FINAL DRAINAGE REPORT
FOR
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2

Prepared For:

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November 2022
Project No. 25188.10

Prepared By:
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PCD Filing No.:
SF-22-18

J·R ENGINEERING

ENGINEER'S 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 El Paso 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.

COLORADO LICENSED MIKE BRAMLETT 32314 9/9/22 PROFESSIONAL ENGINEER

Mike Bramlett, Colorado P.E. 32314
For and On Behalf of JR Engineering, LLC

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: SR Land, LLC

By:

Title: MANAGER

Address: 20 Boulder Crescent, Suite 200
Colorado Springs, CO 80903

El Paso County:

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

Joshua Palmer, P.E. Date
County Engineer/ ECM Administrator

Conditions:

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APPENDIX

PURPOSE

This document is intended to serve as the Final Drainage Report for Homestead North at Sterling Ranch Filing No. 2. The purpose of this report is to identify on-site and off-site drainage patterns, storm sewer, culvert and inlet locations, areas tributary to the site, and to safely route developed storm water to adequate outfall facilities. The proposed use is a permissible use within the residential service zoning criteria.

GENERAL SITE DESCRIPTION

GENERAL LOCATION

Homestead North at Sterling Ranch Filing No. 2 and the undeveloped land to the north (hereby referred to as the “site”) is a proposed development Single-Family SF residential, urban (RS-6000) with a total area of approximately 36.30 acres.

The site is located in a portion of the SW ¼ of the SW ¼ of Section 27, the East ½ of section 28 and NE ¼ of section 33, Township 12 South, Range 65 West of the Sixth Principal Meridian in the County of El Paso, State of Colorado. The site is located immediately east of Vollmer Road. The site is bounded by Homestead North at Sterling Ranch Filing No. 1 to the south, Vacant land and Retreat at Timber Ridge Filing 1 to the north and Sand Creek borders the site to east. Refer to the vicinity map in Appendix A for additional information.

DESCRIPTION OF PROPERTY

The site is currently being designed to accommodate approximately 74 single-family residential lots and (totaling approximately 36.3 platted acres). The site is comprised of variable sloping grasslands that generally slope(s) downward to the east at 3 to 7% towards Sand Creek.

Soil characteristics are comprised of Type B hydrologic Soil groups. Refer to the soil survey map in Appendix A for additional information.

The Sand Creek borders the eastern portion of the site. Currently, JR Engineering is performing studies and plans to address Sand Creek stabilization directly adjacent to the site. This project corresponds to PCD Project Number CDR-20-004.

There are no known irrigation facilities located on the project site.

FLOODPLAIN STATEMENT

Based on the FEMA Firm Maps Number 08041C0535G revised December 7, 2018, the vast majority of the development is located within Zone X, or areas area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The eastern property boundary will be platted to the center of Sand creek, placing a portion of the site within Zone AE. The area of disturbance for site grading is located outside of the delineated floodway within Zone X. The FEMA map containing the site has been presented in Appendix A. The plat for Homestead North at Sterling Ranch Filing No. 2 is anticipated to be recorded prior to a LOMR for channel improvement. It is anticipated that the floodplain improvements will result in a no-rise condition and will not adversely impact the Homestead Filing No. 2 development and surrounding developments.

EXISTING DRAINAGE CONDITIONS

MAJOR BASIN DESCRIPTIONS

The site lies within the Sand Creek Drainage Basin based **o**n the “Sand Creek Drainage Basin Planning Study” (DBPS) completed by Kiowa Engineering Corporation in January 1993, revised March 1996. The Sand Creek Drainage Basin covers approximately 54 square miles and is divided into major sub-basins. The site is within the respective sub-basin is shown in Appendix D.

The site generally drains from north to south consisting of rolling hills. Currently, the site is used as pasture land for cattle. Sand Creek is located adjacent to the east portion of the site running north to south. This reach of drainage conveyance is not currently improved. Currently, JR engineering is performing studies and plans to address Sand Creek stabilization adjacent to the site. It is anticipated that the channel improvements will be in place prior to the development of the site. The design presented herein is coordinated with the proposed channel improvements presented in the "Sand Creek Restoration Public Improvement Plans" by JR Engineering. This project corresponds to PCD Project Number CDR-20-004.

The proposed drainage on the site closely follows the approved "Master Development Drainage Plan for Sterling Ranch", (MMDP) prepared by M&S Civil Consultants, Inc., dated October 24, 2018 and the “Preliminary Drainage Report And MDDP Addendum For Homestead North At Sterling Ranch Preliminary Plan”, prepared by JR Engineering, dated January 2022. The Homestead North Filing No. 2 detention facility closely follows the drainage patterns of pond B in the preliminary drainage report. The Homestead North preliminary drainage report map and WQ map is shown within Appendix E of this report.

EXISTING SUB-BASIN DRAINAGE

The existing/ predeveloped site consists of five basins (H1 through H5). These existing basins outfall to Sand Creek at four outfalls as shown in the Historic Drainage Map in Appendix E. One of the basins drains onto the Homestead North Filing No site and is treated in the Homestead North Filing No. 1 Full spectrum detention facility. A sub-division to the north of the site is being developed called "Retreat at Timberidge". Runoff from this sub-division will be detained and will not impact storm-water runoff on the Sterling Ranch Homestead site.

Basin H-1 (Q5 = 1.2 cfs, Q100 = 7.7 Cfs) is 5.36 acres, and 3% impervious of undeveloped land east of Vollmer road. This basin consists of native grass and an existing interim swale constructed during Homestead North at Sterling Ranch Fil. 1. The runoff from this basin drains into an existing interim swale constructed with Homestead North at Sterling Ranch Filing No. 1. Runoff from this basin drains directly into Sand Creek at design point 1h.

Basin H-2 (Q5 = 10.6 cfs, Q100 = 70.7 cfs) is 49.40 acres, and 2% impervious of undeveloped land adjacent east of Vollmer Road; the northern boundary of this basin borders Retreat at Timber Ridge to the north. The runoff from this basin is collected in existing drainage draws; the runoff from this basin drains directly into Sand Creek at design point 2h.

Basin H-3 (Q5 = 0.5 cfs, Q100 = 2.9 cfs) is 1.57 acres, 4% impervious of undeveloped land with a trail adjacent to Vollmer Road. The runoff from this basin drains to the Homestead Filing No. 1 Storm Drainage infrastructure and is treated in the Filing No. 1 pond. For additional information on the Homestead North Filing No. 1 drainage infrastructure refer to the proposed Filing No. 1 drainage map within Appendix D of this report.

Basin H-4 (Q5 = 0.6 cfs, Q100 = 3.4 cfs) is 1.85 acres, and 3% impervious of undeveloped land. The runoff from this Basin drains directly into Sand Creek at design point 4h.

Basin H-5 (Q5 = 1.1 cfs, Q100 = 7.2 cfs) is 3.97 acres, and 2% impervious of undeveloped land. The runoff from this basin drains directly in Sand Creek at design point 5h.

PROPOSED / FUTURE DRAINAGE CONDITIONS

At the time when Filing No. 2 is developed, it is anticipated that Filing 3 to the north, will still remain undeveloped. However, Filing 3 is planned to be developed shortly after Filing No. 2's construction is completed. For the purposes of this report, the proposed condition map and basin analysis analyzed the Filing No. 3 tributary areas as undeveloped. These areas are represented by basins OS-1, OS-2, and OS-3 as described below and as shown on the Proposed Drainage Map included in Appendix E.

The "Ultimate" condition assumes that Filing No. 3 is fully developed and constructed. This condition has been analyzed as described below and is represented by the "Future Drainage Map" included in appendix E. Basins F1-F5 represent the fully-developed tributary areas part of Filing No. 3. All storm sewer sizing and pond sizing/water quality sizing is based off of the fully developed ultimate/future conditions.

Upon future development of Homestead North Filing No. 3, a final drainage report for Filing No. 3 will be required to confirm that the Ultimate Conditions of the Filing No. 3 tributary areas have remained consistent with the analysis included in this report.

Basin OS1 is part of the future Filing No. 3 development, but is considered undeveloped for the purposes of this analysis. Basin OS-1 is 3.83 acres in area and consists of pasture/fields. This basin sheet flows south to Perry Owens Drive at DP O.1. The basin is comprised of open space and native grass. The runoff (Q_5=1.2 cfs, Q_{100}=8.0 cfs) from basin OS1 drains to design point O.1.

Basin OS2 9.74 acres and 2% impervious, is an offsite basin that drains to an offsite swale, as shown in section BB in Appendix D in the proposed drainage map. Runoff is diverted away from the back of residential lots on Wheatland Drive via swale BB. The basin is comprised of open space and native grass. The runoff (Q_5=2.3 cfs, Q_{100}=15.3 cfs) from basin OS2 drains to design point O.2 and is collected in an interim swale on the northern portion of the site. Runoff in the swale at design point continues east to design point O.3.

Basin OS3 21.02 acres and 2% impervious, is an offsite basin that drains to an offsite swale that diverts offsite runoff away from the back of residential lots on Wheatland Drive. The runoff (Q_5=4.6 cfs, Q_{100}=31.0 cfs) from basin OS3 sheet flows south and enters swale section A-A, which carries flows east to Sand Creek at design point O.3 (Q5 = 6.8 cfs, Q100 = 45.3 cfs) drains to design point O.3 and outfalls directly into Sand Creek.

The OS basins represent the interim condition as shown on the proposed drainage map.

The basin descriptions below represent the future ultimate condition when Filing 3 is fully built out, as shown on the future drainage map in Appendix E of this report. Homestead North Filing No. 3 at Sterling Ranch is expected to begin construction while Homestead North Filing No. 2 is being built or soon after. The Homestead North Filing No. 2 drainage infrastructure has been designed to accept the tributary runoff and flows from the portion of Homestead North Filing No. 3 tributary to the site as shown in the Future drainage map within Appendix E of this report.

All design points at inlets, have a suffix of either "B" or "i" indicating how the total flow at the numbered design point will be split. A suffix of "i" indicates that a portion of the total design point flow is captured by an inlet. A suffix of B, indicates the portion of the total flow that is not captured at an inlet, or that "By-passes" the inlet.

Basin F1 2.08 Acres and 43% percent impervious is comprised of future residential lots, and future, walks and a residential road to be platted within Filing No. 3 i.e. Billy Clairborne Dr. The runoff (Q_5= 2.9 cfs, Q_{100}= 7.4 cfs) will drain via type C El Paso County curb and gutter to Design point 1F into the Filing No. 2 site. The curb and gutter carries flows from DP 1F to design point 1.1B.

Basin F2 1.37 Acres and 48% percent impervious is comprised of future residential lots, a walk and a residential road to be platted within Filing No. 3 i.e. Billy Clairborne Dr. The runoff (Q_5= 2.1 cfs, Q_{100}= 5.0 cfs) will drain via type A El Paso County curb and gutter to Design point 2F into the Filing No. 2 site. The curb and gutter carries flows from DP 2F to design point 1.2B.

Basin F3 0.08 acres and 100% impervious is comprised of future walk, and a local roadway. The runoff from this basin (Q_5= 0.4 cfs, Q_{100}= 0.6 cfs) will drain via type A El Paso County curb and gutter to design point to design point 3F into the filing 3 site. The runoff is carried south by the curb and gutter to design point 1.3B.

Basin F4 0.06 acres and 100% impervious is comprised of future walk, and a local roadway. The runoff from this basin (Q_5= 0.3 cfs, Q_{100}= 0.4 cfs) will drain via type A El Paso County curb and gutter to design point 4F into the filing 3 site. The runoff is carried south and east by the curb and gutter to design point 6B.

Basin F5 0.69 acres and 2% impervious is comprised of future open space from Homestead North at Sterling Ranch Filing No. 3. The runoff (Q_5= 0.3 cfs, Q_{100}= 2.2 cfs) will confluence with the Filing 2 runoff at design point 4B.

Basin B1.1 1.24 acres and 52% percent impervious is comprised of single-family residential lots, a local road, Perry Owens Drive and an urban knuckle. Runoff (Q_5=2.6 cfs, Q_{100}=5.5 cfs) sheet flows to Perry Owens Drive and is carried via Type C curb and gutter to a proposed 15 ft on grade type R inlet at Design point 1.1B/i.

The runoff confluences with upstream runoff from basin F1 at design point 1.1b. The total runoff at design point 1.1 B is (Q_5=5.1 cfs, Q_{100}=12.1 cfs). The captured runoff is represented by design point 1.1i (Q5 = 5.1 cfs, and Q100 = 10.1 cfs) and piped via 18" RCP to DP 2.1. Runoff not captured by the inlet is represented by design point 1.1b (Q5 = 0.0 cfs, and Q100 = 2.0 cfs) continues in the curb and gutter to design point 2B.

Basin B1.2 0.42 acres and 79% percent impervious is comprised of single-family residential lots, a local road Perry Owens Drive and an urban knuckle. The direct runoff from basin B1.2 (Q_5= 1.5 cfs, Q_{100}= 2.9 cfs) sheet flows to Perry Owens Drive and is carried via type C curb and gutter to a 15' type R on grade inlet at design point 1.2B. Total flows at design point 1.2B is (Q_5= 3.1 cfs, Q_{100}= 7.0 cfs). The captured runoff is represented by design point 1.2i (Q_5= 3.1 cfs, Q_{100}= 6.8 cfs). The captured runoff is piped to design point 2.1 via an 18" storm pipe. Runoff is by-passed in the 100-year event to design point 1.3B via type C El Paso County curb and gutter (Q_{100}= 0.2 cfs).

Total flow in the 18" RCP at design point 2.1 is (Q5= 8.2 cfs, Q100= 16.9 cfs) and is piped to design point 2.4.

Basin B1.3 0.43 acres and 50% percent impervious is comprised of single-family residential lots and local roads, Aspen Valley Road and Perry Owens Drive. The runoff (Q_5= 0.9 cfs, Q_{100}= 2.0 cfs) from basin B1.3 drains to design point 1.3b. The runoff is conveyed by Type A El Paso County curb and gutter in Aspen Valley Road and by type C El Paso County curb and gutter in Perry Owens Drive. Design point 1.3b receives by pass flow from the upstream inlet at design point 1.2i in the 100-year event (0.2 cfs). The total runoff at design point 1.3b is (Q_5= 1.0 cfs, Q_{100}= 2.2 cfs) and continues in the curb and gutter south to design point 2B.

Basin B2 0.86 acres and 58% percent impervious is comprised of the northern portion of a local residential road Sam Bass Drive adjacent to the intersecting at Vollmer road and portions of single family residential lots. The runoff is routed via type A El Paso County Curb and gutter. Runoff (Q_5= 2.4 cfs, Q_{100}= 5.1 cfs) from basin B2 drains to design point 2B and confluences with bypass runoff from basin B1.2 direct and B1.3. The total runoff off at design point 2b is (Q_5= 2.7 cfs, Q_{100}= 8.1 cfs) and continue in the curb and gutter to design point 6B.

Basin B3 0.23 acres and 78% percent impervious is comprised of the southern portion of a local residential road Sam Bass Drive adjacent to the intersection of Vollmer road. Runoff (Q_5= 0.9 cfs, Q_{100}= 1.6 cfs)from basin B3 drains to design point 3B and is routed via type A El Paso County curb and gutter. Total flows at design point 3B are Q5= 0.9 cfs and Q100= 1.6 cfs, and continue in the curb and gutter to design point 6B.

Basin B4 3.51 acres and 46% percent impervious is comprised of single-family residential lots, a local residential road, Wheatland Drive and a Cul de Sac. Runoff from basin B4 (Q_5= 6.9 cfs, Q_{100}= 15.3 cfs) sheet flows to the type C curb and gutter of Wheatland Drive, and continues in the curb and gutter to design point 4B at a 15' type R on-grade inlet. The total runoff at design point 4b (include basin F5 flow) is (Q_5= 7.1 cfs, Q_{100}=17.1 cfs). The captured runoff is represented by design point 4i (Q_5= 6.9 cfs, Q_{100}= 12.9 cfs). The captured runoff is piped via a 24" storm sewer and is then piped to design point 2.3. The bypass runoff (Q_{100}= 4.2 cfs) continues in the drainage pan and El Paso County Type A curb and gutter, to design point 6B. There is no by-pass flow in the 5-yr event.

Total flow in the 24" RCP at design point 2.3 is 17.4 cfs and continues to design point 2.4.

Basin B5 1.11 acres and 61% percent impervious is comprised of single-family residential lots, a residential road Wheatland Drive, and a Cul de Sac. Runoff from this basin sheet flow to the El Paso County type C curb and gutter and continues in the gutter to design point B5. Runoff (Q_5= 3.1 cfs,

Q_{100}= 6.2 cfs) from basin B5 drains to design point 5B, a 10’ on grade type R inlet. The captured runoff is represented by design point 5i (Q_5= 3.1 cfs, Q_{100}= 5.1 cfs) and is piped via 18” RCP to design point 2.2 (same flows as DP5i). Flows in the pipe continues to design point 2.3. The bypassed runoff in the 100 year event (Q_{100}=1.1 cfs) continues in the curb and gutter to design point 7B with runoff from basin B7. There is no by-pass flow in the 5-yr event.

Total flow in the 24” RCP at design point 2.3 is 17.4 cfs and continues to design point 2.4.

Basin B6 3.61 acres and 58% percent impervious is comprised of single-family residential lots and a local residential roads Sam Bass Drive, Aspen Valley Road, Perry Owens Drive and Wheatland Drive. Runoff (Q_5= 9.5 cfs, Q_{100}= 19.9 cfs) sheet flows to the adjacent Type A and Type C El Paso County curb and gutter and continues to design point 6B (Total flow, Q5= 10.2 cfs, Q100= 26.7 cfs), an on-grade 15’ type R inlet. Captured flows are represented by design point 6i (Q5= 8.8 cfs, Q100= 14.9 cfs) and are piped via 18 inch RCP to design point 2.6. The uncaptured flows bypass the inlet (Q_5= 1.4 cfs, Q_{100}= 11.8 cfs) and continue in the curb and gutter to a 15’ sump inlet at design point 9B. In total, the flow at design point 6B collects flow from basins B1, B2, B3, B4, B6, F1, F2, F3, F4 and F5.

Total flow in the 36” RCP pipe at design point 2.6 is (Q5= 25.5 cfs and Q100= 48.0 cfs) and is piped to design point 2.7.

Basin B7 1.63 acres and 56% percent impervious, is comprised of single-family lots, local roads and a Cul de Sac Robert Allison Circle. The runoff (Q5= 4.0 cfs, Q100= 8.2 cfs) sheet flows to the type A and C El Paso County curb and gutter and is directed to a proposed 15’ type R on grade type R inlet at design point 7B. Total flow at 7B is (Q5= 4.0 cfs, Q100 = 9.0 cfs) and includes by-pass flows from B5. Captured flows are represented by design point 7i (Q5= 4.0 cfs, Q100= 8.4 cfs) and are piped via 24 inch RCP to design point 2.4. The flow not captured (Q5 = 0.0 cfs, and Q100 = 0.6 cfs) by the 15’ on grade type R inlet at design point 7B continues in the curb and gutter design point 8B.

Total flow in the 36 inch RCP at design point 2.4 is (Q5= 13.3 cfs, and Q100= 25.4 cfs) and is piped to design point 2.5.

Total flow in the 36 inch RCP at design point 2.5 is Q5= 18.3 cfs, Q100= 36.1 cfs and is piped to design point 2.6.

Total flow in the 36” RCP pipe at design point 2.6 is (Q5= 25.5 cfs and Q100= 48.0 cfs) and is piped to design point 2.7.

Basin B8 2.14 acres and 56% percent impervious, is comprised of single-family lots, local road and a Cul de Sac. The runoff (Q5= 5.1 cfs, Q100= 10.6 cfs) sheet flow to the El Paso County type A and C curb and gutter and directed to design point 8B where it combines with by-pass flows from design point 7B, total flow at design point 8B (Q5= 4.7 cfs, Q100= 10.4 cfs). Flows in in the curb and gutter at design point 8B continue south to design point 10B.

Basin B9 3.77 acres and 64% percent impervious, is comprised of single-family lots, and an urban knuckle, and local roads Willey Picket Drive and Wheatland Drive. Runoff (Q_5= 7.3 cfs, Q_{100}= 15.7 cfs) sheet flows to the El Paso County type A and type C curb and gutter and is directed to design point 9B, a 15' type R sump inlet. Design point 9B receives by-pass runoff from the upstream on-grade inlet at design point 6B. The total runoff collected at the sump inlet is (Q_5= 7.7 cfs, Q_{100}= 25.3 cfs). In the event the inlet clogs in the 100-year event runoff will overflow across the curb and gutter of Wheatland Drive and spill directly into pond B. The inlet at design point 9B was sized to capture all flows up-to and including the 100-yr storm event. Captured flows are piped in 24 inch RCP to design point 2.7 (Q5= 32.3 cfs, Q100= 71.0 cfs). Flow in the pipe at design point 2.7 continue to design point 2.8.

Basin B10 0.22 acres and 80% percent impervious, is comprised of a portion of the southeastern side of the local road Wheatland Drive. The runoff (Q_5= 0.8 cfs, Q_{100}= 1.6 cfs) from this basin sheet flows to design point 10b where it combines with flows from upstream design point 8B. The total flow at the 15' type R sump inlet at design point 10b is (Q_5= 5.4 cfs, Q100= 11.7 cfs). This inlet was sized to capture all flows up to and including the 100-yr storm event. Captured flows are piped via 48 inch RCP to design point 2.8 (Q5= 36.5 cfs, Q100= 79.9 cfs). Should this inlet become clogged, flows would overtop the curb and gutter and enter Pond B.

Flows in the 48" RCP at DP 2.8 (Q5= 36.5 cfs, Q100= 79.9 cfs) are piped directly into the proposed Forebay at design point 4 (total pond inflow). See below for additional basins descriptions and total flows.

Basin B11 1.67 acres and 11% percent impervious, is comprised of pond B. Runoff (Q_5= 1.0 cfs, Q_{100}= 4.6 cfs) generated in Basin B11 sheet flows into Pond B where it is treated for water-quality and is detained up until the 100 year-event. The UD Detention sheet for pond B is shown in Appendix C of this report. Total inflows to pond B are combined at design point 4, see below.

Basin B12 is 2.18 acres this basin is 36% percent impervious, and is comprised of single family walk out lots backing up to Sand Creek. The runoff (Q_5= 2.1 cfs, Q_{100}= 6.0 cfs) sheet flows east and is captured in a grass swale and directed to a type C area inlet at design point 3.1 (Q_5= 2.1 cfs, Q_{100}= 6.0 cfs) that captures all flows up-to and including the 100-yr storm event. The grass swale is represented by section C-C, see the drainage map for location and appendix C for hydraulics. The runoff is then piped via 18" RCP pipe to design point 3.2. Should the inlet become clogged at design point 12b, flows will over-top the local depression and existing trail to the east, where they will enter Sand Creek.

Basin B13 is 0.43 acres and 54% impervious, and is comprised of single family walk out lots backing up to sand creek. The runoff (Q_5= 0.9 cfs, Q_{100}= 2.1 cfs) is conveyed via a grass swale, section D-D to a type C area inlet at design point 13b (Q_5= 0.9 cfs, Q_{100}= 2.1 cfs). Captured flows combine with upstream flows form design point 3.1, at design point 3.2 (18 inch RCP). Total flow in the pipe at design point 3.2 is (Q5= 2.6 cfs, Q100= 7.1 cfs) is piped to design point 3.3. Should the inlet become clogged, flows will overtop the local depression and the existing trail to the east, where they will enter Sand Creek.

Flows from design point 3.2 are piped via 18 inch RCP to design point 3.3 (Q5= 2.8 cfs, Q100= 7.7 cfs).

Basin B14 is 0.42 acres and 45% impervious and is comprised of single family walk out lots. The runoff (Q_5=0.7 cfs, Q_{100}=1.7 cfs) is conveyed via a grass swale, section F-F to a type C area inlet at design point 14b (Q_5= 0.7 cfs, Q_{100}= 1.7 cfs). Captured flows combine with upstream flows form design point 3.2, at design point 3.3 (18 inch RCP). Total flow in the pipe at design point 3.3 is (Q5= 2.8 cfs, Q100= 7.7 cfs) is piped to design point 4. Should the inlet become clogged, flows will overtop the local depression and the existing trail to the west, where they will enter Sand Creek.

Flows from design point 3.3 flows enter the forebay and combine with flows from design point 2.8 and basin flows from B11 at design point 4. See below for total flows at design point 4. The total flow entering Pond B is represented by design point 4 (Q5 = 40.2 cfs, Q100 = 91.5 cfs).

Basin C-1 is 0.92 acres and 67% percent impervious and is comprised of single family lots. The runoff (Q_5= 1.8 cfs, Q_{100}= 3.9 cfs) from these lots drains to design point C.1 and is conveyed to the Homestead North Filing No. 1 full spectrum detention facility.

Basin C-2 is 1.24 acres and 52% percent impervious and is comprised of single family lots, road and concrete walk. The runoff (Q_5= 2.1 cfs, Q_{100}= 5.0 cfs) from these lots drains design point C.2 and is conveyed to the Homestead North Filing No. 1 full spectrum detention facility.

Basin C-3 is 0.29 acres and 2% percent impervious and is comprised of a proposed park area. The runoff (Q_5=0.1 cfs, Q_{100}=0.6 cfs) sheet flow south to the Filing No. 1 boundary at design point C.3 and is conveyed to the Homestead North Filing No. 1 full spectrum detention facility, Pond C.

The areas tributary to Filing No. 1 (C basins), presented within this report have remained consistent with the Filing No. 1 Final Drainage Report, by JR Engineering. From the Filing No. 1 drainage report, Basins C1, C4.2, and C3.2 contribute flows to Pond C. The contributing Filing No. 1 basins have a combined area of 8.92 acres with a composite percent imperviousness of 62.5%. Portions of those Filing No. 1 basins are represented within the Filing No. 2 as Basins C-1, C-2, and C-3. The contributing Filing No. 2 basins have a combined 2.45 acres with a composite percent imperviousness of 51.7%. Since the percent imperviousness of the area has decreased, these areas will be treated and detained in Pond C without issue. No design updates are necessary to Pond C as a result of the design presented in this report. Pond C was designed and sized to treat and detain these tributary basins per all applicable County criteria.

Pond B was analyzed for both the proposed and ultimate/future condition. It was determined that the pond will function as designed for both the proposed condition and the future condition without any modifications being necessary. At the time Filing No. 3 is developed, a Final Drainage Report specific to Filing No. 3 will need to confirm that the tributary basins to Pond B, and the Pond Design presented here within remains valid and consistent with this report and that no modification are necessary to Pond B to ensure its functionality and compliance with criteria.

In the proposed condition Pond B will have a tributary area of 27.69 acres and a composite percent impervious of 44.4%.

In the ultimate/future condition the pond has a tributary area of 28.15 acres and composite percent impervious of 49.9%. See Appendix C for the applicable UD-Detention design workbook printouts.

Pond B was design with a full-spectrum design methodology, including a Water Quality Capture Volume drain time of 40 hours and an "Excess Urban Runoff Volume" (EURV) drain time of 72 hours. Additionally the pond was designed to drain or infiltrate the 97% of the 5-yr storm in 72 hours or less and to drain or infiltrate 99% of events greater than the 5-yr storm in 120 hours or less.

Pond B also features the following:
Stabilized maintenance access path designed to facilitate easy maintenance by the anticipated equipment to be used by the maintenance entity. This path consists of a gravel section to access the bottom of pond and outlet structure, design to meet all applicable county criteria and standards. This gravel access allows maintenance vehicles to enter the trickle channel, which was designed to be wide enough for maintenance equipment to travel to and access each forebay.

Each point of concentrated flow entering the pond has a concrete forebay to allow for settlement of sedimentation and ease of removal. Each forebay was deisgned to meet all applicable County criteria and standards. The forebays were each sized to hold a minimum volume equal to 3% of the WQCV based on their tributary basins. Each forebay notch was sized to release 2% of the undetained peak 100-yr tributary flows. See appendix C for all applicable calculations. Each forebay releases flows directly to a concrete trickle channel which carried flows to the proposed outlet structure.

The outlet structure was design per full-spectrum design methodology, and include a micropool. Should the ponds outlet become clogged, or should the pond see flows in excess of the 100-yr storm, an emergency overflow spillway was provided. The spillway is designed to be stable while conveying the peak, undetained 100-yr flows. The spillway include soil rip-rap sized per MHFD Figure 12-21, and a concrete cut-off wall is included at the crest of spillway to ensure the integrity and longevity of the structure. The spillway also has over 1' of freeboard above the 100-yr water surface elevation over the spillway's crest (while its conveying peak flows)

	TABLE 2.2 Pond B (Ultimate/Future)		
	Stage –ft	Volume Provided (Acre-ft)	Release Rate (cfs)
WQCV	3.17	0.484	0.2
EURV	5.32	1.504	0.8
5 Year	5.74	1.738	4.2
100 Year	7.06	2.587	30.4

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

Storm drainage analysis and design criteria for this project were taken from the "*City of Colorado Springs/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual*" Volumes 1 to 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "*Colorado Springs Drainage Criteria Manual*" (CSDCM), dated May 2014, as adopted by El Paso County.

HYDROLOGIC CRITERIA

All hydrologic data was obtained from the "*El Paso Drainage Criteria Manual*" Volumes 1 and 2, and the "*Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual*" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Table 6-2 of the CSDCM. One-hour point rainfall data for the storm events is identified in the chart below. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from CSDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Table 3 - 1-hr Point Rainfall Data

Storm	**Rainfall (in.)**
5-year	1.50
100-year	2.52

HYDRAULIC CRITERIA

The Rational Method and USDCM's SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site, and the UDFCD MHFD-Detention v4.04 spreadsheet was utilized for evaluating the proposed detention and water quality pond(s). Sump and on-grade inlets were sized using UDFCD UD-Inlet v2.07. Autodesk Hydraflow express and UDFCD figure 8-22 was used to size the swales. Storm StormCAD V8i, a modeling program for stormwater drainage, was utilized to determine the hydraulic grade lines and energy grade lines for the storm sewer network. Manhole and pipe losses for the model were obtained from the *Modeling Hydraulic and Energy Gradients in Storm Sewers: A Comparison of Computation Methods*, by AMEC Earth & Environmental, Inc. The manhole loss coefficients used in the model can be seen in Table 2. StormCAD, Autodesk Hydraflow results, along with street and inlet capacities are presented in Appendix C.

Table 2 - StormCAD Standard Method Conversions

StormCAD Conversion Table			
Bend Loss	Bend Angle	K coefficient Conversion	
	0	0.05	
	22.5	0.1	
	45	0.4	
	60	0.64	
	90	1.32	
Lateral Loss	1 Lateral K coefficient Conversion		
	Bend Angle	Non Surcharged	Surcharged
	45	0.27	0.47
	60	0.52	0.9
	90	1.02	1.77
	2 Laterals K coefficient Conversion		
	45	0.96	
	60	1.16	
	90	1.52	

The Sand Creek improvements adjacent to the Sterling Ranch Homestead North are being designed in a separate report, The Final Design Report for Sand Creek Restoration by JR Engineering, October 2021. The general concept of the channel design is to design a low maintenance, high performance channel with a meandering bankfull channel. The design will cut in a new bankfull section offset to the east from the existing thalweg, grade up to the existing thalweg so that it can remain hydraulically connected to the new thalweg, and then extend a 1% flood terrace to the east between 80 and 120 ft. depending on shear stresses and velocities. The purpose of trying to keep the existing channel hydraulically connected to the new thalweg is to maintain as many existing wetlands as possible and satisfy the ACOE. The previous design in the Kiowa DBPS made no attempt to preserve wetlands in order to satisfy the County's design criteria, and was rejected by the ACOE. While the County's criteria are certainly a determining factor, we consider the need to satisfy the ACOE the highest priority, because without their approval JR won't be granted a 404 permit. The County review of the previous design by the Kiowa DBPS states that the maximum stable longitudinal slope of the channel is 0.17%. Using this longitudinal slope will require the use of at least 10 and possibly

15 GSB drop structures. This channel slope will also ensure the destruction of more wetlands by taking the existing ones offline due to large changes in elevation. JR Engineering's intent to prove that a steeper slope can remain stable long term, thus allowing us to preserve more wetlands and appease the ACOE, a work map for the Final Design Report for Sand Creek Restoration by JR Engineering has been provided for information in Appendix D.

A design point, SC, and basin SC has been added for the creek. Flows are from the M&S MDDP Q5= 349.6 cfs and Q100= 1612.2 cfs. This is for informational purposes only and on the request of the reviewer. The above referenced plans and reports supersede the analysis included in this report.

DRAINAGE FACILITY DESIGN

FOUR STEP PROCESS TO MINIMIZE ADVERSE IMPACTS OF URBANIZATION

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

The runoff from the site drains from north to south. The runoff from the future Homestead North Filing 3 site drains onto the northern portion of the site to the proposed Homestead North Filing No. 2 detention facility. The runoff is routed through the site by on-grade inlets, sump inlets, and storm sewers. The runoff captured from the on-grade inlets corresponds to a design point with an i after a number, as shown in the proposed and future drainage map in Appendix E of this Report. The street runoff is piped throughout the site at corresponding design points 2.1 through 2.8 and is treated for water quality in the full spectrum detention facility. In the eastern portion of the site adjacent to Sand Creek, the runoff is routed and captured by a swale and type C inlets. The runoff captured and routed by the type C inlets corresponds to design points 3.1 to 3.3. The runoff is then piped and treated for water quality in the full spectrum detention facility. For additional information on design points, routing, inlets, and storm sewer pipes, refer to the proposed and future drainage maps in Appendix E of this report.

Step 1 – Reducing Runoff Volumes: The Homestead North at Sterling Ranch development project consists single -family homes with open spaces and lawn areas interspersed within the development, which helps disconnect impervious areas and reduce runoff volumes. Roof drains from the structures will discharge to lawn areas, where feasible, to allow for infiltration and runoff volume reduction.

Step 2 – Stabilize Drainageways: The site lies within the Sand Creek Drainage Basin. Basin and bridge fees will be due at time of platting. These funds will be used for the channel stabilization being designed by JR Engineering adjacent to the site and on future projects within the basin to stabilize drainageways. The Soils and Geology study on the site showed a potentially unstable region directly adjacent to the western bank of Sand Creek on the northeast corner of the site. At the time of final design, specifications from a Geotechnical Engineer will be implemented to ensure that the developed site is safe. Homestead North Filing No. 2 lots will discharge into Full Spectrum Detention Ponds, and outflows will be less than or equal to historic flows. Existing flows from the northwest of Vollmer road and runoff from the Vollmer Road improvements will be piped under Vollmer Road and then along the north side of Briargate Parkway and will be detained and treated for water quality directly on-site. The subdivision improvement agreement (SIA) for Sterling Ranch Filing 1 states that "bank stabilization of the Sand Creek channel shall be required prior to any replats of other final plats adjacent to the channel. The design and installation of said improvements shall be accomplished and guaranteed through the normal subdivision review and collateralization process." Additionally, "Other drainage improvements in Tract D and future tracts containing the Sand Creek Channel, such as drop structures, check structures and similar stabilization or protection improvements, will be designed and constructed by the District with the final construction drawings to be approved by the County no later than the final platting of the 700th single family lot within the boundaries of the approved Sterling Ranch Sketch Plan and the completion of all said improvements no later than the 800th single family lot with the boundaries of the approved Sterling Ranch Sketch Plan."

Step 3 – Treat the WQCV: Water Quality treatment for this site is provided in three proposed full spectrum water quality detention ponds: Ponds B & C. The runoff from this site will be collected within inlets and conveyed to the proposed ponds via storm sewer. Upon entrance to the ponds, flows will be captured in a forebay designed to promote settlement of suspended solids. A trickle channel is also incorporated into the ponds to minimize the amount of standing water. The outlet structure has been designed to detain the water quality capture volume (WQCV) for 40 hours, and the extended urban runoff volume (EURV) for approx. 72 hours. All flows released from the ponds will be reduced to less than historic rates.

Step 4 – Consider Need for Industrial and Commercial BMPs: There are no commercial or industrial components to this development; therefore no BMPs of this nature are required. BMPs will be utilized to minimize off-site contaminants and to protect the downstream receiving waters. The site is a residential subdivision (ie: not a high-risk site per Figure I-1 in ECM Appendix I), therefore specialized BMPs do not need to be considered. Site specific temporary source control BMPs that will be implemented include, but are not limited to, silt fencing placed around downstream areas of disturbance, construction vehicle tracking pads at the entrances, designated concrete truck washout basin, designated vehicle fueling areas, covered storage areas, spill containment and control, etc. The permanent erosion control BMPs include asphalt drives and parking, storm inlets and storm pipe, the full spectrum water quality and detention ponds, and permanent vegetation.

WATER QUALITY

For this Final drainage report the design points, pipes and inlets are discussed in the Proposed/Ultimate/Future Drainage Conditions section of this report. The corresponding design points, pipes and basin are shown within the Proposed & Future/Ultimate Drainage Map within Appendix E. The pond has been designed per Section 13.3.2.1 of Resolution 15-042 of the El Paso County Drainage Criteria Manual. For additional information on pond storage and outlet characteristics see the MHFD sheets within Appendix C. Upon future development of Homestead North Filing 3, the Homestead Filing No. 2 pond will need to be re-analyzed to confirm the design remains valid and functions as intended.

EROSION CONTROL PLAN

It is the policy of the El Paso County, that a grading and erosion control plan be submitted with the drainage report. Proposed silt fence, vehicles traffic control, temporary sediment basins, seeding and mulching are proposed as erosion control measure.

OPERATION & MAINTENANCE

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. The property owner shall be responsible for the inspection, maintenance, rehabilitation and repair of stormwater and erosion control facilities located on the property unless another party accepts such responsibility in writing and responsibility is properly assigned through legal documentation. Access is provided from onsite facilities and easements for proposed infrastructure located offsite.

DRAINAGE AND BRIDGE FEES

The site lies within the Sand Creek Drainage Basin. An estimate of the Impervious Acres and Drainage/Bridge is presented below,

HN F2 Impervious Area Calculation

Breakdown	Acres	% Impervious	Impervious Acres
ROW	6.13	100%	6.13
Lots	15.62	50%	7.81
Tracts	14.55	2%	0.29
Total	36.3		14.23

2022 Drainage and Bridge Fee – Sterling Ranch Homestead North Filing 2				
Impervious Acres (Ac.)	Drainage Fee (Per Imp. Acre)	Bridge Fee (Per Imp. Acre)	Sterling Ranch Drainage Fee	Sterling Ranch Bridge Fee
14.230	$21,814	$8,923	$310,413.22	$126,974.29

CONSTRUCTION COST OPINION

A construction cost opinion for the public storm drainage infrastructure has been provided below. The below cost opinion is only an estimate of facility and drainage infrastructure cost and may vary.

Swapping of DBPS improvements for proposed improvements in Sterling Ranch has been agreed to by the Drainage Board. A map demonstrating the DBPS improvements costs are being swapped is found in Appendix D.

Homestead North Filing No. 2 (Public Non-Reimbursable)

Item	Description	Quantity	Unit	Unit Price	Cost
1	18” RCP	727	L.F.	$ 70	$ 50,890.00
2	24" RCP	113	L.F.	$ 83	$ 9,379.00
3	36" RCP	415	L.F.	$ 128	$ 53,120.00
4	48" RCP	58	L.F.	$ 209	$ 12,122.00
4	36" FES	1	Ea.	$ 600	$ 600.00
5	10' Curb Inlet Type R < 10 ft.	1	Ea.	$ 8,706	$ 8,706.00
6	15' Curb Inlet Type R < 10 ft.	7	Ea.	$ 11,775	$ 82,425.00
7	Grated Inlet CDOT TYPE C	3	Ea.	$ 5,138	$ 15,414.00
8	Storm Sewer MH, box base	4	Ea.	$ 12,876	$ 51,504.00
9	Storm Sewer MH, slab base	5	Ea.	$ 7,082	$ 35,410.00
				Sub-Total	$ 319,570.00

Per LDC section 8.5.5.C.3.b(ii) Fee Reductions, Credits or Reimbursement for Facilities, this development requests that no cash drainage or bridge fees are due at platting as the value of reimbursable DBPS improvements for the Sand Creek Tributary segment 159, 164, 169, 186 and the Briargate Parkway and Sterling Ranch Bridges shown in the below table exceed the drainage and bridge fee estimate shown above.

Sterling Ranch Deferred Drainage Fees Analysis
Reimbursable Costs associated with DBPS Segment 159 and 164, Segment 169 and 186

	Reimbursable Estimate Segment 159 and 164 from SR F2 FDR (SF-2015)	$1,918,065.00
	Reimbursable Estimate Segment 169 and 186 from HN F1 FDR (SF-2213)	$611,628.00
	Subtotal Reimb. Costs associated with DBPS Segments 159-164, 169-186	$2,529,693.00
	Earlier Plats Deferred Drainage Fees (Branding Iron F1 & Homestead F1)	$219,540.55
	SR F2 (SF-2015) Drainage Fees Deferred per LDC section 8.5.5.C.3.b(ii)	$400,855.70
	SR F3 (SF-2132) Drainage Fees Deferred per LDC section 8.5.5.C.3.b(ii)	$214,430.47
*	HN F1 (SF-2213) Drainage Fees Deferred per LDC section 8.5.5.C.3.b(ii)	$541,225.00
	HN F2 (SF-2218) Drainage Fees Deferred per LDC section 8.5.5.C.3.b(ii)	$310,413.22
	Subtotal Deferred Drainage Fees	$1,686,464.94
	Unused Reimb. Costs associated with DBPS Segments 159-164, 169-186	$843,228.06

Sterling Ranch Deferred Bridge Fees Analysis
Reimbursable Costs associated with DBPS Bridge at Briargate Parkway and Sterling Ranch Rd.

	Financial Assurance Estimate Briargate Parkway Bridge from CDR 2113	$1,546,676.98
	Financial Assurance Estimate Sterling Ranch Road Bridge from CDR 226	$990,016.80
	Subtotal Reimb. Costs associated with BGP and SR Rd. Bridges	$2,536,693.78
	SR F3 (SF-2132) Bridge Fees Deferred per LDC section 8.5.5.C.3.b(ii)	$87,709.60
*	HN F1 (SF-2213) Bridge Fees Deferred per LDC section 8.5.5.C.3.b(ii)	$221,388.00
	HN F2 (SF-2218) Bridge Fees Deferred per LDC section 8.5.5.C.3.b(ii)	$126,974.29
	Subtotal Deferred Bridge Fees	$436,071.89
	Unused Reimb. Costs associated with Briargate Parkway and SR Road Bridges	$2,100,621.89

* Filing is not yet approved, actual fee at time of approval may be different than shown here

A summary table will be added to the Filing No. 3 final drainage report including the actual and allowable costs for all the filings.

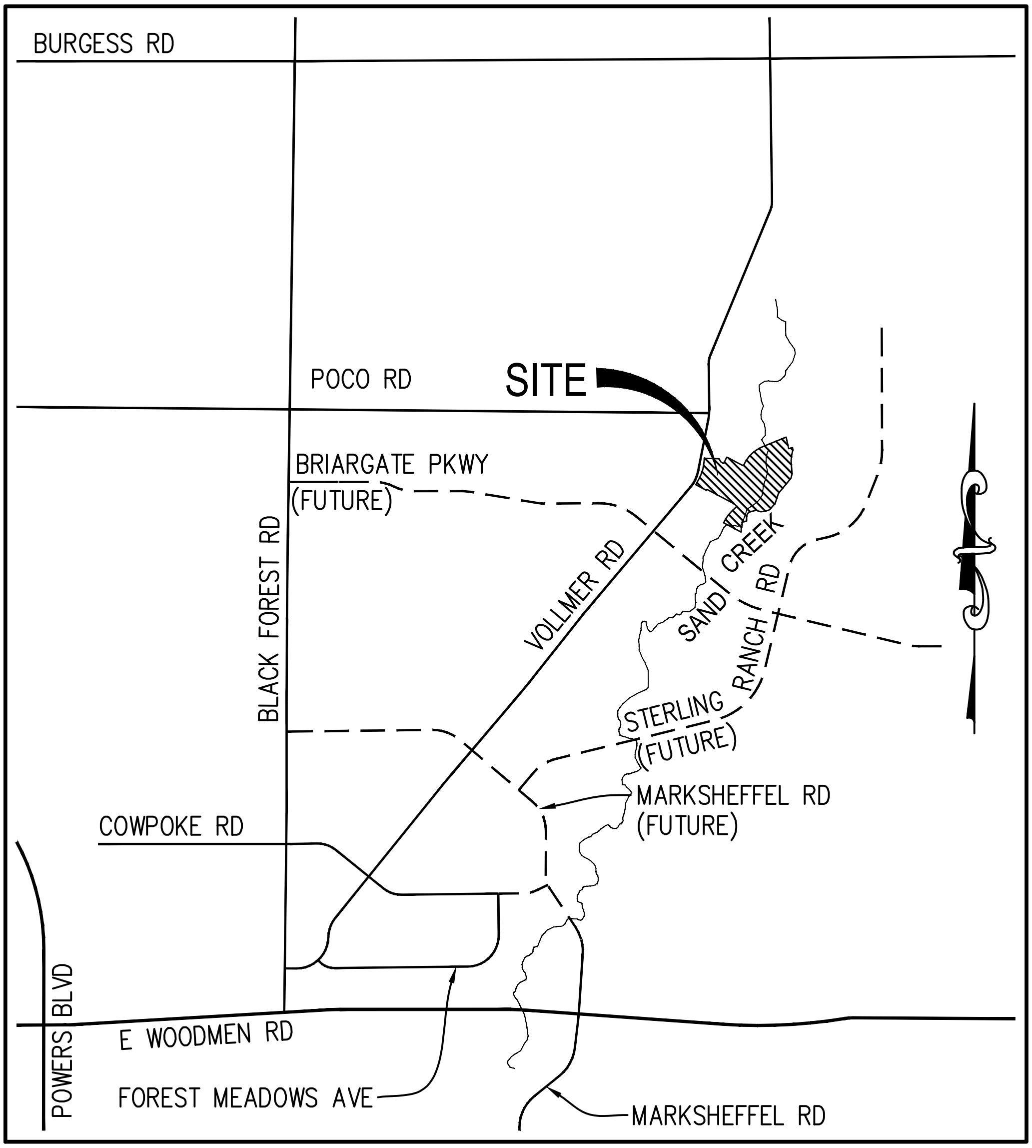
SUMMARY

The proposed Homestead North at Sterling Ranch drainage improvements were designed to meet or exceed the El Paso County Drainage Criteria. The proposed development's ponds are designed to release less than 90% of the predeveloped runoff study associated with the subject site. The proposed development will not adversely affect the offsite drainageways or surrounding development. This report is in conformance and meets the latest El Paso County Storm Drainage Criteria requirements.

REFERENCES

1. "El Paso County and City of Colorado Springs Drainage Criteria Manual, Vol I & II".
2. El Paso County ECM, 2019
3. El Paso County DCM Vol. 1 Update, 2015
4. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3), Urban Drainage and Flood Control District, June 2001.
5. Upper Sand Creek Detention Evaluation Study, Wilson and Company'
6. Final Drainage Report For Retreat at Timberridge Filing No. 1, Classic Consulting Engineers & Surveyors
7. Sand Creek Drainage Basin Planning Study, Stantec, January 2021
8. Sand Creek Channel Design Report JR Engineering, October 2021- Draft
9. Preliminary Drainage Report And MDDP Addendum For Homestead North At Sterling Ranch Preliminary Plan", prepared by JR Engineering, dated January 2022

Appendix A
Vicinity Map, Soil Descriptions, FEMA Floodplain Map



VICINITY MAP

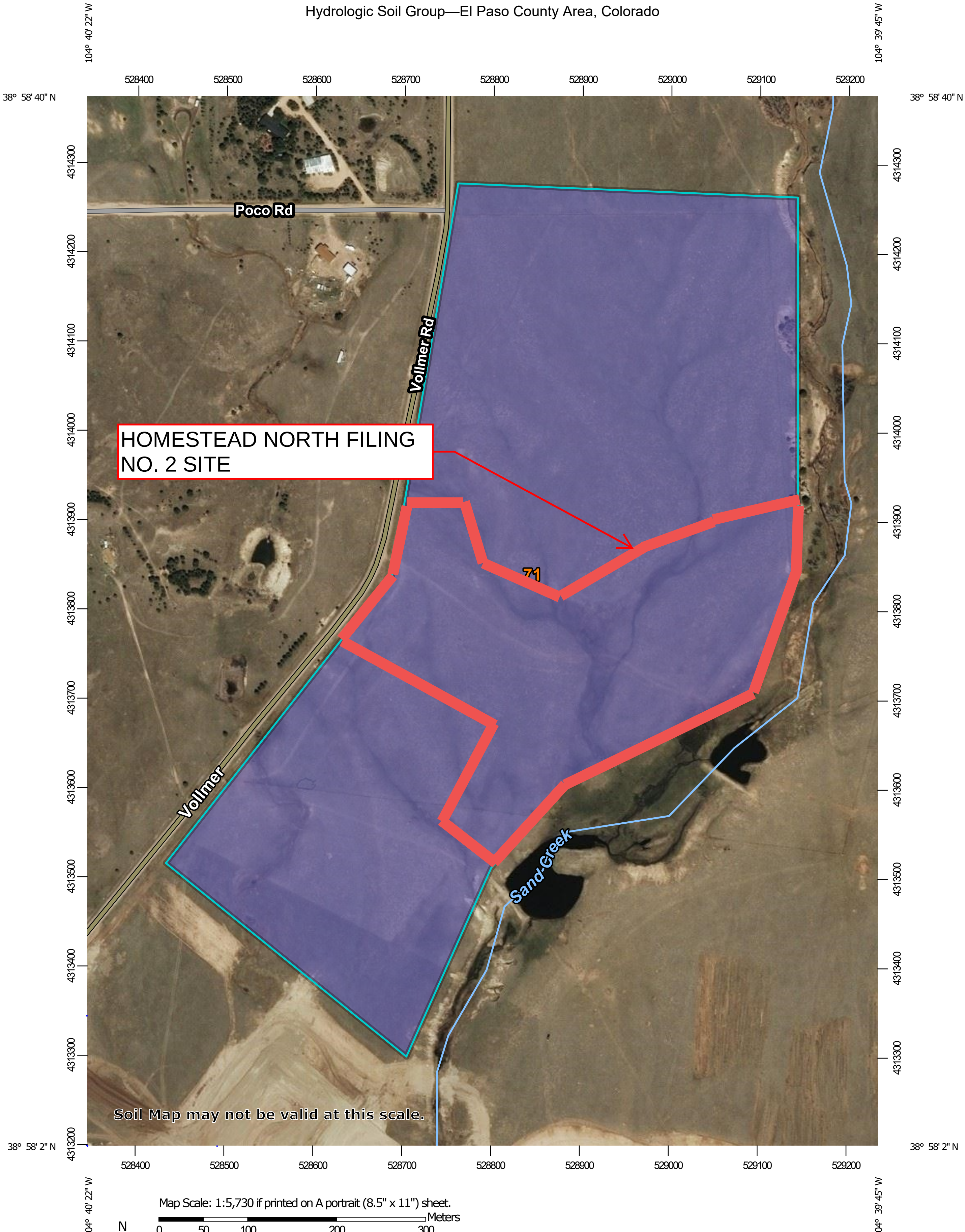
N.T.S.

