

HIGH NOTE REGIONAL PARK PHASE 1

Phase III DRAINAGE REPORT CITY OF LONE TREE

Martin/Martin, Inc. Project No.: 24.1295

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I. GENERAL LOCATION AND DESCRIPTION

A. Site Location

1. See appendix A for the vicinity map.
2. The site is located in a part of section 23 and 24, township 6 south, range 67 west of the 6th P.M. City of Lone Tree, County of Douglas, State of Colorado.
3. The property is bound to the north by RidgeGate Parkway, to the east by Lyric Street, to the west by Happy Canyon Creek, and to the south by the future High Note Avenue. Development of this site will have no negative impacts on the adjacent areas.
4. The proposed regional park will be located on the Northwest corner of Ridgetgate SW Village Filing 1 in Lone Tree, Colorado within Tract AQ.

B. Description of Property

1. The property consists of 49.65 acres. Of this area, approximately 20.20 acres will be disturbed during Phase 1 of the project, with an additional 4.63 acres to be disturbed for the future turf fields in the final phase. In total, both phases will disturb approximately 24.83 acres.
2. The site is currently undeveloped, consisting of native vegetation. The site has varying grades with a majority of the site sloping to the west draining toward Happy Canyon Creek. The sites grades vary from 1% - 25%.
3. The National Resources Conservation Services (NRCS) states that the soils in proximity to the development are Englewood clay loam and Newlin-Satanta complex. These soils are considered to be well-draining soils and are in Hydrologic Soil Group B and C. The NRCS soils map and soil resource report can be found in Appendix D.
4. There are no major or minor drainage ways within the project boundary, but Happy Canyon Creek is located immediately to the west of the property.



5. According to the FEMA FIRM panel 0803C0063H September 4, 2020. The project is shown located within Zone AO of FEMA defined floodplains; however the floodplain is currently under revision and is anticipated to be revised outside the limits of the project. The Happy Canyon Creek Stream Improvements project by Merrick will remove this flood plain within the High Note Regional Park Phase 1 project area. It is anticipated that once the LOMR is accepted for that project, the FIRM panel will be updated at that time removing the AO designation from the project area.
6. There are no existing swales onsite, runoff currently drains via overland flow to the existing Happy Canyon Creek and to the existing EURV pond built for RidgeGate Southwest Village Filing No.1 that ultimately outfalls into Happy Canyon Creek.
7. There are no significant geologic features within the site.
8. The proposed project will include vertical construction of one restroom, two shade structures, one restaurant, two soccer fields, one water feature, one playground, a surface parking lot with associated drive lanes, sidewalks, and landscaping.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

1. Our site is located in the Happy Canyon Creek Drainage Basin which is tributary to Cherry Creek. Runoff on the developed site is anticipated to be conveyed via proposed storm sewer to three proposed EURV ponds. Runoff from the site will ultimately drain to Happy Canyon Creek as indicated in the master drainage report.
2. The proposed land uses within the basin conveying flows to Happy Canyon Creek and the existing EURV Pond will be parking, building, sidewalks, and landscaping.
3. The project includes four (4) major basins; Basin N1, N2, N3, N4. Basin N1 consists of paved parking and landscaping. Runoff generated will be conveyed via overland flow to proposed curb and gutter flow and into proposed storm. Basin N2 consists of two



soccer fields, paved walks, swales, one valley pan, landscaping, and proposed EURV pond N2. Runoff generated will be conveyed via overland flow into proposed storm sewer and into EURV pond N2. Basin N3 consists of one restroom, paved walks, swales, one playground, landscaping, and proposed EURV pond N3. Runoff generated will be conveyed via overland flow into proposed storm and into EURV pond N3. Basin N4 consists of two shade structures, one restaurant, paved walks, swales, landscaping, and proposed EURV pond N4. Runoff generated will be conveyed via overland flow into proposed storm and into EURV pond N4. Offsite flows are not anticipated to affect proposed construction or historical drainage patterns as the generated runoff is considered negligible.

4. High Note regional park will be split into two phases. Phase 1 will consist of a partial build out of basin N1, N3, and N4 which excludes the proposed turf fields, additional paved parking, and a maintenance building. Basin N2 will be built to its final condition. A phase 1 drainage plan has been provided in Appendix A. A final drainage plan is also provided to size stormwater facilities for the final phase and is based on provided information for the intended future conditions of the park and is also provided in Appendix A. Proposed storm infrastructure and EURV ponds have been designed and will be built to final conditions in phase 1 of the park. For further details on proposed storm and water quality, please refer to the stormwater management facility design section of this report.
5. The “Phase III Drainage Report for RidgeGate Southwest Village Filing 1,” by JR Engineering, dated May 2021, designates the project site as Basin A45A, A45, and A46 in the master report. The master report designates these basins as being tributary to EURV Pond A provided in the report. Basin A45 and A45A are basins defined for future storm infrastructure for the regional park parking area. Basin A46 has been defined as overland flow tributary to the existing EURV pond in the master report. The combined Q100 flow of the existing basins in the master report is 42.8 cfs based on a combined weighted C100 of 0.72 for the basins which is conveyed to



EURV Pond A. Basins N1.1 and N1.2 make up the mentioned existing basins in the master report. The combined Q100 design flow of the proposed basins in the final conditions is 28.56 cfs will be conveyed to the existing EURV pond and will have a slightly higher weighted C100 of 0.81. With these results the site is in compliance with the master report. An excerpt from the master report containing this information is located in the appendix D.

6. Off-site drainage is not anticipated to impact the site.

B. Minor Drainage Basins

There are twenty-two (22) sub-basins associated the High Note Regional Park. Basin N1 consists of two sub-basins, Basin N2 consists of three (3) sub-basins, Basin N3 consists of four (4) sub basins, and Basin N4 consists of eight (8) sub-basins. There will be five (5) offsite basins associated with this project. A runoff summary and descriptions of each basin can be found below:

1. **Basin N1.1** contains 2.77 acres consisting of paved parking and landscaping. Runoff in Basin N1.1 is discharged to the existing EURV Pond. Basin N1.1 will consist of a second phase which includes an additional 1.34 acres of paved area within the basin. Proposed curb and gutter directs runoff to a proposed type R inlet and is discharged into a proposed type H low tailwater basin located in the existing EURV pond. Runoff coefficients for phase 1 of the basin were found to be $C_5=0.36$ and $C_{100}=0.65$ and the imperviousness of the basin was found to be 40%. The phase 1, 5-year and 100-year flows are 3.69 cfs and 12.01 cfs respectively. Runoff coefficients for the final phase of the basin were found to be $C_5=0.67$ and $C_{100}=0.85$ and the imperviousness of the basin was found to be 78%. The final phase, 5-year and 100-year flows are 7.77 cfs and 16.90 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of the final phase.



2. **Basin N1.2** contains 1.70 acres consisting of paved parking and landscaping. Runoff in Basin N1.2 is discharged to the existing EURV Pond. Basin N1.2 will remain the same in both phases of the park. Proposed curb and gutter directs runoff to a proposed type R inlet and is discharged into a proposed type H low tailwater basin located in the existing EURV pond. Runoff coefficients for phase 1 and the final phase of the basin were found to be $C_5=0.70$ and $C_{100}=0.82$ and the imperviousness of the basin was found to be 82%. The 5-year and 100-year flows are 5.49 cfs and 11.66 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.
3. **Basin N2.1** contains 1.11 acres consisting of paved walks, one (1) proposed EURV pond, and landscaping. Runoff in Basin N2.1 is directed to EURV Pond N2. Basin N2.1 will remain the same in both phases of the park. Proposed landscaping and walks direct runoff to the ponds outlet structure and is discharged into the existing 66" RCP storm main. Runoff coefficients for the basin were found to be $C_5=0.26$ and $C_{100}=0.60$ and the imperviousness of the basin was found to be 28%. The 5-year and 100-year flows are 1.40 cfs and 5.85 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.
4. **Basin N2.2** contains 4.67 acres consisting of artificial turf fields, a concrete valley pan, and landscaping. Runoff in Basin N2.2 is directed to EURV Pond N2. Basin N2.2 will remain the same in both phases of the park. The artificial turf fields underdrain system, proposed landscaping, and concrete valley pan direct runoff to proposed storm infrastructure that discharge into EURV Pond N2. The fields have been requested to be considered 100% impervious for this project by the owner. Runoff coefficients for the basin were found to be $C_5=0.82$ and $C_{100}=0.88$ and the imperviousness of the basin was found to be 97%. The 5-year and 100-year flows



are 12.58 cfs and 24.44 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

5. **Basin N2.3** contains 0.73 acres consisting of turf fields, a swale, and landscaping. Runoff in Basin N2.3 is directed to EURV Pond N2. Basin N2.3 will remain the same in both phases of the park. The artificial turf fields underdrain system, proposed landscaping, and swale direct runoff to proposed storm infrastructure that discharge into EURV Pond N2. The fields have been requested to be considered 100% impervious for this project by the owner. Runoff coefficients for the basin were found to be $C_5=0.40$ and $C_{100}=0.67$ and the imperviousness of the basin was found to be 45%. The 5-year and 100-year flows are 1.42 cfs and 4.29 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.
6. **Basin N3.1** contains 0.45 acres consisting of paved walks, one (1) proposed EURV pond, and landscaping. Runoff in Basin N3.1 is directed to EURV Pond N3. Basin N3.1 will increase in impervious area of 0.12 acres for paved walks in the final phase intended to be added around the perimeter of the pond. Proposed landscaping and walks direct runoff to the ponds outlet structure and is discharged into Happy Canyon Creek. Runoff coefficients for the basin were found to be $C_5=0.23$ and $C_{100}=0.58$ and the imperviousness of the basin was found to be 24%. The 5-year and 100-year flows are 0.51 cfs and 2.31 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.
7. **Basin N3.2** contains 0.53 acres consisting of one (1) playground, swales, paved walks, and landscaping. Runoff in Basin N3.2 is directed to EURV Pond N3. Basin N3.2 will remain the same in both phases of the park. The playgrounds underdrain system, proposed landscaping, and swales direct runoff to proposed storm infrastructure that discharge into EURV Pond N3. Runoff coefficients for the basin were found to be $C_5=0.26$ and $C_{100}=0.60$ and the imperviousness of the basin was



found to be 27%. The 5-year and 100-year flows are 0.67 cfs and 2.80 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

8. **Basin N3.3** contains 0.22 acres consisting of one (1) water feature, swales, paved walks, and landscaping. Runoff in Basin N3.3 is directed to EURV Pond N3. Basin N3.3 will remain the same in both phases of the park. The paved walks, proposed landscaping, and swales direct runoff to proposed storm infrastructure that discharge into EURV Pond N3. Runoff coefficients for the basin were found to be $C_5=0.81$ and $C_{100}=0.87$ and the imperviousness of the basin was found to be 95%. The 5-year and 100-year flows are 0.86 cfs and 1.68 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.
9. **Basin N3.4** contains 0.11 acres consisting of one (1) restroom building, swales, paved walks, and landscaping. Runoff in Basin N3.4 is directed to EURV Pond N3. Basin N3.4 will remain the same in both phases of the park. The paved walks, proposed landscaping, and swales direct runoff to proposed storm infrastructure that discharge into EURV Pond N3. Runoff coefficients for the basin were found to be $C_5=0.71$ and $C_{100}=0.82$ and the imperviousness of the basin was found to be 83%. The 5-year and 100-year flows are 0.39 cfs and 0.83 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.
10. **Basin N4.1** contains 0.87 acres consisting of paved walks, one (1) proposed EURV pond, and landscaping. Runoff in Basin N4.1 is directed to EURV Pond N4. Basin N4.1 will increase in impervious area of 0.11 acres for paved walks in the final phase intended to be added around the perimeter of the pond. Proposed landscaping and walks direct runoff to the ponds outlet structure and is discharged into Happy Canyon Creek. Runoff coefficients for the basin were found to be $C_5=0.24$ and



$C_{100}=0.59$ and the imperviousness of the basin was found to be 25%. The 5-year and 100-year flows are 1.02 cfs and 4.50 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

11. **Basin N4.2** contains 1.85 acres consisting of swales, paved walks, and landscaping. Runoff in Basin N4.2 is directed to EURV Pond N4. Basin N4.2 will have increase in impervious area of 2.24 acres within the basin in the final phase. Proposed landscaping, and swales direct runoff to a proposed wet well where runoff will percolate into the soil in phase 1. In the final phase runoff will be collected by the future turf fields underdrain system and directed to EURV Pond N4. Runoff coefficients for phase 1 of the basin were found to be $C_5=0.27$ and $C_{100}=0.60$ and the imperviousness of the basin was found to be 29%. The 5-year and 100-year flows are 1.72 cfs and 6.89 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

12. **Basin N4.3** contains 0.45 acres consisting of trickle channels, paved walks, and landscaping. Runoff in Basin N4.3 is directed to EURV Pond N4. Basin N4.3 will remain the same in both phases of the park. The paved walks, proposed landscaping, and trickle channels direct runoff to proposed storm infrastructure that discharge into EURV Pond N4. Runoff coefficients for the basin were found to be $C_5=0.49$ and $C_{100}=0.71$ and the imperviousness of the basin was found to be 56%. The 5-year and 100-year flows are 1.00 cfs and 2.64 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

13. **Basin N4.4** contains 0.32 acres consisting of one (1) shade structure, one (1) restaurant building, paved walks, and landscaping. Runoff in Basin N4.4 is directed to EURV Pond N4. Basin N4.4 will remain the same in both phases of the park. The paved walks and proposed landscaping direct runoff to proposed storm infrastructure that discharge into EURV Pond N4. Runoff coefficients for the basin were found to be $C_5=0.61$ and $C_{100}=0.77$ and the imperviousness of the basin was



found to be 70%. The 5-year and 100-year flows are 0.84 cfs and 1.95 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

14. **Basin N4.5** contains 0.39 acres consisting of swales, paved walks, and landscaping. Runoff in Basin N4.4 is directed to EURV Pond N4. Basin N4.4 will remain the same in both phases of the park. The paved walks, proposed landscaping, and swales direct runoff to proposed storm infrastructure that discharge into EURV Pond N4. Runoff coefficients for the basin were found to be $C_5=0.36$ and $C_{100}=0.65$ and the imperviousness of the basin was found to be 40%. The 5-year and 100-year flows are 0.58 cfs and 1.90 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

15. **Basin N4.6** contains 0.56 acres consisting of swales, paved walks, and landscaping. Runoff in Basin N4.6 is directed to EURV Pond N4. Basin N4.6 will remain the same in both phases of the park. The paved walks, proposed landscaping, and swales direct runoff to proposed storm infrastructure that discharge into EURV Pond N4. Runoff coefficients for the basin were found to be $C_5=0.24$ and $C_{100}=0.59$ and the imperviousness of the basin was found to be 26%. The 5-year and 100-year flows are 0.58 cfs and 2.53 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.

16. **Basin N4.7** contains 0.49 acres consisting of swales, paved walks, and landscaping. Runoff in Basin N4.7 is directed to EURV Pond N4. Basin N4.7 will remain the same in both phases of the park. The paved walks, proposed landscaping, and swales direct runoff to proposed storm infrastructure that discharge into EURV Pond N4. Runoff coefficients for the basin were found to be $C_5=0.34$ and $C_{100}=0.64$ and the imperviousness of the basin was found to be 37%. The 5-year and 100-year flows are 0.63 cfs and 2.15 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.



17. **Basin N4.8** contains 0.26 acres consisting of swales, paved walks, and landscaping. Runoff in Basin N4.8 is directed to EURV Pond N4. Basin N4.8 will remain the same in both phases of the park. The paved walks, proposed landscaping, and swales direct runoff to proposed storm infrastructure that discharge into EURV Pond N4. Runoff coefficients for the basin were found to be $C_5=0.34$ and $C_{100}=0.64$ and the imperviousness of the basin was found to be 37%. The 5-year and 100-year flows are 0.35 cfs and 1.20 cfs respectively. All storm infrastructure in this basin has been designed to convey the 100-year flows of both phases of the park.
18. **Basin OFF1** contains 0.49 acres consisting of paved walks and drives, and landscaping. Runoff in Basin OFF1 is directed to Lyric Street. The proposed landscaping, and curb and gutter direct runoff to existing storm infrastructure that in Lyric Street that discharge into the existing EURV Pond. Runoff coefficients for the basin were found to be $C_5=0.38$ and $C_{100}=0.66$ and the imperviousness of the basin was found to be 43%. The 5-year and 100-year flows are 0.90 cfs and 2.82 cfs respectively.
19. **Basin OFF2** contains 0.42 acres consisting of a swale and landscaping. Runoff in Basin OFF2 is directed to a proposed culvert. The proposed swale and landscaping direct runoff to existing storm infrastructure that in High Note Avenue that discharge into the existing EURV Pond. Runoff coefficients for the basin were found to be $C_5=0.20$ and $C_{100}=0.57$ and the imperviousness of the basin was found to be 20%. The 5-year and 100-year flows are 0.38 cfs and 1.97 cfs respectively.
20. **Basin OFF3** contains 0.36 acres consisting of a swale, paved walks, and landscaping. Runoff in Basin OFF3 is directed to a proposed flared end section that connects to an existing type R inlet in High Note Avenue. The proposed swale and landscaping direct runoff to existing storm infrastructure that in High Note Avenue that discharge into the existing EURV Pond. Runoff coefficients for the basin were found



to be $C_5=0.23$ and $C_{100}=0.58$ and the imperviousness of the basin was found to be 24%. The 5-year and 100-year flows are 0.33 cfs and 1.50 cfs respectively.

21. **Basin OFF4** contains 1.20 acres consisting of paved walks and landscaping. Runoff in Basin OFF4 is directed to Happy Canyon Creek. The proposed walks and landscaping direct runoff to landscaped buffer areas before discharging into Happy Canyon Creek. Runoff coefficients for the basin were found to be $C_5=0.24$ and $C_{100}=0.58$ and the imperviousness of the basin was found to be 25%. The 5-year and 100-year flows are 1.26 cfs and 5.68 cfs respectively.

22. **Basin OFF5** contains 0.23 acres consisting of landscaping. Runoff in Basin OFF5 is directed to Happy Canyon Creek. The landscaping direct runoff to landscaped buffer. Runoff coefficients for the basin were found to be $C_5=0.24$ and $C_{100}=0.58$ and the imperviousness of the basin was found to be 20%. The 5-year and 100-year flows are 0.22 cfs and 1.16 cfs respectively.



Table 1: Phase 1 Runoff Summary

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C ₅	C ₁₀₀	Q ₅ (CFS)	Q ₁₀₀ (CFS)
N1.1	N1.1	2.77	40.1%	0.36	0.65	3.69	12.01
N1.2	N1.2	1.70	81.5%	0.70	0.82	5.49	11.66
N2.1	N2.1	1.11	27.5%	0.26	0.60	1.40	5.85
N2.2	N2.2	4.67	96.7%	0.82	0.88	12.58	24.44
N2.3	N2.3	0.73	45.3%	0.40	0.67	1.42	4.29
N3.1	N3.1	0.45	24.4%	0.23	0.58	0.51	2.30
N3.2	N3.2	0.53	27.4%	0.26	0.60	0.67	2.80
N3.3	N3.3	0.22	95.0%	0.81	0.87	0.86	1.68
N3.4	N3.4	0.11	82.6%	0.71	0.82	0.39	0.83
N4.1	N4.1	0.87	25.3%	0.24	0.59	1.02	4.50
N4.2	N4.2	1.89	29.3%	0.27	0.60	1.72	6.89
N4.3	N4.3	0.45	56.3%	0.49	0.71	1.00	2.64
N4.4	N4.4	0.32	70.1%	0.61	0.77	0.84	1.95
N4.5	N4.5	0.39	40.1%	0.36	0.65	0.58	1.90
N4.6	N4.6	0.56	25.7%	0.24	0.59	0.58	2.53
N4.7	N4.7	0.49	37.1%	0.34	0.64	0.63	2.15
N4.8	N4.8	0.26	37.1%	0.34	0.64	0.35	1.20
OFF1	O1	0.49	42.8%	0.38	0.66	0.90	2.82
OFF2	O2	0.42	20.0%	0.20	0.57	0.38	1.97
OFF3	O3	0.36	23.9%	0.23	0.58	0.33	1.50
OFF4	O4	1.20	24.7%	0.24	0.58	1.26	5.68
OFF5	O5	0.23	20.0%	0.20	0.57	0.22	1.16
SITE COMPOSITE		20.20	53.2%	0.47	0.70	36.81	102.75



III. DRAINAGE DESIGN CRITERIA

A. Regulations

Drainage design is in compliance with the Douglas County Storm Drainage Design and Technical Criteria Manual and the Urban Drainage and Flood Control District Drainage Criteria Manual. See the appendices for calculations and design aids.

B. Drainage Studies, Outfall, Systems Plans, Site Constraints

Several studies have been prepared for the area surrounding and including the Project area, and are listed below:

1. Phase III Drainage Report for RidgeGate Southwest Village Filing 1, dated May 2021.

This master drainage report provides information for the existing EURV Pond A on the northwest portion of the site where runoff from proposed basins N1 directs flow. These proposed basins are compared to the existing basins A45, A45A and A46 in the master drainage report to maintain compliance with the report's hydrology design.

C. Hydrology

The rational method used to estimate onsite flows. This is designed in accordance with the Douglas County Storm Drainage Design and Technical Criteria Manual (Reference 1) Chapter 6 – Hydrology, Table 6-3. In accordance with Douglas County criteria, two design storms are analyzed as a part of this report; the 5-year is utilized as the minor storm and 100-year recurrence interval is used as the major storm. The 1-hr design rainfall for these improvements is taken from the *Douglas County Storm Drainage Design and Technical Criteria Manual* (Reference 1) Chapter 6 - Hydrology, Table 6-1. The Project location is within Zone 1. The five-year 1-hr rainfall depth is 1.43 inches, and the 100-year 1-hr rainfall depth is 2.60 inches. Douglas County 1-hr rainfall values are



used in-lieu of NOAA Atlas-14 values because Douglas County values are more conservative.

D. Hydraulics

Drainage facilities are designed in accordance with Douglas County and Mile High Flood District criteria. Existing drainageways and all conveyance facility capacities are evaluated using Bentley FlowMaster software. A nyloplast area inlet capacity charts are used to calculate capacities for the area inlets. Proposed storm sewer improvements are sized to convey 5-year and 100-year flows. Detention ponds are designed using the MHFD Detention workbook and are included as a part of this report.

E. Water Quality Enhancement

Water quality will be provided by proposed EURV ponds and existing EURV Pond A offsite.

F. Existing Downstream Regional Pond

There is an existing downstream regional pond that will provide 10-yr and 100-year detention for the High Note Regional Park Project. Our site imperviousness is less than that of the master study.

IV. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

1. General conveyance is provided by inlets and storm sewer strategically placed on-site.
2. The proposed storm sewer was designed to convey the calculated on-site runoff. All Type R inlets were sized using UDFCD UD-Inlet V 6.00. All sections of pipe were sized and analyzed using StormCAD. The pond outlet structure capacity was sized using the Douglas County Storm Drainage Design and Technical Criteria Manual. All storm structures have been designed to capture and convey the 100-year flows. These calculations and analysis can be found in the Appendix B.



3. Once flows reach the proposed and existing ponds, detention and water quality are provided for WQCV and the EURV before reaching Happy Canyon Creek.
4. On-site curb and gutter has been designed to adequately convey runoff. See UDFCD UD Inlet worksheets in Appendix B.
5. All on-site maintenance related to storm water conveyance will be provided by the property owner.
6. No off-site facilities will be needed for the conveyance of major or minor flows. Flows will be conveyed to the existing and proposed EURV ponds.

B. Stormwater Storage Facilities

Existing EURV Pond A – The existing EURV Pond A developed with Filing 1 provides water quality for a majority of the filing 1 site, and outfalls into Happy Canyon Creek. The pond is equipped with forebays, trickle channels, and an outlet structure that is sized to release the WQCV and EURV events over a period of 40 and 72 hours. The outlet structure was designed to have a release rate of 446.5 cfs for the 100-year storm event and provides roughly 9.9 acre-ft of storage.

Proposed EURV Pond N2 – The proposed EURV Pond N2 is located on the southeast portion of the site. The pond is designed with a forebay, trickle channels, and an outlet structure sized to release the WQCV and EURV events over 40 and 72 hours, respectively. The outlet structure is designed to release 14.7 cfs during the 100-year storm event and provides approximately 0.680 acre-feet of storage.

The pond utilizes three (3) Type C inlet close-mesh grates to capture the full required flow of 42.62 cfs for Basin N2. A minimum head of 11 inches is required to achieve this capture. An overflow box equipped with three (3) Type C inlet close-mesh grates will be placed 1 foot above the outlet structure grate elevation to operate during emergency overflow conditions. The pond provides an additional 1.41 feet of head from the overflow box to the top of pond. An overflow box is used in lieu of a spillway due to



topographic constraints. Detention pond information has been provided in the table below and detention calculations can be found in Appendix C.

Table 2: EURV Pond N2

Design Storm Period	Volume (AC-FT)	Depth (FT)	Qout (CFS)
WQCV	0.183	2.79	0.1
EURV	0.554	5.42	1.2
100-YR	0.680	6.07	14.7

Proposed EURV Pond N3 – The proposed EURV Pond N3 is located on the northwest portion of the site. The pond is designed with a trickle channels and an outlet structure sized to release the WQCV and EURV events over 40 and 72 hours, respectively. The pond will utilize use different orifice plates between the projects development phases.

In Phase 1, the outlet structure is designed to release 1.7 cfs for the 100-year storm event and provides approximately 0.118 acre-feet of storage. In the final phase, the outlet structure is designed to release 12.2 cfs for the 100-year storm event and provides approximately 0.611 acre-feet of storage.

The pond utilizes three (3) Type C inlet close-mesh grates to capture the full required flow of 40.33 cfs for Basin N3 during the final phase. A minimum head of 11 inches is required to capture this flow; however, 1 foot of head has been provided between the spillway and the outlet structure grate. The pond will utilize an emergency overflow spillway in the event that additional relief is required that directs runoff to Happy Canyon Creek.

The pond has been designed for the final site conditions and accounts for the increased imperviousness resulting from future paving and turf field construction. Detention pond



information has been provided in the table below and detention calculations can be found in Appendix C.

Table 3: EURV Pond N3 (Initial Phase)

Design Storm Period	Volume (AC-FT)	Depth (FT)	Qout (CFS)
WQCV	0.02	0.55	0.1
EURV	0.055	1.25	0.1
100-YR	0.118	2.21	1.7

Table 4: EURV Pond N3 (Final Phase)

Design Storm Period	Volume (AC-FT)	Depth (FT)	Qout (CFS)
WQCV	0.194	3.09	0.1
EURV	0.550	5.73	3.8
100-YR	0.611	6.07	12.2

Proposed EURV Pond N4 – The proposed EURV Pond N4 is located on the northeast portion of the site. The pond is designed with trickle channels and an outlet structure sized to release the WQCV and EURV events over 40 and 72 hours, respectively. The pond will utilize use different orifice plates between the project’s development phases.

In Phase 1, the outlet structure is designed to release 3.7 cfs for the 100-year storm event and provides approximately 0.464 acre-feet of storage. In the final phase, the outlet structure is designed to release 10.1 cfs for the 100-year storm event and provides approximately 0.516 acre-feet of storage.

The pond utilizes three (3) Type C inlet close-mesh grates to capture the full required flow of 31.84 cfs for Basin N4 during the final phase. A minimum head of 10-inches is



required to capture this flow; however, 1 foot of head has been provided between the spillway and the outlet structure grate. The pond will utilize an emergency overflow spillway in the event that additional relief is required that directs runoff to Happy Canyon Creek.

The pond has been designed for the final site conditions and accounts for the increased imperviousness resulting from future paving and turf field construction. Detention pond information has been provided in the table below and detention calculations can be found in Appendix C.

Table 5: EURV Pond N4 (Phase 1)

Design Storm Period	Volume (AC-FT)	Depth (FT)	Qout (CFS)
WQCV	0.068	1.20	0.0
EURV	0.182	2.16	0.1
100-YR	0.464	3.66	0.8

Table 6: EURV Pond N4 (Final Phase)

Design Storm Period	Volume (AC-FT)	Depth (FT)	Qout (CFS)
WQCV	0.117	1.67	0.1
EURV	0.370	3.22	0.8
100-YR	0.516	3.87	10.1

C. Water Quality Enhancement Best Management Practices

Water Quality BMPs include Erosion and Sedimentation Control BMPs during construction, storm sewer improvements, LID treatment along landscaped areas, and storm sewer outfalls. These BMPs create a treatment train for the runoff generated onsite prior to discharging to the proposed and existing ponds.



D. Floodplain Modification

Based on FIRM Map Numbers 0803C0063H, Drainage improvements are shown located within Zone AO of FEMA defined floodplains; however the floodplain is currently under revision and is anticipated to be revised outside the limits of the project. A copy of the FEMA FIRM maps are attached in Appendix D.

E. Additional Permitting Requirements

Environmental permitting is not anticipated for the High Note Regional Park Project.

F. General

Supporting documentation for the drainage facilities designed as a part of this report is included in the appendix.

V. CONCLUSIONS

A. Compliance with Standards

The High Note Regional Park Phase 1 Project is designed in accordance with applicable criteria. The *Douglas County Storm Drainage and Technical Criteria Manual* (Reference 1) is used as the primary source for hydrologic and hydraulic criteria. Mile High flood District criteria is used where Douglas County criteria deferred to MHFD.

B. Variances

At this time, a variance is not anticipated for the submittal of this report.



C. Drainage Concept

All proposed runoff will be safely and efficiently conveyed to the proposed storm sewer system, where it will be collected by existing and proposed storage facilities and released at allowable discharge rates at each pond outfall. Water quality treatment will be provided within the EURV ponds. No adverse effects to Happy Canyon Creek or downstream infrastructure are expected as a result of the High Note Regional Park project. Additionally, no impacts are anticipated with respect to stormwater quality, quantity, or timing.

REFERENCES

1. Douglas County Storm Drainage Design and Technical Criteria Manual, amended July 8, 2008
2. Urban Storm Drainage and Technical Criteria Manual (USDCM) Volumes 1, 2, and 3, dated September 1969, updated January 2016.
3. Master Drainage Plan for RidgeGate – Happy Canyon Creek and Badger Gulch Drainage Basins, prepared by Merrick & Company, dated February 2017.
4. Phase III Drainage Report for RidgeGate Southwest Village Filing 1, prepared by JR Engineering, LLC, dated May 2021.

APPENDICES

APPENDIX A – HYDROLOGY

Vicinity Map

Existing Rational Calculations

Existing Drainage Plan

Phase 1 Rational Calculations

Phase 1 Drainage Plan

Final Phase Rational Calculations

Final Phase Drainage Plan

RIDGEGATE PARKWAY

APPROXIMATE PROJECT LOCATION

HAPPY CANYON CREEK FLOODPLAIN

RIDGEGATE SOUTHWEST VILLAGE REGIONAL INFRASTRUCTURE



Google Earth

AN

1000 ft

EXISTING CONDITIONS
RATIONAL CALCULATIONS

PROJECT INFORMATION

PROJECT NAME: High Note Park
 PROJECT NO: 24.1295
 DESIGN BY: JES
 REVIEWED BY: BW
 JURISDICTION: Lone Tree
 REPORT TYPE: North Park Existing Conditions
 DATE: 02/17/26



JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.14	0.20	0.28	0.57	20%
ROOF	0.79	0.81	0.83	0.87	95%
PAVED	0.79	0.81	0.83	0.87	95%
GRAVEL	0.30	0.36	0.43	0.65	40%

TOTAL SITE COMPOSITE	24.83	0.03	0.08	0.17	0.50	5.0%
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SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
EX1	HISTORIC FLOW ANALYSIS	18.40	0.03	0.08	0.17	0.50	5%
SUB-BASIN COMPOSITE		18.40	0.03	0.08	0.17	0.50	5.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
EX2	HISTORIC FLOW ANALYSIS	6.43	0.03	0.08	0.17	0.50	5%
SUB-BASIN COMPOSITE		6.43	0.03	0.08	0.17	0.50	5.0%

TOTAL SITE COMPOSITE	24.83	0.03	0.08	0.17	0.50	5.0%
----------------------	-------	------	------	------	------	------

CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/17/26

STANDARD FORM SF-2
 TIME OF CONCENTRATION SUMMARY
 (RATIONAL METHOD PROCEDURE)

24.1295
 High Note Park

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t _i)			TRAVEL TIME (t _t)					t _c CHECK (URBANIZED BASINS)							REMARKS
BASIN	DESIGN POINT	C _s	AREA ac	LENGTH ft	SLOPE ft/ft	t _i min	LENGTH ft	SLOPE ft/ft	C _v	VEL. fps	t _t min	COMP. t _c	TOT. LENGTH ft	SLOPE ft/ft	Is Project Urban?		tc First DP	tc min	
															Yes				
EX1	EX1	0.08	18.40	50	0.1000	6.1	1100	0.0200	7	0.99	18.5	24.6	1150.0	0.02	5.0%	38.5	24.6		
EX2	EX2	0.08	6.43	50	0.1000	6.1	710	0.0200	7	0.99	12.0	18.1	760.0	0.03	5.0%	33.8	18.1		

*Velocity (V) = C_vS_w^{0.5}

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, C _v
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

*Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5

in which: C_v = Conveyance Coefficient (See Table Above)
 S_w = Watercourse Slope (ft/ft)



CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/17/26

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

JOB NO: 24.1295
 PROJECT: High Note Park
 DESIGN STORM: 5-YEAR
 ONE-HR PRECIP: 1.43

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t _c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t _c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
EX1	EX1	18.40	0.08	24.6	1.39	2.51	3.50					
EX2	EX2	6.43	0.08	18.1	0.49	2.96	1.44					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	1.06	1.43	2.26	2.60

*Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9

*Rainfall Intensity:

$$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:

I = Rainfall Intensity (Inches Per Hour)
 P1 = 1-Hour Point Rainfall Depth (Inches)
 t_c = Time Of Concentration (Minutes)



CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/17/26

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

JOB NO: 24.1295
 PROJECT: High Note Park
 DESIGN STORM: 100-YEAR
 ONE-HR PRECIP: 2.60

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t _c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t _c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
EX1	EX1	18.40	0.50	24.6	9.28	4.57	42.40					
EX2	EX2	6.43	0.50	18.1	3.24	5.39	17.48					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	1.06	1.43	2.26	2.60

*Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9

*Rainfall Intensity:

$$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:

I = Rainfall Intensity (Inches Per Hour)
 P1 = 1-Hour Point Rainfall Depth (Inches)
 t_c = Time Of Concentration (Minutes)



PROJECT: High Note Park
 JOB NO: 24.130
 DATE: 02/17/26



RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C ₅	C ₁₀₀	Q ₅ (CFS)	Q ₁₀₀ (CFS)
EX1	EX1	18.40	5.0%	0.08	0.50	3.50	42.40
EX2	EX2	6.43	5.0%	0.08	0.50	1.44	17.48
SITE COMPOSITE		24.83	5.0%	0.08	0.50	4.95	59.88

PLOT DATE: Wednesday, February 18, 2026 1:08 PM LAST SAVED BY: JSANFORD
DRAWING LOCATION: C:\PALING\24.1295-High Note Park Eng\Drainage\Drainage Plan\Existing Drainage Plan.dwg



HIGH NOTE REGIONAL

NORTH PARK EXISTING DRAINAGE PLAN

No.	Issue / Revision	Date	Name

Job Number	24.1295
Project Manager	BAW
Design By	JES
Drawn By	JES
Principal in Charge	SEP

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Sheet Number:

DP-1

PHASE 1

RATIONAL CALCULATIONS

PROJECT INFORMATION

PROJECT NAME: High Note North Park
 PROJECT NO: 24.1295
 DESIGN BY: JES
 REVIEWED BY: BW
 JURISDICTION: Lone Tree
 REPORT TYPE: North Park (Phase 1 Drainage Plan)
 DATE: 02/12/26



JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.14	0.20	0.28	0.57	20%
ROOF	0.79	0.81	0.83	0.87	95%
PAVED	0.79	0.81	0.83	0.87	95%
GRAVEL	0.30	0.36	0.43	0.65	40%

TOTAL SITE COMPOSITE	20.20	0.41	0.47	0.52	0.70	53.2%
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SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N1.1	DISTURBED SOIL	2.03	0.14	0.20	0.28	0.57	20%
	PAVED	0.74	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		2.77	0.30	0.36	0.43	0.65	40.1%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N1.2	DISTURBED SOIL	0.31	0.14	0.20	0.28	0.57	20%
	PAVED	1.39	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		1.70	0.66	0.70	0.73	0.82	81.5%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N2.1	DISTURBED SOIL	1.00	0.14	0.20	0.28	0.57	20%
	PAVED	0.11	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		1.11	0.20	0.26	0.33	0.60	27.5%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N2.2	DISTURBED SOIL	0.18	0.14	0.20	0.28	0.57	20%
	WATER SURFACES	4.38	0.83	0.85	0.87	0.89	100%
	PAVED	0.11	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		4.67	0.80	0.82	0.84	0.88	96.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N2.3	DISTURBED SOIL	0.50	0.14	0.20	0.28	0.57	20%
	PAVED	0.01	0.79	0.81	0.83	0.87	95%
	WATER SURFACES	0.22	0.83	0.85	0.87	0.89	100%
SUB-BASIN COMPOSITE		0.73	0.34	0.40	0.46	0.67	45.3%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N3.1	DISTURBED SOIL	0.42	0.14	0.20	0.28	0.57	20%
	PAVED	0.03	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.45	0.17	0.23	0.31	0.58	24.4%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N3.2	DISTURBED SOIL	0.25	0.14	0.20	0.28	0.57	20%
	PAVED	0.04	0.79	0.81	0.83	0.87	95%
	PARKS, CEMETERIES	0.25	0.18	0.24	0.32	0.59	25%
SUB-BASIN COMPOSITE		0.53	0.19	0.26	0.33	0.60	27.4%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N3.3	PAVED	0.22	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.22	0.79	0.81	0.83	0.87	95.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N3.4	DISTURBED SOIL	0.02	0.14	0.20	0.28	0.57	20%
	ROOF	0.06	0.79	0.81	0.83	0.87	95%
	PAVED	0.04	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.11	0.67	0.71	0.74	0.82	82.6%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.1	DISTURBED SOIL	0.81	0.14	0.20	0.28	0.57	20%
	PAVED	0.06	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.87	0.18	0.24	0.32	0.59	25.3%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.2	DISTURBED SOIL	1.65	0.14	0.20	0.28	0.57	20%
	PAVED	0.23	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		1.89	0.21	0.27	0.35	0.60	29.3%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.3	DISTURBED SOIL	0.23	0.14	0.20	0.28	0.57	20%
	PAVED	0.22	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.45	0.44	0.49	0.55	0.71	56.3%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.4	DISTURBED SOIL	0.11	0.14	0.20	0.28	0.57	20%
	PAVED	0.07	0.79	0.81	0.83	0.87	95%
	ROOF	0.15	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.32	0.56	0.61	0.65	0.77	70.1%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.5	DISTURBED SOIL	0.28	0.14	0.20	0.28	0.57	20%
	PAVED	0.10	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.39	0.30	0.36	0.43	0.65	40.1%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.6	DISTURBED SOIL	0.46	0.14	0.20	0.28	0.57	20%
	PAVED	0.02	0.79	0.81	0.83	0.87	95%
	GRAVEL	0.08	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		0.56	0.18	0.24	0.32	0.59	25.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.7	DISTURBED SOIL	0.38	0.14	0.20	0.28	0.57	20%
	PAVED	0.11	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.49	0.27	0.34	0.40	0.64	37.1%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N4.8	DISTURBED SOIL	0.17	0.14	0.20	0.28	0.57	20%
	PAVED	0.05	0.79	0.81	0.83	0.87	95%
	GRAVEL	0.04	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		0.26	0.27	0.34	0.40	0.64	37.1%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF1	DISTURBED SOIL	0.34	0.14	0.20	0.28	0.57	20%
	PAVED	0.15	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.49	0.32	0.38	0.45	0.66	42.8%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF2	DISTURBED SOIL	0.42	0.14	0.20	0.28	0.57	20%
SUB-BASIN COMPOSITE		0.42	0.14	0.20	0.28	0.57	20.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF3	DISTURBED SOIL	0.35	0.14	0.20	0.28	0.57	20%
	PAVED	0.02	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.36	0.17	0.23	0.31	0.58	23.9%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF4	DISTURBED SOIL	1.10	0.14	0.20	0.28	0.57	20%
	GRAVEL	0.03	0.30	0.36	0.43	0.65	40%
	PAVED	0.07	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		1.20	0.17	0.24	0.31	0.58	24.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF5	DISTURBED SOIL	0.23	0.14	0.20	0.28	0.57	20%
SUB-BASIN COMPOSITE		0.23	0.14	0.20	0.28	0.57	20.0%

