

Final Drainage Report

West Canyon Subdivision

November 30, 2023

Prepared for:

West Canyon Fruita, LLC
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Prepared by:



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Engineer's Certification

I hereby certify that the Drainage Report for the design of **West Canyon Subdivision** was prepared by me, or under my direct supervision, in accordance with the provisions of the Stormwater Management Manual (dated December 31, 2007) for the owners thereof. I understand that **The City of Fruita** does not and will not assume liability for drainage facilities designed by others.



Paul Southworth, P.E.
State of Colorado Reg. No. 60123

Developer's Certification

I, DAVID BAGA hereby certify that the drainage facilities for the **West Canyon Subdivision** shall be constructed according to the design presented in this report. I understand that **The City of Fruita** reviews drainage plans but cannot, on behalf of the **West Canyon Subdivision** guarantee that the preliminary drainage design review will absolve **West Canyon Subdivision** and/or their successors and/or assigns of future liability for improper design.

West Canyon Fruita LLC (Name of Developer)

[Signature] (Authorized Signature)

11-30-23 (Date)

I. Introduction

A. Background

The purpose of this Drainage Report is to identify pre-development and post-development drainage conditions for the proposed West Canyon Subdivision development. This report identifies the following items with respect to the site:

- existing drainage patterns and issues
- developed drainage patterns
- potential drainage issues resulting from development
- solutions to the potential drainage issues
- design of the various elements of the storm drain system for the site
- stormwater water quality requirements
- post construction BMP's

B. Project Location

The proposed project site is located in the City of Fruita on the southeastern side of the N Pine St and Ottley Ave intersection. The current project does not have a location address but is identified as Parcel No. 2697-162-21-001. In more legal terms, the project site is in the NW ¼ of the NW ¼ of Section 16, Township 1 North, Range 2 West of the Ute Meridian, Mesa County, Colorado. Refer to **Figure 1** for the General Location Map.

Access to the site will be from the south side of Ottley Ave and the east side of N Pine St at the proposed Toms Canyon Dr and West Canyon Dr respectively. The surrounding area contains a mix of uses including existing subdivisions and agricultural lots. The proposed project site is zoned CR – Community Residential, along with the parcels located directly to the north and west of the project site. The parcels located directly to the east and south of the project site are subdivisions zoned PUD – Planned Unit Development.

C. Project Description

The current project parcel (Parcel No. 2697-162-21-001) is approximately 9.11 acres of pasture. The proposed development will be a residential subdivision consisting of 50 total lots split between single-family attached and single-family detached units. The subdivision will include public streets, landscape and pedestrian tracts, and a detention pond. The development will be constructed in two phases. This drainage report analyzes and discusses the full-buildout condition.

The project parcel is bordered on the north and west by City of Fruita owned irrigation lines. Irrigation water is pulled from the northern line and flood irrigates east to west across the parcel. A tailwater ditch collects excess irrigation and stormwater runoff and conveys the flow to the north where a 10" CMP line drains the ditch to a stormwater manhole maintained by the Grand Valley Drainage District (GVDD) in the intersection of N Pine St and Ottley Ave. See *Section II.A Existing Drainage Conditions & Offsite Tributary Area* for further detail.

According to the NRCS soil survey web site, the soils present at the site consist primarily of Turley clay loams (0-2% slopes) and Sagers silty clay loams (0-2% slopes). Both Turley and Sagers are classified as Hydrologic Soil Group C. Group C soils have slower infiltration rates than Groups A and B Soils. NRCS Soil information is included in Appendix A.

The proposed development is located entirely within the Little Salt Wash Major Drainage Basin. The Little Salt Wash Major Drainage Basin drains to the Colorado River at a point approximately 1.7 miles southwest of the site. A graphical representation of the project boundary in relation to the major drainage basins is provided in **Figure 2**. There are no mapped FEMA Floodplains within or adjacent to the project site. The project site is located entirely within a Zone X – “Area of Minimal Flood Warning”. FEMA FIRM Maps for the area are available in Appendix A.

D. Previous Investigations

No prior investigations are known to exist for the project site. A geotechnical investigation was performed by Huddleston-Berry Engineering & Testing (HBET) as a part of this project. Contents of that geotechnical report are discussed in Section II.C below. Select excerpts can be found in Appendix A.

II. Drainage System Description

A. Existing Drainage Conditions & Offsite Tributary Area

Existing topography at the site consistently slopes from east to west with typical grades between 0.5% and 2.0%. Existing curb and gutter along N Pine St and Ottley Avenue prevent offsite runoff from entering the project parcel from the west or north. Lot grading from the existing subdivisions located to the east and south of the project parcel prevents offsite runoff from entering the project parcel across their shared boundaries. A tailwater ditch is located along the western edge of the project parcel that collects stormwater and excess flood irrigation. The tailwater ditch drains northerly where a 10” CMP drains the ditch to a GVDD storm drain manhole located in the intersection of N Pine St and Ottley Ave.

According to City of Fruita GIS information, once the project parcel’s stormwater discharge is in the GVDD storm drain system, it is conveyed westerly for approximately 1,350 linear feet (“K Road Drain” in Ottley Ave) and then northerly for approximately 325 linear feet (“Starr School Drain” in Little Salt Wash Park access) in 24”-48” storm drain before discharging to the Starr School Drain open channel in Little Salt Wash Park. The open channel continues to convey the flow northerly for approximately another 1,100 linear feet before discharging to the Little Salt Wash. From there, Little Salt Wash flows for approximately 1.8 miles southwesterly before discharging to the Colorado River.

A single sub-basin for the project, EX-01, is present in the existing condition. Refer to **Figure 3** for a layout of the existing sub-basins covering the project site. **Table 1** provides a summary of the existing sub-basins that were analyzed for this project.

Table 1: Existing Sub-Basins

Sub-Basin ID	Area (acres)	Average Slope (ft/ft)	Weighted Percent Impervious	Weighted SCS Curve Number	3-hour Design Storm Peak Runoff Rates (cfs)		
					2-Year	10-Year	100-Year
EX-01	9.11	1.1%	4%	79.0	0.40	0.65	2.12

B. Master Drainage Plan

No “Master Drainage Plan” is known to exist for the subject property.

C. Proposed Drainage System Description

The proposed project will include lot grading, paved curb & gutter, concrete v-pan, storm drain, and a detention pond to collect, convey, and treat stormwater in the proposed condition. Runoff from the developed areas on the interior of the subdivision will sheet flow directly to curb & gutter in the street sections or to backlot v-pans that collect and convey stormwater to the curb and gutter through sidewalk drain trough connections. Once in the curb and gutter, stormwater is conveyed to curb inlets that then convey the stormwater underground via storm drain to the detention pond. The only exceptions are the exterior lots along the southern and western boundary of the project parcel where the rear of those lots have runoff sheet flow to a combination of backlot v-pan and/or area inlets. The area inlets then convey the runoff underground via storm drain to the detention pond.

Proposed grading for this project divides the site into thirteen (13) sub-basins. Refer to **Figure 4** for the proposed sub-basin layout and more detailed basin information. **Table 2** provides a summary of the proposed sub-basins that were analyzed for this project.

Table 2: Proposed Sub-Basins

Sub-Basin ID	Area (acres)	Average Slope (ft/ft)	Weighted Percent Impervious	Weighted SCS Curve Number	3-hour Design Storm Peak Runoff Rates (cfs)		
					2-Year	10-Year	100-Year
PR-01	0.41	4.0%	3.4%	74.35	0.01	0.02	0.11
PR-02	2.15	0.7%	61.1%	89.14	1.26	2.26	4.33
PR-03	2.02	0.9%	63.9%	89.94	1.16	2.17	4.23
PR-04	1.81	0.9%	64.0%	89.99	1.08	1.97	3.81
PR-05	1.69	0.7%	62.8%	89.87	1.06	1.86	3.53
PR-06	0.69	0.7%	51.4%	87.25	0.34	0.56	1.05
PR-07	0.03	2.6%	45.4%	85.47	0.02	0.03	0.05
PR-08	0.06	1.2%	46.7%	85.90	0.03	0.05	0.09
PR-09	0.07	3.0%	46.4%	85.82	0.03	0.05	0.10
PR-10	0.03	3.5%	45.3%	85.56	0.01	0.02	0.04
PR-11	0.09	3.0%	45.3%	85.57	0.05	0.08	0.14
PR-12	0.06	1.9%	88.5%	96.10	0.06	0.10	0.20
PR-13	0.02	0.9%	90.9%	96.53	0.02	0.03	0.06

Sub-basins PR-01 thru PR-11 will be routed thru the subdivision’s proposed detention pond. The proposed detention pond outlet discharges to the existing City of Fruita curb inlet STP487 in N Pine St. Sub-basin PR-12 is formed by the highpoint in the subdivision entrance off N Pine St and sub-basin PR-13 is formed by the highpoint in the subdivision off Ottley Ave. Combined, sub-basins PR-12 and PR-13 account for only 0.08 acres or approximately 0.9% of the subdivision’s total acreage. The runoff from PR-12 and PR-13 is collected by existing curb and gutter that conveys and discharges to the same existing City of Fruita curb inlet STP487 in N Pine St. From there, the total project discharge is conveyed to the same GVDD storm drain manhole in the intersection of N Pine St and Ottley Ave that was the historical discharge point for the project (Design Point EX1 & corresponding Design Point PR1). **Table 3** provides the existing and proposed discharge rates for the development at the design points.

Over-detention is provided on-site to account for undetained areas (Design Points PR1B & PR1C) being discharged from the project site without first being routed thru the detention pond. Compensating detention analysis confirming detention pond release rates (Design Point PR1A) are less than adjusted allowable release rates has been provided showing compliance with Section 1407.3 of the SWMM. Calculations can be found in Appendix B.

Table 3: Project Discharge Rates

Design Point ID*	Design Point Condition	Design Point Location	Peak Flow at Design Point		
			2-year Storm (cfs)	10-year Storm (cfs)	100-year Storm (cfs)
EX1	Existing	GVDD MH - N Pine St @ Ottley Ave	0.40	0.65	2.12
PR1	Proposed	GVDD MH - N Pine St @ Ottley Ave	0.40	0.59	1.01
PR1A	Proposed	Detention Pond Discharge (Sub-basins PR-01 thru PR-11)	0.32	0.46	0.75
PR1B	Proposed	Discharge to N Pine St Access (Sub-basin PR-12)	0.06	0.10	0.20
PR1C	Proposed	Discharge to Ottley Ave Access (Sub-basin PR-13)	0.02	0.03	0.06

(See Figures 3 & 4 for Design Point Locations.)

The proposed detention pond for the West Canyon subdivision is a permanent stormwater solution. The pond has been designed to detain and release minor storms at or below historical discharge rates for the parcel at full buildout conditions (Phase 1 and Phase 2). The pond is also designed to detain and release the major storm (100-year storm event) at less than 50% of the historical discharge rate at full buildout conditions (Phase 1 and Phase 2). The detention pond design information for this filing is shown in **Table 4**.

Table 4: Detention Pond Water Surface Elevation & Volume Summary

Event	Elevation	Volume (cuft)
Top of Pond	4531.60	40,749.00
Top of Structure	4531.30	37,189.00
100-Year Storm*	4530.38	27,027.00
10-Year Storm*	4528.71	11,379.30
WQCV WSEL	4528.04	6,042.42
Bottom of Pond/Structure	4526.20	0.00

*Elevations are pulled from hydraulic model results

Table 4 demonstrates that the detention pond is more than large enough to detain the full 100-year design storm runoff from the developed area while also meeting the 1-foot minimum freeboard requirement. As designed, the pond will have 1.22 feet of freeboard at the peak of the major storm event. The detention pond is anticipated to be near full capacity upon the full development of this filing and is not intended to service any other parcels.