VICINITY MAP
HOMESTEAD NORTH AT
STERLING RANCH FILING NO. 2
JOB NO. 25188.00
02-16-2022

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

X:\2510000.all\2518810\Drawings\Presentations\Vicinity Map Homestead North at SR Filing 2.dwg, 8.5x11 Portrait, 2/16/2022 10:52:53 AM, CS



Map Scale: 1:5,730 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

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 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	90.2	100.0%
Totals for Area of Interest			**90.2**	**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

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 referenced 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, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

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.

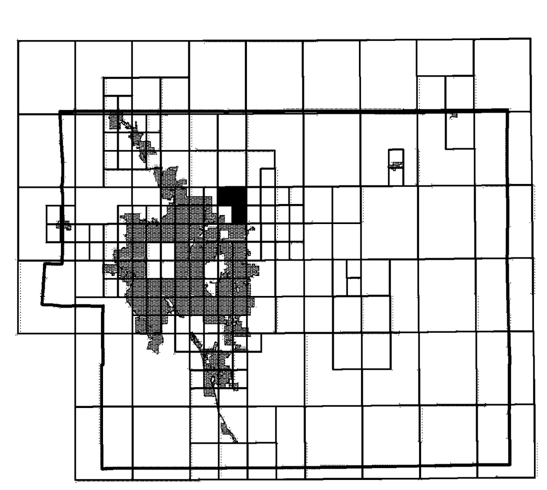
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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

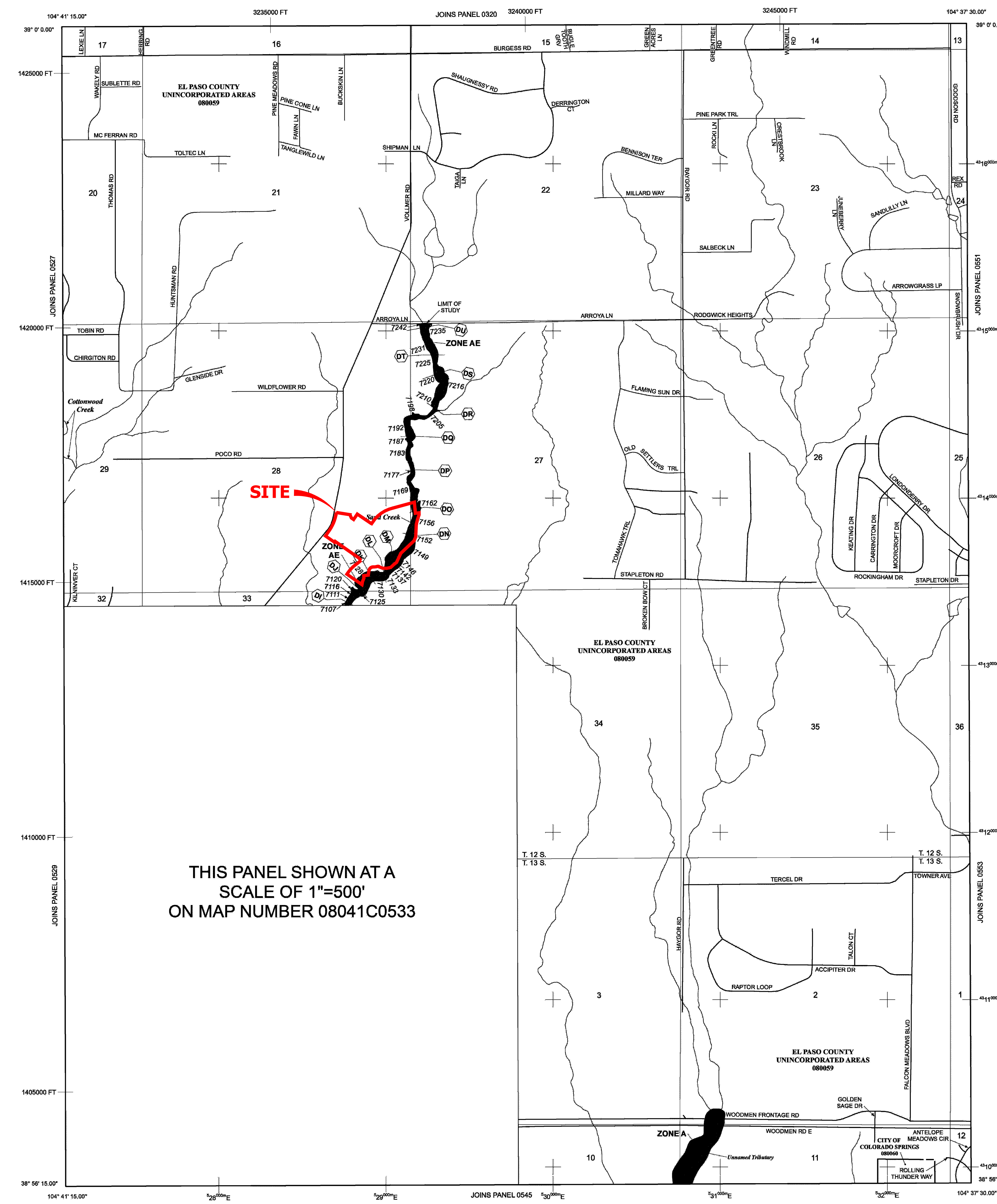
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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.



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)
$^{42}75^{000m}$N	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" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0535G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0535	G
EL PASO COUNTY	080059	0535	G

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

MAP NUMBER
08041C0535G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

Appendix B
Hydrologic Calculations

COMPOSITE % IMPERVIOUS & COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision:	Existing Conditions Homestead Fil.2	Project Name:	Homestead North
Location:	El Paso County	Project No.:	25188.00
		Calculated By:	ARJ
		Checked By:	
		Date:	7/15/22

Basin ID	Total Area (ac)	Streets/Paved (100% Impervious)				Residential (45%-65% Impervious)				Lawns (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
H-1	5.36	0.90	0.96	0.03	0.6%	0.45	0.59	0.00	0.0%	0.09	0.36	5.32	2.0%	0.10	0.36	2.6%
H-2	49.40	0.90	0.96	0.01	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	49.39	2.0%	0.09	0.36	2.0%
H-3	1.57	0.90	0.96	0.03	1.7%	0.45	0.59	0.00	0.0%	0.09	0.36	1.54	2.0%	0.10	0.37	3.7%
H-4	1.85	0.90	0.96	0.03	1.4%	0.45	0.59	0.00	0.0%	0.09	0.36	1.82	2.0%	0.10	0.37	3.4%
H-5	3.97	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	3.97	2.0%	0.09	0.36	2.0%

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Existing Conditions Homestead Fil.2
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 7/15/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
H-1	5.36	B	3%	0.10	0.36	300	1.0%	31.4	685	2.9%	7.0	3.2	3.6	35.0	985.0	32.7	32.7
H-2	49.40	B	2%	0.09	0.36	130	1.0%	20.8	2216	2.5%	7.0	3.2	11.5	32.3	2346.0	50.9	32.3
H-3	1.57	B	4%	0.10	0.37	130	1.0%	20.5	88	5.6%	7.0	3.2	0.5	21.0	218.0	26.0	21.0
H-4	1.85	B	3%	0.10	0.37	130	1.0%	20.6	127	3.1%	7.0	3.2	0.7	21.2	257.0	26.7	21.2
H-5	3.97	B	2%	0.09	0.36	130	1.0%	20.8	95	5.6%	7.0	3.2	0.5	21.3	225.0	26.4	21.3

NOTES:

$$t_c = t_i + t_t \qquad \text{Equation 6-2}$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}} \qquad \text{Equation 6-3}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t} \qquad \text{Equation 6-4}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}} \qquad \text{Equation 6-5}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

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

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 7/15/22

Subdivision: Existing Conditions Homestead Fil.2
Location: El Paso County
Design Storm: 5-Year

STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1h	H-1	5.36	0.10	32.7	0.51	2.35	1.2															
	2h	H-2	49.40	0.09	32.3	4.46	2.37	10.6															
	3h	H-3	1.57	0.10	21.0	0.16	3.02	0.5															
	4h	H-4	1.85	0.10	21.2	0.19	3.00	0.6															
	5h	H-5	3.97	0.09	21.3	0.36	3.00	1.1															

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are private and RCP unless otherwise noted. Pipe size shown in table column.

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

Subdivision: Existing Conditions Homestead Fil.2
Location: El Paso County
Design Storm: 100-Year

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 7/15/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1h	H-1	5.36	0.36	32.7	1.95	3.95	7.7															
	2h	H-2	49.40	0.36	32.3	17.79	3.98	70.7															
	3h	H-3	1.57	0.37	21.0	0.58	5.07	2.9															
	4h	H-4	1.85	0.37	21.2	0.68	5.04	3.4															
	5h	H-5	3.97	0.36	21.3	1.43	5.03	7.2															

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are private and RCP unless otherwise noted. Pipe size shown in table column.

COMPOSITE % IMPERVIOUS & COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Homestead Fil. 2 - Proposed Conditions
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

OS basins only valid for proposed condition, used for interim swale calculations sections AA and BB only.

Basin ID	Total Area (ac)	Streets/Paved (100% Impervious)				Residential (45%-65% Impervious)				Lawns (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
OS1	3.83	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	3.83	2.0%	0.09	0.36	2.0%
B1.1	1.24	0.90	0.96	0.25	20.1%	0.45	0.59	0.89	32.2%	0.09	0.36	0.10	0.2%	0.51	0.64	52.4%
B1.2	0.38	0.90	0.96	0.11	29.0%	0.45	0.59	0.18	21.4%	0.09	0.36	0.09	0.5%	0.50	0.64	50.9%
B1.3	0.45	0.90	0.96	0.13	28.0%	0.45	0.59	0.19	18.6%	0.09	0.36	0.14	0.6%	0.47	0.62	47.3%
B2	0.86	0.90	0.96	0.33	38.6%	0.45	0.59	0.35	18.5%	0.09	0.36	0.17	0.4%	0.55	0.69	57.5%
B3	0.23	0.90	0.96	0.18	77.6%	0.45	0.59	0.00	0.0%	0.09	0.36	0.05	0.4%	0.72	0.83	78.1%
B4	3.51	0.90	0.96	0.45	12.9%	0.45	0.59	2.58	33.1%	0.09	0.36	0.48	0.3%	0.46	0.61	46.3%
B5	1.11	0.90	0.96	0.35	31.7%	0.45	0.59	0.73	29.5%	0.09	0.36	0.03	0.1%	0.58	0.70	61.2%
B6	3.61	0.90	0.96	1.25	34.7%	0.45	0.59	1.85	23.0%	0.09	0.36	0.51	0.3%	0.55	0.69	58.0%
B7	1.63	0.90	0.96	0.43	26.6%	0.45	0.59	1.07	29.4%	0.09	0.36	0.13	0.2%	0.54	0.67	56.2%
B8	2.14	0.90	0.96	0.50	23.3%	0.45	0.59	1.53	32.2%	0.09	0.36	0.11	0.1%	0.54	0.66	55.6%
B9	3.77	0.90	0.96	0.80	21.2%	0.45	0.59	2.44	42.1%	0.09	0.36	0.53	0.3%	0.50	0.64	63.6%
B10	0.22	0.90	0.96	0.18	79.1%	0.45	0.59	0.00	0.0%	0.09	0.36	0.05	0.4%	0.73	0.83	79.5%
B11	1.67	0.90	0.96	0.00	0.0%	0.45	0.59	0.25	9.7%	0.09	0.36	1.42	1.7%	0.14	0.39	11.4%
B12	2.18	0.90	0.96	0.00	0.0%	0.45	0.59	1.19	35.5%	0.09	0.36	0.99	0.9%	0.29	0.49	36.4%
B13	0.43	0.90	0.96	0.00	0.0%	0.45	0.59	0.35	53.4%	0.09	0.36	0.08	0.4%	0.39	0.55	53.8%
B14	0.42	0.90	0.96	0.00	0.0%	0.45	0.59	0.28	43.9%	0.09	0.36	0.14	0.6%	0.33	0.52	44.5%
Pond B	27.69															44.4%
OS2	9.74	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	9.74	2.0%	0.09	0.36	2.0%
OS3	21.02	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	21.02	2.0%	0.09	0.36	2.0%
C-1	0.92	0.90	0.96	0.06	6.6%	0.45	0.59	0.86	60.2%	0.09	0.36	0.01	0.0%	0.48	0.61	66.8%
C-2	1.24	0.90	0.96	0.13	10.8%	0.45	0.59	0.78	40.8%	0.09	0.36	0.33	0.5%	0.40	0.57	52.1%
C-3	0.29	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.29	2.0%	0.09	0.36	2.0%

DRAINAGE - FEE CALCULATION

Subdivision: Homestead Fil. 2 - Proposed Conditions
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 7/15/22

Basin ID	Total Area (ac)	New -Streets/Paved (100% Impervious)				New -Residential (45%-65% Impervious)				New - Lawns (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.	Imperv. Area
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}		
Platted Filing No. 2 Area	36.3	0.90	0.96	5.16	14.2%	0.45	0.59	15.52	21.4%	0.09	0.36	9.18	0.5%	0.34	0.48	36.1%	13.1

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Homestead Fil. 2 - Proposed Conditions
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
OS1	3.83	B	2%	0.09	0.36	93	3.0%	12.2	350	6.3%	7.0	1.8	3.3	15.5	443	28.2	15.5
OS2	9.74	B	2%	0.09	0.36	207	2.8%	18.8	703	3.6%	7.0	1.3	8.9	27.7	910	32.4	27.7
OS3	21.02	B	2%	0.09	0.36	202	3.5%	17.1	902	2.4%	7.0	1.1	13.8	30.9	1104	36.0	30.9
B1.1	1.24	B	52%	0.51	0.64	100	2.0%	8.5	610	3.1%	20.0	3.5	2.9	11.4	710	20.6	11.4
B1.2	0.38	B	51%	0.50	0.64	100	3.0%	7.6	60	2.5%	20.0	3.2	0.3	7.9	160	17.7	7.9
B1.3	0.45	B	47%	0.47	0.62	50	2.0%	6.4	270	2.0%	20.0	2.8	1.6	8.0	320	20.0	8.0
B2	0.86	B	58%	0.55	0.69	9.5	2.0%	2.4	368	3.4%	20.0	3.7	1.7	4.1	378	18.2	5.0
B3	0.23	B	78%	0.72	0.83	9.5	2.0%	1.7	360	3.7%	20.0	3.9	1.6	3.2	370	14.3	5.0
B4	3.51	B	46%	0.46	0.61	25	2.0%	4.6	680	1.6%	20.0	2.5	4.5	9.1	705	24.0	9.1
B5	1.11	B	61%	0.58	0.70	25	2.0%	3.7	460	1.5%	20.0	2.5	3.1	6.8	485	19.1	6.8
B6	3.61	B	58%	0.55	0.69	9.5	2.0%	2.4	855	3.0%	20.0	3.5	4.1	6.5	865	20.9	6.5
B7	1.63	B	56%	0.54	0.67	50	2.0%	5.7	315	1.5%	20.0	2.4	2.1	7.8	365	19.0	7.8
B8	2.14	B	56%	0.54	0.66	50	2.0%	5.7	280	1.0%	20.0	2.0	2.4	8.1	330	19.4	8.1
B9	3.77	B	64%	0.50	0.64	100	2.0%	8.7	600	2.9%	20.0	3.4	2.9	11.6	700	18.5	11.6
B10	0.22	B	80%	0.73	0.83	9.5	2.0%	1.6	200	0.5%	20.0	1.4	2.4	4.1	210	14.9	5.0
B11	1.67	B	11%	0.14	0.39	30	2.0%	7.5	200	0.5%	20.0	1.4	2.4	9.9	230	28.5	9.9
B12	2.18	B	36%	0.29	0.49	30	2.0%	6.4	500	1.4%	7.0	0.8	10.2	16.6	530	24.8	16.6
B13	0.43	B	54%	0.39	0.55	30	20.0%	2.6	144	2.0%	7.0	1.0	2.4	5.0	174	17.9	5.0
B14	0.42	B	45%	0.33	0.52	30	20.0%	2.8	200	2.0%	7.0	1.0	3.4	6.2	230	20.0	6.2
C-1	0.92	B	67%	0.48	0.61	100	2.0%	9.0	80	3.0%	7.0	1.2	1.1	10.1	180	15.1	10.1
C-2	1.24	B	52%	0.40	0.57	30	2.0%	5.5	902	3.8%	20.0	3.9	3.9	9.3	932	21.9	9.3
C-3	0.29	B	2%	0.09	0.36	100	2.0%	14.5	85	2.0%	7.0	1.0	1.4	15.9	185	26.7	15.9

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 2 - Proposed Conditions
Location: El Paso County
Design Storm: 5-Year

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	O.2	OS2	9.74	0.09	27.7	0.88	2.60	2.3															Sect. BB Offsite undeveloped runoff. Drains to Sand Creek within interim swale
	O.3	OS3	21.02	0.09	30.9	1.89	2.44	4.6	30.9	2.77	2.44	6.8											Sect. AA Offsite undeveloped runoff. Drains to Sand Creek within interim swale
	1.1b	B1.1	1.24	0.51	11.4	0.63	3.94	2.5					0.00	0	2.6					210	3.2	1.1	On-grade Type R Inlet, Bypass to DP 2B Tributary basins B1.1 and OS1
	1.1i								11.4	0.63	3.94	2.5											Captured runoff from on-grade type R -Inlet DP 1.1b piped to DP2.1
	O.1	OS1	3.83	0.09	15.5	0.34	3.47	1.2															Offsite runoff from basin OS1 sheet flows onto Perry Owens Drive
	1.2b	B1.2	0.38	0.50	7.9	0.19	4.48	0.9	15.5	0.53	3.47	1.8	0.00	0.00	2.6					235	3.2	1.2	On-grade Type R Inlet, Bypass to DP 1.3B Tributary basins B1.2 and OS1
	1.2i								15.5	0.53	3.47	1.8											Captured runoff from on-grade type R -Inlet from DP 1.2b
	2.1								15.5	1.16	3.47	4.0				4.0		2.0	24	487	2.8	2.9	Piped runoff to DP 2.4 Tributary Basins B1.1 OS1 and B1.2
	1.3b	B1.3	0.45	0.47	8.0	0.21	4.46	0.9	8.0	0.21	4.46	0.9											Street flow Indudes by-pass flow from DP 1.2b and direct runoff from basin B1.3
	2b	B2	0.86	0.55	5.0	0.47	5.17	2.4	8.0	0.68	4.46	3.0											Street flow from Sam Bass Drive and Aspen Valley Drive Recives bypass flow from 1.1b,1.2b and direct runoff from basin B1.3 and B2, continues in C&g to DP- 6b
	3b	B3	0.23	0.72	5.0	0.17	5.17	0.9															Street flow from Sam Bass Drive
	4b	B4	3.51	0.46	9.1	1.61	4.27	6.9					0.0	0	2.5					340	3.2	1.8	Type R Inlet, Bypass to DP 6B
	4i								9.1	1.61	4.27	6.9											Captured runoff from on-grade type R -Inlet from DP 4b, Piped to DP2.3
	6b	B6	3.61	0.55	6.5	2.00	4.77	9.5	8.0	2.85	4.46	12.7	5.2	1.167	2.5					95	3.2	0.5	Recives by-pass flows from Basins (B1.1, B1.2 and B4), Direct Runoff from B1.3,B2,B3, and B6 Runoff bypassed to sump inlet at DP 9B
	6i								8.0	1.68	4.46	7.5											Captured runoff from on-grade type R -Inlet DP 6i
	9b	B9	3.77	0.50	11.6	1.87	3.91	7.3	11.6	3.04	3.91	11.9											Sump inlet Recives by-pass flows from (B1.1, B1.2 and B4) Direct Runoff from B1.3,B2,B3, B6 and B9
	5b	B5	1.11	0.58	6.8	0.65	4.70	3.1					0.0	0	1.5					240	2.4	1.6	
	5i								6.8	0.65	4.70	3.1											On-grade Type R Inlet, Bypass to DP 7b Tributary basins B5
	2.2								6.8	0.65	4.70	3.1						2.0	18	240	2.8	1.4	Piped runoff to DP-2.3 Tributary basins B5
	7b	B7	1.63	0.54	7.8	0.88	4.50	4.0	7.8	0.88	4.50	4.0	0.0	0	1.6					340	2.5	2.2	On-grade Type R Inlet, Bypass to DP 8B
	7i								7.8	0.88	4.50	4.0											. Captured runoff from on-grade type R -Inlet from DP 1.2b
	2.3								9.1	2.26	4.27	9.6						2.0	24	50	2.8	0.3	Piped runoff Tributary basins B5,and B4
	2.4								9.4	3.14	4.22	13.3						2.0	24	10	2.8	0.1	Piped runoff Tributary Basins B4,B5 and B7

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 2 - Proposed Conditions
Location: El Paso County
Design Storm: 5-Year

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	2.5								18.4	4.30	3.21	13.8						2.0	36	380	2.8	2.2	Piped runoff to DP 2.6 Tributary Basins B1.1, B1.2, B4, B5 and B7
	8b	B8	2.14	0.54	8.1	1.15	4.45	5.1	10.1	1.15	4.12	4.7	4.7		0.9					125	1.9	1.1	Street Flow, Recives bypass flow from DP 7B
	2.6								21.0	5.98	3.02	18.1						2.0	36	100	5.5	0.3	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6, and B7
	2.7								21.0	9.02	3.02	27.2						2.0	36	3	5.5	0.0	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7,B8, and B9
	10b	B10	0.22	0.73	5.0	0.16	5.17	0.8	10.1	1.31	4.12	5.4											Sump inlet revices by-pass flow from 7b and runoff from 5b,8b, and 10b
	2.8								21.0	10.33	3.02	31.2						2.0	48	50	5.5	0.2	Piped runoff in to forebay Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7, and B9
	11b	B11	1.67	0.14	9.9	0.24	4.15	1.0															
	12b	B12	2.18	0.29	16.6	0.62	3.37	2.1															Runoff from back of yard lots drains in swale to design point 12b
	3.1								16.6	0.62	3.37	2.1						2.8	18	220	3.3	1.1	Runoff from Basin B12 drains to type C inlet
	13b	B13	0.43	0.39	5.0	0.17	5.16	0.9															Runoff from back of yard lots drains in swale to design point 13b
	3.2								17.7	0.79	3.28	2.6						0.9	18	346	1.9	3.0	Runoff from Basin B13 drains to type C inlet in confluence with runoff from basin B12
	14b	B14	0.42	0.33	6.2	0.14	4.85	0.7															Runoff from Basin B14 drains directly into pond B
	3.3								20.7	0.93	3.04	2.8							18				Runoff from DP 3.2 Outfalls into Forebay at DP 3.3
	4								21.0	11.26	3.02	34.0											Flow confluences into Pond B. All of Basin B
	C.1	C-1	0.92	0.48	10.1	0.44	4.12	1.8															Offsite runoff to design point C.1. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-1
	C.2	C-2	1.24	0.40	9.3	0.50	4.23	2.1															Offsite runoff to design point C.2. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-2
	C.3	C-3	0.29	0.09	15.9	0.03	3.43	0.1															Offsite runoff to design point C.1. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-1

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are RCP unless otherwise noted.
Pipe size shown in table column

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

Subdivision: Homestead Fil. 2 - Proposed Conditions
Location: El Paso County
Design Storm: 100-Year

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	O.2	OS2	9.74	0.36	27.7	3.51	4.37	15.3															Sect. BB Offsite undeveloped runoff. Drains to Sand Creek within interim swale
	O.3	OS3	21.02	0.36	30.9	7.57	4.09	31.0	30.9	11.08	4.09	45.3											Sect. AA Offsite undeveloped runoff. Drains to Sand Creek within interim swale
	1.1b	B1.1	1.24	0.64	11.4	0.80	6.61	5.3					0.00	0.00	2.6					210	3.2	1.1	On-grade Type R Inlet, Bypass to DP 2B Tributary basins B1.1 and OS1
	1.1i								11.4	0.80	6.61	5.3											Captured runoff from on-grade type R -Inlet DP 1.1b piped to DP2.1
	O.1	OS1	3.83	0.36	15.5	1.38	5.82	8.0															Offsite runoff from basin OS1 sheet flows onto Perry Owens Drive
	1.2b	B1.2	0.38	0.64	7.9	0.24	7.53	1.8	15.5	1.62	5.82	9.43	0.70	0.12	2.6					235	3.2	1.2	On-grade Type R Inlet, Bypass to DP 1.3B Tributary basins B1.2 and OS1
	1.2i								15.5	1.50	5.82	8.7											Captured runoff from on-grade type R -Inlet from DP 1.2b
	2.1								15.5	2.30	5.82	13.4				13.4		2.0	24	487	2.8	2.9	Piped runoff to DP 2.4 Tributary Basins B1.1 OS1 and B1.2
	1.3b	B1.3	0.45	0.62	8.0	0.28	7.48	2.1	16.8	0.40	5.63	2.3											Street flow Includes by-pass flow from DP 1.2b and direct runoff from basin B1.3
	2b	B2	0.86	0.69	5.0	0.59	8.68	5.1	16.8	0.99	5.63	5.58											Street flow from Sam Bass Drive and Aspen Valley Drive Recives bypass flow from 1.1b,1.2b and direct runoff from basin B1.3 and B2, continues in C&g to DP- 6b
	3b	B3	0.23	0.83	5.0	0.19	8.68	1.6															Street flow from Sam Bass Drive
	4b	B4	3.51	0.61	9.1	2.13	7.17	15.3					3.5	0.49	2.5					340	3.2	1.8	Type R Inlet, Bypass to DP 6B
	4i								9.1	1.64	7.17	11.8											Captured runoff from on-grade type R -Inlet from DP 4b, Piped to DP2.3
	6b	B6	3.61	0.69	6.5	2.48	8.01	19.9	16.8	4.15	5.63	23.36	13.3	2.36	2.5					95	3.2	0.5	Recives by-pass flows from Basins (B1.1, B1.2 and B4), Direct Runoff from B1.3,B2,B3, and B6 Runoff bypassed to sump inlet at DP 9B
	6i								16.8	1.79	5.63	10.06											Captured runoff from on-grade type R -Inlet DP 6i
	9b	B9	3.77	0.64	11.6	2.40	6.56	15.7	17.3	4.76	5.56	26.46											Sump inlet Recives by-pass flows from (B1.1, B1.2 and B4) Direct Runoff from B1.3,B2,B3, B6 and B9
	5b	B5	1.11	0.70	6.8	0.78	7.90	6.2					1.2	0.15	1.5					240	2.4	1.6	
	5i								6.8	0.63	7.90	5.0											On-grade Type R Inlet, Bypass to DP 7b Tributary basins B5
	2.2								6.8	0.63	7.90	5.0						2.0	18	240	2.8	1.4	Piped runoff to DP-2.3 Tributary basins B5
	7b	B7	1.63	0.67	7.8	1.09	7.55	8.2	8.5	1.24	7.36	9.1	1.4	0.19	1.6					340	2.5	2.2	On-grade Type R Inlet, Bypass to DP 8B
	7i								8.5	1.05	7.36	7.7											. Captured runoff from on-grade type R -Inlet from DP 1.2b
	2.3								9.1	2.27	7.17	16.3						2.0		50	2.8	0.3	Piped runoff Tributary basins B5,and B4
	2.4								9.4	3.32	7.09	23.5						2.0	24	10	2.8	0.1	Piped runoff Tributary Basins B4,B5 and B7

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 2 - Proposed Conditions
Location: El Paso County
Design Storm: 100-Year

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	2.5								18.4	5.62	5.39	30.3						2.0	36	380	2.8	2.2	Piped runoff to DP 2.6 Tributary Basins B1.1, B1.2, B4, B5 and B7
	8b	B8	2.14	0.66	8.1	1.42	7.47	10.6	10.1	1.61	6.92	11.1	11.1		0.9					125	1.9	1.1	Street Flow, Recives bypass flow from DP 7B
	2.6								20.7	7.41	5.10	37.8						2.0	36	100	5.5	0.3	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6, and B7
	2.7								21.0	12.17	5.07	61.7						2.0	36	3	5.5	0.0	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7,B8, and B9
	10b	B10	0.22	0.83	5.0	0.19	8.68	1.6	10.1	1.80	6.92	12.5											Sump inlet revices by-pass flow from 7b and runoff from 5b,8b, and 10b
	2.8								21.0	13.97	5.07	70.8						2.0	48	50	5.5	0.2	Piped runoff in to forebay Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7, and B9
	11b	B11	1.67	0.39	9.9	0.66	6.96	4.6															
	12b	B12	2.18	0.49	16.6	1.06	5.66	6.0															Runoff from back of yard lots drains in swale to design point 12b
	3.1								16.6	1.06	5.66	6.0						2.8	18	220	3.3	1.1	Runoff from Basin B12 drains to type C inlet
	13b	B13	0.43	0.55	5.0	0.24	8.66	2.1															Runoff from back of yard lots drains in swale to design point 13b
	3.2								17.7	1.30	5.50	7.1						0.9	18	346	1.9	3.0	Runoff from Basin B13 drains to type C inlet in confluence with runoff from basin B12
	14b	B14	0.42	0.52	6.2	0.21	8.14	1.7															Runoff from Basin B14 drains directly into pond B
	3.3								20.7	1.51	5.10	7.7							18				Runoff from DP 3.2 Outfalls into Forebay at DP 3.3
	4								21.0	15.48	5.07	78.4											Flow confluences into Pond B. All of Basin B
	C.1	C-1	0.92	0.61	10.1	0.57	6.92	3.9															Offsite runoff to design point C.1. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-1
	C.2	C-2	1.24	0.57	9.3	0.71	7.10	5.0															Offsite runoff to design point C.2. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-2
	C.3	C-3	0.29	0.36	15.9	0.10	5.76	0.6															Offsite runoff to design point C.1. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-1

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are RCP unless otherwise noted.
Pipe size shown in table column

COMPOSITE % IMPERVIOUS & COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Homestead Fil. 2 - Future Conditions
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

Future conditions used for all hydraulic calculations except swale sections AA and BB.

Basin ID	Total Area (ac)	Streets/Paved (100% Impervious)				Residential (40%-65% Impervious)				Lawns (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
B1.1	1.24	0.90	0.96	0.25	20.1%	0.45	0.59	0.89	32.2%	0.09	0.36	0.10	0.2%	0.51	0.64	52.4%
B1.2	0.42	0.90	0.96	0.26	61.3%	0.45	0.59	0.16	17.4%	0.09	0.36	0.00	0.0%	0.73	0.82	78.7%
B1.3	0.43	0.90	0.96	0.13	29.7%	0.45	0.59	0.19	19.7%	0.09	0.36	0.11	0.5%	0.49	0.64	49.9%
B2	0.86	0.90	0.96	0.33	38.6%	0.45	0.59	0.35	18.5%	0.09	0.36	0.17	0.4%	0.55	0.69	57.5%
B3	0.23	0.90	0.96	0.18	77.6%	0.45	0.59	0.00	0.0%	0.09	0.36	0.05	0.4%	0.72	0.83	78.1%
B4	3.51	0.90	0.96	0.45	12.9%	0.45	0.59	2.58	33.1%	0.09	0.36	0.48	0.3%	0.46	0.61	46.3%
B5	1.11	0.90	0.96	0.35	31.7%	0.45	0.59	0.73	29.5%	0.09	0.36	0.03	0.1%	0.58	0.70	61.2%
B6	3.61	0.90	0.96	1.25	34.7%	0.45	0.59	1.85	23.0%	0.09	0.36	0.51	0.3%	0.55	0.69	58.0%
B7	1.63	0.90	0.96	0.43	26.6%	0.45	0.59	1.07	29.4%	0.09	0.36	0.13	0.2%	0.54	0.67	56.2%
B8	2.14	0.90	0.96	0.50	23.3%	0.45	0.59	1.53	32.2%	0.09	0.36	0.11	0.1%	0.54	0.66	55.6%
B9	3.77	0.90	0.96	0.80	21.2%	0.45	0.59	2.44	42.1%	0.09	0.36	0.53	0.3%	0.50	0.64	63.6%
B10	0.22	0.90	0.96	0.18	79.1%	0.45	0.59	0.00	0.0%	0.09	0.36	0.05	0.4%	0.73	0.83	79.5%
B11	1.67	0.90	0.96	0.00	0.0%	0.45	0.59	0.25	9.7%	0.09	0.36	1.42	1.7%	0.14	0.39	11.4%
B12	2.18	0.90	0.96	0.00	0.0%	0.45	0.59	1.19	35.5%	0.09	0.36	0.99	0.9%	0.29	0.49	36.4%
B13	0.43	0.90	0.96	0.00	0.0%	0.45	0.59	0.35	53.4%	0.09	0.36	0.08	0.4%	0.39	0.55	53.8%
B14	0.42	0.90	0.96	0.00	0.0%	0.45	0.59	0.28	43.9%	0.09	0.36	0.14	0.6%	0.33	0.52	44.5%
F1	2.08	0.90	0.96	0.32	15.6%	0.30	0.50	1.42	27.2%	0.09	0.36	0.34	0.3%	0.36	0.55	43.1%
F2	1.37	0.90	0.96	0.21	15.4%	0.30	0.50	1.11	32.3%	0.09	0.36	0.05	0.1%	0.38	0.57	47.8%
F3	0.08	0.90	0.96	0.08	100.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.00	0.0%	0.90	0.96	100.0%
F4	0.06	0.90	0.96	0.06	100.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.00	0.0%	0.90	0.96	100.0%
F5	0.69	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.69	2.0%	0.09	0.36	2.0%
Pond B	28.15															49.9%
C-1	0.92	0.90	0.96	0.06	6.6%	0.45	0.59	0.86	60.2%	0.09	0.36	0.01	0.0%	0.48	0.61	66.8%
C-2	1.24	0.90	0.96	0.13	10.8%	0.45	0.59	0.78	40.8%	0.09	0.36	0.33	0.5%	0.40	0.57	52.1%
C-3	0.29	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.29	2.0%	0.09	0.36	2.0%
SC	10.09	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	10.09	2.0%	0.09	0.36	2.0%

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Homestead Fil. 2 - Future Conditions
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
B1.1	1.24	B	52%	0.51	0.64	100	2.0%	8.5	300	2.1%	20.0	2.9	1.7	10.2	400	19.2	10.2
B1.2	0.42	B	79%	0.73	0.82	100	3.0%	4.7	60	2.5%	20.0	3.2	0.3	5.0	160	12.9	5.0
B1.3	0.43	B	50%	0.49	0.64	50	2.0%	6.2	270	2.0%	20.0	2.8	1.6	7.8	320	19.5	7.8
B2	0.86	B	58%	0.55	0.69	9.5	2.0%	2.4	368	3.4%	20.0	3.7	1.7	4.1	378	18.2	5.0
B3	0.23	B	78%	0.72	0.83	9.5	2.0%	1.7	360	3.7%	20.0	3.9	1.6	3.2	370	14.3	5.0
B4	3.51	B	46%	0.46	0.61	25	2.0%	4.6	680	1.6%	20.0	2.5	4.5	9.1	705	24.0	9.1
B5	1.11	B	61%	0.58	0.70	25	2.0%	3.7	460	1.5%	20.0	2.5	3.1	6.8	485	19.1	6.8
B6	3.61	B	58%	0.55	0.69	9.5	2.0%	2.4	855	3.0%	20.0	3.5	4.1	6.5	865	20.9	6.5
B7	1.63	B	56%	0.54	0.67	50	2.0%	5.7	315	1.5%	20.0	2.4	2.1	7.8	365	19.0	7.8
B8	2.14	B	56%	0.54	0.66	50	2.0%	5.7	280	1.0%	20.0	2.0	2.4	8.1	330	19.4	8.1
B9	3.77	B	64%	0.50	0.64	100	2.0%	8.7	600	2.9%	20.0	3.4	2.9	11.6	700	18.5	11.6
B10	0.22	B	80%	0.73	0.83	9.5	2.0%	1.6	200	0.5%	20.0	1.4	2.4	4.1	210	14.9	5.0
B11	1.67	B	11%	0.14	0.39	30	2.0%	7.5	200	0.5%	20.0	1.4	2.4	9.9	230	28.5	9.9
B12	2.18	B	36%	0.29	0.49	30	2.0%	6.4	500	1.4%	7.0	0.8	10.2	16.6	530	24.8	16.6
B13	0.43	B	54%	0.39	0.55	30	20.0%	2.6	144	2.0%	7.0	1.0	2.4	5.0	174	17.9	5.0
B14	0.42	B	45%	0.33	0.52	30	20.0%	2.8	200	2.0%	7.0	1.0	3.4	6.2	230	20.0	6.2
C-1	0.92	B	67%	0.48	0.61	100	2.0%	9.0	80	3.0%	7.0	1.2	1.1	10.1	180	15.1	10.1
C-2	1.24	B	52%	0.40	0.57	30	2.0%	5.5	902	3.8%	20.0	3.9	3.9	9.3	932	21.9	9.3
C-3	0.29	B	2%	0.09	0.36	100	2.0%	14.5	85	2.0%	7.0	1.0	1.4	15.9	185	26.7	15.9
F1	2.08	B	43%	0.36	0.55	100	2.0%	10.6	340	3.8%	20.0	3.9	1.5	12.1	440	20.6	12.1
F2	1.37	B	48%	0.38	0.57	100	2.0%	10.3	340	3.8%	20.0	3.9	1.5	11.7	440	19.7	11.7
F3	0.08	B	100%	0.90	0.96	5	2.0%	0.6	87	0.9%	20.0	1.9	0.8	1.4	92	9.7	5.0
F4	0.06	B	100%	0.90	0.96	5	2.0%	0.6	87	0.9%	20.0	1.9	0.8	1.4	92	9.7	5.0
F5	0.69	B	2%	0.09	0.36	10	4.0%	3.6	40	8.0%	7.0	2.0	0.3	4.0	50	25.9	5.0
SC	10.09	B	2%	0.09	0.36	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

STORMCAD AND HYDRAULIC CALULATIONS WERE MODELED IN THE FUTURE DEVELOPED CONDITION DUE

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 2 - Future Conditions
Location: El Paso County
Design Storm: 5-Year

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1F	F1	2.08	0.36	12.1	0.75	3.84	2.9					2.9	2.08	3					240	3.5	1.2	Future runoff from Homestead North at Sterling Ranch Filing 3 residential lots Captured at on grade type R inlet at DP1.1B
	1.1b	B1.1	1.24	0.51	10.2	0.63	4.10	2.6	13.3	1.38	3.71	5.1	0.0	0.00	2.6					210	3.2	1.1	Tributary basins B1.1 and F1
	1.1i								13.3	1.38	3.71	5.1											Captured runoff from on-grade type R -Inlet DP 1.1b piped to DP2.1
	2F	F2	1.37	0.38	11.7	0.53	3.89	2.1					2.1	0.38	3					240	3.5	1.2	Future runoff from Homestead North at Sterling Ranch Filing 3 residential lots Captured at on grade type R inlet at DP1.2B
	1.2b	B1.2	0.42	0.73	5.0	0.30	5.16	1.5	12.9	0.83	3.75	3.1	0.0	0.00	2.2					60	3.0	0.3	On-grade Type R Inlet, Bypass to DP 1.3B Tributary basins B1.2 and F2. Drains to DP 2B
	1.2i								13.3	0.83	3.71	3.1											Captured runoff from on-grade type R -Inlet from DP 1.2b
	2.1								13.3	2.21	3.71	8.2				8.2		2.0	24	487	2.8	2.9	Piped runoff to DP 2.4 Tributary Basins B1.1 and B1.2 +(F1,F2)
	3F	F3	0.08	0.90	5.0	0.07	5.17	0.4					0.4	0.90	3					150	3.5	0.7	Future runoff from Homestead North at Sterling Ranch Filing 3 residential lots Runoff drains from street to residential area to design point 3F. Drains to design point 1.3B
	1.3b	B1.3	0.43	0.49	7.8	0.21	4.50	0.9	13.2	0.28	3.71	1.0	1.0	0.49	2.3					160	3.0	0.9	Street flow Indudes by-pass flow from DP 1.2b and direct runoff from basin B1.3 and runoff from Basin F3
	2b	B2	0.86	0.55	5.0	0.47	5.17	2.4	14.1	0.75	3.61	2.7	2.7	0.75	4.6					480	4.3	1.9	Street flow from Sam Bass Drive and Aspen Valley Drive Recives bypass flow from 1.1b,1.2b and direct runoff from basin B1.3 and B2, continues in C&g to DP- 6b
	3b	B3	0.23	0.72	5.0	0.17	5.17	0.9					0.9	0.72	4.6					430	4.3	1.7	Street flow from Sam Bass Drive. Runoff drains to design point 6B via C & G
		F5	0.69	0.09	5.0	0.06	5.17	0.3															Runoff drains across future grass open space to DP 4B
	4b	B4	3.51	0.46	9.1	1.61	4.27	6.9	9.1	1.67	4.27	7.1	0.0	0.00	2.5					340	3.2	1.8	Type R Inlet, Bypass to DP 6B
	4i								9.1	1.61	4.27	6.9											Captured runoff from on-grade type R -Inlet from DP 4b, Piped to DP2.3
	4F	F4	0.06	0.90	5.0	0.05	5.17	0.3					0.3	0.90	5					750	4.5	2.8	Future runoff from Homestead North at Sterling Ranch Filing 3 Residential Area Runoff drains from street to residential area to design point 6b
	6b	B6	3.61	0.55	6.5	2.00	4.77	9.5	16.0	2.97	3.43	10.2	1.4	0.409	2.5					95	3.2	0.5	Recives by-pass flows from Basins (B1.1, B1.2 and B4, F1, F2), Direct Runoff from B1.3,B2,B3, and B6 Runoff bypassed to sump inlet at DP 9B
	6i								16.0	2.56	3.43	8.8											Captured runoff from on-grade type R -Inlet DP 6i
	9b	B9	3.77	0.50	11.6	1.87	3.91	7.3	16.5	2.28	3.38	7.7											Sump inlet Recives by-pass flows from (B1.1, B1.2 and B4) Direct Runoff from B1.3,B2,B3, B6 and B9
	5b	B5	1.11	0.58	6.8	0.65	4.70	3.1					0.0	0	1.5					240	2.4	1.6	Runoff drains to on grade type R inlet at DP 5b By-pass runoff drains to DP 7B
	5i								6.8	0.65	4.70	3.1											On-grade Type R Inlet, Bypass to DP 7b Tributary basins B5
	2.2								6.8	0.65	4.70	3.1						2.0	18	240	2.8	1.4	Piped runoff to DP-2.3 Tributary basins B5
	7b	B7	1.63	0.54	7.8	0.88	4.50	4.0	7.8	0.88	4.50	4.0	0.0	0	1.6					340	2.5	2.2	On-grade Type R Inlet, Bypass to DP 8B
	7i								7.8	0.88	4.50	4.0											Captured runoff from on-grade type R -Inlet from DP 7b. No by-pass runoff recived in the 5 year event
	2.3								9.1	2.26	4.27	9.6						2.0	24	50	2.8	0.3	Piped runoff Tributary basins B5,B4, and F5

STORMCAD AND HYDRAULIC CALULATIONS WERE MODELED IN THE FUTURE DEVELOPED CONDITION DUE

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 2 - Future Conditions
Location: El Paso County
Design Storm: 5-Year

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

Description	Design Point	DIRECT RUNOFF								TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	2.4								9.4	3.14	4.22	13.3						2.0	36	10	2.8	0.1	Piped runoff Tributary Basins B4,B5, B7,and F5
	2.5								16.1	5.35	3.41	18.3						2.0	36	380	2.8	2.2	Piped runoff to DP 2.6. Runoff confluenced w/ upstream lateral at DP 2.1 Tributary Basins B1.1, B1.2, B4, B5, B7,F1, F2 and F5
	8b	B8	2.14	0.54	8.1	1.15	4.45	5.1	10.1	1.15	4.12	4.7	4.7		0.9					125	1.8	1.1	Street Flow, Recives bypass flow from DP 7B. Goes to DP 10B
	2.6								18.4	7.91	3.22	25.5						2.0	36	100	2.8	0.6	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6, and B7+ (F1,F2,F3,F4 and F5)
	2.7								19.0	10.19	3.17	32.3						2.0	36	3	5.5	0.0	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7,B8, and B9 + (F1,F2,F3,F4 and F5)
	10b	B10	0.22	0.73	5.0	0.16	5.17	0.8	10.1	1.31	4.12	5.4											Sump inlet revices by-pass flow from 7b and runoff from 5b,8b, and 10b
	2.8								19.0	11.50	3.17	36.5						2.0	48	50	5.5	0.2	Piped runoff in to forebay Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7, and B9+ (F1,F2,F3,F4 and F5)
	11b	B11	1.67	0.14	9.9	0.24	4.15	1.0															
	12b	B12	2.18	0.29	16.6	0.62	3.37	2.1															Runoff from back of yard lots drains in swale to design point 12b, a type c area inlet.
	3.1								16.6	0.62	3.37	2.1						2.8	18	220	3.3	1.1	Runoff from Basin B12 drains to type C inlet, piped to DP 3.2
	13b	B13	0.43	0.39	5.0	0.17	5.16	0.9															Runoff from back of yard lots drains in swale to design point 13b
	3.2								17.7	0.79	3.28	2.6						0.9	18	346	1.9	3.0	Runoff from Basin B13 drains to type C inlet in confluence with runoff from basin B12/DP 3.1
	14b	B14	0.42	0.33	6.2	0.14	4.85	0.7															Runoff from Basin B14 drains directly into pond B
	3.3								20.7	0.93	3.04	2.8							18				Runoff from DP 3.2. Outfalls into Forebay at DP 3.3
	4								19.0	12.67	3.17	40.2											Flow confluences into Pond B. All of Basin B
	C.1	C-1	0.92	0.48	10.1	0.44	4.12	1.8															Offsite runoff to design point C.1. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-1
	C.2	C-2	1.24	0.40	9.3	0.50	4.23	2.1															Offsite runoff to design point C.2. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-2
	C.3	C-3	0.29	0.09	15.9	0.03	3.43	0.1															Offsite runoff to design point C.3. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-3
	SC	SC	10.09	0.09	-	-	-	360															Sand Creek portion of the site. Flows used the M&S MDDP which will be existing at the time of channel development.

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are RCP unless otherwise noted.
Pipe size shown in table column.
Values in RED indicate they are from M&S MDDP to be existing at the time of channel development.

STORMCAD AND HYDRAULIC CALULATIONS WERE MODELED IN THE FUTURE DEVELOPED CONDITION DUE TO GREATER FLOWS

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 2 - Future Conditions
Location: El Paso County
Design Storm: 100-Year

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
Description	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1F	F1	2.08	0.55	12.1	1.14	6.45	7.4					7.4	2.08	3					240	3.5	1.2	Future runoff from Homestead North at Sterling Ranch Filing 3 residential lots Captured at on-grade type R inlets at DP1.1B
	1.1b	B1.1	1.24	0.64	10.2	0.80	6.89	5.5	13.3	1.94	6.22	12.1	2.0	0.32	2.6					210	3.2	1.1	On-grade Type R Inlet, Bypass to DP 2B Tributary basins B1.1 and F1
	1.1i								13.3	1.62	6.22	10.1											Captured runoff from on-grade type R -Inlet DP 1.1b piped to DP2.1
	2F	F2	1.37	0.57	11.7	0.77	6.53	5.0					5.0	0.57	3					240	3.5	1.2	Future runoff from Homestead North at Sterling Ranch Filing 3 residential lots Captured at on-gade inlets at DP1.2B
	1.2b	B1.2	0.42	0.82	5.0	0.34	8.67	2.9	12.9	1.11	6.29	7.0	0.1	0.02	2.2					60	3.0	0.3	On-grade Type R Inlet, Bypass to DP 1.3B Tributary basins B1.2 and F2. Drains to DP 1.3B
	1.2i								13.3	1.09	6.22	6.8											Captured runoff from on-grade type R -Inlet from DP 1.2b
	2.1								13.3	2.71	6.22	16.9				16.9		2.0	24	487	2.8	2.9	Piped runoff to DP 2.4 Tributary Basins B1.1 and B1.2 + (F1,F2)
	3F	F3	0.08	0.96	5.0	0.07	8.68	0.6					0.6	0.96	3					150	3.5	0.7	Future runoff from Homestead North at Sterling Ranch Filing 3 residential lots Runoff drains from street to residential area to design point 3F. Drains to design point 1.3B
	1.3b	B1.3	0.43	0.64	7.8	0.27	7.55	2.0	13.2	0.36	6.23	2.2	2.2	0.64	2.3					160	3.0	0.9	Street flow Indudes by-pass flow from DP 1.2b and direct runoff from basin B1.3 and runoff from Basin F3. Drains to DP 2b
	2b	B2	0.86	0.69	5.0	0.59	8.68	5.1	14.1	1.34	6.06	8.1	8.1	1.34	4.6					480	4.3	1.9	Street flow from Sam Bass Drive and Aspen Valley Drive Recives bypass flow from 1.1b,1.2b and direct runoff from basin B1.3 and B2, continues in C&g to DP- 6b
	3b	B3	0.23	0.83	5.0	0.19	8.68	1.6					1.6	0.83	4.6					430	4.3	1.7	Street flow from Sam Bass Drive. Runoff drains to design point 6B via C & G
		F5	0.69	0.36	5.0	0.25	8.68	2.2															Future runoff from Homestead North at Sterling Ranch Filing 3 residential lots Runoff drains across future grass open space to DP 4B
	4b	B4	3.51	0.61	9.1	2.13	7.17	15.3	9.1	2.38	7.17	17.1	4.2	0.59	2.5					340	3.2	1.8	Type R Inlet, Bypass to DP 6B
	4i								9.1	1.79	7.17	12.9											Captured runoff from on-grade type R -Inlet from DP 4b, Piped to DP2.3
	4F	F4	0.06	0.96	5.0	0.05	8.68	0.4					0.4	0.96	5					750	4.5	2.8	Future runoff from Filing 3 Residential Area Runoff drains from street to residential area
	6b	B6	3.61	0.69	6.5	2.48	8.01	19.9	16.0	4.64	5.75	26.7	11.8	2.05	2.5					95	3.2	0.5	Recives by-pass flows from Basins (B1.1, B1.2 and B4 +F1, F2), Direct Runoff from B1.3,B2,B3, and B6, 4F Runoff bypassed to sump inlet at DP 9B
	6i								16.0	2.59	5.75	14.9											Captured runoff from on-grade type R -Inlet DP 6i, piped to DP 2.6.
	9b	B9	3.77	0.64	11.6	2.40	6.56	15.7	16.5	4.45	5.67	25.3											Sump inlet Recives by-pass flows from (B1.1, B1.2 and B4) Direct Runoff from B1.3,B2,B3, B6 and B9
	5b	B5	1.11	0.70	6.8	0.78	7.90	6.2					1.1	0.14	1.5					240	2.4	1.6	Runoff drains to on grade type R inlet at DP 5b By-pass runoff drains to DP 7B
	5i								6.8	0.64	7.90	5.1											On-grade Type R Inlet, Bypass to DP 7b Tributary basins B5
	2.2								6.8	0.64	7.90	5.1						2.0	18	240	2.8	1.4	Piped runoff to DP-2.3 Tributary basins B5
	7b	B7	1.63	0.67	7.8	1.09	7.55	8.2	8.5	1.23	7.36	9.0	0.6	0.08	1.6					340	2.5	2.2	On-grade Type R Inlet, Bypass to DP 8B
	7i								8.5	1.15	7.36	8.4											Captured runoff from on-grade type R -Inlet from DP 7b
	2.3								9.1	2.43	7.17	17.4						2.0	24	50	2.8	0.3	Piped runoff Tributary basins B5,B4, and F5
	2.4								9.4	3.58	7.09	25.4						2.0	36	10	2.8	0.1	Piped runoff Tributary Basins B4,B5, B7,and F5
	2.5								16.1	6.29	5.73	36.1						2.0	36	380	2.8	2.2	Piped runoff to DP 2.6. Runoff confluenced w/ upstream lateral at DP 2.1 Tributary Basins B1.1, B1.2, B4, B5, B7, F1,F2 and F5
	8b	B8	2.14	0.66	8.1	1.42	7.47	10.6	10.1	1.50	6.92	10.4	10.4		0.9					125	1.8	1.1	Street Flow, Recives bypass flow from DP 7B. Goes to DP 10B

STORMCAD AND HYDRAULIC CALULATIONS WERE MODELED IN THE FUTURE DEVELOPED CONDITION DUE TO GREATER FLOWS

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

Subdivision: Homestead Fil. 2 - Future Conditions
Location: El Paso County
Design Storm: 100-Year

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 11/10/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
Description	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	2.6								18.4	8.89	5.40	48.0						2.0	36	100	2.8	0.6	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6, and B7+(F1,F2,F3,F4 and F5)
	2.7								19.0	13.34	5.32	71.0						2.0	36	3	2.8	0.0	Piped runoff Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7,B8, and B9 +(F1,F2,F3,F4 and F5)
	10b	B10	0.22	0.83	5.0	0.19	8.68	1.6	10.1	1.69	6.92	11.7											Sump inlet revices by-pass flow from 7b and runoff from 5b,8b, and 10b
	2.8								19.0	15.03	5.32	79.9						2.0	48	50	5.5	0.2	Piped runoff in to forebay Tributary Basins B1.1, B1.2,B3, B4, B5,B6,B7, and B9+ (F1,F2,F3,F4 and F5)
	11b	B11	1.67	0.39	9.9	0.66	6.96	4.6															
	12b	B12	2.18	0.49	16.6	1.06	5.66	6.0															Runoff from back of yard lots drains in swale to design point 12b, a type c area inlet.
	3.1								16.6	1.06	5.66	6.0						2.8	18	220	3.3	1.1	Runoff from Basin B12 drains to type C inlet
	13b	B13	0.43	0.55	5.0	0.24	8.66	2.1															Runoff from back of yard lots drains in swale to design point 13b
	3.2								17.7	1.30	5.50	7.1						0.9	18	346	1.9	3.0	Runoff from Basin B13 drains to type C inlet in confluence with runoff from basin B12
	14b	B14	0.42	0.52	6.2	0.21	8.14	1.7															Runoff from Basin B14 drains directly into pond B
	3.3								20.7	1.51	5.10	7.7							18				Runoff from DP 3.2. Outfalls into Forebay at DP 3.3
	4								19.0	17.20	5.32	91.5											Flow confluences into Pond B. All of Basin B
	C.1	C-1	0.92	0.61	10.1	0.57	6.92	3.9															Offsite runoff to design point C.1. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-1
	C.2	C-2	1.24	0.57	9.3	0.71	7.10	5.0															Offsite runoff to design point C.2. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-2
	C.3	C-3	0.29	0.36	15.9	0.10	5.76	0.6															Offsite runoff to design point C.3. Runoff treated in Homestead North Filing 1 Pond C Tributary Basin C-3
	SC	SC	10.09	0.36	-	-	-	1780															Sand Creek portion of the site. Flows used the M&S MDDP which will be existing at the time of channel development.