TOTAL SITE COMPOSITE		20.20	0.41	0.47	0.52	0.70	53.2%
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CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/12/26

STANDARD FORM SF-2
 TIME OF CONCENTRATION SUMMARY
 (RATIONAL METHOD PROCEDURE)

24.1295
 High Note North Park

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t _i)			TRAVEL TIME (t _t)					t _c CHECK (URBANIZED BASINS)							REMARKS
BASIN	DESIGN POINT	C _s	AREA ac	LENGTH ft	SLOPE ft/ft	t _i min	LENGTH ft	SLOPE ft/ft	C _v	VEL. fps	t _t min	COMP. t _c	TOT. LENGTH ft	SLOPE ft/ft	Is Project Urban?		tc First DP	tc min	
															Yes	IMP %			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)			
N1.1	N1.1	0.36	2.77	50	0.0200	7.5	650	0.0200	20	2.83	3.8	11.3	700.0	0.02	40.1%	24.4	11.3		
N1.2	N1.2	0.70	1.70	50	0.0200	4.1	325	0.0200	20	2.83	1.9	6.0	375.0	0.02	81.5%	14.0	6.0		
N2.1	N2.1	0.26	1.11	50	0.2500	3.7	150	0.2500	15	7.50	0.3	4.0	200.0	0.25	27.5%	21.7	5.0		
N2.2	N2.2	0.82	4.67	50	0.0080	3.8	625	0.0080	7	0.63	16.6	20.4	675.0	0.01	96.7%	14.7	14.7		
N2.3	N2.3	0.40	0.73	50	0.2500	3.1	25	0.2500	15	7.50	0.1	3.1	75.0	0.25	45.3%	18.4	5.0		
N3.1	N3.1	0.23	0.45	50	0.2500	3.8	25	0.2500	15	7.50	0.1	3.9	75.0	0.25	24.4%	21.9	5.0		
N3.2	N3.2	0.26	0.53	50	0.2500	3.7	80	0.0200	20	2.83	0.5	4.2	130.0	0.11	27.4%	22.1	5.0		
N3.3	N3.3	0.81	0.22	50	0.0200	3.0	50	0.0200	20	2.83	0.3	3.2	100.0	0.02	95.0%	10.1	5.0		
N3.4	N3.4	0.71	0.11	50	0.0200	4.0				0.00	0.0	4.0	50.0	0.02	82.6%		5.0		
N4.1	N4.1	0.24	0.87	50	0.2500	3.8	30	0.2500	15	7.50	0.1	3.9	80.0	0.25	25.3%	21.8	5.0		
N4.2	N4.2	0.27	1.89	50	0.0100	10.5	220	0.0100	10	1.00	3.7	14.2	270.0	0.01	29.3%	23.8	14.2		
N4.3	N4.3	0.49	0.45	50	0.0200	6.2	20	0.2500	15	7.50	0.0	6.2	70.0	0.09	56.3%	16.5	6.2		
N4.4	N4.4	0.61	0.32	50	0.0100	6.3	50	0.0100	10	1.00	0.8	7.1	100.0	0.01	70.1%	14.5	7.1		
N4.5	N4.5	0.36	0.39	50	0.0200	7.5	100	0.0200	20	2.83	0.6	8.1	150.0	0.02	40.1%	20.0	8.1		
N4.6	N4.6	0.24	0.56	50	0.0400	6.9	180	0.0200	20	2.83	1.1	8.0	230.0	0.02	25.7%	23.3	8.0		
N4.7	N4.7	0.34	0.49	50	0.0200	7.7	500	0.0200	20	2.83	2.9	10.7	550.0	0.02	37.1%	23.8	10.7		
N4.8	N4.8	0.34	0.26	50	0.0200	7.7	200	0.0200	20	2.83	1.2	8.9	250.0	0.02	37.1%	21.4	8.9		
OFF1	O1	0.38	0.49	50	0.2500	3.2	150	0.0200	20	2.83	0.9	4.0	200.0	0.08	42.8%	19.9	5.0		
OFF2	O2	0.20	0.42	50	0.2500	4.0	380	0.0200	20	2.83	2.2	6.2	430.0	0.05	20.0%	26.4	6.2		
OFF3	O3	0.23	0.36	50	0.0200	8.8	180	0.0200	20	2.83	1.1	9.9	230.0	0.02	23.9%	23.7	9.9		
OFF4	O4	0.24	1.20	50	0.0600	6.1	160	0.0600	20	4.90	0.5	6.7	210.0	0.06	24.7%	22.7	6.7		
OFF5	O5	0.20	0.23	25	0.2500	2.8				0.00	0.0	2.8	25.0	0.25	20.0%		5.0		

*Velocity (V) = C_sS_w^{0.5}

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, C _v
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

*Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5

in which: C_v = Conveyance Coefficient (See Table Above)
 S_w = Watercourse Slope (ft/ft)



CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/12/26

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

JOB NO: 24.1295
 PROJECT: High Note North Park
 DESIGN STORM: 5-YEAR
 ONE-HR PRECIP: 1.43

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t _c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t _c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
N1.1	N1.1	2.77	0.36	11.3	1.00	3.68	3.69					
N1.2	N1.2	1.70	0.70	6.0	1.19	4.61	5.49					
N2.1	N2.1	1.11	0.26	5.0	0.29	4.85	1.40					
N2.2	N2.2	4.67	0.82	14.7	3.84	3.28	12.58					
N2.3	N2.3	0.73	0.40	5.0	0.29	4.85	1.42					
N3.1	N3.1	0.45	0.23	5.0	0.10	4.85	0.51					
N3.2	N3.2	0.53	0.26	5.0	0.14	4.85	0.67					
N3.3	N3.3	0.22	0.81	5.0	0.18	4.85	0.86					
N3.4	N3.4	0.11	0.71	5.0	0.08	4.85	0.39					
N4.1	N4.1	0.87	0.24	5.0	0.21	4.85	1.02					
N4.2	N4.2	1.89	0.27	14.2	0.52	3.33	1.72					
N4.3	N4.3	0.45	0.49	6.2	0.22	4.56	1.00					
N4.4	N4.4	0.32	0.61	7.1	0.19	4.37	0.84					
N4.5	N4.5	0.39	0.36	8.1	0.14	4.19	0.58					
N4.6	N4.6	0.56	0.24	8.0	0.14	4.21	0.58					
N4.7	N4.7	0.49	0.34	10.7	0.17	3.77	0.63					
N4.8	N4.8	0.26	0.34	8.9	0.09	4.04	0.35					
OFF1	O1	0.49	0.38	5.0	0.19	4.85	0.90					
OFF2	O2	0.42	0.20	6.2	0.08	4.56	0.38					
OFF3	O3	0.36	0.23	9.9	0.08	3.88	0.33					
OFF4	O4	1.20	0.24	6.7	0.28	4.47	1.26					
OFF5	O5	0.23	0.20	5.0	0.05	4.85	0.22					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	1.06	1.43	2.26	2.60

*Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9

*Rainfall Intensity:

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

In Which:

I = Rainfall Intensity (Inches Per Hour)
 P1 = 1-Hour Point Rainfall Depth (Inches)
 tc = Time Of Concentration (Minutes)



CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/12/26

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

JOB NO: 24.1295
 PROJECT: High Note North Park
 DESIGN STORM: 100-YEAR
 ONE-HR PRECIP: 2.60

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t _c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t _c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
N1.1	N1.1	2.77	0.65	11.3	1.80	6.69	12.01					
N1.2	N1.2	1.70	0.82	6.0	1.39	8.39	11.66					
N2.1	N2.1	1.11	0.60	5.0	0.66	8.82	5.85					
N2.2	N2.2	4.67	0.88	14.7	4.10	5.95	24.44					
N2.3	N2.3	0.73	0.67	5.0	0.49	8.82	4.29					
N3.1	N3.1	0.45	0.58	5.0	0.26	8.82	2.30					
N3.2	N3.2	0.53	0.60	5.0	0.32	8.82	2.80					
N3.3	N3.3	0.22	0.87	5.0	0.19	8.82	1.68					
N3.4	N3.4	0.11	0.82	5.0	0.09	8.82	0.83					
N4.1	N4.1	0.87	0.59	5.0	0.51	8.82	4.50					
N4.2	N4.2	1.89	0.60	14.2	1.14	6.05	6.89					
N4.3	N4.3	0.45	0.71	6.2	0.32	8.30	2.64					
N4.4	N4.4	0.32	0.77	7.1	0.25	7.94	1.95					
N4.5	N4.5	0.39	0.65	8.1	0.25	7.61	1.90					
N4.6	N4.6	0.56	0.59	8.0	0.33	7.65	2.53					
N4.7	N4.7	0.49	0.64	10.7	0.31	6.85	2.15					
N4.8	N4.8	0.26	0.64	8.9	0.16	7.35	1.20					
OFF1	O1	0.49	0.66	5.0	0.32	8.82	2.82					
OFF2	O2	0.42	0.57	6.2	0.24	8.29	1.97					
OFF3	O3	0.36	0.58	9.9	0.21	7.06	1.50					
OFF4	O4	1.20	0.58	6.7	0.70	8.12	5.68					
OFF5	O5	0.23	0.57	5.0	0.13	8.82	1.16					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	1.06	1.43	2.26	2.60

*Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9

*Rainfall Intensity:

$$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:

I = Rainfall Intensity (Inches Per Hour)
 P1 = 1-Hour Point Rainfall Depth (Inches)
 tc = Time Of Concentration (Minutes)

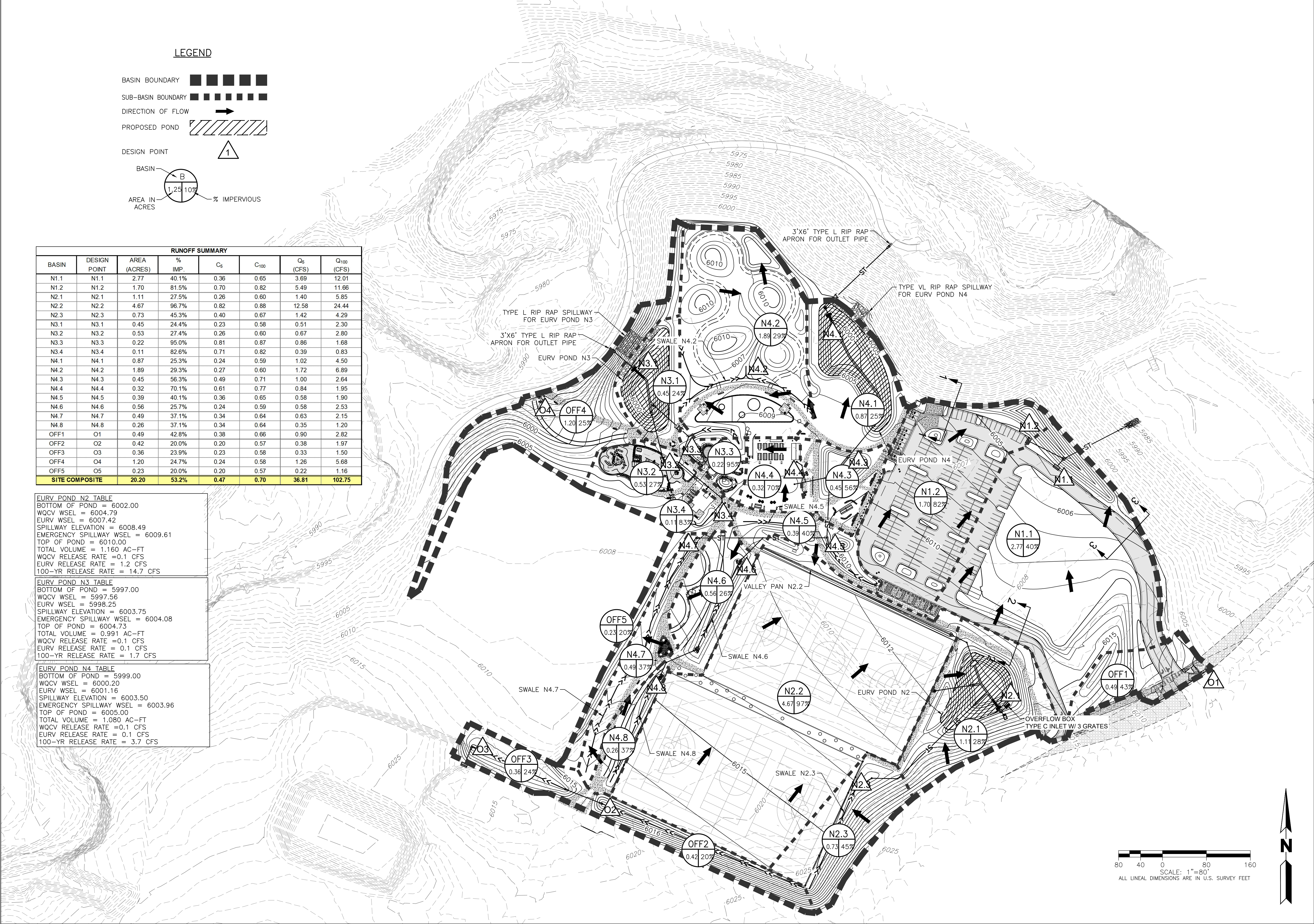


PROJECT: High Note North Park
 JOB NO: 24.130
 DATE: 02/12/26



RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C ₅	C ₁₀₀	Q ₅ (CFS)	Q ₁₀₀ (CFS)
N1.1	N1.1	2.77	40.1%	0.36	0.65	3.69	12.01
N1.2	N1.2	1.70	81.5%	0.70	0.82	5.49	11.66
N2.1	N2.1	1.11	27.5%	0.26	0.60	1.40	5.85
N2.2	N2.2	4.67	96.7%	0.82	0.88	12.58	24.44
N2.3	N2.3	0.73	45.3%	0.40	0.67	1.42	4.29
N3.1	N3.1	0.45	24.4%	0.23	0.58	0.51	2.30
N3.2	N3.2	0.53	27.4%	0.26	0.60	0.67	2.80
N3.3	N3.3	0.22	95.0%	0.81	0.87	0.86	1.68
N3.4	N3.4	0.11	82.6%	0.71	0.82	0.39	0.83
N4.1	N4.1	0.87	25.3%	0.24	0.59	1.02	4.50
N4.2	N4.2	1.89	29.3%	0.27	0.60	1.72	6.89
N4.3	N4.3	0.45	56.3%	0.49	0.71	1.00	2.64
N4.4	N4.4	0.32	70.1%	0.61	0.77	0.84	1.95
N4.5	N4.5	0.39	40.1%	0.36	0.65	0.58	1.90
N4.6	N4.6	0.56	25.7%	0.24	0.59	0.58	2.53
N4.7	N4.7	0.49	37.1%	0.34	0.64	0.63	2.15
N4.8	N4.8	0.26	37.1%	0.34	0.64	0.35	1.20
OFF1	O1	0.49	42.8%	0.38	0.66	0.90	2.82
OFF2	O2	0.42	20.0%	0.20	0.57	0.38	1.97
OFF3	O3	0.36	23.9%	0.23	0.58	0.33	1.50
OFF4	O4	1.20	24.7%	0.24	0.58	1.26	5.68
OFF5	O5	0.23	20.0%	0.20	0.57	0.22	1.16
SITE COMPOSITE		20.20	53.2%	0.47	0.70	36.81	102.75

PLOT DATE: Thursday, February 19, 2026 8:35 PM LAST SAVED BY: JSANFORD
DRAWING LOCATION: C:\PALING\24.1295-High Note Park Eng\Drainage\Phase 1 Drainage Plan.dwg



HIGH NOTE REGIONAL

No.	Issue / Revision	Date	Name

Job Number	24.1295
Project Manager	BAW
Design By	JES
Drawn By	JES
Principal In Charge	SEP

Sheet Number:

DP-2

NORTH PARK
PHASE 1 DRAINAGE PLAN

NOT FOR CONSTRUCTION

FINAL PHASE RATIONAL CALCULATIONS

PROJECT INFORMATION

PROJECT NAME: High Note North Park
 PROJECT NO: 24.1295
 DESIGN BY: JES
 REVIEWED BY: BW
 JURISDICTION: Lone Tree
 REPORT TYPE: North Park (Final Phase)
 DATE: 02/18/26



JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.14	0.20	0.28	0.57	20%
ROOF	0.79	0.81	0.83	0.87	95%
PAVED	0.79	0.81	0.83	0.87	95%
GRAVEL	0.30	0.36	0.43	0.65	40%

TOTAL SITE COMPOSITE	24.83	0.59	0.64	0.67	0.79	73.8%
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SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N1.1	DISTURBED SOIL	0.62	0.14	0.20	0.28	0.57	20%
	PAVED	2.02	0.79	0.81	0.83	0.87	95%
	ROOF	0.13	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		2.77	0.63	0.67	0.71	0.80	78.2%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N1.2	DISTURBED SOIL	0.31	0.14	0.20	0.28	0.57	20%
	PAVED	1.39	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		1.70	0.66	0.70	0.73	0.82	81.5%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N-2	DISTURBED SOIL	1.51	0.14	0.20	0.28	0.57	20%
	WATER SURFACES	4.60	0.83	0.85	0.87	0.89	100%
	PAVED	0.40	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		6.51	0.66	0.70	0.73	0.82	81.2%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N-3	DISTURBED SOIL	0.45	0.14	0.20	0.28	0.57	20%
	ROOF	0.06	0.79	0.81	0.83	0.87	95%
	PAVED	0.46	0.79	0.81	0.83	0.87	95%
	WATER SURFACES	4.56	0.83	0.85	0.87	0.89	100%
	PARKS, CEMETERIES	0.25	0.18	0.24	0.32	0.59	25%
	GRAVEL	0.01	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		5.78	0.74	0.77	0.79	0.85	90.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N-4	DISTURBED SOIL	2.35	0.14	0.20	0.28	0.57	20%
	PAVED	0.74	0.79	0.81	0.83	0.87	95%
	ROOF	0.15	0.79	0.81	0.83	0.87	95%
	WATER SURFACES	2.24	0.83	0.85	0.87	0.89	100%
	GRAVEL	0.12	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		5.60	0.51	0.56	0.60	0.75	64.3%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF1	DISTURBED SOIL	0.34	0.14	0.20	0.28	0.57	20%
	PAVED	0.15	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.49	0.32	0.39	0.45	0.66	43.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF2	DISTURBED SOIL	0.42	0.14	0.20	0.28	0.57	20%
SUB-BASIN COMPOSITE		0.42	0.14	0.20	0.28	0.57	20.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF3	DISTURBED SOIL	0.34	0.14	0.20	0.28	0.57	20%
	PAVED	0.02	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		0.36	0.17	0.23	0.31	0.58	24.2%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
OFF4	DISTURBED SOIL	1.10	0.14	0.20	0.28	0.57	20%
	GRAVEL	0.03	0.30	0.36	0.43	0.65	40%
	PAVED	0.07	0.79	0.81	0.83	0.87	95%
SUB-BASIN COMPOSITE		1.20	0.18	0.24	0.31	0.59	24.9%

TOTAL SITE COMPOSITE		24.83	0.59	0.64	0.67	0.79	73.8%
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CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/18/26

STANDARD FORM SF-2
 TIME OF CONCENTRATION SUMMARY
 (RATIONAL METHOD PROCEDURE)

24.1295
 High Note North Park

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t _i)			TRAVEL TIME (t _t)					t _c CHECK (URBANIZED BASINS)							REMARKS
BASIN	DESIGN POINT	C _s	AREA ac	LENGTH ft	SLOPE ft/ft	t _i min	LENGTH ft	SLOPE ft/ft	C _v	VEL. fps	t _t min	COMP. t _c	TOT. LENGTH ft	SLOPE ft/ft	Is Project Urban?		tc First DP	tc min	
															Yes	IMP %			
															(1)	(2)			
N1.1	N1.1	0.67	2.77	50	0.0200	4.3	650	0.0200	20	2.83	3.8	8.2	700.0	0.02	78.2%	16.6	8.2		
N1.2	N1.2	0.70	1.70	50	0.0200	4.1	325	0.0200	20	2.83	1.9	6.0	375.0	0.02	81.5%	14.0	6.0		
N-2	N2	0.70	6.51	50	0.0080	5.5	325	0.0200	20	2.83	1.9	7.5	375.0	0.02	81.2%	14.1	7.5		
N-3	N3	0.77	5.78	50	0.0200	3.4	650	0.0300	20	3.46	3.1	6.5	700.0	0.03	90.0%	13.6	6.5		
N-4	N4	0.56	5.60	50	0.0200	5.5	440	0.0200	20	2.83	2.6	8.1	490.0	0.02	64.3%	18.0	8.1		
OFF1	O1	0.39	0.49	50	0.2500	3.2	150	0.0200	20	2.83	0.9	4.0	200.0	0.08	43.0%	19.9	5.0		
OFF2	O2	0.20	0.42	50	0.2500	4.0	380	0.0200	20	2.83	2.2	6.2	430.0	0.05	20.0%	26.4	6.2		
OFF3	O3	0.23	0.36	50	0.0200	8.8	180	0.0200	20	2.83	1.1	9.9	230.0	0.02	24.2%	23.6	9.9		
OFF4	O4	0.24	1.20	50	0.0600	6.1	160	0.0200	20	2.83	0.9	7.0	210.0	0.03	24.9%	23.3	7.0		

*Velocity (V) = C_sS_w^{0.5}

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, C _v
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

*Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5

in which: C_v = Conveyance Coefficient (See Table Above)
 S_w = Watercourse Slope (ft/ft)



CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/18/26

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

JOB NO: 24.1295
 PROJECT: High Note North Park
 DESIGN STORM: 5-YEAR
 ONE-HR PRECIP: 1.43

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t _c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t _c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
N1.1	N1.1	2.77	0.67	8.2	1.86	4.17	7.77					
N1.2	N1.2	1.70	0.70	6.0	1.19	4.61	5.49					
N-2	N2	6.51	0.70	7.5	4.54	4.30	19.52					
N-3	N3	5.78	0.77	6.5	4.44	4.50	20.01					
N-4	N4	5.60	0.56	8.1	3.13	4.19	13.10					
OFF1	O1	0.49	0.39	5.0	0.19	4.85	0.92					
OFF2	O2	0.42	0.20	6.2	0.08	4.56	0.38					
OFF3	O3	0.36	0.23	9.9	0.08	3.89	0.32					
OFF4	O4	1.20	0.24	7.0	0.29	4.39	1.25					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	1.06	1.43	2.26	2.60

*Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9

*Rainfall Intensity:

$$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:

I = Rainfall Intensity (Inches Per Hour)
 P1 = 1-Hour Point Rainfall Depth (Inches)
 t_c = Time Of Concentration (Minutes)



CALCULATED BY: JES
 CHECKED BY: BW
 DATE: 02/18/26

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

JOB NO: 24.1295
 PROJECT: High Note North Park
 DESIGN STORM: 100-YEAR
 ONE-HR PRECIP: 2.60

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t _c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t _c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
N1.1	N1.1	2.77	0.80	8.2	2.23	7.58	16.90					
N1.2	N1.2	1.70	0.82	6.0	1.39	8.39	11.66					
N-2	N2	6.51	0.82	7.5	5.31	7.83	41.58					
N-3	N3	5.78	0.85	6.5	4.93	8.19	40.33					
N-4	N4	5.60	0.75	8.1	4.18	7.61	31.84					
OFF1	O1	0.49	0.66	5.0	0.32	8.82	2.85					
OFF2	O2	0.42	0.57	6.2	0.24	8.29	1.97					
OFF3	O3	0.36	0.58	9.9	0.21	7.07	1.48					
OFF4	O4	1.20	0.59	7.0	0.70	7.98	5.61					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	1.06	1.43	2.26	2.60

*Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9

*Rainfall Intensity:

$$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:

I = Rainfall Intensity (Inches Per Hour)
 P1 = 1-Hour Point Rainfall Depth (Inches)
 t_c = Time Of Concentration (Minutes)



PROJECT: High Note North Park
JOB NO: 24.130
DATE: 02/18/26



RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C ₅	C ₁₀₀	Q ₅ (CFS)	Q ₁₀₀ (CFS)
N1.1	N1.1	2.77	78.2%	0.67	0.80	7.77	16.90
N1.2	N1.2	1.70	81.5%	0.70	0.82	5.49	11.66
N-2	N2	6.51	81.2%	0.70	0.82	19.52	41.58
N-3	N3	5.78	90.0%	0.77	0.85	20.01	40.33
N-4	N4	5.60	64.3%	0.56	0.75	13.10	31.84
OFF1	O1	0.49	43.0%	0.39	0.66	0.92	2.85
OFF2	O2	0.42	20.0%	0.20	0.57	0.38	1.97
OFF3	O3	0.36	24.2%	0.23	0.58	0.32	1.48
OFF4	O4	1.20	24.9%	0.24	0.59	1.25	5.61
SITE COMPOSITE		24.83	73.8%	0.64	0.79	68.76	154.22

NORTH PARK
FINAL PHASE

Job Number	24.1295
Project Manager	BAW
Design By	JES
Drawn By	JES
Principal In Charge	SEP

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DP-3



APPENDIX B – HYDRAULICS

Inlet Calculations

Swale Calculations

Roadway Calculations

Rip Rap Design

Forebay Calculations

Stormcad Calculations

INLET CALCS

INLET MANAGEMENT

Project: High Note Park

Minor: 2-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet A1	Inlet A2
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening
Number of Inlet Units	2	2

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	7.77	5.49
Major Peak Flow, Q (cfs)	16.90	11.66

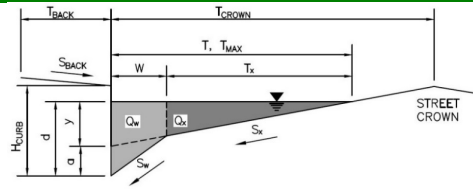
Bypass (Carry-Over) Flow from Upstream

Inlets must be organized from upstream (left) to downstream (right) in order for bypass

Receive Bypass Flow from:		
Bypass Flow Description (Optional):		
Minor Bypass Flow Received, Q _b (cfs)		
Major Bypass Flow Received, Q _b (cfs)		

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	7.77	5.49
Major Total Design Peak Flow, Q (cfs)	16.90	11.66
Minor Inlet Interception Capacity, Q _a (cfs)	8.28	6.56
Major Inlet Interception Capacity, Q _a (cfs)	18.33	12.22
Minor Flow Bypassed Downstream, Q _b (cfs)	N/A	N/A
Major Flow Bypassed Downstream, Q _b (cfs)	N/A	N/A
Minor Flow Capture Percentage, C%	100%	100%
Major Flow Capture Percentage, C%	100%	100%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)****Project: High Note Park****Inlet ID: Inlet A1****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$$\begin{aligned} T_{BACK} &= 7.0 \text{ ft} \\ S_{BACK} &= 0.020 \text{ ft/ft} \\ n_{BACK} &= 0.020 \end{aligned}$$

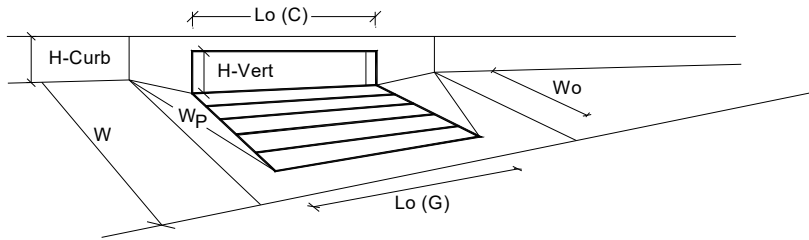
$$\begin{aligned} H_{CURB} &= 6.00 \text{ inches} \\ T_{CROWN} &= 40.0 \text{ ft} \\ W &= 2.00 \text{ ft} \\ S_x &= 0.020 \text{ ft/ft} \\ S_w &= 0.083 \text{ ft/ft} \\ S_o &= 0.000 \text{ ft/ft} \\ n_{STREET} &= 0.013 \end{aligned}$$

	Minor Storm	Major Storm	
T_{MAX}	20.0	40.0	ft
d_{MAX}	6.0	8.5	inches
	☐	☐	

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)



Design Information (Input)

CDOT Type R Curb Opening

Type of Inlet

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Open Area Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Grated Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

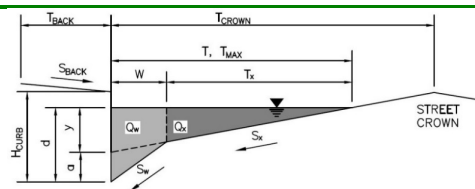
Combination Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	2	2	
Ponding Depth =	6.0	8.5	inches
	MINOR	MAJOR	
L_o (G) =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
C_r (G) =	N/A	N/A	
C_w (G) =	N/A	N/A	
C_o (G) =	N/A	N/A	
	MINOR	MAJOR	
L_o (C) =	5.00	5.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
C_r (C) =	0.10	0.10	
C_w (C) =	3.60	3.60	
C_o (C) =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.33	0.54	ft
RF_{Grate} =	N/A	N/A	
RF_{Curb} =	0.93	1.00	
$RF_{Combination}$ =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	8.3	18.3	cfs
$Q_{PEAK REQUIRED}$ =	7.8	16.9	cfs

☐ Override Depths

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)****Project: High Note Park****Inlet ID: Inlet A2****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$T_{BACK} =$	10.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.020	

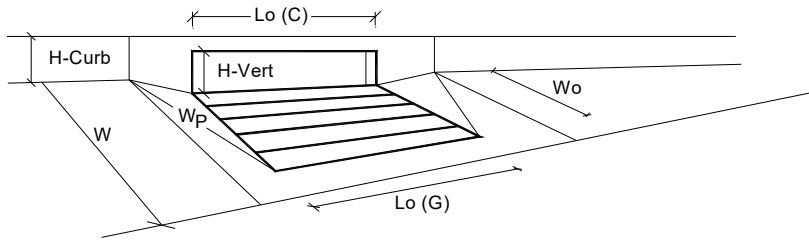
$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	40.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.013	

	Minor Storm	Major Storm	
$T_{MAX} =$	30.0	40.0	ft
$d_{MAX} =$	5.5	7.0	inches
	☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

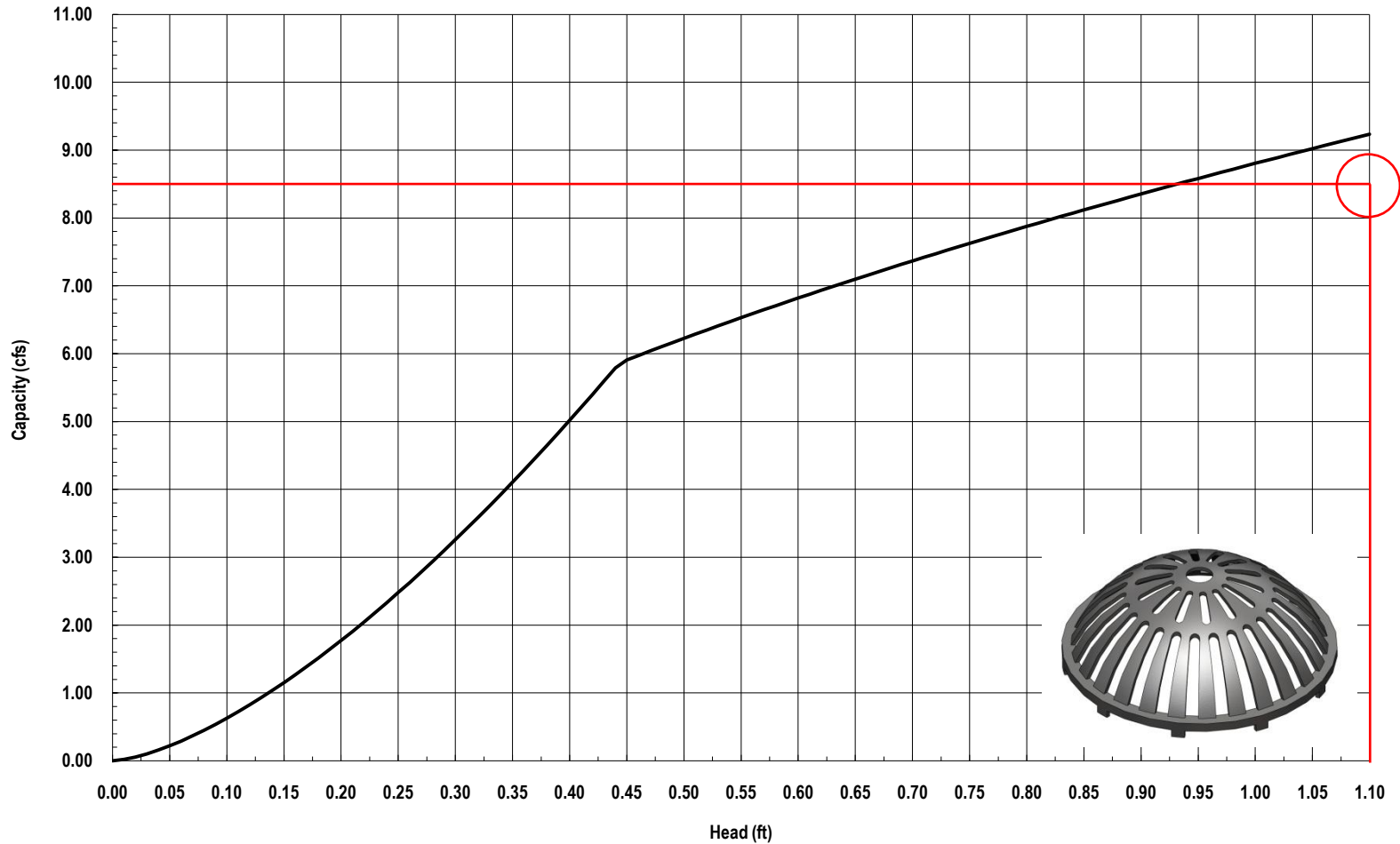
MHFD-Inlet, Version 6.00 (August 2025)



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' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	7.0	inches
<u>Grate Information</u>		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G)$ =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area 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)		$C_r (G)$ =	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	
<u>Curb Opening Information</u>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		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)		$C_r (C)$ =	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	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.29	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.90	0.99	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q_a =	6.6	12.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED}$ =	5.5	11.7	cfs

INLET B4
AVAILABLE HEAD = 2.01 ft
TRIBUTARY BASIN = N2.3
Q100 = 4.29 CFS
Q100x2 = 8.58 CFS

Nyloplast 24" Dome Grate Inlet Capacity Chart

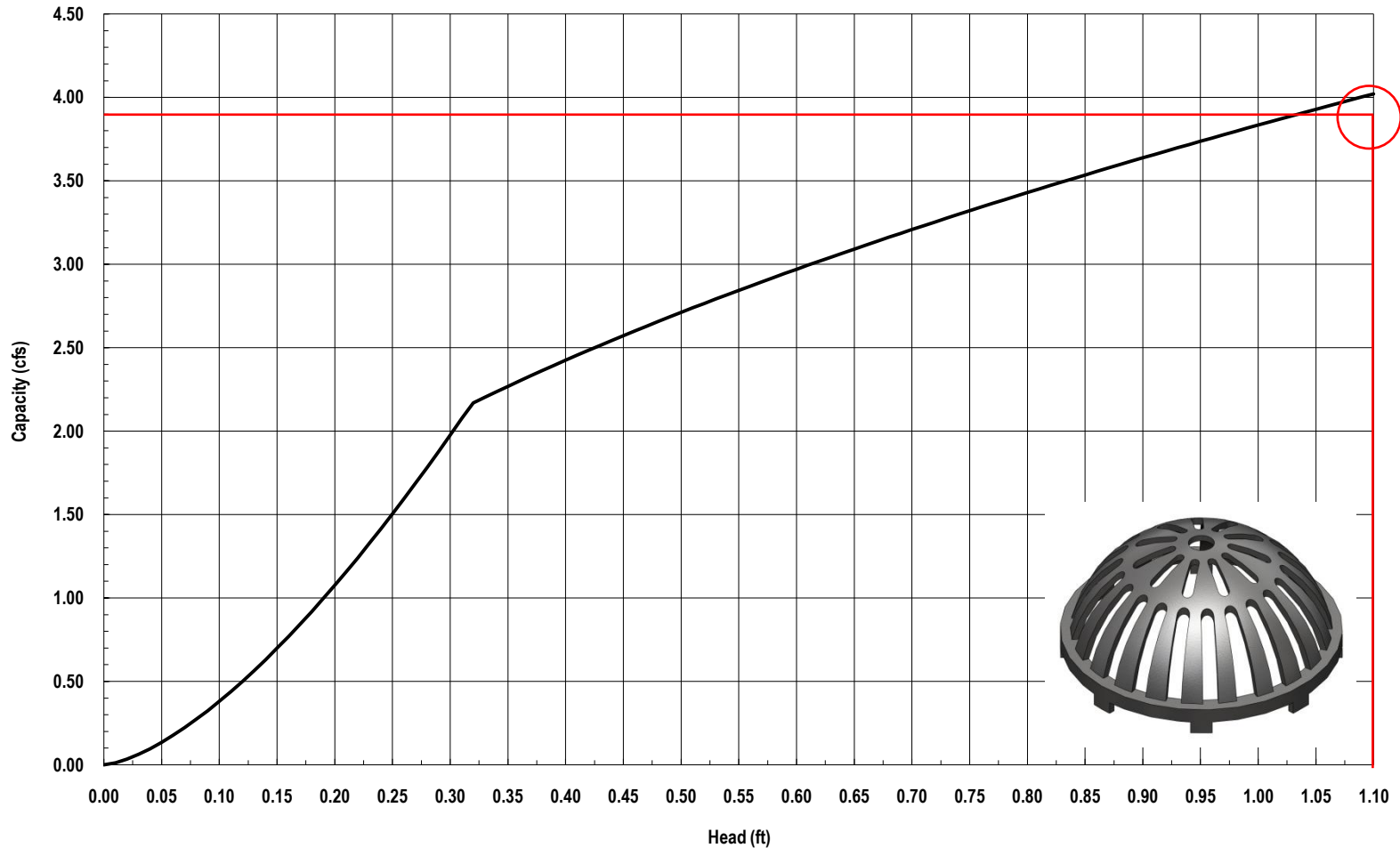


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INLET C4
AVAILABLE HEAD = 2.34 ft
TRIBUTARY BASIN = N4.5
Q100 = 1.90 CFS
Q100x2 = 3.80 CFS

