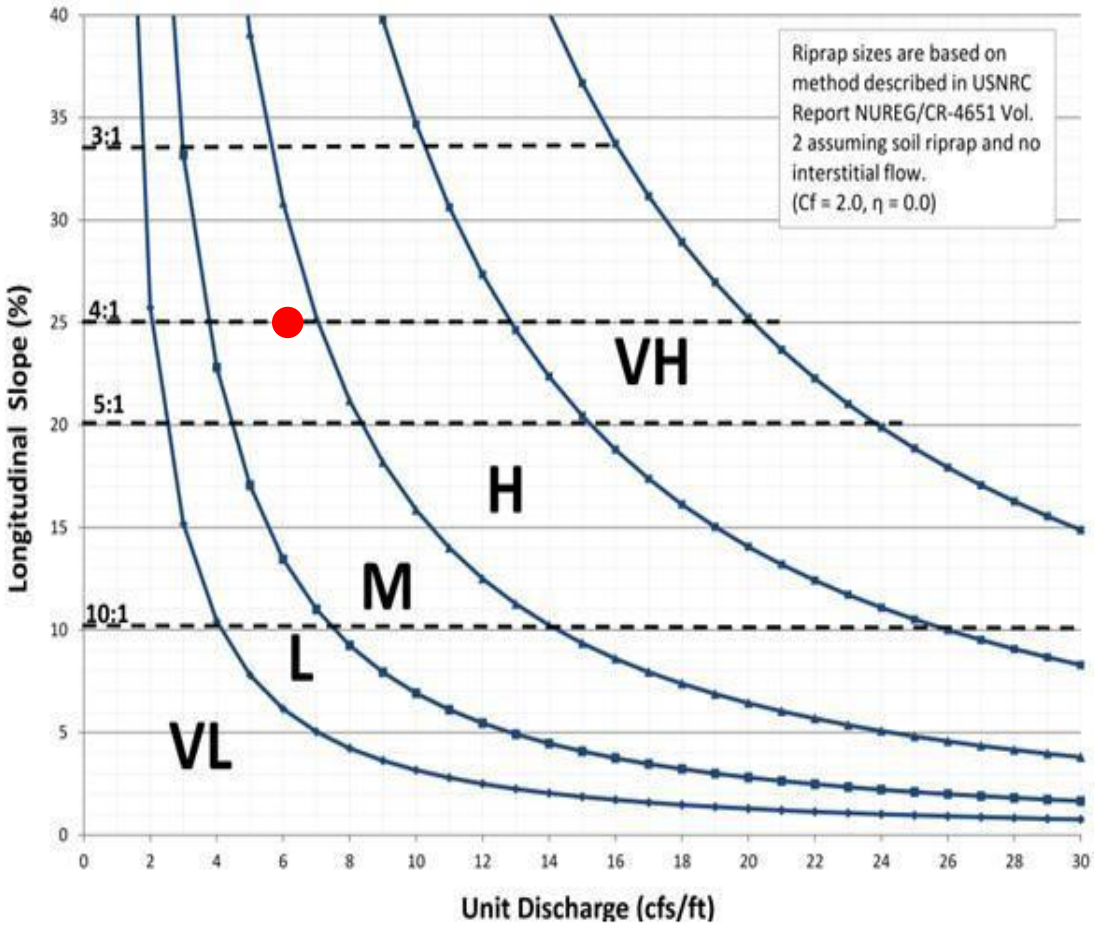


Figure 13-12d. Riprap Types for Emergency Spillway Protection



Kimley»Horn

Extended Detention Basin (EDB) Calculations

Date	10/9/2020
Prepared By	KRK
Checked By	JRH

			Required (CF)	Provided (CF)
Minimum Forebay Volume Required	2% of the WQCV	40hr drain time a = 1 I = 0.378 A = 3.94 AC	49.76	74.25

	Required	Provided
Maximum Forebay Depth	18" Max	18"

$$WQCV = a(0.91I^3 - 1.19I^2 + 0.78I)$$ Equation 3-1

Where:

WQCV = Water Quality Capture Volume (watershed inches)

a = Coefficient corresponding to WQCV drain time (Table 3-2)