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are RCP unless otherwise noted.
Pipe size shown in table column.
Values in RED indicate they are from M&S MDDP to be existing at the time of channel development.

Appendix C
Hydraulic Calculations

Used to Calculate swale capacity for swales AA-BB

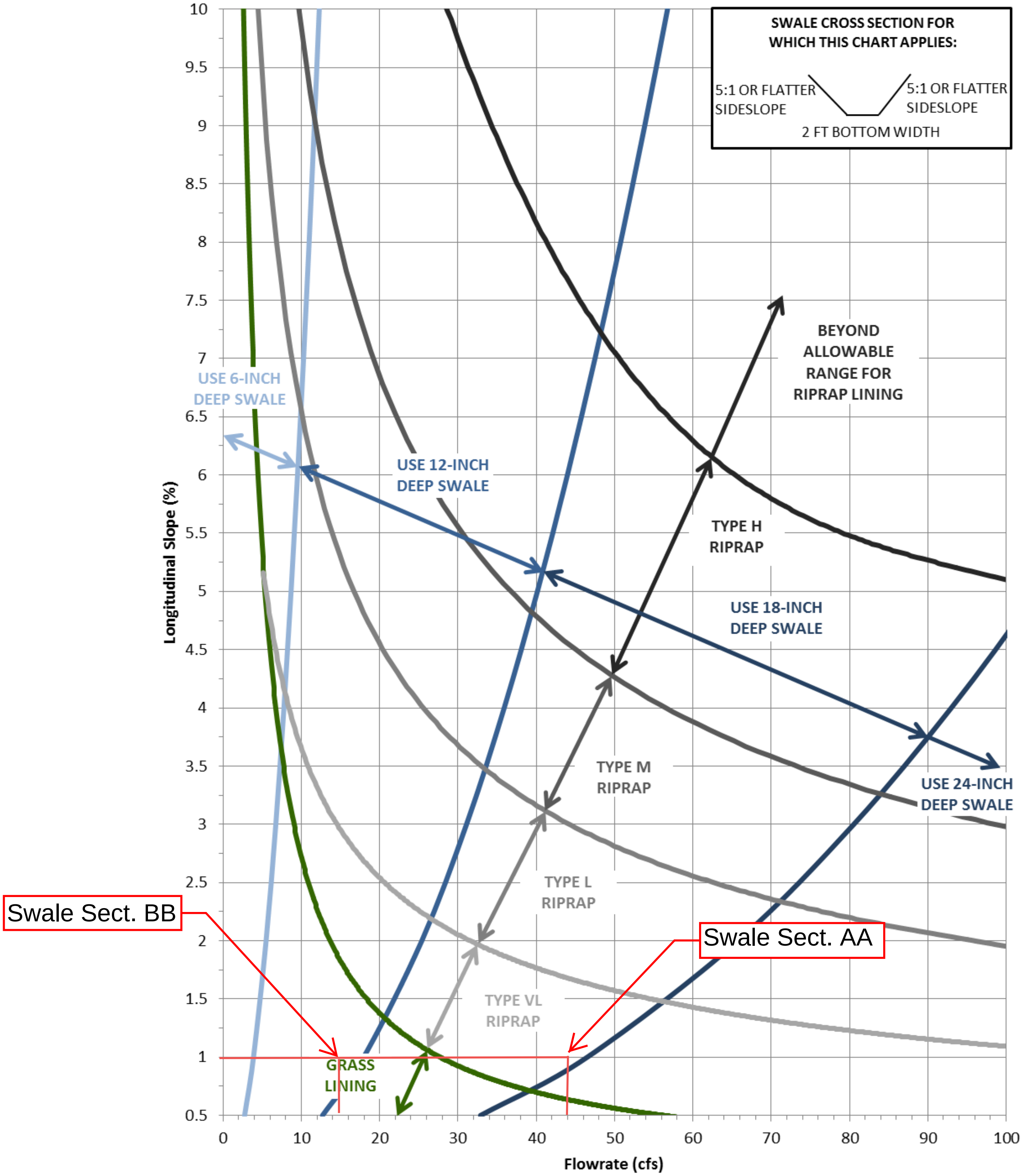


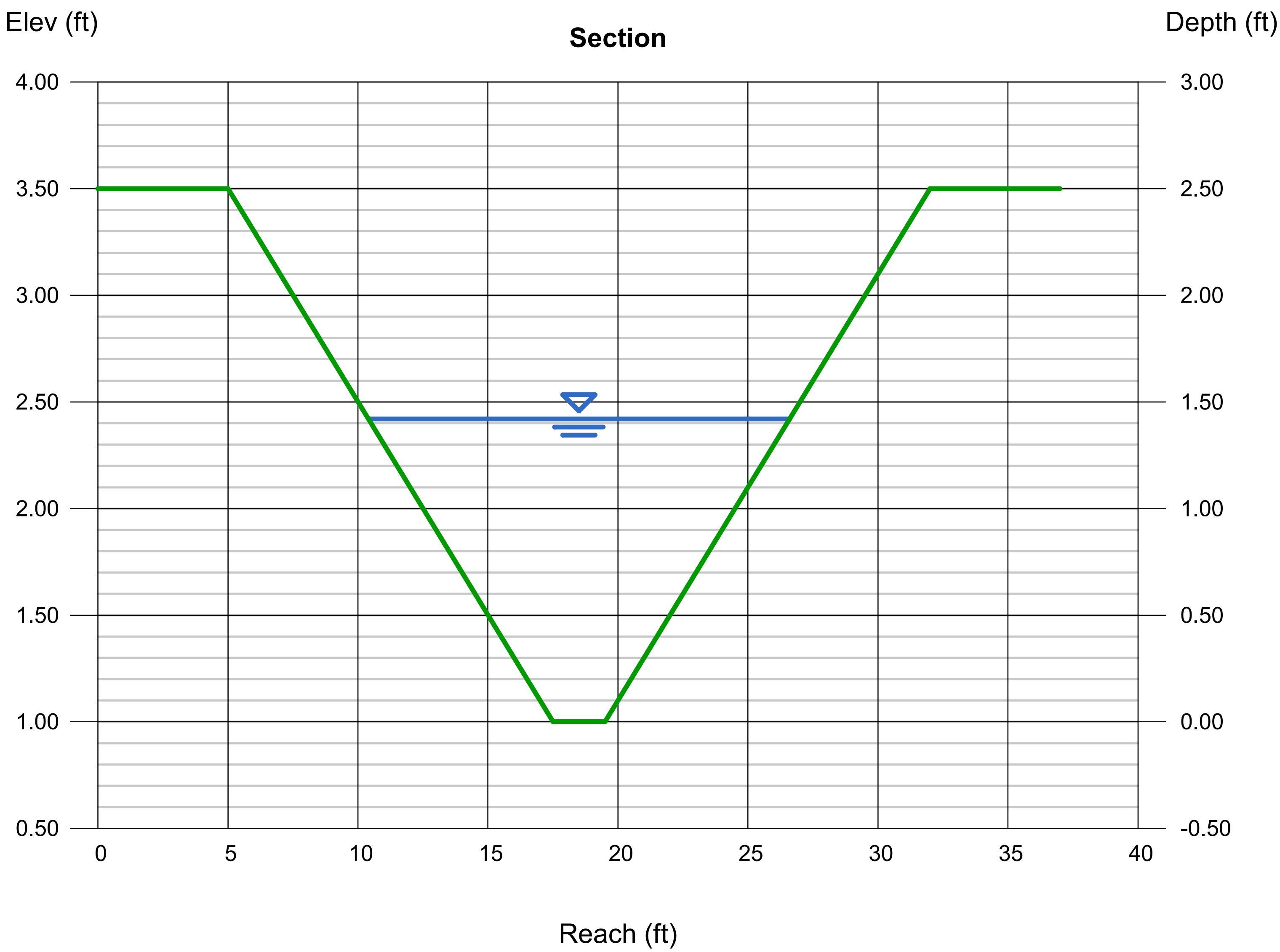
Figure 8-22. Swale stability chart; 2- to 4-foot bottom width and side slopes between 5:1 and 10:1
(Note: Riprap classifications refer to gradation for riprap used in soil riprap or void-filled riprap. See Figure 8-34 for gradations.) (Source: Muller Engineering Company)

Channel Report

Swale Section AA - DP O.3

Interim/Proposed condition only, will be removed upon Filing 3 Development

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 2.00	Depth (ft)	= 1.42
Side Slopes (z:1)	= 5.00, 5.00	Q (cfs)	= 46.00
Total Depth (ft)	= 2.50	Area (sqft)	= 12.92
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 3.56
Slope (%)	= 1.00	Wetted Perim (ft)	= 16.48
N-Value	= 0.035	Crit Depth, Yc (ft)	= 1.22
		Top Width (ft)	= 16.20
Calculations		EGL (ft)	= 1.62
Compute by:	Known Q		
Known Q (cfs)	= 46.00		

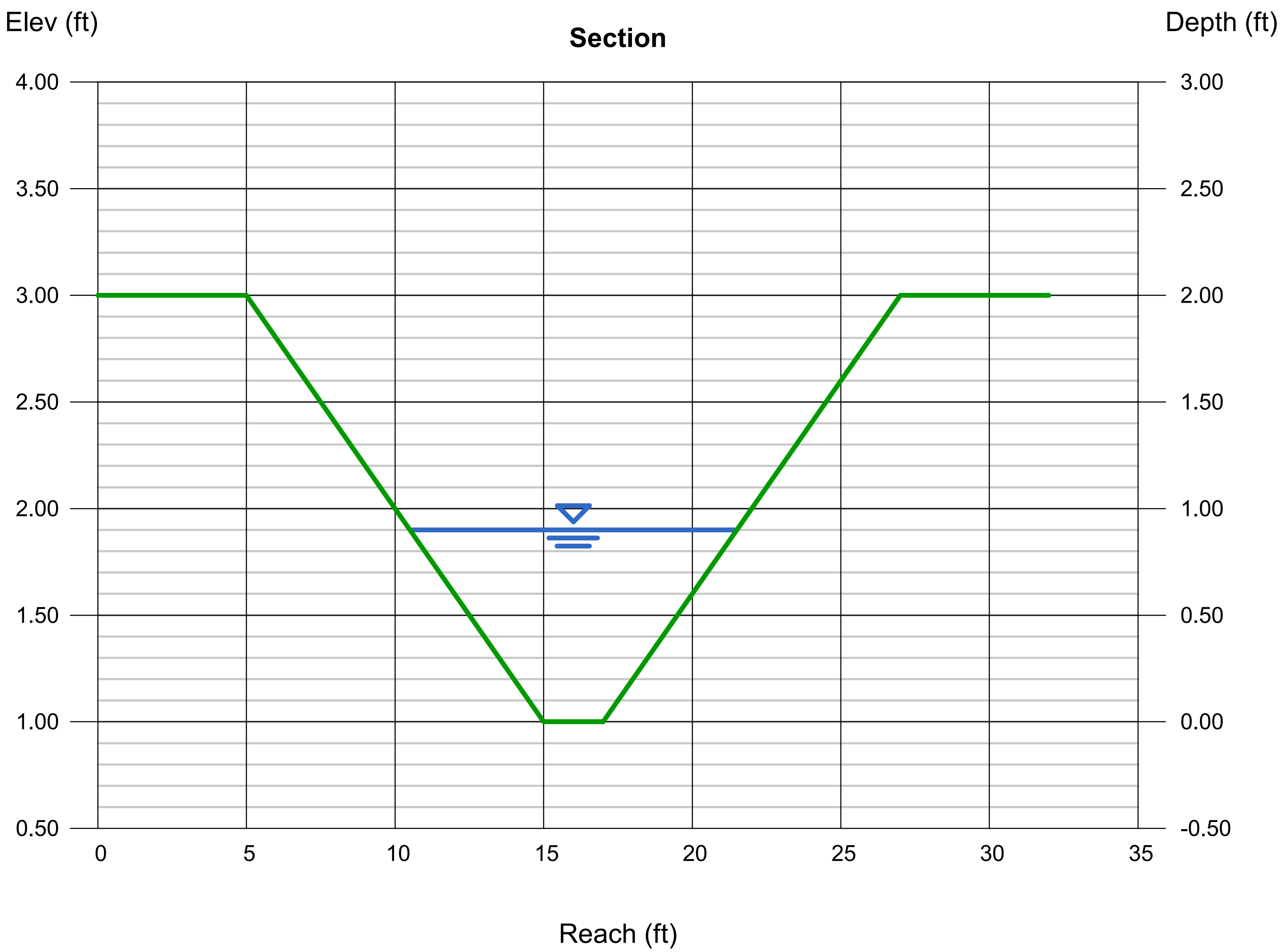


Channel Report

Swale Section BB - DP O.2

Interim/Proposed condition only, will be removed upon Filing 3 Development

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 2.00	Depth (ft)	= 0.90
Side Slopes (z:1)	= 5.00, 5.00	Q (cfs)	= 16.00
Total Depth (ft)	= 2.00	Area (sqft)	= 5.85
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.74
Slope (%)	= 1.00	Wetted Perim (ft)	= 11.18
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.74
		Top Width (ft)	= 11.00
Calculations		EGL (ft)	= 1.02
Compute by:	Known Q		
Known Q (cfs)	= 16.00		

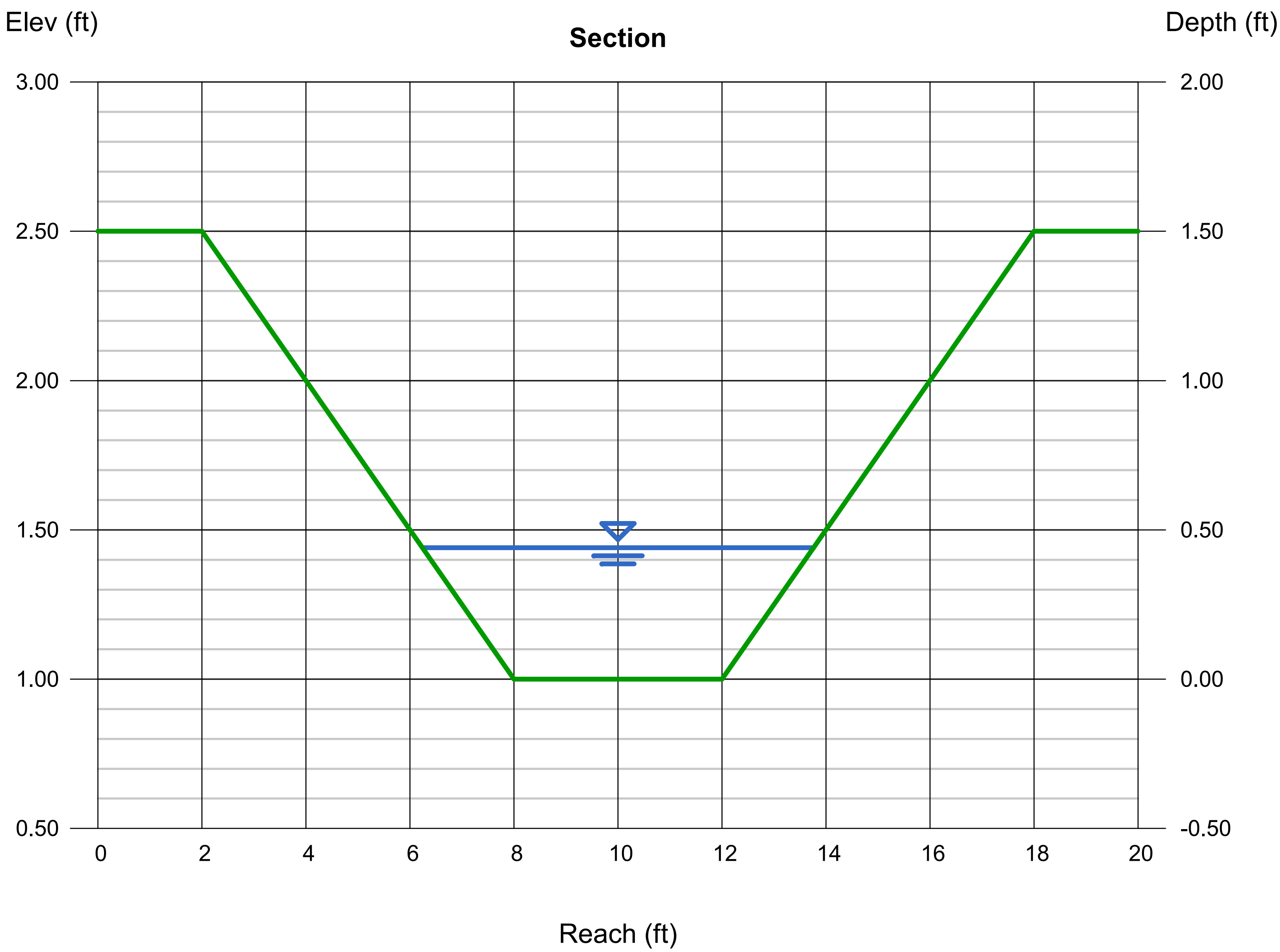


Channel Report

Swale Section CC - DP 12b

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 4.00	Depth (ft)	= 0.44
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 6.000
Total Depth (ft)	= 1.50	Area (sqft)	= 2.53
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.37
Slope (%)	= 1.44	Wetted Perim (ft)	= 7.63
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.37
		Top Width (ft)	= 7.52
Calculations		EGL (ft)	= 0.53
Compute by:	Known Q		
Known Q (cfs)	= 6.00		

See inlet section for shear stress checks/ calcs in this swale.

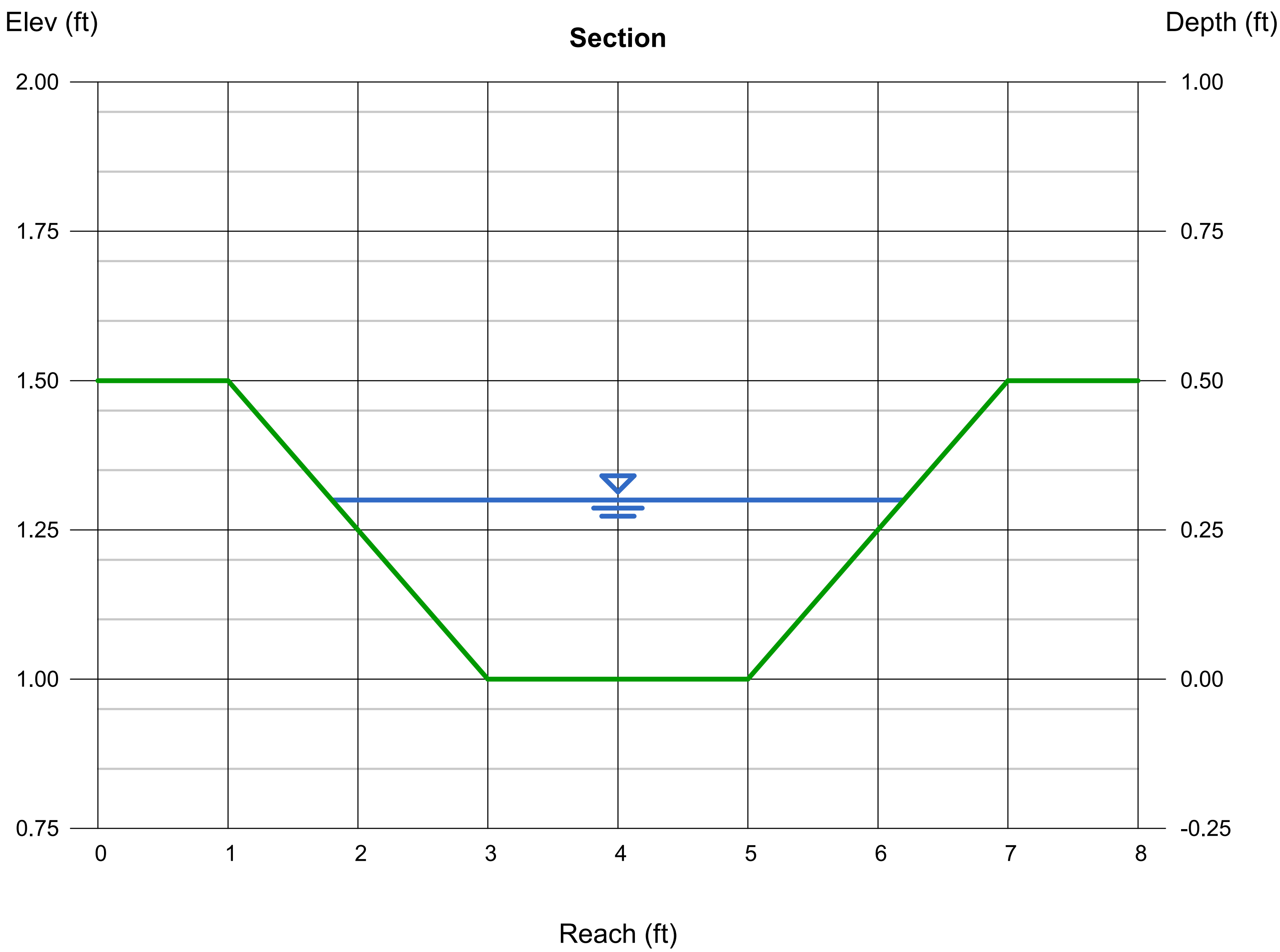


Channel Report

Swale Sect. DD- DP13B

Trapezoidal			**Highlighted**		
Bottom Width (ft)	=	2.00	Depth (ft)	=	0.30
Side Slopes (z:1)	=	4.00, 4.00	Q (cfs)	=	2.100
Total Depth (ft)	=	0.50	Area (sqft)	=	0.96
Invert Elev (ft)	=	1.00	Velocity (ft/s)	=	2.19
Slope (%)	=	2.31	Wetted Perim (ft)	=	4.47
N-Value	=	0.035	Crit Depth, Yc (ft)	=	0.27
			Top Width (ft)	=	4.40
Calculations			EGL (ft)	=	0.37
Compute by:		Known Q			
Known Q (cfs)	=	2.10			

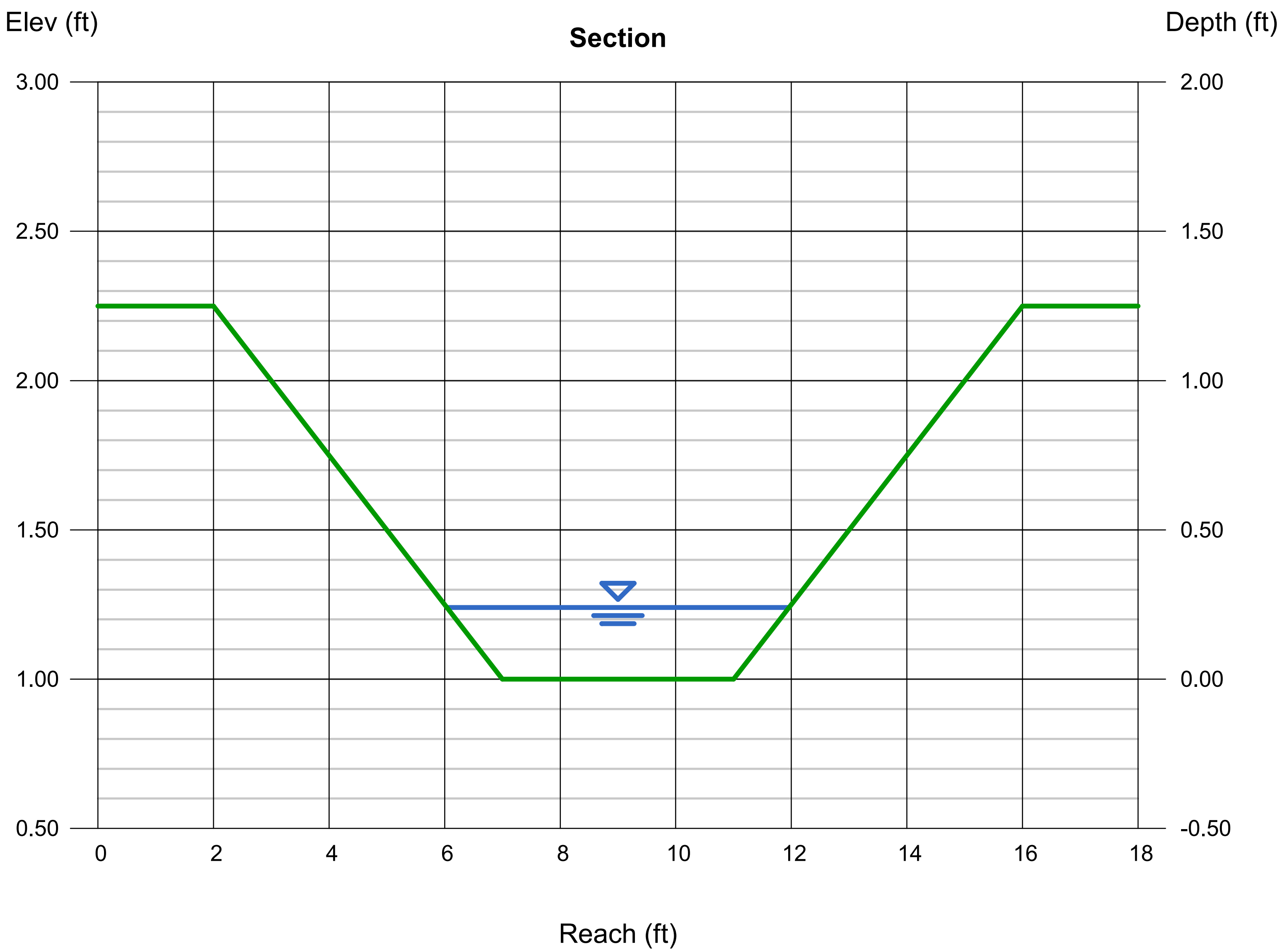
See inlet section for shear stress checks/
calcs in this swale.



Channel Report

Swale Section FF - DP 14b

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 4.00	Depth (ft)	= 0.24
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 1.700
Total Depth (ft)	= 1.25	Area (sqft)	= 1.19
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 1.43
Slope (%)	= 1.00	Wetted Perim (ft)	= 5.98
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.17
		Top Width (ft)	= 5.92
Calculations		EGL (ft)	= 0.27
Compute by:	Known Q		
Known Q (cfs)	= 1.70		



Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet DP 1.1B	Inlet DP 1.2B	Inlet DP 4b
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	5.1	3.1	7.1
Major Q_{Known} (cfs)	12.1	7.0	17.1

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**5.1**	**3.1**	**7.1**
Major Total Design Peak Flow, Q (cfs)	**12.1**	**7.0**	**17.1**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	2.0	0.1	4.2

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet DP 9b	Inlet DP 7b	Inlet DP 10b
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	7.7	4.0	5.4
Major Q_{Known} (cfs)	25.3	9.0	11.7

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**7.7**	**4.0**	**5.4**
Major Total Design Peak Flow, Q (cfs)	**25.3**	**9.0**	**11.7**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.6	N/A

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet DP 6B	Inlet DP5B
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	10.2	3.1
Major Q_{Known} (cfs)	26.7	6.2

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**10.2**	**3.1**
Major Total Design Peak Flow, Q (cfs)	**26.7**	**6.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	1.3	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	11.8	1.1

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet 12b	Inlet 13b	Inlet 14b
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	AREA	AREA	AREA
Hydraulic Condition	Swale	Swale	Swale
Inlet Type	CDOT Type C	CDOT Type C	CDOT Type C

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.1	0.9	0.7
Major Q_{Known} (cfs)	6.0	2.1	1.7

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.1	0.9	0.7
Major Total Design Peak Flow, Q (cfs)	6.0	2.1	1.7
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.7	0.2	0.0

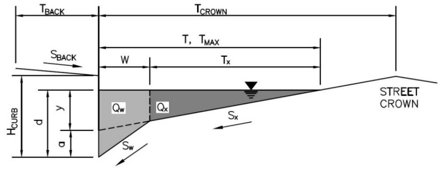
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 1.1B



Gutter Geometry (Enter data in the blue cells)

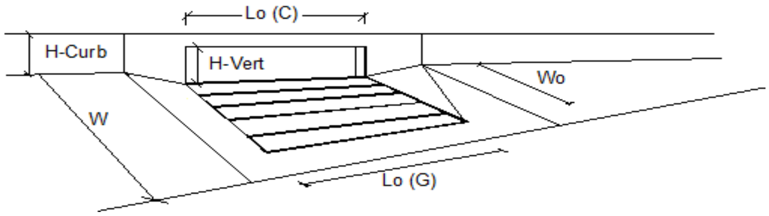
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2		ft
Gutter Width	W =	1.17		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 =	0.030		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} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
MINOR STORM Allowable Capacity is based on Spread Criterion		Minor Storm	Major Storm	
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**15.5**	**15.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



			MINOR	MAJOR	
Design Information (Input)			MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)		**Q_o =**	**5.1**	**12.1**	cfs
Water Spread Width		T =	10.5	14.7	ft
Water Depth at Flowline (outside of local depression)		d =	3.4	4.4	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.333	0.234	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	3.4	9.3	cfs
Discharge within the Gutter Section W		Q_w =	1.7	2.8	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.27	0.37	sq ft
Velocity within the Gutter Section W		V_W =	6.2	7.6	fps
Water Depth for Design Condition		d_{LOCAL} =	6.4	7.4	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.112	0.085	ft/ft
Required Length L_T to Have 100% Interception		L_T =	13.05	23.07	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	13.05	15.00	ft
Interception Capacity		Q_i =	5.1	10.3	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	13.03	13.03	ft
Actual Interception Capacity		**Q_a =**	**5.1**	**10.1**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**2.0**	cfs
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**5.1**	**10.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**2.0**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**83**	**%**

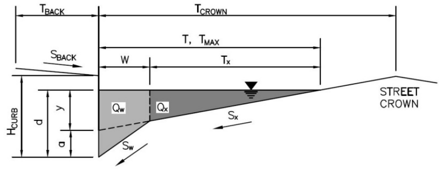
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 1.2B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	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 =	0.030	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} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

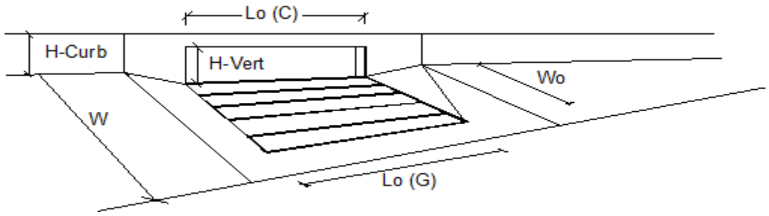
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**15.5**	**15.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



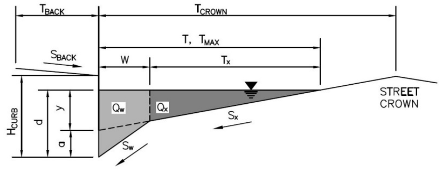
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)		**Q_o =**	**3.1**	**7.0**	cfs
Water Spread Width		T =	8.6	11.9	ft
Water Depth at Flowline (outside of local depression)		d =	2.9	3.7	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.408	0.292	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	1.8	5.0	cfs
Discharge within the Gutter Section W		Q_w =	1.3	2.0	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.23	0.31	sq ft
Velocity within the Gutter Section W		V_W =	5.5	6.7	fps
Water Depth for Design Condition		d_{LOCAL} =	5.9	6.7	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.133	0.101	ft/ft
Required Length L_T to Have 100% Interception		L_T =	9.37	16.10	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	9.37	15.00	ft
Interception Capacity		Q_i =	3.1	6.9	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	13.03	13.03	ft
Actual Interception Capacity		**Q_a =**	**3.1**	**6.9**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.1**	cfs
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**3.1**	**6.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**98**	**%**

Version 4.05 Released March 2017

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

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

Project: Homestead North
Inlet ID: Inlet DP 4b



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.027	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 =	0.016	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

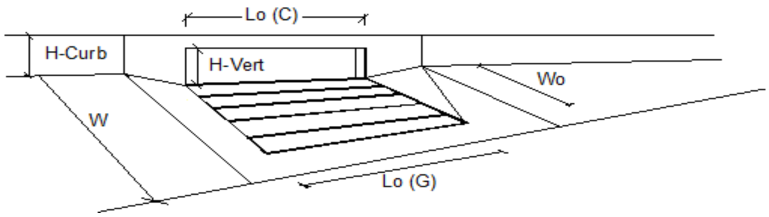
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**18.2**	**18.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)		Q_o =	**7.1**	**17.1**	cfs
Water Spread Width		T =	11.2	15.7	ft
Water Depth at Flowline (outside of local depression)		d =	4.4	5.9	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.290	0.206	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	5.0	13.6	cfs
Discharge within the Gutter Section W		Q_w =	2.1	3.5	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.37	0.51	sq ft
Velocity within the Gutter Section W		V_W =	5.5	6.9	fps
Water Depth for Design Condition		d_{LOCAL} =	7.4	8.9	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		Q_a =	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		Q_b =	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.106	0.083	ft/ft
Required Length L_T to Have 100% Interception		L_T =	15.32	26.81	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	15.00	15.00	ft
Interception Capacity		Q_i =	7.1	13.2	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	13.03	13.03	ft
Actual Interception Capacity		Q_a =	**7.1**	**12.9**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		Q_b =	**0.0**	**4.2**	cfs
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		Q =	**7.1**	**12.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	**0.0**	**4.2**	**cfs**
Capture Percentage = Q_a/Q_o =		C% =	**99**	**75**	**%**

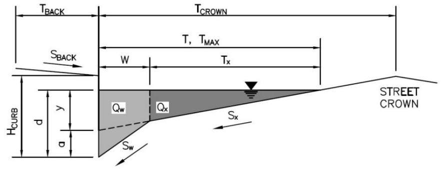
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 9b



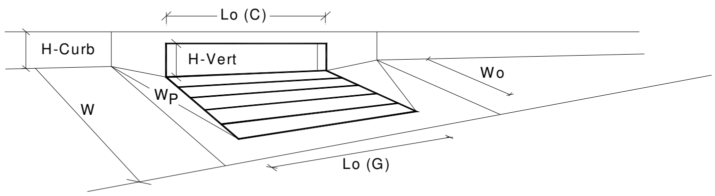
Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2		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} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	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 4.05 Released March 2017



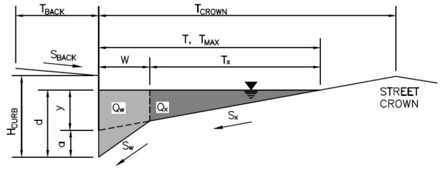
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	7.2	12.0	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) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.43	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.68	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.85	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 =	**15.6**	**39.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	7.7	25.3	cfs

Version 4.05 Released March 2017

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

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

Project: Homestead North
Inlet ID: Inlet DP 7b



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.022	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 =	0.016	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

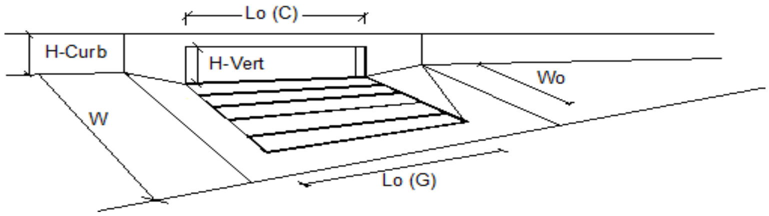
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.2**	**13.2**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	Q_o =	**4.0**	**9.0**	cfs
Water Spread Width	T =	10.2	14.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.5	4.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.336	0.243	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	2.7	6.8	cfs
Discharge within the Gutter Section W	Q_w =	1.3	2.2	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.29	0.39	sq ft
Velocity within the Gutter Section W	V_W =	4.7	5.7	fps
Water Depth for Design Condition	d_{LOCAL} =	6.5	7.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.114	0.089	ft/ft
Required Length L_T to Have 100% Interception	L_T =	11.02	18.74	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	11.02	15.00	ft
Interception Capacity	Q_i =	4.0	8.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	Q_a =	**4.0**	**8.4**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	**0.0**	**0.6**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	**4.0**	**8.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	C% =	**100**	**93**	**%**

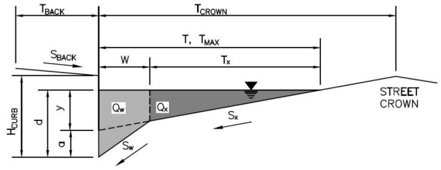
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 10b



Gutter Geometry (Enter data in the blue cells)

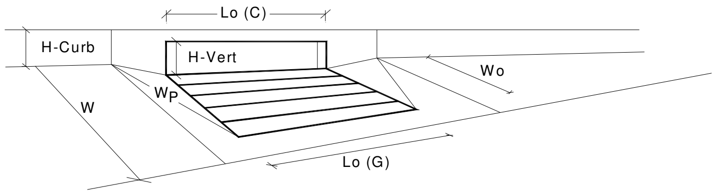
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	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} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	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 4.05 Released March 2017



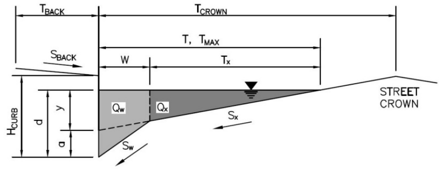
		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.4	7.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.28	0.46	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.51	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.75	0.87	
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 =	**7.2**	**17.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.4	11.7	cfs

Version 4.05 Released March 2017

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

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

Project: Homestead North
Inlet ID: Inlet DP 6B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

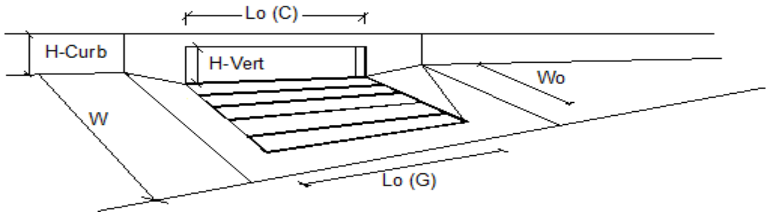
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**18.1**	**43.3**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



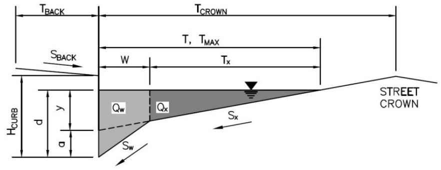
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**10.2**	**26.7**	cfs
Water Spread Width	T =	12.8	16.2	ft
Water Depth at Flowline (outside of local depression)	d =	4.6	6.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.7	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.465	0.315	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	5.5	18.3	cfs
Discharge within the Gutter Section W	Q_w =	4.7	8.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.60	0.84	sq ft
Velocity within the Gutter Section W	V_W =	8.0	10.0	fps
Water Depth for Design Condition	d_{LOCAL} =	7.6	9.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.107	0.079	ft/ft
Required Length L_T to Have 100% Interception	L_T =	21.13	39.70	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	9.1	15.3	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	**8.9**	**14.9**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**1.3**	**11.8**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.9**	**14.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.3**	**11.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**88**	**56**	**%**

Version 4.05 Released March 2017

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

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

Project: Homestead North
Inlet ID: Inlet DP5B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	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 =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

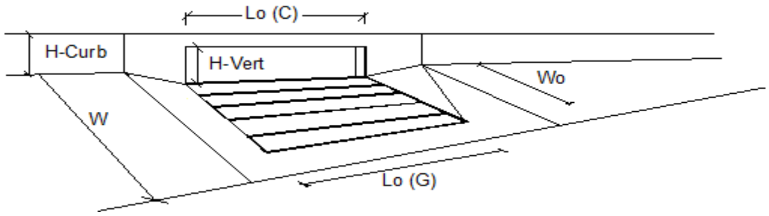
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**15.1**	**15.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

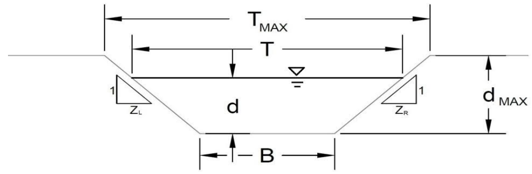
Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)		**Q_o =**	**3.1**	**6.2**	cfs
Water Spread Width		T =	8.0	11.1	ft
Water Depth at Flowline (outside of local depression)		d =	3.4	4.2	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.688	0.528	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	1.0	2.9	cfs
Discharge within the Gutter Section W		Q_w =	2.1	3.3	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.41	0.53	sq ft
Velocity within the Gutter Section W		V_W =	5.3	6.2	fps
Water Depth for Design Condition		d_{LOCAL} =	6.4	7.2	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.149	0.119	ft/ft
Required Length L_T to Have 100% Interception		L_T =	9.70	15.30	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	9.70	10.00	ft
Interception Capacity		Q_i =	3.1	5.3	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.06	0.06	
Effective (Unclogged) Length		L_e =	8.75	8.75	ft
Actual Interception Capacity		**Q_a =**	**3.1**	**5.1**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.1**	cfs
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**3.1**	**5.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**83**	**%**

AREA INLET IN A SWALE

Inlet 12b



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 =	0.035	
Channel Invert Slope	S_O =	0.0140	ft/ft
Bottom Width	B =	4.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	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	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	6.00	8.00	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	0.50	0.50	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	2.2	7.8	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	0.25	0.50	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	2.1	6.0	cfs
Water Depth	d =	0.24	0.44	ft

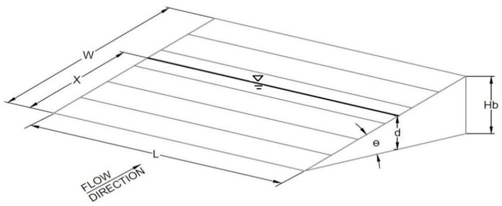
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Inlet 12b

Inlet Design Information (Input)

Type of Inlet: CDOT Type C — Inlet Type = CDOT Type C

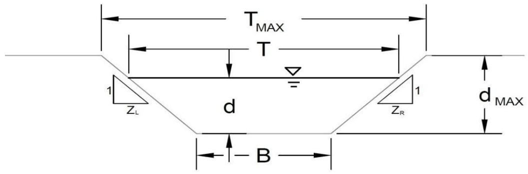


Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	3.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.96	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient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

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.24	0.44	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	2.2	5.3	cfs
Bypassed Flow	Q_b =	0.0	0.7	cfs
Capture Percentage = Qa/Qo	C% =	100	88	%

AREA INLET IN A SWALE

inlet 13b



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 =	0.035	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	4.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	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	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	6.00	8.00	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	0.50	0.50	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	2.6	9.3	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	0.25	0.50	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.9	2.1	cfs
Water Depth	d =	0.14	0.22	ft

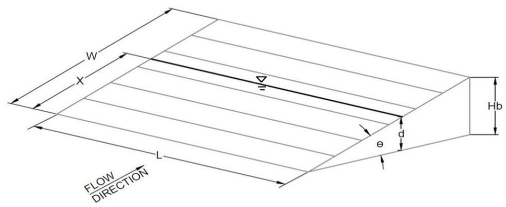
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

inlet 13b

Inlet Design Information (Input)

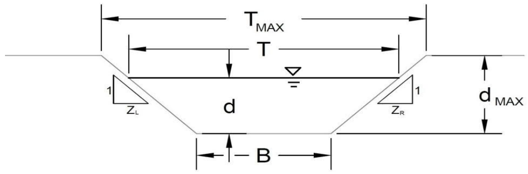
Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient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



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.14	0.22	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	0.9	1.9	cfs
Bypassed Flow	Q_b =	0.0	0.2	cfs
Capture Percentage = Qa/Qo	C% =	100	91	%

AREA INLET IN A SWALE

Inlet 14b



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 =	0.035	
Channel Invert Slope	S_O =	0.0070	ft/ft
Bottom Width	B =	4.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	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	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	6.00	8.00	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	0.50	0.50	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	1.6	5.5	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	0.25	0.50	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.7	1.7	cfs
Water Depth	d =	0.16	0.26	ft

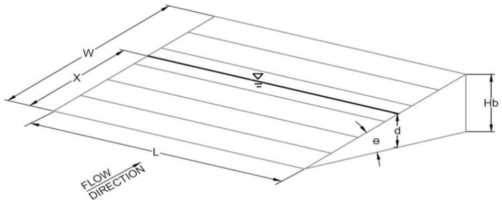
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Inlet 14b

Inlet Design Information (Input)

Type of Inlet: CDOT Type C — Inlet Type = CDOT Type C



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

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.16	0.26	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	1.2	2.5	cfs
Bypassed Flow	Q_b =	0.0	0.0	cfs
Capture Percentage = Qa/Qo	C% =	100	100	%

Froude Number Calculation’s

Homestead North F2

Froude Number Equation:

$$Fr = \frac{v}{(gh_m)^{1/2}}$$

Where: v= velocity (ft/s)

g= acceleration of gravity (32.2ft/s^2)

h_m=hydraulic mean depth (ft)

Hydraulic Mean Depth Equation:

$$h_m = \frac{A}{T}$$

Where: A= cross sectional area of filled flow in channel (ft^2)

T= width of channel open to surface (ft)

Inlet 12B Calculations:

Parameters: A= 2.53 ft^2 , T= 7.52 ft, v= 2.37 ft/s

There for:

$$h_m = \frac{2.53}{7.52} = 0.34\ ft$$

$$Fr = \frac{2.37}{(32.2*0.34)^{1/2}} = 0.72$$

For cohesive soils maximum Froude Number is 0.80.

Inlet 13B Calculations:

Parameters: A= 1.07 ft^2 , T= 5.76 ft, v= 1.96 ft/s

There for:

$$h_m = \frac{1.07}{5.76} = 0.19\ ft$$

$$Fr = \frac{1.96}{(32.2*0.19)^{1/2}} = 0.79$$

For cohesive soils maximum Froude Number is 0.80.

Inlet 14B Calculations:

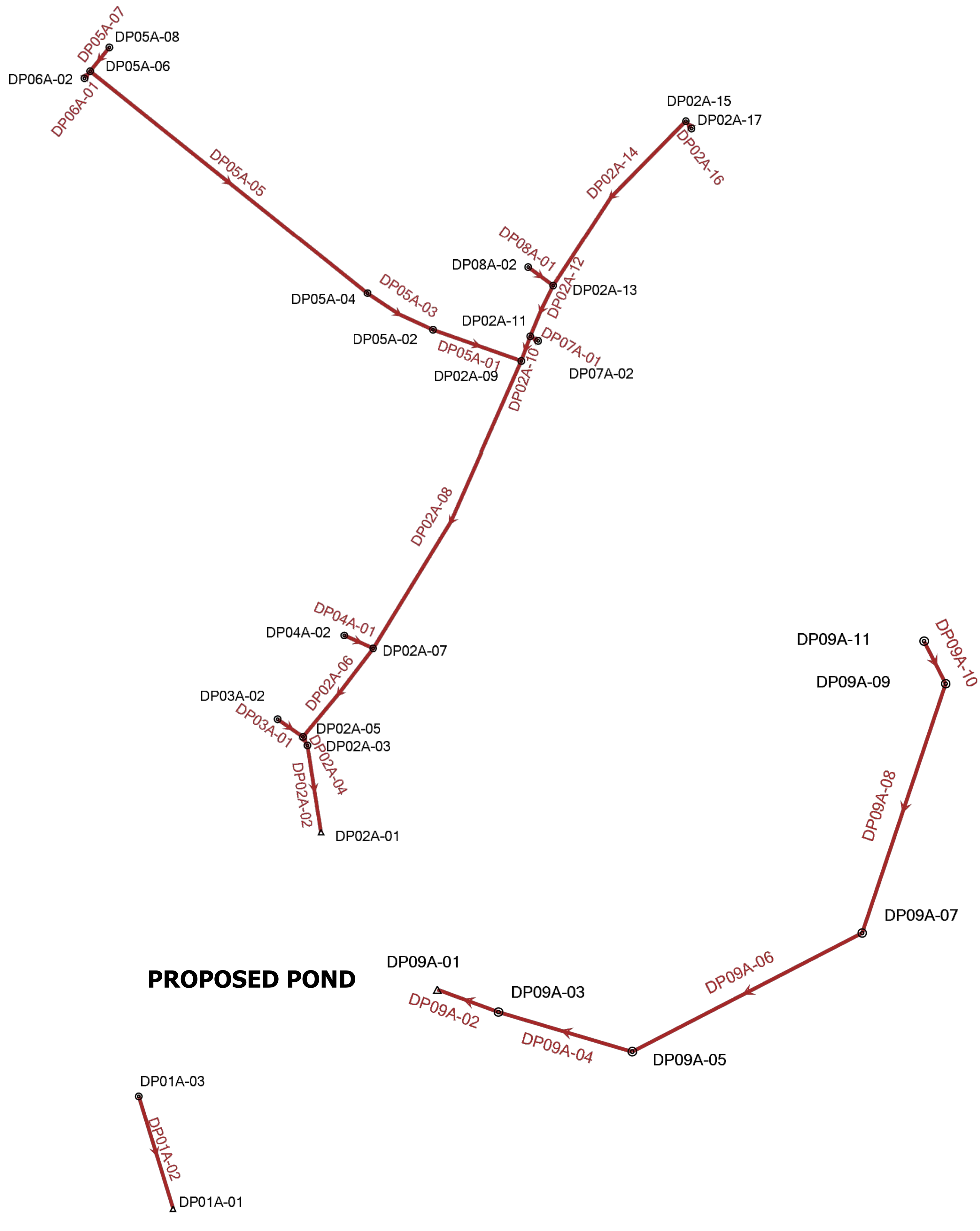
Parameters: A= 1.37 ft^2 , T= 6.16 ft, v= 1.24 ft/s

There for:

$$h_m = \frac{1.37}{6.16} = 0.22\,ft$$

$$Fr = \frac{1.24}{(32.2*0.22)^{1/2}} = 0.47$$

For cohesive soils maximum Froude Number is 0.80.