A Geotechnical Report for the project area was performed by Huddleston-Berry Engineering & Testing (HBET) in October 2023. The report includes analysis of two borings advanced in May of 2023 as well as nine test pits excavated across the parcel in September of 2023. One of these test pits (TP-3) was excavated in the vicinity of the proposed detention pond. The soil borings were advanced to a depth of 20-ft below ground surface while the test pits were excavated to a depth of 8-ft below ground surface.

Groundwater was encountered in each of the soil borings at a depth of 3.5-ft and 5-ft below ground surface respectively. It is noted that these soil borings were advanced during a time of active flood irrigating when the project parcel was being actively used to grow hay. Groundwater was encountered in three of the test pits at a depth of 8-ft below ground surface, including TP-3, and was not encountered at all in the remaining five test pits.

It is believed that the test pits excavated in September are more representative of the developed conditions of the project parcel when it is no longer actively being used as a pasture to grow hay. The proposed detention pond is proposed to be a depth of approximately 5.4-ft below ground surface and is therefore designed to be approximately 2.6-ft above the expected groundwater level. Excerpts from the Geotechnical Report are included in Appendix A.

SWMM requirements dictate that the pond must drain within 48 hours of all storm events up to and including the 100-year storm event. The outlet control structure is designed to drain the major storm (100-year storm event) in approximately 47 hours. Pond drain time output from the hydraulic model is provided in Appendix F.

The detention pond outlet is to the GVDD storm drain manhole in the intersection of N Pine St and Ottley Ave that was the historical discharge point for the project. **Table 3** provides the existing and proposed discharge rates for the development.

D. Drainage Facility Maintenance

Ownership and maintenance of the proposed drainage improvements within public ROW shall be by the City of Fruita. All storm drain, concrete v-pan, the detention pond, and other drainage facilities within private property will be owned and maintained by the subdivision's homeowner's association.

Inspection of the drainage facility and associated BMP's shall be as per Sections 403.10 and 1606.10 of the Stormwater Management Manual (SWMM).

The developed drainage for the site has been designed to minimize maintenance. Anticipated maintenance includes periodic (1-2 times per year and as needed after major storm events) clearing of debris from swales, drain troughs, concrete v-pans, and flared end sections. Periodic sediment removal from the pond may also be required. The removal frequency will vary depending on the sediment removal loading through the system to the detention pond, but it is unlikely sediment removal would be required more often than once every 5 to 10 years.

III. Drainage Analysis and Design Criteria

A. Regulations

The policy, design criteria, design constraints, methods of analysis, recommendations, and conclusions presented in this report are in conformance with standard engineering practice and the Stormwater Management Manual (dated December 31, 2007).

B. Development Criteria

No drainage constraints were noted for this project.

C. Hydrologic Criteria

The hydrologic design criteria presented in this report are in conformance with standard engineering practice and the Stormwater Management Manual (dated December 31, 2007), except as noted within the report.

D. Hydraulic Criteria

The hydraulic design criteria presented in this report are in conformance with standard engineering practice and the Stormwater Management Manual (dated December 31, 2007), except as noted within the report.

E. Variance from Criteria

Over-detention is provided to account for undetained areas being discharged from the project site without first being routed thru the detention pond. Compensating detention analysis confirming detention pond release rates are less than adjusted allowable release rates has been provided showing compliance with Section 1407.3 of the SWMM. Calculations can be found in Appendix B.

F. Calculation Methodology

Autodesk Storm and Sanitary Analysis 2022 was used to model basin runoff and perform the routing hydraulics. The following modeling methods were used within the model: the US EPA SWMM, SCS Curve Number, Hydrodynamic, and Hazen-Williams. The Autodesk software and selected methods are all accepted by the regulatory and engineering community and within standard engineering practice.

G. Calculation and Modeling Results

Analysis of the developed site drainage conditions are included in Appendices E & F and highlighted below.

- All design storms used for this project had a rainfall duration of 3-hours, as per SWMM Section 28.24. Rainfall values used for analysis of this project are the values provided in Table 28.24.040(a) of the SWMM. Specifically, point rainfall values used for the 2-year, 10-year, and 100-year storms are 0.47 inches, 0.77 inches, and 1.44 inches, respectively.
- One existing sub-basin and thirteen separate proposed sub-basins have been analyzed for this project. Design storm peak flows for each of the project's sub-basins are shown on Figures 3 and 4.
- There are thirteen proposed storm drain pipes for this project. **Table 5** shows the pipe modeling results for the 2-year 3-hour & 100-year 3-hour storm events. Profiles of the proposed storm drain system showing the 100-year HGL are provided in Appendix F.

Table 5: Proposed Storm Drain Pipes

Pipe ID	Pipe Material	Pipe Diameter (inches)	Pipe Length (ft)	Pipe Slope (%)	2-yr Peak Flow in Pipe (cfs)	2-yr Max Velocity in Pipe (ft/sec)	100-yr Peak Flow in Pipe (cfs)	100-yr Max Velocity in Pipe (ft/sec)
J1-J2	12" PVC	12	8.52	1.17	1.05	2.28	3.50	4.46
J2-J3	12" PVC	12	22.47	0.44	1.08	2.26	3.79	4.82
K1-K2	18" PVC	18	276.99	0.30	2.07	2.46	7.29	4.13
L1-L2	24" PVC	24	32.68	0.50	4.39	4.18	15.77	5.56
L2-L3	24" PVC	24	8.53	0.50	3.20	2.49	11.50	3.66
L3-L4	12" PVC	12	22.47	0.51	1.16	3.09	4.23	5.38
M1-M2	12" PVC	12	28.04	0.40	0.46	2.29	1.46	3.10
M2-M3	12" PVC	12	89.69	0.40	0.43	2.11	1.33	2.63
M3-M4	12" PVC	12	77.18	0.40	0.41	2.24	1.29	2.80
M4-M5	12" PVC	12	71.20	0.40	0.38	2.12	1.20	2.65
M5-M6-M7	12" PVC	12	76.65	0.40	0.36	2.09	1.10	2.62
M7-M8	12" PVC	12	5.00	0.40	0.34	1.81	1.05	2.34
N1-N2	12" PVC	12	29.56	0.50	0.32	2.18	0.75	2.69

- The proposed drainage system requires thirteen storm drain inlets/structures to collect the stormwater runoff. **Table 6** shows the structure/inlet modeling results for this filing during the minor (2-year) and major (100-year) storm events. Table 6 shows the hydraulic grade line does not exceed the allowable maximum of 1.0-ft above gutter flow line for any of the proposed inlets during the 100-year, 3-hour storm event and the hydraulic grade line does not exceed the rim on any of the storm manholes during the 100-year, 3-hour storm event. All inlet capacities are adequate, per SWMM inlet capacity charts and manufacturer inlet capacity charts found in Appendix G. Profiles of the proposed storm drain system showing the 100-year HGL are provided in Appendix F.

Table 6: Proposed Storm Drain Inlets

Inlet ID	Description	Grate Elevation (ft)	100-Year Max HGL Elevation (ft)	Invert Elevation (ft)	2-Year Peak Flow to Inlet (cfs)	100-Year Peak Flow to Inlet (cfs)
OCS Begin	Outlet Control	4531.30	4530.46	4526.20	0.00	0.00
OCS End	Outlet Control	4531.30	4526.62	4526.20	0.00	0.00
SDAI-M2	Area Inlet	4531.62	4530.42	4527.94	0.04	0.14
SDAI-M3	Area Inlet	4531.96	4530.42	4528.30	0.01	0.04
SDAI-M4	Area Inlet	4532.00	4530.43	4528.61	0.03	0.10
SDAI-M5	Area Inlet	4532.09	4530.42	4528.89	0.03	0.09
SDAI-M7	Area Inlet	4531.52	4530.44	4529.20	0.02	0.05
SDAI-M8	Area Inlet	4531.34	4530.42	4529.22	0.34	1.05
SDCI-J1	Curb Inlet	4531.60	4531.95	4528.97	1.06	3.53
SDCI-J3	Curb Inlet	4531.60	4532.14	4528.97	1.08	3.81
SDCI-L2	Curb Inlet	4531.55	4530.43	4527.99	1.26	4.33
SDCI-L4	Curb Inlet	4531.55	4530.89	4529.15	1.16	4.23
SDMH-K1-L3	Manhole	4531.94	4530.42	4528.04	0.00	0.00
SDMH-J2-K2	Manhole	4531.98	4531.49	4528.87	0.00	0.00

- Street capacities for the street sections were checked based on the 100-year 3-hour peak flow rates generated for the maximum combined flow to a half-street section during fully developed conditions. There are no issues with ½ Street Conveyance Capacity for each basin as per SWMM Figures 1105. See the SWMM Street Capacity sheet provided in Appendix G for more detail.
- Maximum peak discharge rates have been analyzed for all storm outfalls to determine the need for riprap protection. Detailed riprap calculations are provided in Appendix G for the fully developed conditions of the subdivision. Riprap locations and dimensions are shown on the construction plans.

IV. Post Construction Stormwater Management

A. Stormwater Quality Control Measures

The detention pond for this filing has been designed to hold the 100-year storm event, with at least 1.0-ft of freeboard and a drain time below 48-hours.

B. Stormwater Quality Calculations

The WQCV was determined based on the percent imperviousness of the fully developed subdivision and all areas tributary to the proposed detention pond. WQCV was calculated using Section 1604.2 in the SWMM. WQCV calculations are provided in Appendix B of this report.

V. Conclusions

A. Compliance with Manual

The policy, design criteria, design constraints, methods of analysis, recommendations, and conclusions presented in this report are in conformance with standard engineering practice and the Stormwater Management Manual (dated December 31, 2007).

B. Design Effectiveness

This design will be very effective for controlling runoff from this site and will provide stormwater quality measures.

C. Areas in Flood Hazard Zone

There are no areas within the proposed project site that are classified as Flood Hazard Zones. There are no floodplains within the project area. The project site is located entirely within a Zone X – “Area of Minimal Flood Warning”. FEMA FIRM Maps for the area are available in Appendix A.