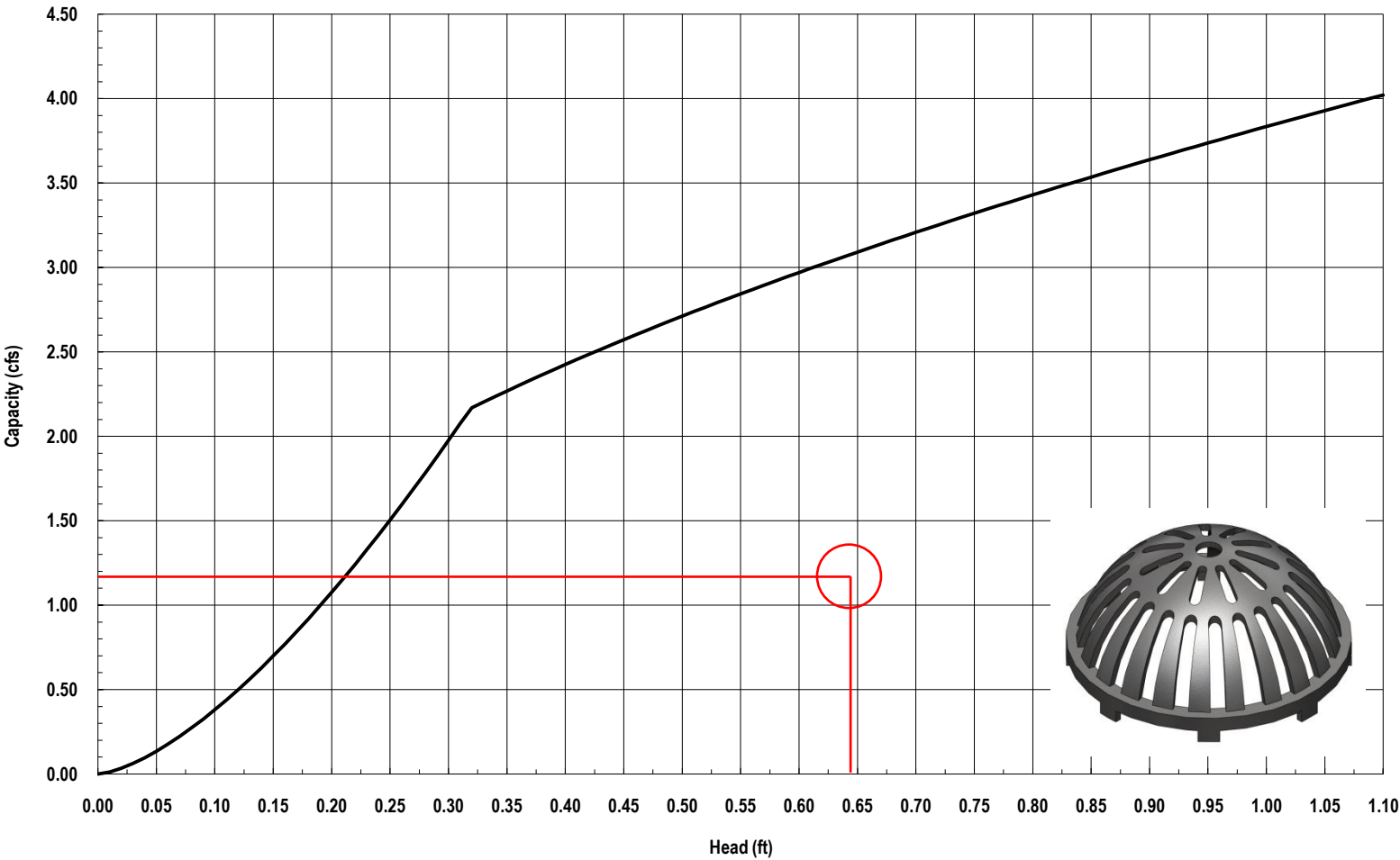
Nyloplast 15" Dome Grate Inlet Capacity Chart



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INLET D3.1
AVAILABLE HEAD = 0.64 ft
TRIBUTARY BASIN = 20% OF N3.2
Q100 = 0.56 CFS
Q100x2 = 1.12 CFS

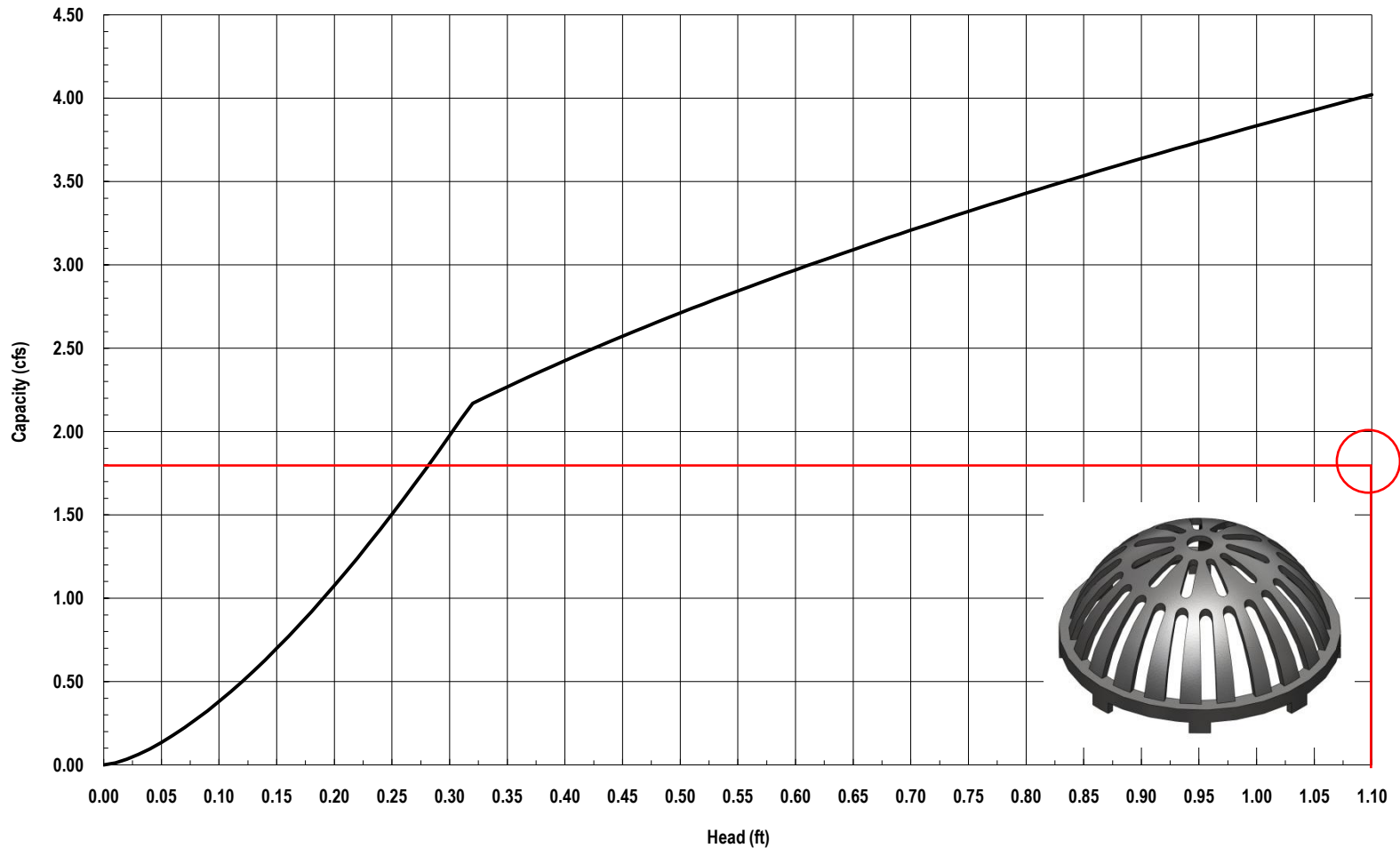
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INLET D3.2
AVAILABLE HEAD = 1.50 ft
TRIBUTARY BASIN = N3.4
Q100 = 0.89 CFS
Q100x2 = 1.76 CFS

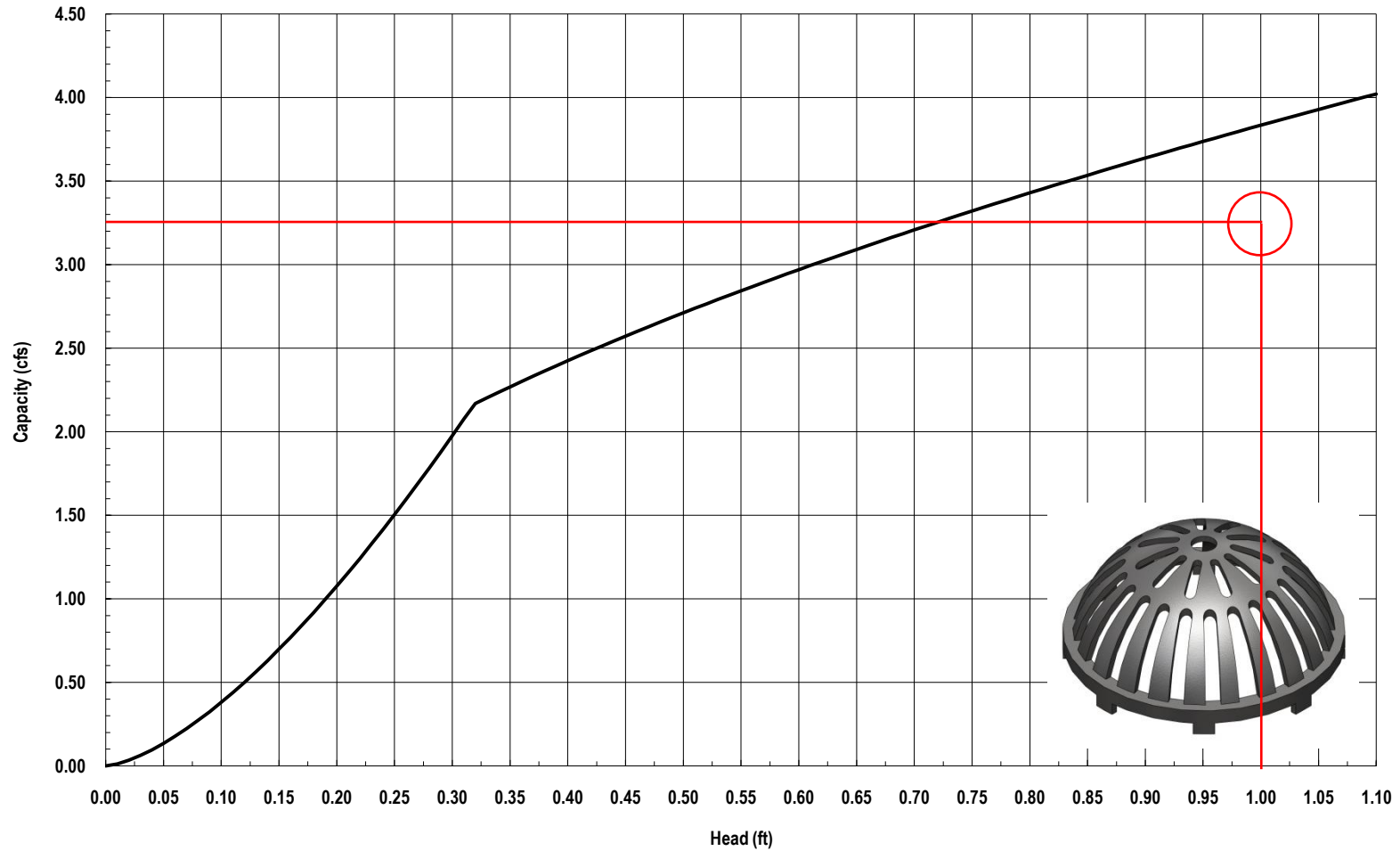
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INLET D3
AVAILABLE HEAD = 1.00 ft
TRIBUTARY BASIN = N3.3
Q100 = 1.68 CFS
Q100x2 = 3.36 CFS

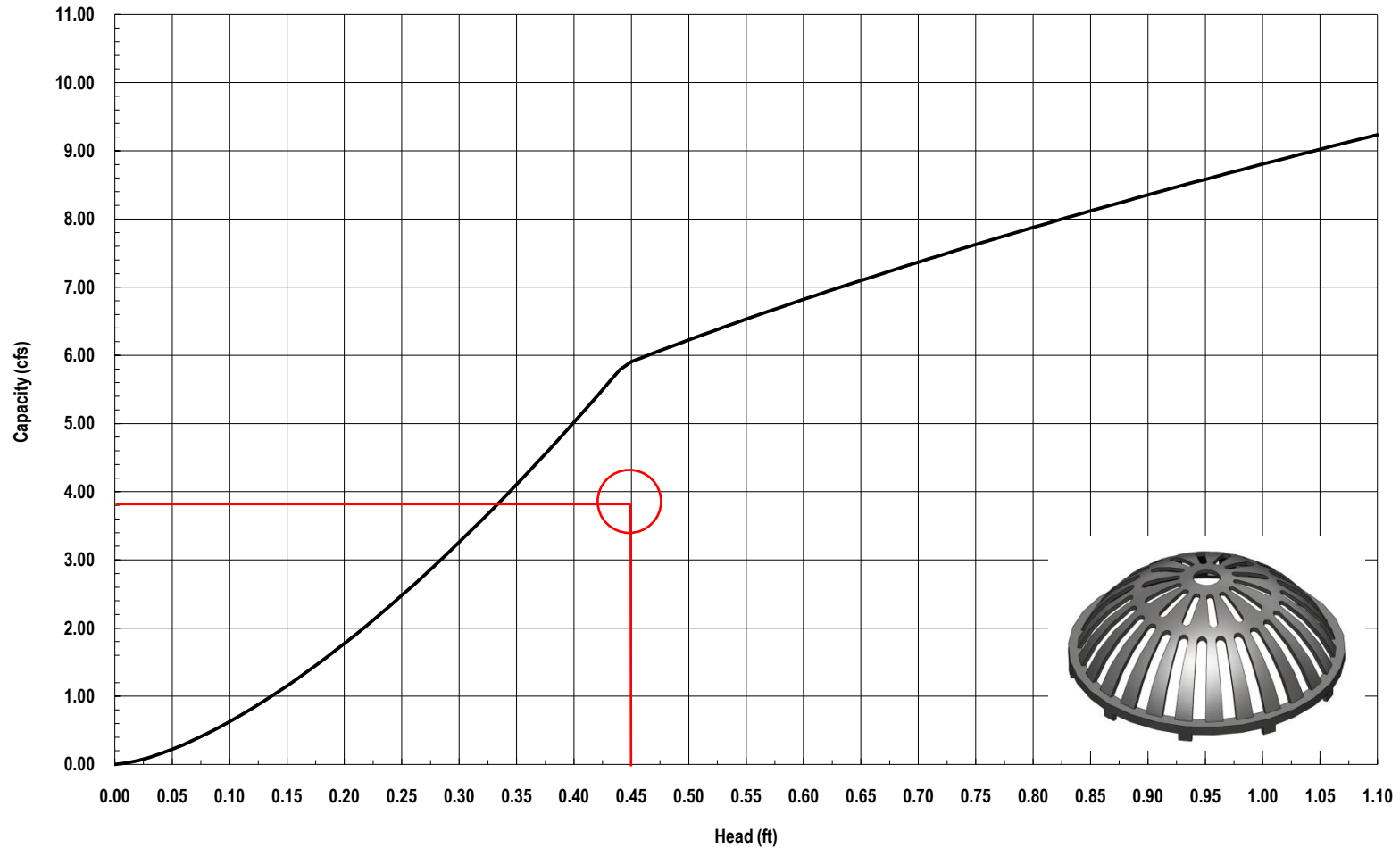
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INLET C3
AVAILABLE HEAD = 0.45 ft
TRIBUTARY BASIN = N4.4
Q100 = 1.95 CFS
Q100x2 = 3.90 CFS

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SWALE CALCS

SWALE N2.2

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.500 %
Discharge	24.44 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	6,011.65
0+08	6,011.53
0+16	6,009.08
0+17	6,009.00
0+18	6,009.08
0+24	6,011.06

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 6,011.65)	(0+08, 6,011.53)	0.030
(0+08, 6,011.53)	(0+16, 6,009.08)	0.030
(0+16, 6,009.08)	(0+17, 6,009.00)	0.013
(0+17, 6,009.00)	(0+18, 6,009.08)	0.013
(0+18, 6,009.08)	(0+24, 6,011.06)	0.030

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

Results	
Normal Depth	16.3 in
Roughness Coefficient	0.028
Elevation	6,010.36 ft
Elevation Range	6,009.0 to 6,011.7 ft
Flow Area	7.8 ft ²
Wetted Perimeter	10.5 ft
Hydraulic Radius	8.9 in
Top Width	10.06 ft
Normal Depth	16.3 in
Critical Depth	13.2 in
Critical Slope	1.351 %

24" AVAILABLE

SWALE N2.2

Results

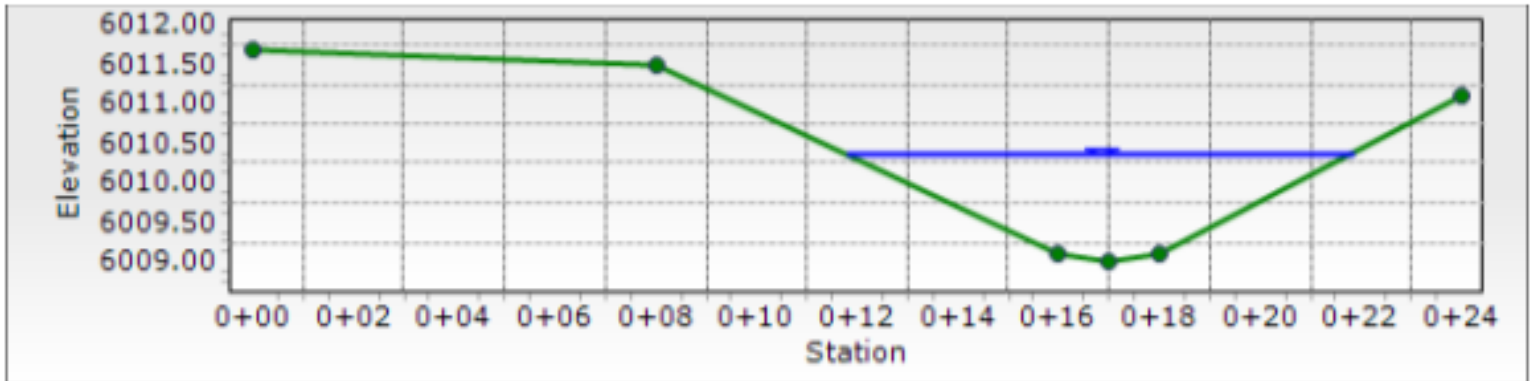
Velocity	3.13 ft/s
Velocity Head	0.15 ft
Specific Energy	1.51 ft
Froude Number	0.627
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	16.3 in
Critical Depth	13.2 in
Channel Slope	0.500 %
Critical Slope	1.351 %



SWALE N2.3

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	2.000 %
Left Side Slope	23.000 %
Right Side Slope	15.000 %
Discharge	4.23 cfs
Results	
Normal Depth	6.6 in
Flow Area	1.7 ft ²
Wetted Perimeter	6.2 ft
Hydraulic Radius	3.3 in
Top Width	6.08 ft
Critical Depth	6.2 in
Critical Slope	2.868 %
Velocity	2.52 ft/s
Velocity Head	0.10 ft
Specific Energy	0.65 ft
Froude Number	0.845
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	6.6 in
Critical Depth	6.2 in
Channel Slope	2.000 %
Critical Slope	2.868 %

30" AVAILABLE

SWALE N4.2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.260 %
Left Side Slope	5.000 %
Right Side Slope	19.000 %
Discharge	2.00 cfs
Results	
Normal Depth	4.0 in
Flow Area	1.4 ft ²
Wetted Perimeter	8.4 ft
Hydraulic Radius	2.0 in
Top Width	8.39 ft
Critical Depth	3.3 in
Critical Slope	3.482 %
Velocity	1.44 ft/s
Velocity Head	0.03 ft
Specific Energy	0.36 ft
Froude Number	0.621
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	4.0 in
Critical Depth	3.3 in
Channel Slope	1.260 %
Critical Slope	3.482 %

24" AVAILABLE

SWALE N4.5.1

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	0.800 %
Left Side Slope	7.000 %
Right Side Slope	25.000 %
Discharge	0.85 cfs
Results	
Normal Depth	3.6 in
Flow Area	0.8 ft ²
Wetted Perimeter	5.5 ft
Hydraulic Radius	1.8 in
Top Width	5.42 ft
Critical Depth	2.7 in
Critical Slope	3.758 %
Velocity	1.06 ft/s
Velocity Head	0.02 ft
Specific Energy	0.31 ft
Froude Number	0.484
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	3.6 in
Critical Depth	2.7 in
Channel Slope	0.800 %
Critical Slope	3.758 %

9" AVAILABLE

SWALE N4.5.2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	2.000 %
Left Side Slope	25.000 %
Right Side Slope	25.000 %
Discharge	0.85 cfs
Results	
Normal Depth	4.1 in
Flow Area	0.5 ft ²
Wetted Perimeter	2.8 ft
Hydraulic Radius	2.0 in
Top Width	2.74 ft
Critical Depth	3.7 in
Critical Slope	3.464 %
Velocity	1.81 ft/s
Velocity Head	0.05 ft
Specific Energy	0.39 ft
Froude Number	0.773
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	4.1 in
Critical Depth	3.7 in
Channel Slope	2.000 %
Critical Slope	3.464 %

16" AVAILABLE

SWALE N4.6

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.000 %
Left Side Slope	5.000 %
Right Side Slope	25.000 %
Discharge	2.53 cfs
Results	
Normal Depth	4.6 in
Flow Area	1.8 ft ²
Wetted Perimeter	9.3 ft
Hydraulic Radius	2.3 in
Top Width	9.27 ft
Critical Depth	3.7 in
Critical Slope	3.358 %
Velocity	1.41 ft/s
Velocity Head	0.03 ft
Specific Energy	0.42 ft
Froude Number	0.567
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	4.6 in
Critical Depth	3.7 in
Channel Slope	1.000 %
Critical Slope	3.358 %

16" AVAILABLE

SWALE N4.7

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.680 %
Left Side Slope	8.500 %
Right Side Slope	18.500 %
Discharge	2.15 cfs
Results	
Normal Depth	4.5 in
Flow Area	1.2 ft ²
Wetted Perimeter	6.5 ft
Hydraulic Radius	2.2 in
Top Width	6.42 ft
Critical Depth	4.0 in
Critical Slope	3.289 %
Velocity	1.79 ft/s
Velocity Head	0.05 ft
Specific Energy	0.42 ft
Froude Number	0.730
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	4.5 in
Critical Depth	4.0 in
Channel Slope	1.680 %
Critical Slope	3.289 %

16" AVAILABLE

SWALE N4.8

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	2.000 %
Left Side Slope	10.000 %
Right Side Slope	23.000 %
Discharge	1.20 cfs
Results	
Normal Depth	3.7 in
Flow Area	0.7 ft ²
Wetted Perimeter	4.5 ft
Hydraulic Radius	1.8 in
Top Width	4.47 ft
Critical Depth	3.4 in
Critical Slope	3.488 %
Velocity	1.72 ft/s
Velocity Head	0.05 ft
Specific Energy	0.36 ft
Froude Number	0.771
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	3.7 in
Critical Depth	3.4 in
Channel Slope	2.000 %
Critical Slope	3.488 %

18" AVAILABLE

SWALE 02

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.000 %
Left Side Slope	25.000 %
Right Side Slope	25.000 %
Discharge	1.97 cfs
Results	
Normal Depth	6.4 in
Flow Area	1.1 ft ²
Wetted Perimeter	4.4 ft
Hydraulic Radius	3.1 in
Top Width	4.27 ft
Critical Depth	5.2 in
Critical Slope	3.097 %
Velocity	1.73 ft/s
Velocity Head	0.05 ft
Specific Energy	0.58 ft
Froude Number	0.589
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	6.4 in
Critical Depth	5.2 in
Channel Slope	1.000 %
Critical Slope	3.097 %

24" AVAILABLE



SWALE 03

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.000 %
Left Side Slope	17.000 %
Right Side Slope	6.000 %
Discharge	3.47 cfs
Results	
Normal Depth	5.3 in
Flow Area	2.2 ft ²
Wetted Perimeter	10.1 ft
Hydraulic Radius	2.7 in
Top Width	10.04 ft
Critical Depth	4.3 in
Critical Slope	3.188 %
Velocity	1.55 ft/s
Velocity Head	0.04 ft
Specific Energy	0.48 ft
Froude Number	0.580
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	5.3 in
Critical Depth	4.3 in
Channel Slope	1.000 %
Critical Slope	3.188 %

24" AVAILABLE

ROADWAY CALCULATIONS

Worksheet for ROADWAY SECTION 1-1

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.020 ft/ft
Discharge	11.66 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+01	6,005.90
0+22	6,005.61
0+28	6,006.44

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+01, 6,005.90)	(0+22, 6,005.61)	0.013
(0+22, 6,005.61)	(0+28, 6,006.44)	0.013

Options

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

Results

Normal Depth	3.2 in
Roughness Coefficient	0.013
Elevation	6,005.88 ft
Elevation Range	6,005.6 to 6,006.4 ft
Flow Area	2.8 ft ²
Wetted Perimeter	20.9 ft
Hydraulic Radius	1.6 in
Top Width	20.89 ft
Normal Depth	3.2 in
Critical Depth	4.2 in
Critical Slope	0.004 ft/ft
Velocity	4.20 ft/s
Velocity Head	0.27 ft
Specific Energy	0.54 ft
Froude Number	2.033
Flow Type	Supercritical

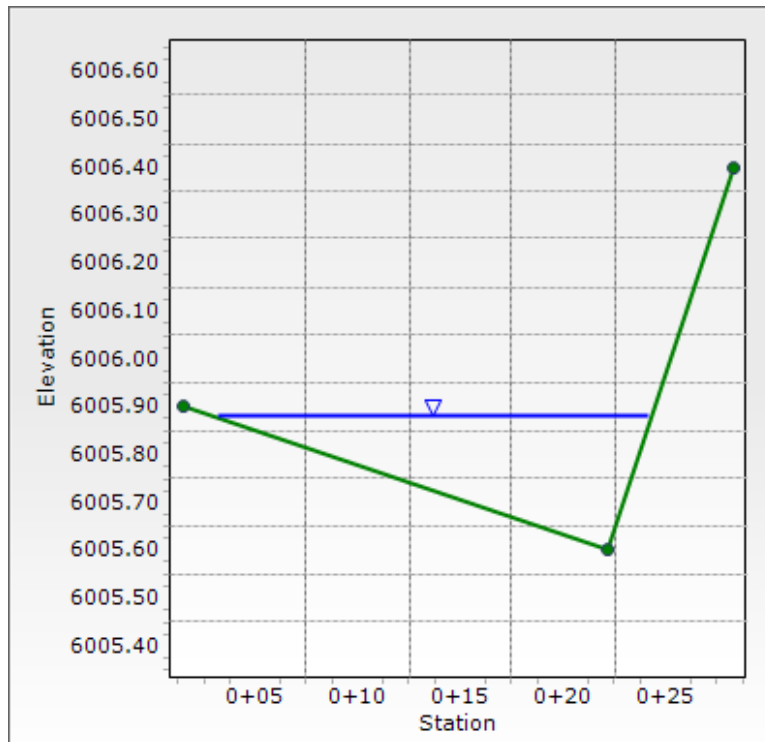
Worksheet for ROADWAY SECTION 1-1

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.2 in
Critical Depth	4.2 in
Channel Slope	0.020 ft/ft
Critical Slope	0.004 ft/ft



Worksheet for ROADWAY SECTION 2-2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.020 ft/ft
Discharge	16.90 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+15	6,014.32
0+16	6,013.81
0+36	6,012.91
0+36	6,013.40

Roughness Segment Definitions

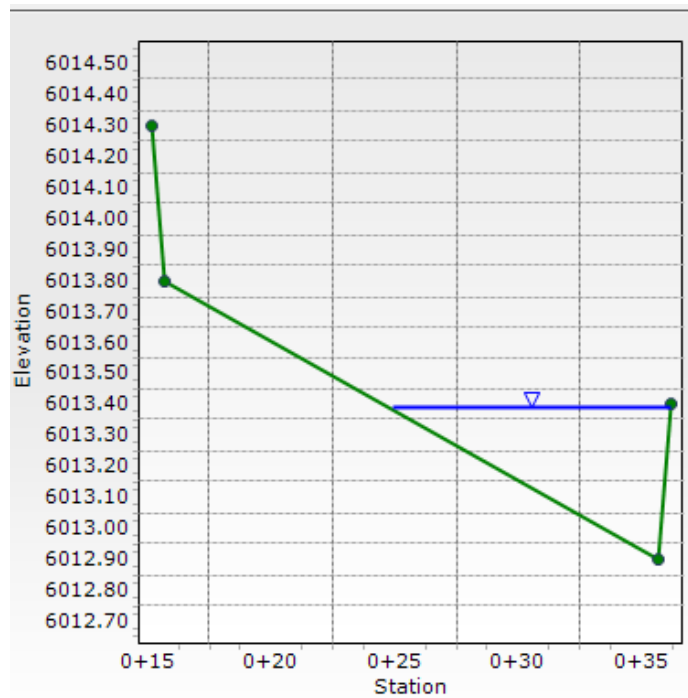
Start Station	Ending Station	Roughness Coefficient
(0+15, 6,014.32)	(0+16, 6,013.81)	0.013
(0+16, 6,013.81)	(0+36, 6,012.91)	0.013
(0+36, 6,012.91)	(0+36, 6,013.40)	0.013

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

Results	
Normal Depth	5.8 in
Roughness Coefficient	0.013
Elevation	6,013.39 ft
Elevation Range	6,012.9 to 6,014.3 ft
Flow Area	2.7 ft ²
Wetted Perimeter	11.5 ft
Hydraulic Radius	2.9 in
Top Width	11.25 ft
Normal Depth	5.8 in
Critical Depth	8.0 in
Critical Slope	0.004 ft/ft
Velocity	6.20 ft/s
Velocity Head	0.60 ft
Specific Energy	1.08 ft
Froude Number	2.222

Worksheet for ROADWAY SECTION 2-2

Results	
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.8 in
Critical Depth	8.0 in
Channel Slope	0.020 ft/ft
Critical Slope	0.004 ft/ft



Worksheet for ROADWAY SECTION 3-3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.020 ft/ft
Discharge	16.90 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+02	6,006.42
0+23	6,005.98
0+24	6,006.48
0+31	6,006.61

Roughness Segment Definitions

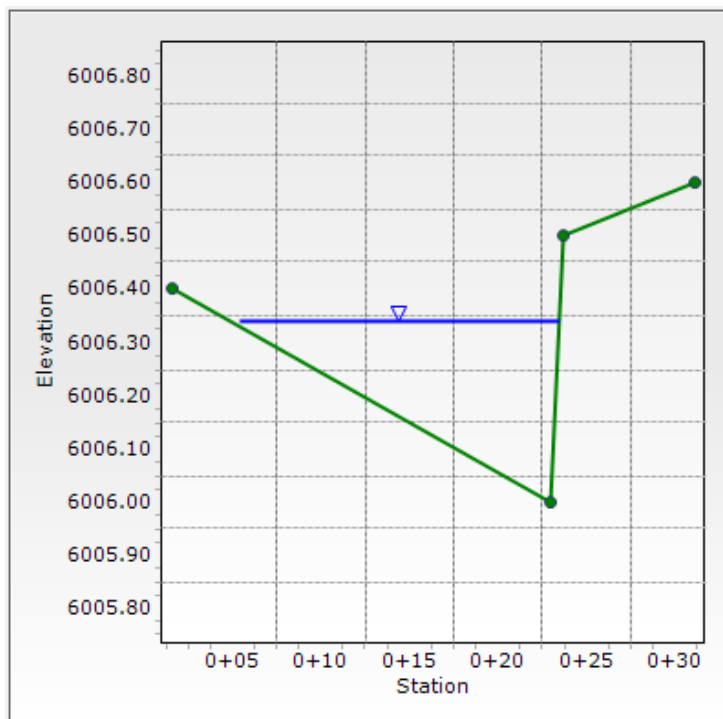
Start Station	Ending Station	Roughness Coefficient
(0+02, 6,006.42)	(0+23, 6,005.98)	0.013
(0+23, 6,005.98)	(0+24, 6,006.48)	0.013
(0+24, 6,006.48)	(0+31, 6,006.61)	0.013

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

Results	
Normal Depth	4.4 in
Roughness Coefficient	0.013
Elevation	6,006.34 ft
Elevation Range	6,006.0 to 6,006.6 ft
Flow Area	3.3 ft ²
Wetted Perimeter	18.2 ft
Hydraulic Radius	2.2 in
Top Width	18.06 ft
Normal Depth	4.4 in
Critical Depth	5.8 in
Critical Slope	0.004 ft/ft
Velocity	5.16 ft/s
Velocity Head	0.41 ft
Specific Energy	0.78 ft
Froude Number	2.134

Worksheet for ROADWAY SECTION 3-3

Results	
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.4 in
Critical Depth	5.8 in
Channel Slope	0.020 ft/ft
Critical Slope	0.004 ft/ft



RIPRAP CALCS

Project	High Note Park
Project #	21.1295
Date	2/19/2026
Title	EURV Pond N4



RIP-RAP APRON FOR CIRCULAR PIPE

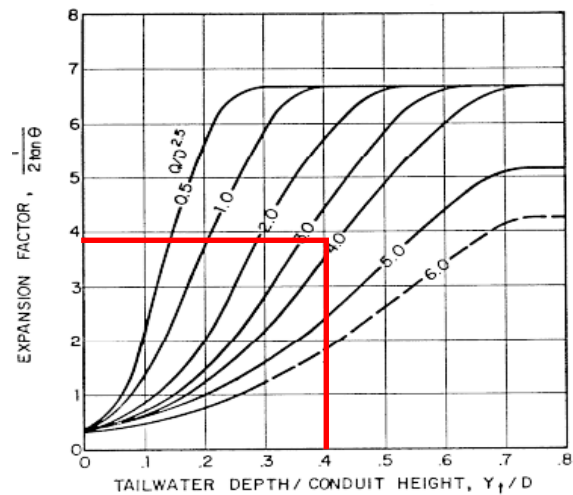
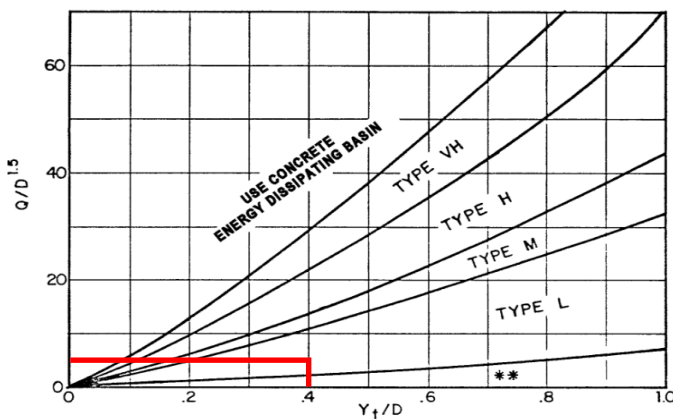
References UDFCD Storm Drainage Criteria Manual, 2016
HEC 14 3rd Edition, 2006

Formulas

$$d_{50} = \frac{0.023 \cdot Q}{Y_t^{1.2} \cdot D_c^{0.3}} \quad D_a = \frac{(D_c + Y_n)}{2} \quad L_p = \left(\frac{1}{2 \cdot \tan \theta} \right) \left(\frac{A_t}{Y_t} - D_c \right) \quad W_p = 2(L_p \cdot \tan \theta) + D_c \quad L_p = 2 \cdot d_{50}$$

Rip Rap Sizing

Q	10.1	cfs	design outflow
D _c	1.5	ft	diameter of circular conduit
Q/D ^{2.5}	3.67		Must be less than 6
Y _t Known?	No		Is the tail water depth known?
Y _t	0.6	ft	Estimated tail water depth, if unknown, use Y _t /D _c = 0.40
Y _t /D _c	0.40	ft/ft	Ratio of tailwater depth to conduit diameter
Q/D ^{1.5}	5.497743645		
Hydraulic Jump?	No		Is a hydraulic jump suspected downstream?
Y _n	1	ft	Normal depth of supercritical flow in the culvert
D _a	1.25	ft	Adjusted depth for supercritical flow
d ₅₀	4.56	in	Riprap mean rock size
d _{50-design}	9.00	in	Riprap mean rock size
Type	L		Riprap Type



Rip Rap Mat Dimensions

$Q/D^{2.5}$	3.7		
$(2 \tan(\Theta))^{-1}$	3.90		Use figure above
Θ	7.31	°	Expansion angle of the culvert flow
$V_{\text{acceptable}}$	5.50	fps	5.5 fps for very erosive soils, 7.7 fps for erosion resistant soils
A_t	1.84	ft ²	Required area of flow at allowable velocity
L_p	6.09	ft	Length of riprap protection (Min $3 \times D_c$)
W_p	3.06	ft	Downstream width of riprap protection
T_p	18	in	Thickness of riprap protection

Rock Type
VL ⁺⁺ ($d_{50} = 6$ inches)
L ⁺⁺ ($d_{50} = 9$ inches)
M ($d_{50} = 12$ inches)
H ($d_{50} = 18$ inches)
VH ($d_{50} = 24$ inches)

Notes

none

Project	High Note Park
Project #	21.1295
Date	2/19/2026
Title	EURV Pond N3



RIP-RAP APRON FOR CIRCULAR PIPE

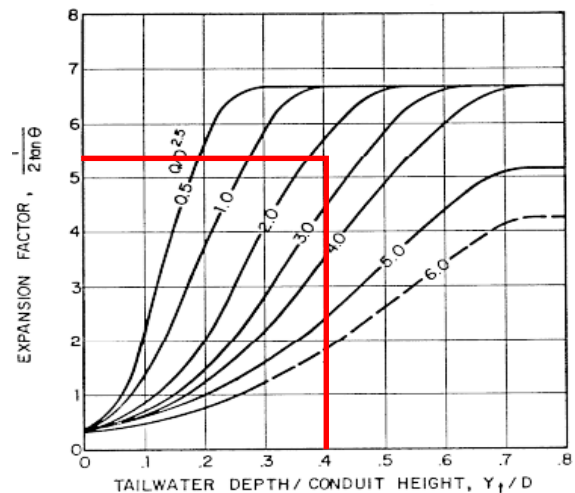
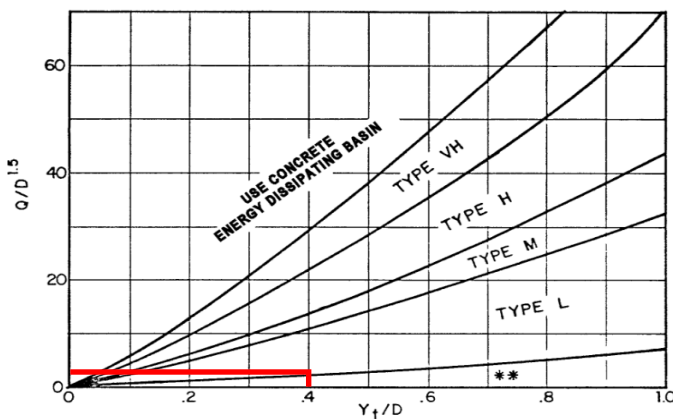
References UDFCD Storm Drainage Criteria Manual, 2016
HEC 14 3rd Edition, 2006