STORMCAD MAP
HOMESTEAD NORTH FILING 2
JOB NO. 25188.10
11/11/2022
SHEET 1 OF 1

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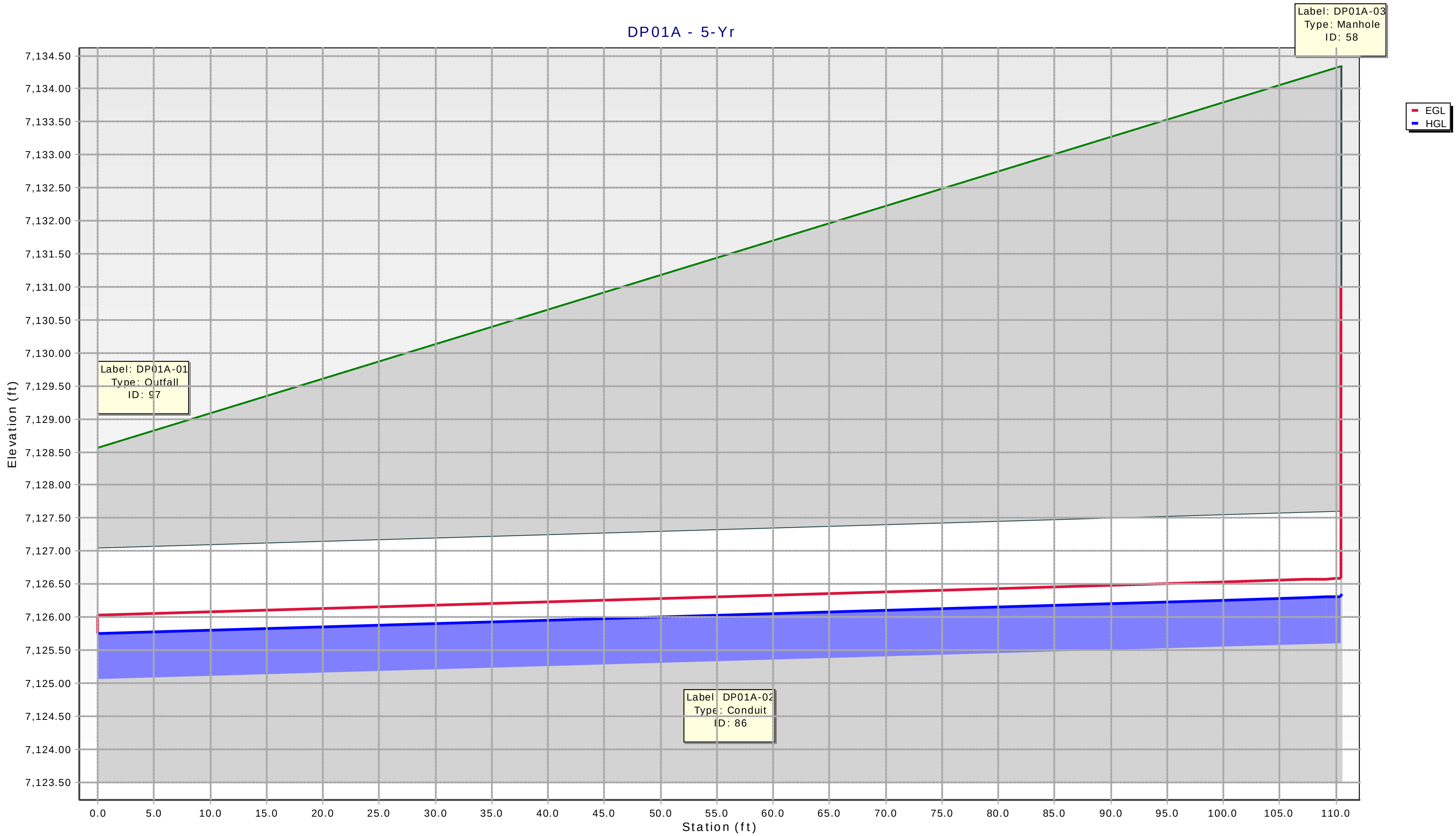
DP01A - 5-Yr
Label: DP01A-03
Type: Manhole
ID: 58
Label: DP01A-01
Type: Outfall
ID: 97
Label: DP01A-02
Type: Conduit
ID: 86
EGL
HGL
Elevation (ft)
Station (ft)
7,134.50
7,134.00
7,133.50
7,133.00
7,132.50
7,132.00
7,131.50
7,131.00
7,130.50
7,130.00
7,129.50
7,129.00
7,128.50
7,128.00
7,127.50
7,127.00
7,126.50
7,126.00
7,125.50
7,125.00
7,124.50
7,124.00
7,123.50
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
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80.0
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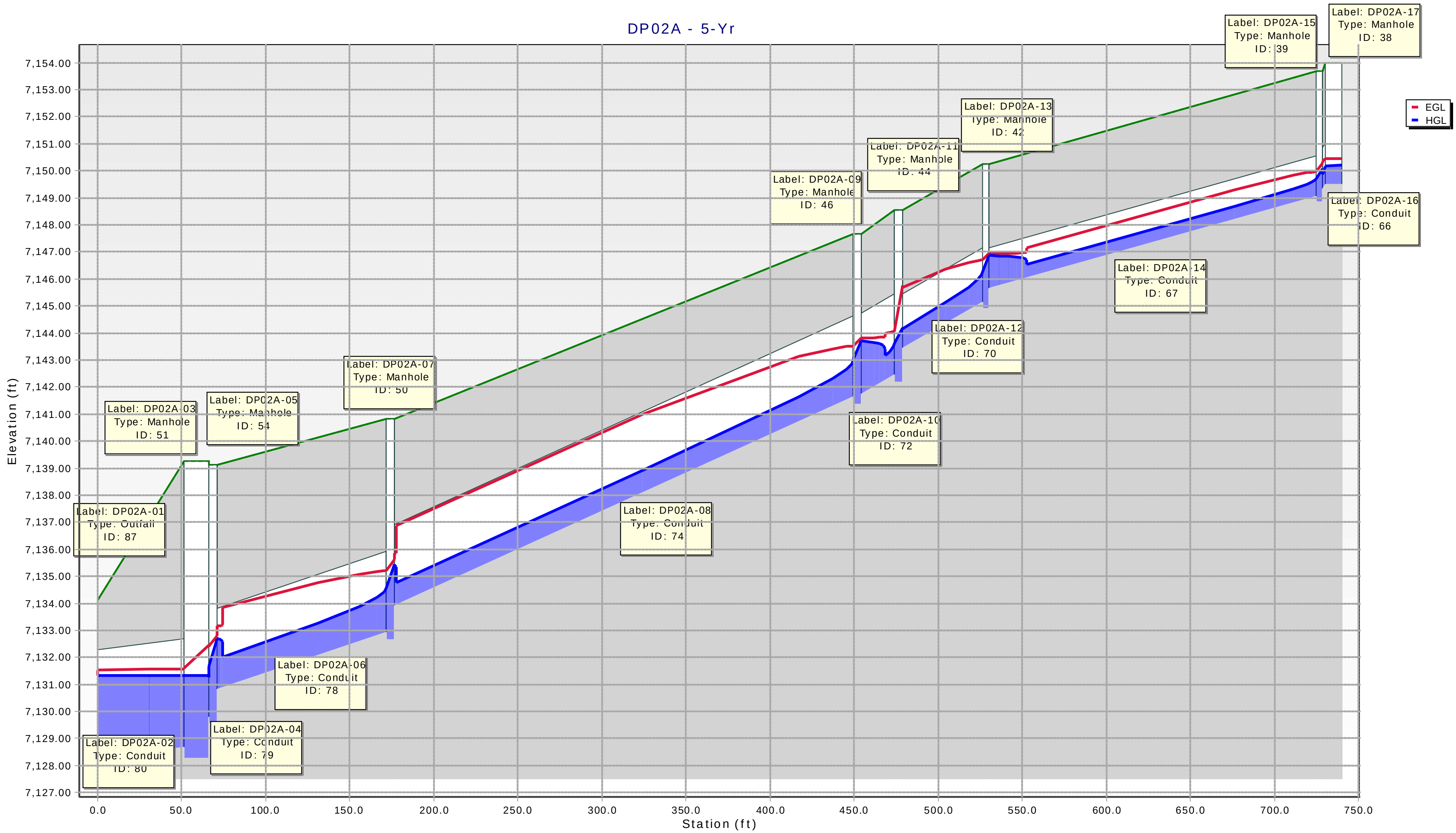
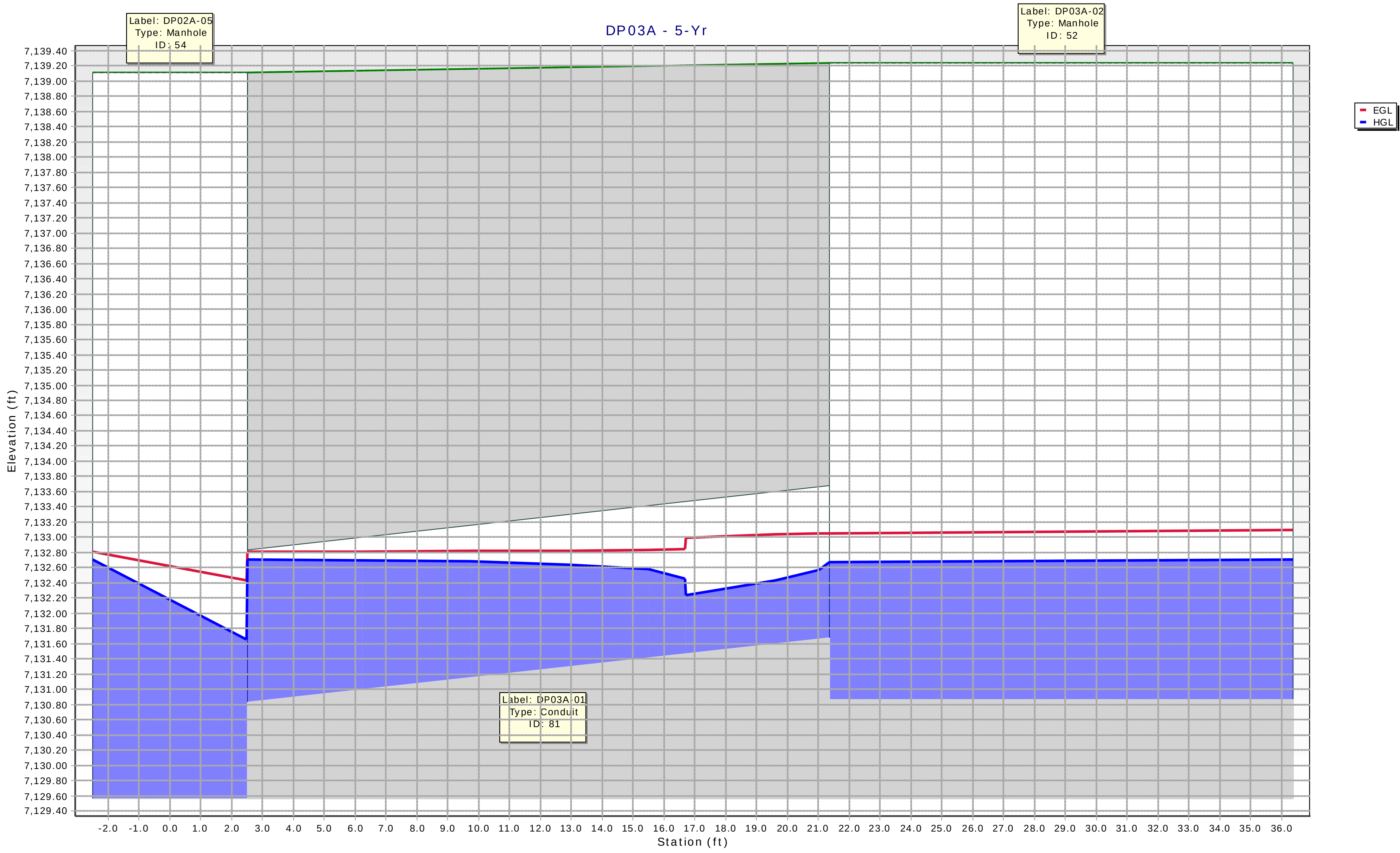
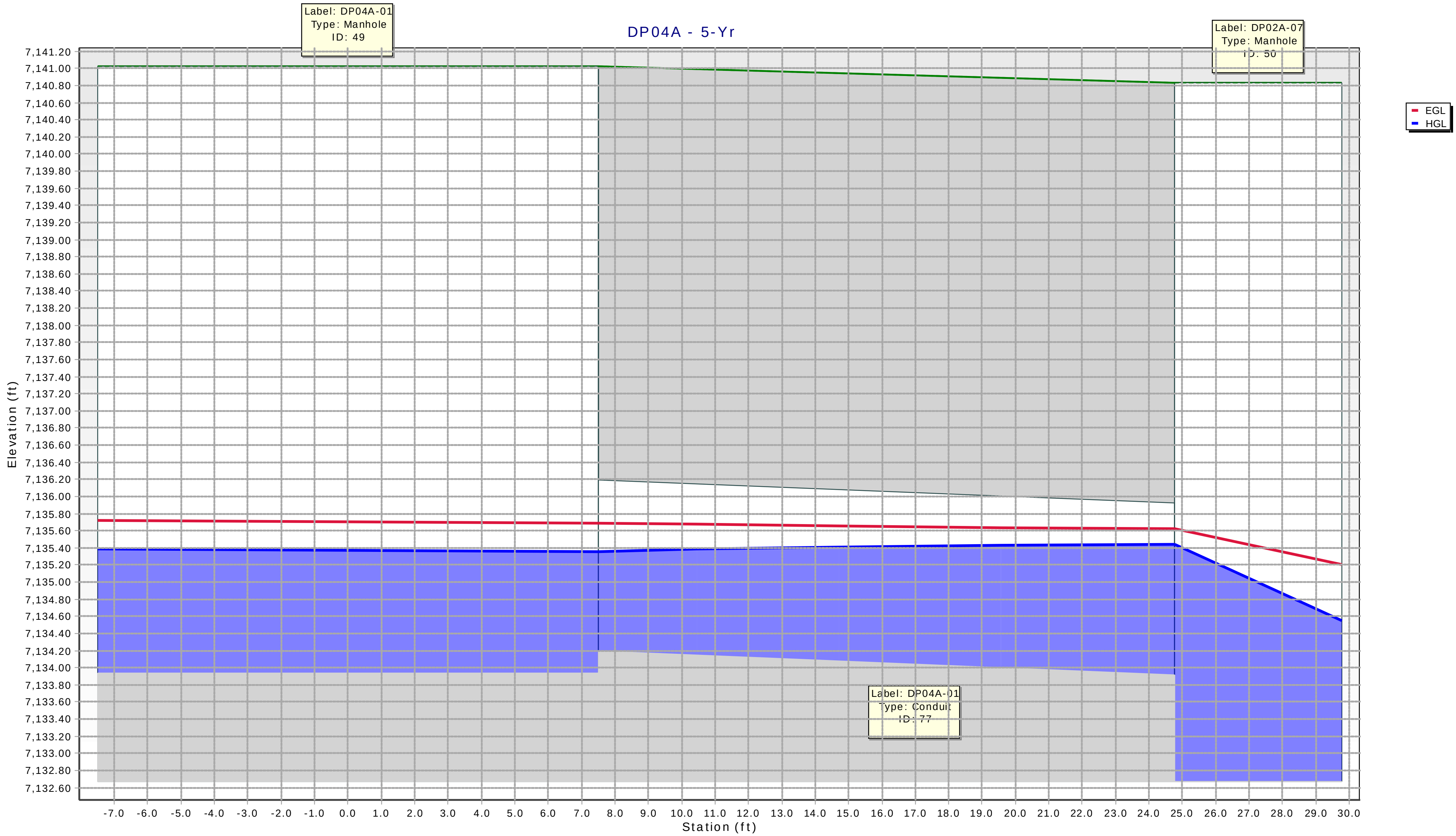
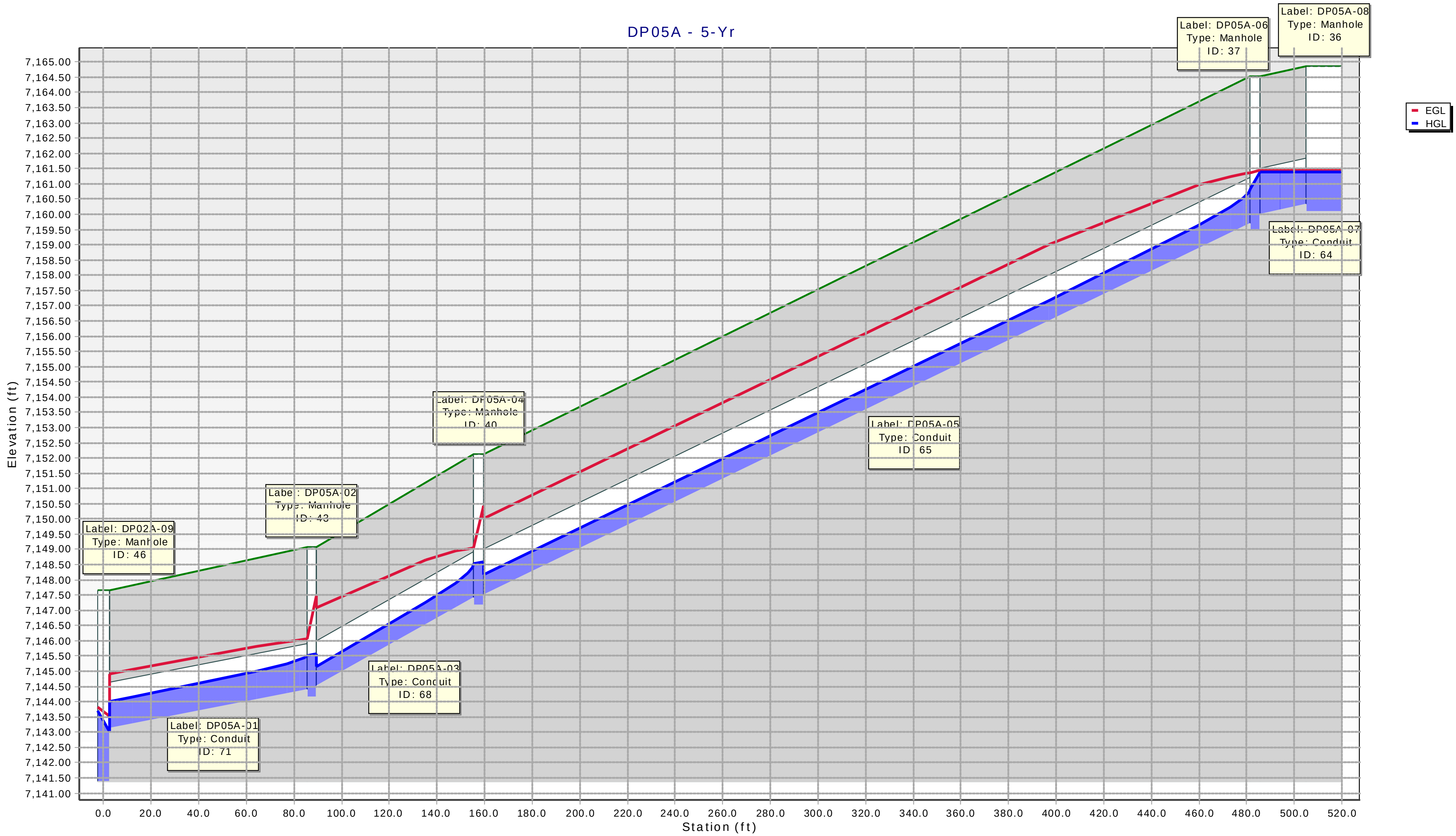
90.0
95.0
100.0
105.0
110.0


DP02A - 5-Yr
Elevation (ft)
Station (ft)
EGL
HGL
7,154.00
7,153.00
7,152.00
7,151.00
7,150.00
7,149.00
7,148.00
7,147.00
7,146.00
7,145.00
7,144.00
7,143.00
7,142.00
7,141.00
7,140.00
7,139.00
7,138.00
7,137.00
7,136.00
7,135.00
7,134.00
7,133.00
7,132.00
7,131.00
7,130.00
7,129.00
7,128.00
7,127.00
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
550.0
600.0
650.0
700.0
750.0
Label: DP02A-01 Type: Outfall ID: 87
Label: DP02A-02 Type: Conduit ID: 80
Label: DP02A-03 Type: Manhole ID: 51
Label: DP02A-04 Type: Conduit ID: 79
Label: DP02A-05 Type: Manhole ID: 54
Label: DP02A-06 Type: Conduit ID: 78
Label: DP02A-07 Type: Manhole ID: 50
Label: DP02A-08 Type: Conduit ID: 74
Label: DP02A-09 Type: Manhole ID: 46
Label: DP02A-10 Type: Conduit ID: 72
Label: DP02A-11 Type: Manhole ID: 44
Label: DP02A-12 Type: Conduit ID: 70
Label: DP02A-13 Type: Manhole ID: 42
Label: DP02A-14 Type: Conduit ID: 67
Label: DP02A-15 Type: Manhole ID: 39
Label: DP02A-16 Type: Conduit ID: 66
Label: DP02A-17 Type: Manhole ID: 38

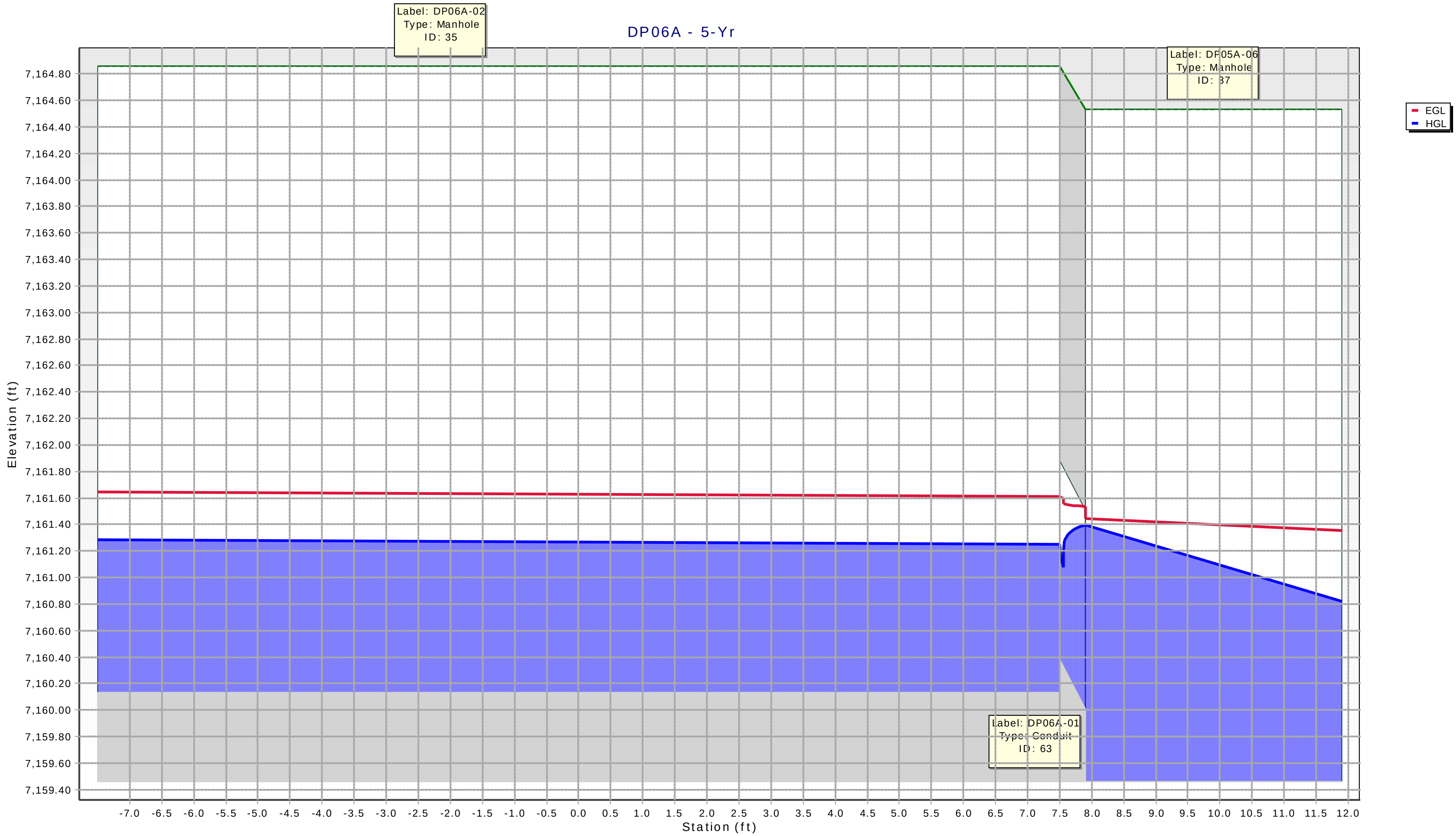

DP03A - 5-Yr
Label: DP02A-05
Type: Manhole
ID: 54
Label: DP03A-02
Type: Manhole
ID: 52
Label: DP03A-01
Type: Conduit
ID: 81
EGL
HGL
Elevation (ft)
Station (ft)
7,139.40
7,139.20
7,139.00
7,138.80
7,138.60
7,138.40
7,138.20
7,138.00
7,137.80
7,137.60
7,137.40
7,137.20
7,137.00
7,136.80
7,136.60
7,136.40
7,136.20
7,136.00
7,135.80
7,135.60
7,135.40
7,135.20
7,135.00
7,134.80
7,134.60
7,134.40
7,134.20
7,134.00
7,133.80
7,133.60
7,133.40
7,133.20
7,133.00
7,132.80
7,132.60
7,132.40
7,132.20
7,132.00
7,131.80
7,131.60
7,131.40
7,131.20
7,131.00
7,130.80
7,130.60
7,130.40
7,130.20
7,130.00
7,129.80
7,129.60
7,129.40
-2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0

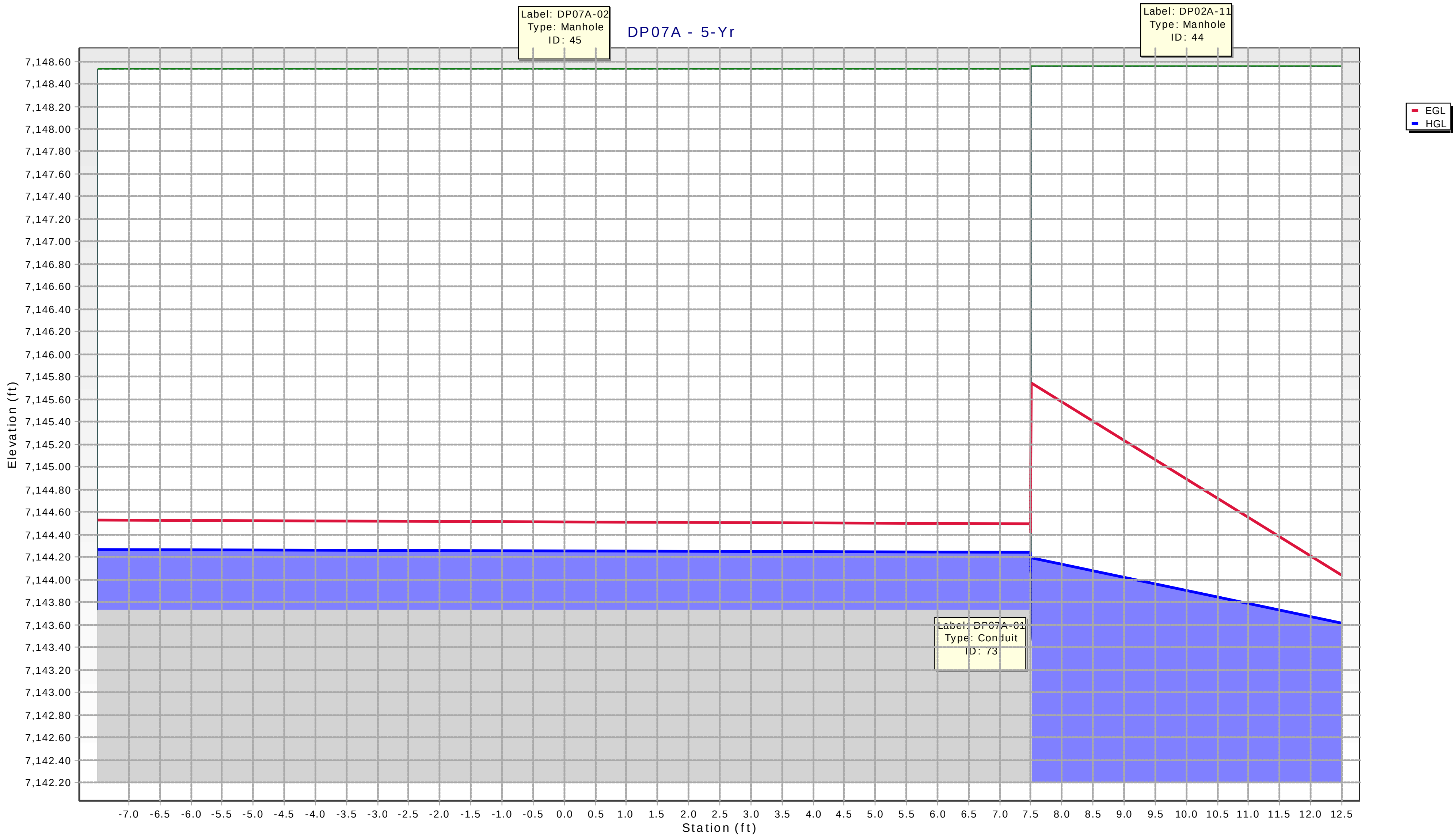


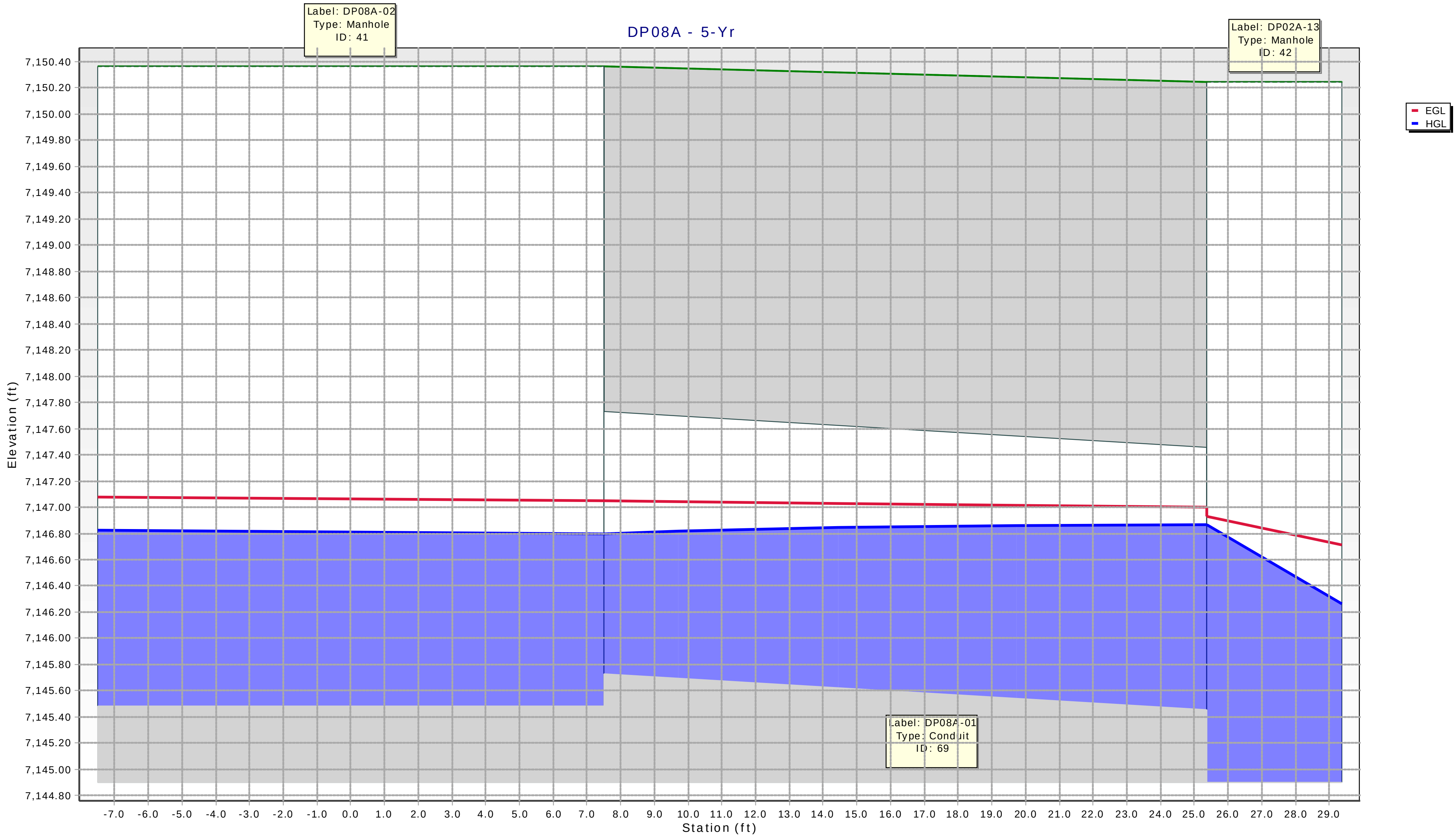
DP04A - 5-Yr
Label: DP04A-01
Type: Manhole
ID: 49
Label: DP02A-07
Type: Manhole
ID: 50
Label: DP04A-01
Type: Conduit
ID: 77
EGL
HGL
Elevation (ft)
Station (ft)
7,141.20
7,141.00
7,140.80
7,140.60
7,140.40
7,140.20
7,140.00
7,139.80
7,139.60
7,139.40
7,139.20
7,139.00
7,138.80
7,138.60
7,138.40
7,138.20
7,138.00
7,137.80
7,137.60
7,137.40
7,137.20
7,137.00
7,136.80
7,136.60
7,136.40
7,136.20
7,136.00
7,135.80
7,135.60
7,135.40
7,135.20
7,135.00
7,134.80
7,134.60
7,134.40
7,134.20
7,134.00
7,133.80
7,133.60
7,133.40
7,133.20
7,133.00
7,132.80
7,132.60
-7.0 -6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0

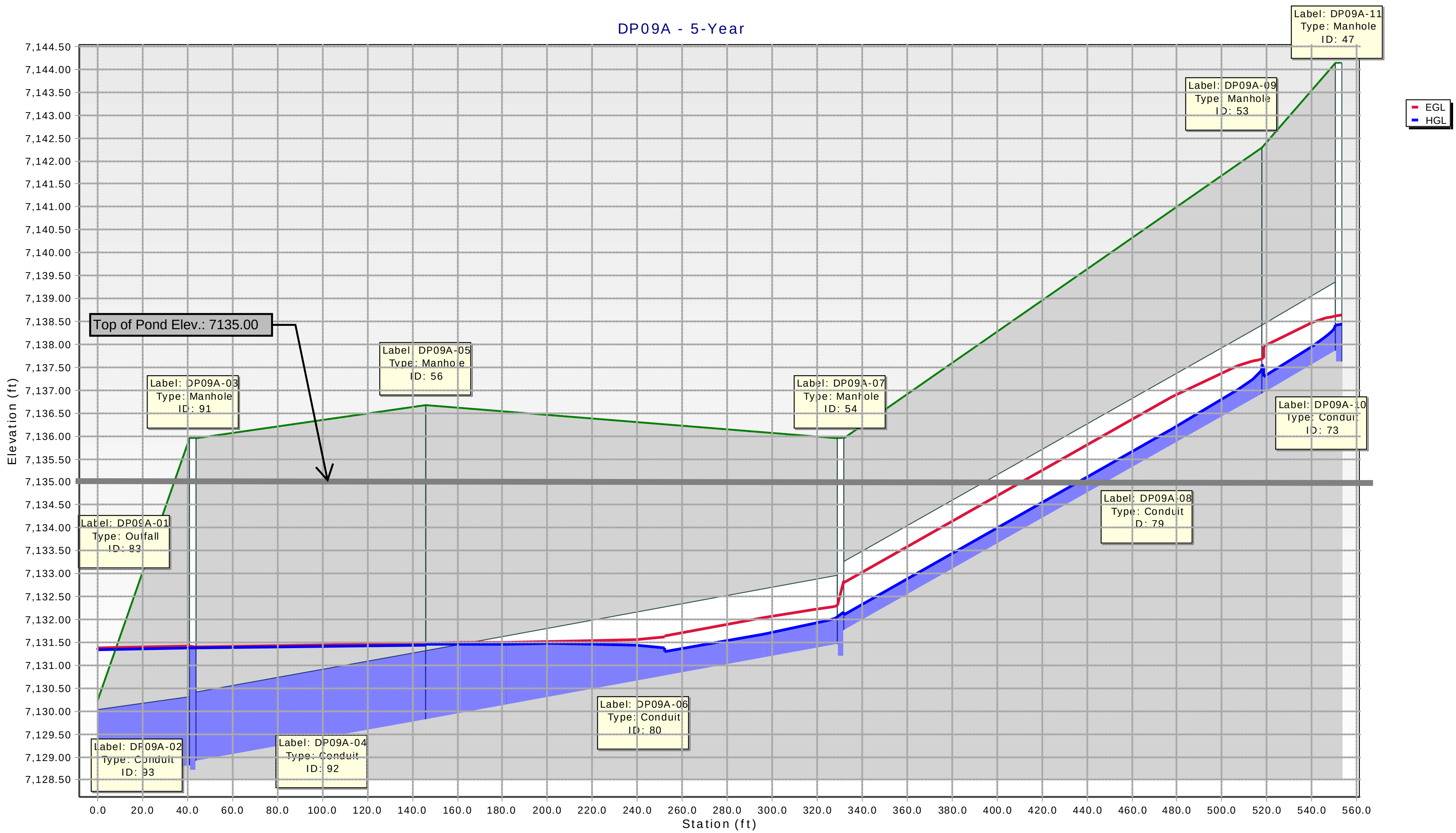


DP05A - 5-Yr
Label: DP02A-09
Type: Manhole
ID: 46
Label: DP05A-01
Type: Conduit
ID: 71
Label: DP05A-02
Type: Manhole
ID: 43
Label: DP05A-03
Type: Conduit
ID: 68
Label: DP05A-04
Type: Manhole
ID: 40
Label: DP05A-05
Type: Conduit
ID: 65
Label: DP05A-06
Type: Manhole
ID: 37
Label: DP05A-07
Type: Conduit
ID: 64
Label: DP05A-08
Type: Manhole
ID: 36
EGL
HGL
Elevation (ft)
Station (ft)

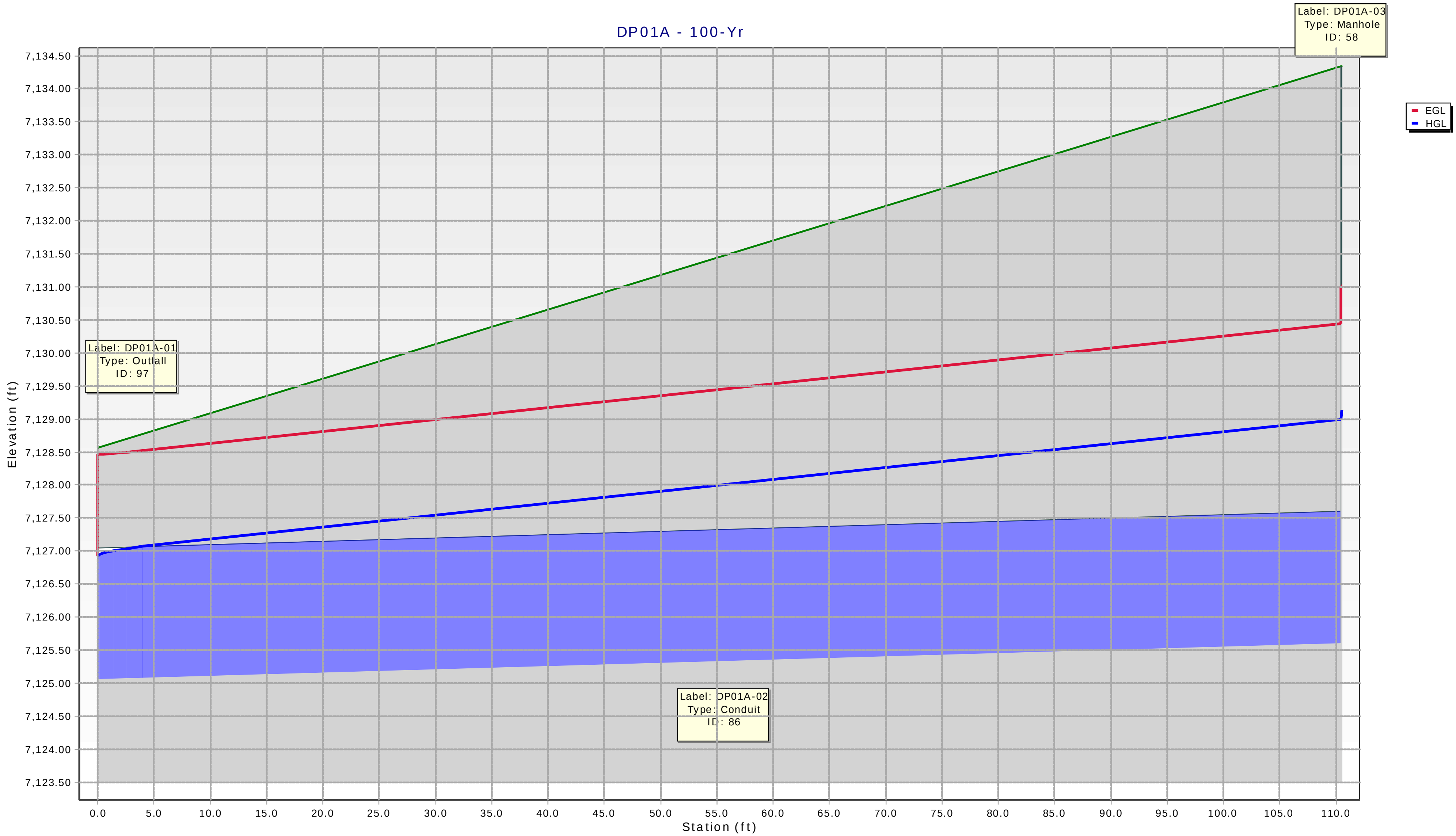

DP06A - 5-Yr
Label: DP06A-02
Type: Manhole
ID: 35
Label: DP05A-06
Type: Manhole
ID: 37
Label: DP06A-01
Type: Conduit
ID: 63
EGL
HGL
Elevation (ft)
Station (ft)
7,164.80
7,164.60
7,164.40
7,164.20
7,164.00
7,163.80
7,163.60
7,163.40
7,163.20
7,163.00
7,162.80
7,162.60
7,162.40
7,162.20
7,162.00
7,161.80
7,161.60
7,161.40
7,161.20
7,161.00
7,160.80
7,160.60
7,160.40
7,160.20
7,160.00
7,159.80
7,159.60
7,159.40
-7.0 -6.5 -6.0 -5.5 -5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0


DP07A - 5-Yr
Label: DP07A-02
Type: Manhole
ID: 45
Label: DP02A-11
Type: Manhole
ID: 44
Label: DP07A-01
Type: Conduit
ID: 73
EGL
HGL
Elevation (ft)
Station (ft)
7,148.60
7,148.40
7,148.20
7,148.00
7,147.80
7,147.60
7,147.40
7,147.20
7,147.00
7,146.80
7,146.60
7,146.40
7,146.20
7,146.00
7,145.80
7,145.60
7,145.40
7,145.20
7,145.00
7,144.80
7,144.60
7,144.40
7,144.20
7,144.00
7,143.80
7,143.60
7,143.40
7,143.20
7,143.00
7,142.80
7,142.60
7,142.40
7,142.20
-7.0 -6.5 -6.0 -5.5 -5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5


DP08A - 5-Yr
Label: DP08A-02
Type: Manhole
ID: 41
Label: DP02A-13
Type: Manhole
ID: 42
Label: DP08A-01
Type: Conduit
ID: 69
EGL
HGL
Elevation (ft)
Station (ft)
7,150.40
7,150.20
7,150.00
7,149.80
7,149.60
7,149.40
7,149.20
7,149.00
7,148.80
7,148.60
7,148.40
7,148.20
7,148.00
7,147.80
7,147.60
7,147.40
7,147.20
7,147.00
7,146.80
7,146.60
7,146.40
7,146.20
7,146.00
7,145.80
7,145.60
7,145.40
7,145.20
7,145.00
7,144.80
-7.0 -6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0


DP09A - 5-Year
Elevation (ft)
Station (ft)
EGL
HGL
Top of Pond Elev.: 7135.00
Label: DP09A-01
Type: Outfall
ID: 83
Label: DP09A-02
Type: Conduit
ID: 93
Label: DP09A-03
Type: Manhole
ID: 91
Label: DP09A-04
Type: Conduit
ID: 92
Label: DP09A-05
Type: Manhole
ID: 56
Label: DP09A-06
Type: Conduit
ID: 80
Label: DP09A-07
Type: Manhole
ID: 54
Label: DP09A-08
Type: Conduit
ID: 79
Label: DP09A-09
Type: Manhole
ID: 53
Label: DP09A-10
Type: Conduit
ID: 73
Label: DP09A-11
Type: Manhole
ID: 47

Homestead North Filing No. 2: 5- year Model Results																		
Upstream Structure	Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Diameter (in)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Upstream Structure Headloss Coefficient	Manning's n
DP01A-03	DP01A-02	4.2	15.96	24	110.5	0.005	4.28	7,125.60	7,125.05	7,134.34	7,128.56	7,126.32	7,125.75	7,126.58	7,126.04	0.1	0.013
DP02A-03	DP02A-02	36.5	120.08	48	58.7	0.007	8.38	7,128.68	7,128.27	7,139.24	7,134.11	7,131.32	7,131.34	7,131.59	7,131.53	0.1	0.013
DP02A-05	DP02A-04	32.3	87.71	36	7.5	0.017	11.47	7,129.81	7,129.68	7,139.12	7,139.24	7,131.65	7,131.28	7,132.43	7,132.39	1.35	0.013
DP02A-07	DP02A-06	25.5	93.96	36	105.3	0.02	11.3	7,132.92	7,130.83	7,140.83	7,139.12	7,134.55	7,132.71	7,135.21	7,133.17	1.35	0.013
DP02A-09	DP02A-08	18.3	111.06	36	277.9	0.028	11.61	7,141.63	7,133.92	7,147.65	7,140.83	7,143.00	7,135.44	7,143.53	7,135.84	1.35	0.013
DP02A-11	DP02A-10	13.3	114.51	36	24.4	0.029	10.82	7,142.45	7,141.73	7,148.56	7,147.65	7,143.61	7,143.71	7,144.04	7,143.82	1.35	0.013
DP02A-13	DP02A-12	9.6	40.92	24	52	0.033	10.64	7,145.15	7,143.45	7,150.25	7,148.56	7,146.26	7,144.14	7,146.71	7,145.70	1.35	0.013
DP02A-15	DP02A-14	3.1	13.73	18	198.4	0.017	6.28	7,149.04	7,145.65	7,153.69	7,150.25	7,149.71	7,146.87	7,149.97	7,146.93	1.35	0.013
DP02A-17	DP02A-16	3.1	14.85	18	8.5	0.02	6.64	7,149.51	7,149.34	7,153.99	7,153.69	7,150.18	7,150.06	7,150.44	7,150.28	0.1	0.013
DP03A-02	DP03A-01	7.7	38.82	24	28.9	0.029	9.62	7,131.68	7,130.83	7,139.24	7,139.12	7,132.67	7,132.71	7,133.05	7,132.81	0.1	0.013
DP04A-01	DP04A-01	8.8	22.51	24	27.3	0.01	6.72	7,134.19	7,133.92	7,141.03	7,140.83	7,135.35	7,135.44	7,135.69	7,135.62	0.1	0.013
DP05A-02	DP05A-01	8.2	12.72	18	87.3	0.015	7.65	7,144.41	7,143.13	7,149.07	7,147.65	7,145.52	7,144.01	7,146.05	7,144.92	0.11	0.013
DP05A-04	DP05A-03	8.2	21.35	18	70.2	0.041	11.29	7,147.41	7,144.51	7,152.13	7,149.07	7,148.52	7,145.16	7,149.05	7,147.07	0.11	0.013
DP05A-06	DP05A-05	8.2	20.32	18	326.1	0.037	10.88	7,159.71	7,147.51	7,164.53	7,152.13	7,160.82	7,148.17	7,161.35	7,150.01	1.08	0.013
DP05A-08	DP05A-07	3.1	11.22	18	28.9	0.011	5.42	7,160.34	7,160.01	7,164.86	7,164.53	7,161.39	7,161.39	7,161.47	7,161.45	0.1	0.013
DP06A-02	DP06A-01	5.1	20.31	18	9.9	0.037	9.56	7,160.38	7,160.01	7,164.86	7,164.53	7,161.25	7,161.39	7,161.61	7,161.53	0.1	0.013
DP07A-02	DP07A-01	4	23.14	24	8.6	0.01	5.52	7,143.54	7,143.45	7,148.53	7,148.56	7,144.24	7,144.19	7,144.50	7,144.41	0.1	0.013
DP08A-02	DP08A-01	6.9	22.62	24	27.4	0.01	6.33	7,145.73	7,145.45	7,150.37	7,150.25	7,146.80	7,146.87	7,147.05	7,147.00	0.1	0.013
DP09A-03	DP09A-02	2.8	8.48	18	42.3	0.007	1.58	7,128.81	7,128.53	7,135.96	7,130.24	7,131.37	7,131.34	7,131.41	7,131.38	0.1	0.013
DP09A-05	DP09A-04	2.6	9.87	18	103.6	0.009	1.47	7,129.82	7,128.91	7,136.68	7,135.96	7,131.44	7,131.37	7,131.47	7,131.41	0.4	0.013
DP09A-07	DP09A-06	2.6	9.88	18	184.5	0.009	4.71	7,131.45	7,129.82	7,135.95	7,136.68	7,132.07	7,131.45	7,132.29	7,131.48	0.4	0.013
DP09A-09	DP09A-08	2.1	17.44	18	187.4	0.028	6.67	7,136.92	7,131.75	7,142.29	7,135.95	7,137.47	7,132.11	7,137.67	7,132.80	0.4	0.013
DP09A-11	DP09A-10	2.1	17.45	18	34.1	0.028	6.67	7,137.86	7,136.92	7,144.14	7,142.29	7,138.41	7,137.55	7,138.61	7,137.69	0.1	0.013