D. Variances from Manual

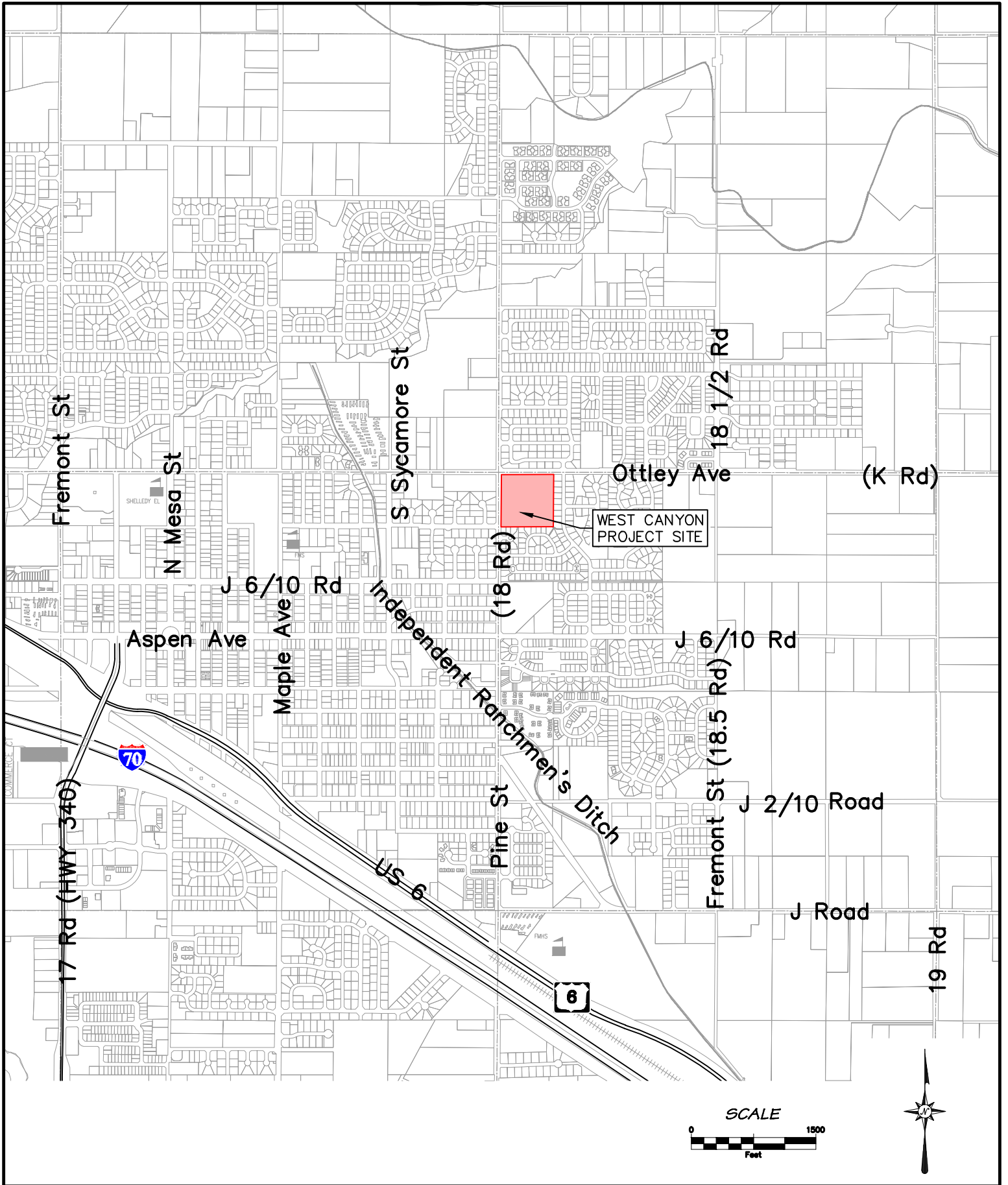
Over-detention is provided to account for undetained areas being discharged from the project site without first being routed thru the detention pond. Compensating detention analysis confirming detention pond release rates are less than adjusted allowable release rates has been provided showing compliance with Section 1407.3 of the SWMM. Calculations can be found in Appendix B.

VI. References

1. Stormwater Management Manual, WRC Engineering under the direction of Mesa County Colorado, December 31, 2007.
2. City of GJ GIS Website, [City Map \(gjcitiy.org\)](http://gjcitiy.org)
3. Mesa County Colorado GIS Website, <https://gis.mesacounty.us/> .
4. Natural Resources Conservation Service National Cooperative Soils Survey Website, <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> .
5. FEMA Flood Map Service Center website, <https://msc.fema.gov/portal> .
6. Drainage Criteria Manual, Urban Drainage and Flood Control District, Volumes 1, 2, & 3; Denver, Colorado 2001.

FIGURES

- 1. General Location Map**
- 2. Major Basin & Floodplain Map**
- 3. Existing Drainage Map**
- 4. Developed Drainage Plan**



West Canyon Subdivision

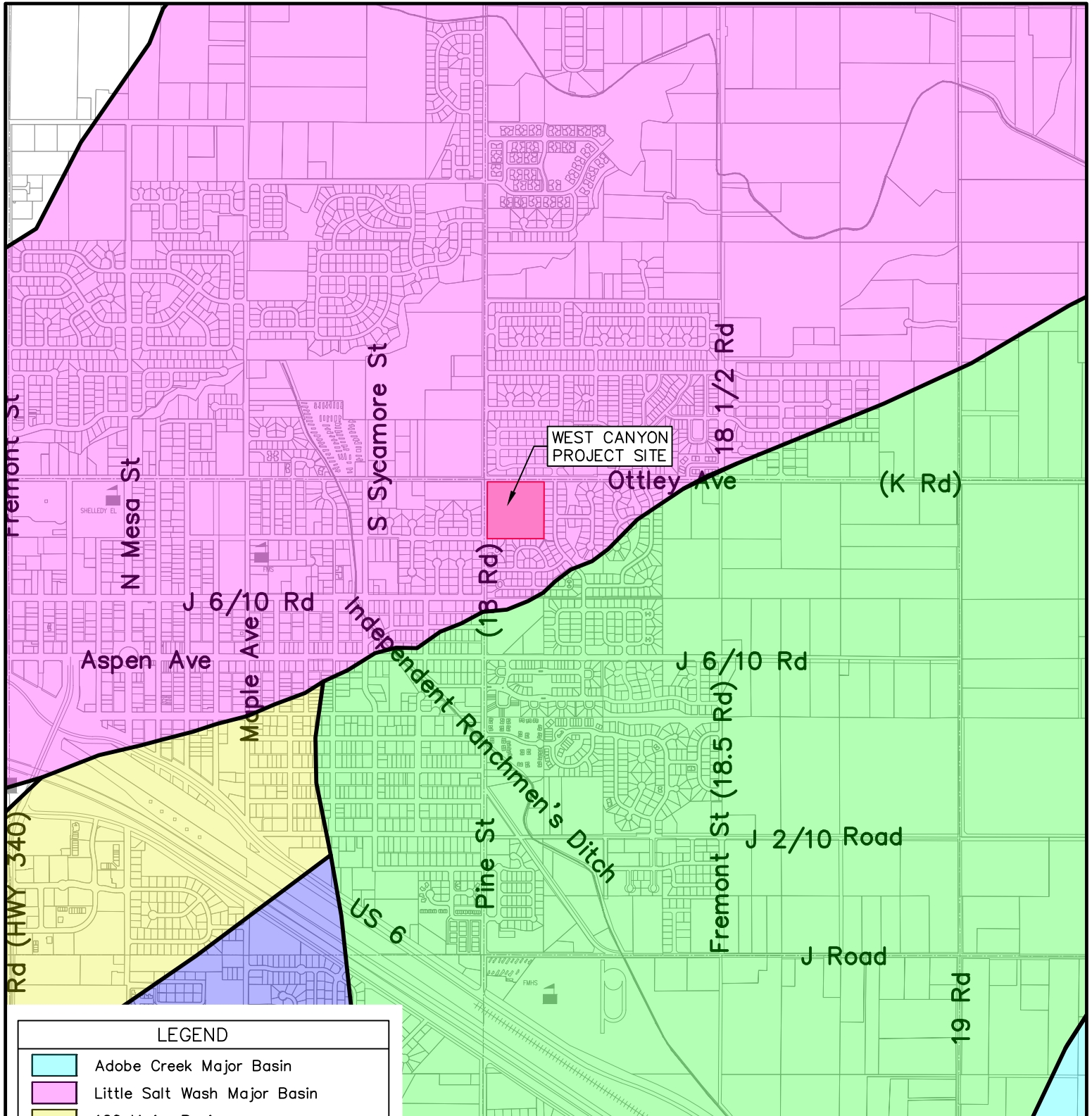
GENERAL LOCATION MAP

DATE: 27.NOV.2023









Figure

1





LEGEND

	Adobe Creek Major Basin
	Little Salt Wash Major Basin
	120 Major Basin
	118 Major Basin
	117 Major Basin
	Big Salt Wash Major Basin
	Project Site
	Major Basin Boundary

NOTE:

1. The entire proposed project area is within the Little Salt Wash Major Basin.
2. The project site is not within a mapped Special Flood Hazard Area per FEMA Firmette 08077C0437F. The project site is within a Zone X – Area of Minimal Flood Hazard.



West Canyon Subdivision

MAJOR BASIN & FLOODPLAIN MAP

DATE: 27.NOV.2023

Figure

2





LEGEND	
	A - SUB-BASIN ID B - ACREAGE C - COMPOSITE SCS CURVE NUMBER
	D - DESIGN POINT (SEE TABLE FOR FLOWS)
	EXISTING SHEET FLOW
	EXISTING CONCENTRATED FLOW
	SUB-BASIN BOUNDARY
	SUB-BASIN FLOWPATH

EXISTING DESIGN POINT TABLE				
Design Point ID	Design Point Location	Peak Flow at Design Point (cfs)		
		2-year Storm	10-year Storm	100-year Storm
EX1	GVDD MH - N Pine St @ Ottley Ave	0.40	0.65	2.12

EXISTING SUB-BASIN TABLE							
Sub-Basin ID	Area (acres)	Average Slope (ft/ft)	Weighted Percent Impervious	Weighted SCS Curve Number	3-hour Design Storm Peak Runoff Rates (cfs)		
					2-Year	10-Year	100-Year
EX-01	9.11	1.1%	0.04	79	0.4	0.65	2.12

- NOTE:**
- EXISTING PARCELS, UTILITIES, AND SURFACE CONTOURS ARE TAKEN FROM MESA COUNTY GIS. THESE ITEMS ARE APPROXIMATE AND FOR INFORMATIONAL PURPOSES ONLY.
 - PERMISSION TO REPRODUCE THESE PLANS IS HEREBY GIVEN TO MESA COUNTY FOR COUNTY PURPOSES ASSOCIATED WITH NEW PLAN REVIEW, APPROVAL, PERMITTING, INSPECTION AND CONSTRUCTION OF WORK.

811
UNCC
Know what's below.
Call before you dig.
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

Project Benchmark
MCSM 19-1 3.28 Aluminum Cap
Intersection of 18 Rd. & K Rd.
NE Corner, Sec.17 T.1N R.2W Ute Meridian
NORTHING: 71186.17
EASTING: 47251.63
ELEVATION: 4531.79
DATUM SOURCE: MCLCS Zone "GVA" (NAVD 88)

SCALE
(FEET)
0 50 100
HORIZONTAL
VERTICAL: N/A
CONTOUR INTERVAL: N/A

PROJECT PHASE: Preliminary/Review		DATE ISSUED: 27.NOV.2023	
NO.	DATE	REVISION	BY