Formulas

$$d_{50} = \frac{0.023 \cdot Q}{Y_t^{1.2} \cdot D_c^{0.3}} \quad D_a = \frac{(D_c + Y_n)}{2} \quad L_p = \left(\frac{1}{2 \cdot \tan \theta} \right) \left(\frac{A_t}{Y_t} - D_c \right) \quad W_p = 2(L_p \cdot \tan \theta) + D_c \quad L_p = 2 \cdot d_{50}$$

Rip Rap Sizing

Q	12.2	cfs	design outflow
D _c	2	ft	diameter of circular conduit
Q/D ^{2.5}	2.16		Must be less than 6
Y _t Known?	No		Is the tail water depth known?
Y _t	0.8	ft	Estimated tail water depth, if unknown, use Y _t /D _c = 0.40
Y _t /D _c	0.40	ft/ft	Ratio of tailwater depth to conduit diameter
Q/D ^{1.5}	4.313351365		
Hydraulic Jump?	No		Is a hydraulic jump suspected downstream?
Y _n	1	ft	Normal depth of supercritical flow in the culvert
D _a	1.50	ft	Adjusted depth for supercritical flow
d ₅₀	3.57	in	Riprap mean rock size
d _{50-design}	9.00	in	Riprap mean rock size
Type	L		Riprap Type



Rip Rap Mat Dimensions

$Q/D^{2.5}$	2.2		
$(2 \tan(\Theta))^{-1}$	5.40		Use figure above
Θ	5.29	°	Expansion angle of the culvert flow
$V_{\text{acceptable}}$	5.50	fps	5.5 fps for very erosive soils, 7.7 fps for erosion resistant soils
A_t	2.22	ft ²	Required area of flow at allowable velocity
L_p	6.00	ft	Length of riprap protection (Min $3 \times D_c$)
W_p	3.11	ft	Downstream width of riprap protection
T_p	18	in	Thickness of riprap protection

Rock Type
VL ^{**} ($d_{50} = 6$ inches)
L ^{**} ($d_{50} = 9$ inches)
M ($d_{50} = 12$ inches)
H ($d_{50} = 18$ inches)
VH ($d_{50} = 24$ inches)

Notes

none

Project	Aurora Animal Shelter
Project #	24.1149
Date	2/19/2026
Title	EURV Pond N3 Riprap Requirements



SPILLWAY

OPEN CHANNEL RIP-RAP DESIGN

References *Development of RipRap Design Criteria by Riprap Testing in Flumes, CSU, September 1988*
Interstitial flow ignored due to minimal impact and use of standard Rip-Rap gradations

Formulas

$$D_{50} = 5.23 \cdot s^{0.43} (q'_{design})^{0.56}$$

$$q = \sqrt{32.2} y_c^{1.5}$$

UNIT DISCHARGE

y_c	0.35	ft	Critical flow depth for channel
s	0.3	ft/ft	Slope
Type	Channelized Flow		
q	1.17	cfs/ft	Equivalent unit discharge
C_f	3		Flow concentration factor
q'_{design}	3.52	cfs	Design unit discharge
q^*_{design}	4.76	cfs	Adjusted unit discharge
D_{50}	7.47	in	Mean rock size
D_{50}	9.00	in	Design mean rock size
Type	L	in	Design mean rock size
t_r	18.00	in	Riprap layer thickness

Notes

none

Project	Aurora Animal Shelter
Project #	24.1149
Date	2/19/2026
Title	EURV Pond N4 Spillway Riprap Requirements



OPEN CHANNEL RIP-RAP DESIGN

References *Development of RipRap Design Criteria by Riprap Testing in Flumes, CSU, September 1988*
Interstitial flow ignored due to minimal impact and use of standard Rip-Rap gradations

Formulas

$$D_{50} = 5.23 \cdot s^{0.43} (q'_{design})^{0.56} \qquad q = \sqrt{32.2} y_c^{1.5}$$

UNIT DISCHARGE

y_c	0.46	ft	Critical flow depth for channel
s	0.05	ft/ft	Slope
Type	Channelized Flow		
q	1.77	cfs/ft	Equivalent unit discharge
C_f	3		Flow concentration factor
q'_{design}	5.31	cfs	Design unit discharge
q^*_{design}	7.17	cfs	Adjusted unit discharge
D_{50}	4.35	in	Mean rock size
D_{50}	6.00	in	Design mean rock size
Type	VL	in	Design mean rock size
t_r	12.00	in	Riprap layer thickness

Notes

none

FOREBAY CALCS

Forebay Calculations

Forebay Name	Surface Area (sq ft.)	Drain Time (Minutes)	Forebay Depth (Inches)	Width of Notch (Inches)	Pond WQCV (CF)	Forebay Volume (CF)
N2	63.44	5	15	0.50	7930	79.3

$$w = 9.23 (A_{FB} / t) (1 / \sqrt{h_{max}})$$

Equation 4-1

Where:

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

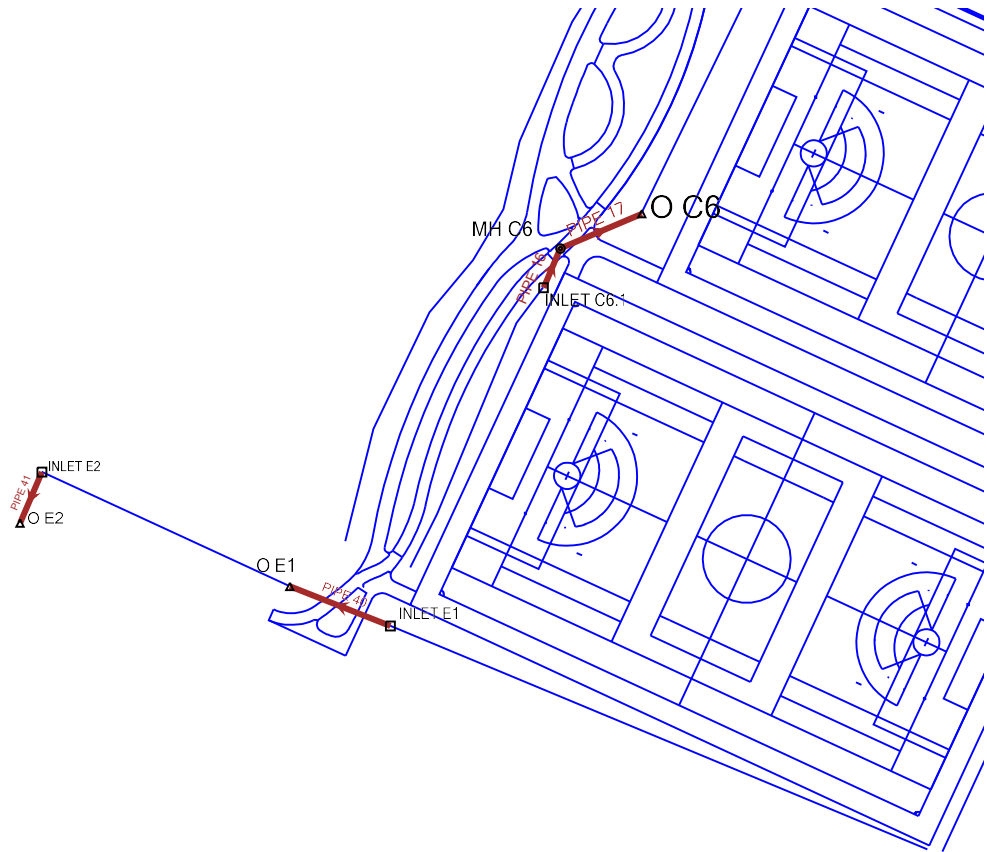
h_{max} = maximum depth of the forebay (feet)

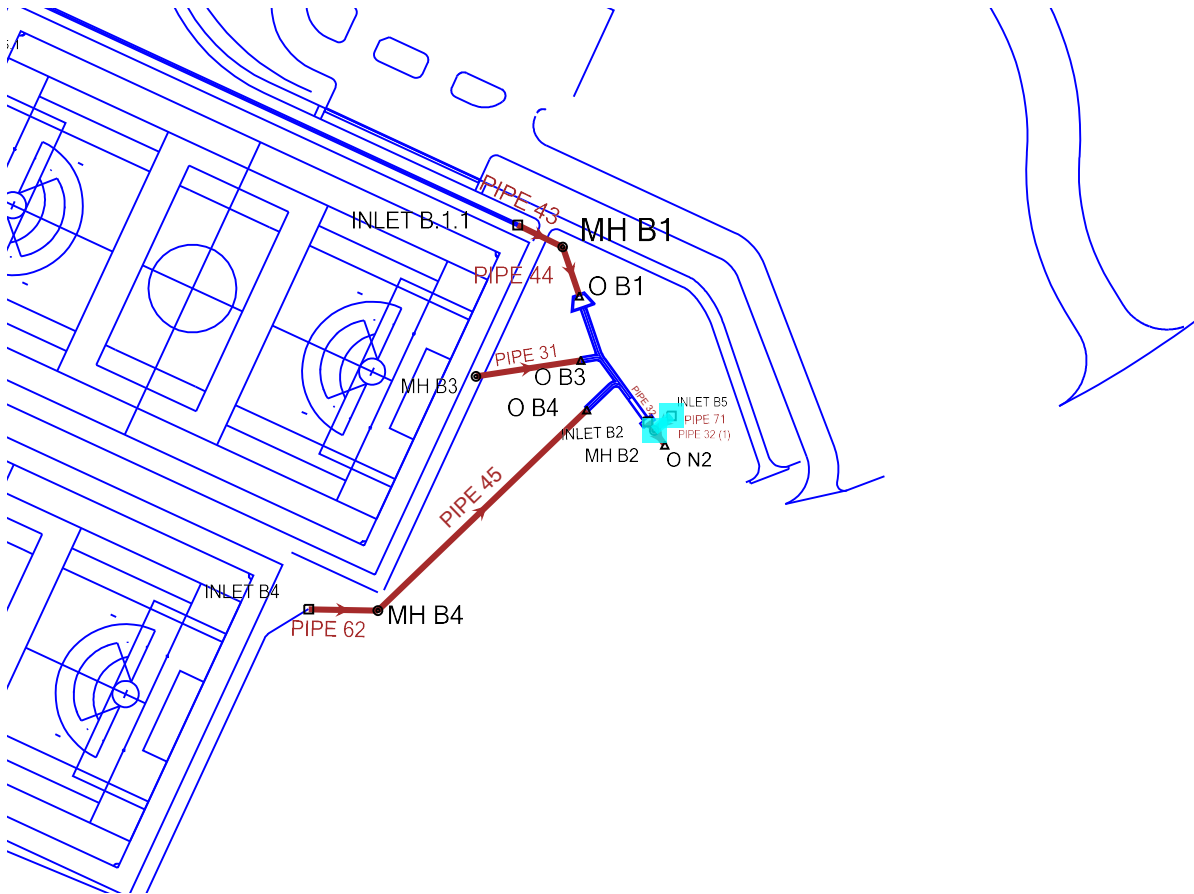
TABLE 4-12. FOREBAY SIZING CRITERIA

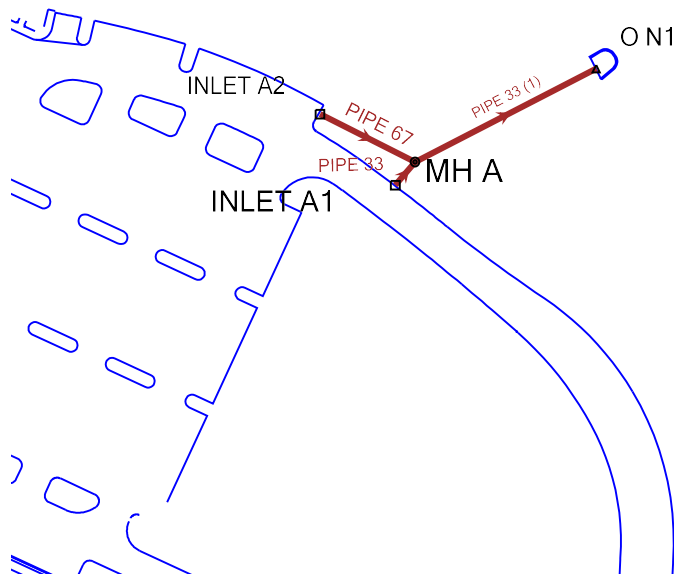
FOREBAY SIZING CRITERIA	WATERSHED IMPERVIOUS AREA (IA)				
	IA UP TO 2 ACRES	IA 2 UP TO 5 ACRES	IA 5 UP TO 10 ACRES	IA 10 UP TO 20 ACRES	IA GREATER THAN 20 ACRES
Forebay Release Rate and Configuration	Concrete sediment pad with dense grasses surrounding, Size to drain in 4 to 5 minutes using Equation 4-1				
Minimum Forebay Volume ¹	1% of WQCV				
Forebay Depth ¹	Concrete pad with slotted metal edge, or similar design	12 to 15 inches	15 to 18 inches	18 to 24 inches	24 to 30 inches

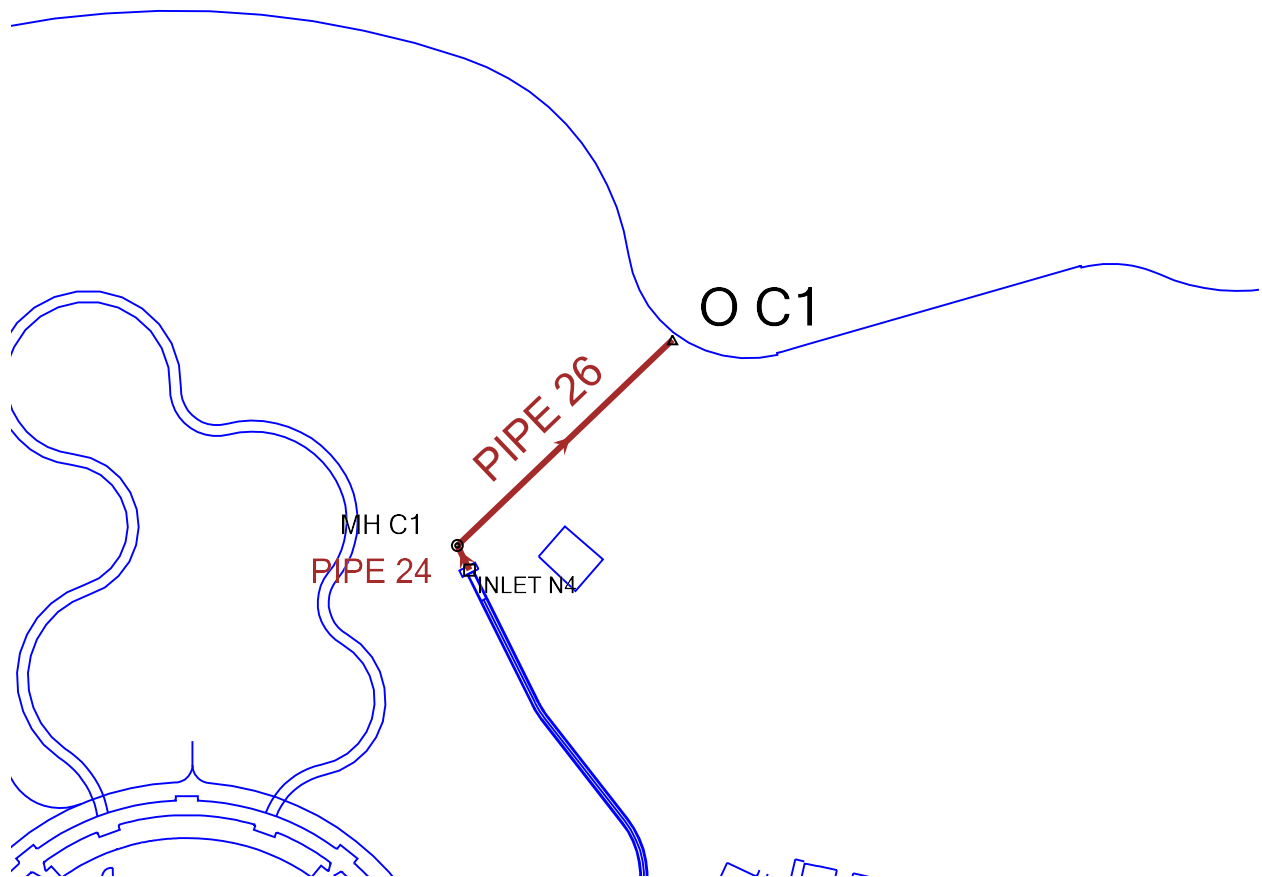
¹ Appropriate volume and depth should consider maintenance and access needs. The values provided are approximate and provide a starting point for design.

STORMCAD CALCULATIONS





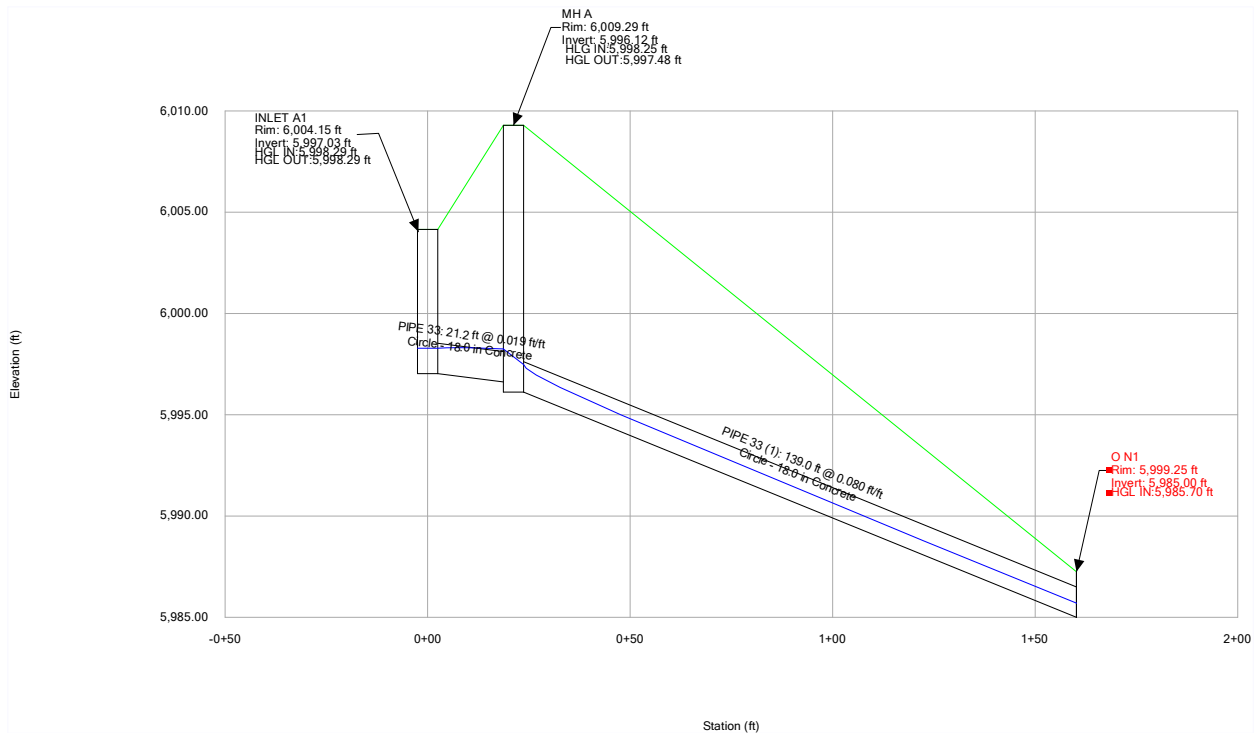




5-YR
STORMCAD
CALCULATIONS

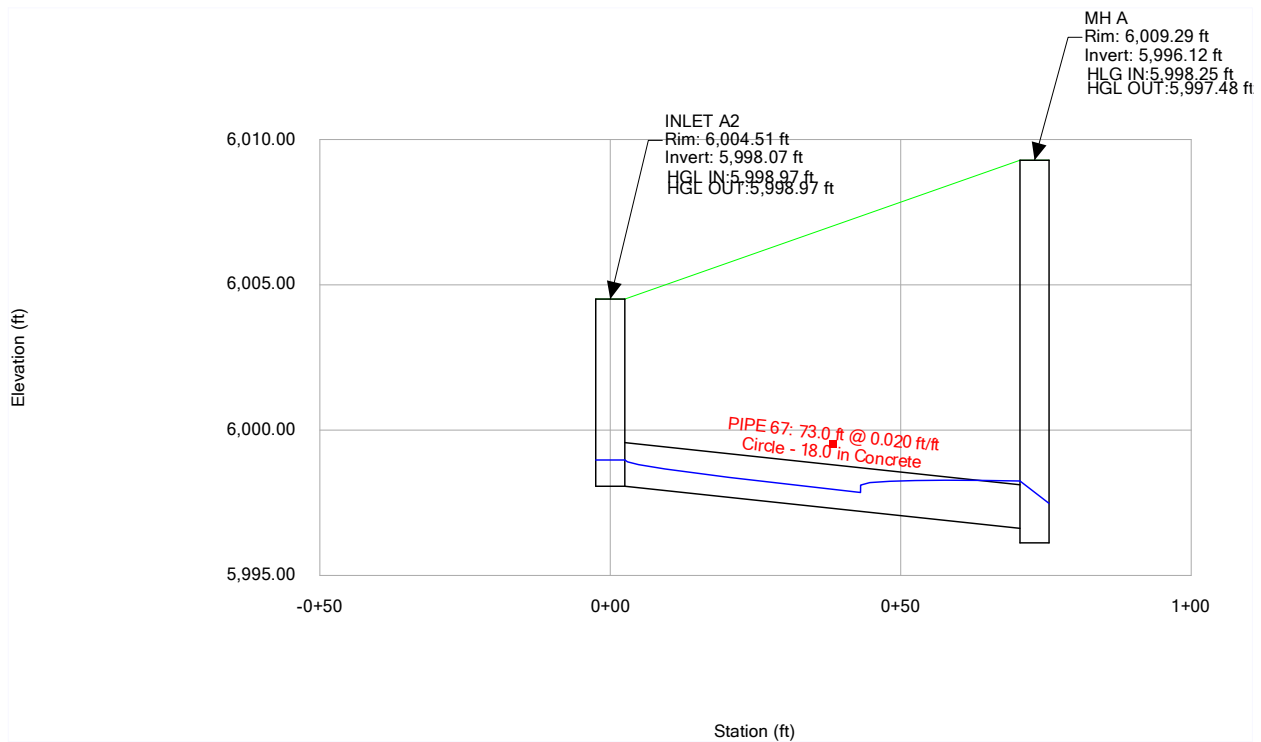
Profile Report

Engineering Profile - Stormline A1 (High Note Park Phase 1.stsw)

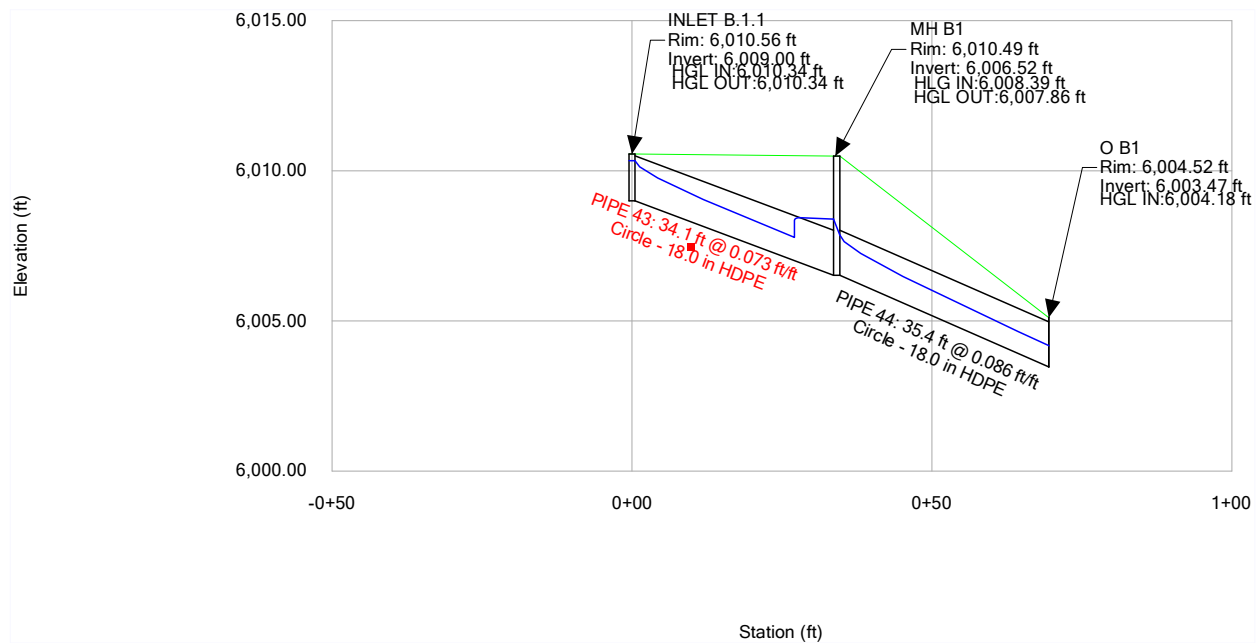


Profile Report

Engineering Profile - Stormline A2 (High Note Park Phase 1.stsw)

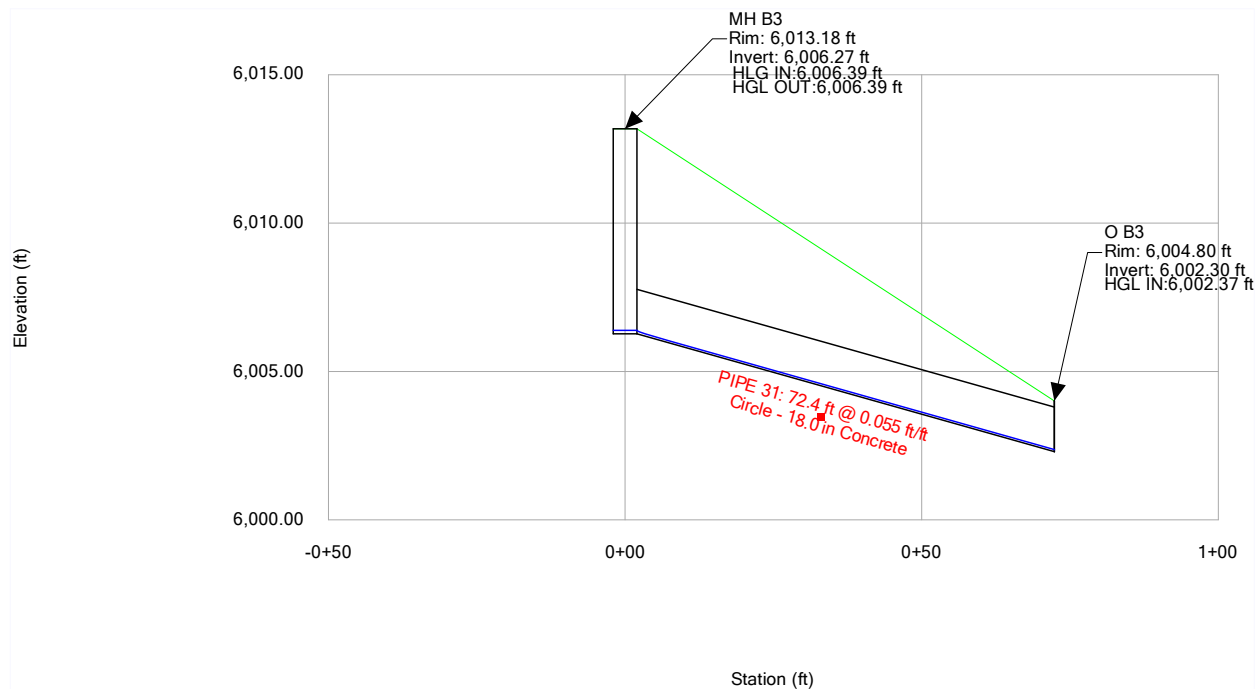


Profile Report **Engineering Profile - Stormline B1 (High Note Park Phase 1.stsw)**

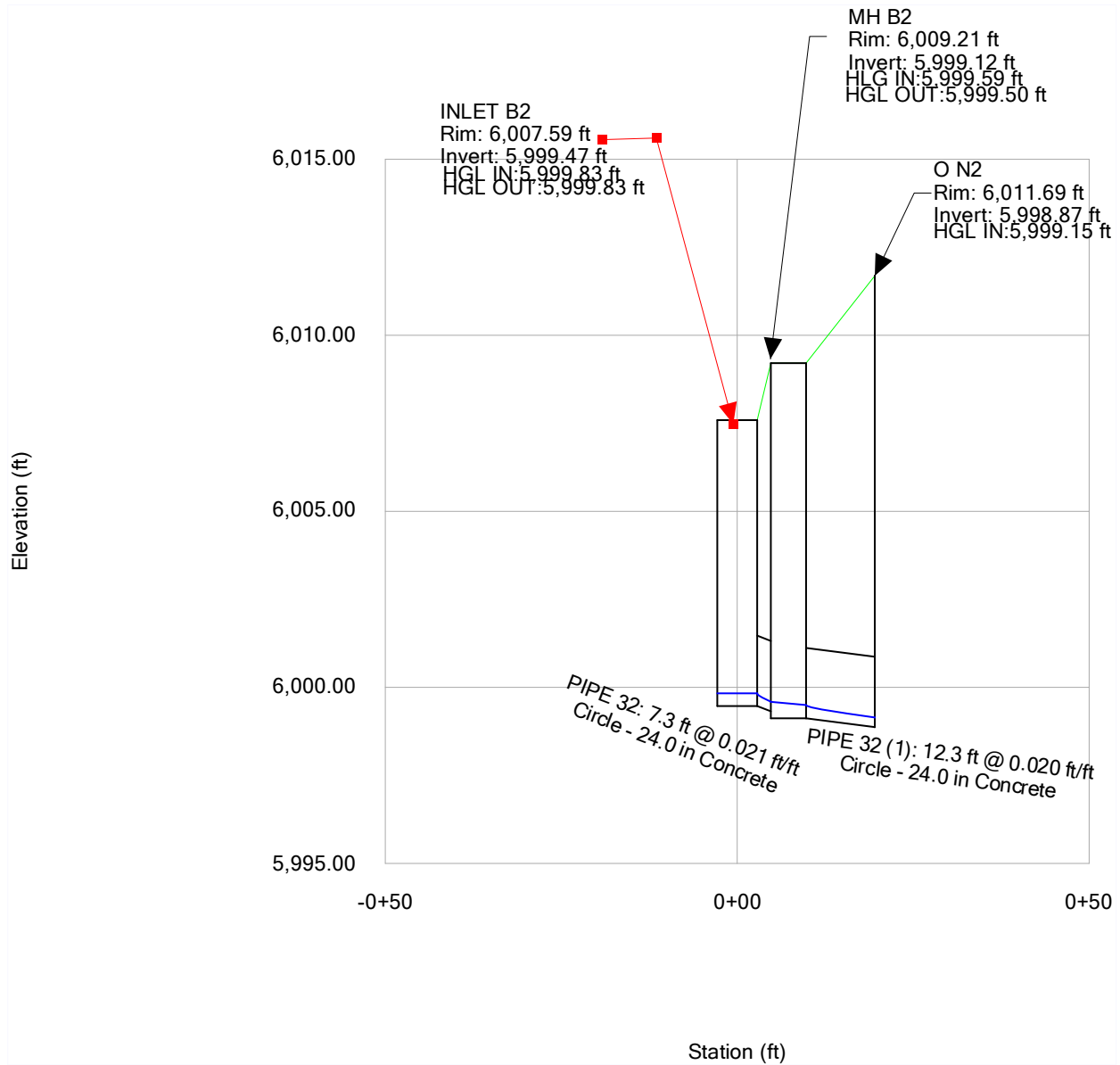


Profile Report

Engineering Profile - Stormline B3 (High Note Park Phase 1.stsw)

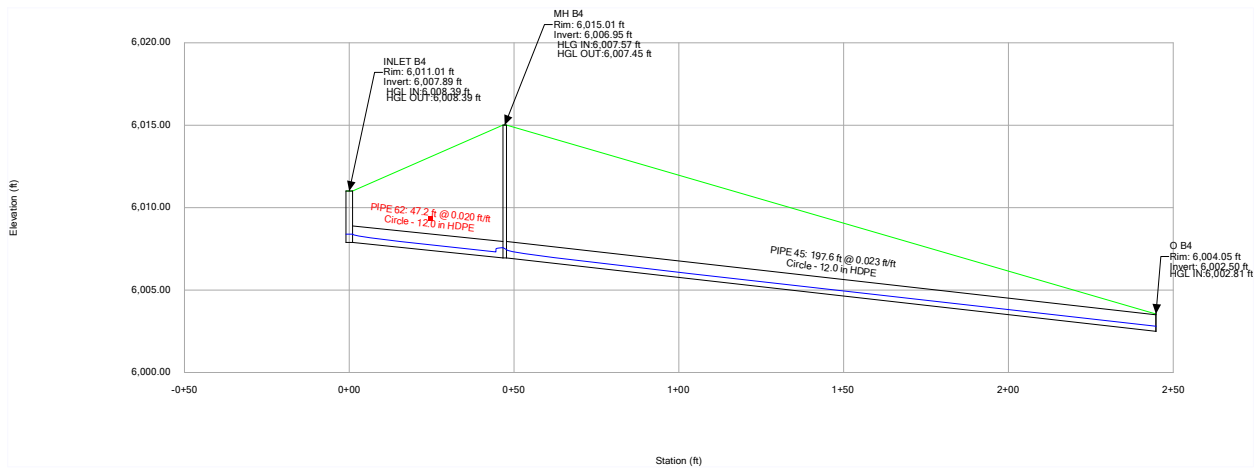


Profile Report **Engineering Profile - Stormline B2 (High Note Park Phase 1.stsw)**

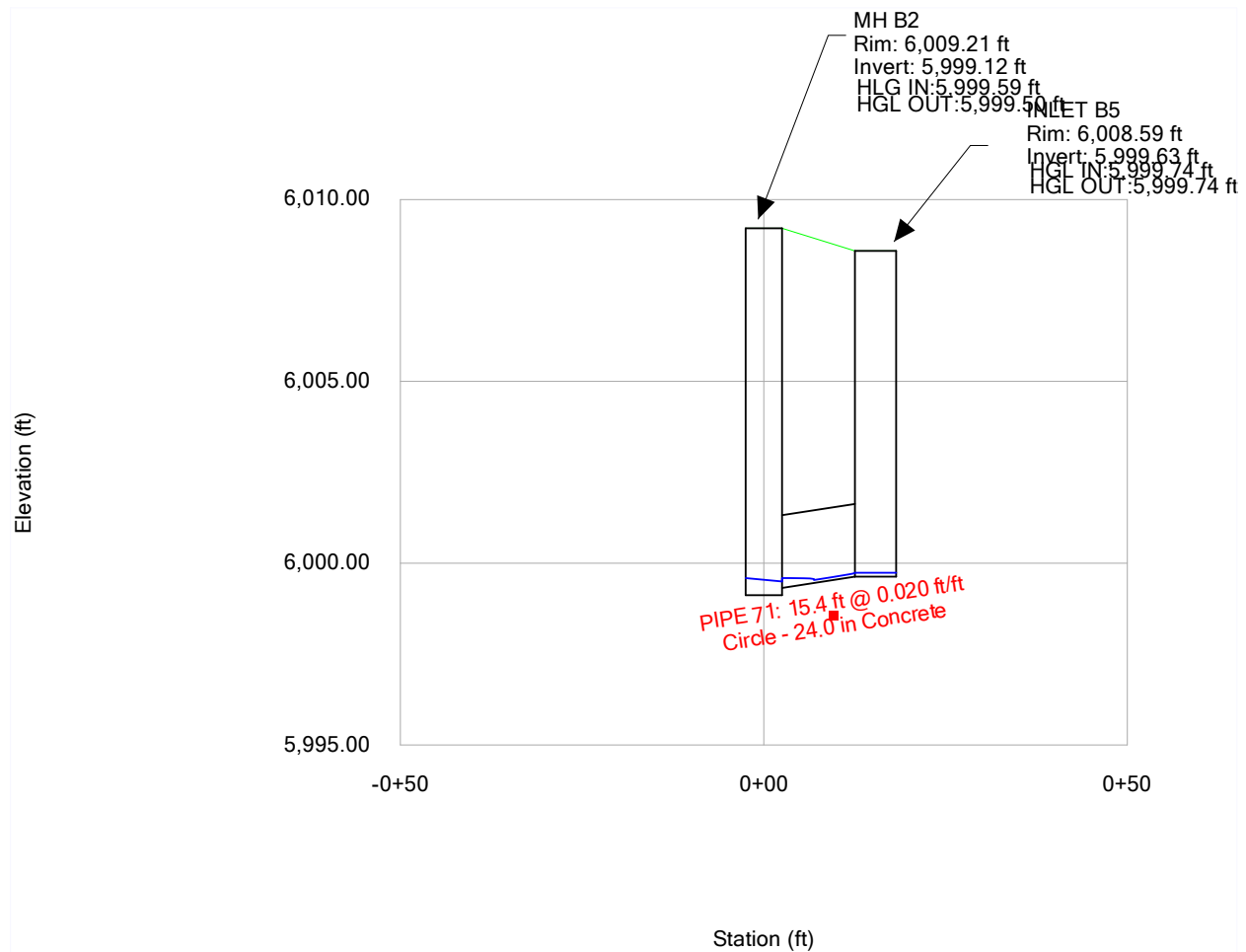


Profile Report

Engineering Profile - Stormline B4 (High Note Park Phase 1.stsw)