I = Imperviousness (%/100) (see Figures 3-3 through 3-5 [single family land use] and /or the *Runoff* chapter of Volume 1[other typical land uses])

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hrs)	Coefficient, a
12 hours	0.8
24 hours	0.9
40 hours	1.0

Kimley»Horn

Extended Detention Basin (EDB) Calculations

Date	10/9/2020
Prepared By	KRK
Checked By	JRH

			Required (CF)	Provided (CF)
Minimum Forebay Volume Required	2% of the WQCV	40hr drain time a = 1 I = 0.378 A = 1.81 AC	22.86	74.25

	Required	Provided
Maximum Forebay Depth	18" Max	18"

$$WQCV = a(0.91I^3 - 1.19I^2 + 0.78I)$$ Equation 3-1

Where:

WQCV = Water Quality Capture Volume (watershed inches)

a = Coefficient corresponding to WQCV drain time (Table 3-2)

I = Imperviousness (%/100) (see Figures 3-3 through 3-5 [single family land use] and /or the *Runoff* chapter of Volume 1[other typical land uses])

Table 3-2. Drain Time Coefficients for WQCV Calculations

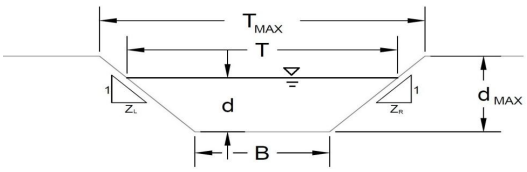
Drain Time (hrs)	Coefficient, a
12 hours	0.8
24 hours	0.9
40 hours	1.0

Version 4.06 Released August 2018

AREA INLET IN A SWALE

Meadowbrook Park

Design Point 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 =	0.020	
Channel Invert Slope	S_O =	0.0010	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Slope	Z2 =	4.00	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	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	8.00	8.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.00	1.00	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	5.8	5.8	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	0.1	cfs
Water Depth	d =	0.09	0.23	feet

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

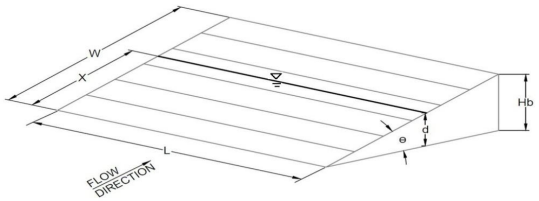
Meadowbrook Park

Design Point 2

Inlet Design Information (Input)

Type of Inlet: CDOT Type C (Depresse

Inlet Type = CDOT Type C (Depressed)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	feet
Length of Grate	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.84	
Orifice Coefficient	C_o =	0.56	
Weir Coefficient	C_w =	1.81	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.09	1.23	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**14.9**	**15.8**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

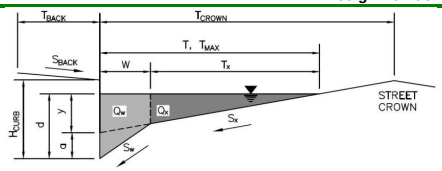
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 3



Gutter Geometry (Enter data in the blue cells)

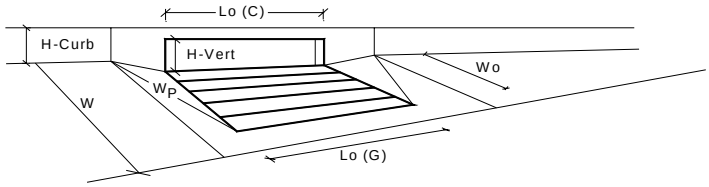
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	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

Version 4.06 Released August 2018



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} =	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 =	4.6	6.0	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} =	0.22	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.44	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.84	0.93	
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 =**	**4.0**	**8.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.6	7.7	cfs

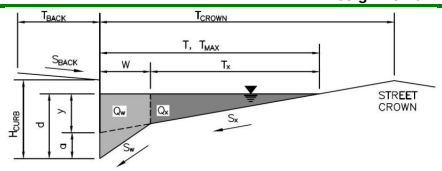
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 4



Gutter Geometry (Enter data in the blue cells)