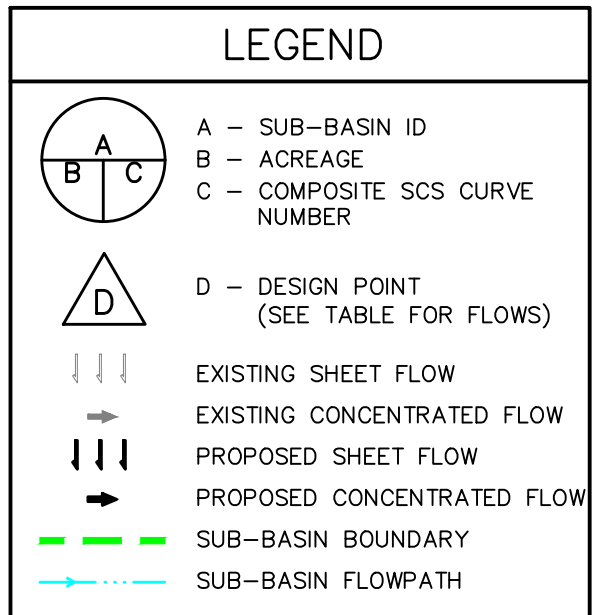
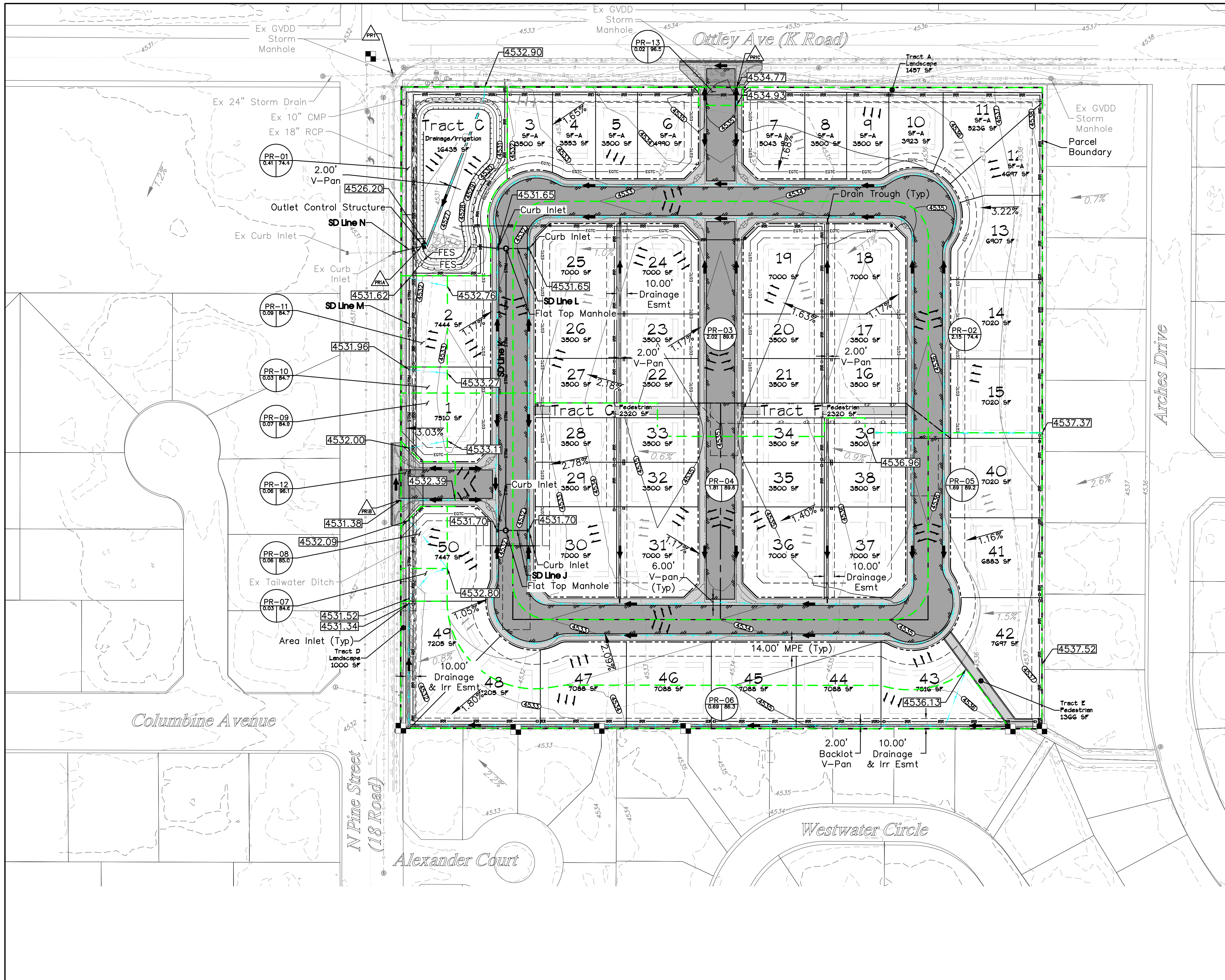
RIVER CITY CONSULTANTS
215 Pitkin Avenue, Unit 201
Grand Junction, CO 81501
Phone: 970.241.4722
Fax: 970.241.8841
www.rcwest.com

PRELIMINARY

DRAWN BY: KAC PROJECT: 0208-029
CHECKED BY: PJS
ORIGINAL SHEET SIZE: 22 x 34

WEST CANYON FRUITA, LLC
West Canyon
Drainage Plans
Existing Drainage Map

Fig 3



PROPOSED DESIGN POINT TABLE

Design Point ID	Design Point Location	Peak Flow at Design Point (cfs)		
		2-year Storm	10-year Storm	100-year Storm
PR1	GVDD MH - N Pine St @ Otley Ave	0.40	0.59	1.01
PR1A	Detention Pond Discharge (Sub-basins PR-01 thru PR-11)	0.32	0.46	0.75
PR1B	Discharge to N Pine St Access (Sub-basin PR-12)	0.06	0.10	0.20
PR1C	Discharge to Otley Ave Access (Sub-basin PR-13)	0.02	0.03	0.06

PROPOSED SUB-BASIN TABLE

Sub-Basin ID	Area (acres)	Average Slope (ft/ft)	Weighted Percent Impervious	Weighted SCS Curve Number	3-hour Design Storm Peak Runoff Rates (cfs)		
					2-Year	10-Year	100-Year
PR-01	0.41	4.0%	3.4%	74.35	0.01	0.02	0.11
PR-02	2.15	0.7%	61.1%	89.14	1.26	2.26	4.33
PR-03	2.02	0.9%	63.9%	89.94	1.16	2.17	4.23
PR-04	1.81	0.9%	64.0%	89.99	1.08	1.97	3.81
PR-05	1.69	0.7%	62.8%	89.87	1.06	1.86	3.53
PR-06	0.69	0.7%	51.4%	87.25	0.34	0.56	1.05
PR-07	0.03	2.6%	45.4%	85.47	0.02	0.03	0.05
PR-08	0.06	1.2%	46.7%	85.90	0.03	0.05	0.09
PR-09	0.07	3.0%	46.4%	85.82	0.03	0.05	0.10
PR-10	0.03	3.5%	45.3%	85.56	0.01	0.02	0.04
PR-11	0.09	3.0%	45.3%	85.57	0.05	0.08	0.14
PR-12	0.06	1.9%	88.5%	96.10	0.06	0.10	0.20
PR-13	0.02	0.9%	90.9%	96.53	0.02	0.03	0.06

PROPOSED DETENTION POND SUMMARY TABLE

Event	Elevation	Volume (cubic ft)
Top of Pond	4531.60	40,749
Top of Structure	4531.30	37,189
100-Year Storm*	4530.38	27,027
10-Year Storm*	4528.71	11,379
WQCV WSEL	4528.04	6,042
Bottom of Pond/Structure	4526.20	0

*Elevations are pulled from hydraulic model results

- NOTES:**
- EXISTING PARCELS, UTILITIES, AND SURFACE CONTOURS ARE TAKEN FROM MESA COUNTY GIS. THESE ITEMS ARE APPROXIMATE AND FOR INFORMATIONAL PURPOSES ONLY.
 - NO BUILDING, STRUCTURE, OR FILL WILL BE PLACED IN THE DETENTION AREAS AND NO CHANGES OR ALTERATIONS AFFECTING THE HYDRAULIC CHARACTERISTICS OF THE DETENTION AREAS WILL BE MADE WITHOUT THE APPROVAL OF THE COUNTY.
 - MAINTENANCE AND OPERATION OF THE DETENTION AND WATER QUALITY AREAS ARE THE RESPONSIBILITY OF PROPERTY OWNER. IF OWNER FAILS IN THIS RESPONSIBILITY, THE COUNTY HAS THE RIGHT TO ENTER THE PROPERTY, MAINTAIN THE DETENTION AREAS, AND BE REIMBURSED FOR COSTS INCURRED.
 - DETENTION POND VOLUMES, ALL DRAINAGE APPURTENANCES, AND BASIN BOUNDARIES SHALL BE VERIFIED. AS-BUILT DRAWINGS SHALL BE PREPARED BY A REGISTERED PROFESSIONAL ENGINEER PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY FOR ANY STRUCTURE WITHIN THE DEVELOPMENT.
 - PERMISSION TO REPRODUCE THESE PLANS IS HEREBY GIVEN TO MESA COUNTY FOR COUNTY PURPOSES ASSOCIATED WITH NEW PLAN REVIEW, APPROVAL, PERMITTING, INSPECTION AND CONSTRUCTION OF WORK.

Project Benchmark
 MCSM 19-1 3.28 Aluminum Cap
 Intersection of 18 Rd. & K Rd.
 NE Corner, Sec.17 T.1N R.2W Ute Meridian
 NORTHING: 71186.17
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PROJECT PHASE: Preliminary/Review DATE ISSUED: 27.NOV.2023

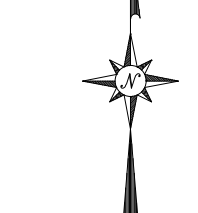
NO.	DATE	REVISION	BY

RIVER CITY CONSULTANTS
 215 Pitkin Avenue, Unit 201 Phone: 970.241.4722
 Grand Junction, CO 81501 www.rcwest.com Fax: 970.241.8841
 DRAWN BY: KAC/PROJECT: 0208-029
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 ORIGINAL SHEET SIZE: 22 x 34

WEST CANYON FRUITA, LLC
 West Canyon
 Drainage Plans
 Proposed Drainage Plan
 Fig 4

PRELIMINARY

811 UNCC
 Know what's below. Call before you dig.
 800.922.1987
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APPENDIX A

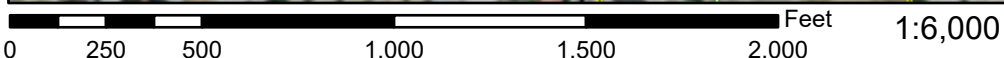
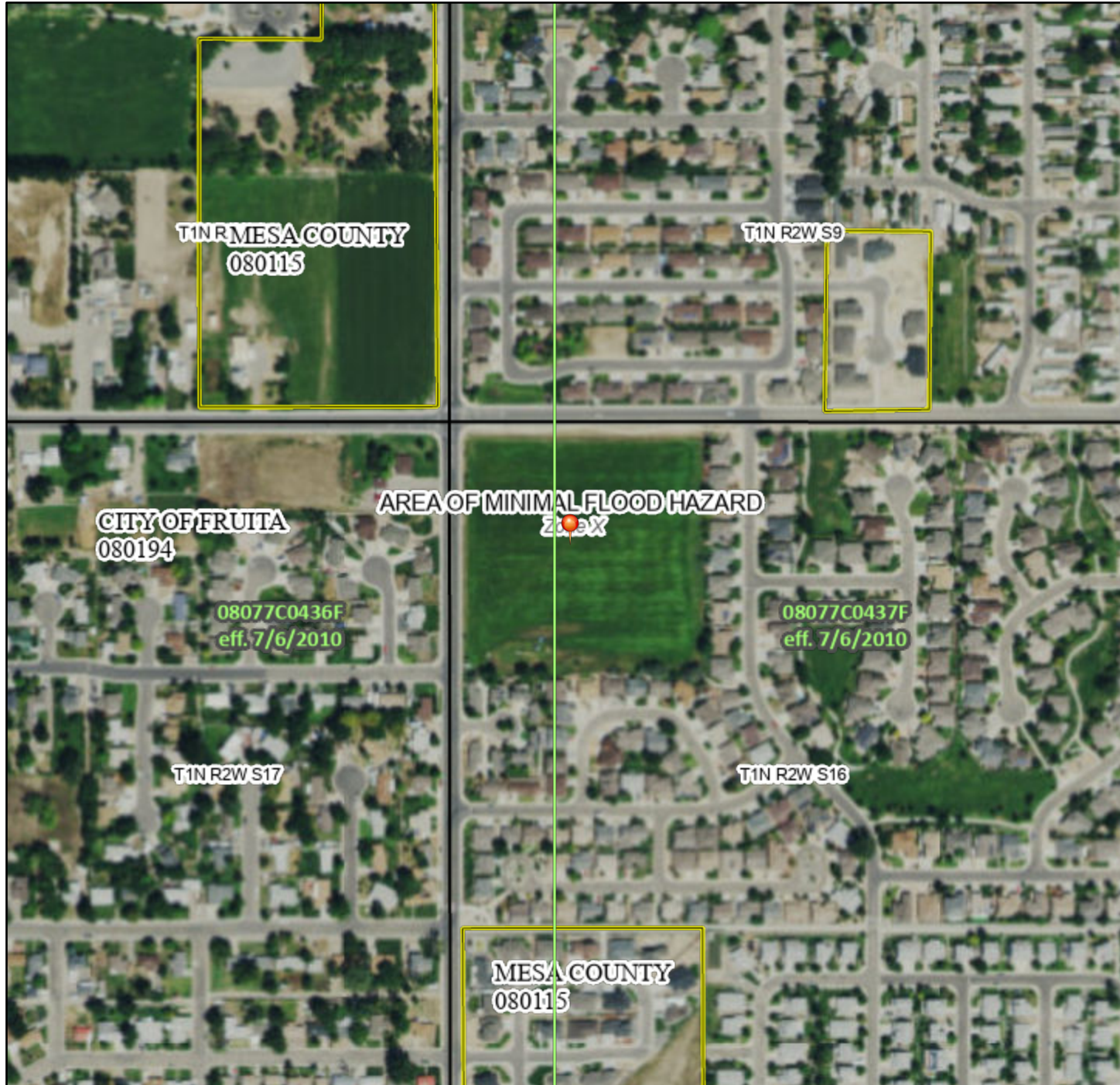
Project Site Information