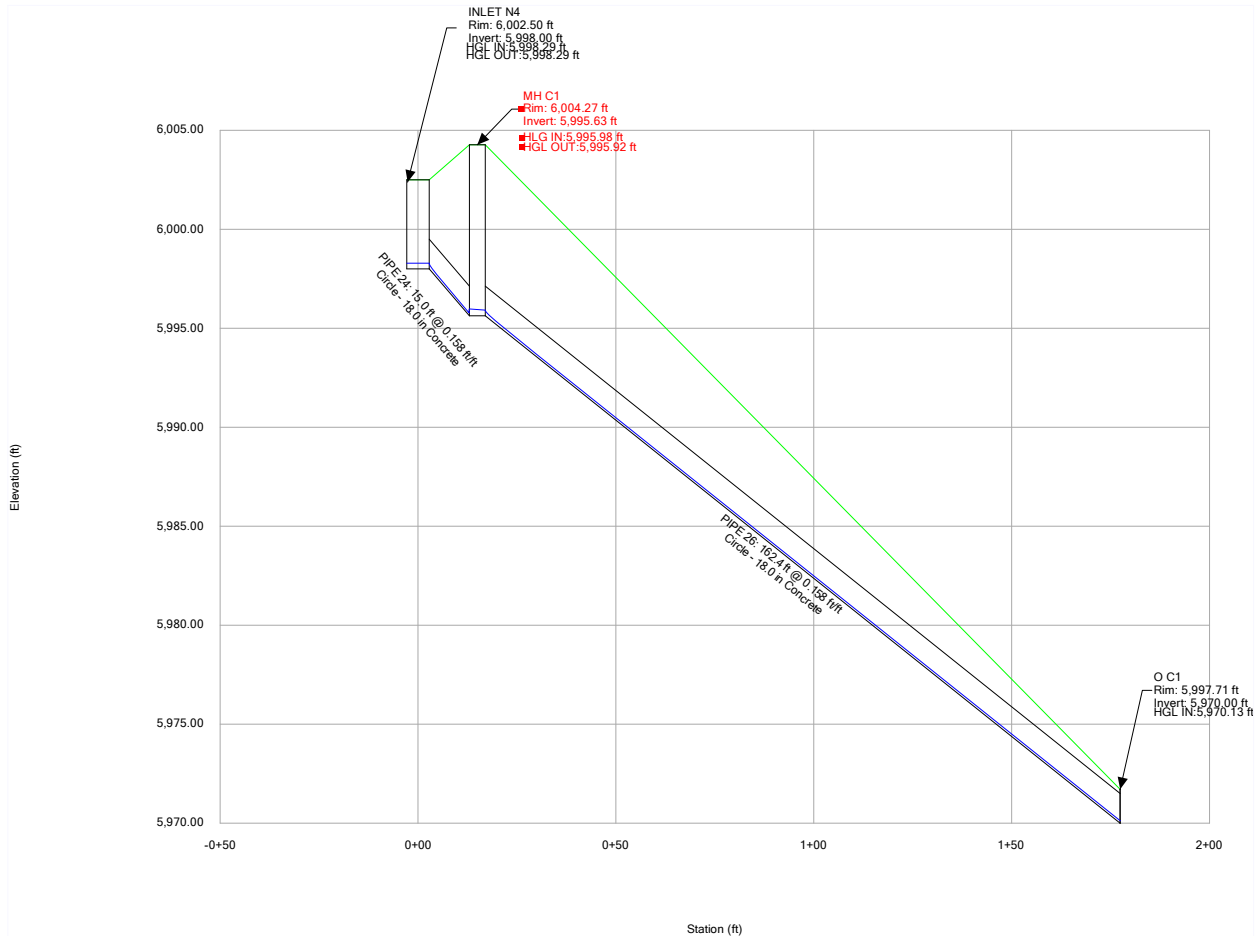


Profile Report **Engineering Profile - Stormline B5 (High Note Park Phase 1.stsw)**



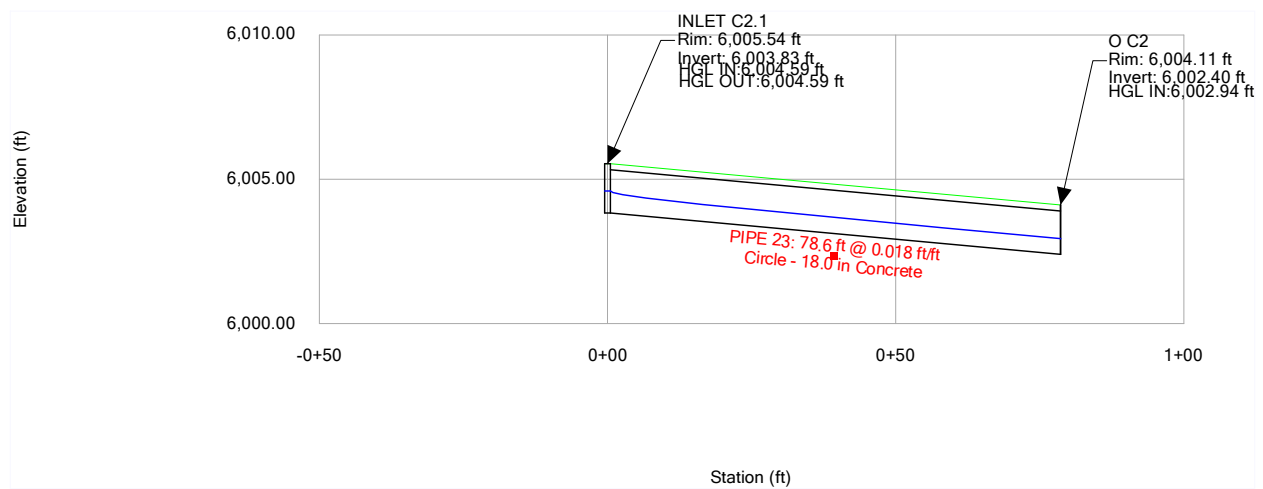
Profile Report

Engineering Profile - Stormline C1 (High Note Park Phase 1.stsw)

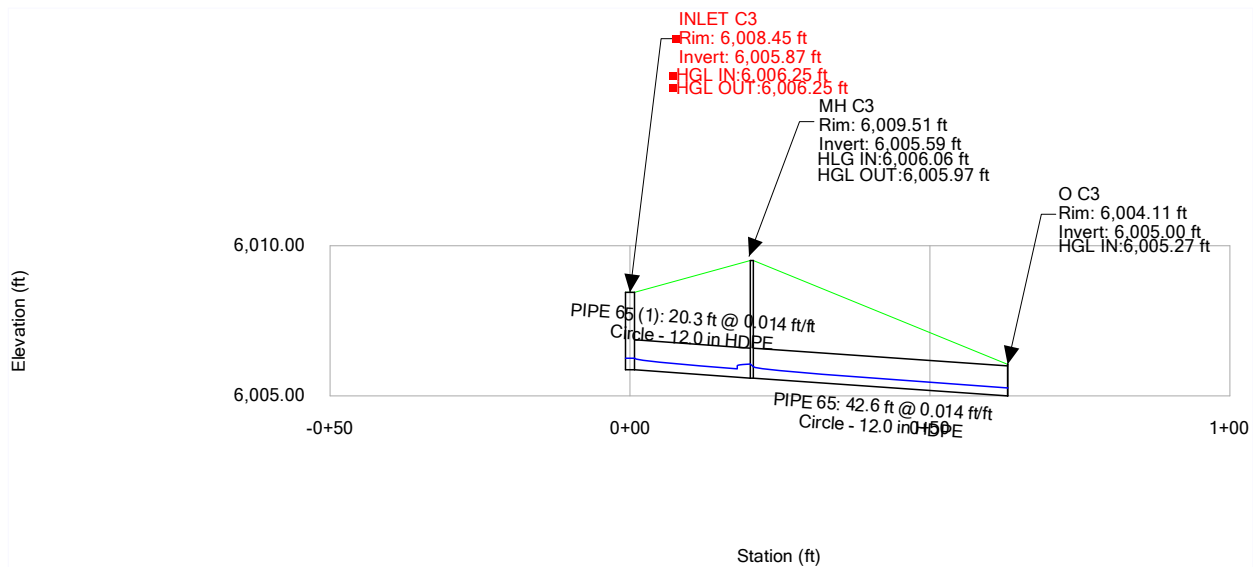


Profile Report

Engineering Profile - Stormline C2 (High Note Park Phase 1.stsw)

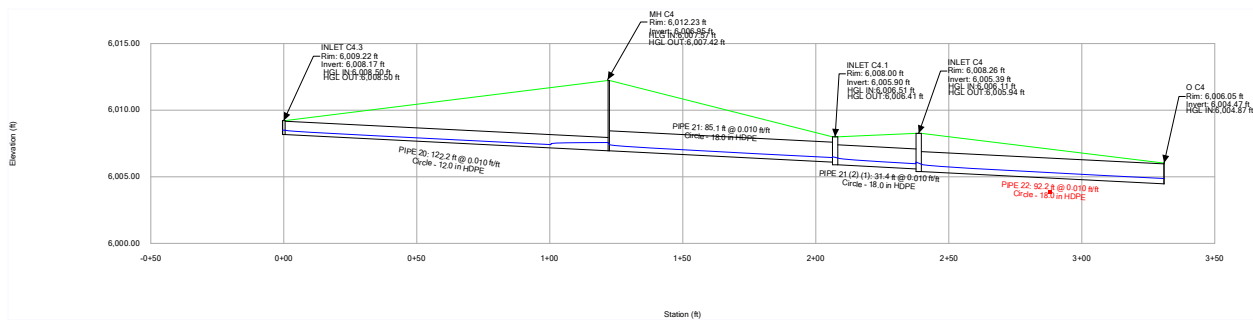


Profile Report **Engineering Profile - Stormline C3 (High Note Park Phase 1.stsw)**



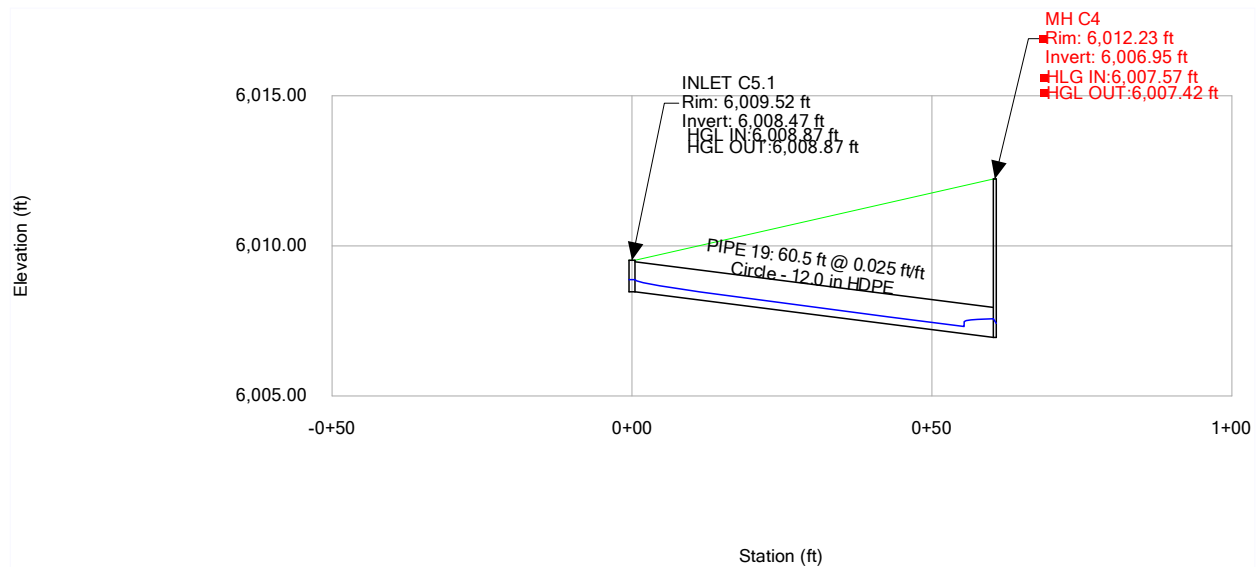
Profile Report

Engineering Profile - Stormline C4 (High Note Park Phase 1.stsw)



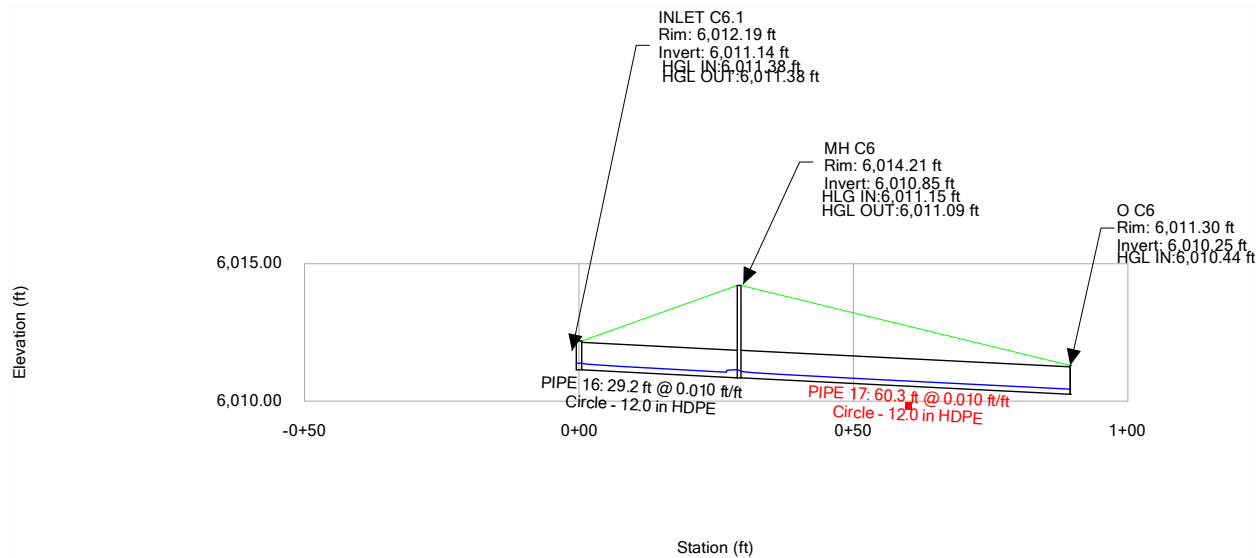
Profile Report

Engineering Profile - Stormline C5 (High Note Park Phase 1.stsw)



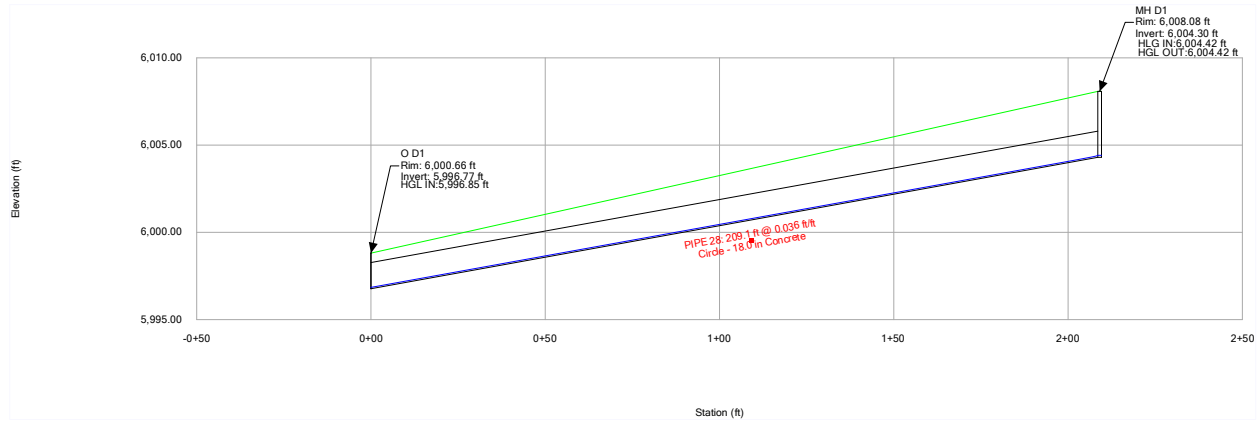
Profile Report

Engineering Profile - Stormline C6 (High Note Park Phase 1.stsw)



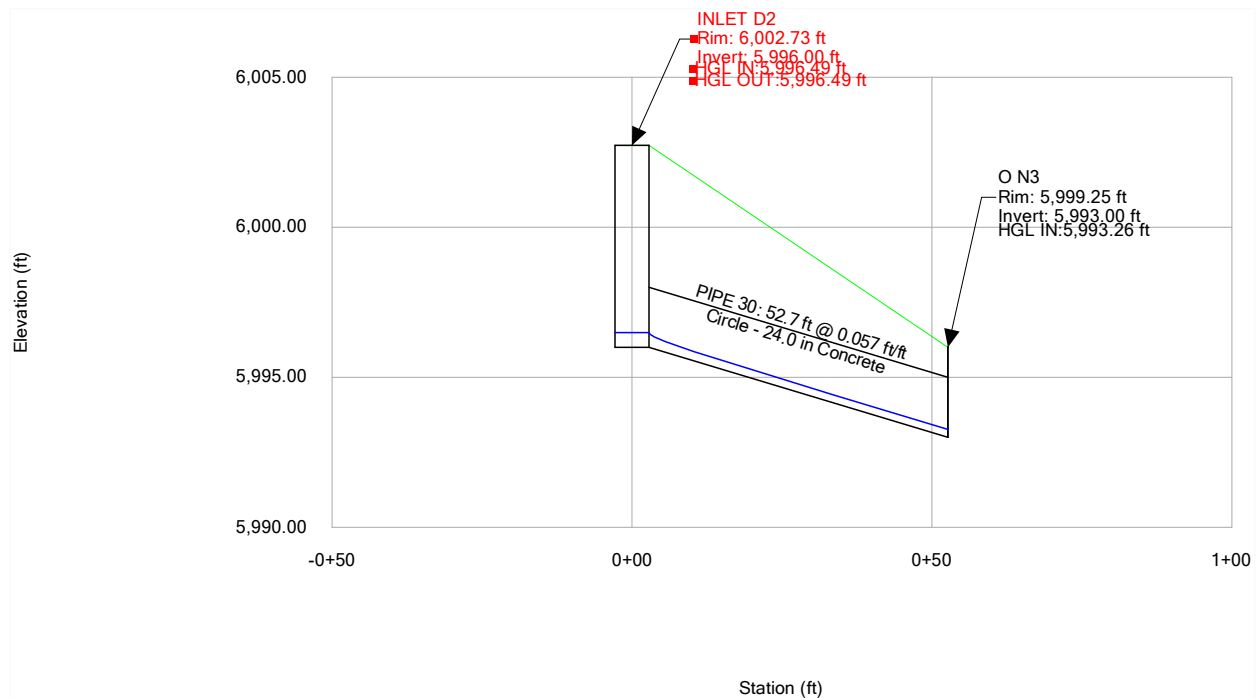
Profile Report

Engineering Profile - Stormline D1 (High Note Park Phase 1.stsw)



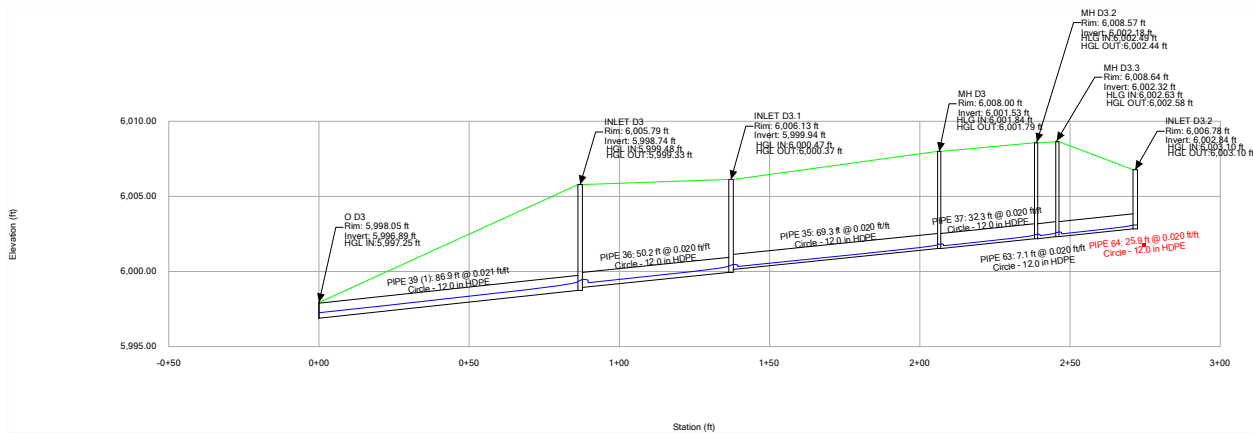
Profile Report

Engineering Profile - Stormline D2 (High Note Park Phase 1.stsw)



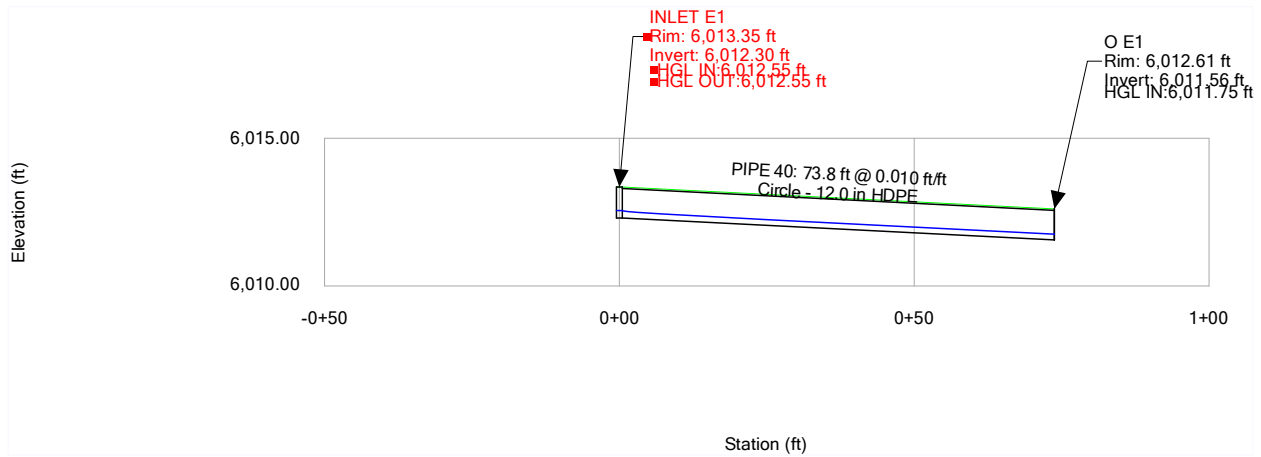
Profile Report

Engineering Profile - Stormline D3 (High Note Park Phase 1.stsw)



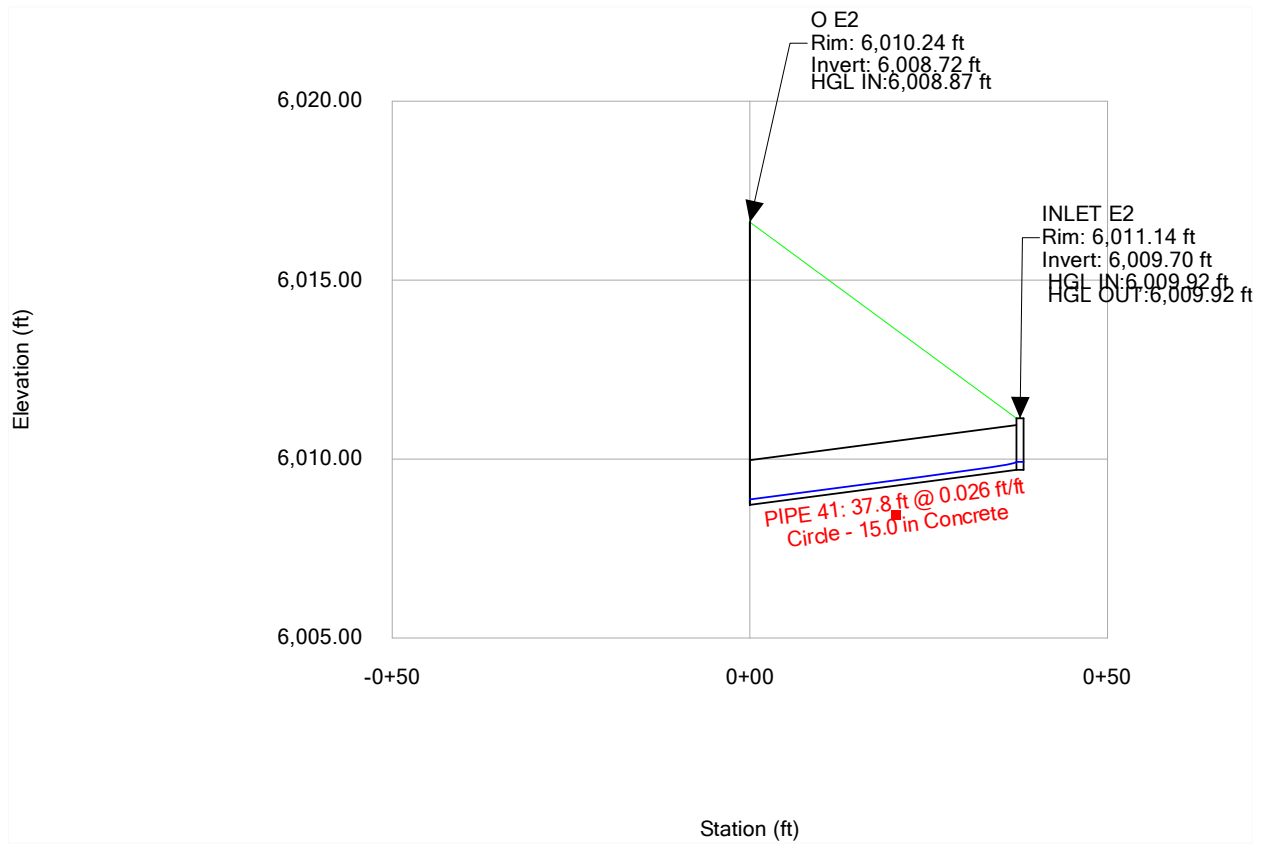
Profile Report

Engineering Profile - Stormline E1 (High Note Park Phase 1.stsw)



Profile Report

Engineering Profile - Stormline E2 (High Note Park Phase 1.stsw)



Scenario: 5-YR
Current Time Step: 0.000 h
FlexTable: Conduit Table

Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydrau Grade L (Out) (ft)
PIPE 16	INLET C6.1	6,011.14	MH C6	6,010.85	29.2	0.010	12.0	0.010	0.35	3.47	4.62	6,011.38	6,011
PIPE 17	MH C6	6,010.85	O C6	6,010.25	60.3	0.010	12.0	0.010	0.35	3.47	4.62	6,011.09	6,010
PIPE 19	INLET C5.1	6,008.47	MH C4	6,006.95	60.5	0.025	12.0	0.010	0.93	6.40	7.34	6,008.87	6,007
PIPE 20	INLET C4.3	6,008.17	MH C4	6,006.95	122.2	0.010	12.0	0.010	0.63	4.12	4.63	6,008.50	6,007
PIPE 21	MH C4	6,006.95	INLET C4.1	6,006.10	85.1	0.010	18.0	0.010	1.56	5.13	13.65	6,007.42	6,006
PIPE 22	INLET C4	6,005.39	O C4	6,004.47	92.2	0.010	18.0	0.010	2.14	5.62	13.64	6,005.94	6,004
PIPE 23	INLET C2.1	6,003.83	O C2	6,002.40	78.6	0.018	18.0	0.013	3.98	6.88	14.17	6,004.59	6,002
PIPE 24	INLET N4	5,998.00	MH C1	5,995.63	15.0	0.158	18.0	0.013	0.60	8.44	41.75	5,998.29	5,995
PIPE 26	MH C1	5,995.63	O C1	5,970.00	162.4	0.158	18.0	0.013	0.60	8.44	41.73	5,995.92	5,970
PIPE 28	MH D1	6,004.30	O D1	5,996.77	209.1	0.036	18.0	0.013	0.10	2.93	19.93	6,004.42	5,996
PIPE 30	INLET D2	5,996.00	O N3	5,993.00	52.7	0.057	24.0	0.013	2.00	8.19	53.99	5,996.49	5,993
PIPE 31	MH B3	6,006.27	O B3	6,002.30	72.4	0.055	18.0	0.013	0.10	3.40	24.60	6,006.39	6,002
PIPE 32	INLET B2	5,999.47	MH B2	5,999.32	7.3	0.021	24.0	0.013	1.10	4.80	32.48	5,999.83	5,999
PIPE 33	INLET A1	5,997.03	MH A	5,996.62	21.2	0.019	18.0	0.013	7.77	8.39	14.61	5,998.29	5,998
PIPE 35	MH D3	6,001.53	INLET D3.1	6,000.14	69.3	0.020	12.0	0.010	0.39	4.58	6.56	6,001.79	6,000
PIPE 36	INLET D3.1	5,999.94	INLET D3	5,998.94	50.2	0.020	12.0	0.010	1.06	6.12	6.53	6,000.37	5,999
PIPE 37	MH D3.2	6,002.18	MH D3	6,001.53	32.3	0.020	12.0	0.010	0.39	4.59	6.57	6,002.44	6,001
PIPE 39 (1)	INLET D3	5,998.74	O D3	5,996.89	86.9	0.021	12.0	0.010	1.92	7.40	6.76	5,999.33	5,997
PIPE 40	INLET E1	6,012.30	O E1	6,011.56	73.8	0.010	12.0	0.010	0.38	3.56	4.64	6,012.55	6,011
PIPE 41	INLET E2	6,009.70	O E2	6,008.72	37.8	0.026	15.0	0.013	0.33	3.87	10.41	6,009.92	6,008
PIPE 43	INLET B.1.1	6,009.00	MH B1	6,006.52	34.1	0.073	18.0	0.010	12.58	18.86	36.81	6,010.34	6,008
PIPE 44	MH B1	6,006.52	O B1	6,003.47	35.4	0.086	18.0	0.010	12.58	20.08	40.11	6,007.86	6,004
PIPE 45	MH B4	6,006.95	O B4	6,002.50	197.6	0.023	12.0	0.010	1.42	6.95	6.95	6,007.45	6,002
PIPE 46	MH D3.1	6,001.97	MH D3	6,001.78	4.8	0.040	6.0	0.010	0.00	0.00	1.46	6,001.97	6,001
PIPE 62	INLET B4	6,007.89	MH B4	6,006.95	47.2	0.020	12.0	0.010	1.42	6.65	6.54	6,008.39	6,007
PIPE 63	MH D3.3	6,002.32	MH D3.2	6,002.18	7.1	0.020	12.0	0.010	0.39	4.56	6.52	6,002.58	6,002
PIPE 65	MH C3	6,005.59	O C3	6,005.00	42.6	0.014	12.0	0.010	0.84	5.03	5.45	6,005.97	6,005
PIPE 67	INLET A2	5,998.07	MH A	5,996.62	73.0	0.020	18.0	0.013	5.49	7.75	14.80	5,998.97	5,998
PIPE 33 (1)	MH A	5,996.12	O N1	5,985.00	139.0	0.080	18.0	0.013	13.26	16.34	29.71	5,997.48	5,985
PIPE 64	INLET D3.2	6,002.84	MH D3.3	6,002.32	25.9	0.020	12.0	0.010	0.39	4.58	6.56	6,003.10	6,002
PIPE 21 (2) (1)	INLET C4.1	6,005.90	INLET C4	6,005.59	31.4	0.010	18.0	0.010	1.85	5.37	13.57	6,006.41	6,006
PIPE 32 (1)	MH B2	5,999.12	O N2	5,998.87	12.3	0.020	24.0	0.013	1.20	4.91	32.29	5,999.50	5,999
PIPE 65 (1)	INLET C3	6,005.87	MH C3	6,005.59	20.3	0.014	12.0	0.010	0.84	5.02	5.44	6,006.25	6,006
PIPE 70	MH C3	6,005.59	MH C3.1	6,005.76	31.1	-0.005	8.0	0.010	0.00	0.00	1.16	6,006.06	6,006
PIPE 71	INLET B5	5,999.63	MH B2	5,999.32	15.4	0.020	24.0	0.013	0.10	2.30	32.14	5,999.74	5,999

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Scenario: 5-YR
Current Time Step: 0.000 h
FlexTable: Catch Basin Table

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Flow (Additional Subsurface) (cfs)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Notes	Headloss Method	Headloss Coefficient (Standard)
INLET A1	6,004.15	5,997.03	Full Capture	7.77	5,998.66	5,998.29	Type R Inlet 10'	Absolute	-
INLET A2	6,004.51	5,998.07	Full Capture	5.49	5,999.35	5,998.97	Type R Inlet 10'	Absolute	-
INLET B.1.1	6,010.56	6,009.00	Full Capture	12.58	6,011.23	6,010.34	FES 18"	Absolute	-
INLET B2	6,007.59	5,999.47	Full Capture	1.10	5,999.96	5,999.83	Type D Inlet	Absolute	-
INLET B4	6,011.01	6,007.89	Full Capture	1.42	6,008.59	6,008.39	Area Inlet Nylo Round 24"	Absolute	-
INLET B5	6,008.59	5,999.63	Full Capture	0.10	5,999.77	5,999.74	Type D Inlet	Absolute	-
INLET C2.1	6,005.54	6,003.83	Full Capture	3.98	6,004.90	6,004.59	FES 18"	Absolute	-
INLET C3	6,008.45	6,005.87	Full Capture	0.84	6,006.40	6,006.25	Area Inlet Nylo Round 18"	Absolute	-
INLET C4	6,008.26	6,005.39	Full Capture	0.29	6,006.15	6,005.94	Area Inlet Nylo Round 24"	Standard	0.800
INLET C4.1	6,008.00	6,005.90	Full Capture	0.29	6,006.60	6,006.41	Area Inlet Nylo Round 24"	Standard	0.500
INLET C4.3	6,009.22	6,008.17	Full Capture	0.63	6,008.62	6,008.50	FES 12"	Absolute	-
INLET C5.1	6,009.52	6,008.47	Full Capture	0.93	6,009.03	6,008.87	FES 12"	Absolute	-
INLET C6.1	6,012.19	6,011.14	Full Capture	0.35	6,011.47	6,011.38	FES 12"	Absolute	-
INLET D2	6,002.73	5,996.00	Full Capture	2.00	5,996.66	5,996.49	Type D Inlet	Absolute	-
INLET D3	6,005.79	5,998.74	Full Capture	0.86	5,999.58	5,999.33	Area Inlet Nylo Round 18"	Standard	0.600
INLET D3.1	6,006.13	5,999.94	Full Capture	0.67	6,000.54	6,000.37	Area Inlet Nylo Round 18"	Standard	0.600
INLET D3.2	6,006.78	6,002.84	Full Capture	0.39	6,003.19	6,003.10	Area Inlet Nylo Round 18"	Absolute	-
INLET E1	6,013.35	6,012.30	Full Capture	0.38	6,012.64	6,012.55	FES 12"	Absolute	-
INLET E2	6,011.14	6,009.70	Full Capture	0.33	6,010.00	6,009.92	FES 15"	Absolute	-
INLET N4	6,002.50	5,998.00	Full Capture	0.60	5,998.39	5,998.29	Type D Inlet	Absolute	-

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Scenario: 5-YR
Current Time Step: 0.000 h
FlexTable: Manhole Table

Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Notes
MH D3.3	6,008.64	6,002.32	0.39	6,002.63	6,002.58	6,002.69	6,002.67	Standard	0.600	Standard
MH D3.2	6,008.57	6,002.18	0.39	6,002.49	6,002.44	6,002.55	6,002.53	Standard	0.600	Standard
MH D3.1	6,008.26	(N/A)	0.00	6,001.97	6,001.97	6,001.97	6,001.97	Absolute	-	Clean Out
MH D3	6,008.00	6,001.53	0.39	6,001.84	6,001.79	6,001.84	6,001.88	Standard	0.600	Standard
MH D1	6,008.08	(N/A)	0.10	6,004.42	6,004.42	6,004.46	6,004.46	Absolute	-	Cap
MH C6	6,014.21	6,010.85	0.35	6,011.15	6,011.09	6,011.20	6,011.18	Standard	0.600	Clean Out
MH C4	6,012.23	6,006.95	1.56	6,007.57	6,007.42	6,007.62	6,007.59	Standard	0.900	WYE Connection
MH C3.1	6,009.59	(N/A)	0.00	6,006.06	6,006.06	6,006.06	6,006.06	Absolute	-	Standard
MH C3	6,009.51	6,005.59	0.84	6,006.06	6,005.97	6,006.06	6,006.12	Standard	0.600	WYE Connection
MH C1	6,004.27	5,995.63	0.60	5,995.98	5,995.92	5,996.04	5,996.02	Standard	0.600	Storm MH 4'
MH B4	6,015.01	6,006.95	1.42	6,007.57	6,007.45	6,007.69	6,007.65	Standard	0.600	Standard
MH B3	6,013.18	(N/A)	0.10	6,006.39	6,006.39	6,006.43	6,006.43	Absolute	-	Storm MH 4'
MH B2	6,009.21	5,999.32	1.20	5,999.59	5,999.50	5,999.59	5,999.63	Standard	0.700	Storm MH 5'
MH B1	6,010.49	6,006.52	12.58	6,008.39	6,007.86	6,009.18	6,008.75	Standard	0.600	Standard
MH A	6,009.29	5,996.62	13.26	5,998.25	5,997.48	5,998.40	5,998.44	Standard	0.800	Storm MH 5'

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Scenario: 5-YR
Current Time Step: 0.000 h
FlexTable: Outfall Table

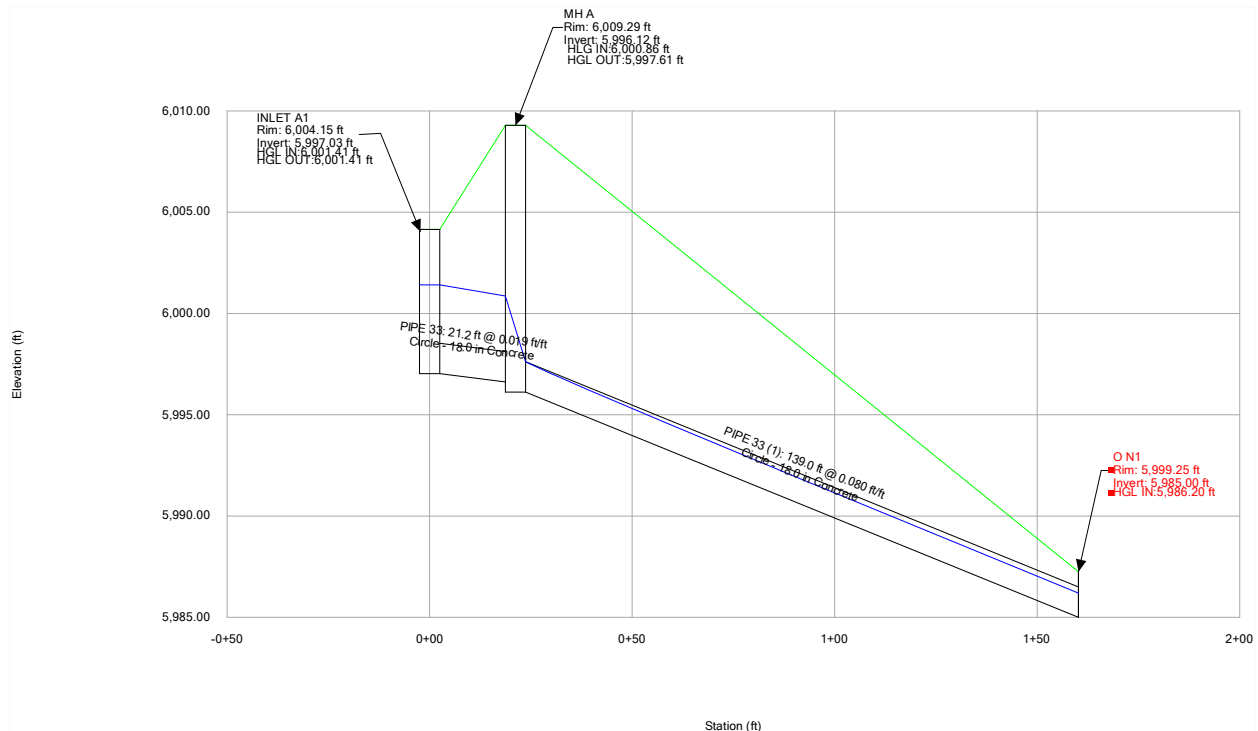
Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
O B1	6,005.11	6,003.47	Free Outfall	-	6,004.18	6,004.18	12.58
O B3	6,004.01	6,002.30	Free Outfall	-	6,002.37	6,002.37	0.10
O B4	6,003.55	6,002.50	Free Outfall	-	6,002.81	6,002.81	1.42
O C1	5,971.71	5,970.00	Free Outfall	-	5,970.13	5,970.13	0.60
O C3	6,006.05	6,005.00	Free Outfall	-	6,005.27	6,005.27	0.84
O C4	6,006.03	6,004.47	Free Outfall	-	6,004.87	6,004.87	2.14
O D1	5,998.81	5,996.77	Free Outfall	-	5,996.85	5,996.85	0.10
O D3	5,997.94	5,996.89	Free Outfall	-	5,997.25	5,997.25	1.92
O E1	6,012.61	6,011.56	Free Outfall	-	6,011.75	6,011.75	0.38
O E2	6,016.62	6,008.72	Free Outfall	-	6,008.87	6,008.87	0.33
O N2	6,011.69	5,998.87	Free Outfall	-	5,999.15	5,999.15	1.20
O N3	5,996.00	5,993.00	Free Outfall	-	5,993.26	5,993.26	2.00
O N1	5,987.25	5,985.00	Free Outfall	-	5,985.70	5,985.70	13.26
O C2	6,004.11	6,002.40	Free Outfall	-	6,002.94	6,002.94	3.98
O C6	6,011.30	6,010.25	Free Outfall	-	6,010.44	6,010.44	0.35