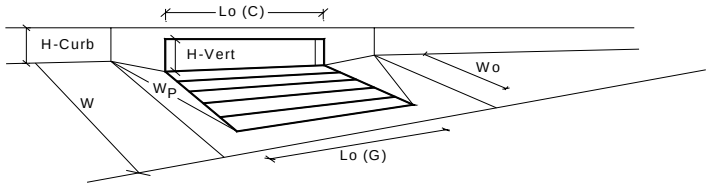
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	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

Version 4.06 Released August 2018



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} =	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 =	4.2	6.0	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) =	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	

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} =	0.18	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.53	0.77	
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 =**	**2.1**	**5.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.3	cfs

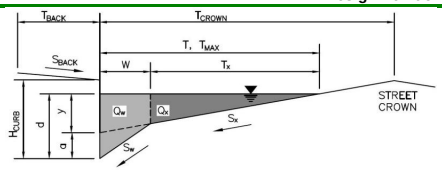
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 5



Gutter Geometry (Enter data in the blue cells)

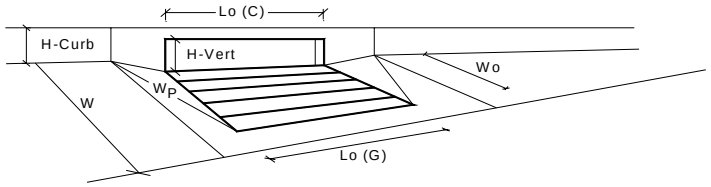
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	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

Version 4.06 Released August 2018



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} =	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 =	4.2	6.0	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} =	0.18	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.39	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.80	0.93	
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 =**	**2.8**	**8.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.5	5.7	cfs

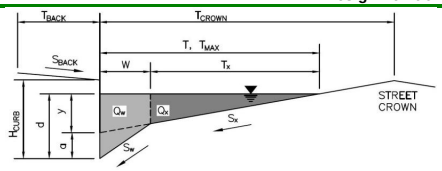
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 6



Gutter Geometry (Enter data in the blue cells)

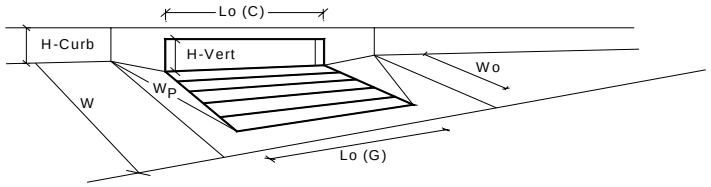
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	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

Version 4.06 Released August 2018



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} =	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 =	4.4	4.4	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) =	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	
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} =	0.20	0.20	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.56	0.56	
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 =**	**2.5**	**2.5**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	1.4	2.5	cfs

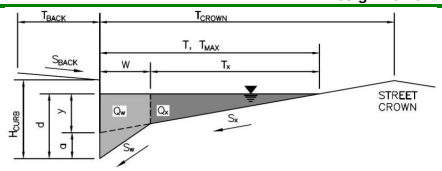
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 7



Gutter Geometry (Enter data in the blue cells)

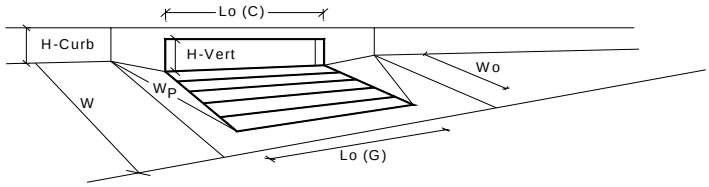
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	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} =	0.016	

		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	6.0	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

Version 4.06 Released August 2018



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} =	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 =	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) =	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	
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	$RF_{Combination}$ =	0.72	0.72	
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 =**	**4.6**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.4	0.8	cfs

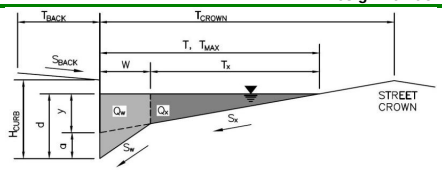
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 8



Gutter Geometry (Enter data in the blue cells)