- 1. FEMA Firm Panel**
- 2. NRCS Web Soil Survey & K Factor Whole Soil**
- 3. Geotechnical Report – Selected Excerpts**

National Flood Hazard Layer FIRMMette



108°43'26"W 39°10'2"N



108°42'48"W 39°9'34"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		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 <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
		Area of Undetermined Flood Hazard <i>Zone D</i>
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



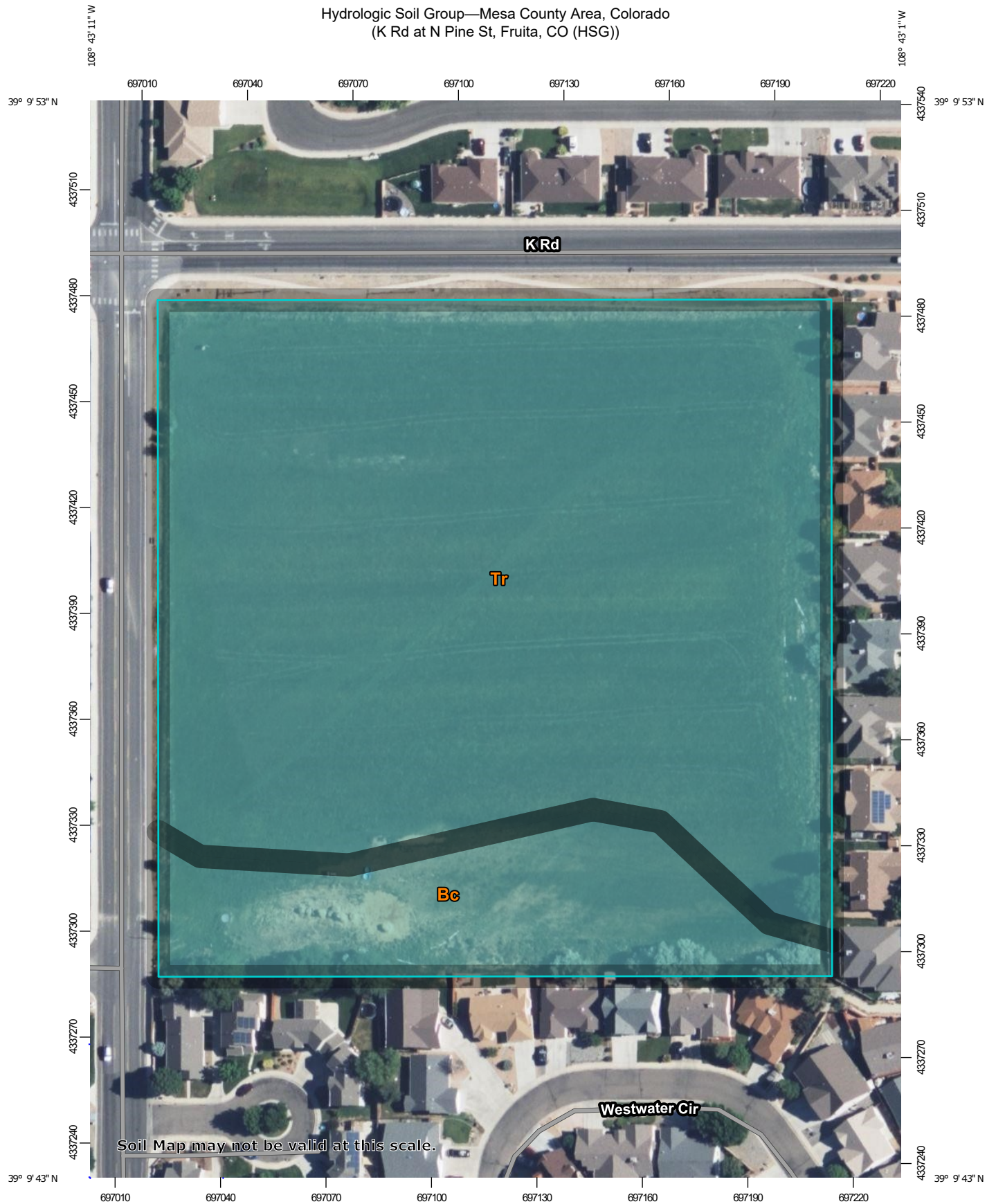
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

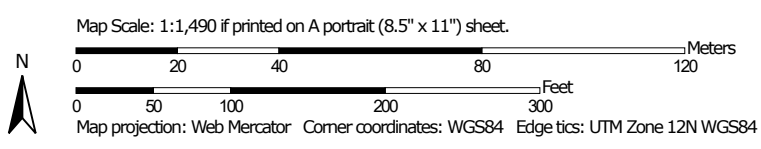
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **11/2/2023 at 4:57 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrologic Soil Group—Mesa County Area, Colorado
(K Rd at N Pine St, Fruita, CO (HSG))




Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines


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

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Mesa County Area, Colorado
 Survey Area Data: Version 14, Aug 22, 2023

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

Date(s) aerial images were photographed: Jun 24, 2020—Jul 8, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Bc	Sagers silty clay loam, 0 to 2 percent slopes	C	1.6	17.9%
Tr	Turley clay loam, 0 to 2 percent slopes	C	7.5	82.1%
Totals for Area of Interest			9.1	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Huddleston-Berry
Engineering & Testing, LLC

**GEOTECHNICAL AND GEOLOGIC HAZARDS
INVESTIGATION
18 ROAD AND K ROAD
FRUITA, COLORADO
PROJECT #01326-0027**

**J. HOWELL, LLC
2120 BARBERRY AVENUE
GRAND JUNCTION, COLORADO 81506**

OCTOBER 12, 2023

**Huddleston-Berry Engineering and Testing, LLC
2789 Riverside Parkway
Grand Junction, Colorado 81501**

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

A geologic hazards and geotechnical investigation was conducted for a proposed residential subdivision at 18 Road and K Road in Fruita, Colorado. The project location is shown on Figure 1 – Site Location Map. The purpose of the investigation was to evaluate the surface and subsurface conditions at the site with respect to geologic hazards, foundation design, pavement design, and earthwork for the proposed development. This summary has been prepared to include the information required by civil engineers, structural engineers, and contractors involved in the project.

Subsurface Conditions (p. 2)

The subsurface investigation consisted of two borings and nine test pits. The locations of the borings and test pits are shown on Figure 2 – Site Plan. The borings and test pits encountered sandy silt and silty sand soils. Groundwater was encountered at depths of between 3.5 and 8.0 feet at the time of the investigations. The native soils are slightly plastic and slightly collapsible to very slightly expansive.

Geologic Hazards and Constraints (p. 3)

No geologic hazards or constraints were identified which would preclude development of this property. However, moisture sensitive soils were encountered during the subsurface investigation and these materials may impact the design and construction of foundations, driveways, etc. Shallow groundwater may also impact the development.

Summary of Foundation Recommendations

- *Foundation Type* – Spread Footings or Monolithic (turndown) Structural Slabs. (p. 4)
- *Structural Fill* – Minimum of 24-inches below foundations. The native soils are suitable for re-use as structural fill. Imported structural fill should consist of granular, non-expansive, ***non-free draining*** material with greater than 10% passing the #200 sieve and Liquid Limit of less than 30 approved by HBET.(p. 4)
- *Maximum Allowable Bearing Capacity* – 1,500 psf. (p. 5)
- *Subgrade Modulus* –150 pci for native soils. 200 pci for imported granular materials. (p. 5)
- *Lateral Earth Pressure* – 45 pcf active. 65 pcf at-rest. (p. 5)

Summary of Pavement Recommendations (p. 6)

Internal Subdivision Roadways

EDLA = 20, Structural Number = 3.50

ALTERNATIVE	PAVEMENT SECTION (Inches)				TOTAL
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	
A	3.0	15.0			18.0
B	4.0	12.0			16.0
C	3.0	6.0	13.0		22.0
Rigid Pavement		6.0		8.0	14.0

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FIGURES

Figure 1 – Site Location Map

Figure 2 – Site Plan

APPENDICES

Appendix A – UDSA NRCS Soil Survey Data

Appendix B – Typed Boring and Test Pit Logs

Appendix C – Laboratory Testing Results

2.0 GEOLOGIC SETTING

2.1 Soils

Soils data was obtained from the USDA Natural Resource Conservation Service Web Soil Survey. The data indicates that the soils at the site consist of Sagers silty clay loam, 0 to 2 percent slopes; and Turley clay loam, 0 to 2 percent slopes. Soil survey data, including descriptions of the soil units, is included in Appendix A.

Structure construction in the site soils is described as being not limited to somewhat limited due to shrink-swell. The site soils are indicated to have a moderate potential for frost action, moderate risk of corrosion of uncoated steel, and low to moderate risk of corrosion of concrete.

2.2 Geology

According to the *Geologic Map of the Fruita Quadrangle, Mesa County, Colorado* (2009), the site is underlain by alluvial mudflow and fan valley fill deposits.

2.3 Groundwater

Groundwater was encountered in the subsurface at depths of between 3.5 and 8.0 at the time of the investigations.

3.0 FIELD INVESTIGATION

3.1 Subsurface Investigation

The subsurface investigation included two borings on May 18, 2023 and nine test pits on September 15, 2023. The locations of the borings and test pits are shown on Figure 2 – Site Plan. Typed boring and test pit logs are included in Appendix B. Samples of the subsurface soils were collected during Standard Penetration Testing (SPT) and using bulk sampling methods at the locations shown on the logs.

As indicated on the logs, the subsurface conditions at the site were consistent. The borings and test pits generally encountered 1.0 to 1.5 feet of topsoil above brown, moist to wet, medium stiff to soft / medium dense to loose sandy silt and silty sand soils to the bottoms of the borings/excavations. Groundwater was encountered in the borings conducted in March at depths of between 3.5 and 5.5 feet. In the test pits conducted in September, groundwater was encountered in three of the test pits at a depth of 8.0 feet.

3.2 Field Reconnaissance

The field reconnaissance included walking the site during the subsurface investigation. In general, the site was gently sloping. No evidence of landslides, debris flows, rockfalls, etc. was observed.

4.0 LABORATORY TESTING

Selected soil samples collected from the test pits were tested in the Huddlestone-Berry Engineering and Testing LLC geotechnical laboratory for natural moisture content determination, grain size analysis, Atterberg limits determination, maximum dry density and optimum moisture content (Proctor) determination, water soluble sulfates content, and California Bearing Ratio (CBR). The laboratory testing results are included in Appendix C.

The laboratory testing results indicate that the native silt and sand soils are slightly plastic. In general, based upon the Atterberg limits of the materials and upon our experience with similar soils in the vicinity of the subject site, the native sand and silt soils are anticipated to be slightly collapsible at their existing density. However, the CBR results indicate that the native soils are very slightly expansive when compacted and introduced to excess moisture with up to approximately 0.4% expansion measured in the laboratory.

5.0 GEOLOGIC INTERPRETATION

5.1 Geologic Hazards

The primary geologic hazard identified on the site is the presence of moisture sensitive soils. However, shallow groundwater may also impact the construction.