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100-YR STORMCAD CALCULATIONS

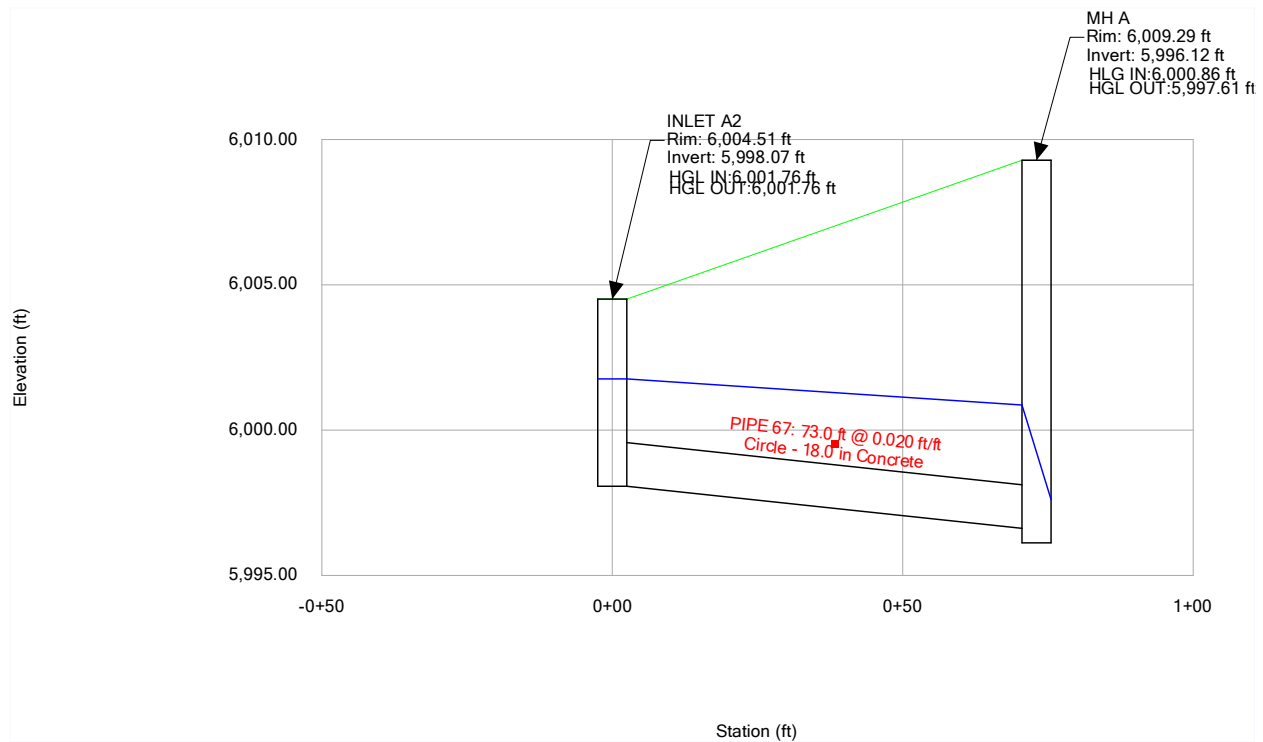
Profile Report

Engineering Profile - Stormline A1 (High Note Park Phase 1.stsw)

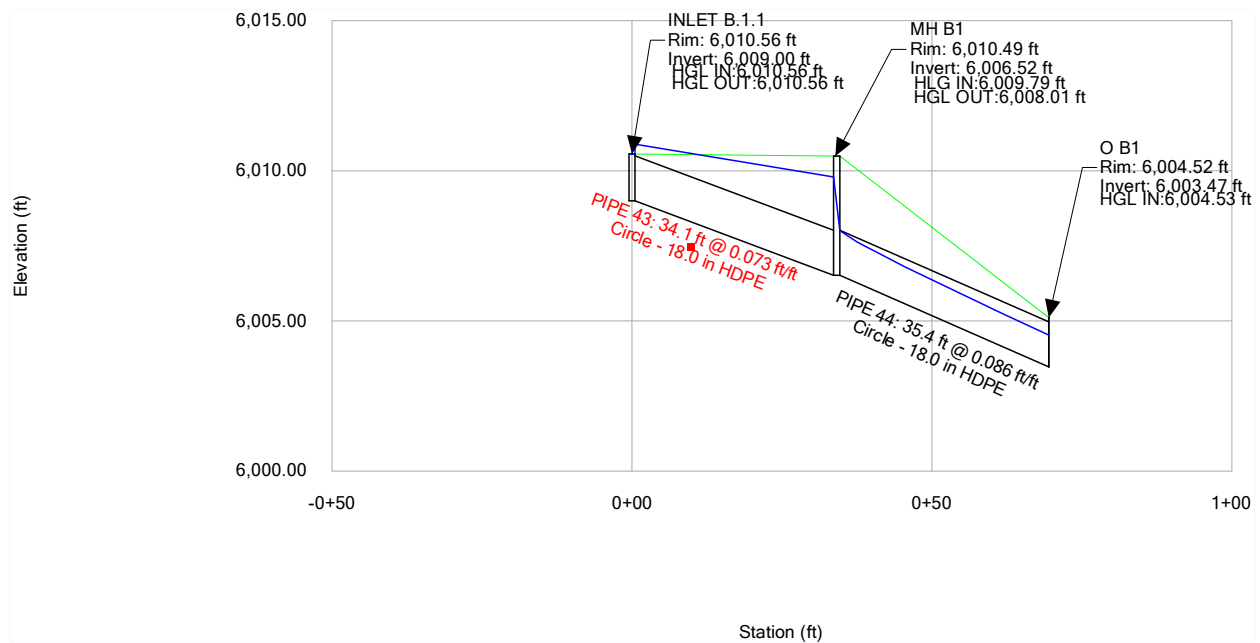


Profile Report

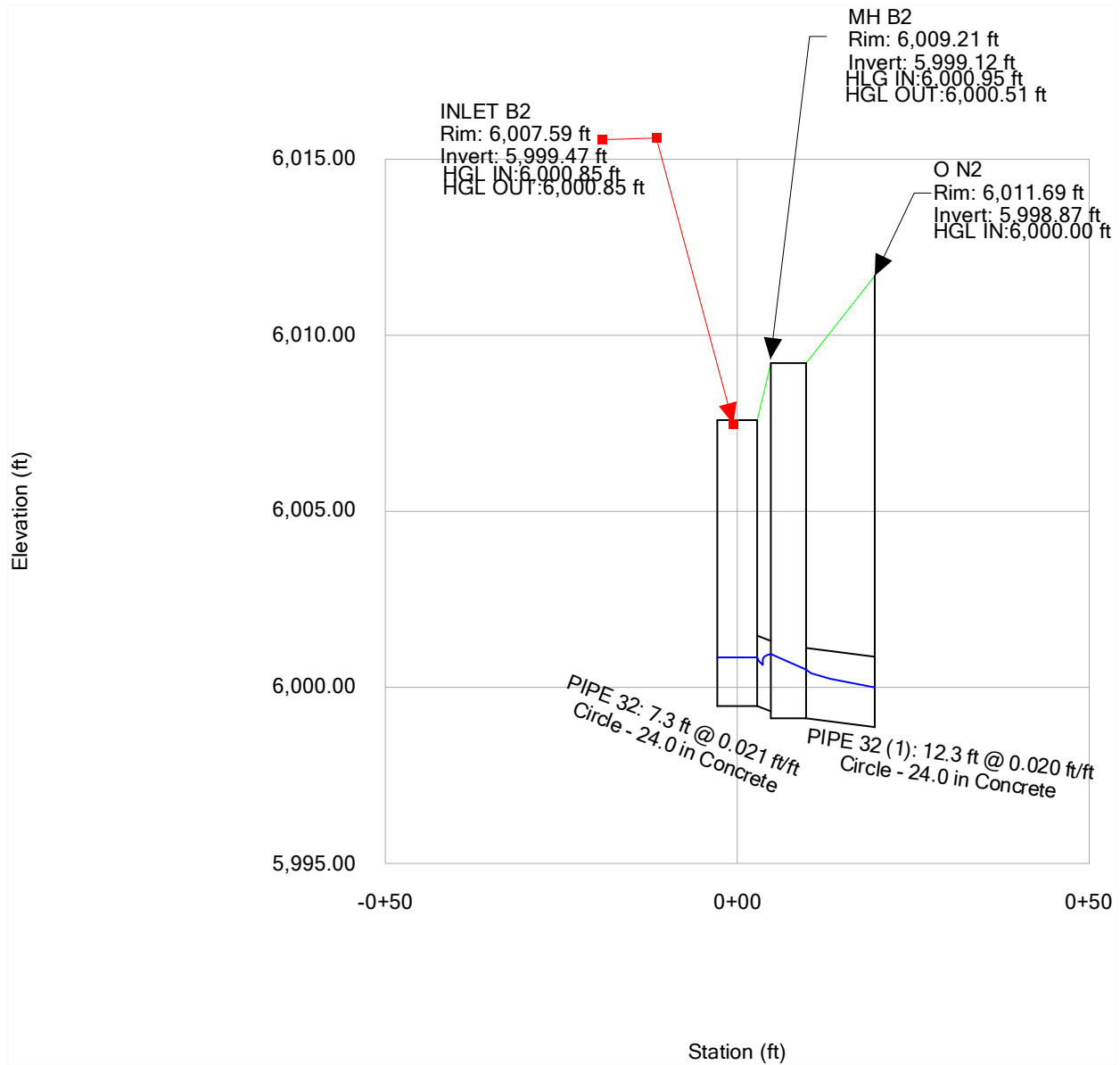
Engineering Profile - Stormline A2 (High Note Park Phase 1.stsw)



Profile Report **Engineering Profile - Stormline B1 (High Note Park Phase 1.stsw)**

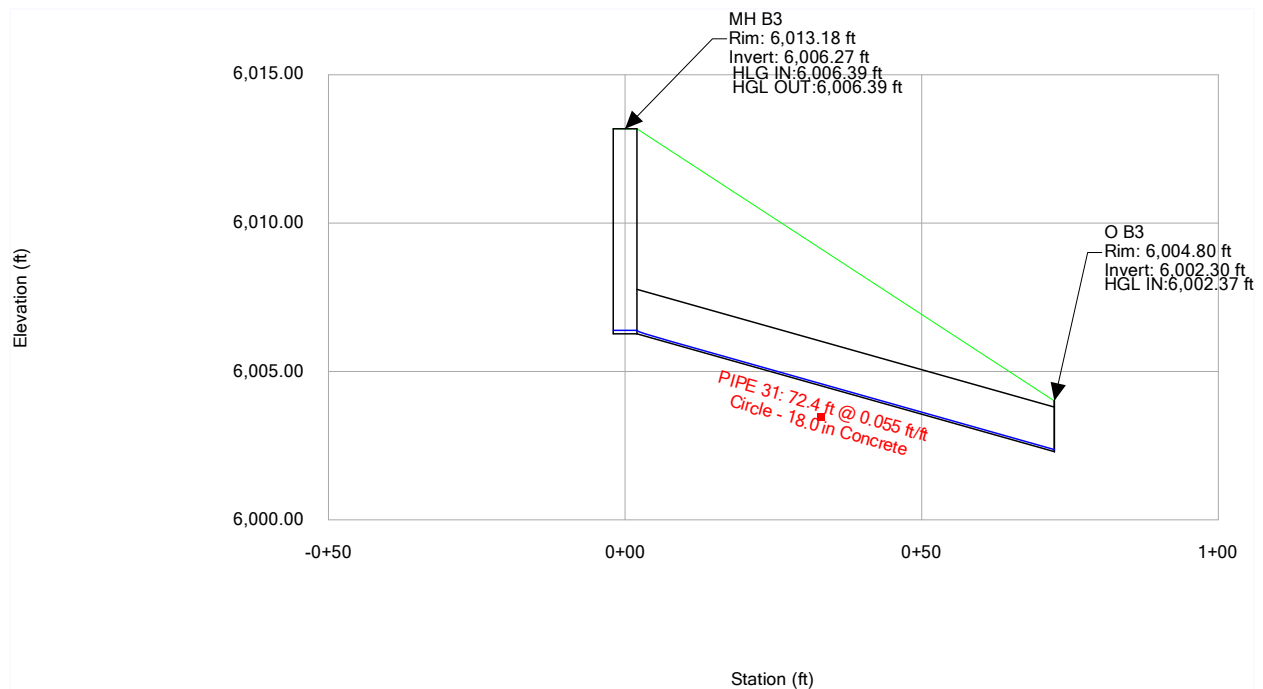


Profile Report **Engineering Profile - Stormline B2 (High Note Park Phase 1.stsw)**



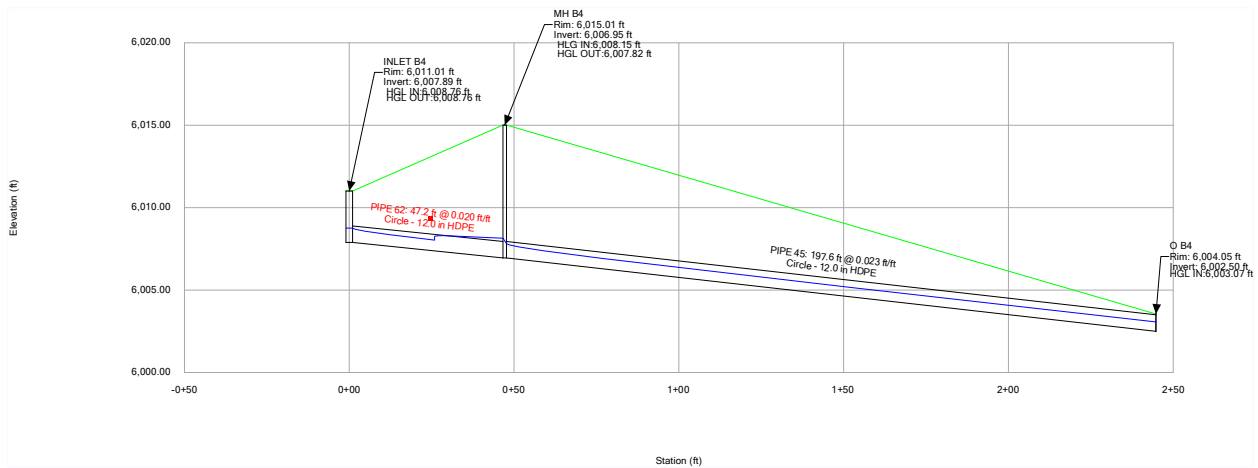
Profile Report

Engineering Profile - Stormline B3 (High Note Park Phase 1.stsw)

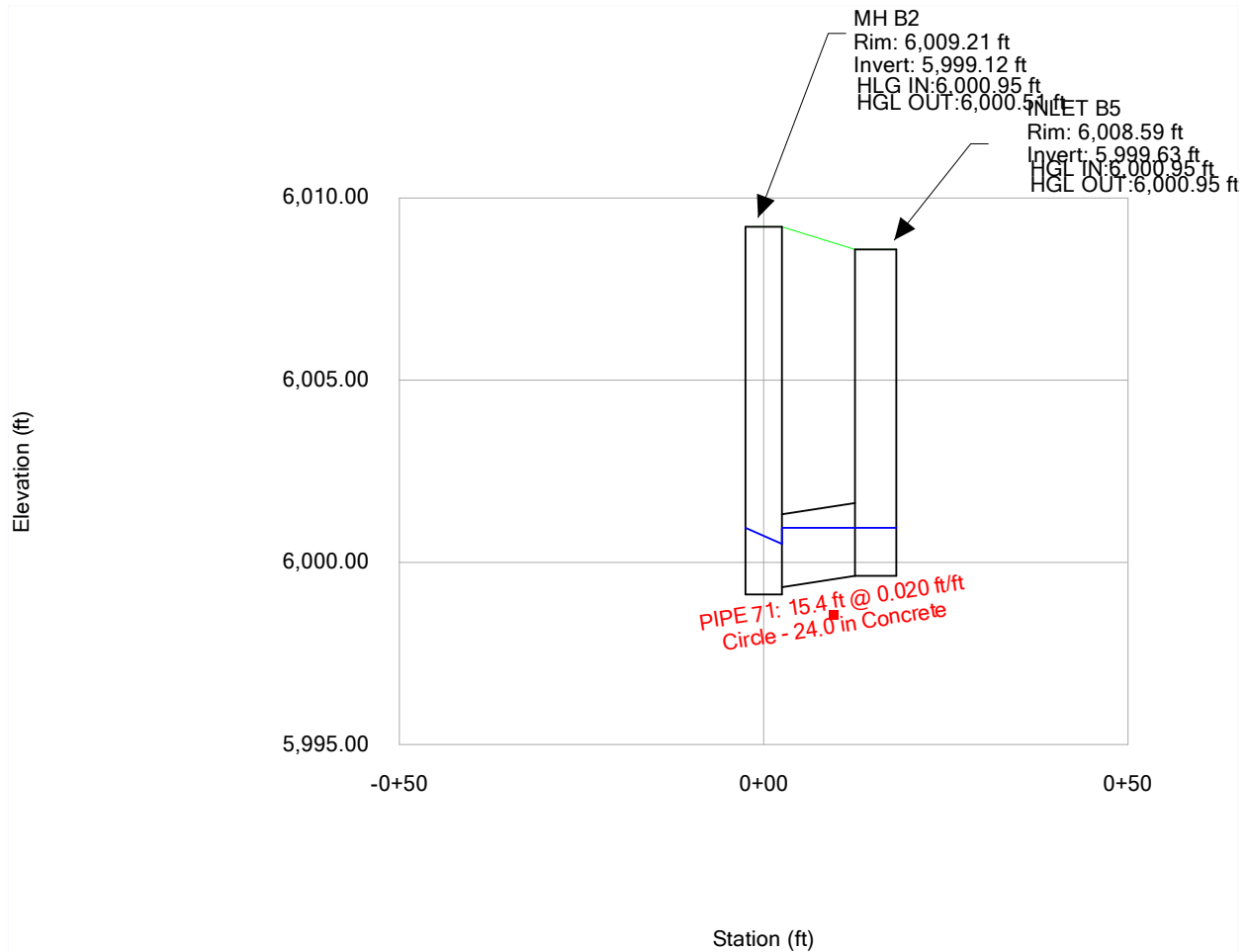


Profile Report

Engineering Profile - Stormline B4 (High Note Park Phase 1.stsw)

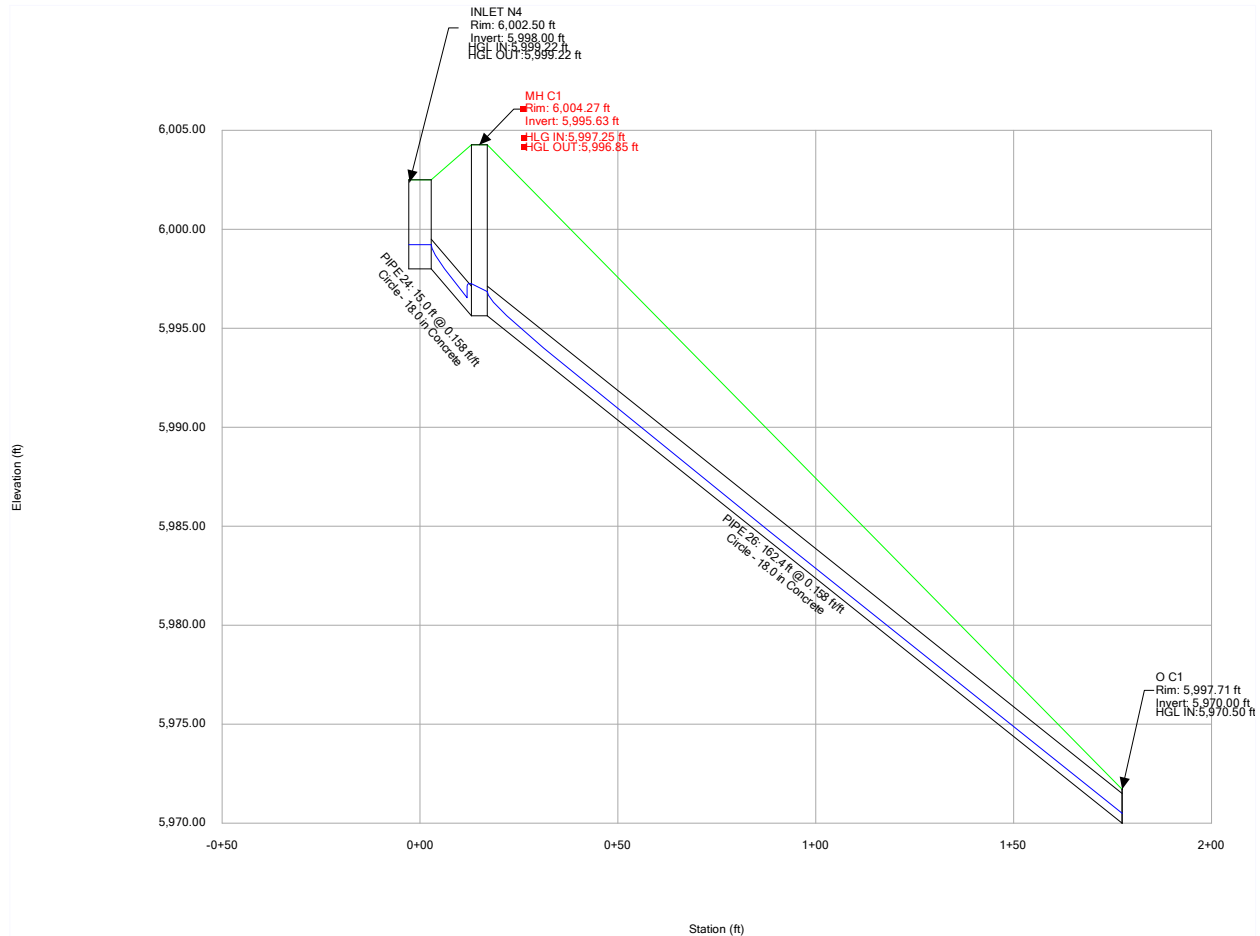


Profile Report **Engineering Profile - Stormline B5 (High Note Park Phase 1.stsw)**



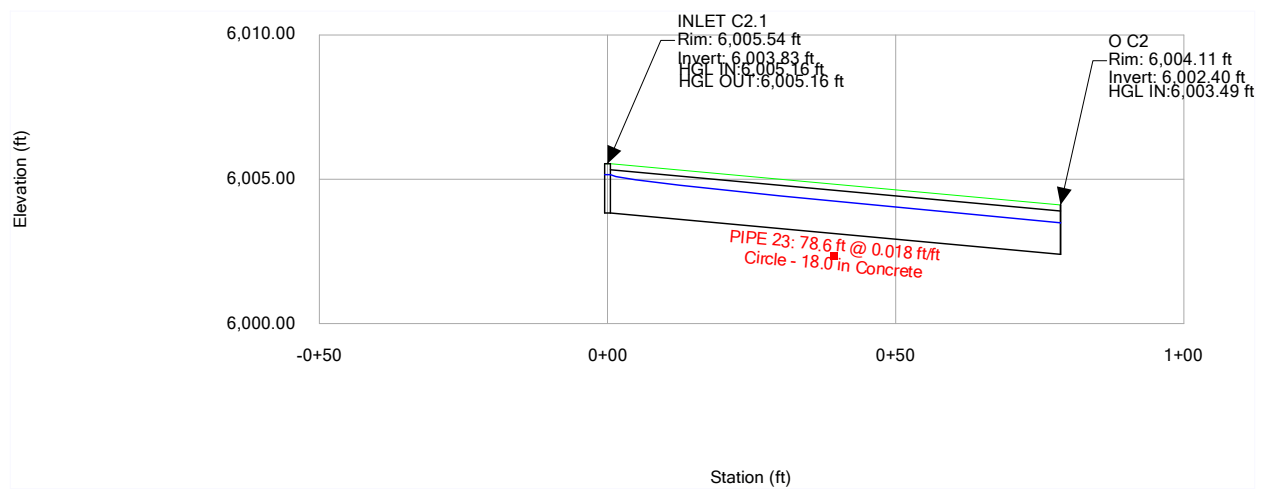
Profile Report

Engineering Profile - Stormline C1 (High Note Park Phase 1.stsw)



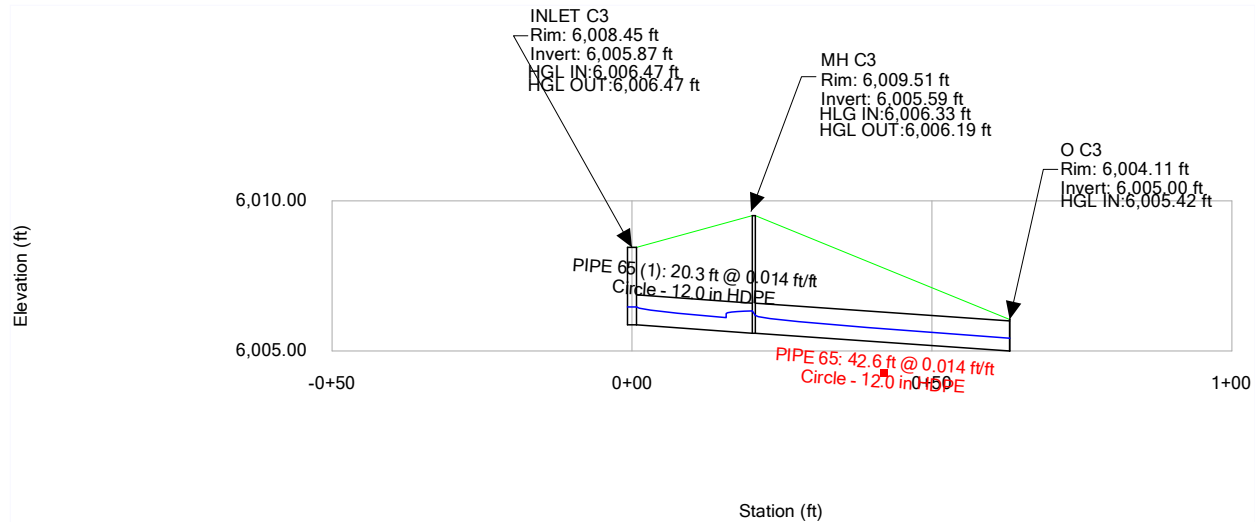
Profile Report

Engineering Profile - Stormline C2 (High Note Park Phase 1.stsw)



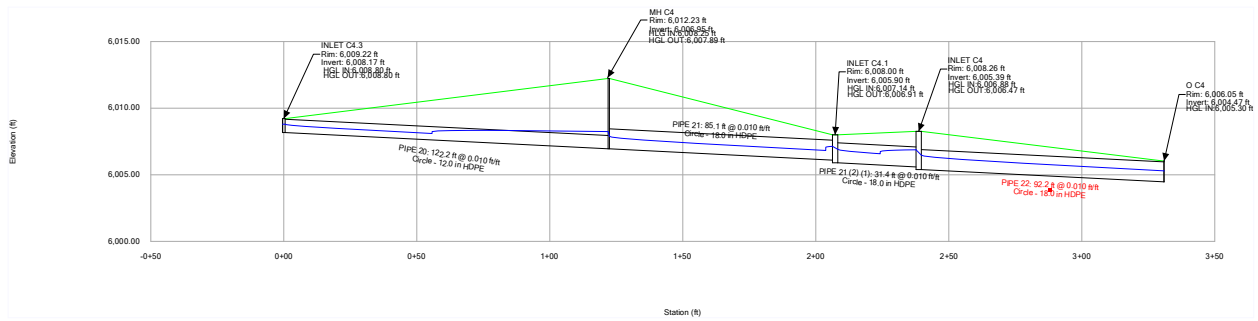
Profile Report

Engineering Profile - Stormline C3 (High Note Park Phase 1.stsw)



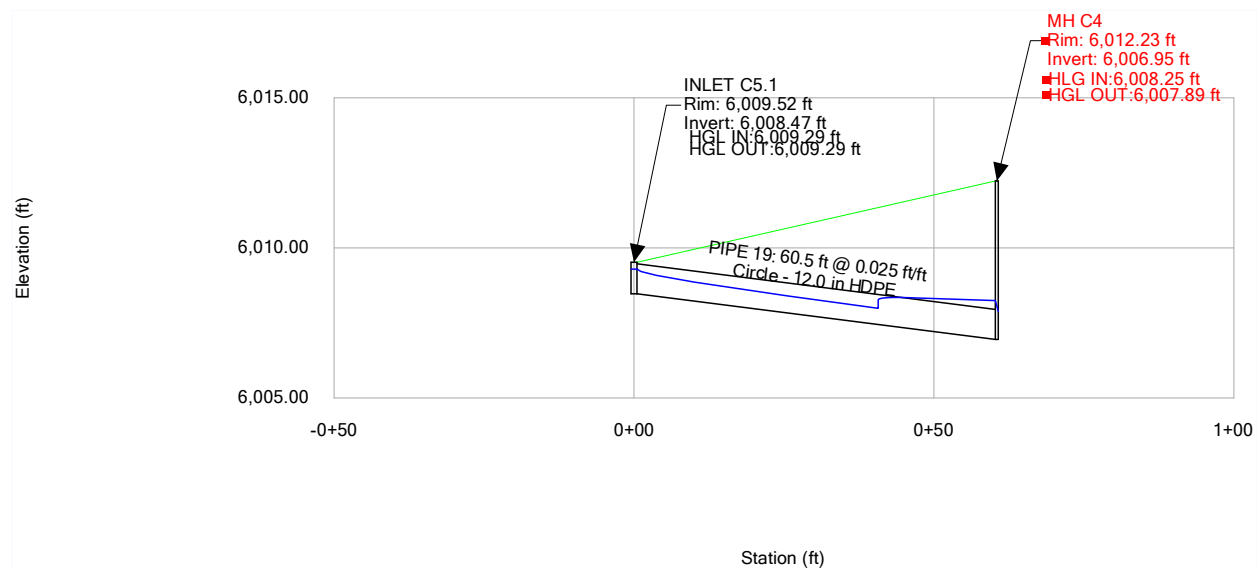
Profile Report

Engineering Profile - Stormline C4 (High Note Park Phase 1.stsw)



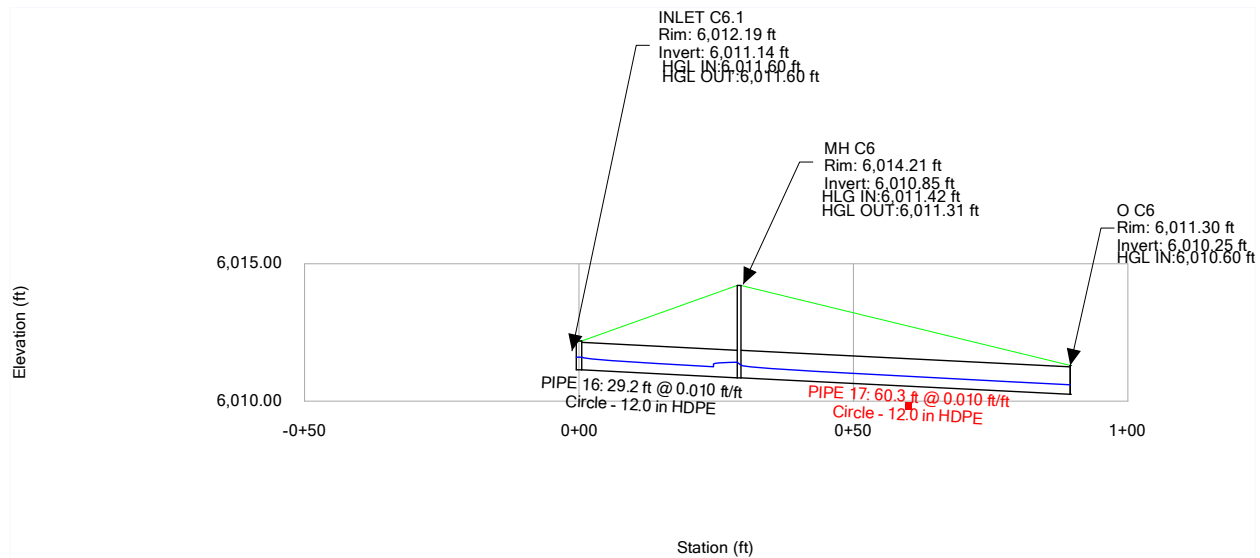
Profile Report

Engineering Profile - Stormline C5 (High Note Park Phase 1.stsw)



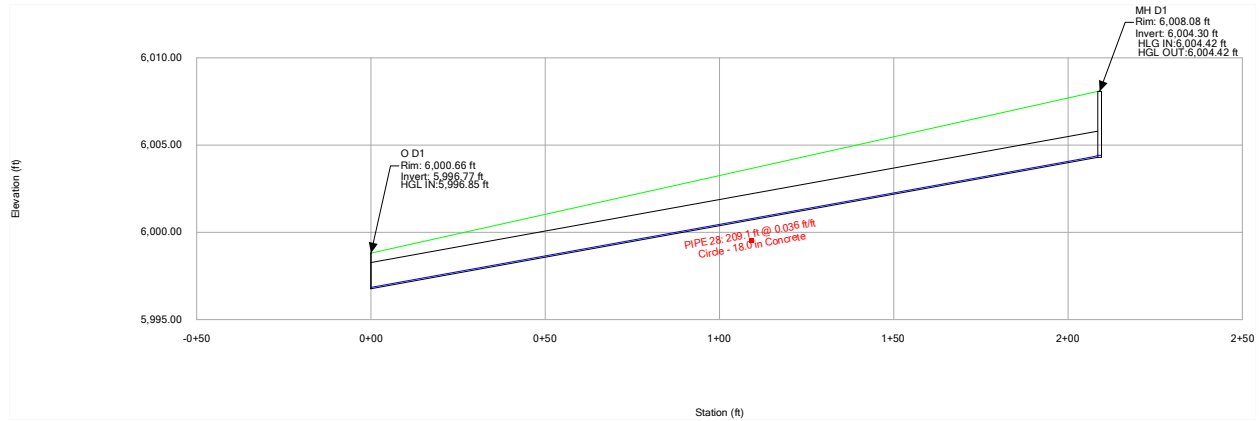
Profile Report

Engineering Profile - Stormline C6 (High Note Park Phase 1.stsw)



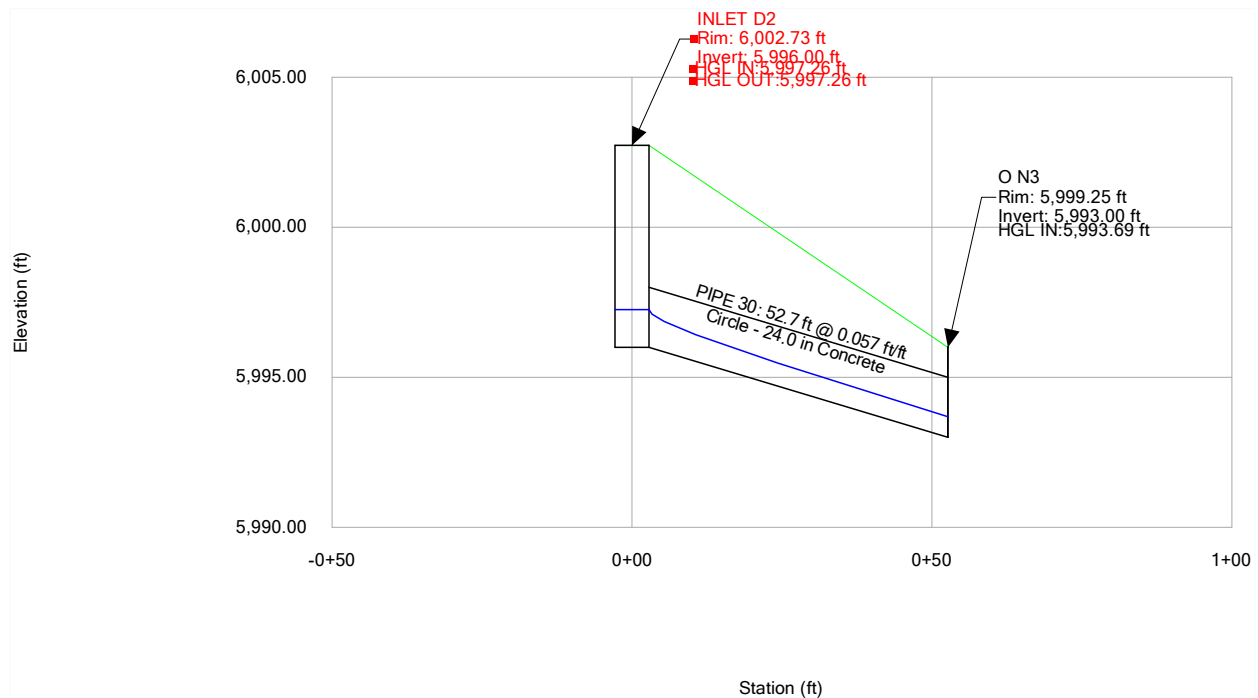
Profile Report

Engineering Profile - Stormline D1 (High Note Park Phase 1.stsw)