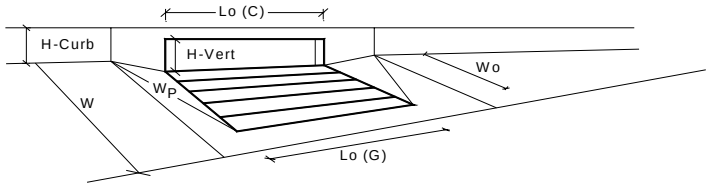
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	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} =	0.016	

		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	6.0	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

Version 4.06 Released August 2018



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} =	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 =	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) =	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	
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	$RF_{Combination}$ =	0.72	0.72	
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 =**	**4.6**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	4.5	cfs

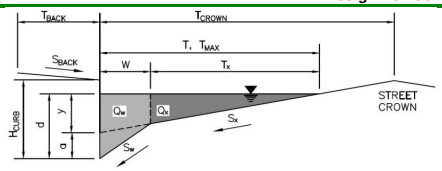
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 9



Gutter Geometry (Enter data in the blue cells)

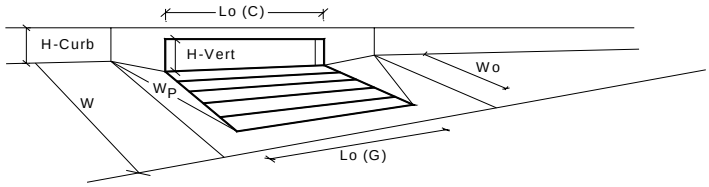
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	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

Version 4.06 Released August 2018



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} =	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 =	4.2	6.0	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} =	0.18	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.39	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.80	0.93	
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 =**	**2.8**	**8.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	4.4	cfs

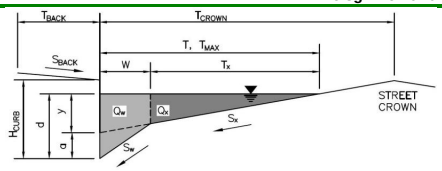
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Deisgn Point 10



Gutter Geometry (Enter data in the blue cells)

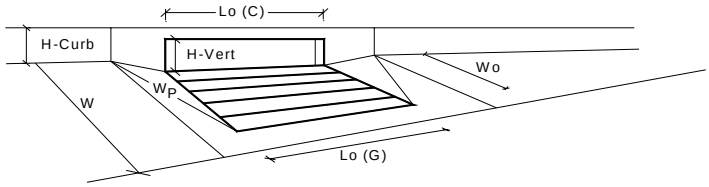
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	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

Version 4.06 Released August 2018



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} =	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 =	4.2	4.2	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) =	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	
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} =	0.18	0.18	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} =	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 =**	**2.1**	**2.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.8	1.6	cfs

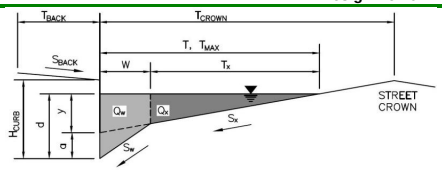
Version 4.06 Released August 2018

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

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

Project: Meadowbrook Park

Inlet ID: Design Point 11



Gutter Geometry (Enter data in the blue cells)

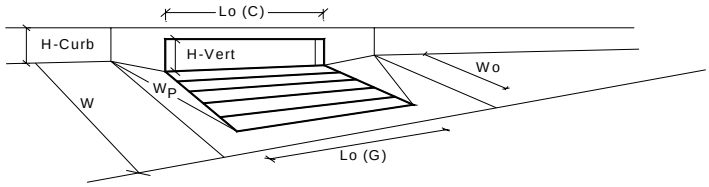
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.018	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	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

Version 4.06 Released August 2018



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} =	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 =	4.2	4.2	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) =	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	

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} =	0.18	0.18	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} =	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 =**	**2.1**	**2.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.8	1.5	cfs

Rip-Rap Calculation

Grass lined Swale outfall to Pond

.