DP01A - 100-Yr
Label: DP01A-03
Type: Manhole
ID: 58
Label: DP01A-01
Type: Outfall
ID: 97
Label: DP01A-02
Type: Conduit
ID: 86
EGL
HGL
Elevation (ft)
Station (ft)
7,134.50
7,134.00
7,133.50
7,133.00
7,132.50
7,132.00
7,131.50
7,131.00
7,130.50
7,130.00
7,129.50
7,129.00
7,128.50
7,128.00
7,127.50
7,127.00
7,126.50
7,126.00
7,125.50
7,125.00
7,124.50
7,124.00
7,123.50
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
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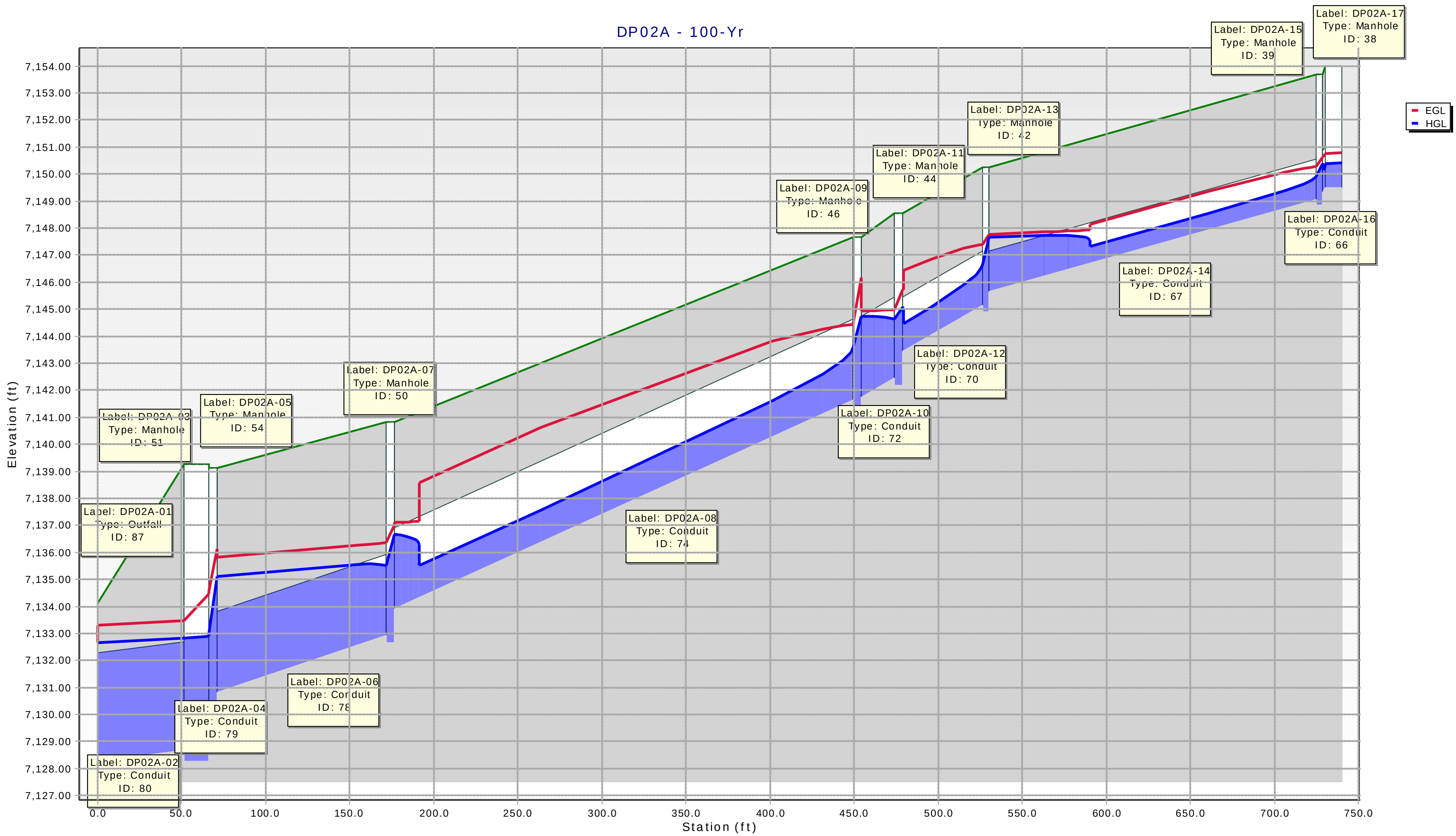
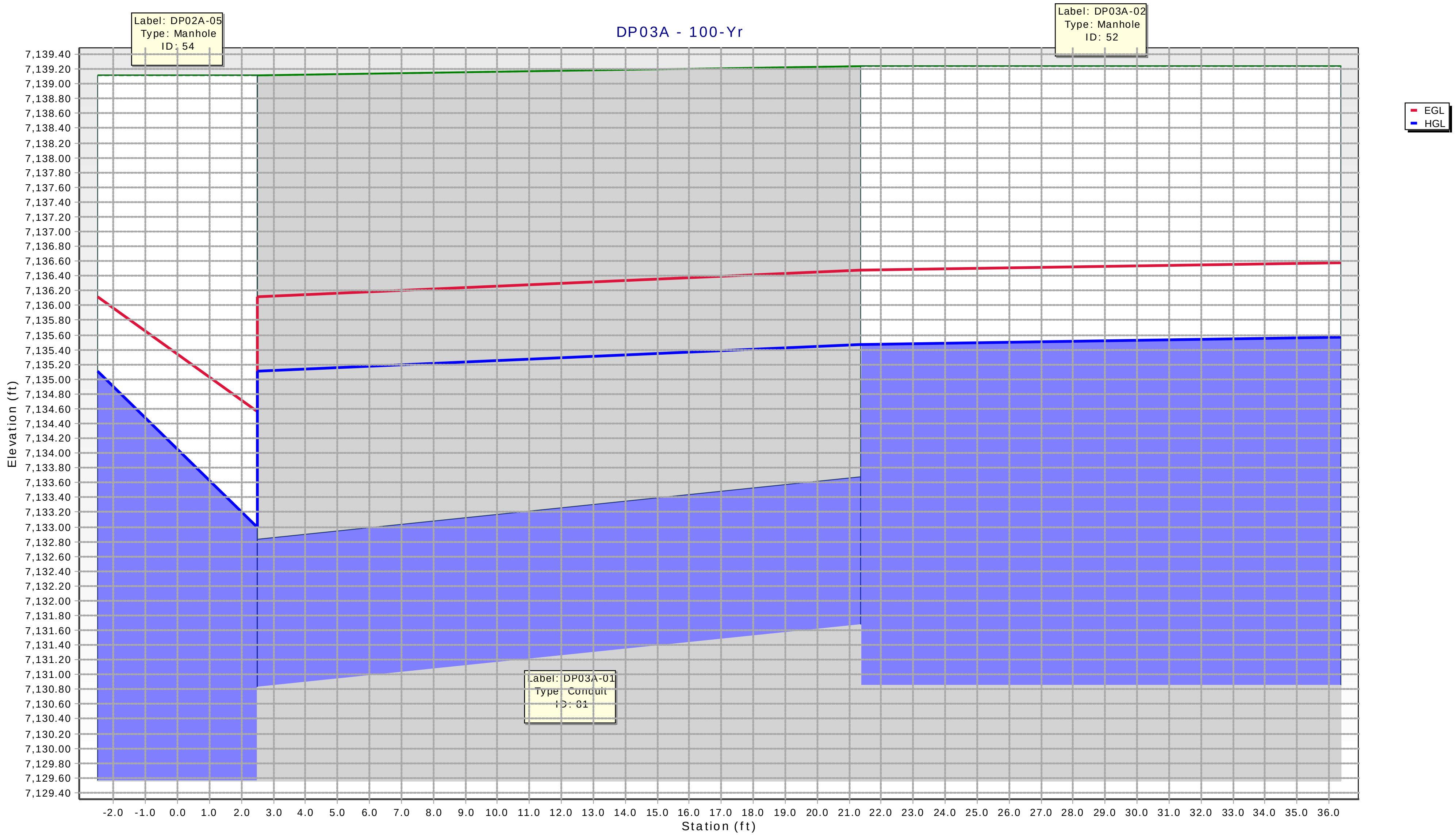
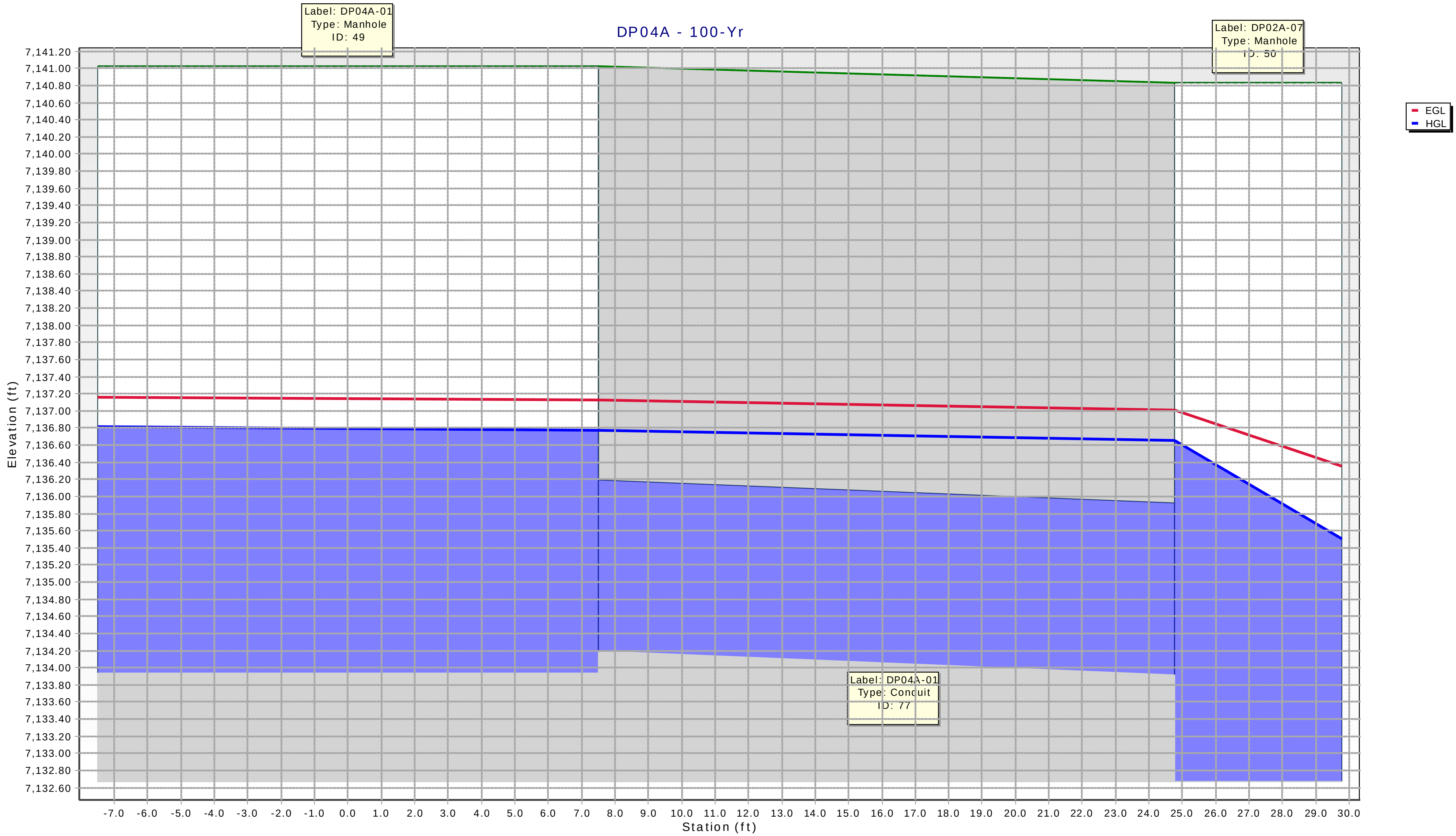
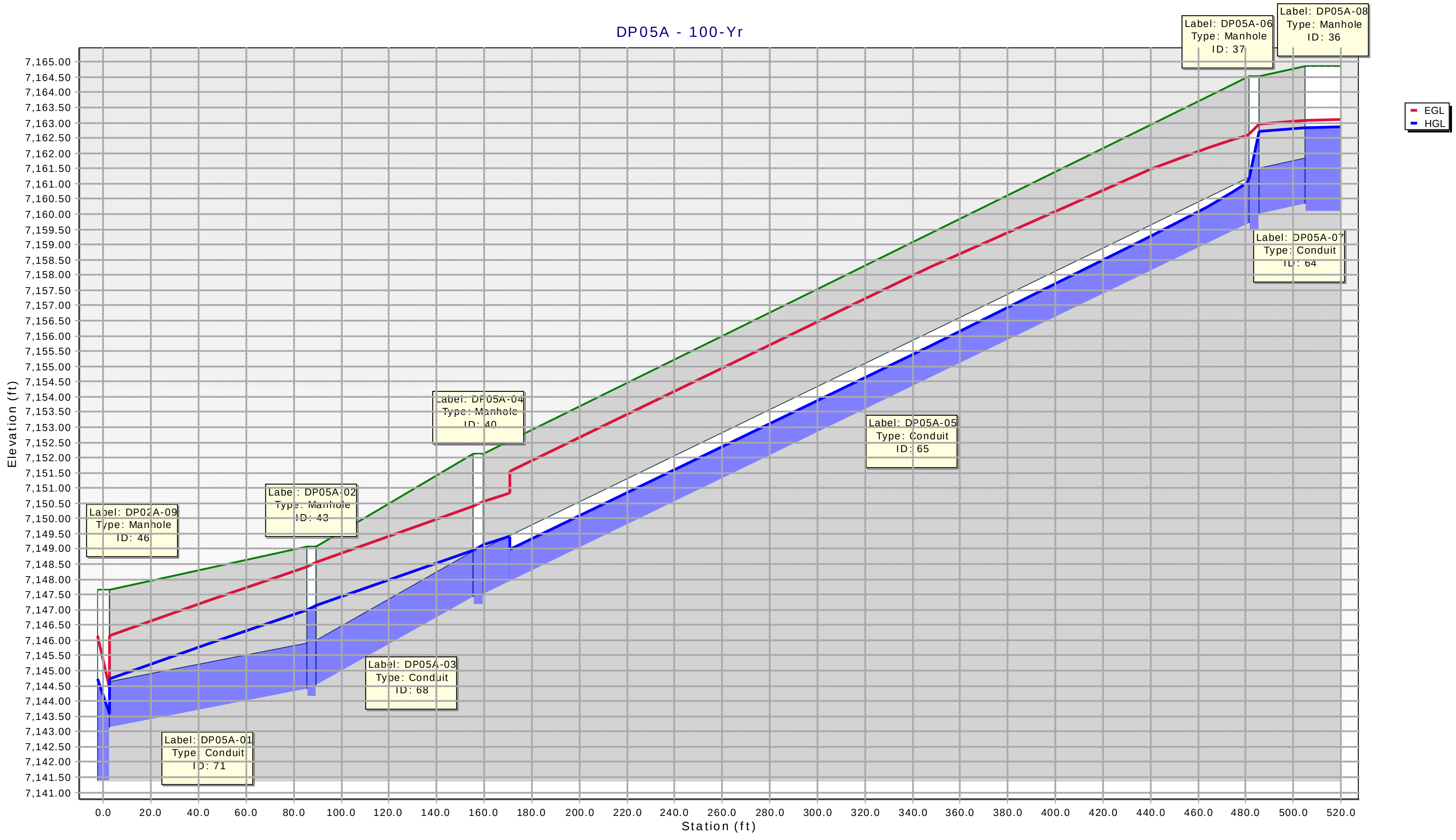
100.0
105.0
110.0

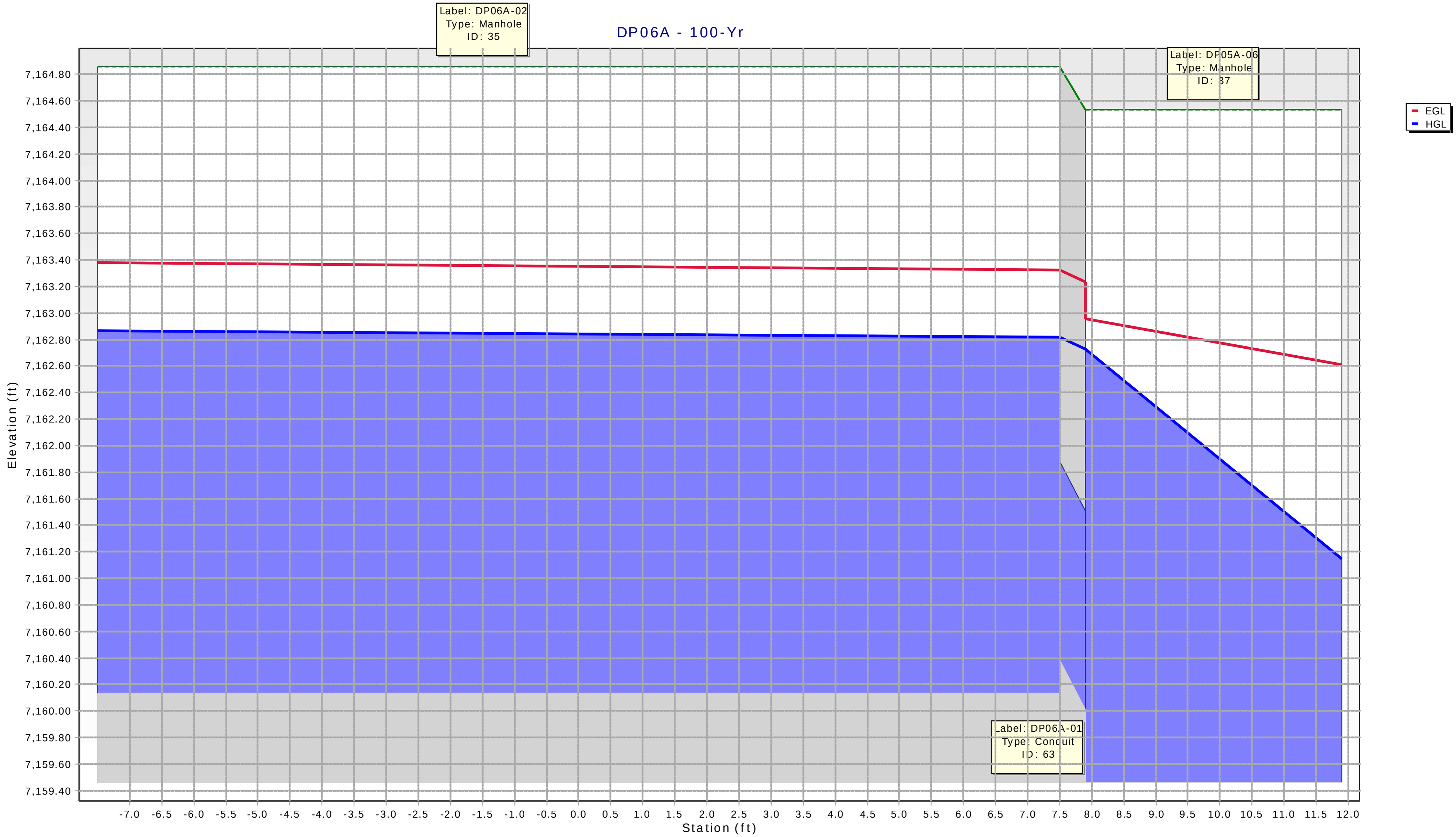

DP02A - 100-Yr
Elevation (ft)
Station (ft)
EGL
HGL
Label: DP02A-01
Type: Outfall
ID: 87
Label: DP02A-02
Type: Conduit
ID: 80
Label: DP02A-03
Type: Manhole
ID: 51
Label: DP02A-04
Type: Conduit
ID: 79
Label: DP02A-05
Type: Manhole
ID: 54
Label: DP02A-06
Type: Conduit
ID: 78
Label: DP02A-07
Type: Manhole
ID: 50
Label: DP02A-08
Type: Conduit
ID: 74
Label: DP02A-09
Type: Manhole
ID: 46
Label: DP02A-10
Type: Conduit
ID: 72
Label: DP02A-11
Type: Manhole
ID: 44
Label: DP02A-12
Type: Conduit
ID: 70
Label: DP02A-13
Type: Manhole
ID: 42
Label: DP02A-14
Type: Conduit
ID: 67
Label: DP02A-15
Type: Manhole
ID: 39
Label: DP02A-16
Type: Conduit
ID: 66
Label: DP02A-17
Type: Manhole
ID: 38
7,154.00
7,153.00
7,152.00
7,151.00
7,150.00
7,149.00
7,148.00
7,147.00
7,146.00
7,145.00
7,144.00
7,143.00
7,142.00
7,141.00
7,140.00
7,139.00
7,138.00
7,137.00
7,136.00
7,135.00
7,134.00
7,133.00
7,132.00
7,131.00
7,130.00
7,129.00
7,128.00
7,127.00
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
550.0
600.0
650.0
700.0
750.0



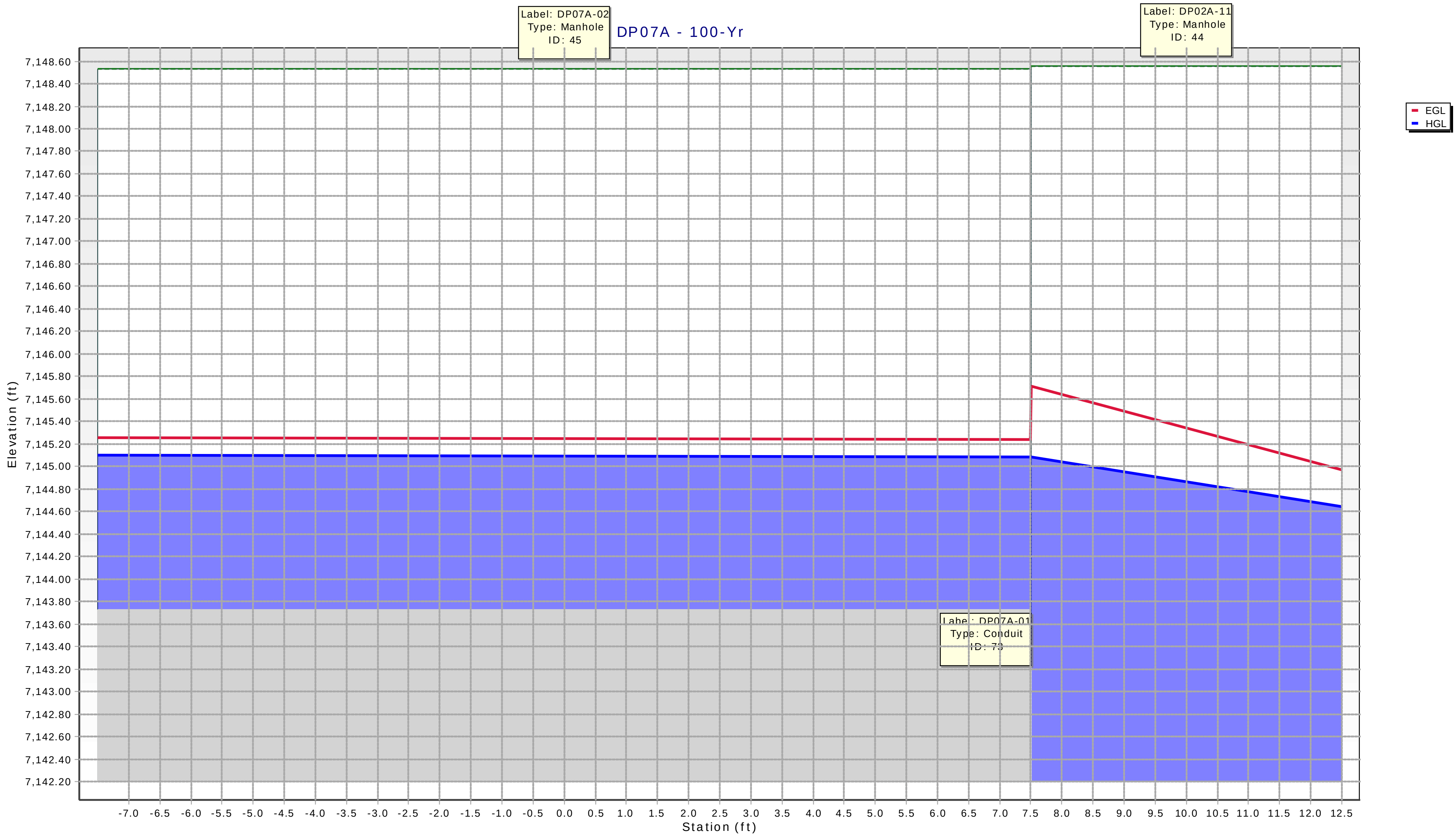
DP03A - 100-Yr
Label: DP02A-05
Type: Manhole
ID: 54
Label: DP03A-02
Type: Manhole
ID: 52
Label: DP03A-01
Type: Conduit
ID: 81
EGL
HGL
Elevation (ft)
Station (ft)

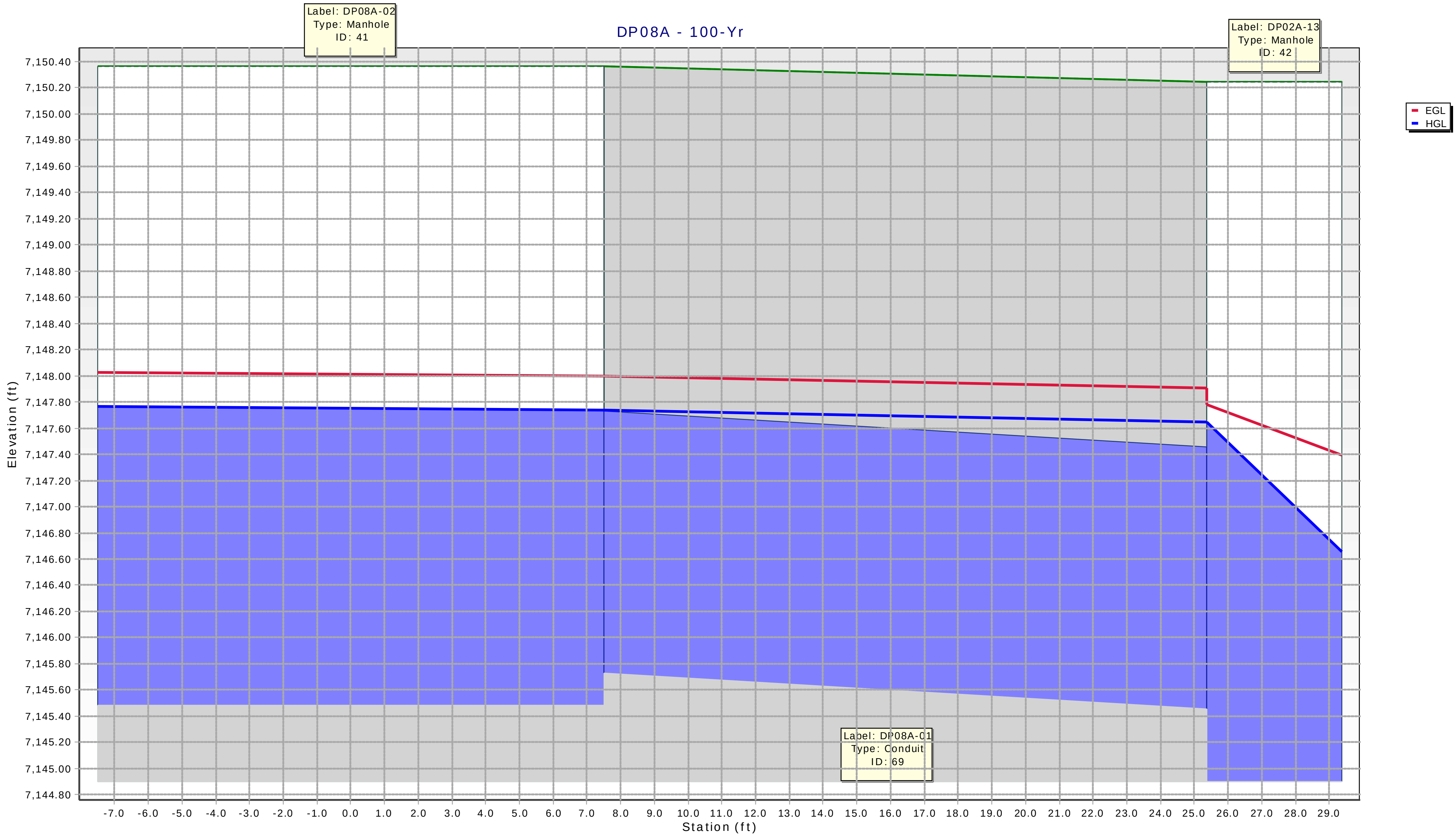

DP04A - 100-Yr
Label: DP04A-01
Type: Manhole
ID: 49
Label: DP02A-07
Type: Manhole
ID: 50
Label: DP04A-01
Type: Conduit
ID: 77
EGL
HGL
Elevation (ft)
Station (ft)
7,141.20
7,141.00
7,140.80
7,140.60
7,140.40
7,140.20
7,140.00
7,139.80
7,139.60
7,139.40
7,139.20
7,139.00
7,138.80
7,138.60
7,138.40
7,138.20
7,138.00
7,137.80
7,137.60
7,137.40
7,137.20
7,137.00
7,136.80
7,136.60
7,136.40
7,136.20
7,136.00
7,135.80
7,135.60
7,135.40
7,135.20
7,135.00
7,134.80
7,134.60
7,134.40
7,134.20
7,134.00
7,133.80
7,133.60
7,133.40
7,133.20
7,133.00
7,132.80
7,132.60
-7.0 -6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0


DP05A - 100-Yr
Elevation (ft)
Station (ft)
EGL
HGL
Label: DP02A-09
Type: Manhole
ID: 46
Label: DP05A-02
Type: Manhole
ID: 43
Label: DP05A-04
Type: Manhole
ID: 40
Label: DP05A-06
Type: Manhole
ID: 37
Label: DP05A-08
Type: Manhole
ID: 36
Label: DP05A-01
Type: Conduit
ID: 71
Label: DP05A-03
Type: Conduit
ID: 68
Label: DP05A-05
Type: Conduit
ID: 65
Label: DP05A-07
Type: Conduit
ID: 64

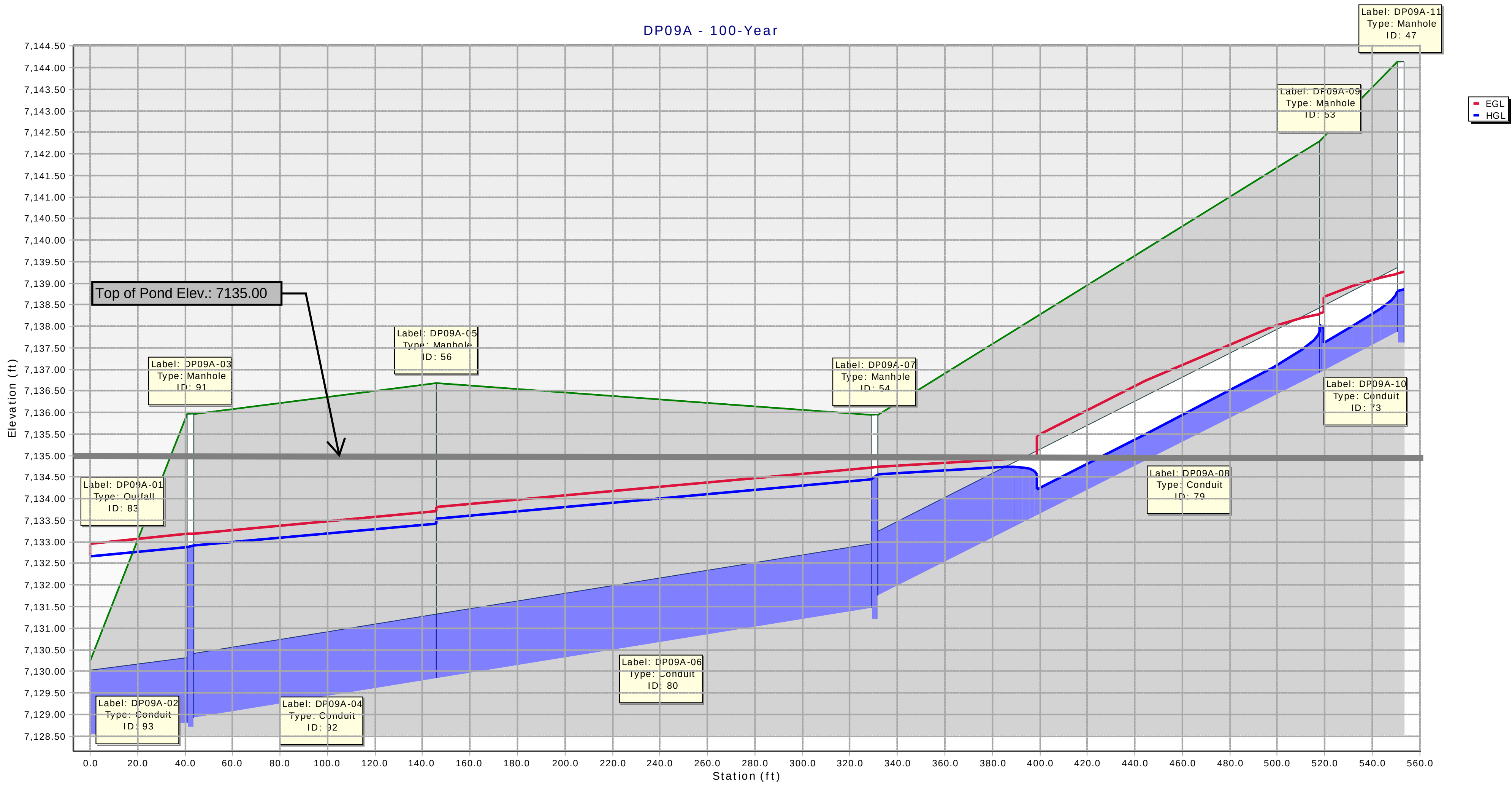


DP06A - 100-Yr
Label: DP06A-02
Type: Manhole
ID: 35
Label: DP05A-06
Type: Manhole
ID: 37
Label: DP06A-01
Type: Conduit
ID: 63
EGL
HGL
Elevation (ft)
Station (ft)
7,164.80
7,164.60
7,164.40
7,164.20
7,164.00
7,163.80
7,163.60
7,163.40
7,163.20
7,163.00
7,162.80
7,162.60
7,162.40
7,162.20
7,162.00
7,161.80
7,161.60
7,161.40
7,161.20
7,161.00
7,160.80
7,160.60
7,160.40
7,160.20
7,160.00
7,159.80
7,159.60
7,159.40
-7.0 -6.5 -6.0 -5.5 -5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0


DP07A - 100-Yr
Label: DP07A-02
Type: Manhole
ID: 45
Label: DP02A-11
Type: Manhole
ID: 44
Label: DP07A-01
Type: Conduit
ID: 73
EGL
HGL
Elevation (ft)
Station (ft)
7,148.60
7,148.40
7,148.20
7,148.00
7,147.80
7,147.60
7,147.40
7,147.20
7,147.00
7,146.80
7,146.60
7,146.40
7,146.20
7,146.00
7,145.80
7,145.60
7,145.40
7,145.20
7,145.00
7,144.80
7,144.60
7,144.40
7,144.20
7,144.00
7,143.80
7,143.60
7,143.40
7,143.20
7,143.00
7,142.80
7,142.60
7,142.40
7,142.20
-7.0 -6.5 -6.0 -5.5 -5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5



DP08A - 100-Yr
Label: DP08A-02
Type: Manhole
ID: 41
Label: DP02A-13
Type: Manhole
ID: 42
Label: DP08A-01
Type: Conduit
ID: 69
EGL
HGL
Elevation (ft)
Station (ft)
7,150.40
7,150.20
7,150.00
7,149.80
7,149.60
7,149.40
7,149.20
7,149.00
7,148.80
7,148.60
7,148.40
7,148.20
7,148.00
7,147.80
7,147.60
7,147.40
7,147.20
7,147.00
7,146.80
7,146.60
7,146.40
7,146.20
7,146.00
7,145.80
7,145.60
7,145.40
7,145.20
7,145.00
7,144.80
-7.0 -6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0



DP09A - 100-Year
Elevation (ft)
Station (ft)
Top of Pond Elev.: 7135.00
EGL
HGL
Label: DP09A-01
Type: Outfall
ID: 83
Label: DP09A-02
Type: Conduit
ID: 93
Label: DP09A-03
Type: Manhole
ID: 91
Label: DP09A-04
Type: Conduit
ID: 92
Label: DP09A-05
Type: Manhole
ID: 56
Label: DP09A-06
Type: Conduit
ID: 80
Label: DP09A-07
Type: Manhole
ID: 54
Label: DP09A-08
Type: Conduit
ID: 79
Label: DP09A-09
Type: Manhole
ID: 53
Label: DP09A-10
Type: Conduit
ID: 73
Label: DP09A-11
Type: Manhole
ID: 47

Homestead North Filing No. 2: 100- year Model Results																		
Upstream Structure	Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Diameter (in)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Upstream Structure Headloss Coefficient	Manning's n
DP01A-03	DP01A-02	30.4	16.0	24	110.5	0.005	9.68	7,125.60	7,125.05	7,134.34	7,128.56	7,128.99	7,126.92	7,130.45	7,128.46	0.1	0.013
DP02A-03	DP02A-02	79.9	120.1	48	58.7	0.007	6.36	7,128.68	7,128.27	7,139.24	7,134.11	7,132.84	7,132.66	7,133.47	7,133.29	0.1	0.013
DP02A-05	DP02A-04	71.0	87.7	36	7.5	0.017	10.04	7,129.81	7,129.68	7,139.12	7,139.24	7,132.99	7,132.90	7,134.56	7,134.47	1.35	0.013
DP02A-07	DP02A-06	48.0	94.0	36	105.3	0.02	13.36	7,132.92	7,130.83	7,140.83	7,139.12	7,135.51	7,135.11	7,136.36	7,135.82	1.35	0.013
DP02A-09	DP02A-08	36.1	111.1	36	277.9	0.028	14.04	7,141.63	7,133.92	7,147.65	7,140.83	7,143.58	7,136.66	7,144.44	7,137.10	1.35	0.013
DP02A-11	DP02A-10	25.4	114.5	36	24.4	0.029	13.02	7,142.45	7,141.73	7,148.56	7,147.65	7,144.64	7,144.73	7,144.97	7,144.94	1.35	0.013
DP02A-13	DP02A-12	17.4	40.9	24	52	0.033	12.5	7,145.15	7,143.45	7,150.25	7,148.56	7,146.66	7,145.08	7,147.39	7,145.71	1.35	0.013
DP02A-15	DP02A-14	5.1	13.7	18	198.4	0.017	7.19	7,149.04	7,145.65	7,153.69	7,150.25	7,149.91	7,147.65	7,150.27	7,147.78	1.35	0.013
DP02A-17	DP02A-16	5.1	14.9	18	8.5	0.02	7.62	7,149.51	7,149.34	7,153.99	7,153.69	7,150.38	7,150.40	7,150.74	7,150.63	0.1	0.013
DP03A-02	DP03A-01	25.3	38.8	24	28.9	0.029	8.05	7,131.68	7,130.83	7,139.24	7,139.12	7,135.47	7,135.11	7,136.48	7,136.11	0.1	0.013
DP04A-01	DP04A-01	14.9	22.5	24	27.3	0.01	4.74	7,134.19	7,133.92	7,141.03	7,140.83	7,136.78	7,136.66	7,137.13	7,137.01	0.1	0.013
DP05A-02	DP05A-01	16.9	12.7	18	87.3	0.015	9.56	7,144.41	7,143.13	7,149.07	7,147.65	7,146.99	7,144.73	7,148.42	7,146.16	0.11	0.013
DP05A-04	DP05A-03	16.9	21.4	18	70.2	0.041	9.56	7,147.41	7,144.51	7,152.13	7,149.07	7,148.97	7,147.15	7,150.39	7,148.57	0.11	0.013
DP05A-06	DP05A-05	16.9	20.3	18	326.1	0.037	12.86	7,159.71	7,147.51	7,164.53	7,152.13	7,161.15	7,149.12	7,162.61	7,150.55	1.08	0.013
DP05A-08	DP05A-07	6.8	11.2	18	28.9	0.011	3.85	7,160.34	7,160.01	7,164.86	7,164.53	7,162.85	7,162.73	7,163.08	7,162.96	0.1	0.013
DP06A-02	DP06A-01	10.1	20.3	18	9.9	0.037	5.72	7,160.38	7,160.01	7,164.86	7,164.53	7,162.82	7,162.73	7,163.33	7,163.23	0.1	0.013
DP07A-02	DP07A-01	8.4	23.1	24	8.6	0.01	6.78	7,143.54	7,143.45	7,148.53	7,148.56	7,145.08	7,145.08	7,145.24	7,145.23	0.1	0.013
DP08A-02	DP08A-01	12.9	22.6	24	27.4	0.01	4.11	7,145.73	7,145.45	7,150.37	7,150.25	7,147.74	7,147.65	7,148.00	7,147.91	0.1	0.013
DP09A-03	DP09A-02	7.7	8.5	18	42.3	0.007	4.36	7,128.81	7,128.53	7,135.96	7,130.24	7,132.89	7,132.66	7,133.18	7,132.96	0.1	0.013
DP09A-05	DP09A-04	7.4	9.9	18	103.6	0.009	4.19	7,129.82	7,128.91	7,136.68	7,135.96	7,133.43	7,132.92	7,133.70	7,133.19	0.4	0.013
DP09A-07	DP09A-06	7.4	9.9	18	184.5	0.009	4.19	7,131.45	7,129.82	7,135.95	7,136.68	7,134.46	7,133.54	7,134.73	7,133.81	0.4	0.013
DP09A-09	DP09A-08	6.0	17.4	18	187.4	0.028	8.95	7,136.92	7,131.75	7,142.29	7,135.95	7,137.87	7,134.56	7,138.27	7,134.74	0.4	0.013
DP09A-11	DP09A-10	6.0	17.5	18	34.1	0.028	8.96	7,137.86	7,136.92	7,144.14	7,142.29	7,138.81	7,138.03	7,139.22	7,138.32	0.1	0.013

FOREBAY VOLUME AND RELEASE REQUIREMENTS				
Equation 3-1	$WQCV = a(0.91I^3 - 1.19I^2 + 0.78I)$			
Pond Forebay	WQCV=watershed-inches, *I* =% Impervious, a=1 (40 hour drain time)			
	I (Impervious,%) =	49.90%	WQCV =	0.20598
Equation 3-3	V=(WQCV/12)A			
Pond Forebay	V=Volume (ac-ft.), A=Area (acres)			
	A (ac.) =	28.15	V (ac-ft.) =	**0.4832**
3% OF WQCV	$(V_{req})=.03(V)$			
Forebay Required Volume				
			V_{req} (ac-ft.) =	0.014
			V_{req} (ft^3) =	**631**
W. Forebay	Contributing Area (ac.)	25.13	Ratio	0.893
			V_{req} (ft^3) =	**564**
E. Forebay	Contributing Area (ac.)	3.02	Ratio	0.107
			V_{req} (ft^3) =	**68**
Volume Provided For Pond (West Forebay) =			V_{prop} (ft^3) =	654
Volume Provided For Pond (East Forebay) =			V_{prop} (ft^3) =	74
W. Forebay Release Rate	2% OF Q_{100} Inflow Into Pond			
Q_{100} Discharges				
			Q_{100} (cfs) =	67.1
			Q_{out} (cfs) =	**1.34**
E. Forebay Release Rate	2% OF Q_{100} Inflow Into Pond			
Q_{100} Discharges				
			Q_{100} (cfs) =	8.3
			Q_{out} (cfs) =	**0.17**

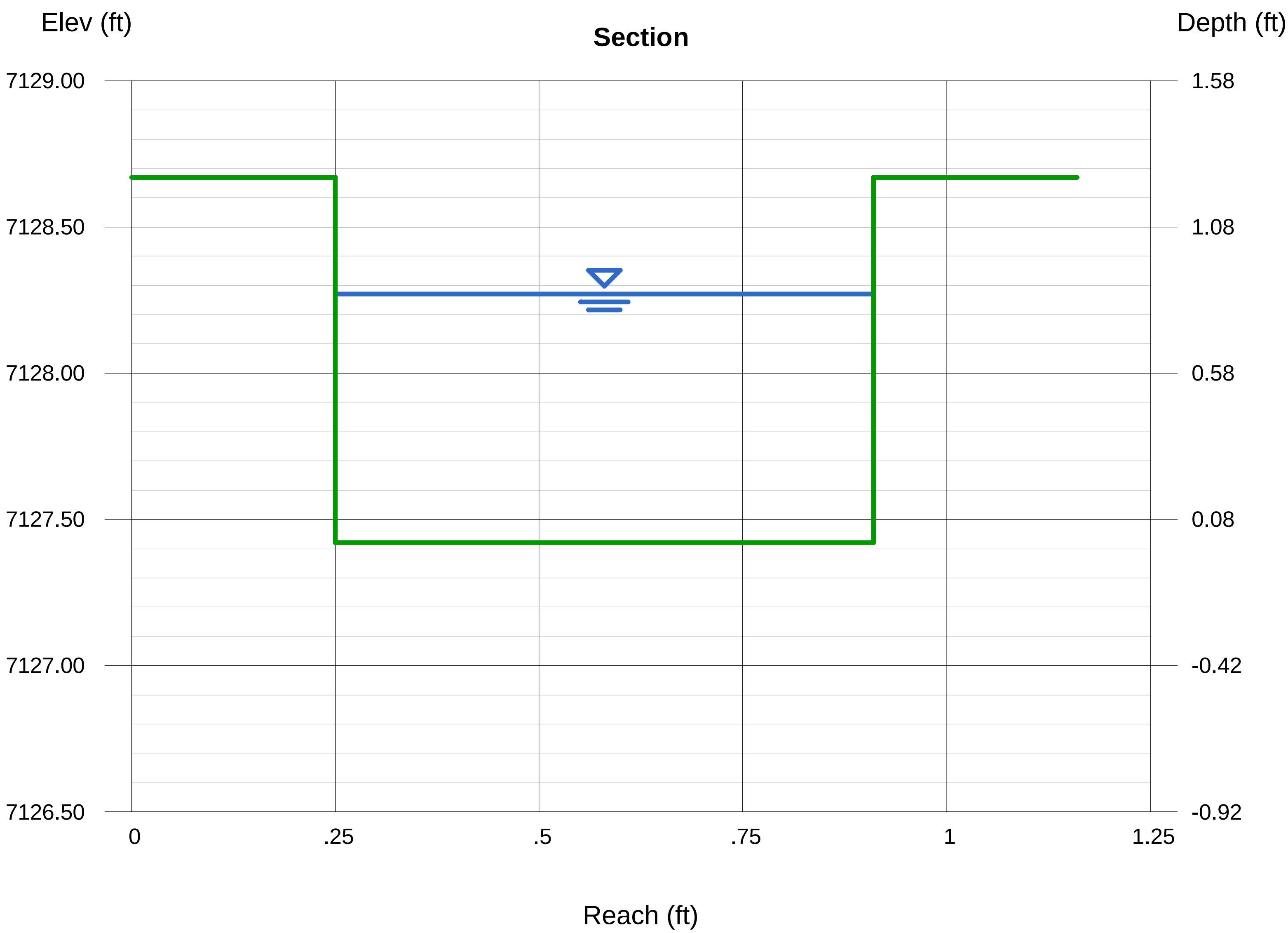
Note: Forebay calculations represent the fully built condition

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Nov 11 2022

West - Forebay Slot

Rectangular			**Highlighted**	
Bottom Width (ft)	= 0.66		Depth (ft)	= 0.85
Total Depth (ft)	= 1.25		Q (cfs)	= 1.340
			Area (sqft)	= 0.56
Invert Elev (ft)	= 7127.42		Velocity (ft/s)	= 2.39
Slope (%)	= 0.30		Wetted Perim (ft)	= 2.36
N-Value	= 0.013		Crit Depth, Yc (ft)	= 0.51
			Top Width (ft)	= 0.66
Calculations			EGL (ft)	= 0.94
Compute by:	Known Q			
Known Q (cfs)	= 1.34			



Weir Report

East Forebay Release_Pond B

Rectangular Weir

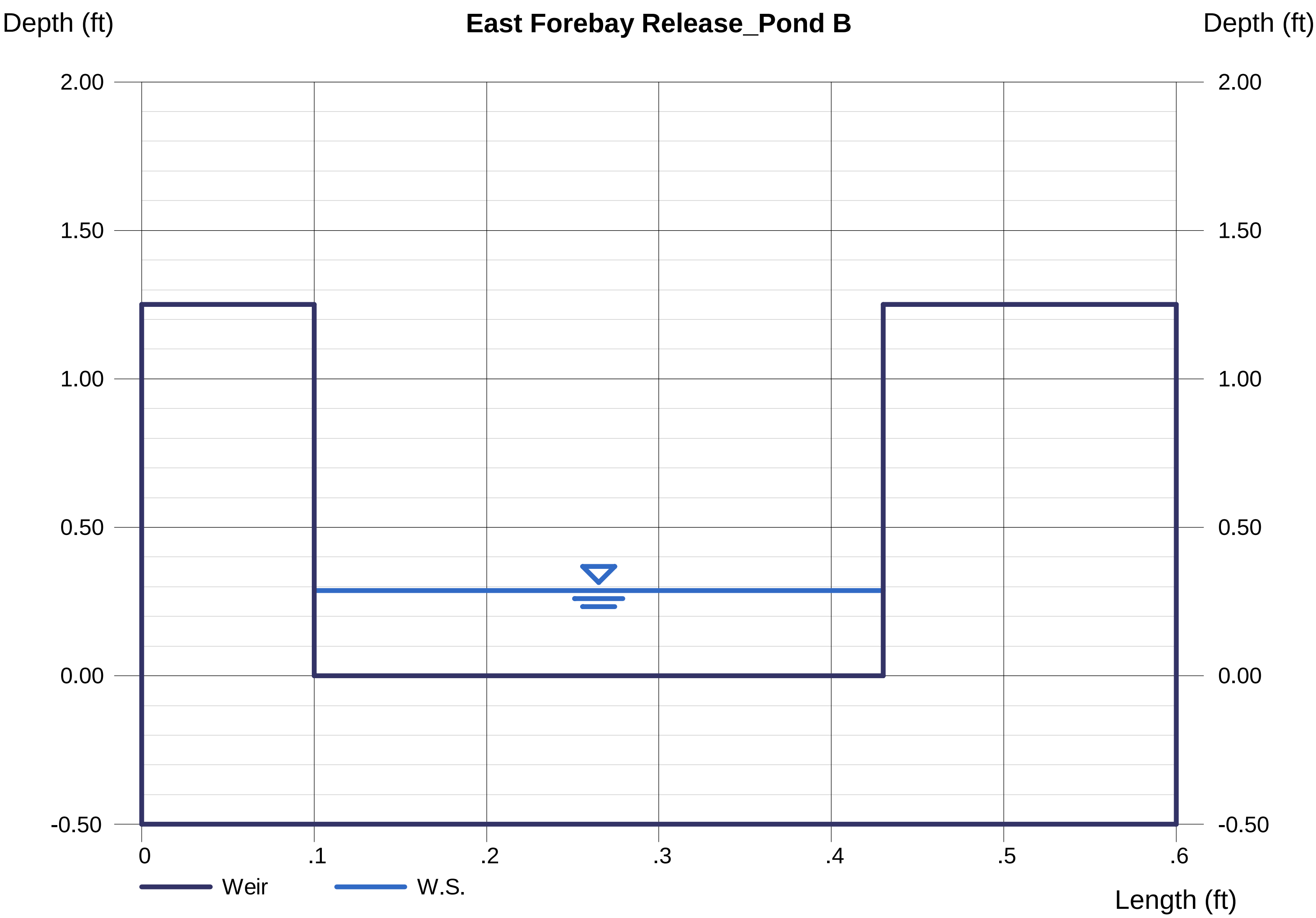
Crest	= Sharp
Bottom Length (ft)	= 0.33
Total Depth (ft)	= 1.25