5.2 Geologic Constraints

In general, the primary geologic constraint to construction at the site is the presence of moisture sensitive soils. However, shallow groundwater may also impact the construction.

5.3 Water Resources

No water supply wells were observed on the property. However, shallow groundwater was encountered at the site. In general, with proper design and construction, development of the site is not anticipated to adversely affect surface water or groundwater.

5.4 Mineral Resources

Potential mineral resources in the Grand Valley generally include gravel, uranium ore, and commercial rock products such as flagstone. Based upon the results of the subsurface investigation and available geologic information, HBET does not believe that any commercial quality mineral resources exist at this site.

7.4 Drainage

Grading and drainage are critical for the long-term performance of the structures and grading around the structures should be designed to carry precipitation and runoff away from the structures. It is recommended that the finished ground surface drop at least twelve inches within the first ten feet away from the structures. It is also recommended that landscaping within five feet of the structures include primarily desert plants with low water requirements. In addition, it is recommended that irrigation, including drip lines, within ten feet of foundations be minimized.

HBET recommends that downspout extensions be used which discharge a minimum of 15 feet from the structures or beyond the backfill zones, whichever is greater. However, if subsurface downspout drains are utilized, they should be carefully constructed of solid-wall PVC and should daylight a minimum of 15 feet from the structures. In addition, an impermeable membrane is recommended below subsurface downspout drain lines. Dry wells should not be used.

7.5 Excavations

Excavations in the soils at the site may stand for short periods of time but should not be considered to be stable. Therefore, trenching and excavations should be sloped back, shored, or shielded for worker protection in accordance with applicable OSHA standards. The native soils at the site generally classify as Type C soil with regard to OSHA's *Construction Standards for Excavations*. For Type C soils, the maximum allowable slope in temporary cuts is 1.5H:1V.

7.6 Pavements

The proposed construction is anticipated to include internal subdivision roadways. As discussed previously, the pavement subgrade materials consist primarily of silt and sand soils. The design California Bearing Ratio (CBR) of the native soils was determined in the laboratory to be approximately 2.0. This corresponds to a Resilient Modulus of 3,000 psi.

Based upon the subgrade conditions and anticipated traffic loading, flexible and rigid pavement section alternatives were developed in accordance with AASHTO design methodologies. The following minimum pavement section alternatives are recommended:

Internal Subdivision Roadways

EDLA = 20, Structural Number = 3.50

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	3.0	15.0			18.0
B	4.0	12.0			16.0
C	3.0	6.0	13.0		22.0
Rigid Pavement		6.0		8.0	14.0

It is important to note that the recommendations herein are intended to reduce the risk of structural movement and/or damage, to varying degrees, associated with volume change of the native soils. However, HBET cannot predict long-term changes in subsurface moisture conditions and/or the precise magnitude or extent of volume change. Where significant changes in shallow subsurface moisture occur due to poor grading, improper stormwater management, utility line failure, excess irrigation, or other cause, either during construction or the result of actions of the property owners, several inches of movement are possible. In addition, any failure to comply with the recommendations in this report releases Huddleston-Berry Engineering & Testing, LLC of any liability with regard to the performance of structures, flatwork, etc. at this site.

Huddleston-Berry Engineering and Testing, LLC is pleased to be of service to your project. Please contact us if you have any questions or comments regarding the contents of this report.

Respectfully Submitted:
Huddleston-Berry Engineering and Testing, LLC



Michael A. Berry, P.E.
Vice President of Engineering

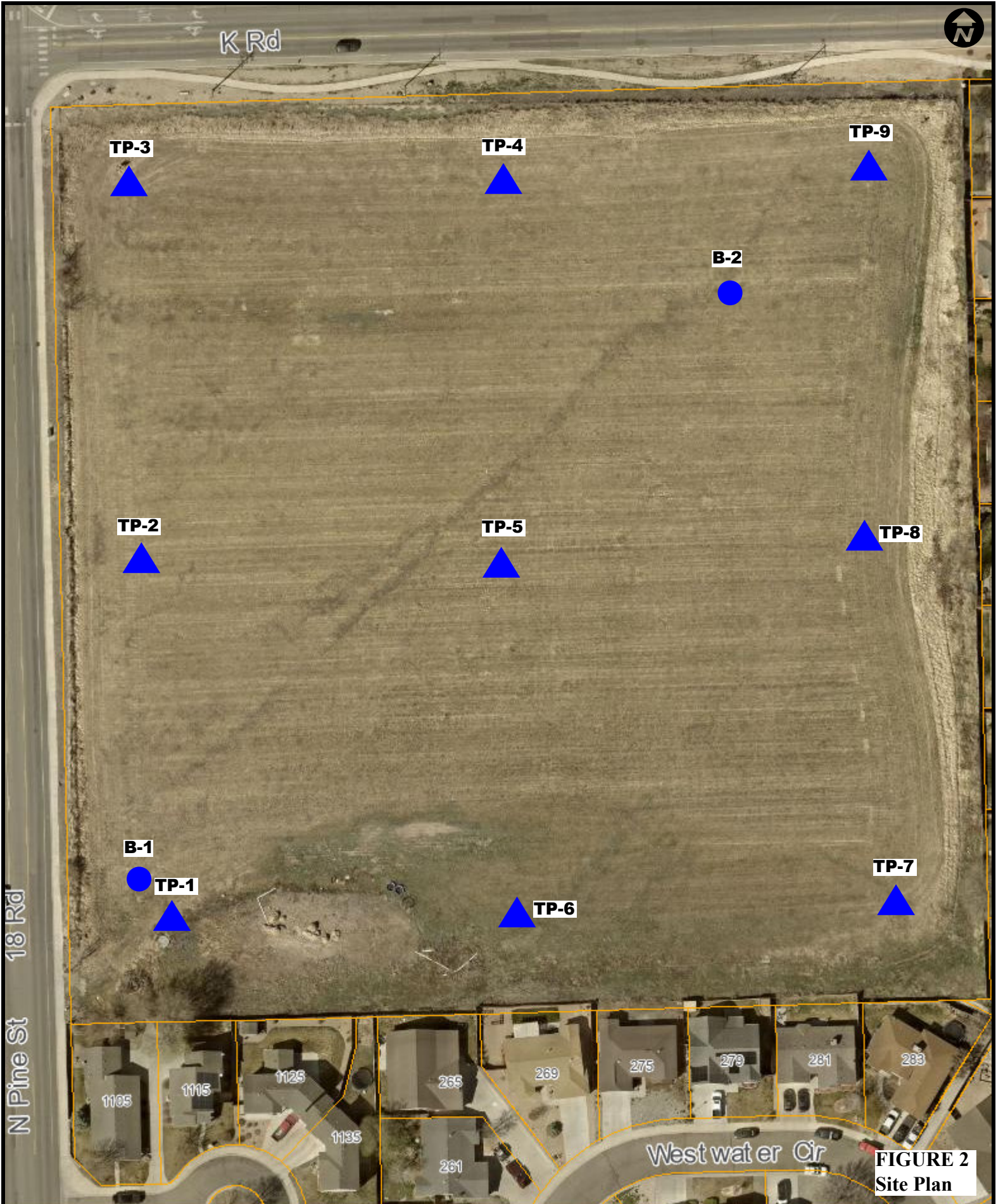
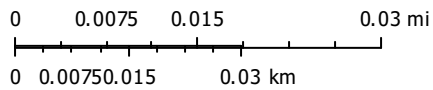


FIGURE 2
Site Plan

Mesa County Map

The Geographic Information System (GIS) and its components are designed as a source of reference for answering inquiries, for planning and for modeling. GIS is not intended or does not replace legal description information in the chain of title and other information contained in official government records such as the County Clerk and Records office or the courts. In addition, the representations of location in this GIS cannot be substituted for actual legal surveys. The information contained herein is believed accurate and suitable for the limited uses, and subject to the limitations, set forth above. Mesa County makes no warranty as to the accuracy or suitability of any information contained herein. Users assume all risk and responsibility for any and all damages, including consequential damages, which may flow from the user's use of this information.



Print Date: May 22, 2023



Mesa County, Colorado

GIS/IT Department
gis.mesacounty.us

APPENDIX B
Typed Boring and Test Pit Logs



Huddlestone-Berry Engineering & Testing, LLC
 2789 Riverside Parkway
 Grand Junction, CO 81501
 970-255-8005

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 5/18/23 COMPLETED 5/18/23	GROUND ELEVATION _____ HOLE SIZE 3
DRILLING CONTRACTOR S. McCracken	GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig	▽ AT TIME OF DRILLING 5.5 ft
LOGGED BY TEC CHECKED BY MAB	▼ AT END OF DRILLING 5.5 ft
NOTES _____	AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Sandy SILT with Organics (TOPSOIL)										
		Sandy SILT (ml) to Silty SAND (sm), brown, moist to wet, medium stiff to very soft / medium dense to loose										
5	▼		SS 1	78	2-2-3 (5)							
10			SS 2	83	1-1-1 (2)							
15			SS 3	100	1-1-2 (3)							
20			SS 4	100	0-1-2-1 (3)							
		Bottom of hole at 20.0 feet.										

GEOTECH\BH COLUMNS 01326-0027 18 AND K ROAD.GPJ GINT US LAB.GDT 10/12/23



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BORING NUMBER B-2

PAGE 1 OF 1

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 5/18/23 COMPLETED 5/18/23	GROUND ELEVATION _____ HOLE SIZE 4
DRILLING CONTRACTOR S. McCracken	GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Truck Rig	▽ AT TIME OF DRILLING 3.5 ft
LOGGED BY TEC CHECKED BY MAB	▼ AT END OF DRILLING 3.5 ft
NOTES _____	AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Sandy SILT with Organics (TOPSOIL)										
		Sandy SILT (ml) to Silty SAND (sm), brown, moist to wet, medium stiff to very soft / medium dense to loose										
			SS 1	72	3-1-2 (3)							
5												
			SS 2	100	0-0-0 (0)							
10												
			SS 3	100	1-1-1 (2)							
15												
			SS 4	100	1-1-1-3 (2)							
20		Bottom of hole at 20.0 feet.										

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TEST PIT NUMBER TP-1

PAGE 1 OF 1

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:
EXCAVATION METHOD Trackh/Backhoe	▽ AT TIME OF EXCAVATION 8.0 ft
LOGGED BY TEC CHECKED BY MAB	▼ AT END OF EXCAVATION 8.0 ft
NOTES _____	AFTER EXCAVATION ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ML) to Silty SAND (sm), brown, moist to wet, medium stiff to soft / medium dense to loose **Lab Classified GB1	GB 1					14	20	18	2	70
5.0												
7.5		*Walls collapsing at 6'										
		▼ Bottom of test pit at 8.0 feet.										

GEO TECH BH COLUMNS 01326-0027 18 AND K ROAD.GPJ GINT US LAB.GDT 10/12/23



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TEST PIT NUMBER TP-2

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:
EXCAVATION METHOD Trackh/Backhoe	AT TIME OF EXCAVATION Dry
LOGGED BY TEC CHECKED BY MAB	AT END OF EXCAVATION Dry
NOTES _____	AFTER EXCAVATION --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ml) to Silty SAND (sm), brown, moist, medium stiff to soft / medium dense to loose										
5.0												
7.5												
		Bottom of test pit at 8.0 feet.										

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TEST PIT NUMBER TP-3

PAGE 1 OF 1

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:
EXCAVATION METHOD Trackh/Backhoe	▽ AT TIME OF EXCAVATION 8.0 ft
LOGGED BY TEC CHECKED BY MAB	▼ AT END OF EXCAVATION 8.0 ft
NOTES _____	AFTER EXCAVATION --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0	[Symbol: Dotted pattern]	Sandy SILT with organics (TOPSOIL)										
2.5	[Symbol: Vertical lines]	Sandy SILT (ml) to Silty SAND (sm), brown, moist to wet, medium stiff to soft / medium dense to loose										
5.0	[Symbol: Vertical lines]											
7.5	[Symbol: Vertical lines]	*Walls collapsing 6.5'										
	[Symbol: Arrow pointing down]	Bottom of test pit at 8.0 feet.										