Applicable Equations:

$L_p = (1/2\tan\Theta)(A_t/Y_t-D)$	Equation 9-11 per USCDM
$A_t = Q/V$	Equation 9-12 per USDCM
$\Theta = \tan^{-1}(1/(2*\text{ExpansionFactor}))$	Equation 9-13 per USDCM
$W = 2(L_p\tan\Theta)+D$	Equation 9-14 per USDCM
$T = 2D_{50}$	Equation 9-15 per USDCM

Assumptions

Maximum Major Event Velocity is 7fps for FES outletting into trickle channels

Input parameters:

Description		Variable	Input	Unit
Width of the conduit (use diameter for circular conduits),		D:	10.00	ft
HGL Elevation			6621.50	ft
Invert Elevation			6621.00	ft
Tailwater depth (ft),		Y_t:	0.50	ft
Expansion angle of the culvert flow		Θ:	0.51	radians
Design discharge (cfs)*		Q:	9.67	cfs
Froude Number		F_r	0.03	Subcritical
Unitless Variables for Tables:				
	For Figure 9-35	$Q/D^{2.5}$	0.03	
	For Figure 9-35	Y_t/D	0.05	
	For Figure 9-38	$Q/D^{1.5}$	0.31	
	For Figure 9-38	Y_t/D	0.05	
Allowable non-eroding velocity in the downstream channel (ft/sec)		V:	7	ft/sec
Expansion Factor (Figure 9-35), 1/(2tan(θ))			0.9	

Solve for:

Description	Variable	Output	Unit
1. Required area of flow at allowable velocity (ft^2)	A_t:	1.38	ft^2
2. Length of Protection	L_p:	-6.51	ft
	L_p < 3D?	Yes	
	L_{pmin}:	30.00	ft
3. Width of downstream riprap protection	W:	16.00	ft
4. Rip Rap Type (Figure 9-38)	-	L	
5. Rip Rap Size (Figure 8-34)	D_{50}:	9	inches

Rip Rap Summary

Length	L_p	30.00	ft
Width	W	16.00	ft
Size	D_{50}	9	inches
Type	-	L	-
Thickness	T	18	inches