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 0.17

Highlighted

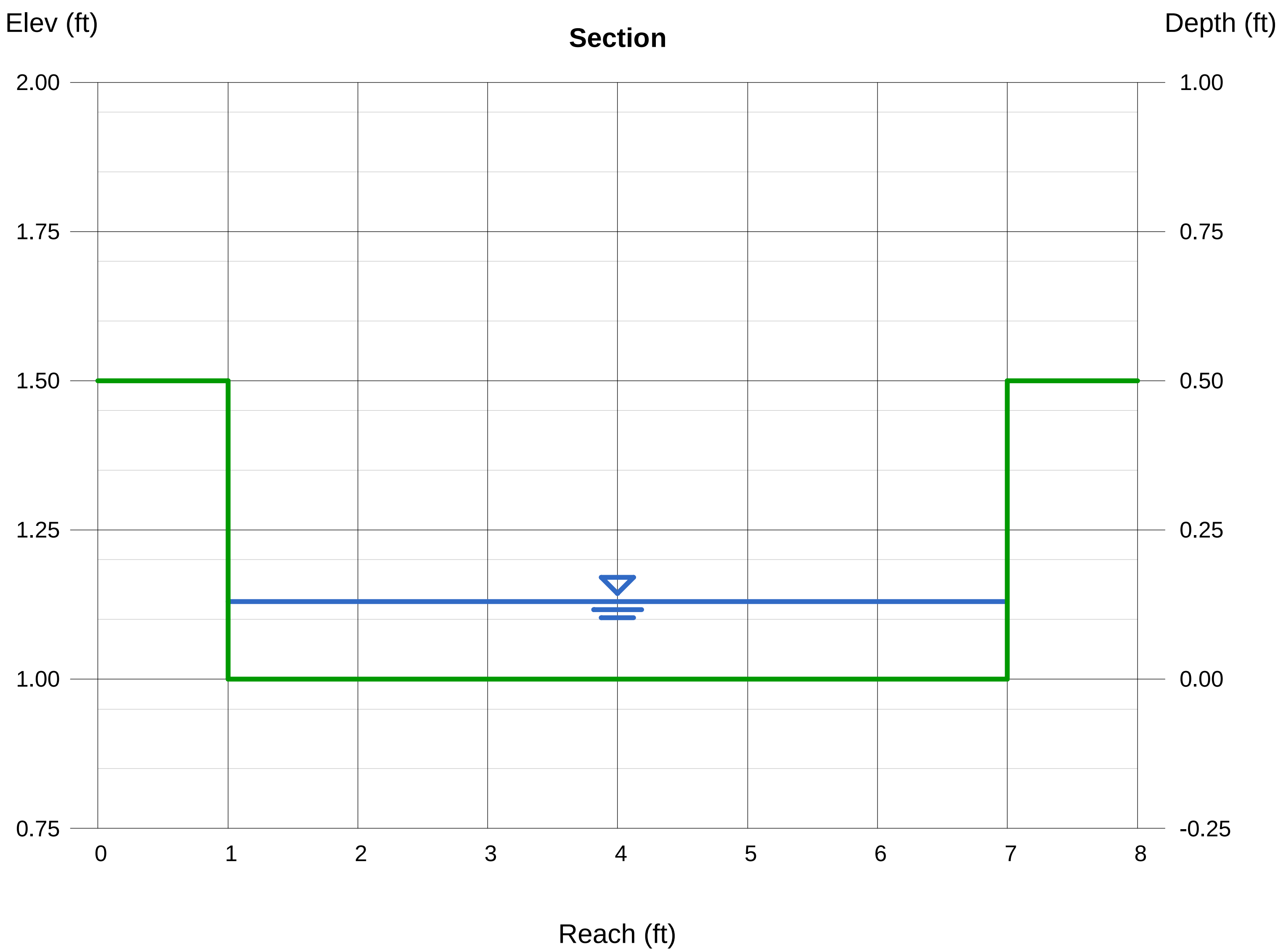
Depth (ft)	= 0.29
Q (cfs)	= 0.170
Area (sqft)	= 0.10
Velocity (ft/s)	= 1.79
Top Width (ft)	= 0.33



Channel Report

Pond B Trickle Channel

Rectangular		**Highlighted**	
Bottom Width (ft)	= 6.00	Depth (ft)	= 0.13
Total Depth (ft)	= 0.50	Q (cfs)	= 1.500
		Area (sqft)	= 0.78
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 1.92
Slope (%)	= 0.50	Wetted Perim (ft)	= 6.26
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.13
		Top Width (ft)	= 6.00
Calculations		EGL (ft)	= 0.19
Compute by:	Known Q		
Known Q (cfs)	= 1.50		

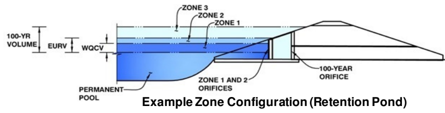


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: 25188.10 Homestead North Filing No. 2

Basin ID: Pond B (Proposed Condition)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	27.69	acres
Watershed Length =	1,600	ft
Watershed Length to Centroid =	960	ft
Watershed Slope =	0.032	ft/ft
Watershed Imperviousness =	44.40%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	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) =	0.442	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.302	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.255	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.836	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.352	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.073	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.644	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.379	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 4 in.) =	7.939	acre-feet	4.00	inches
Approximate 2-yr Detention Volume =	0.970	acre-feet		
Approximate 5-yr Detention Volume =	1.343	acre-feet		
Approximate 10-yr Detention Volume =	1.815	acre-feet		
Approximate 25-yr Detention Volume =	2.007	acre-feet		
Approximate 50-yr Detention Volume =	2.102	acre-feet		
Approximate 100-yr Detention Volume =	2.380	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.442	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.860	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.078	acre-feet
Total Detention Basin Volume =	2.380	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

	Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
25.59	**Top of Micropool**	--	0.00	--	--	--	10	0.000		
	7125.92	--	0.33	--	--	--	49	0.001	10	0.000
	7126	--	0.41	--	--	--	65	0.001	14	0.000
	7127	--	1.41	--	--	--	3,181	0.073	1,637	0.038
	7128	--	2.41	--	--	--	12,986	0.298	9,720	0.223
	7129	--	3.41	--	--	--	18,085	0.415	25,256	0.580
	7130	--	4.41	--	--	--	21,210	0.487	44,903	1.031
	7131	--	5.41	--	--	--	24,408	0.560	67,712	1.554
	7132	--	6.41	--	--	--	27,857	0.640	93,844	2.154
	7133	--	7.41	--	--	--	31,439	0.722	123,492	2.835
	7134	--	8.41	--	--	--	35,190	0.808	156,807	3.600
	7135	--	9.41	--	--	--	37,675	0.865	193,239	4.436
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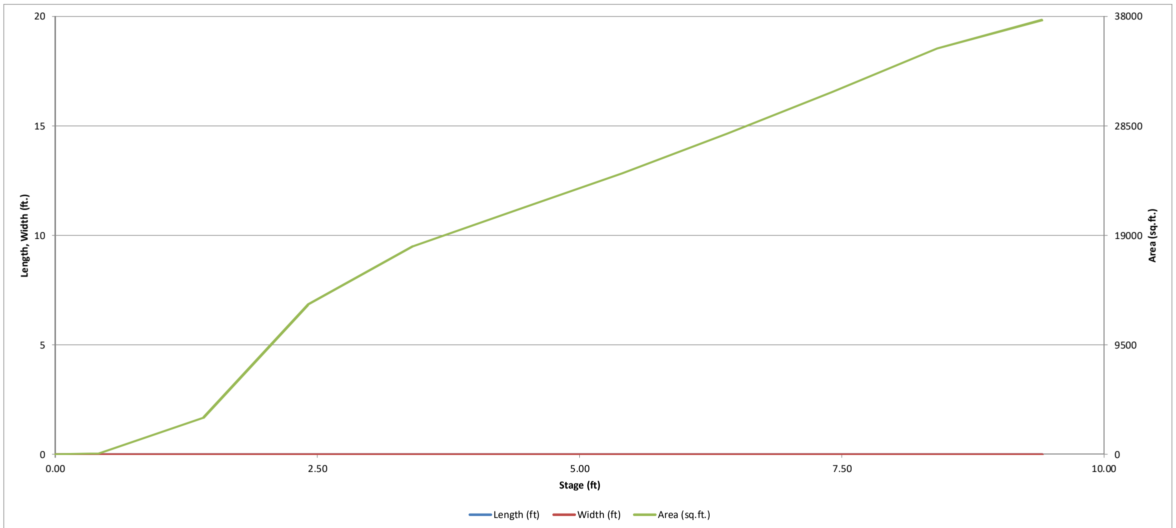
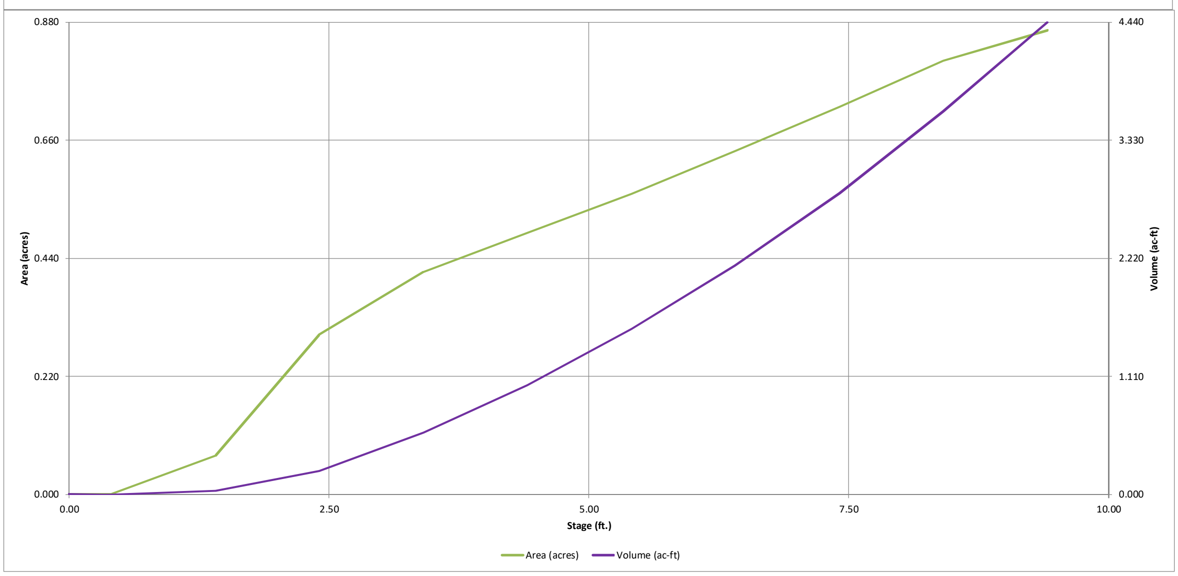
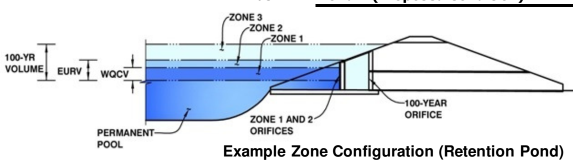

Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)


Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: 25188.10 Homestead North Filing No. 2
Basin ID: Pond B (Proposed Condition)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.06	0.442	Orifice Plate
Zone 2 (EURV)	4.95	0.860	Orifice Plate
ne 3 (100-year)	6.76	1.078	Weir&Pipe (Restrict)
	Total (all zones)	2.380	

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

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

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) — Calculated Parameters for Plate

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 =	5.36	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	ow 3 (optiona	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.79	3.57	4.00				
Orifice Area (sq. inches)	2.00	2.00	2.00	12.00				

	Row 9 (optional)	Row 10 (optional)	w 11 (option	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) — Calculated Parameters for Vertical Orifice

	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				

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.60	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.88	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.40	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.40	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

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

	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 =	2.53	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.83	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.09	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal) — Calculated Parameters for Spillway

Spillway Invert Stage=	7.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.44	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	8.64	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.82	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.79	acre-ft

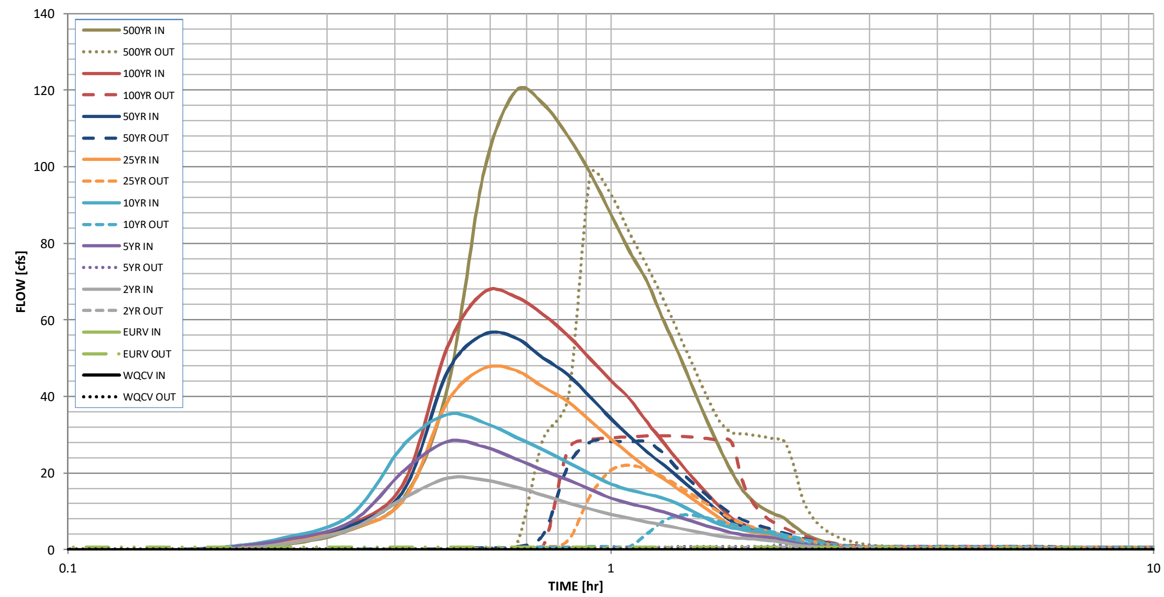
Routed Hydrograph Results

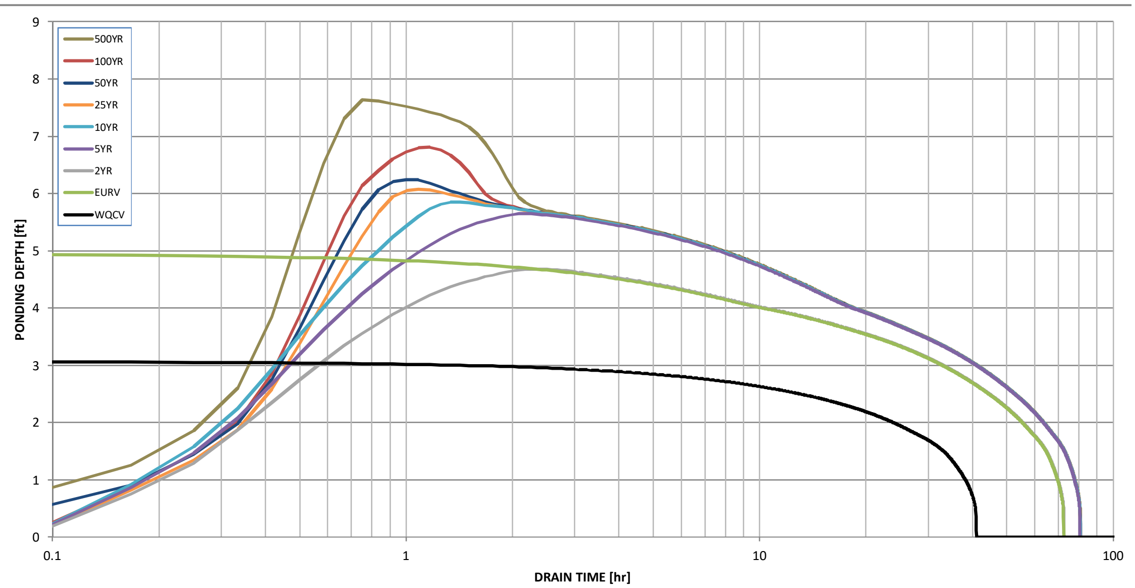
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

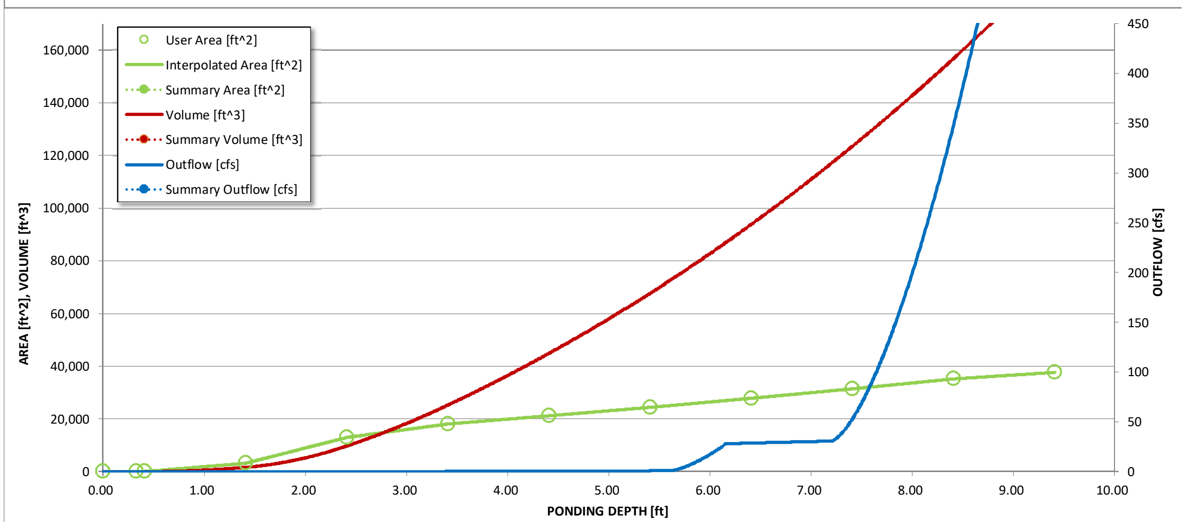
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	4.00
CUHP Runoff Volume (acre-ft) =	0.442	1.302	1.255	1.836	2.352	3.073	3.644	4.379	7.939
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.255	1.836	2.352	3.073	3.644	4.379	7.939
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	3.0	8.2	12.5	22.4	28.1	36.0	70.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.30	0.45	0.81	1.02	1.30	2.55
Peak Inflow Q (cfs) =	N/A	N/A	18.7	28.3	35.4	47.4	56.3	67.3	119.7
Peak Outflow Q (cfs) =	0.2	0.7	0.7	1.6	9.0	22.1	28.3	29.8	98.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.7	1.0	1.0	0.8	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.5	1.2	1.6	1.6	1.8
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	66	66	71	69	66	65	63	54
Time to Drain 99% of Inflow Volume (hours) =	**40**	70	70	77	76	75	74	73	68
Maximum Ponding Depth (ft) =	3.07	4.95	4.68	5.65	5.85	6.07	6.25	6.81	7.64
Area at Maximum Ponding Depth (acres) =	0.38	0.53	0.51	0.58	0.60	0.61	0.63	0.67	0.74
Maximum Volume Stored (acre-ft) =	0.445	1.304	1.165	1.685	1.809	1.942	2.047	2.417	2.996

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.02	1.35
	0:15:00	0.00	0.00	1.56	2.56	3.17	2.13	2.67	2.60	5.41
	0:20:00	0.00	0.00	5.63	7.46	9.36	5.56	6.49	6.94	13.86
	0:25:00	0.00	0.00	13.61	20.88	27.68	13.40	15.94	17.90	42.45
	0:30:00	0.00	0.00	18.74	28.32	35.41	38.74	46.60	53.06	98.82
	0:35:00	0.00	0.00	18.24	26.90	33.22	47.40	56.32	67.31	119.75
	0:40:00	0.00	0.00	16.49	23.82	29.49	46.91	55.38	66.10	116.43
	0:45:00	0.00	0.00	14.22	20.74	26.12	42.52	50.15	61.47	107.92
	0:50:00	0.00	0.00	12.28	18.25	22.76	38.74	45.69	55.91	98.24
	0:55:00	0.00	0.00	10.66	15.77	19.78	33.65	39.79	49.78	87.53
	1:00:00	0.00	0.00	9.26	13.52	17.19	28.90	34.24	44.19	77.77
	1:05:00	0.00	0.00	8.28	12.02	15.59	24.85	29.55	39.37	69.87
	1:10:00	0.00	0.00	7.29	11.01	14.49	21.36	25.49	33.22	59.77
	1:15:00	0.00	0.00	6.42	9.86	13.48	18.52	22.16	28.04	51.17
	1:20:00	0.00	0.00	5.65	8.60	11.89	15.74	18.80	23.07	42.03
	1:25:00	0.00	0.00	4.91	7.38	9.95	13.18	15.71	18.67	33.87
	1:30:00	0.00	0.00	4.20	6.28	8.19	10.69	12.69	14.81	26.74
	1:35:00	0.00	0.00	3.60	5.33	6.71	8.38	9.90	11.32	20.41
	1:40:00	0.00	0.00	3.19	4.47	5.79	6.43	7.54	8.39	15.45
	1:45:00	0.00	0.00	3.00	3.94	5.26	5.27	6.19	6.70	12.54
	1:50:00	0.00	0.00	2.90	3.59	4.90	4.56	5.34	5.62	10.62
	1:55:00	0.00	0.00	2.59	3.34	4.55	4.11	4.79	4.88	9.29
	2:00:00	0.00	0.00	2.30	3.07	4.12	3.79	4.40	4.34	8.32
	2:05:00	0.00	0.00	1.82	2.43	3.24	2.97	3.43	3.29	6.31
	2:10:00	0.00	0.00	1.40	1.86	2.47	2.23	2.58	2.39	4.59
	2:15:00	0.00	0.00	1.08	1.42	1.87	1.68	1.93	1.75	3.36
	2:20:00	0.00	0.00	0.83	1.08	1.40	1.27	1.45	1.32	2.52
	2:25:00	0.00	0.00	0.63	0.81	1.04	0.95	1.08	0.99	1.87
	2:30:00	0.00	0.00	0.48	0.60	0.77	0.70	0.80	0.74	1.40
	2:35:00	0.00	0.00	0.35	0.43	0.57	0.51	0.58	0.55	1.03
	2:40:00	0.00	0.00	0.26	0.32	0.42	0.39	0.44	0.41	0.77
	2:45:00	0.00	0.00	0.18	0.22	0.30	0.28	0.31	0.29	0.55
	2:50:00	0.00	0.00	0.12	0.15	0.19	0.19	0.21	0.20	0.36
	2:55:00	0.00	0.00	0.07	0.09	0.11	0.11	0.13	0.12	0.22
	3:00:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.06	0.11
	3:05:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

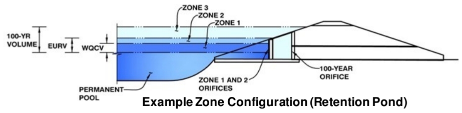
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **25188.10 Homestead North Filing No. 2**

Basin ID: **POND B (Ultimate/Future)**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	28.15	acres
Watershed Length =	1,600	ft
Watershed Length to Centroid =	960	ft
Watershed Slope =	0.032	ft/ft
Watershed Imperviousness =	49.90%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	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) =	0.483	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.501	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.424	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.035	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.572	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.294	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.879	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.620	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 4 in.) =	8.248	acre-feet	4.00	inches
Approximate 2-yr Detention Volume =	1.133	acre-feet		
Approximate 5-yr Detention Volume =	1.553	acre-feet		
Approximate 10-yr Detention Volume =	2.057	acre-feet		
Approximate 25-yr Detention Volume =	2.252	acre-feet		
Approximate 50-yr Detention Volume =	2.355	acre-feet		
Approximate 100-yr Detention Volume =	2.629	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.483	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.018	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.128	acre-feet
Total Detention Basin Volume =	2.629	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
7125.93	--	0.33	--	--	--	49	0.001	10	0.000
7126	--	0.41	--	--	--	65	0.001	14	0.000
7127	--	1.41	--	--	--	3,181	0.073	1,637	0.038
7128	--	2.41	--	--	--	12,986	0.298	9,721	0.223
7129	--	3.41	--	--	--	18,085	0.415	25,256	0.580
7130	--	4.41	--	--	--	21,210	0.487	44,904	1.031
7131	--	5.41	--	--	--	24,408	0.560	67,713	1.554
7132	--	6.41	--	--	--	27,857	0.640	93,845	2.154
7133	--	7.41	--	--	--	31,439	0.722	123,493	2.835
7134	--	8.41	--	--	--	35,190	0.808	156,808	3.600
7135	--	9.41	--	--	--	37,675	0.865	193,240	4.436
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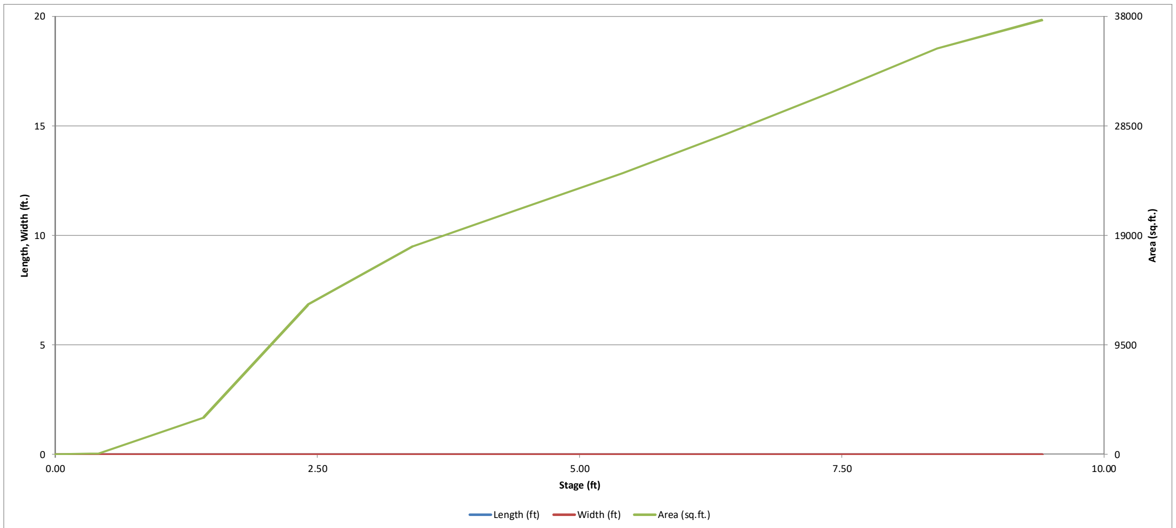
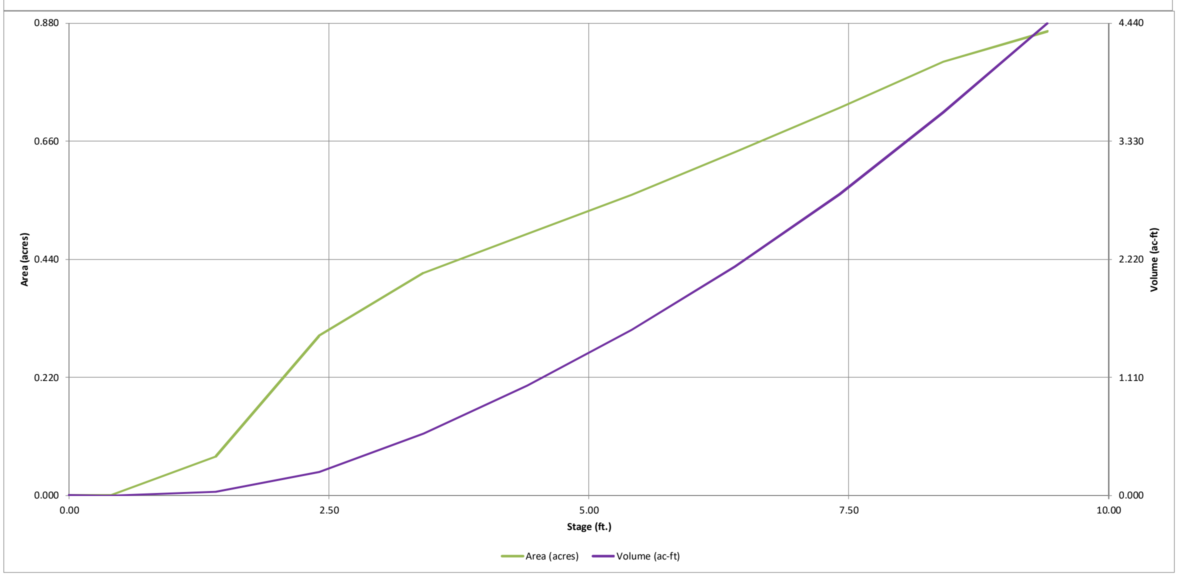
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



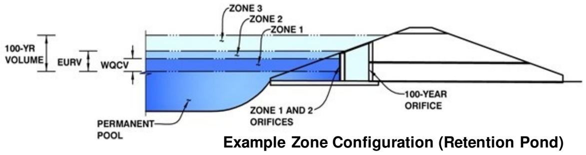


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: 25188.10 Homestead North Filing No. 2

Basin ID: POND B (Ultimate/Future)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.17	0.483	Orifice Plate
Zone 2 (EURV)	5.32	1.018	Orifice Plate
ne 3 (100-year)	7.12	1.128	Weir&Pipe (Restrict)
Total (all zones)		2.629	

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

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

Calculated Parameters for Plate

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 =	5.28	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	ow 3 (optiona	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.79	3.57	4.00				
Orifice Area (sq. inches)	2.00	2.00	2.00	12.00				

	Row 9 (optional)	Row 10 (optional)	w 11 (option	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)

Calculated Parameters for Vertical Orifice

	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				

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.60	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.88	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.40	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.40	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	one 3 Restricto	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 =	2.53	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.83	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.09	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage=	7.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.47	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	8.67	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.82	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.81	acre-ft

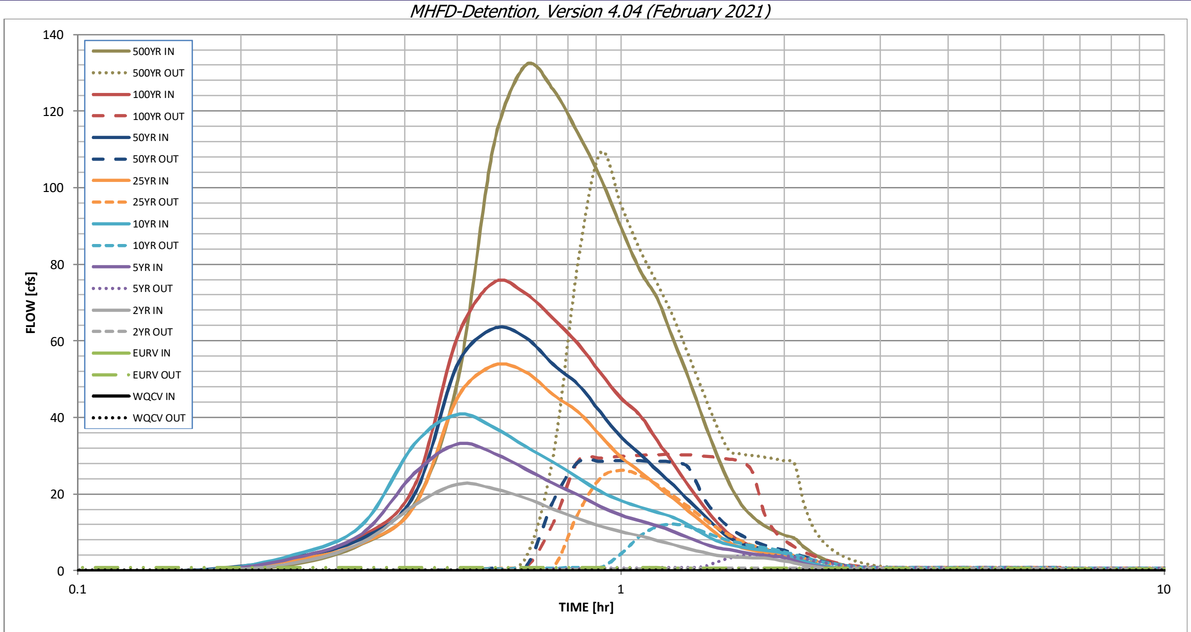
Routed Hydrograph Results

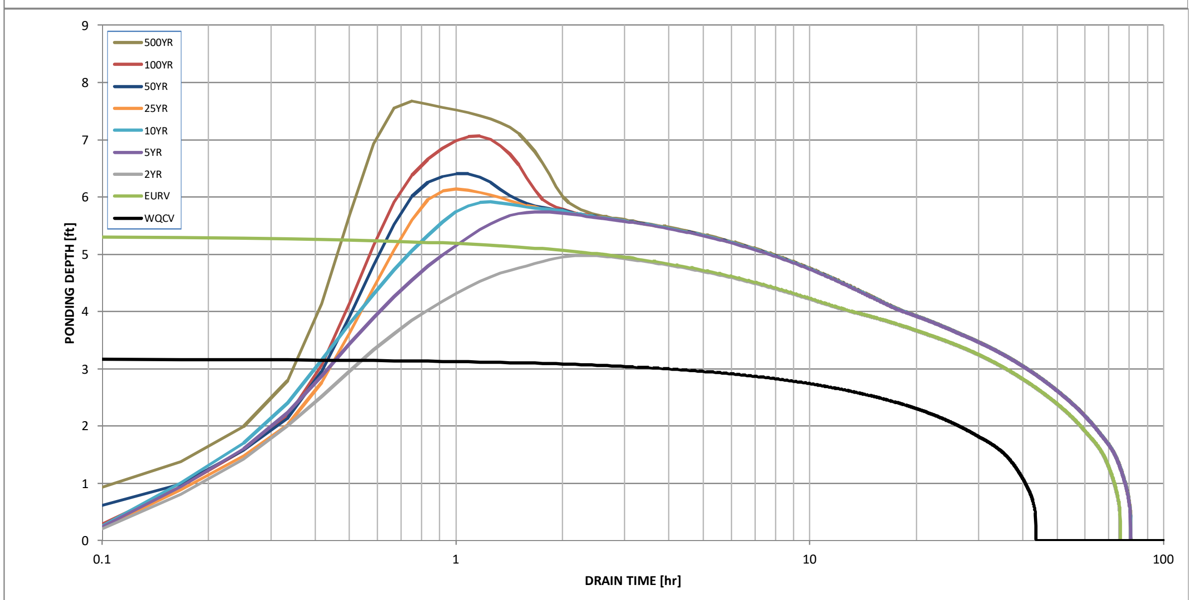
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

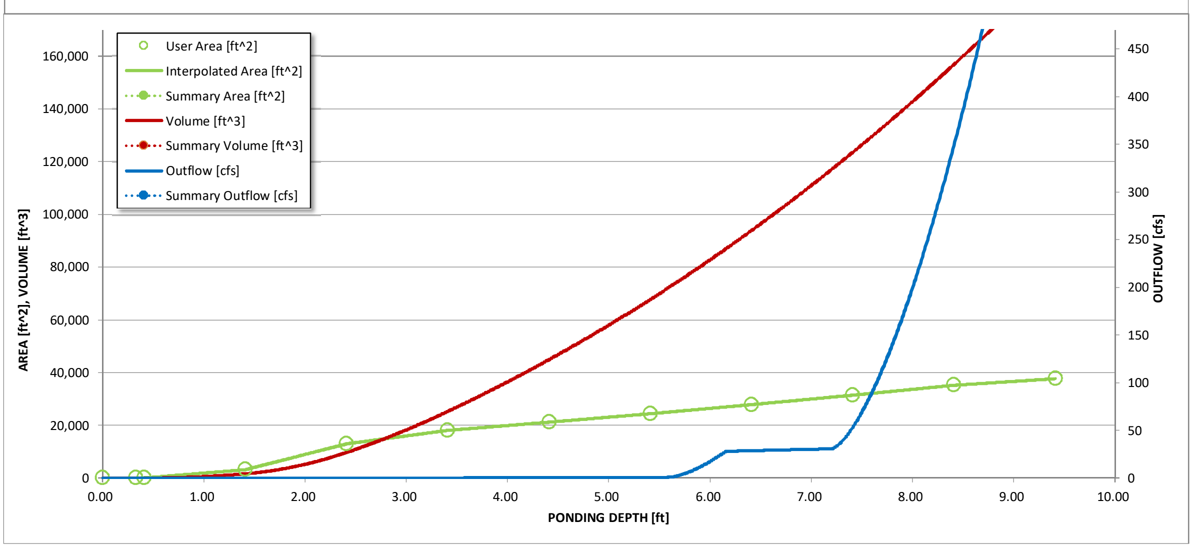
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	4.00
CUHP Runoff Volume (acre-ft) =	0.483	1.501	1.424	2.035	2.572	3.294	3.879	4.620	8.248
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.424	2.035	2.572	3.294	3.879	4.620	8.248
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	3.0	8.4	12.8	22.9	28.7	36.8	72.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.30	0.46	0.81	1.02	1.31	2.56
Peak Inflow Q (cfs) =	N/A	N/A	22.7	33.2	40.9	53.7	63.3	75.4	132.0
Peak Outflow Q (cfs) =	0.2	0.8	0.7	4.2	12.2	26.3	28.7	30.4	109.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	1.0	1.1	1.0	0.8	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.6	1.5	1.6	1.7	1.8
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) =	41	68	68	70	68	66	64	62	53
Time to Drain 99% of Inflow Volume (hours) =	**42**	72	72	77	76	75	74	73	68
Maximum Ponding Depth (ft) =	3.17	5.32	4.98	5.74	5.91	6.14	6.41	7.06	7.68
Area at Maximum Ponding Depth (acres) =	0.39	0.55	0.53	0.59	0.60	0.62	0.64	0.69	0.74
Maximum Volume Stored (acre-ft) =	0.484	1.504	1.320	1.738	1.845	1.978	2.148	2.587	3.033

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.02	1.77
	0:15:00	0.00	0.00	2.05	3.36	4.16	2.80	3.50	3.41	7.02
	0:20:00	0.00	0.00	7.35	9.71	11.99	7.21	8.40	9.00	17.44
	0:25:00	0.00	0.00	17.16	25.50	33.12	16.85	19.92	22.15	49.46
	0:30:00	0.00	0.00	22.66	33.16	40.85	45.21	53.93	61.07	111.34
	0:35:00	0.00	0.00	21.48	30.73	37.45	53.67	63.32	75.37	132.01
	0:40:00	0.00	0.00	19.02	26.61	32.49	51.97	60.96	72.46	125.70
	0:45:00	0.00	0.00	16.11	22.85	28.41	45.99	53.90	65.89	114.21
	0:50:00	0.00	0.00	13.67	19.83	24.34	41.51	48.66	59.27	102.64
	0:55:00	0.00	0.00	11.65	16.78	20.75	35.30	41.45	51.76	89.63
	1:00:00	0.00	0.00	10.17	14.54	18.32	29.72	34.96	45.09	78.49
	1:05:00	0.00	0.00	9.16	13.03	16.69	25.88	30.57	40.62	71.10
	1:10:00	0.00	0.00	7.94	11.79	15.30	22.09	26.16	33.92	60.04
	1:15:00	0.00	0.00	6.80	10.28	13.93	18.82	22.33	27.97	50.15
	1:20:00	0.00	0.00	5.75	8.62	11.90	15.44	18.30	22.14	39.62
	1:25:00	0.00	0.00	4.82	7.17	9.60	12.47	14.74	17.09	30.42
	1:30:00	0.00	0.00	4.09	6.08	7.83	9.58	11.27	12.74	22.74
	1:35:00	0.00	0.00	3.69	5.48	6.82	7.38	8.66	9.52	17.31
	1:40:00	0.00	0.00	3.51	4.85	6.20	6.11	7.15	7.64	14.05
	1:45:00	0.00	0.00	3.41	4.36	5.75	5.32	6.19	6.43	11.88
	1:50:00	0.00	0.00	3.35	4.02	5.44	4.79	5.55	5.59	10.38
	1:55:00	0.00	0.00	2.96	3.75	5.09	4.43	5.11	5.00	9.31
	2:00:00	0.00	0.00	2.61	3.46	4.58	4.20	4.82	4.58	8.53
	2:05:00	0.00	0.00	2.01	2.66	3.50	3.22	3.68	3.42	6.36
	2:10:00	0.00	0.00	1.51	1.98	2.58	2.36	2.70	2.48	4.60
	2:15:00	0.00	0.00	1.13	1.47	1.90	1.75	1.99	1.84	3.38
	2:20:00	0.00	0.00	0.84	1.09	1.39	1.29	1.47	1.37	2.51
	2:25:00	0.00	0.00	0.62	0.78	1.01	0.94	1.06	1.00	1.83
	2:30:00	0.00	0.00	0.44	0.55	0.73	0.67	0.76	0.72	1.31
	2:35:00	0.00	0.00	0.31	0.39	0.52	0.49	0.55	0.52	0.95
	2:40:00	0.00	0.00	0.21	0.27	0.36	0.34	0.39	0.36	0.66
	2:45:00	0.00	0.00	0.13	0.17	0.22	0.22	0.25	0.24	0.42
	2:50:00	0.00	0.00	0.07	0.10	0.12	0.13	0.14	0.13	0.24
	2:55:00	0.00	0.00	0.03	0.05	0.05	0.06	0.07	0.06	0.11
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

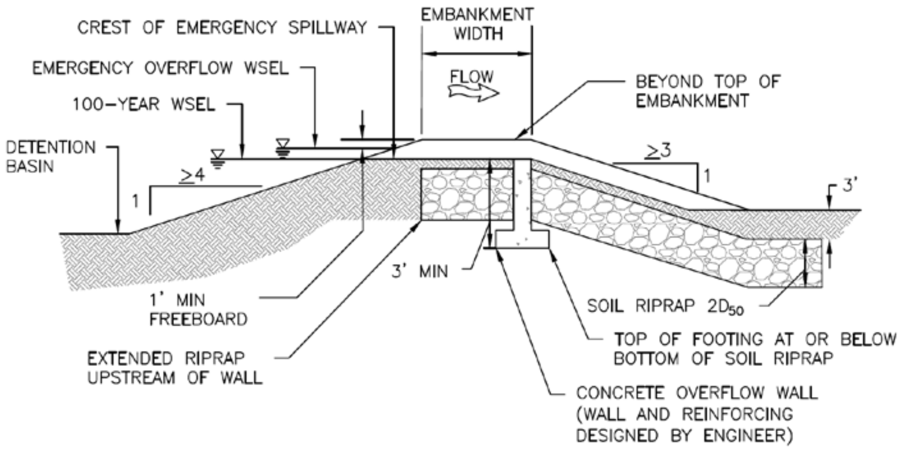
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

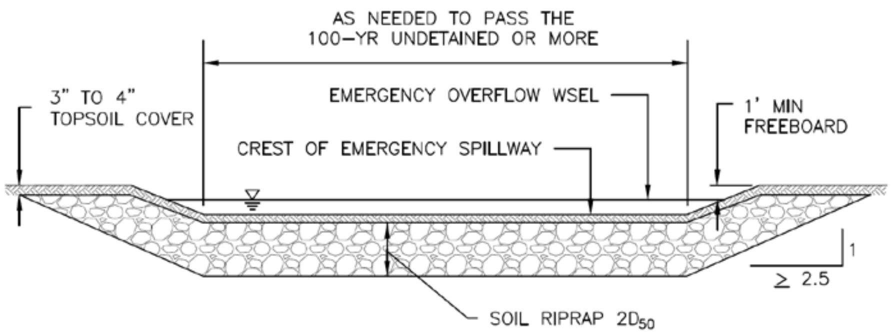
For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

POND B SPILLWAY RIPRAP CALCULATION



EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

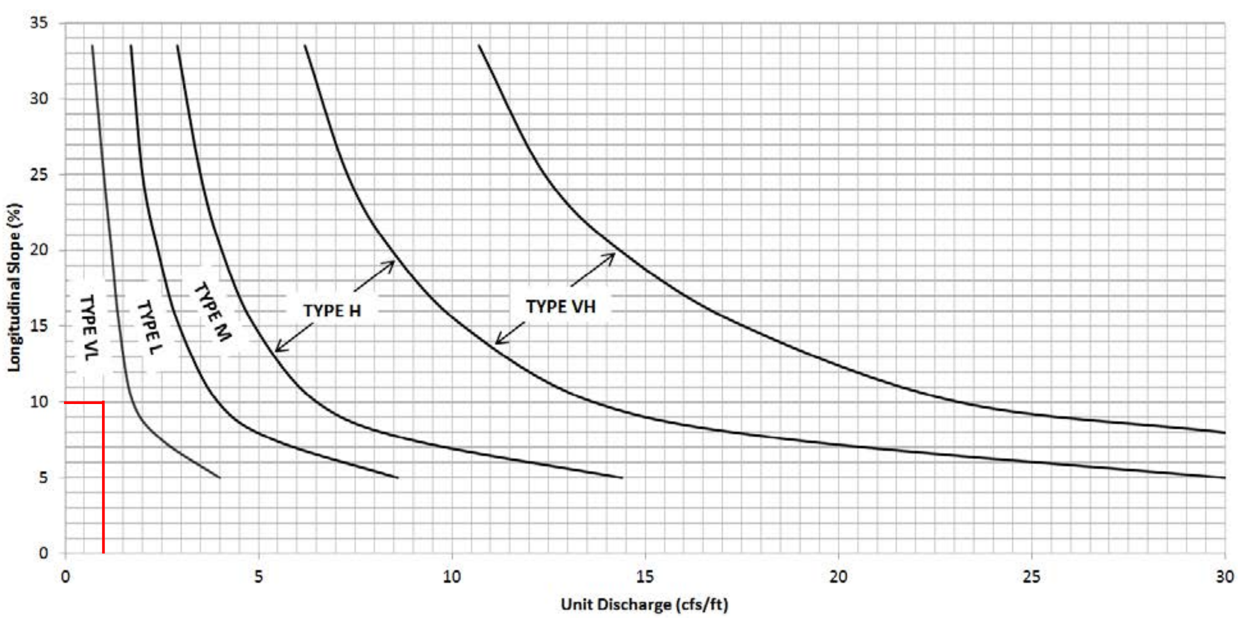


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Q100=75.4 cfs, Length=75 ft
75.4 / 75 = 1.00

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Homestead Fil. 2 - Future Conditions
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.10
Calculated By: ARJ
Checked By:
Date: 9/13/22

	STORM DRAIN SYSTEM			
	Pond B - Outfall	**DESIGN POINT**	**DESIGN POINT**	**Notes**
Q_{100} (cfs):	31.0			Flows are the greater of proposed vs. future
Conduit	Pipe			
D_c, Pipe Diameter (in):	24			
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y_t, Tailwater Depth (ft):	0.80			If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.40			
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	5.48			
Supercritical?	No			
Y_n, Normal Depth (ft) [Supercritical]:	0.00			
D_a, H_a (in) [Supercritical]:	N/A			$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A			
Riprap d_{50} (in) [Subcritical]:	9.08			
Required Riprap Size:	**M**			**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**12**			
Expansion Factor, $1/(2\tan\theta)$:	2.10			Read from Fig. 9-35 or 9-36
θ:	0.23			
Erosive Soils?	No			
Area of Flow, A_t (ft^2):	4.43			$A_t=Q/V$
Length of Protection, L_p (ft):	7.4			$L=(1/(2\tan\theta))(At/Yt - D)$
Min Length (ft)	6.0			Min L=3D or 3H
Max Length (ft)	20.0			Max L=10D or 10H
Min Bottom Width, T (ft):	5.5			$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**8.0**			
Design Width (ft)	**5.5**			
Riprap Depth (in)	**24**			Depth=2(d_{50})
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans
* For use when the flow in the culvert is supercritical (and less than full).