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TEST PIT NUMBER TP-4

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:
EXCAVATION METHOD Trackh/Backhoe	▽ AT TIME OF EXCAVATION 8.0 ft
LOGGED BY TEC CHECKED BY MAB	▼ AT END OF EXCAVATION 8.0 ft
NOTES _____	AFTER EXCAVATION --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ml) to Silty SAND (sm), brown, moist, medium stiff to soft / medium dense to loose										
5.0												
7.5												
		▼ Bottom of test pit at 8.0 feet.										

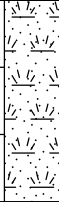
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TEST PIT NUMBER TP-5

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:
EXCAVATION METHOD Trackh/Backhoe	AT TIME OF EXCAVATION Dry
LOGGED BY TEC CHECKED BY MAB	AT END OF EXCAVATION Dry
NOTES _____	AFTER EXCAVATION ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ml) to Silty SAND (SM), brown, moist, medium stiff to soft / medium dense to loose **Lab Classified GB1	GB 1					6	19	17	2	50
5.0												
7.5												
		Bottom of test pit at 8.0 feet.										

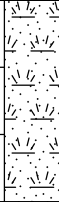
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TEST PIT NUMBER TP-6

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads	
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO	
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____	
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:	
EXCAVATION METHOD Trackh/Backhoe		AT TIME OF EXCAVATION Dry
LOGGED BY TEC CHECKED BY MAB		AT END OF EXCAVATION Dry
NOTES _____	AFTER EXCAVATION --	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ml) to Silty SAND (sm), brown, moist, medium stiff to soft / medium dense to loose										
5.0												
7.5												
		Bottom of test pit at 8.0 feet.										

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TEST PIT NUMBER TP-7

PAGE 1 OF 1

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:
EXCAVATION METHOD Trackh/Backhoe	AT TIME OF EXCAVATION Dry
LOGGED BY TEC CHECKED BY MAB	AT END OF EXCAVATION Dry
NOTES _____	AFTER EXCAVATION --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ml) to Silty SAND (sm), brown, moist, medium stiff to soft / medium dense to loose *6 inch layer of snad and gravel at 2 feet										
5.0												
7.5												
		Bottom of test pit at 8.0 feet.										

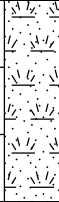
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TEST PIT NUMBER TP-8

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads	
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO	
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____	
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:	
EXCAVATION METHOD Trackh/Backhoe		AT TIME OF EXCAVATION Dry
LOGGED BY TEC CHECKED BY MAB		AT END OF EXCAVATION Dry
NOTES _____	AFTER EXCAVATION --	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ml) to Silty SAND (sm), brown, moist, medium stiff to soft / medium dense to loose										
5.0												
7.5												
		Bottom of test pit at 8.0 feet.										

GEOTECHIBH COLUMNS 01326-0027 18 AND K ROAD.GPJ GINT US LAB.GDT 10/12/23



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TEST PIT NUMBER TP-9

CLIENT J Howell, LLC	PROJECT NAME 18 and K Roads
PROJECT NUMBER 01326-0027	PROJECT LOCATION Fruita, CO
DATE STARTED 9/15/23 COMPLETED 9/15/23	GROUND ELEVATION _____ TEST PIT SIZE _____
EXCAVATION CONTRACTOR Wiseland	GROUND WATER LEVELS:
EXCAVATION METHOD Trackh/Backhoe	AT TIME OF EXCAVATION Dry
LOGGED BY TEC CHECKED BY MAB	AT END OF EXCAVATION Dry
NOTES _____	AFTER EXCAVATION --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		Sandy SILT with organics (TOPSOIL)										
2.5		Sandy SILT (ml) to Silty SAND (sm), brown, moist, medium stiff to soft / medium dense to loose										
5.0												
7.5												
		Bottom of test pit at 8.0 feet.										

GEOTECH\BH COLUMNS 01326-0027 18 AND K ROAD.GPJ GINT US LAB.GDT 10/12/23

APPENDIX C
Laboratory Testing Results



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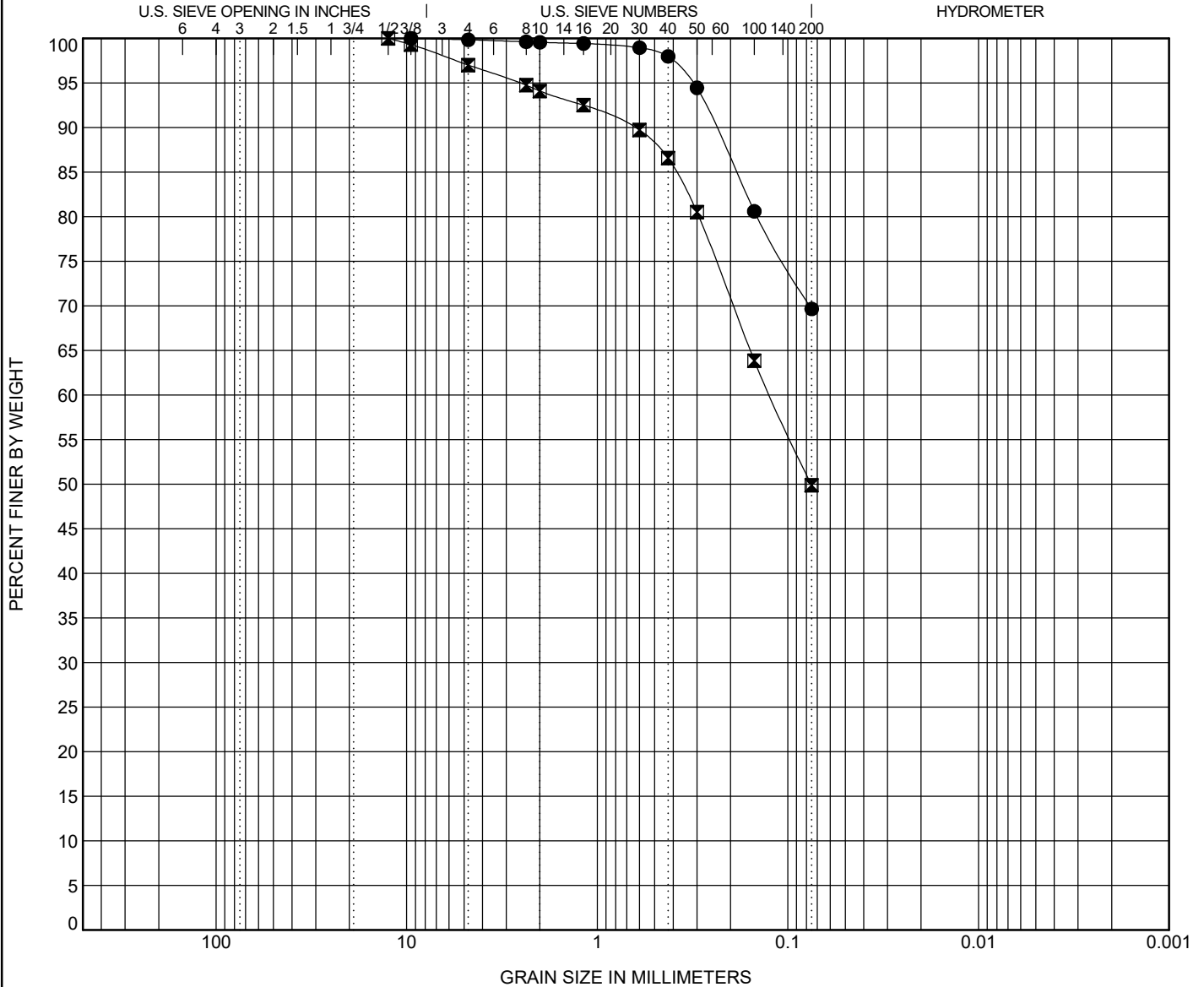
GRAIN SIZE DISTRIBUTION

CLIENT J Howell, LLC

PROJECT NAME 18 and K Roads

PROJECT NUMBER 01326-0027

PROJECT LOCATION Fruita, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification					LL	PL	PI	Cc	Cu
● TP-1, GB-1 9/15	SANDY SILT(ML)					20	18	2		
■ TP-5, GB-1 9/15	SILTY SAND(SM)					19	17	2		
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● TP-1, GB-1 9/15	9.5				0.2	30.2	69.7			
■ TP-5, GB-1 9/15	12.5	0.124			3.0	47.1	49.9			

GRAIN SIZE 01326-0027 18 AND K ROAD.GPJ GINT US LAB.GDT 10/11/23

APPENDIX B

SWMM Calculations

1. **Existing Conditions – Sub-basin Information**
2. **Proposed Conditions – Sub-basin Information**
3. **Minimum Detention Volumes**
4. **Allowable Release Rates – Compensating Detention Analysis**
5. **Water Quality Capture Volume**
6. **Detention Pond Stage Storage**

West Canyon (K Rd Fruita)

0208-029

Existing Conditions Sub-Basin Information

Sub-Basin ID	Area (sqft)	Area (acres)	Flowpath Length (ft)	Flowpath High Elev	Flowpath Low Elev	Flowpath Slope (%)	Basin Avg. Slope (%)	Equiv. Width Area 1	Equiv. Width Area 2	Equivalent Width
EX-01	396900	9.11	1180	4537.52	4524.90	1.07%	1.1%	58399.64	338500.36	1530

Existing Sub-Basin Breakdown & Imperviousness

Sub-Basin ID	Pavement (sqft)	Sub-Basin % Hardscaped	Walks, Roofs & Drives (sqft)	Sub-Basin % Open Space	Open Space Area (sqft)	Sub-Basin % Lot Area	Sub-Basin % Impervious
EX-01	0	0%	0	0%	396900	100%	4%

West Canyon (K Rd Fruita)

0208-029

Proposed Conditions Sub-Basin Information (Full Buildout)

Sub-Basin ID	Area (sqft)	Area (acres)	Flowpath Length (ft)	Flowpath High Elev	Flowpath Low Elev	Flowpath Slope (%)	Basin Avg. Slope (%)	Equiv. Width Area 1	Equiv. Width Area 2	Equivalent Width
PR-01	17857	0.410	169	4532.90	4526.20	3.96%	4.00%	8599.22	9257.94	330
PR-02	93467	2.146	847	4537.37	4531.65	0.68%	0.70%	75233.68	18232.96	1180
PR-03	87832	2.016	649	4536.96	4531.65	0.82%	0.90%	9749.86	78082.63	790
PR-04	78724	1.807	647	4536.96	4531.70	0.81%	0.90%	9754.07	68970.37	810
PR-05	73503	1.687	839	4537.37	4531.70	0.68%	0.70%	12531.97	60970.92	1120
PR-06	29842	0.685	706	4536.13	4531.34	0.68%	0.70%	4476.90	25364.96	920
PR-07	1465	0.034	50	4532.80	4531.52	2.57%	2.60%	657.56	807.78	90
PR-08	2570	0.059	60	4532.80	4532.09	1.18%	1.20%	1286.63	1282.88	120
PR-09	2866	0.066	38	4533.11	4532.00	2.90%	3.00%	565.53	2299.97	50
PR-10	1164	0.027	38	4533.27	4531.96	3.48%	3.50%	161.92	1002.57	50
PR-11	4081	0.094	38	4532.76	4531.62	2.98%	3.00%	238.71	3841.98	40
PR-12	2744	0.063	53	4532.39	4531.38	1.90%	1.90%	545.48	2198.44	70
PR-13	787	0.018	18	4534.93	4534.77	0.89%	0.90%	116.24	670.62	20

Total: 396902 9.11

**Imperviousness area on lots were calculated assuming the full-setback area was occupied by a proposed home and an 18-ft-wide driveway extended to the ROW line.