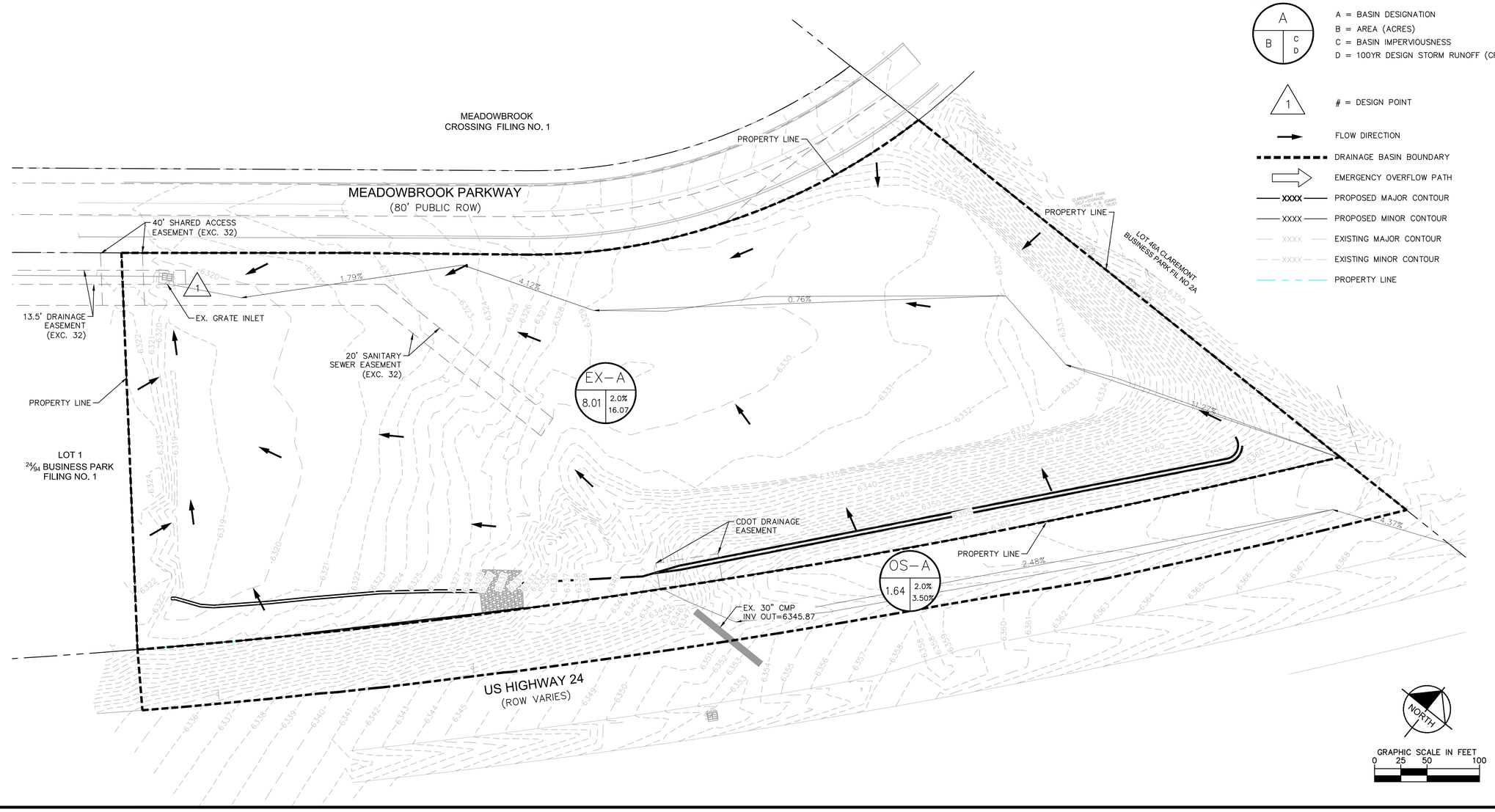
EXISTING AND PROPOSED DRAINAGE MAP

GENERAL NOTES

1. THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.

SUMMARY - EXISTING RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX-A	8.01	2.19	16.07		
2	OS-A	1.64	0.48	3.50		
TOTAL		9.65	2.66	19.57		



LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = BASIN IMPERVIOUSNESS
D = 100YR DESIGN STORM RUNOFF (CFS)

= DESIGN POINT

FLOW DIRECTION

DRAINAGE BASIN BOUNDARY

EMERGENCY OVERFLOW PATH

XXXX PROPOSED MAJOR CONTOUR

XXXX PROPOSED MINOR CONTOUR

XXXX EXISTING MAJOR CONTOUR

XXXX EXISTING MINOR CONTOUR

PROPERTY LINE

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2020 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue Suite 300
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: KK
DRAWN BY: KK
CHECKED BY: JH
DATE: 10/9/2020

MEADOWBROOK PARK
EL PASO COUNTY, COLORADO
CONSTRUCTION DOCUMENTS
EXISTING DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
096956009