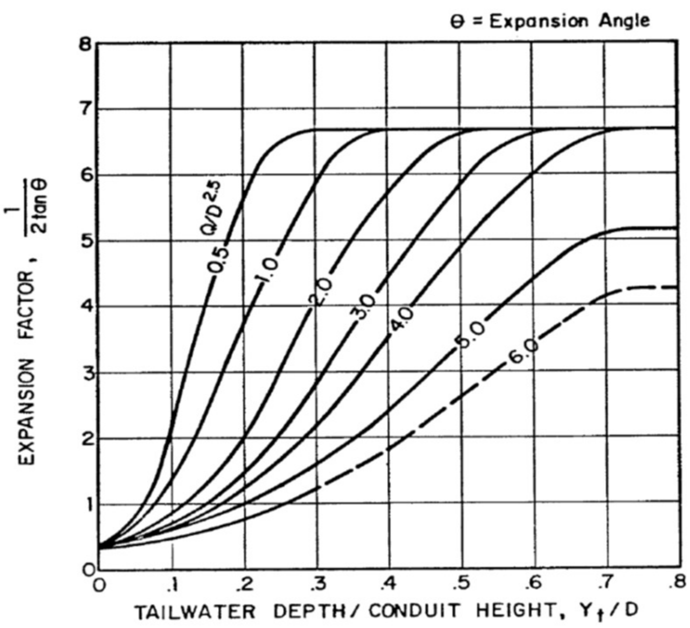


Figure 9-35. Expansion factor for circular conduits

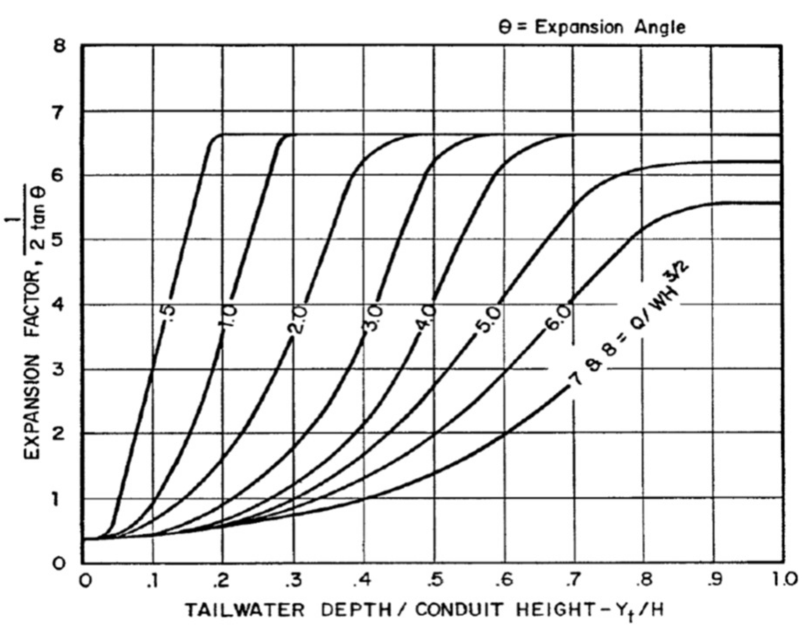


Figure 9-36. Expansion factor for rectangular conduits

Interpolated BFE Tailwater:
NAVD(88) El:7126.88
NGVD29 (Site) El:7123.06

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Thursday, Nov 10 2022

Pond Outfall

Invert Elev Dn (ft)	= 7125.04
Pipe Length (ft)	= 110.48
Slope (%)	= 0.50
Invert Elev Up (ft)	= 7125.59
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Groove end projecting (C)
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

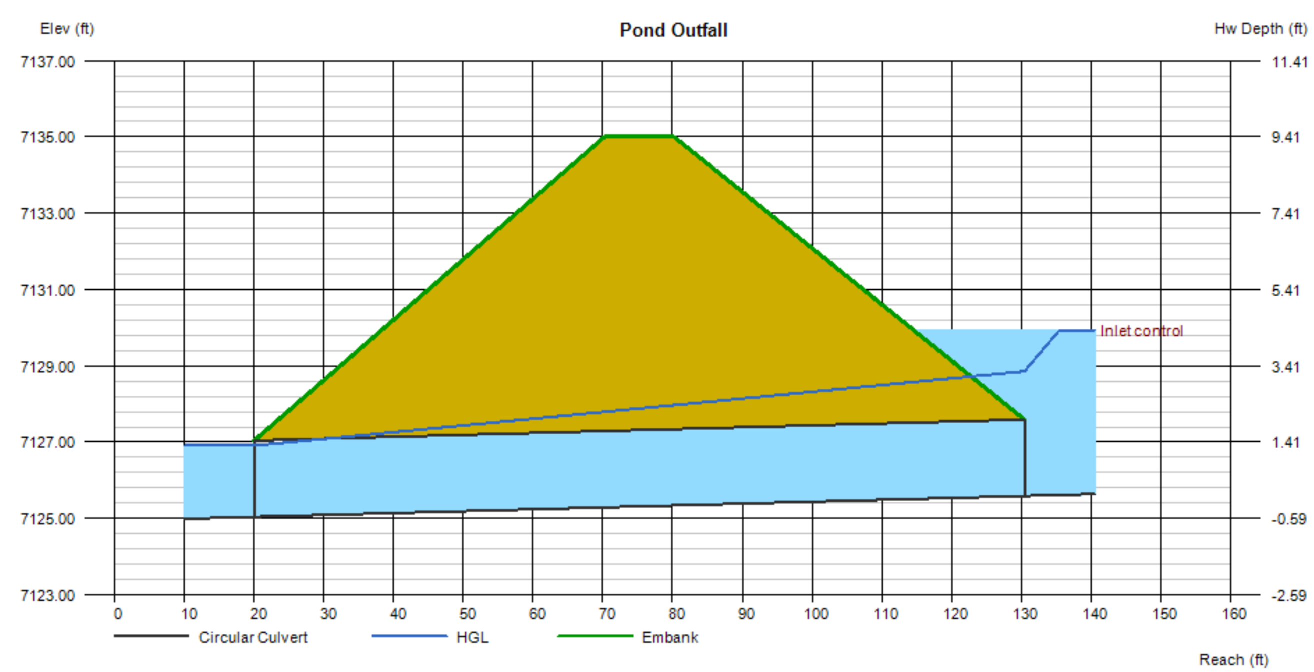
Top Elevation (ft)	= 7135.00
Top Width (ft)	= 10.00
Crest Width (ft)	= 20.00

Calculations

Qmin (cfs)	= 30.40
Qmax (cfs)	= 30.40
Tailwater Elev (ft)	= 7123.06

Highlighted

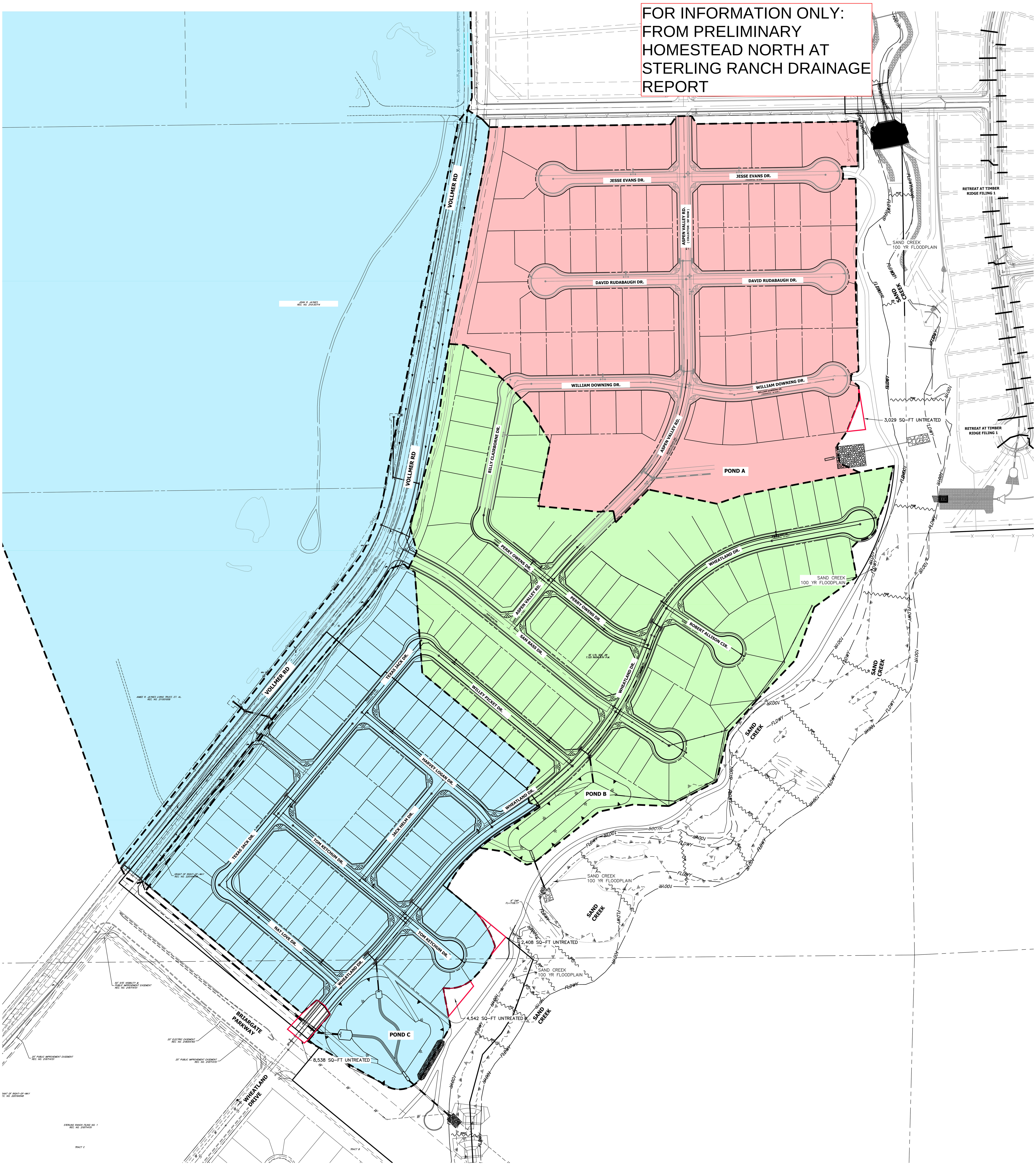
Qtotal (cfs)	= 30.40
Qpipe (cfs)	= 30.40
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 9.96
Veloc Up (ft/s)	= 9.68
HGL Dn (ft)	= 7126.91
HGL Up (ft)	= 7128.85
Hw Elev (ft)	= 7129.93
Hw/D (ft)	= 2.17
Flow Regime	= Inlet Control



Appendix D
Reference Material

WATER QUALITY CAPTURE PLAN

HOMESTEAD NORTH



POND A 30.26 ACRES, 46.5% IMPERVIOUS

POND B 27.86 ACRES, 50.0% IMPERVIOUS

POND C 224.42 ACRES, 10.3% IMPERVIOUS

NOTE:

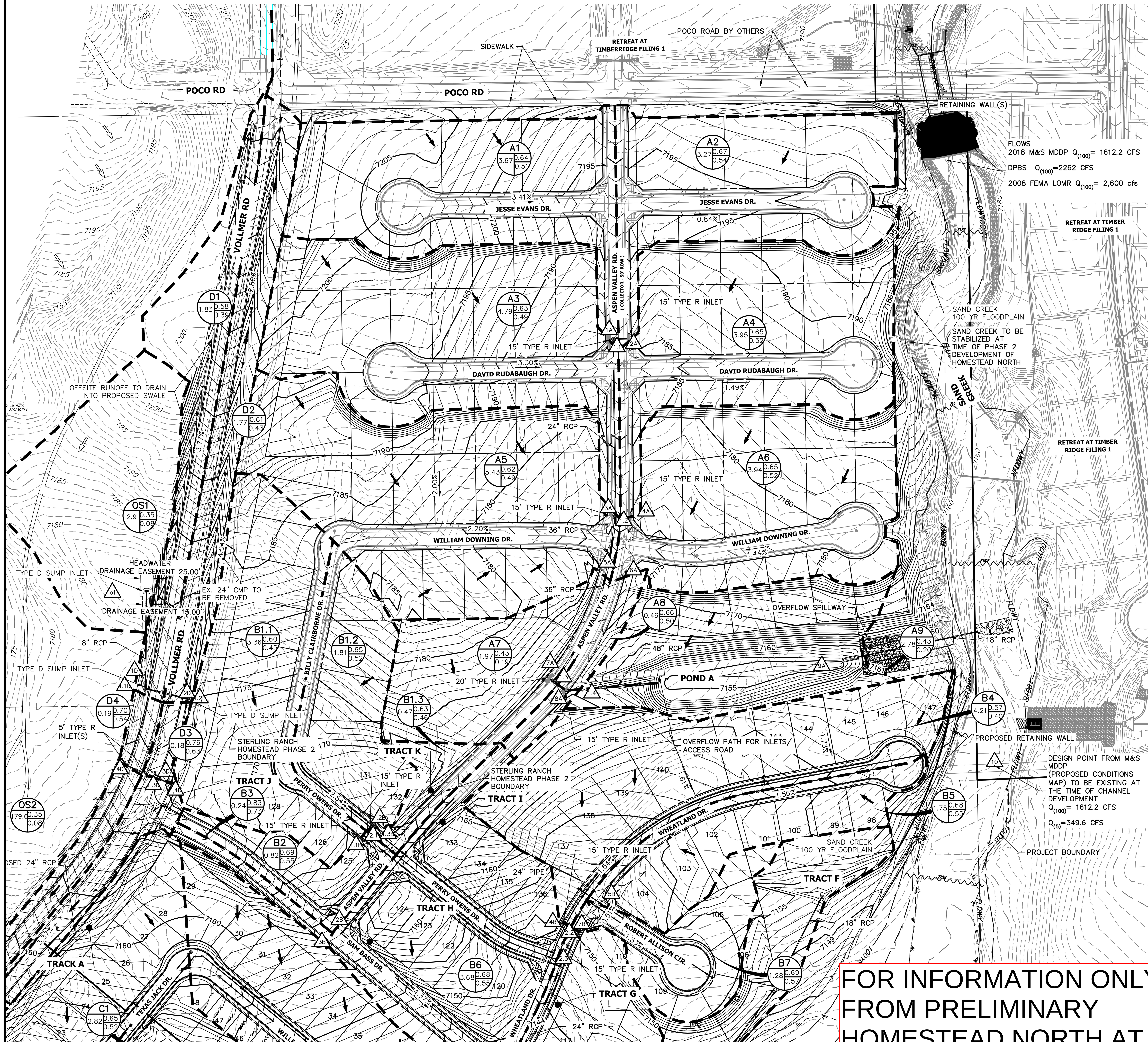
1. A SEPARATE PLAN FOR STERLING RANCH ROAD AND BRIARGATE PKWY WILL BE PROVIDED IN A THE SEPARATE FDR REQUIRED FOR CONSTRUCTION OF THESE ROADWAYS.
2. A TOTAL OF 13,517 SQ-FT ON SITE IS LEFT UNTREATED.
3. POND C TREATS THE IMPROVEMENTS TO VOLLMER ROAD AND THE OFFSITE TRIBUTARY AREA

WQ – PONDS
HOMESTEAD NORTH
JOB NO. 25188.00
1-07-2022
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

DRAINAGE MAP



SEE SHEET 2

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

PROPOSED 6100

DESIGN POINT SUMMARY TABLE		
DP	Q5 Total	Q100 Total
1a	6.9	14.7
3a	8.3	20.5
5a	9.5	26.1
7a	10.4	29.9
2a	6.4	13.3
1.1	13.0	18.7
4a	7.2	16.5
1.2	24.1	49.4
6a	10.7	18.5
1.3	44.2	95.9
8a	11.3	19.9
1.4	45.0	97.6
9A	21.6	104.4
1.1b	5.5	12.5
1.2b	3.5	7.4
2.1	8.7	17.5
1.3b	1.0	2.2
2b	2.4	6.8
3b	0.9	1.7
4b	7.1	16.8
6b	10.3	26.5
9b	12.1	30.3
5b	4.3	8.9
7b	7.3	14.9
2.2	16.3	32.9
2.3	23.5	47.3
8b	5.0	13.1
2.4	35.6	77.6
10b	5.7	14.3
2.5	42.5	91.5
11b	0.9	3.7
12b	1.5	4.1
2.6	46.1	102.6
1c	5.4	11.4
2.3c	7.1	14.9
2.1C	0.8	1.6
2.2C	9.8	20.1
4.2c	5.9	13.3
3.1	6.5	11.7
4C	18.9	42.0
3.1c	1.2	2.4
3.2	7.9	12.6
3.2c	3.6	7.9
3.3	14.3	24.1
3.4	31.6	63.3
5C	4.1	8.8
3.5	34.7	69.9
6C	2.5	8.8
3.6	41.4	79.2
1o	0.8	6.0
1d	2.4	6.0
1.1d	3.2	11.6
2d	2.5	6.1
1.2d	5.7	17.7
3d	0.6	1.2
4d	1.0	1.1
1.3d	0.5	2.2
1.4d	6.4	19.2
2o	27.1	190.9
6d	2.5	4.6
5d	3.1	6.1
1.5d	29.2	195.0
1.6d	32.6	205.3
3o	1.7	12.6
8d	2.5	14.4
7d	2.8	4.7
2.1d	3.5	16.1
1.7d	36.0	220.9
5	56.0	264.1

BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C5	C100	tc (min)	Q5 (cfs)	Q100 (cfs)
A1	3.67	52%	0.51	0.64	13.3	6.9	14.7
A2	3.27	56%	0.54	0.67	13.8	6.4	13.3
A3	4.79	50%	0.49	0.63	13.9	8.5	18.4
A4	3.95	54%	0.52	0.65	14.2	7.4	15.6
A5	5.43	50%	0.49	0.62	11.1	10.5	22.6
A6	3.94	53%	0.52	0.65	12.5	7.7	16.2
A7	1.97	15%	0.19	0.43	16.5	1.3	4.8
A8	0.46	52%	0.50	0.66	5.0	1.2	2.6
A9	2.78	16%	0.20	0.43	13.4	2.1	7.4
B1.1	3.36	45%	0.45	0.60	13.4	5.5	12.5
B1.2	1.81	54%	0.52	0.65	12.8	3.5	7.4
B1.3	0.47	47%	0.46	0.63	8.1	1.0	2.2
B2	0.82	58%	0.55	0.69	5.0	2.3	4.9
B3	0.24	79%	0.73	0.83	5.0	0.9	1.7
B4	4.21	39%	0.40	0.57	9.5	7.1	16.8
B5	1.75	58%	0.55	0.68	7.8	4.3	8.9
B6	3.66	57%	0.55	0.68	6.6	9.5	19.9
B7	1.28	60%	0.57	0.69	8.9	3.1	6.4
B8	2.30	55%	0.53	0.66	9.6	5.1	10.7
B9	3.69	65%	0.50	0.64	13.1	6.9	14.8
B10	0.22	80%	0.73	0.83	5.0	0.8	1.6
B11	1.65	15%	0.16	0.40	16.7	0.9	3.7
B12	2.40	40%	0.30	0.50	39.8	1.5	4.1
C1	2.82	69%	0.52	0.65	13.1	5.4	11.4
C2.1	0.20	91%	0.82	0.90	5.0	0.8	1.6
C2.2	4.69	73%	0.56	0.68	12.8	9.9	20.3
C2.3	0.83	67%	0.54	0.68	10.1	1.9	3.9
C3.1	0.35	73%	0.68	0.79	5.0	1.2	2.4
C3.2	1.46	71%	0.56	0.68	8.4	3.6	7.4
C4.1	6.35	65%	0.49	0.63	12.0	12.1	25.9
C4.2	3.44	59%	0.46	0.61	12.6	5.9	13.3
C5	0.16	81%	0.74	0.84	6.4	0.6	1.0
C6	2.48	21%	0.22	0.45	6.8	2.5	8.8
D1	1.83	39%	0.39	0.58	16.7	2.4	6.0
D2	1.77	43%	0.43	0.61	16.3	2.5	6.1
D3	0.18	68%	0.63	0.76	5.4	0.6	1.2
D4	0.19	57%	0.54	0.70	6.3	0.5	1.1
D5	0.91	77%	0.71	0.82	6.0	3.1	6.1
D6	0.83	69%	0.64	0.77	6.4	2.5	5.2
D7	0.75	79%	0.72	0.83	5.0	2.8	5.4
D8	0.72	69%	0.64	0.77	5.0	2.4	4.8
OS1	2.85	2%	0.08	0.35	14.5	0.8	6.0
OS2	179.61	2%	0.08	0.35	47.4	27.1	190.9
OS3	11.99	2%	0.08	0.35	47.6	1.7	12.6

FOR INFORMATION ONLY: FROM PRELIMINARY HOMESTEAD NORTH AT STERLING RANCH DRAINAGE REPORT

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

DRAINAGE MAP
HOMESTEAD NORTH
JOB NO. 25188.00
1/7/22
SHEET 1 OF 2

J·R ENGINEERING
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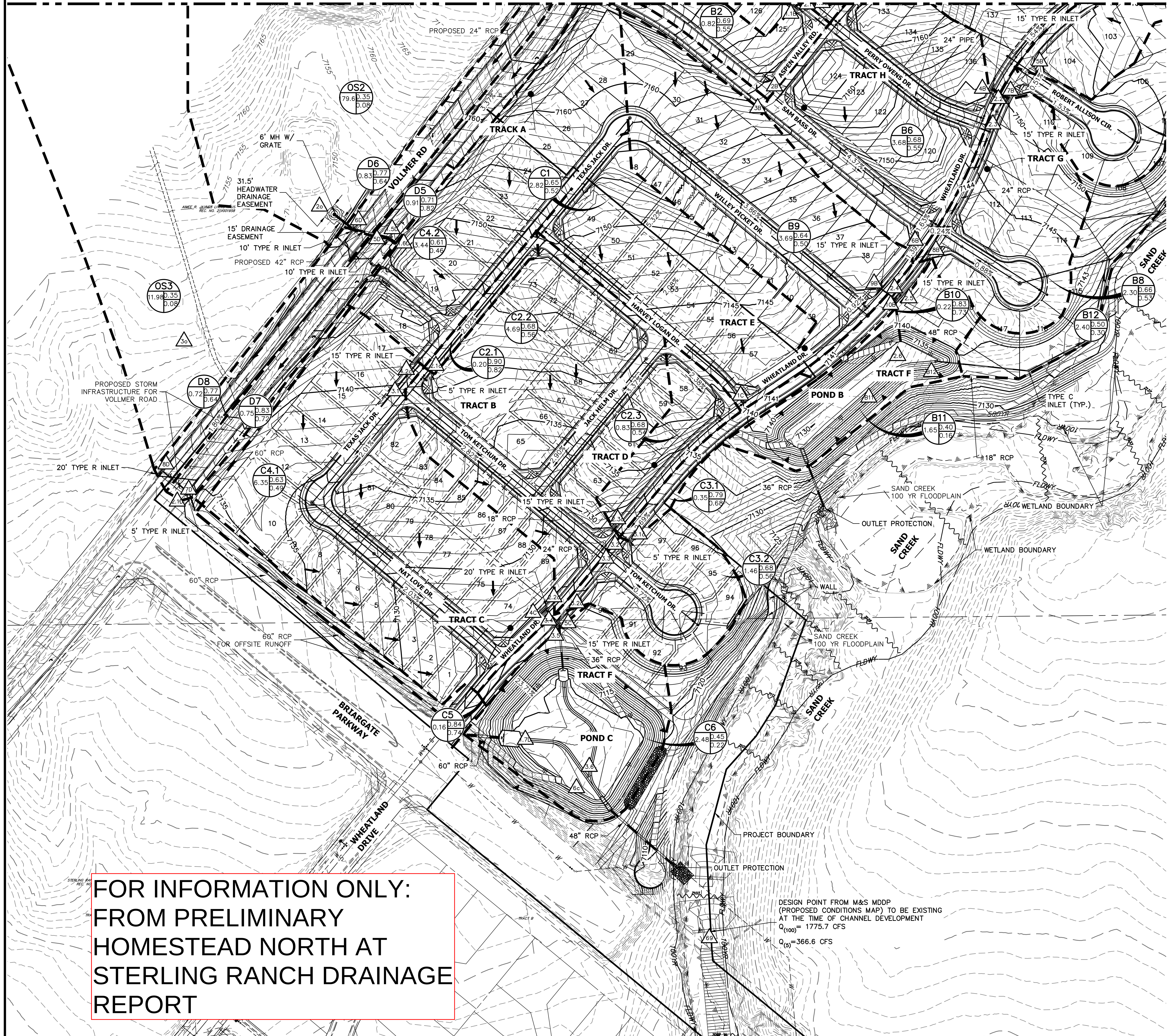
DRAINAGE MAP



FOR INFORMATION ONLY: FROM PRELIMINARY HOMESTEAD NORTH AT STERLING RANCH DRAINAGE REPORT

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C –100 YR
D: C–5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

PROPOSED 6100

DESIGN POINT SUMMARY TABLE		
DP	Q5 Total	Q100 Total
1a	6.9	14.7
3a	8.3	20.5
5a	9.5	26.1
7a	10.4	29.9
2a	6.4	13.3
1.1	13.0	18.7
4a	7.2	16.5
1.2	24.1	49.4
6a	10.7	18.5
1.3	44.2	95.9
8a	11.3	19.9
1.4	45.0	97.6
9A	21.6	104.4
1.1b	5.5	12.5
1.2b	3.5	7.4
2.1	8.7	17.5
1.3b	1.0	2.2
2b	2.4	6.8
3b	0.9	1.7
4b	7.1	16.8
6b	10.3	26.5
9b	12.1	30.3
5b	4.3	8.9
7b	7.3	14.9
2.2	16.3	32.9
2.3	23.5	47.3
8b	5.0	13.1
2.4	35.6	77.6
10b	5.7	14.3
2.5	42.5	91.5
11b	0.9	3.7
12b	1.5	4.1
2.6	46.1	102.6
1c	5.4	11.4
2.3c	7.1	14.9
2.1C	0.8	1.6
2.2C	9.8	20.1
4.2c	5.9	13.3
3.1	6.5	11.7
4C	18.9	42.0
3.1c	1.2	2.4
3.2	7.9	12.6
3.2c	3.6	7.9
3.3	14.3	24.1
3.4	31.6	63.3
5C	4.1	8.8
3.5	34.7	69.9
6C	2.5	8.8
3.6	41.4	79.2
1o	0.8	6.0
1d	2.4	6.0
1.1d	3.2	11.6
2d	2.5	6.1
1.2d	5.7	17.7
3d	0.6	1.2
4d	1.0	1.1
1.3d	0.5	2.2
1.4d	6.4	19.2
2o	27.1	190.9
6d	2.5	4.6
5d	3.1	6.1
1.5d	29.2	195.0
1.6d	32.6	205.3
3o	1.7	12.6
8d	2.5	14.4
7d	2.8	4.7
2.1d	3.5	16.1
1.7d	36.0	220.9
5	56.0	264.1

BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C5	C100	tc (min)	Q5 (cfs)	Q100 (cfs)
A1	3.67	52%	0.51	0.64	13.3	6.9	14.7
A2	3.27	56%	0.54	0.67	13.8	6.4	13.3
A3	4.79	50%	0.49	0.63	13.9	8.5	18.4
A4	3.95	54%	0.52	0.65	14.2	7.4	15.6
A5	5.43	50%	0.49	0.62	11.1	10.5	22.6
A6	3.94	53%	0.52	0.65	12.5	7.7	16.2
A7	1.97	15%	0.19	0.43	16.5	1.3	4.8
A8	0.46	52%	0.50	0.66	5.0	1.2	2.6
A9	2.78	16%	0.20	0.43	13.4	2.1	7.4
B1.1	3.36	45%	0.45	0.60	13.4	5.5	12.5
B1.2	1.81	54%	0.52	0.65	12.8	3.5	7.4
B1.3	0.47	47%	0.46	0.63	8.1	1.0	2.2
B2	0.82	58%	0.55	0.69	5.0	2.3	4.9
B3	0.24	79%	0.73	0.83	5.0	0.9	1.7
B4	4.21	39%	0.40	0.57	9.5	7.1	16.8
B5	1.75	58%	0.55	0.68	7.8	4.3	8.9
B6	3.66	57%	0.55	0.68	6.6	9.5	19.9
B7	1.28	60%	0.57	0.69	8.9	3.1	6.4
B8	2.30	55%	0.53	0.66	9.6	5.1	10.7
B9	3.69	65%	0.50	0.64	13.1	6.9	14.8
B10	0.22	80%	0.73	0.83	5.0	0.8	1.6
B11	1.65	15%	0.16	0.40	16.7	0.9	3.7
B12	2.40	40%	0.30	0.50	39.8	1.5	4.1
C1	2.82	69%	0.52	0.65	13.1	5.4	11.4
C2.1	0.20	91%	0.82	0.90	5.0	0.8	1.6
C2.2	4.69	73%	0.56	0.68	12.8	9.9	20.3
C2.3	0.83	67%	0.54	0.68	10.1	1.9	3.9
C3.1	0.35	73%	0.68	0.79	5.0	1.2	2.4
C3.2	1.46	71%	0.56	0.68	8.4	3.6	7.4
C4.1	6.35	65%	0.49	0.63	12.0	12.1	25.9
C4.2	3.44	59%	0.46	0.61	12.6	5.9	13.3
C5	0.16	81%	0.74	0.84	6.4	0.6	1.0
C6	2.48	21%	0.22	0.45	6.8	2.5	8.8
D1	1.83	39%	0.39	0.58	16.7	2.4	6.0
D2	1.77	43%	0.43	0.61	16.3	2.5	6.1
D3	0.18	68%	0.63	0.76	5.4	0.6	1.2
D4	0.19	57%	0.54	0.70	6.3	0.5	1.1
D5	0.91	77%	0.71	0.82	6.0	3.1	6.1
D6	0.83	69%	0.64	0.77	6.4	2.5	5.2
D7	0.75	79%	0.72	0.83	5.0	2.8	5.4
D8	0.72	69%	0.64	0.77	5.0	2.4	4.8
OS1	2.85	2%	0.08	0.35	14.5	0.8	6.0
OS2	179.61	2%	0.08	0.35	47.4	27.1	190.9
OS3	11.99	2%	0.08	0.35	47.6	1.7	12.6

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

DRAINAGE MAP
HOMESTEAD NORTH
JOB NO. 25188.00
1/7/22
SHEET 2 OF 2

J·R ENGINEERING
A Westrian Company

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DRAINAGE MAP

LEGEND

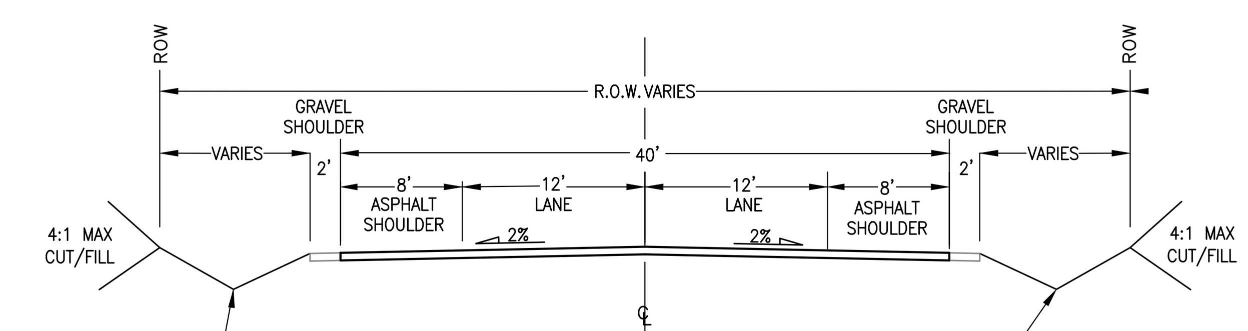
- BASIN ID — A: BASIN LABEL; B: AREA; C: C -100 YR; D: C-5 YR
- DESIGN POINT
- PROPOSED FLOW DIRECTION
- BASIN DRAINAGE AREA
- EXISTING STORM SEWER
- STORM SEWER PROPOSED
- PROPOSED R.O.W
- PROPOSED PROPERTY LINES
- PROPOSED SIDEWALK
- EXISTING PROPERTY LINE
- ROW EXISTING
- FL EXISTING
- SIDEWALK EXISTING
- DRAINAGE ACCESS & MAINTENANCE EASEMENT
- EXISTING 6100
- PROPOSED 6100

BASIN SUMMARY TABLE

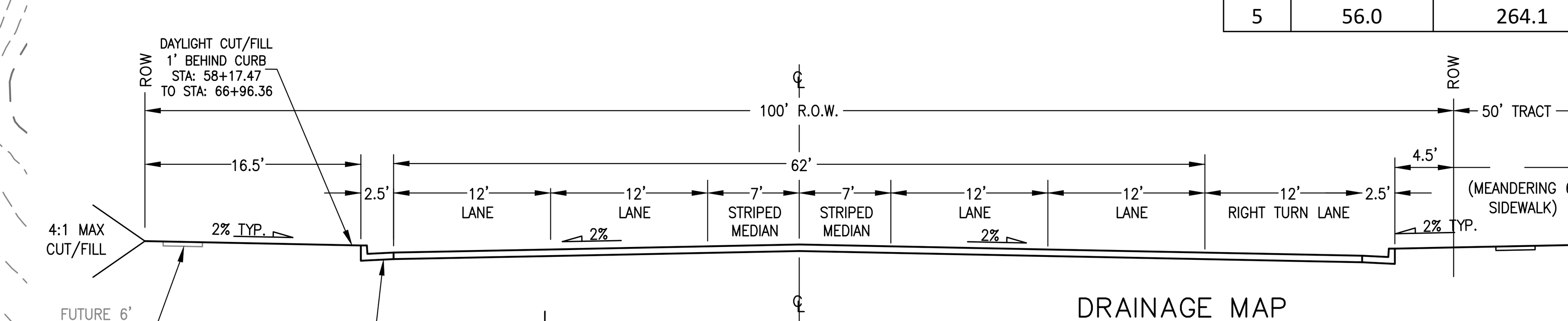
Tributary Sub-basin	Area (acres)	Percent Impervious	C5	C100	tc (min)	Q5 (cfs)	Q100 (cfs)
C1	2.82	69%	0.52	0.65	13.1	5.4	11.4
C2.1	0.20	91%	0.82	0.90	5.0	0.8	1.6
C2.2	4.69	73%	0.56	0.68	12.8	9.9	20.3
C2.3	0.83	67%	0.54	0.68	10.1	1.9	3.9
C3.1	0.35	73%	0.68	0.79	5.0	1.2	2.4
C3.2	1.66	63%	0.49	0.60	9.1	3.5	7.2
C4.1	6.34	65%	0.49	0.63	12.0	12.1	25.9
C4.2	3.59	57%	0.44	0.58	12.9	5.9	13.1
C5	0.16	81%	0.74	0.84	6.4	0.6	1.0
C6	2.59	20%	0.21	0.43	6.8	2.5	8.8
D1	1.77	40%	0.40	0.60	16.5	2.4	6.0
D2	1.44	56%	0.55	0.78	15.0	2.8	6.6
D3	0.18	68%	0.63	0.76	5.4	0.6	1.2
D4	0.19	57%	0.54	0.70	6.3	0.5	1.1
D5	0.91	77%	0.71	0.82	6.0	3.1	6.1
D6	0.83	69%	0.64	0.77	6.4	2.5	5.2
D7	0.75	79%	0.72	0.82	5.0	2.8	5.3
D8	0.72	69%	0.64	0.74	5.0	2.4	4.6
OS1	2.84	2%	0.08	0.35	14.5	0.8	6.0
OS2	179.61	2%	0.08	0.35	47.4	27.1	190.9
OS3	11.98	2%	0.08	0.35	47.6	1.7	12.6

DESIGN POINT SUMMARY TABLE

DP	Q5 Total	Q100 Total
1c	5.4	11.4
2.3c	7.1	14.9
2.3i	7.0	11.5
2.1c	0.8	1.6
2.1i	0.8	1.5
2.2C	9.8	20.1
4.2c	5.9	13.1
4.2i	5.9	10.5
4C	18.8	41.8
3.1	4.7	11.6
3.1c	1.2	2.4
3.1i	1.2	1.9
3.2	7.9	12.9
3.3	9.1	17.6
3.4	26.0	54.9
3.2c	3.5	7.6
5C	4.0	8.5
6C	2.5	8.8
3.5	30.7	65.0
o1	0.8	6.0
1d	2.4	6.0
1.1d	3.2	11.7
2d	2.8	6.6
1.2d	5.8	18.0
3d	0.6	1.2
4d	0.5	1.1
4.1d	0.5	1.1
1.3d	1.0	2.2
1.4d	6.6	19.6
2o	27.1	190.9
6d	2.1	4.3
6.1d	28.1	192.5
1.5d	29.2	195.0
5d	3.1	6.1
1.6d	32.7	205.4
1.7d	36.1	221.0
3o	1.7	12.6
8d	2.5	14.3
2.1d	2.5	13.2
7d	2.4	5.3
2.2d	3.5	16.0
1.7d	36.1	221.0
5	56.0	264.1



VOLLMER ROAD
RURAL MINOR ARTERIAL CROSS SECTION
SECTION AA - SCALE: NTS



VOLLMER ROAD
URBAN MINOR ARTERIAL CROSS SECTION
SECTION BB - SCALE: NTS

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

DRAINAGE MAP
HOMESTEAD NORTH - FILLING ONE
JOB NO. 25188.00
9/9/22
SHEET 1 OF 2

J·R ENGINEERING
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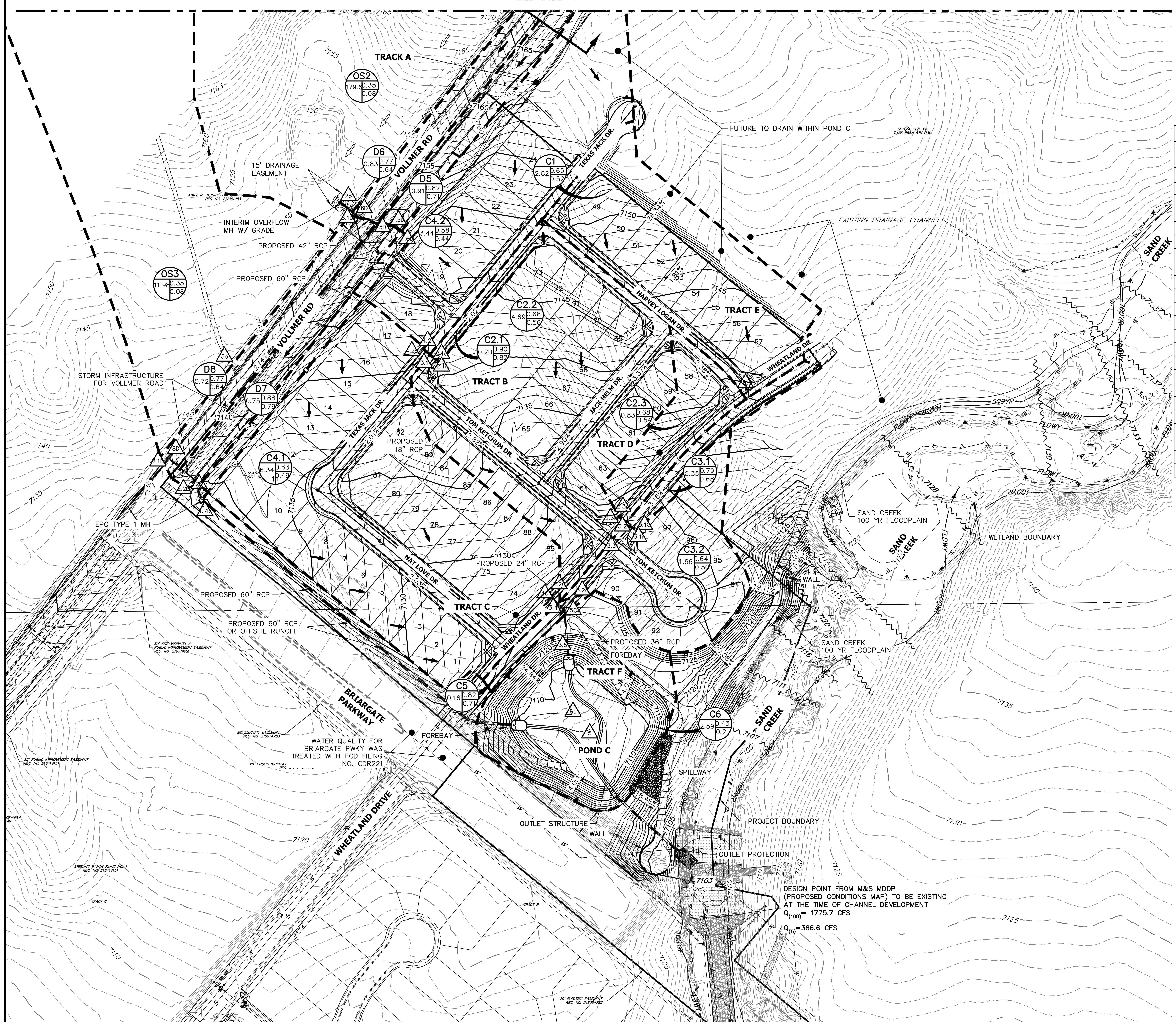
DRAINAGE MAP



DESIGN POINT FROM M&S MDDP (PROPOSED CONDITIONS MAP) TO BE EXISTING AT THE TIME OF CHANNEL DEVELOPMENT
$Q_{(100)}$= 1775.7 CFS
$Q_{(5)}$=366.6 CFS

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

PROPOSED 6100

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C5	C100	tc (min)	Q5 (cfs)	Q100 (cfs)
C1	2.82	69%	0.52	0.65	13.1	5.4	11.4
C2.1	0.20	91%	0.82	0.90	5.0	0.8	1.6
C2.2	4.69	73%	0.56	0.68	12.8	9.9	20.3
C2.3	0.83	67%	0.54	0.68	10.1	1.9	3.9
C3.1	0.35	73%	0.68	0.79	5.0	1.2	2.4
C3.2	1.66	63%	0.49	0.60	9.1	3.5	7.2
C4.1	6.34	65%	0.49	0.63	12.0	12.1	25.9
C4.2	3.59	57%	0.44	0.58	12.9	5.9	13.1
C5	0.16	81%	0.74	0.84	6.4	0.6	1.0
C6	2.59	20%	0.21	0.43	6.8	2.5	8.8
D1	1.77	40%	0.40	0.60	16.5	2.4	6.0
D2	1.44	56%	0.55	0.78	15.0	2.8	6.6
D3	0.18	68%	0.63	0.76	5.4	0.6	1.2
D4	0.19	57%	0.54	0.70	6.3	0.5	1.1
D5	0.91	77%	0.71	0.82	6.0	3.1	6.1
D6	0.83	69%	0.64	0.77	6.4	2.5	5.2
D7	0.75	79%	0.72	0.82	5.0	2.8	5.3
D8	0.72	69%	0.64	0.74	5.0	2.4	4.6
OS1	2.84	2%	0.08	0.35	14.5	0.8	6.0
OS2	179.61	2%	0.08	0.35	47.4	27.1	190.9
OS3	11.98	2%	0.08	0.35	47.6	1.7	12.6

DESIGN POINT SUMMARY TABLE

DP	Q5 Total	Q100 Total
1c	5.4	11.4
2.3c	7.1	14.9
2.3i	7.0	11.5
2.1c	0.8	1.6
2.1i	0.8	1.5
2.2C	9.8	20.1
4.2c	5.9	13.1
4.2i	5.9	10.5
4C	18.8	41.8
3.1	4.7	11.6
3.1c	1.2	2.4
3.1i	1.2	1.9
3.2	7.9	12.9
3.3	9.1	17.6
3.4	26.0	54.9
3.2c	3.5	7.6
5C	4.0	8.5
6C	2.5	8.8
3.5	30.7	65.0
o1	0.8	6.0
1d	2.4	6.0
1.1d	3.2	11.7
2d	2.8	6.6
1.2d	5.8	18.0
3d	0.6	1.2
4d	0.5	1.1
4.1d	0.5	1.1
1.3d	1.0	2.2
1.4d	6.6	19.6
2o	27.1	190.9
6d	2.1	4.3
6.1d	28.1	192.5
1.5d	29.2	195.0
5d	3.1	6.1
1.6d	32.7	205.4
1.7d	36.1	221.0
3o	1.7	12.6
8d	2.5	14.3
2.1d	2.5	13.2
7d	2.4	5.3
2.2d	3.5	16.0
1.7d	36.1	221.0
5	56.0	264.1

Design Point	Inlet Size
Inlet DP 2.3C	15' Type R
Inlet DP 2.1C	5' Type R
Inlet DP 4.2C	15' Type R
Inlet DP 3.1C	5' Type R
Inlet DP 4C	20' Type R (15' Type R + 5' Type R)
Inlet DP 5C	15' Type R
Inlet DP 3D	5' Type R
Inlet DP 4D	5' Type R
Inlet DP 5D	10' Type R
Inlet DP 6D	10' Type R
Inlet DP 7D	10' Type R
Inlet DP 8D	15' Type R
Inlet DP 1D	Type D Inlet
Inlet DP 2D	Type D Inlet

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

DRAINAGE MAP
HOMESTEAD NORTH FILLING NO. 1
JOB NO. 25188.00
9/9/22
SHEET 2 OF 2

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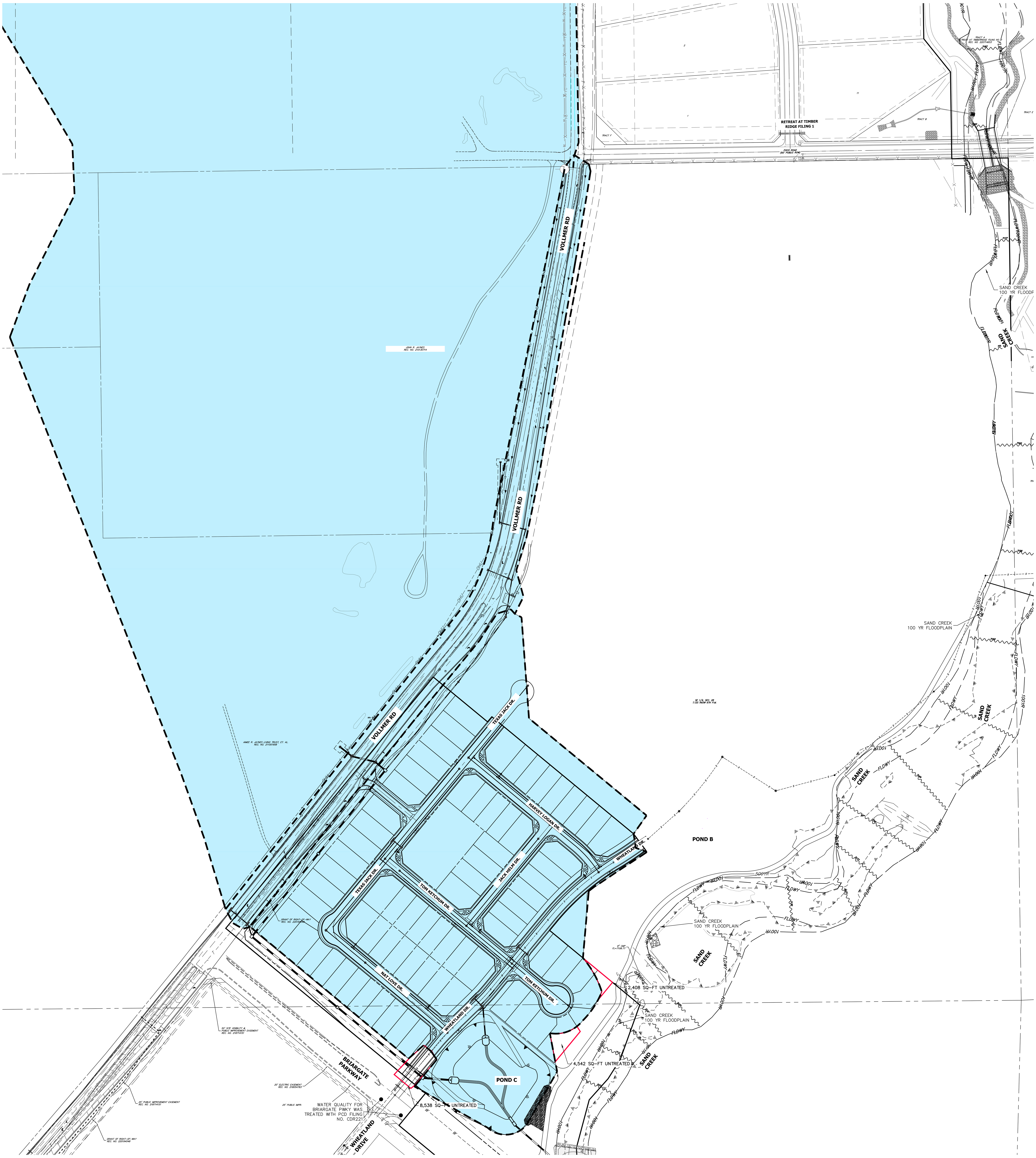
WATER QUALITY CAPTURE PLAN

HOMESTEAD NORTH



NOTE:

1. A SEPARATE PLAN FOR STERLING RANCH ROAD AND BRIARGATE PKWY WILL BE PROVIDED IN A THE SEPARATE FDR REQUIRED FOR CONSTRUCTION OF THESE ROADWAYS.
2. A TOTAL OF 15,488 SQ-FT ON SITE IS LEFT UNTREATED.
3. POND C TREATS THE IMPROVEMENTS TO VOLLMER ROAD AND THE OFFSITE TRIBUTARY AREA

POND C 224.4 ACRES, 10.3% IMPERVIOUS

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

WQ – POND C
HOMESTEAD NORTH – FILING ONE
JOB NO. 25188.00
9/9/22
SHEET 1 OF 1

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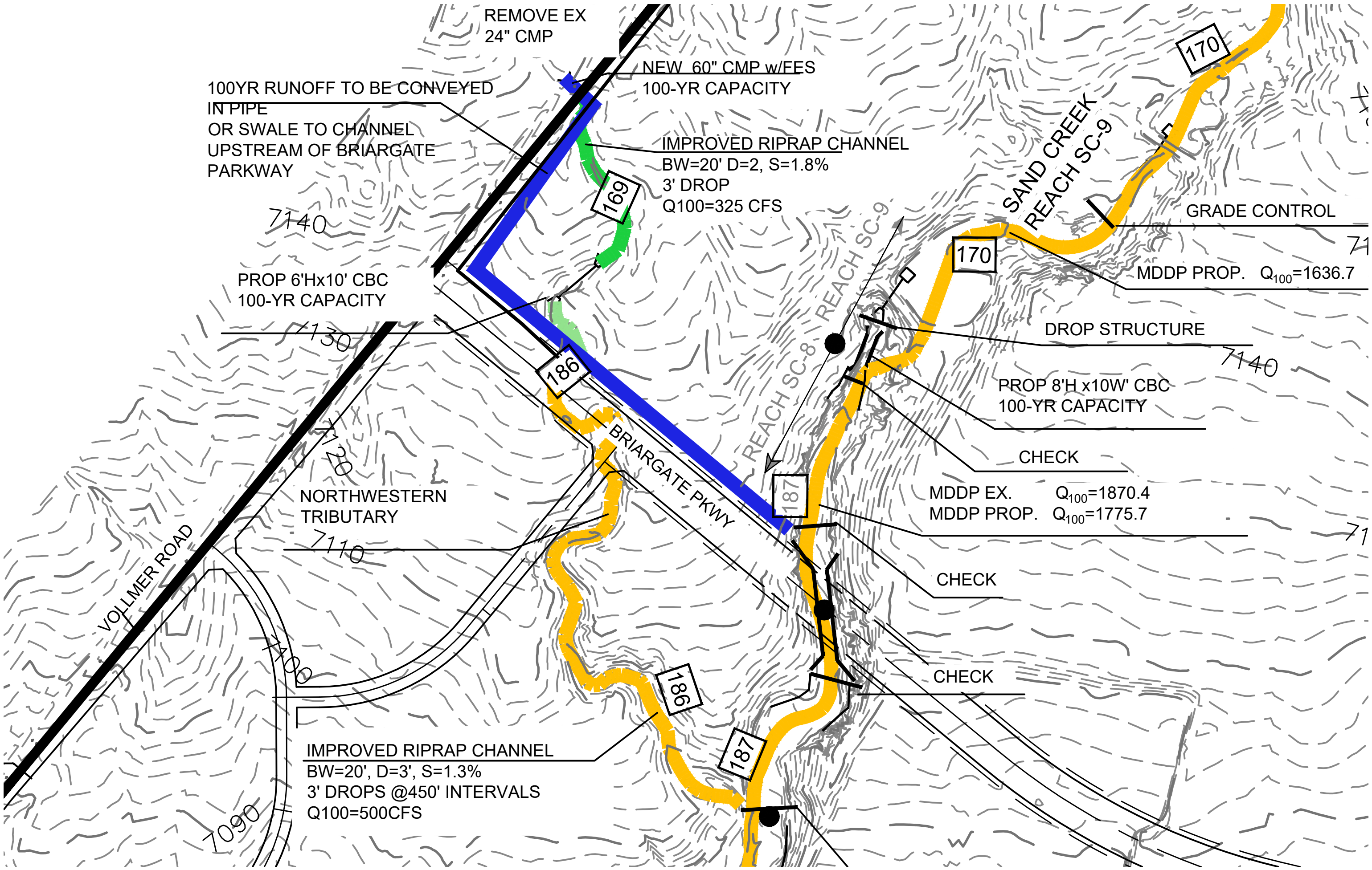
FOR INFORMATION ONLY