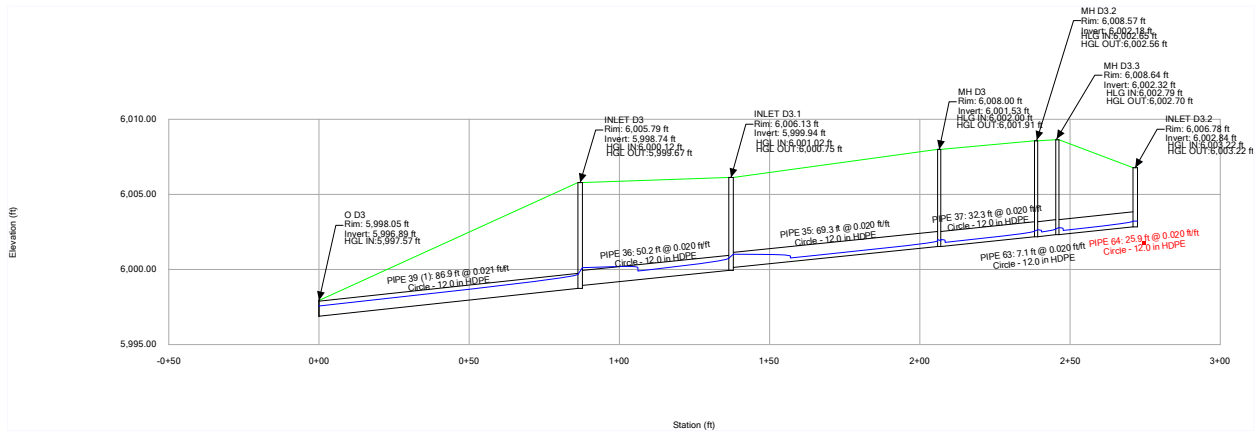
Profile Report

Engineering Profile - Stormline D2 (High Note Park Phase 1.stsw)



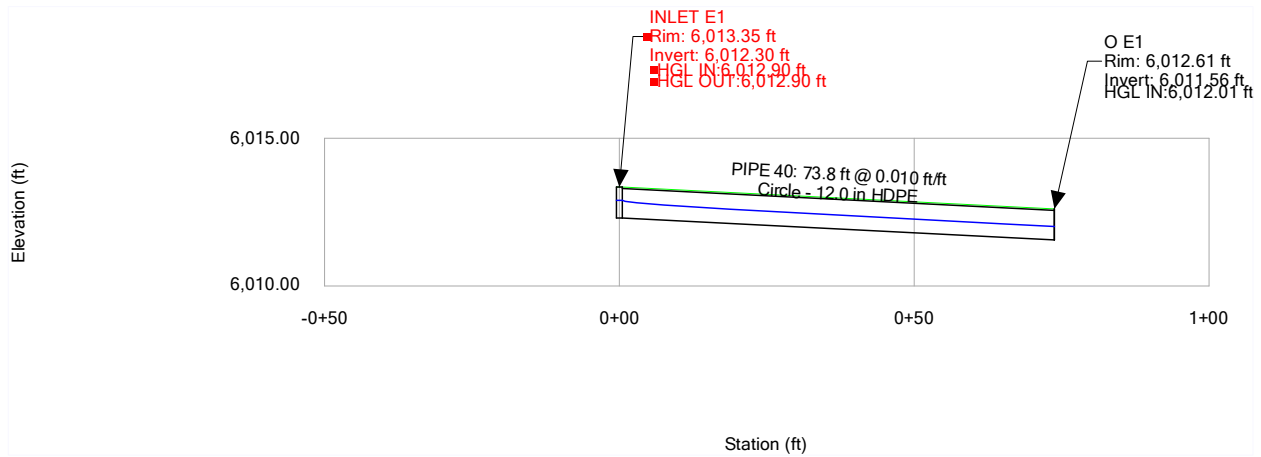
Profile Report

Engineering Profile - Stormline D3 (High Note Park Phase 1.stsw)



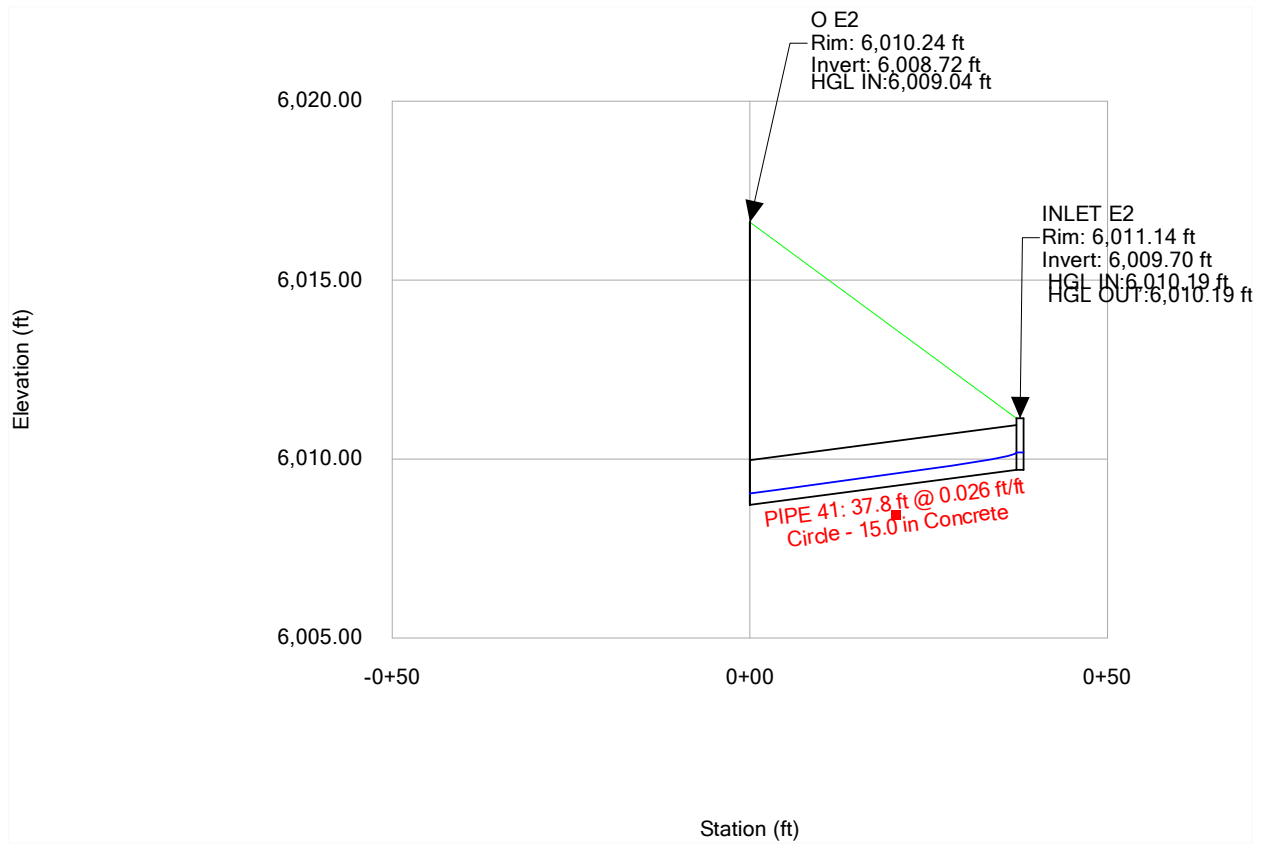
Profile Report

Engineering Profile - Stormline E1 (High Note Park Phase 1.stsw)



Profile Report

Engineering Profile - Stormline E2 (High Note Park Phase 1.stsw)



Scenario: 100-YR
Current Time Step: 0.000 h
FlexTable: Conduit Table

Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydrau Grade L (Out) (ft)
PIPE 16	INLET C6.1	6,011.14	MH C6	6,010.85	29.2	0.010	12.0	0.010	1.20	4.94	4.62	6,011.60	6,011
PIPE 17	MH C6	6,010.85	O C6	6,010.25	60.3	0.010	12.0	0.010	1.20	4.94	4.62	6,011.31	6,010
PIPE 19	INLET C5.1	6,008.47	MH C4	6,006.95	60.5	0.025	12.0	0.010	3.73	9.39	7.34	6,009.29	6,008
PIPE 20	INLET C4.3	6,008.17	MH C4	6,006.95	122.2	0.010	12.0	0.010	2.15	5.79	4.63	6,008.80	6,008
PIPE 21	MH C4	6,006.95	INLET C4.1	6,006.10	85.1	0.010	18.0	0.010	5.88	7.43	13.65	6,007.89	6,007
PIPE 22	INLET C4	6,005.39	O C4	6,004.47	92.2	0.010	18.0	0.010	7.78	7.97	13.64	6,006.47	6,005
PIPE 23	INLET C2.1	6,003.83	O C2	6,002.40	78.6	0.018	18.0	0.013	12.37	9.04	14.17	6,005.16	6,003
PIPE 24	INLET N4	5,998.00	MH C1	5,995.63	15.0	0.158	18.0	0.013	10.10	19.46	41.75	5,999.22	5,997
PIPE 26	MH C1	5,995.63	O C1	5,970.00	162.4	0.158	18.0	0.013	10.10	19.45	41.73	5,996.85	5,970
PIPE 28	MH D1	6,004.30	O D1	5,996.77	209.1	0.036	18.0	0.013	0.10	2.93	19.93	6,004.42	5,996
PIPE 30	INLET D2	5,996.00	O N3	5,993.00	52.7	0.057	24.0	0.013	12.20	13.89	53.99	5,997.26	5,993
PIPE 31	MH B3	6,006.27	O B3	6,002.30	72.4	0.055	18.0	0.013	0.10	3.40	24.60	6,006.39	6,002
PIPE 32	INLET B2	5,999.47	MH B2	5,999.32	7.3	0.021	24.0	0.013	14.70	10.08	32.48	6,000.85	6,000
PIPE 33	INLET A1	5,997.03	MH A	5,996.62	21.2	0.019	18.0	0.013	16.90	9.56	14.61	6,001.41	6,000
PIPE 35	MH D3	6,001.53	INLET D3.1	6,000.14	69.3	0.020	12.0	0.010	0.83	5.72	6.56	6,001.91	6,001
PIPE 36	INLET D3.1	5,999.94	INLET D3	5,998.94	50.2	0.020	12.0	0.010	3.63	8.54	6.53	6,000.75	6,000
PIPE 37	MH D3.2	6,002.18	MH D3	6,001.53	32.3	0.020	12.0	0.010	0.83	5.72	6.57	6,002.56	6,002
PIPE 39 (1)	INLET D3	5,998.74	O D3	5,996.89	86.9	0.021	12.0	0.010	5.31	9.52	6.76	5,999.67	5,997
PIPE 40	INLET E1	6,012.30	O E1	6,011.56	73.8	0.010	12.0	0.010	1.97	5.67	4.64	6,012.90	6,012
PIPE 41	INLET E2	6,009.70	O E2	6,008.72	37.8	0.026	15.0	0.013	1.50	6.03	10.41	6,010.19	6,009
PIPE 43	INLET B.1.1	6,009.00	MH B1	6,006.52	34.1	0.073	18.0	0.010	24.44	13.83	36.81	6,010.89	6,009
PIPE 44	MH B1	6,006.52	O B1	6,003.47	35.4	0.086	18.0	0.010	24.44	23.81	40.11	6,008.01	6,004
PIPE 45	MH B4	6,006.95	O B4	6,002.50	197.6	0.023	12.0	0.010	4.29	9.31	6.95	6,007.82	6,003
PIPE 46	MH D3.1	6,001.97	MH D3	6,001.78	4.8	0.040	6.0	0.010	0.00	0.00	1.46	6,002.00	6,002
PIPE 62	INLET B4	6,007.89	MH B4	6,006.95	47.2	0.020	12.0	0.010	4.29	8.88	6.54	6,008.76	6,008
PIPE 63	MH D3.3	6,002.32	MH D3.2	6,002.18	7.1	0.020	12.0	0.010	0.83	5.69	6.52	6,002.70	6,002
PIPE 65	MH C3	6,005.59	O C3	6,005.00	42.6	0.014	12.0	0.010	1.95	6.36	5.45	6,006.19	6,005
PIPE 67	INLET A2	5,998.07	MH A	5,996.62	73.0	0.020	18.0	0.013	11.66	6.60	14.80	6,001.76	6,000
PIPE 33 (1)	MH A	5,996.12	O N1	5,985.00	139.0	0.080	18.0	0.013	28.56	19.15	29.71	5,997.61	5,986
PIPE 64	INLET D3.2	6,002.84	MH D3.3	6,002.32	25.9	0.020	12.0	0.010	0.83	5.72	6.56	6,003.22	6,002
PIPE 21 (2) (1)	INLET C4.1	6,005.90	INLET C4	6,005.59	31.4	0.010	18.0	0.010	6.83	7.69	13.57	6,006.91	6,006
PIPE 32 (1)	MH B2	5,999.12	O N2	5,998.87	12.3	0.020	24.0	0.013	14.80	10.06	32.29	6,000.51	6,000
PIPE 65 (1)	INLET C3	6,005.87	MH C3	6,005.59	20.3	0.014	12.0	0.010	1.95	6.36	5.44	6,006.47	6,006
PIPE 70	MH C3	6,005.59	MH C3.1	6,005.76	31.1	-0.005	8.0	0.010	0.00	0.00	1.16	6,006.33	6,006
PIPE 71	INLET B5	5,999.63	MH B2	5,999.32	15.4	0.020	24.0	0.013	0.10	2.30	32.14	6,000.95	6,000

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Scenario: 100-YR
Current Time Step: 0.000 h
FlexTable: Catch Basin Table

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Flow (Additional Subsurface) (cfs)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Notes	Headloss Method	Headloss Coefficient (Standard)
INLET A1	6,004.15	5,997.03	Full Capture	16.90	6,002.83	6,001.41	Type R Inlet 10'	Absolute	-
INLET A2	6,004.51	5,998.07	Full Capture	11.66	6,002.44	6,001.76	Type R Inlet 10'	Absolute	-
INLET B.1.1	6,010.56	6,009.00	Full Capture	24.44	6,013.53	6,010.56	FES 18"	Absolute	-
INLET B2	6,007.59	5,999.47	Full Capture	14.70	6,001.48	6,000.85	Type D Inlet	Absolute	-
INLET B4	6,011.01	6,007.89	Full Capture	4.29	6,009.30	6,008.76	Area Inlet Nylo Round 24"	Absolute	-
INLET B5	6,008.59	5,999.63	Full Capture	0.10	6,000.95	6,000.95	Type D Inlet	Absolute	-
INLET C2.1	6,005.54	6,003.83	Full Capture	12.37	6,006.03	6,005.16	FES 18"	Absolute	-
INLET C3	6,008.45	6,005.87	Full Capture	1.95	6,006.71	6,006.47	Area Inlet Nylo Round 18"	Absolute	-
INLET C4	6,008.26	6,005.39	Full Capture	0.95	6,006.98	6,006.47	Area Inlet Nylo Round 24"	Standard	0.800
INLET C4.1	6,008.00	6,005.90	Full Capture	0.95	6,007.36	6,006.91	Area Inlet Nylo Round 24"	Standard	0.500
INLET C4.3	6,009.22	6,008.17	Full Capture	2.15	6,009.06	6,008.80	FES 12"	Absolute	-
INLET C5.1	6,009.52	6,008.47	Full Capture	3.73	6,009.75	6,009.29	FES 12"	Absolute	-
INLET C6.1	6,012.19	6,011.14	Full Capture	1.20	6,011.78	6,011.60	FES 12"	Absolute	-
INLET D2	6,002.73	5,996.00	Full Capture	12.20	5,997.79	5,997.26	Type D Inlet	Absolute	-
INLET D3	6,005.79	5,998.74	Full Capture	1.68	6,000.43	5,999.67	Area Inlet Nylo Round 18"	Standard	0.600
INLET D3.1	6,006.13	5,999.94	Full Capture	2.80	6,001.19	6,000.75	Area Inlet Nylo Round 18"	Standard	0.600
INLET D3.2	6,006.78	6,002.84	Full Capture	0.83	6,003.36	6,003.22	Area Inlet Nylo Round 18"	Absolute	-
INLET E1	6,013.35	6,012.30	Full Capture	1.97	6,013.15	6,012.90	FES 12"	Absolute	-
INLET E2	6,011.14	6,009.70	Full Capture	1.50	6,010.37	6,010.19	FES 15"	Absolute	-
INLET N4	6,002.50	5,998.00	Full Capture	10.10	5,999.89	5,999.22	Type D Inlet	Absolute	-

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Scenario: 100-YR
Current Time Step: 0.000 h
FlexTable: Manhole Table

Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Notes
MH D3.3	6,008.64	6,002.32	0.83	6,002.79	6,002.70	6,002.87	6,002.84	Standard	0.600	Standard
MH D3.2	6,008.57	6,002.18	0.83	6,002.65	6,002.56	6,002.73	6,002.70	Standard	0.600	Standard
MH D3.1	6,008.26	(N/A)	0.00	6,002.00	6,002.00	6,002.00	6,002.00	Absolute	-	Clean Out
MH D3	6,008.00	6,001.53	0.83	6,002.00	6,001.91	6,002.00	6,002.05	Standard	0.600	Standard
MH D1	6,008.08	(N/A)	0.10	6,004.42	6,004.42	6,004.46	6,004.46	Absolute	-	Cap
MH C6	6,014.21	6,010.85	1.20	6,011.42	6,011.31	6,011.52	6,011.49	Standard	0.600	Clean Out
MH C4	6,012.23	6,006.95	5.88	6,008.25	6,007.89	6,008.60	6,008.29	Standard	0.900	WYE Connection
MH C3.1	6,009.59	(N/A)	0.00	6,006.33	6,006.33	6,006.33	6,006.33	Absolute	-	Standard
MH C3	6,009.51	6,005.59	1.95	6,006.33	6,006.19	6,006.33	6,006.43	Standard	0.600	WYE Connection
MH C1	6,004.27	5,995.63	10.10	5,997.25	5,996.85	5,997.76	5,997.52	Standard	0.600	Storm MH 4'
MH B4	6,015.01	6,006.95	4.29	6,008.15	6,007.82	6,008.61	6,008.36	Standard	0.600	Standard
MH B3	6,013.18	(N/A)	0.10	6,006.39	6,006.39	6,006.43	6,006.43	Absolute	-	Storm MH 4'
MH B2	6,009.21	5,999.32	14.80	6,000.95	6,000.51	6,000.95	6,001.14	Standard	0.700	Storm MH 5'
MH B1	6,010.49	6,006.52	24.44	6,009.79	6,008.01	6,012.77	6,010.99	Standard	0.600	Standard
MH A	6,009.29	5,996.62	28.56	6,000.86	5,997.61	6,001.54	6,001.68	Standard	0.800	Storm MH 5'

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Scenario: 100-YR
Current Time Step: 0.000 h
FlexTable: Outfall Table

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
O B1	6,005.11	6,003.47	Free Outfall	-	6,004.53	6,004.53	24.44
O B3	6,004.01	6,002.30	Free Outfall	-	6,002.37	6,002.37	0.10
O B4	6,003.55	6,002.50	Free Outfall	-	6,003.07	6,003.07	4.29
O C1	5,971.71	5,970.00	Free Outfall	-	5,970.50	5,970.50	10.10
O C3	6,006.05	6,005.00	Free Outfall	-	6,005.42	6,005.42	1.95
O C4	6,006.03	6,004.47	Free Outfall	-	6,005.30	6,005.30	7.78
O D1	5,998.81	5,996.77	Free Outfall	-	5,996.85	5,996.85	0.10
O D3	5,997.94	5,996.89	Free Outfall	-	5,997.57	5,997.57	5.31
O E1	6,012.61	6,011.56	Free Outfall	-	6,012.01	6,012.01	1.97
O E2	6,016.62	6,008.72	Free Outfall	-	6,009.04	6,009.04	1.50
O N2	6,011.69	5,998.87	Free Outfall	-	6,000.00	6,000.00	14.80
O N3	5,996.00	5,993.00	Free Outfall	-	5,993.69	5,993.69	12.20
O N1	5,987.25	5,985.00	Free Outfall	-	5,986.20	5,986.20	28.56
O C2	6,004.11	6,002.40	Free Outfall	-	6,003.49	6,003.49	12.37
O C6	6,011.30	6,010.25	Free Outfall	-	6,010.60	6,010.60	1.20

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APPENDIX C – WATER QUALITY

Pond N2 Detention Calculations

Pond N3 Detention Calculations

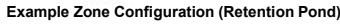
Pond N4 Detention Calculations

POND N2

DETENTION CALCULATIONS

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: EURV Pond N2



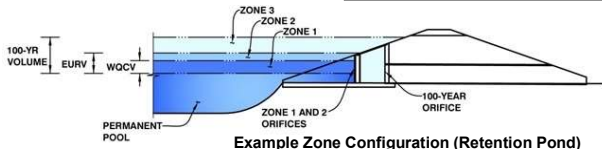
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **HN NORTH PARK**

Basin ID: **EURV Pond N2**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.79	0.182	Orifice Plate
Zone 2 (EURV)	5.42	0.371	Circular Orifice
Zone 3			
Total (all zones)		0.553	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Calculated Parameters for Plate

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-3/16 inches)

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.90	3.80					
Orifice Area (sq. inches)	1.15	1.15	1.15					

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

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected		Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	4.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.20	ft ²
Depth at top of Zone using Vertical Orifice =	5.42		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25	feet
Vertical Orifice Diameter =	6.00		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

	Not Selected	Not Selected		Not Selected	Not Selected	
Overflow Weir Front Edge Height, H _o =	5.59		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H _g =	5.59	feet
Overflow Weir Front Edge Length =	8.37		feet	Overflow Weir Slope Length =	3.43	feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	12.85	
Horiz. Length of Weir Sides =	3.43		feet	Overflow Grate Open Area w/o Debris =	22.71	ft ²
Overflow Grate Type =	Close Mesh Grate			Overflow Grate Open Area w/ Debris =	11.35	ft ²
Debris Clogging % =	50%		%			

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected		Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	2.53		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	ft ²
Circular Orifice Diameter =	18.00		inches	Outlet Orifice Centroid =	0.75	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	6.59	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.02	feet	
Spillway Crest Length =	8.37	feet	Stage at Top of Freeboard =	8.61	feet	
Spillway End Slopes =	0.00	H:V	Basin Area at Top of Freeboard =	0.29	acres	
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.16	acre-ft	

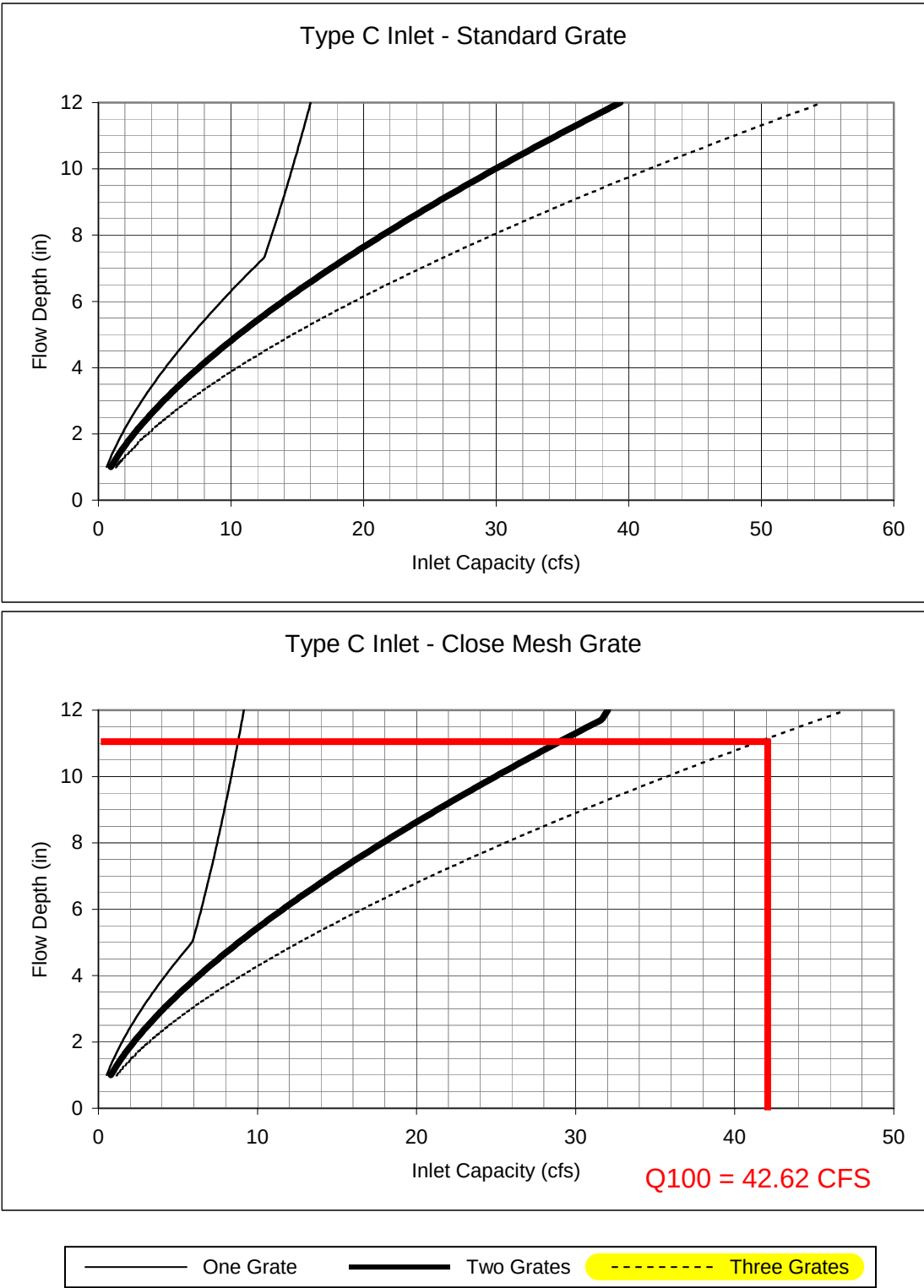
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.68	2.26	2.60	3.07
One-Hour Rainfall Depth (in) =	0.182	0.553	0.432	0.622	0.743	0.762	1.073	1.265	1.521
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.432	0.622	0.743	0.762	1.073	1.265	1.521
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.4	2.5	3.7	4.8	8.6	11.1	14.3
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.07	0.38	0.56	0.74	1.33	1.71	2.20
Peak Inflow Q (cfs) =	N/A	N/A	9.0	12.8	15.4	16.2	22.9	26.2	31.4
Peak Outflow Q (cfs) =	0.1	1.2	0.5	1.1	1.5	2.0	9.4	14.7	20.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.4	0.4	1.1	1.3	1.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.0	0.3	0.6	0.8
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) =	39	55	56	56	55	55	52	50	48
Time to Drain 99% of Inflow Volume (hours) =	41	59	60	61	61	61	60	59	58
Maximum Ponding Depth (ft) =	2.79	5.42	4.44	5.15	5.62	5.65	5.93	6.07	6.21
Area at Maximum Ponding Depth (acres) =	0.11	0.18	0.15	0.17	0.19	0.19	0.20	0.21	0.21
Maximum Volume Stored (acre-ft) =	0.183	0.554	0.390	0.504	0.589	0.597	0.651	0.680	0.709

Chapter 8. Inlets

FIGURE 8-12, INLET CAPACITY CHART SUMP CONDITIONS
AREA (TYPE C) INLET



Notes:
1. The Douglas County standard inlet parameters must apply to use these charts.

POND N3

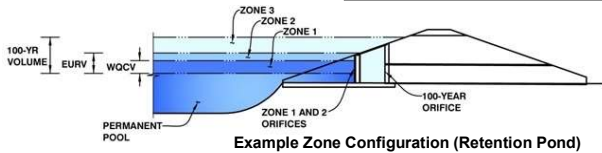
DETENTION CALCULATIONS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **HN NORTH PARK**

Basin ID: **EURV Pond N3 (Phase 1)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.56	0.020	Orifice Plate
Zone 2 (EURV)	1.25	0.034	Circular Orifice
Zone 3			
Total (all zones)		0.055	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Calculated Parameters for Plate

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 11/16 inch)

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.60	1.20					
Orifice Area (sq. inches)	0.40	0.40	0.40					

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

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected		Zone 2 Circular	Not Selected
Invert of Vertical Orifice =	1.45		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79 ft ²
Depth at top of Zone using Vertical Orifice =	1.25		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.50 feet
Vertical Orifice Diameter =	12.00		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

	Not Selected	Not Selected		Not Selected	Not Selected
Overflow Weir Front Edge Height, H _o =	5.73		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H _u =	5.73 feet
Overflow Weir Front Edge Length =	8.37		feet	Overflow Weir Slope Length =	3.43 feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	12.85
Horiz. Length of Weir Sides =	3.43		feet	Overflow Grate Open Area w/o Debris =	22.71 ft ²
Overflow Grate Type =	Close Mesh Grate			Overflow Grate Open Area w/ Debris =	11.35 ft ²
Debris Clogging % =	50%		%		

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected		Not Selected	Not Selected
Depth to Invert of Outlet Pipe =	1.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77 ft ²
Circular Orifice Diameter =	18.00		inches	Outlet Orifice Centroid =	0.75 feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	6.73	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	0.35 feet
Spillway Crest Length =	32.00	feet	Stage at Top of Freeboard =	8.08 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.26 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.99 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).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.68	2.26	2.60	3.07
One-Hour Rainfall Depth (in) =	0.020	0.055	0.046	0.078	0.100	0.108	0.168	0.209	0.260
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.046	0.078	0.100	0.108	0.168	0.209	0.260
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	0.4	0.7	0.9	1.5	2.0	2.6
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.06	0.34	0.50	0.65	1.18	1.52	1.95
Peak Inflow Q (cfs) =	N/A	N/A	0.7	1.3	1.6	1.8	2.8	3.4	4.2
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.1	0.2	0.4	1.1	1.7	2.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.4	0.4	0.7	0.8	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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	56	54	62	61	60	56	53	50
Time to Drain 99% of Inflow Volume (hours) =	42	62	59	68	68	68	65	64	62
Maximum Ponding Depth (ft) =	0.55	1.25	1.02	1.52	1.68	1.75	2.04	2.21	2.37
Area at Maximum Ponding Depth (acres) =	0.04	0.06	0.05	0.06	0.07	0.07	0.07	0.08	0.08
Maximum Volume Stored (acre-ft) =	0.020	0.055	0.042	0.071	0.081	0.086	0.106	0.118	0.130

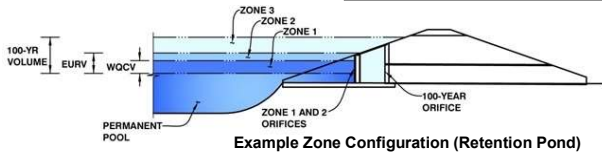
MHFD-Detention, Version 4.06 (July 2022)

Basin ID: EURV Pond N3 (Final)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **HN NORTH PARK**
Basin ID: **EURV Pond N3 (Final)**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.09	0.193	Orifice Plate
Zone 2 (EURV)	5.73	0.356	Circular Orifice
Zone 3			
Total (all zones)		0.549	

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

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-1/4 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.00	4.00					
Orifice Area (sq. inches)	1.25	1.25	1.25					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice
Zone 2 Circular
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Not Selected
Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Not Selected
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

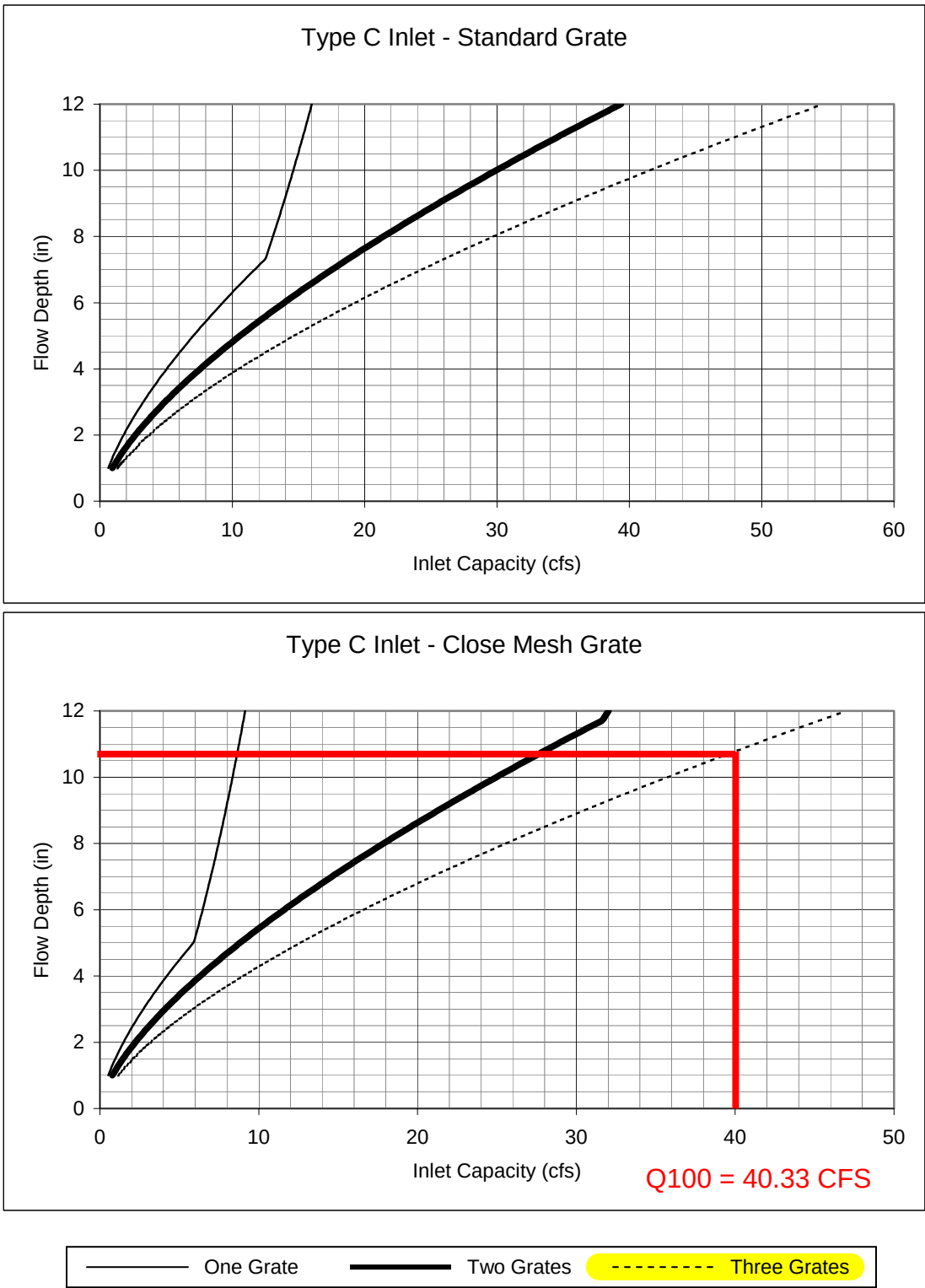
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.68	2.26	2.60	3.07
One-Hour Rainfall Depth (in) =	0.193	0.549	0.436	0.616	0.729	0.742	1.029	1.202	1.436
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.436	0.616	0.729	0.742	1.029	1.202	1.436
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.3	1.6	2.4	3.2	5.7	7.6	9.7
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.05	0.28	0.41	0.55	0.99	1.31	1.68
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.05	0.28	0.41	0.55	0.99	1.31	1.68
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.05	0.28	0.41	0.55	0.99	1.31	1.68
Peak Inflow Q (cfs) =	N/A	N/A	7.6	10.5	12.0	12.5	17.3	20.6	24.6
Peak Outflow Q (cfs) =	0.1	3.8	0.8	2.0	3.0	3.4	7.9	12.2	17.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.3	1.2	1.1	1.4	1.6	1.8
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.2	0.3	0.5
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) =	40	50	52	50	49	49	46	44	42
Time to Drain 99% of Inflow Volume (hours) =	44	55	57	56	56	56	54	53	52
Maximum Ponding Depth (ft) =	3.09	5.73	4.67	5.06	5.28	5.44	5.93	6.07	6.19
Area at Maximum Ponding Depth (acres) =	0.10	0.18	0.14	0.15	0.16	0.17	0.19	0.19	0.20
Maximum Volume Stored (acre-ft) =	0.194	0.550	0.380	0.437	0.471	0.497	0.587	0.611	0.635

Chapter 8. Inlets

FIGURE 8-12, INLET CAPACITY CHART SUMP CONDITIONS
AREA (TYPE C) INLET

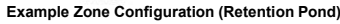


Notes:
1. The Douglas County standard inlet parameters must apply to use these charts.