SHEET

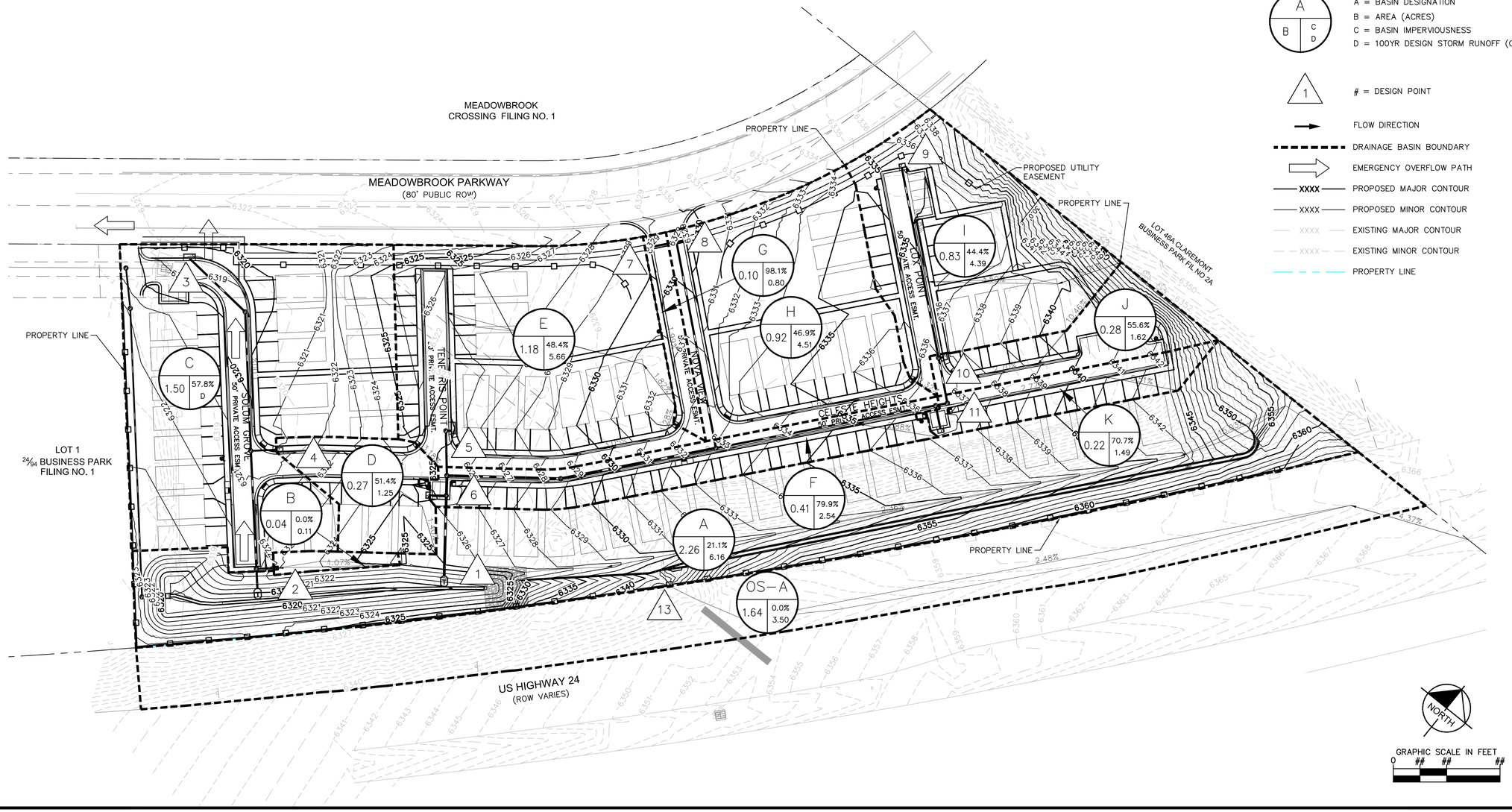
K:\COS_Civil\096956009_Meadowbrook\CADD\PlanSheets\096956009-EXIST DRMP.dwg Kofford, Kevin 10/9/2020 5:20 PM

GENERAL NOTES

1. THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	A	2.26	1.86	6.16		
2	B	0.04	0.01	0.11		
3	C	1.50	3.57	7.69		
4	D	0.27	0.55	1.25		
5	E	1.18	2.47	5.66		
6	F	0.41	1.42	2.54		
7	G	0.10	0.44	0.80		
8	H	0.92	1.94	4.51		
9	I	0.83	1.86	4.39		
10	J	0.28	0.75	1.62		
11	K	0.22	0.75	1.49		
12	OS-A	1.64	0.48	3.50		
TOTAL		9.65	16.10	39.70		



LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = BASIN IMPERVIOUSNESS
D = 100YR DESIGN STORM RUNOFF (CFS)

= DESIGN POINT

FLOW DIRECTION

DRAINAGE BASIN BOUNDARY

EMERGENCY OVERFLOW PATH

XXXX PROPOSED MAJOR CONTOUR

XXXX PROPOSED MINOR CONTOUR

XXXX EXISTING MAJOR CONTOUR

XXXX EXISTING MINOR CONTOUR

PROPERTY LINE

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2020 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue Suite 300
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: KK
DRAWN BY: KK
CHECKED BY: JH
DATE: 10/9/2020

MEADOWBROOK PARK
EL PASO COUNTY, COLORADO
CONSTRUCTION DOCUMENTS
PROPOSED DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
096956009

SHEET

K:\COS_Civil\096956009_Meadowbrook\CADD\PlanSheets\096956009-DRMP.dwg Kofford, Kevin 10/12/2020 4:23 PM