SAND CREEK RESTORATION WORK MAP

HEC-RAS WORK MAP
SAND CREEK RESTORATION
PROJECT NO: 25188.04
DATE: 10/21/2021
SHEET 1 OF 1



NORTHWESTERN TRIBUTARY
SHEET 1 OF 5

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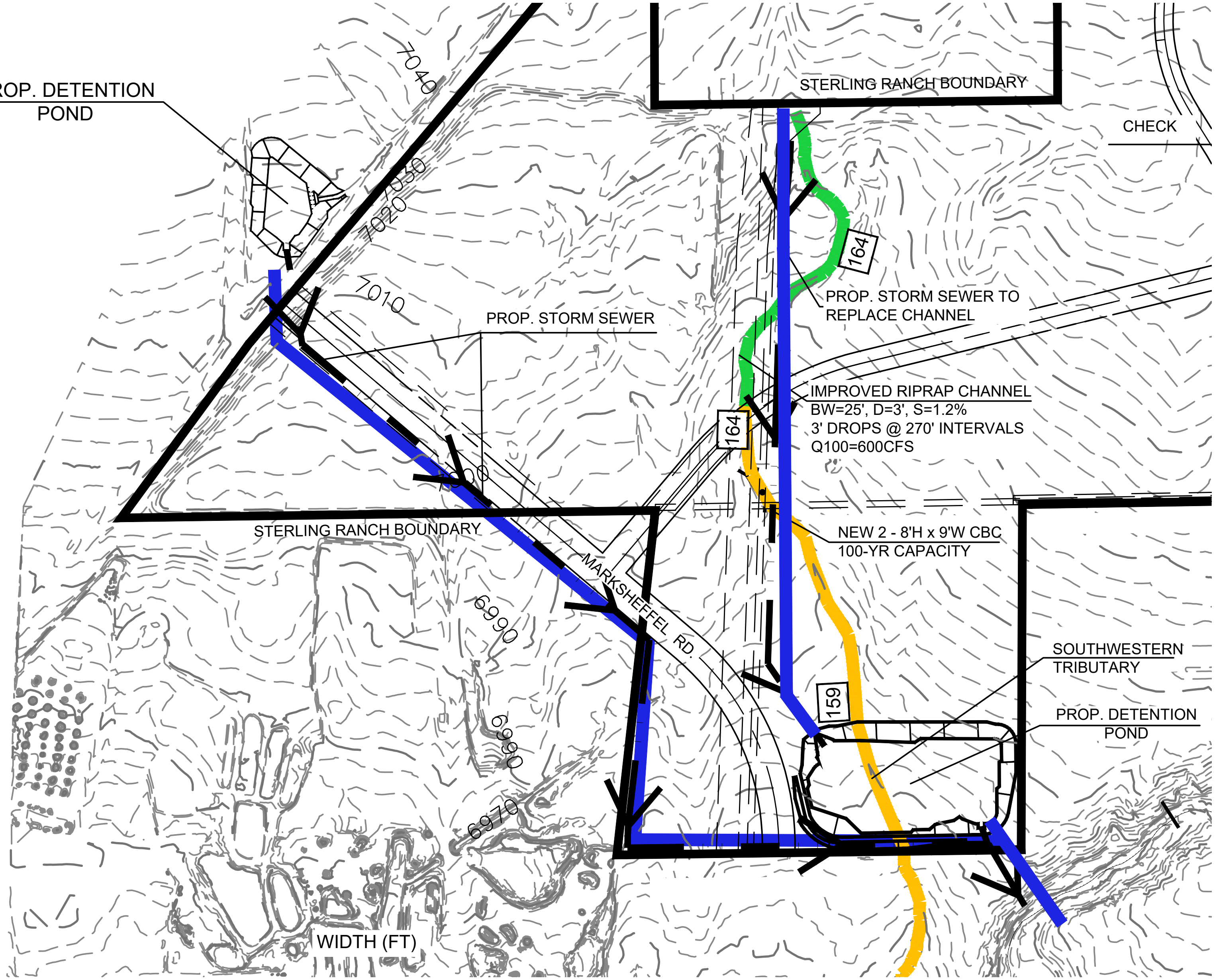

SOUTHWEST TRIBUTARY
SHEET 3 OF 5

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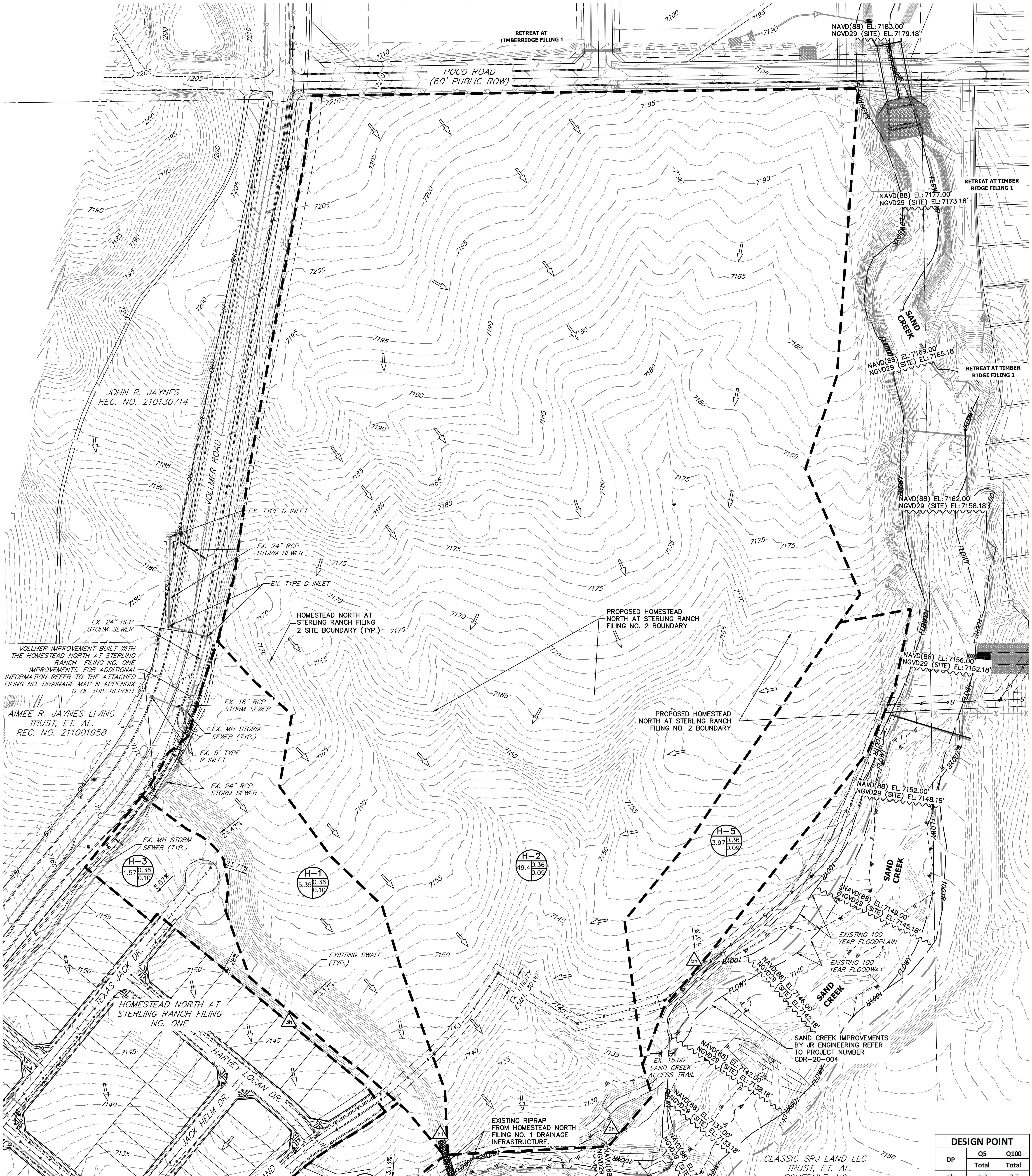
Appendix E
Drainage Maps

HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2

EXISTING DRAINAGE MAP



DESIGN POINT		
DP	Q5 Total	Q100 Total
1h	1.2	7.7
2H	10.6	70.7
3H	0.5	2.9
4H	0.6	3.4
5H	1.1	7.2

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
H-1	5.36	3%	0.10	0.36	32.7	1.2	7.7
H-2	49.40	2%	0.09	0.36	32.3	10.6	70.7
H-3	1.57	4%	0.10	0.37	21.0	0.5	2.9
H-4	1.85	3%	0.10	0.37	21.2	0.6	3.4
H-5	3.97	2%	0.09	0.36	21.3	1.1	7.2

EXISTING DRAINAGE MAP
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2
JOB NO. 25188.10
11-09-2022
SHEET 1 OF 1

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT

EXISTING FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

EXISTING PROPERTY LINE
ROW EXISTING
FL EXISTING
SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

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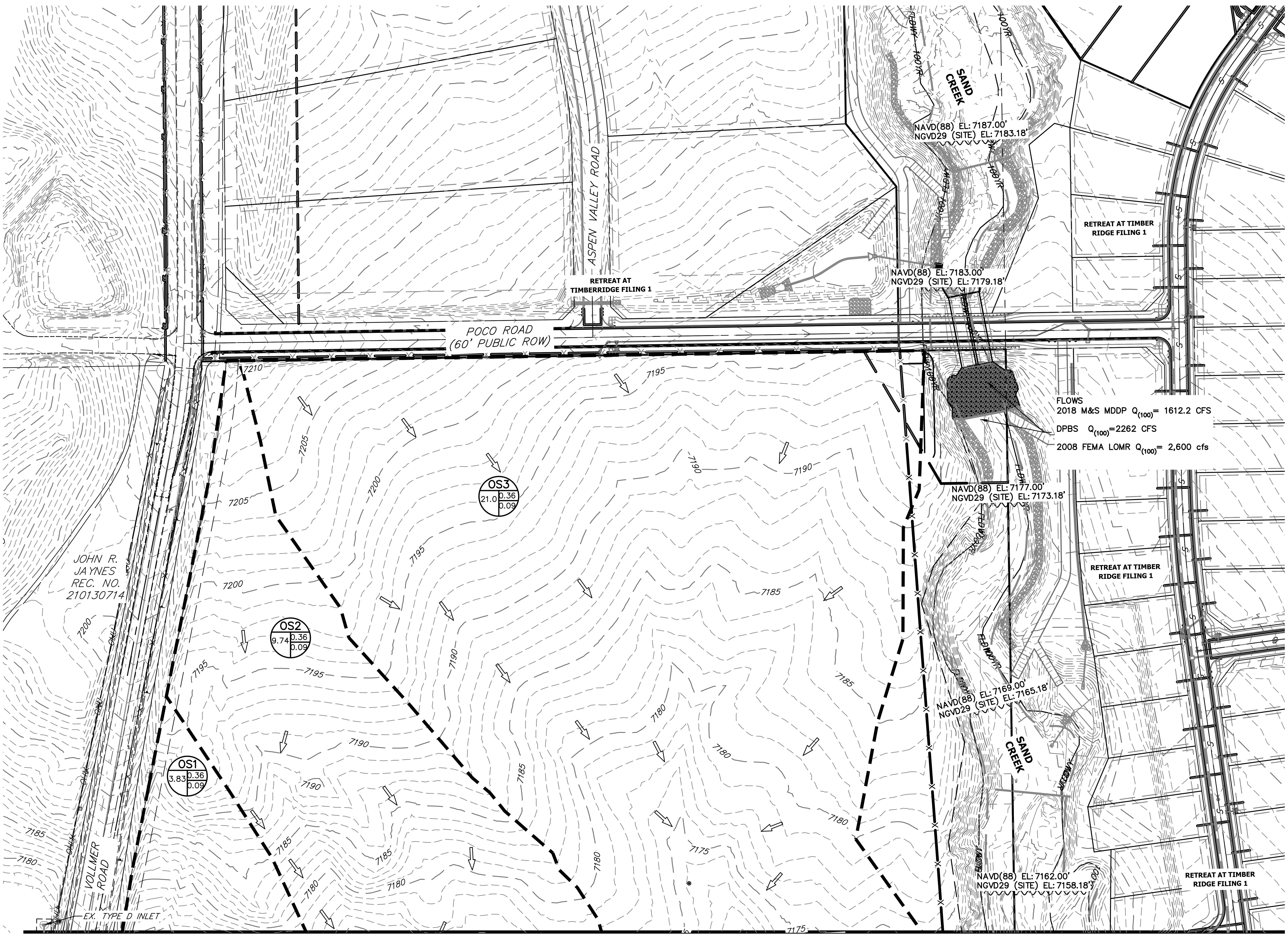
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2
PROPOSED DRAINAGE MAP



SEE SHEET 2

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

PROPOSED 6100

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C5	C100	tc (min)	Q5 (cfs)	Q100 (cfs)
OS1	3.83	2%	0.09	0.36	15.5	1.2	8.0
OS2	9.74	2%	0.09	0.36	27.7	2.3	15.3
OS3	21.02	2%	0.09	0.36	30.9	4.6	31.0
B1.1	1.24	52%	0.51	0.64	11.4	2.5	5.3
B1.2	0.38	51%	0.50	0.64	7.9	0.9	1.8
B1.3	0.45	47%	0.47	0.62	8.0	0.9	2.1
B2	0.86	58%	0.55	0.69	5.0	2.4	5.1
B3	0.23	78%	0.72	0.83	5.0	0.9	1.6
B4	3.51	46%	0.46	0.61	9.1	6.9	15.3
B5	1.11	61%	0.58	0.70	6.8	3.1	6.2
B6	3.61	58%	0.55	0.69	6.5	9.5	19.9
B7	1.63	56%	0.54	0.67	7.8	4.0	8.2
B8	2.14	56%	0.54	0.66	8.1	5.1	10.6
B9	3.77	64%	0.50	0.64	11.6	7.3	15.7
B10	0.22	80%	0.73	0.83	5.0	0.8	1.6
B11	1.67	11%	0.14	0.39	9.9	1.0	4.6
B12	2.18	36%	0.29	0.49	16.6	2.1	6.0
B13	0.43	54%	0.39	0.55	5.0	0.9	2.1
B14	0.42	45%	0.33	0.52	6.2	0.7	1.7
C-1	0.92	67%	0.48	0.61	10.1	1.8	3.9
C-2	1.24	52%	0.40	0.57	9.3	2.1	5.0

DESIGN POINT SUMMARY TABLE

DP	Q5 Total	Q100 Total
O.2	2.3	15.3
O.3	6.8	45.3
1.1b	2.5	5.3
1.1i	2.5	5.3
O.1	1.2	8.0
1.2b	1.8	9.4
1.2i	1.8	8.7
2.1	4.0	13.4
1.3b	0.9	2.3
2b	3.0	5.6
3b	0.9	1.6
4b	6.9	15.3
4i	6.9	11.8
6b	12.7	23.4
6i	7.5	10.1
9b	11.9	26.5
5b	3.1	6.2
5i	3.1	5.0
2.2	3.1	5.0
7b	4.0	9.1
7i	4.0	7.7
2.3	9.6	16.3
2.4	13.3	23.5
2.5	13.8	30.3
8b	4.7	11.1
2.6	18.1	37.8
2.7	27.2	61.7
10b	5.4	12.5
2.8	31.2	70.8
11b	1.0	4.6
C.1	1.8	3.9
C.2	2.1	5.0
12b	2.1	6.0
3.1	2.1	6.0
13b	0.9	2.1
3.2	2.6	7.1
3.3	2.8	7.7
14b	0.7	1.7
4	34.0	78.4

PROPOSED DRAINAGE MAP
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2
JOB NO. 25188.10
11-10-2022
SHEET 1 OF 2

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

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

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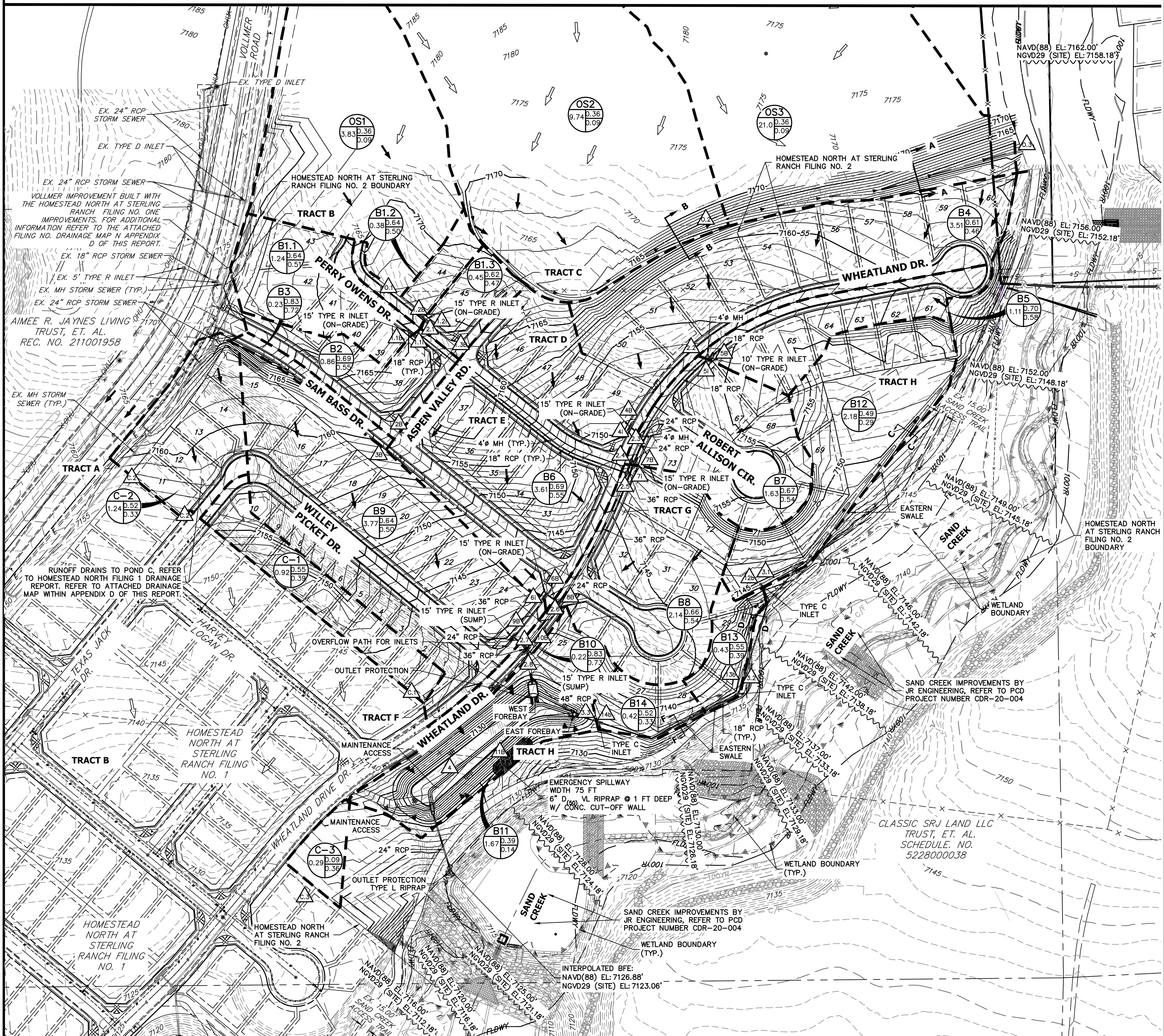
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2

PROPOSED DRAINAGE MAP

SEE SHEET 1



LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C –100 YR
D: C–5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

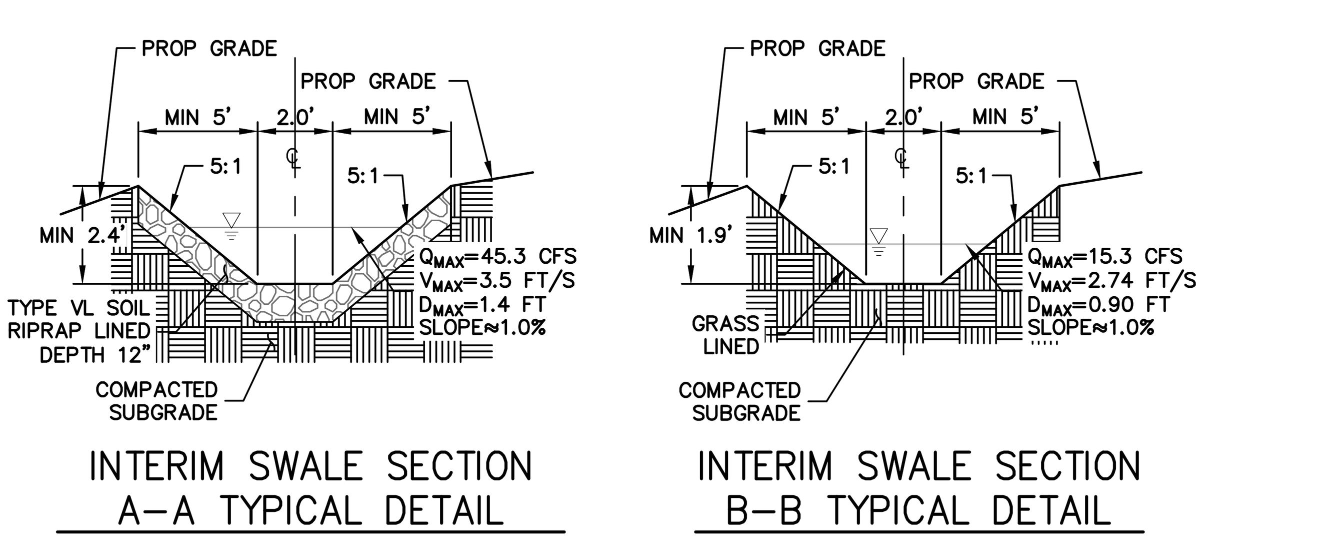
SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

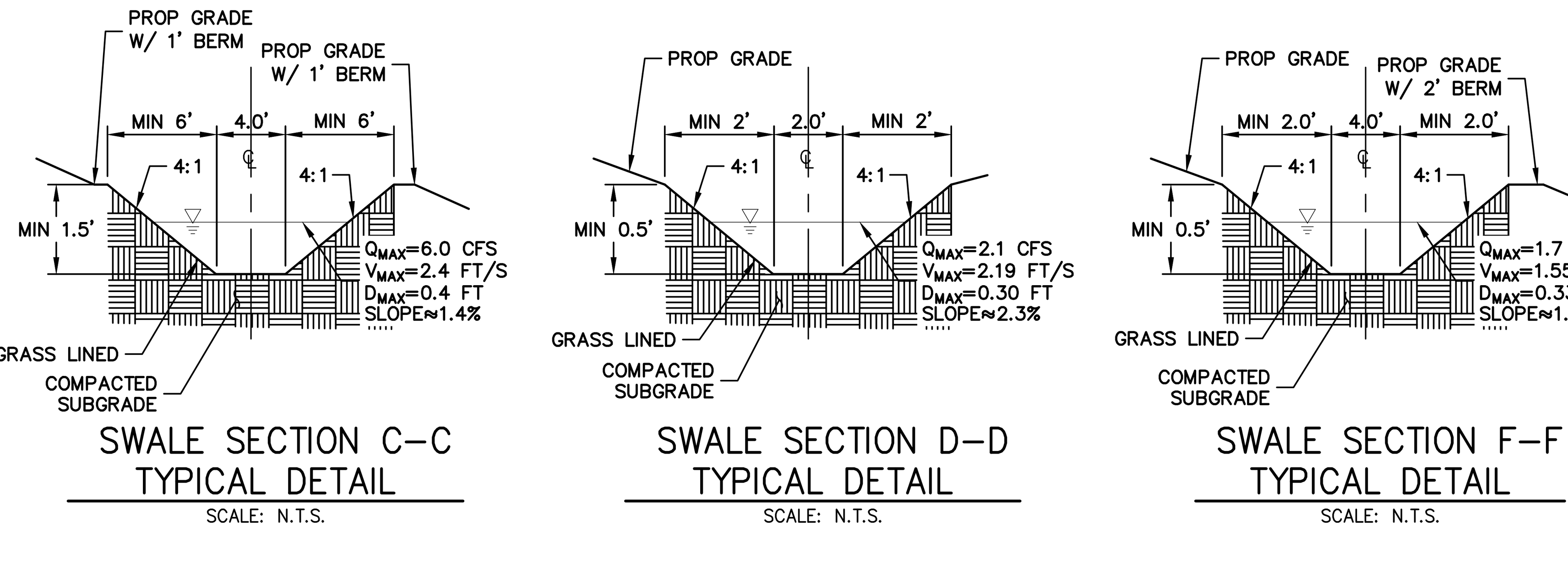
PROPOSED 6100

NOTE: STORM INFRASTRUCTURE IN PUBLIC R.O.W CONSIDERED PUBLIC. ALL OTHER STORM SEWER INFRASTRUCTURE IS PRIVATE UNLESS STATED OTHERWISE.



INTERIM SWALE SECTION A–A TYPICAL DETAIL
SCALE: N.T.S.

INTERIM SWALE SECTION B–B TYPICAL DETAIL
SCALE: N.T.S.



SWALE SECTION C–C TYPICAL DETAIL
SCALE: N.T.S.

SWALE SECTION D–D TYPICAL DETAIL
SCALE: N.T.S.

SWALE SECTION F–F TYPICAL DETAIL
SCALE: N.T.S.

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C5	C100	tc (min)	Q5 (cfs)	Q100 (cfs)
OS1	3.83	2%	0.09	0.36	15.5	1.2	8.0
OS2	9.74	2%	0.09	0.36	27.7	2.3	15.3
OS3	21.02	2%	0.09	0.36	30.9	4.6	31.0
B1.1	1.24	52%	0.51	0.64	11.4	2.5	5.3
B1.2	0.38	51%	0.50	0.64	7.9	0.9	1.8
B1.3	0.45	47%	0.47	0.62	8.0	0.9	2.1
B2	0.86	58%	0.55	0.69	5.0	2.4	5.1
B3	0.23	78%	0.72	0.83	5.0	0.9	1.6
B4	3.51	46%	0.46	0.61	9.1	6.9	15.3
B5	1.11	61%	0.58	0.70	6.8	3.1	6.2
B6	3.61	58%	0.55	0.69	6.5	9.5	19.9
B7	1.63	56%	0.54	0.67	7.8	4.0	8.2
B8	2.14	56%	0.54	0.66	8.1	5.1	10.6
B9	3.77	64%	0.50	0.64	11.6	7.3	15.7
B10	0.22	80%	0.73	0.83	5.0	0.8	1.6
B11	1.67	11%	0.14	0.39	9.9	1.0	4.6
B12	2.18	36%	0.29	0.49	16.6	2.1	6.0
B13	0.43	54%	0.39	0.55	5.0	0.9	2.1
B14	0.42	45%	0.33	0.52	6.2	0.7	1.7
C-1	0.92	67%	0.48	0.61	10.1	1.8	3.9
C-2	1.24	52%	0.40	0.57	9.3	2.1	5.0

DESIGN POINT SUMMARY TABLE

DP	Q5 Total	Q100 Total
O.2	2.3	15.3
O.3	6.8	45.3
1.1b	2.5	5.3
1.1i	2.5	5.3
O.1	1.2	8.0
1.2b	1.8	9.4
1.2i	1.8	8.7
2.1	4.0	13.4
1.3b	0.9	2.3
2b	3.0	5.6
3b	0.9	1.6
4b	6.9	15.3
4i	6.9	11.8
6b	12.7	23.4
6i	7.5	10.1
9b	11.9	26.5
5b	3.1	6.2
5i	3.1	5.0
2.2	3.1	5.0
7b	4.0	9.1
7i	4.0	7.7
2.3	9.6	16.3
2.4	13.3	23.5
2.5	13.8	30.3
8b	4.7	11.1
2.6	18.1	37.8
2.7	27.2	61.7
10b	5.4	12.5
2.8	31.2	70.8
11b	1.0	4.6
C.1	1.8	3.9
C.2	2.1	5.0
12b	2.1	6.0
3.1	2.1	6.0
13b	0.9	2.1
3.2	2.6	7.1
3.3	2.8	7.7
14b	0.7	1.7
4	34.0	78.4

PROPOSED DRAINAGE MAP
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2
JOB NO. 25188.10
11-10-2022
SHEET 2 OF 2

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

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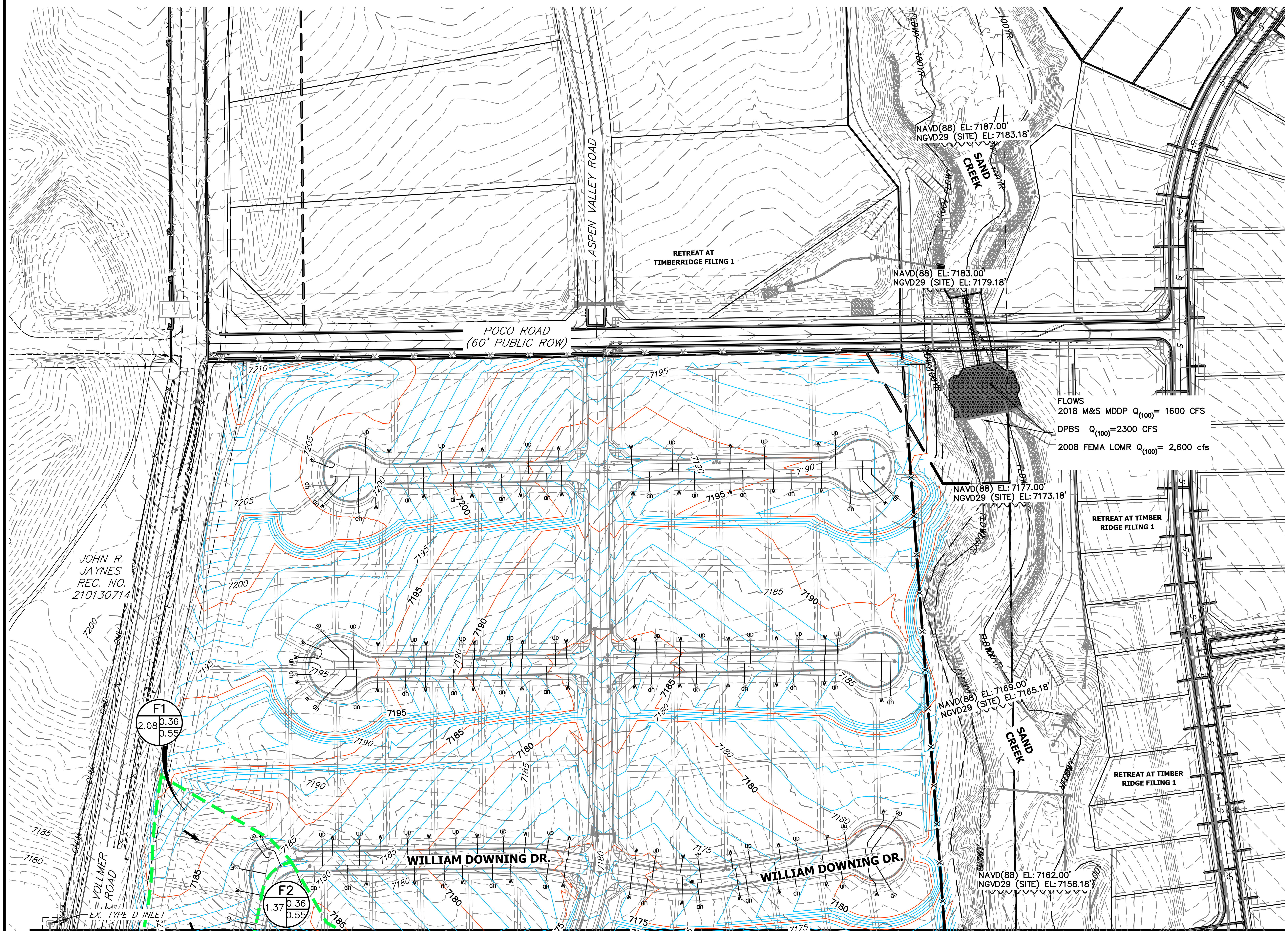
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2

DRAINAGE MAP (ULTIMATE/FUTURE)



SEE SHEET 2

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

FUTURE BASIN AREA

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

PROPOSED 6100

FUTURE 6100

NOTE: STORM INFRASTRUCTURE IN PUBLIC R.O.W CONSIDERED PUBLIC. ALL OTHER STORM SEWER INFRASTRUCTURE IS PRIVATE UNLESS STATED OTHERWISE.

DESIGN POINT SUMMARY TABLE

DP	Q5 Total	Q100 Total
1.1b	5.1	12.1
1.1i	5.1	10.1
1.2b	3.1	7.0
1.2i	3.1	6.8
2.1	8.2	16.9
1.3b	1.0	2.2
2b	2.7	8.1
3b	0.9	1.6
4b	7.1	17.1
4i	6.9	12.9
6b	10.2	26.7
6i	8.8	14.9
9b	7.7	25.3
5b	3.1	6.2
5i	3.1	5.1
2.2	3.1	5.1
7b	4.0	9.0
7i	4.0	8.4
2.3	9.6	17.4
2.4	13.3	25.4
2.5	18.3	36.1
8b	4.7	10.4
2.6	25.5	48.0
2.7	32.3	71.0
10b	5.4	11.7
2.8	36.5	79.9
11b	1.0	4.6
C.1	1.8	3.9
C.2	2.1	5.0
12b	2.1	6.0
3.1	2.1	6.0
13b	0.9	2.1
3.2	2.6	7.1
3.3	2.8	7.7
14b	0.7	1.7
4	40.2	91.5
1F	2.9	7.4
2F	2.1	5.0
3F	0.4	0.6
4F	0.3	0.4
C.3	0.1	0.6
SC	360.0	1780.0

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
B1.1	1.24	52%	0.51	0.64	10.2	2.6	5.5
B1.2	0.42	79%	0.73	0.82	5.0	1.5	2.9
B1.3	0.43	50%	0.49	0.64	7.8	0.9	2.0
B2	0.86	58%	0.55	0.69	5.0	2.4	5.1
B3	0.23	78%	0.72	0.83	5.0	0.9	1.6
B4	3.51	46%	0.46	0.61	9.1	6.9	15.3
B5	1.11	61%	0.58	0.70	6.8	3.1	6.2
B6	3.61	58%	0.55	0.69	6.5	9.5	19.9
B7	1.63	56%	0.54	0.67	7.8	4.0	8.2
B8	2.14	56%	0.54	0.66	8.1	5.1	10.6
B9	3.77	64%	0.50	0.64	11.6	7.3	15.7
B10	0.22	80%	0.73	0.83	5.0	0.8	1.6
B11	1.67	11%	0.14	0.39	9.9	1.0	4.6
B12	2.18	36%	0.29	0.49	16.6	2.1	6.0
B13	0.43	54%	0.39	0.55	5.0	0.9	2.1
B14	0.42	45%	0.33	0.52	6.2	0.7	1.7
C-1	0.92	67%	0.48	0.61	10.1	1.8	3.9
C-2	1.24	52%	0.40	0.57	9.3	2.1	5.0
C-3	0.29	2%	0.09	0.36	15.9	0.1	0.6
F1	2.08	43%	0.36	0.55	12.1	2.9	7.4
F2	1.37	48%	0.38	0.57	11.7	2.1	5.0
F3	0.08	100%	0.90	0.96	5.0	0.4	0.6
F4	0.06	100%	0.90	0.96	5.0	0.3	0.4
F5	0.69	2%	0.09	0.36	5.0	0.3	2.2
SC	10.09	2%	0.09	0.36	-	360.0	1780.0

DRAINAGE MAP (ULTIMATE/FUTURE)
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2
JOB NO. 25188.10
11-10-2022
SHEET 1 OF 2

N

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

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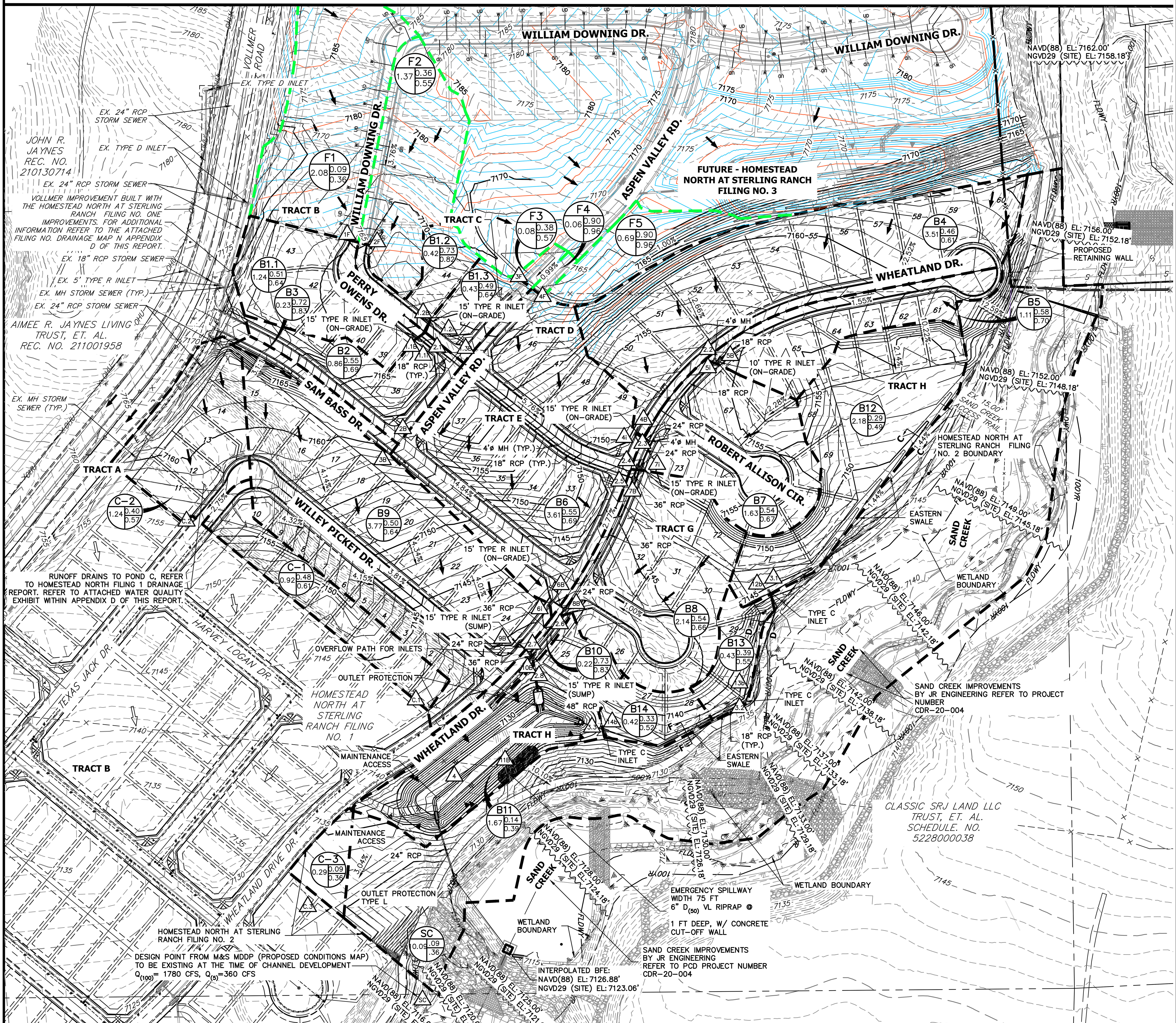
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2

DRAINAGE MAP (FUTURE/PROPOSED)

SEE SHEET 1



LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

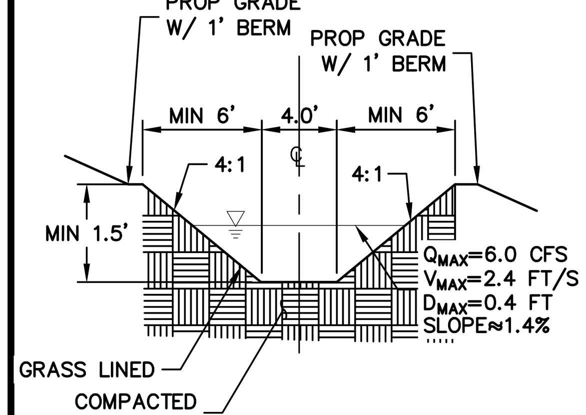
STORM SEWER PROPOSED

FUTURE BASIN AREA

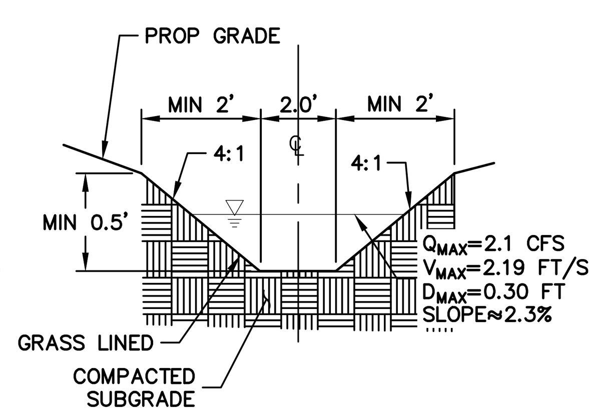
NOTE: STORM INFRASTRUCTURE IN PUBLIC R.O.W CONSIDERED PUBLIC. ALL OTHER STORM SEWER INFRASTRUCTURE IS PRIVATE UNLESS STATED OTHERWISE.

PROPOSED R.O.W
PROPOSED PROPERTY LINES
PROPOSED SIDEWALK
EXISTING PROPERTY LINE
ROW EXISTING
FL EXISTING
SIDEWALK EXISTING
DRAINAGE ACCESS & MAINTENANCE EASEMENT

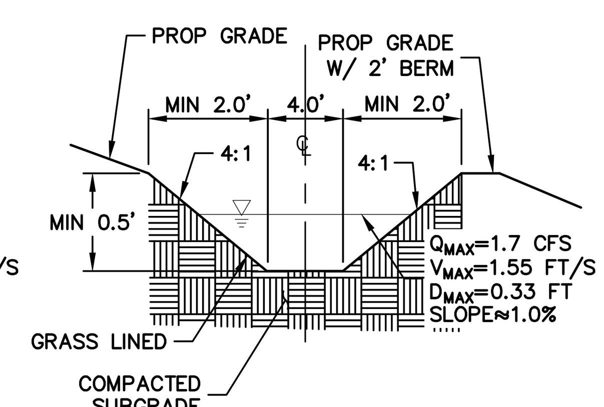
EXISTING 6100
PROPOSED 6100
FUTURE 6100



SWALE SECTION C–C
TYPICAL DETAIL
SCALE: N.T.S.



SWALE SECTION D–D
TYPICAL DETAIL
SCALE: N.T.S.



SWALE SECTION F–F
TYPICAL DETAIL
SCALE: N.T.S.

DESIGN POINT SUMMARY TABLE

DP	Q5 Total	Q100 Total
1.1b	5.1	12.1
1.1i	5.1	10.1
1.2b	3.1	7.0
1.2i	3.1	6.8
2.1	8.2	16.9
1.3b	1.0	2.2
2b	2.7	8.1
3b	0.9	1.6
4b	7.1	17.1
4i	6.9	12.9
6b	10.2	26.7
6i	8.8	14.9
9b	7.7	25.3
5b	3.1	6.2
5i	3.1	5.1
2.2	3.1	5.1
7b	4.0	9.0
7i	4.0	8.4
2.3	9.6	17.4
2.4	13.3	25.4
2.5	18.3	36.1
8b	4.7	10.4
2.6	25.5	48.0
2.7	32.3	71.0
10b	5.4	11.7
2.8	36.5	79.9
11b	1.0	4.6
C.1	1.8	3.9
C.2	2.1	5.0
12b	2.1	6.0
3.1	2.1	6.0
13b	0.9	2.1
3.2	2.6	7.1
3.3	2.8	7.7
14b	0.7	1.7
4	40.2	91.5
1F	2.9	7.4
2F	2.1	5.0
3F	0.4	0.6
4F	0.3	0.4
C.3	0.1	0.6
SC	360.0	1780.0

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
B1.1	1.24	52%	0.51	0.64	10.2	2.6	5.5
B1.2	0.42	79%	0.73	0.82	5.0	1.5	2.9
B1.3	0.43	50%	0.49	0.64	7.8	0.9	2.0
B2	0.86	58%	0.55	0.69	5.0	2.4	5.1
B3	0.23	78%	0.72	0.83	5.0	0.9	1.6
B4	3.51	46%	0.46	0.61	9.1	6.9	15.3
B5	1.11	61%	0.58	0.70	6.8	3.1	6.2
B6	3.61	58%	0.55	0.69	6.5	9.5	19.9
B7	1.63	56%	0.54	0.67	7.8	4.0	8.2
B8	2.14	56%	0.54	0.66	8.1	5.1	10.6
B9	3.77	64%	0.50	0.64	11.6	7.3	15.7
B10	0.22	80%	0.73	0.83	5.0	0.8	1.6
B11	1.67	11%	0.14	0.39	9.9	1.0	4.6
B12	2.18	36%	0.29	0.49	16.6	2.1	6.0
B13	0.43	54%	0.39	0.55	5.0	0.9	2.1
B14	0.42	45%	0.33	0.52	6.2	0.7	1.7
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F4	0.06	100%	0.90	0.96	5.0	0.3	0.4
F5	0.69	2%	0.09	0.36	5.0	0.3	2.2
SC	10.09	2%	0.09	0.36	-	360.0	1780.0

DRAINAGE MAP (FUTURE/PROPOSED)
HOMESTEAD NORTH AT STERLING RANCH FILING NO. 2
JOB NO. 25188.10
11–10–2022
SHEET 2 OF 2

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

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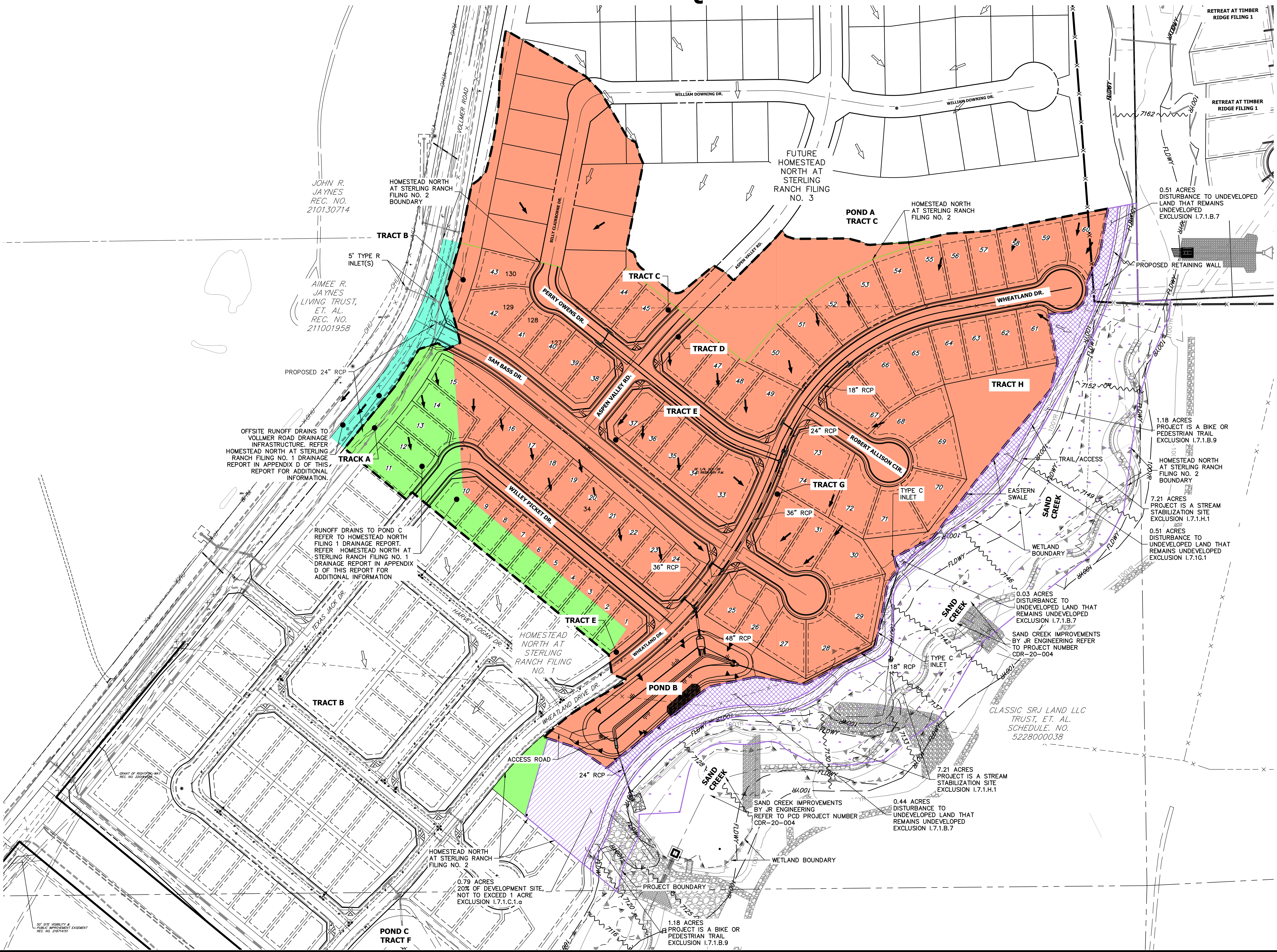
HOMESTEAD NORTH AT STERLING RANCH
WATER QUALITY EXHIBIT



- AREA TREATED IN HOMESTEAD NORTH FILING NO. 2 POND – B
- HOMESTEAD NORTH FILING NO. 2 AREA TREATED IN HOMESTEAD NORTH FILING NO. 1 POND – A
- EXISTING AREA WITHIN THE PLATTED BOUNDARY TREATED IN HOMESTEAD NORTH FILING NO. 1 POND – A
- EXCLUDED AREAS FROM POST-CONSTRUCTION STORM WATER MANAGEMENT
- EXCLUDED AREA: PER EXCLUSION I.7.1.C.1.a "20% OF APPLICABLE SITE NOT TO EXCEED 1 ACRE"
- EXCLUDED AREA: PER EXCLUSION I.7.1.B.7 DISTURBANCE TO UNDEVELOPED LAND THAT REMAINS UNDEVELOPED
- EXCLUDED AREA: PER EXCLUSION I.7.1.B.8 PROJECT IS A STREAM STABILIZATION SITE
- EXCLUDED AREA: PER EXCLUSION I.7.1.B.9 PROJECT IS A BIKE OR PEDESTRIAN TRAIL

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

WATER QUALITY EXHIBIT
HOMESTEAD NORTH @ SR FN2
JOB NO. 25188.10
09/08/2022
SHEET 1 OF 1

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