POND N4 DETENTION CALCULATIONS

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: EURV POND N4 (PHASE 1)

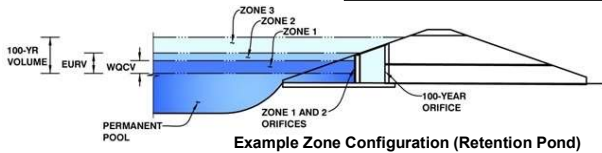


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **HN NORTH PARK**

Basin ID: **EURV POND N4 (PHASE 1)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.20	0.067	Orifice Plate
Zone 2 (EURV)	2.16	0.114	Circular Orifice
Zone 3			
Total (all zones)		0.181	

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

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

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	N/A ft ²
Underdrain Orifice Centroid =	N/A feet

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.16	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.00	inches
Orifice Plate: Orifice Area per Row =	0.65	sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate	
WQ Orifice Area per Row =	4.514E-03 ft ²
Elliptical Half-Width =	N/A feet
Elliptical Slot Centroid =	N/A feet
Elliptical Slot Area =	N/A ft ²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80	1.60					
Orifice Area (sq. inches)	0.65	0.65	0.65					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.00		ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	2.16		ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	6.00		inches

Calculated Parameters for Vertical Orifice	
Vertical Orifice Area =	0.20 ft ²
Vertical Orifice Centroid =	0.25 feet

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

	Not Selected	Not Selected	
Overflow Weir Front Edge Height, H _o =	3.50		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.37		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	3.43		feet
Overflow Grate Type =	Close Mesh Grate		
Debris Clogging % =	50%		%

Calculated Parameters for Overflow Weir	
Height of Grate Upper Edge, H _u =	3.50 feet
Overflow Weir Slope Length =	3.43 feet
Grate Open Area / 100-yr Orifice Area =	12.85
Overflow Grate Open Area w/o Debris =	22.71 ft ²
Overflow Grate Open Area w/ Debris =	11.35 ft ²

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	1.00		ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	18.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	
Outlet Orifice Area =	1.77 ft ²
Outlet Orifice Centroid =	0.75 feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	4.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	15.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway	
Spillway Design Flow Depth =	0.46 feet
Stage at Top of Freeboard =	5.96 feet
Basin Area at Top of Freeboard =	0.31 acres
Basin Volume at Top of Freeboard =	1.07 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).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.68	2.26	2.60	3.07
One-Hour Rainfall Depth (in) =	N/A	N/A	0.157	0.267	0.343	0.371	0.578	0.719	0.896
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.157	0.267	0.343	0.371	0.578	0.719	0.896
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.2	1.0	1.4	2.0	3.5	4.6	6.0
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.04	0.22	0.33	0.45	0.81	1.07	1.38
Peak Inflow Q (cfs) =	N/A	N/A	1.7	3.0	3.7	4.4	6.8	8.3	10.3
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.5	0.7	0.8	1.4	3.7	6.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.5	0.4	0.4	0.8	1.1
Structure Controlling Flow =	Plate	Vertical Orifice 1	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.2
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	61	59	63	62	61	58	54	51
Time to Drain 99% of Inflow Volume (hours) =	44	66	64	69	69	69	68	67	65
Maximum Ponding Depth (ft) =	1.20	2.16	1.89	2.44	2.70	2.81	3.53	3.66	3.76
Area at Maximum Ponding Depth (acres) =	0.09	0.15	0.13	0.16	0.18	0.19	0.22	0.23	0.23
Maximum Volume Stored (acre-ft) =	0.068	0.182	0.145	0.225	0.268	0.289	0.437	0.464	0.490

MHFD-Detention, Version 4.06 (July 2022)

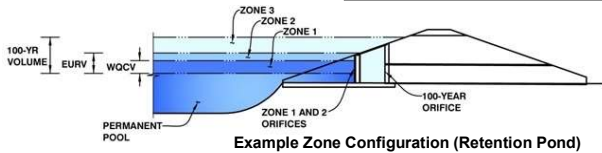
Basin ID: EURV POND N4 (FINAL PHASE)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **HN NORTH PARK**

Basin ID: **EURV POND N4 (FINAL PHASE)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.67	0.117	Orifice Plate
Zone 2 (EURV)	3.22	0.253	Circular Orifice
Zone 3			
Total (all zones)		0.370	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Calculated Parameters for Plate

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-1/16 inches)

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.20					
Orifice Area (sq. inches)	0.90	0.90	0.90					

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

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

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

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter = inches

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

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

Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

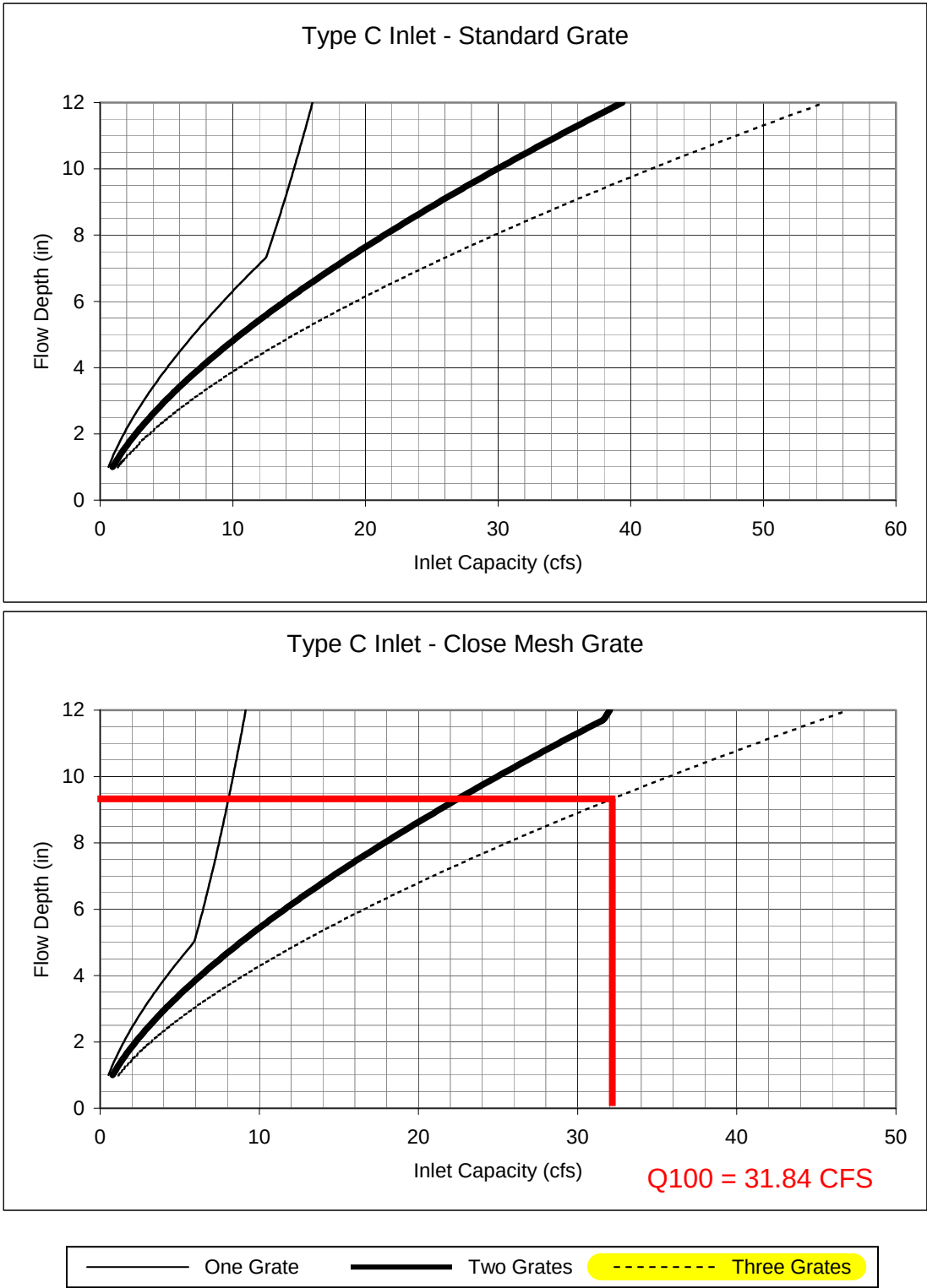
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.68	2.26	2.60	3.07
One-Hour Rainfall Depth (in) =	0.117	0.370	0.307	0.466	0.569	0.595	0.868	1.044	1.273
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.307	0.466	0.569	0.595	0.868	1.044	1.273
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.2	1.4	2.0	2.7	4.9	6.5	8.4
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.04	0.24	0.36	0.49	0.88	1.16	1.49
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.04	0.24	0.36	0.49	0.88	1.16	1.49
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.04	0.24	0.36	0.49	0.88	1.16	1.49
Peak Inflow Q (cfs) =	N/A	N/A	4.4	6.8	8.1	8.7	12.8	15.5	18.8
Peak Outflow Q (cfs) =	0.1	0.8	0.3	0.8	1.4	2.2	6.8	10.1	13.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.7	0.8	1.4	1.6	1.6
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.3	0.4	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	42	61	63	62	61	60	56	54	50
Time to Drain 99% of Inflow Volume (hours) =	45	67	68	68	68	68	66	65	63
Maximum Ponding Depth (ft) =	1.67	3.22	2.77	3.27	3.55	3.60	3.78	3.87	3.97
Area at Maximum Ponding Depth (acres) =	0.12	0.21	0.18	0.21	0.22	0.23	0.23	0.24	0.24
Maximum Volume Stored (acre-ft) =	0.117	0.370	0.280	0.381	0.442	0.451	0.492	0.516	0.537

Chapter 8. Inlets

FIGURE 8-12, INLET CAPACITY CHART SUMP CONDITIONS
AREA (TYPE C) INLET



Notes:
1. The Douglas County standard inlet parameters must apply to use these charts.

APPENDIX D – REFERENCED INFORMATION

Firm Panel

NRCS Soil Survey

Bridgegate Flg 1 – Phase 3 Master Drainage Report



FLOOD HAZARD INFORMATION

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

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

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-6627) or visit the FEMA Flood Map Service Center website at <https://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

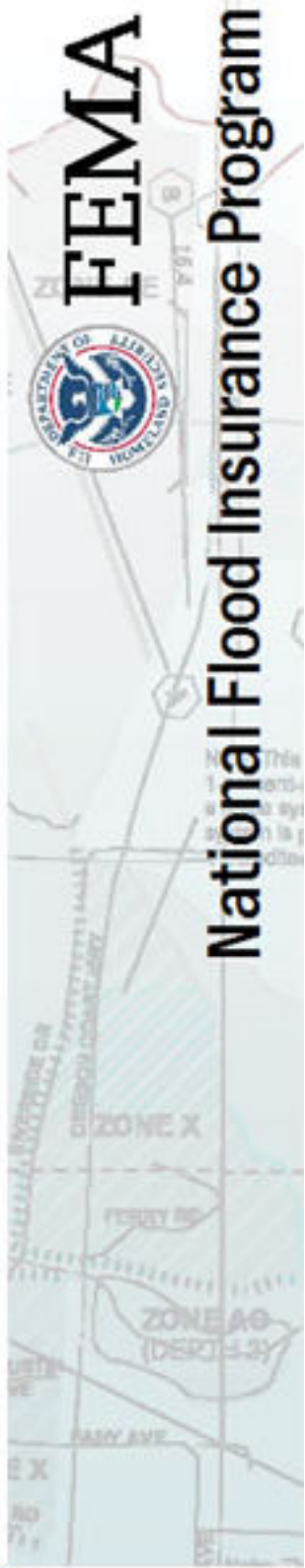
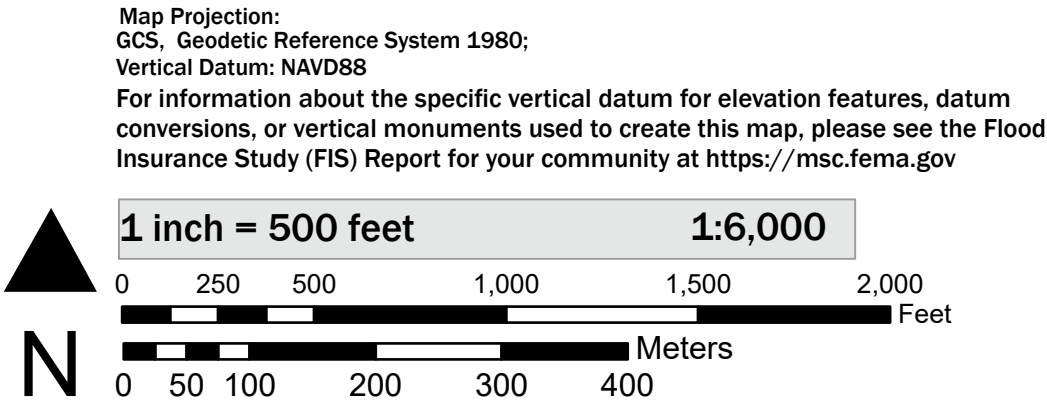
To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **1/13/2026 12:07 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at <https://www.fema.gov/media-library/assets/documents/118418>

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

PANEL 63 OF 461

Panel Contains:
COMMUNITY 080319 NUMBER 080049 PANEL 0063
CITY OF LONE TREE
DOUGLAS COUNTY

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

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

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

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

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

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

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



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for Castle Rock Area, Colorado



January 13, 2026

Preface

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

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

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

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

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

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

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En—Englewood clay loam.....	13
Lo—Loamy alluvial land.....	14
NsE—Newlin-Satanta complex, 5 to 20 percent slopes.....	15
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How Soil Surveys Are Made

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

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

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

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

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

Custom Soil Resource Report

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

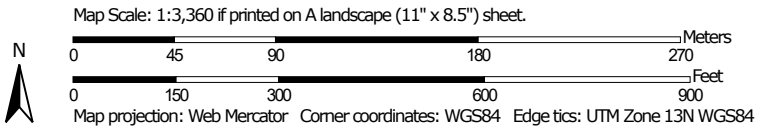
Soil Map

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

Custom Soil Resource Report Soil Map



Soil Map may not be valid at this scale.



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 18, Aug 29, 2025

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
En	Englewood clay loam	11.9	TYPE C 46.9%
Lo	Loamy alluvial land	0.9	TYPE C 3.6%
NsE	Newlin-Satanta complex, 5 to 20 percent slopes	12.6	TYPE B 49.5%
Totals for Area of Interest		25.4	100.0%

Map Unit Descriptions

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

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

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

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

Custom Soil Resource Report

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Castle Rock Area, Colorado

En—Englewood clay loam

Map Unit Setting

National map unit symbol: jqym

Elevation: 5,500 to 6,600 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 47 to 52 degrees F

Frost-free period: 120 to 135 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Englewood and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Englewood

Setting

Landform: Terraces, swales

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Weathered from alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: clay loam

H2 - 10 to 29 inches: clay

H3 - 29 to 60 inches: clay

Properties and qualities

Slope: 1 to 4 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Ecological site: R049XB208CO - Clayey Foothill

Hydric soil rating: No

Minor Components

Sampson

Percent of map unit: 10 percent

Hydric soil rating: No

Satanta

Percent of map unit: 9 percent

Hydric soil rating: No

Fluvaquentic haplustolls

Percent of map unit: 1 percent

Landform: Terraces

Hydric soil rating: Yes

Lo—Loamy alluvial land

Map Unit Setting

National map unit symbol: jqzb

Elevation: 7,000 to 8,000 feet

Mean annual precipitation: 17 to 19 inches

Mean annual air temperature: 44 to 46 degrees F

Frost-free period: 115 to 120 days

Farmland classification: Not prime farmland

Map Unit Composition

Loamy alluvial land: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loamy Alluvial Land

Setting

Landform: Flood plains, swales

Down-slope shape: Linear

Across-slope shape: Linear

Typical profile

H1 - 0 to 20 inches: sandy loam

H2 - 20 to 40 inches: stratified loamy sand to clay loam

H3 - 40 to 60 inches: sand and gravel

Properties and qualities

Slope: 1 to 5 percent

Drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 6.00 in/hr)

Depth to water table: About 48 to 72 inches

Frequency of flooding: Frequent

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Custom Soil Resource Report

Hydrologic Soil Group: C
Ecological site: R049XY036CO - Overflow
Hydric soil rating: No

Minor Components

Sampson

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

Bresser

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

Sandy alluvial land

Percent of map unit: 5 percent

Fluvaquentic haplustolls

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

NsE—Newlin-Satanta complex, 5 to 20 percent slopes

Map Unit Setting

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

Map Unit Composition

Newlin and similar soils: 50 percent
Satanta and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newlin

Setting

Landform: Drainageways, knobs
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Unconformable sandy and gravelly and/or mixed source alluvium

Typical profile

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

Custom Soil Resource Report

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XC202CO - Loamy Foothill Palmer Divide
Hydric soil rating: No

Description of Satanta

Setting

Landform: Drainageways, knobs
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from mixed

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 30 inches: clay loam
H3 - 30 to 60 inches: loam

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Bresser

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

Custom Soil Resource Report

Buick

Percent of map unit: 6 percent

Hydric soil rating: No

Truckton

Percent of map unit: 6 percent

Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 2 percent

Landform: Swales

Hydric soil rating: Yes

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Custom Soil Resource Report

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RIDGEGATE FLG 1 - PHASE 3 MASTER DRAINAGE REPORT

IV. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

The conveyance system within the Ridgeway Southwest Village site is that of a typical subdivision with curb and gutter capturing and conveying flows to on-grade and sump storm sewer inlets. Concentrated off-site flows are proposed to be channelized via swales and routed into the proposed storm sewer system.

All inlets within the proposed roadways will be Type R inlets. Area inlets for the improvements will consist of Type C and Type D inlets. Inlet calculations and sizing can be found in Appendix C.

Storm sewer will be sized to carry the minor storm in a free flowing condition, and the major storm will maintain an HGL a minimum of one foot below finished grade. Storm runoff from the proposed development will be conveyed via proposed storm sewer infrastructure to the proposed EURV Pond A, or to the existing infrastructure within Ridgeway Parkway.

All storm sewer pipes, inlets, and streets will be public improvements. The EURV pond will reside on property owned by the City of Lone Tree but will be maintained by the Rampart Range Metro District. Easements and tracts will be established to allow for maintenance access to drainage facilities outside of public right-of-way.

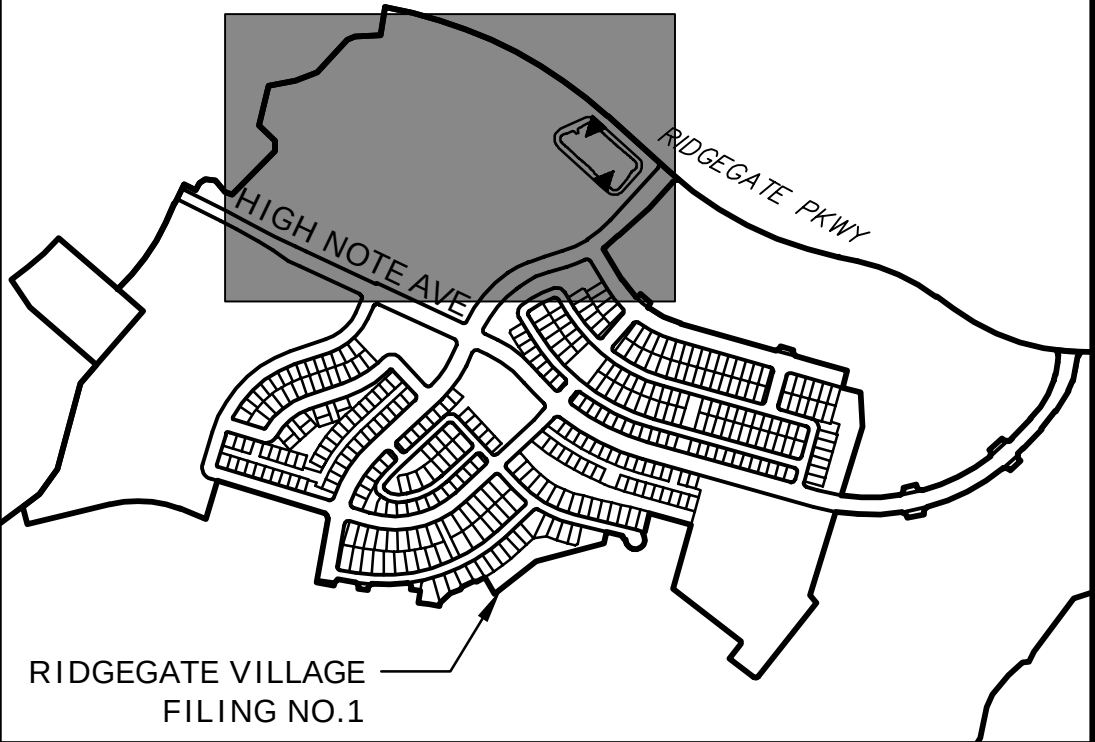
B. Stormwater Storage Facilities

There is one proposed EURV pond within the Filing 1 development. This EURV pond will provide water quality for a majority of the Filing 1 site, and will outfall into Happy Canyon Creek. In-line detention is planned to be provided within Happy Canyon (by others) per the *Ridgeway Master Drainage Report* and will not be provided in the on-site ponds. The site will also utilize existing storm sewer infrastructure within Ridgeway Parkway, along with an existing water quality pond located just north of the site.

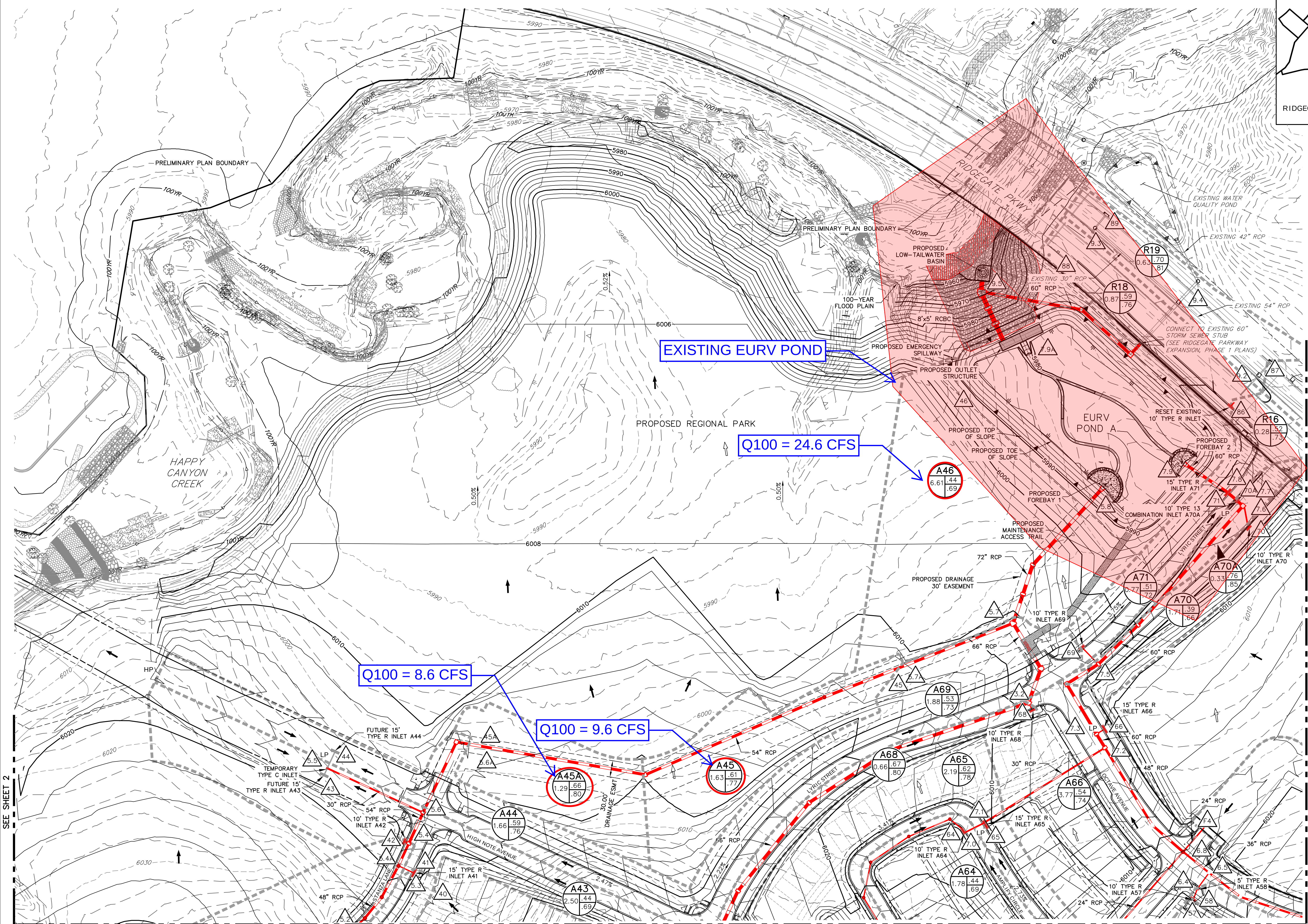
The proposed EURV pond will utilize forebays at each outfall point into the pond in order to dissipate the energy from the storm runoff and collect sediment. Trickle channels will then convey the runoff to the outlet structure. The outlet structure will include a micropool and contain an initial surcharge volume. The outlet structure will utilize orifice plates for both the water quality capture volume (WQCV) and EURV. The outlet structure's orifice plate will be sized to release the WQCV and EURV events over a period of 40 and 72 hours respectively. For the developed 100-year inflows, an overflow grate on the top of the outlet structure will be used in order to pass discharges above the EURV level and minimize incidental detention. The outlet structure will have a release rate of 446.5 cfs for a 100-year storm event and will require 9.933 ac-ft of storage. All flows up to the 100-year storm event shall enter the channel at the proposed outfall location. This outfall shall utilize a low tail-water basin to dissipate the kinetic energy of the storm discharge, and prevent scouring of Happy Canyon Creek. The pond will also have an emergency spillway to discharge emergency flows above the 100-year storm event. Trash racks

RIDEGATE FILING 1 DEVELOPMENT

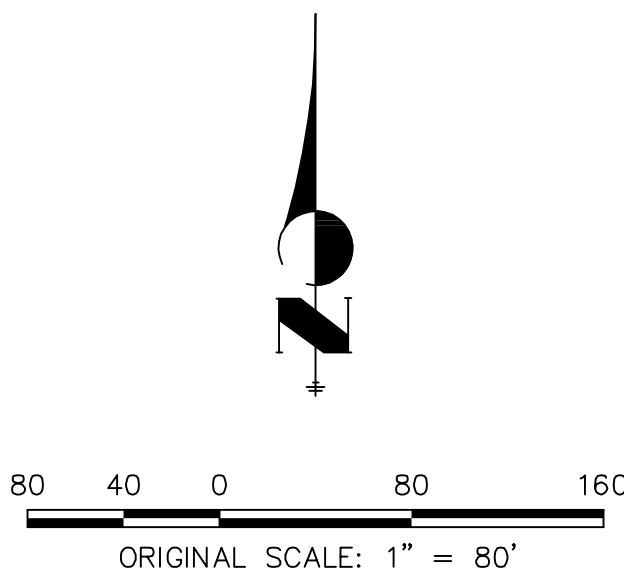
PHASE III DRAINAGE REPORT



KEYMAP
SCALE: 1"=1000'



NOTE:
ALL PIPES ARE 18" UNLESS
OTHERWISE NOTED.



- LEGEND:**
- PROPOSED STORM SEWER
 - 6000 PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - 6000 EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - DRAINAGE BASIN
 - A = BASIN DESIGNATION
 - B = AREA IN ACRES
 - C = 5-YR RUNOFF COEFFICIENT
 - DESIGN POINT
 - HIGH POINT
 - LOW POINT
 - DRAINAGE ARROW
 - EXISTING DRAINAGE ARROW
 - PROPOSED DRAINAGE SWALE

PHASE III DRAINAGE MAP
RIDEGATE DEVELOPMENT
JOB NO. 15950.01
6/4/21
SHEET 7 OF 7



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

Subdivision: Ridgegate
Location: Douglas County - Zone 1
Design Storm: 100-Year

Project Name: _____
Project No.: 15950.01
Calculated By: AAM
Checked By: _____
Date: 6/4/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_r (min)	
	34	A34	1.56	0.69	9.4	1.08	7.19	7.8					1.0	0.13	3.5	6.8	1.08	2.0	18	413 24	3.7 8.1	1.8 0.0	On-grade inlet, Carryover flow to DP 36 Piped to DP 4.7
	4.7								9.5	8.87	7.18	63.7				63.7	8.87	3.0	36	430	16.7	0.4	Sum of DP 4.6 & DP 34, Piped to DP 4.8
	36	A36	1.87	0.71	14.2	1.32	6.05	8.0	14.2	1.45	6.05	8.8	2.1	0.35	4.2	6.7	1.11	2.0	18	617 30	4.1 8.1	2.5 0.1	On-grade inlet, Sum of carryover flow from DP 34 & Sub-Basin A36. Carryover flow to DP 41 Piped to DP 4.8
	4.8								14.3	9.98	6.04	60.3				60.3	9.98	2.0	36	470	14.2	0.6	Sum of DP 36 & DP 4.7, Piped to DP 5.2
	37	A37	1.00	0.70	7.9	0.70	7.67	5.4								5.4	0.70	4.0	18	125	9.9	0.2	On-grade inlet Piped to DP 5.0
	37A	A37A	0.66	0.65	9.0	0.43	7.31	3.1								3.1	0.43	0.0	18	0	1.8	0.0	Type C Inlet Piped to DP 5.0
	5.0								9.0	1.13	7.31	8.3				8.3	1.13	3.5	24	156	10.4	0.2	Sum of DP 37 & DP 37A, Piped to DP 5.1
	38A	A38A	1.07	0.54	18.5	0.58	5.33	3.1								3.1	0.58	6.0	24	306	9.1	0.6	Type C Inlet Piped to DP 5.1
	5.1								19.1	1.71	5.25	9.0				9.0	1.71	3.0	24	90	9.9	0.2	Sum of DP 38A & DP 5.0, Piped to DP 5.1A
	38	A38	1.61	0.68	8.6	1.09	7.43	8.1					1.7	0.23	2.2	6.4	0.86	2.0	18	186 31	3.0 8.1	1.0 0.1	On-grade inlet, carryover flow to DP 41 Piped to DP 5.1A
	39	A39	1.39	0.74	10.9	1.03	6.80	7.0					1.1	0.16	2.2	5.9	0.87	2.0	18	186 9	3.0 7.9	1.0 0.0	On-grade inlet, carryover flow to DP 41 Piped to DP 5.1A
	5.1A								19.2	3.44	5.22	18.0				18.0	3.44	3.0	24	107	12.2	0.1	Sum of DP 38, DP39, & DP 5.1, Piped to DP 5.2
	5.2								19.3	13.42	5.20	69.8				69.8	13.42	2.5	48	189	15.9	0.2	Sum of DP 4.8 & DP 5.1A, Piped to DP 5.4
	40	A40	1.73	0.79	5.7	1.37	8.50	11.6								11.6	1.37	1.0	24	25	7.2	0.1	Storm sewer stub Piped to DP 5.3
	41	A41	1.88	0.70	9.7	1.32	7.11	9.4	16.7	2.06	5.60	11.5	1.3	0.24	2.0	10.2	1.82	2.0	24	263 0	2.8 9.0	1.5 0.0	On-grade inlet, sum of carryover from from DP 36, DP 38, DP 39 & Sub-Basin 41, Carryover flow to DP 43 Piped to DP 5.3
	5.3								18.3	3.19	5.36	17.1				17.1	3.19	2.0	24	31	10.4	0.0	Sum of DP 40 & DP 41, Piped to DP 5.4A
	5.4A								19.5	16.61	5.18	86.0				86.0	16.61	2.5	54	44	16.7	0.0	Sum of DP 5.2 & DP 5.3, Piped to DP 5.4
	42	A42	2.13	0.63	10.7	1.34	6.84	9.2					2.3	0.33	2.0	6.9	1.01	2.0	18	220 9	2.8 8.2	1.3 0.0	On-grade inlet, Carryover flow to DP 43 Piped to DP 5.4
	5.4								19.6	17.62	5.17	91.1				91.1	17.62	2.0	54	62	15.7	0.1	Sum of DP 5.4A & DP 42, Piped to DP 5.6
	43	A43	2.50	0.69	10.6	1.72	6.88	11.8	18.3	2.68	5.36	14.3				14.3	2.68	3.0	24	9	11.5	0.0	Sump inlet, sum of carryover flow from DP 27, DP41, DP 42, & Sub-Basin 43 Piped to DP 5.5
	44	A44	1.66	0.76	7.2	1.27	7.91	10.0								10.0	1.27	3.0	24	38	10.5	0.1	Sump inlet Piped to DP 5.5
	5.5								18.3	3.95	5.36	21.1				21.1	3.95	0.5	30	193	6.4	0.5	Sum of DP 43 & DP 44, Piped to DP 5.6
	5.6								19.7	21.56	5.16	111.3				111.3	21.56	0.5	54	191	9.7	0.3	Sum of DP 5.4 & DP 5.5, Piped to DP 5.6A
	45A	A45A	1.29	0.80	6.1	1.03	8.33	8.6								8.6	1.03	0.5	54	0	4.8	0.0	Future storm infrastructure for parking area Piped to DP 5.6A

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

Subdivision: Ridgegate
Location: Douglas County - Zone 1
Design Storm: 100-Year

Project Name: _____
Project No.: 15950.01
Calculated By: AAM
Checked By: _____
Date: 6/4/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	f (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	f (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_r (min)	
	5.6A								20.0	22.59	5.12	115.7				115.7	22.59	0.5	54	800	9.8	1.4	Sum of DP 45A & DP 5.6, Piped to DP 5.7A
	45	A45	1.63	0.77	8.1	1.26	7.60	9.6								9.6	1.26	0.5	54	0	5.0	0.0	Future storm infrastructure for parking area Piped to DP 5.7A
	5.7A								21.3	23.85	4.94	117.8				117.8	23.85	0.5	54	220	9.8	0.4	Sum of DP 45 & DP 5.6A, Piped to DP 5.7
	5.7								22.4	81.16	4.81	390.4				390.4	81.16	1.0	72	303	17.0	0.3	Sum of DP 3.2, & DP 5.7A, Piped to DP 5.8
	5.8								22.4	81.16	4.81	390.4	390.4	81.16	0.5					292	1.1	4.6	Pond A Forebay Trickle channel conveyance to DP 9.6
	51	A51	1.02	0.74	8.3	0.75	7.54	5.7					2.3	0.30	2.4	3.4	0.45	3.0	18	410	3.1	2.2	On-grade inlet, Carryover flow to DP 54 Piped to DP 6.0
	52	A52	2.31	0.74	7.4	1.72	7.83	13.5					4.4	0.56	3.2	9.1	1.16	2.0	18	690	3.6	3.2	On-grade inlet, Carryover flow to DP 59 Piped to DP 6.0
	6.0								8.4	1.61	7.50	12.1				12.1	1.61	2.5	18	253	10.3	0.4	Sum of DP 51 & DP 52, Piped to DP 6.2
	53A	A53A	3.04	0.79	11.2	2.40	6.71	16.1								16.1	2.40	2.0	18	20	9.1	0.0	Storm Sewer Stub Piped to DP 6.1A
	53	A53	1.95	0.54	15.7	1.06	5.78	6.1								6.1	1.06	2.0	24	0	7.7	0.0	Type C inlet Piped to DP 6.1A
	6.1A								15.7	3.46	5.78	20.0				20.0	3.46	1.0	24	240	8.1	0.5	Sum of DP 53A & DP 53, Piped to DP 6.1
	54A	A54A	1.17	0.67	7.7	0.79	7.74	6.1								6.1	0.79	1.0	18	20	6.1	0.1	Sump inlet Piped to DP 6.1B
	54	A54	1.37	0.77	6.3	1.06	8.24	8.7	10.5	1.36	6.90	9.4				9.4	1.36	1.0	18	0	6.7	0.0	Sump inlet, sum of carryover flow from DP 51 & Sub-basin A54 Piped to DP 6.1B
	6.1B								10.5	2.15	6.90	14.8				14.8	2.15	2.0	18	33	9.6	0.1	Sum of DP 54A & DP 54, Piped to DP 6.1
	55	A55	0.90	0.79	5.5	0.71	8.57	6.1								6.1	0.71	1.0	18	18	6.2	0.0	Sump inlet Piped to DP 6.1
	6.1								16.2	6.32	5.70	36.0				36.0	6.32	0.5	30	226	7.3	0.5	Sum of DP 6.1A, DP 6.1B, & DP 55, Piped to DP 6.2
	6.2								16.7	7.93	5.61	44.5				44.5	7.93	2.5	30	396	14.2	0.5	Sum of DP 6.0 & DP 6.1, Piped to DP 6.3
	56	A56	1.21	0.70	10.9	0.85	6.80	5.8								5.8	0.85	2.0	18	33	7.9	0.1	Sump inlet Piped to DP 6.3
	6.3								17.1	8.78	5.54	48.7				48.7	8.78	4.5	30	368	18.2	0.3	Sum of DP 56 & DP 6.2, Piped to DP 6.5
	57	A57	1.54	0.69	10.6	1.07	6.88	7.4								7.4	1.07	2.0	18	21	8.3	0.0	Sump inlet Piped to DP 6.4
	58	A58	0.76	0.75	6.2	0.57	8.30	4.7					1.9	0.23	2.7	2.8	0.34	2.0	18	298	3.3	1.5	On-grade inlet, Carryover flow to DP 66 Piped to DP 6.4
	6.4								10.6	1.41	6.87	9.7				9.7	1.41	2.0	18	9	8.9	0.0	Sum of DP 57 & DP 58, Piped to DP 6.5
	6.5								17.5	10.19	5.48	55.8				55.8	10.19	4.8	30	64	19.2	0.1	Sum of DP 6.3 & DP 6.4, Piped to DP 6.8
	60	A60	1.02	0.75	9.0	0.77	7.32	5.6					0.2	0.03	3.1	5.4	0.74	2.0	18	754	3.5	3.6	On-grade inlet, Carryover flow to DP 66 Piped to DP 6.6

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

Subdivision: Ridgegate
Location: Douglas County - Zone 1
Design Storm: 100-Year

Project Name: _____
Project No.: 15950.01
Calculated By: AAM
Checked By: _____
Date: 6/4/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_r (min)	
	71	A71	0.77	0.72	7.5	0.56	7.81	4.4	10.0	0.97	7.03	6.8				6.8	0.97	1.0	48	0	5.8	0.0	Sump inlet, sum of carryover flow from DP 69 and Sub-Basin A71 Piped to DP 7.8
	7.8								18.6	30.92	5.31	164.2				164.2	30.92	1.0	60	88	14.0	0.1	Sum of DP 7.7 & DP 71, Piped to DP 7.9
	7.9								18.6	30.92	5.31	164.2	164.2	30.92	0.5					265	1.1	4.2	Pond A Forebay Trickle channel conveyance to DP 9.6
	46	A46	6.61	0.69	17.9	4.53	5.42	24.6					24.6	4.53	2.0								Overland flow Pond conveyance to DP 7.9A
	7.9A								27.0	116.61	4.34	506.1											Pond A outlet structure Sum of DP 46, DP 5.8, & DP 7.9, outfall to Happy Canyon Creek
	7.9A								27.0	102.87	4.34	446.5				446.5	102.87	1.0	96	53	18.1	0.0	Outlet structure release Piped to DP 9.5
	72A	R1	0.75	0.85	5.1	0.64	8.77	5.6								5.6	0.64	1.0	18	85	6.0	0.2	Storm sewer stub Piped to DP 8.0
	72	R2	1.87	0.77	7.0	1.45	8.01	11.6								11.6	1.45	2.0	30	60	9.2	0.1	Storm sewer stub Piped to DP 8.0
	8.0								7.1	2.09	7.97	16.7				16.7	2.09	2.5	30	549	11.0	0.8	Sum of DP 72A & DP 72, Piped to DP 8.1A
	73A	R3A	1.20	0.79	9.8	0.94	7.10	6.7					3.4	0.48	3.2	3.3	0.46	0.5	30	133	3.6	0.6	On-grade inlet, carryover flow to DP 73 Piped to DP 8.1A
	8.1A								10.4	2.55	6.93	17.7				17.7	2.55	3.5	36	142	12.4	0.2	Sum of DP 73 & DP 8.1A, Piped to DP 8.2
	73	R3	2.46	0.80	10.3	1.96	6.96	13.6	10.4	2.44	6.93	16.9				16.9	2.44	0.5	30	149	6.1	0.4	Storm sewer stub, Sum of carryover flow from DP 73A & Sub-basin R3 Piped to DP 8.1
	8.1								10.7	4.53	6.86	31.0				31.0	4.53	3.5	36	142	14.7	0.2	Sum of DP 73 & DP 8.0, Piped to DP 8.2
	74	R4	0.44	0.79	6.2	0.35	8.31	2.9								2.9	0.35	2.0	18	33	6.5	0.1	Storm sewer stub Piped to DP 8.2
	8.2								10.8	4.88	6.81	33.2				33.2	4.88	0.8	36	195	8.5	0.4	Sum of DP 74 & DP 8.1, Piped to DP 8.3
	75	R5	0.36	0.79	6.2	0.28	8.31	2.3								2.3	0.28	2.0	18	30	5.9	0.1	Storm sewer stub Piped to DP 8.3
	8.3								11.2	5.16	6.72	34.6				34.6	5.16	0.5	36	71	7.3	0.2	Sum of DP 75 & DP 8.2, Piped to DP 8.4
	76	R6	2.90	0.69	10.7	2.01	6.84	13.7								13.7	2.01	1.0	18	11	7.8	0.0	Sump inlet Piped to DP 8.4
	77	R7	0.55	0.78	5.0	0.43	8.82	3.8								3.8	0.43	1.0	18	38	5.4	0.1	Sump inlet Piped to DP 8.4
	8.4								11.4	7.60	6.68	50.7				50.7	7.60	1.0	36	398	10.4	0.6	Sum of DP 76, DP 77, & DP 8.3, Piped to DP 8.5
	78	R8	0.28	0.73	8.2	0.21	7.59	1.6								1.6	0.21	8.0	18	19	8.7	0.0	Existing inlet Piped to DP 8.5
	8.5								12.0	7.81	6.52	50.9				50.9	7.81	1.0	36	122	10.4	0.2	Sum of DP 78 & DP 8.4, Piped to DP 8.6
	79	R9	9.78	0.83	6.7	8.14	8.12	66.1								66.1	8.14	2.0	30	67	13.5	0.1	Storm sewer stub Piped to DP 8.6
	8.6								12.2	15.95	6.48	103.3				103.3	15.95	1.1	42	454	12.5	0.6	Sum of DP 79 & DP 8.5, Piped to DP 8.7