Proposed Sub-Basin Breakdown & Imperviousness

Sub-Basin ID	Asphalt Pavement (sqft)	Sub-Basin % Hardscaped	Conc Walks & Vpans (sqft)	Sub-Basin % Open Space	Single Family Detached (sqft)	Sub-Basin % Lot Area	Single Family Attached (sqft)	Sub-Basin % Lot Area	Landscape Lawns (sqft)	Sub-Basin % Lot Area	Sub-Basin % Impervious	Impervious Area (sqft)
PR-01	0	0%	277	2%	0	0%	0	0%	17580	98%	3.4%	601
PR-02	15772	17%	7000	7%	25350	27%	41441	44%	3903	4%	61.1%	57107
PR-03	16659	19%	10228	12%	27290	31%	30767	35%	2888	3%	63.9%	56161
PR-04	15143	19%	8837	11%	27290	35%	25229	32%	2226	3%	64.0%	50422
PR-05	14339	20%	7466	10%	49515	67%	0	0%	2183	3%	62.8%	46157
PR-06	0	0%	1413	5%	27805	93%	0	0%	624	2%	51.4%	15353
PR-07	0	0%	0	0%	1308	89%	0	0%	157	11%	45.4%	665
PR-08	0	0%	0	0%	2365	92%	0	0%	205	8%	46.7%	1201
PR-09	0	0%	0	0%	2618	91%	0	0%	248	9%	46.4%	1330
PR-10	0	0%	0	0%	1037	89%	0	0%	128	11%	45.3%	527
PR-11	0	0%	0	0%	3632	89%	0	0%	448	11%	45.3%	1847
PR-12	1490	54%	1038	38%	0	0%	0	0%	215	8%	88.5%	2429
PR-13	501	64%	237	30%	0	0%	0	0%	49	6%	90.9%	715

63904	+	36497	+	168210	+	97437	+	30854		396902	59.1%	234514
SF		SF		SF		SF		SF		SF	Sub-basin	SF
											Imperviousness	

West Canyon Subdivision

Project Information



215 Pitkin, Unit 201
Grand Junction, CO 81501

Historical Conditions

Developed Conditions

Total Area: 9.11 acres	Total Area: 9.11 acres
Composite Site Imperviousness: 4%	Composite Site Imperviousness: 59%

Soil Type for project = TYPE **C**

Minimum Detention Volumes

SWMM Table	Ultimate % Impervious	X ₁₀₀	X ₁₀
28.56230(a):	< 50%	0.42	0.26
	≥ 50%	0.48	0.38

X₁₀₀ = 0.48

Developed Basin Imperviousness (%)

P = 59

X₁₀ = 0.38

Tributary Area (Acres)

A = 9.11

$K_{100} = (1.78P - 0.002P^2 - 3.56)(X_{100}/900) = 0.05$

$K_{10} = (0.95P - 1.90)(X_{10}/1000) = 0.02$

100-Year Minimum Detention Volume:

$V_{100} = K_{100} * A =$	0.46 acre-feet	20,097.88 ft ³
---------------------------	-----------------------	----------------------------------

10-Year Minimum Detention Volume:

$V_{10} = K_{10} * A =$	0.19 acre-feet	8,208.58 ft ³
-------------------------	-----------------------	---------------------------------

Time to Drain 100-yr Detention Volume

20,097.88 ft³ = 150,332.18 gal
 (divide by 48 hrs) 3,131.92 gal/hr
 (convert to minutes) 52.20 gal/min
 (convert to cfs) 0.116 cfs to drain over 48hrs

West Canyon Subdivision
Project Information

Allowable Release Rates

SWMM Table 28.56.230(b)

FREQUENCY	SOIL GROUP			
	A	B	C	D
10-Year	0.05	0.09	0.12	0.12
100-Year	0.25	0.43	0.50	0.50

per SWMM Table 28.56.230(b):	cfs/Acre	Allowable Release Rate
10-Year	0.12	1.09 cfs
100-Year	0.5	4.56 cfs

Compensating Detention Analysis

SF of area not being routed thru detention pond prior to discharge from site
 PR Sub-basins PR-12 & PR-13 **3,530.79 SF** % of total site **0.89%**

Per SWMM Section 1407.3 *Compensating Detention Analysis*, the total of all un-detained area shall not exceed 5% or 5,000 square feet, whichever is less.

3,530.79	<	5,000.00	Yes
0.89%	<	5.00%	Yes

Undetained Area Post-Project Runoff Rates (cfs)

	Design Point*			
	PR-1B	PR-1C	Total	
10-Year	0.10	0.03	0.13	cfs
100-Year	0.20	0.06	0.26	cfs

* See Figure 4 - Developed Drainage Plan for Sub-basin and Design Point Locations

Adjusted Allowable Release Rates for Detention Pond (SWMM Section 1407.3)

(Allowable Release Rates) - (Undetained Area Post-Project Runoff Rates) = Adjusted Allowable Release Rates

Adjusted Allowable Release Rate			Detention Pond Post-Project Runoff Rates		
Design Point*			Design Point*		
PR-1A			PR-1A		
10-Year	0.96	cfs	10-Year	0.46	cfs
100-Year	4.30	cfs	100-Year	0.75	cfs

* See Figure 4 - Developed Drainage Plan for Sub-basin and Design Point Locations

0.46	<	0.96	Yes
0.75	<	4.30	Yes

Over-Detention has been provided to compensate for undetained areas not being routed thru detention pond

West Canyon Subdivision

Water Quality Capture Volume (WQCV)



215 Pitkin, Unit 201
Grand Junction, CO 81501

Calculate WQCV:

$$WQCV = k[a(0.91*i^3 - 1.19*i^2 + 0.78i)]$$

$$k = d_6/0.43 \quad \text{where } d_6 = 0.28$$

$$= 0.28/0.43$$

$$= 0.65$$

a = BMP Drain Time Coefficient (Assumed it is based on 40 hrs)

$$= 1.00$$

i = Watershed Imperviousness as a decimal

<u>Description</u>	<u>Area (acres)</u>	<u>Imperviousness (decimal)</u>	<u>A*I</u>
Basin D1	9.11	0.59	5.40

$$\text{Total} \quad \underline{\quad 9.11 \quad}$$

$$= [\text{sum}(\text{area} * \text{imperviousness})] / \text{total area}$$

$$= 0.59$$

$$WQCV = 0.65[1.0(0.91*0.80^3 - 1.19*0.80^2 + 0.78*0.80)]$$

$$= 0.1523 \quad \text{in}$$

Calculate 120% WQCV:

$$120\% \text{ WQCV} = 1.2 * WQCV$$

$$= 0.1827 \quad \text{in}$$

Calculate Required Storage Volume, SV:

$$SV = (120\% \text{ WQCV} / 12) * \text{Tributary Area}$$

$$= \mathbf{0.1387 \quad \text{acre-ft}}$$

$$\rightarrow \text{Multiply by } 43,560 \text{ ft}^2/\text{acre}$$

$$\mathbf{6,042 \text{ ft}^3}$$

West Canyon Subdivision
Water Quality Capture Volume (WQCV)



215 Pitkin, Unit 201
 Grand Junction, CO 81501

Design Stage Storage

Contour Elevation	Contour Area (ft ²)	Depth (ft)	Cumulative Volume (cu. ft)	Contour Elevation
4,526.20	0.00	0.00	0.00	4,526.20
4,526.30	17.90	0.10	1.00	4,526.30
4,526.40	84.90	0.20	6.00	4,526.40
4,526.50	244.90	0.30	23.00	4,526.50
4,526.60	501.40	0.40	60.00	4,526.60
4,526.70	854.40	0.50	128.00	4,526.70
4,526.80	1,302.50	0.60	235.00	4,526.80
4,526.90	1,828.80	0.70	392.00	4,526.90
4,527.00	2,392.20	0.80	603.00	4,527.00
4,527.10	2,955.30	0.90	870.00	4,527.10
4,527.20	3,518.20	1.00	1,194.00	4,527.20
4,527.30	4,080.80	1.10	1,574.00	4,527.30
4,527.40	4,643.00	1.20	2,010.00	4,527.40
4,527.50	5,205.00	1.30	2,503.00	4,527.50
4,527.60	5,766.70	1.40	3,051.00	4,527.60
4,527.70	6,328.10	1.50	3,656.00	4,527.70
4,527.80	6,890.70	1.60	4,317.00	4,527.80
4,527.90	7,360.30	1.70	5,029.00	4,527.90
4,528.00	7,477.60	1.80	5,771.00	4,528.00
4,528.10	7,595.50	1.90	6,525.00	4,528.10
4,528.20	7,714.00	2.00	7,291.00	4,528.20
4,528.30	7,833.10	2.10	8,068.00	4,528.30
4,528.40	7,952.70	2.20	8,857.00	4,528.40
4,528.50	8,072.80	2.30	9,658.00	4,528.50
4,528.60	8,193.50	2.40	10,472.00	4,528.60
4,528.70	8,314.80	2.50	11,297.00	4,528.70
4,528.80	8,436.70	2.60	12,135.00	4,528.80
4,528.90	8,559.10	2.70	12,985.00	4,528.90
4,529.00	8,682.00	2.80	13,847.00	4,529.00
4,529.10	8,805.60	2.90	14,721.00	4,529.10
4,529.20	8,929.70	3.00	15,608.00	4,529.20
4,529.30	9,054.30	3.10	16,507.00	4,529.30
4,529.40	9,179.60	3.20	17,419.00	4,529.40
4,529.50	9,305.30	3.30	18,343.00	4,529.50
4,529.60	9,431.70	3.40	19,280.00	4,529.60
4,529.70	9,558.60	3.50	20,229.00	4,529.70
4,529.80	9,686.10	3.60	21,191.00	4,529.80
4,529.90	9,814.10	3.70	22,166.00	4,529.90
4,530.00	9,942.70	3.80	23,154.00	4,530.00
4,530.10	10,071.80	3.90	24,155.00	4,530.10
4,530.20	10,201.60	4.00	25,169.00	4,530.20
4,530.30	10,331.80	4.10	26,195.00	4,530.30
4,530.40	10,462.70	4.20	27,235.00	4,530.40
4,530.50	10,594.10	4.30	28,288.00	4,530.50
4,530.60	10,726.00	4.40	29,354.00	4,530.60
4,530.70	10,858.60	4.50	30,433.00	4,530.70
4,530.80	10,991.70	4.60	31,526.00	4,530.80
4,530.90	11,125.30	4.70	32,632.00	4,530.90
4,531.00	11,259.50	4.80	33,751.00	4,531.00
4,531.10	11,394.30	4.90	34,883.00	4,531.10
4,531.20	11,529.60	5.00	36,030.00	4,531.20
4,531.30	11,665.60	5.10	37,189.00	4,531.30
4,531.40	11,801.80	5.20	38,362.00	4,531.40
4,531.50	11,938.80	5.30	39,549.00	4,531.50
4,531.60	12,076.40	5.40	40,749.00	4,531.60

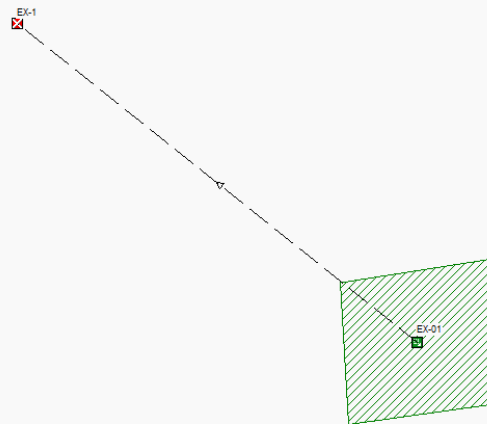
Water Quality Capture Volume		
	Elevation	Volume (ft ³)
Low Contour	4,528.00	5,771.00
WQCV WSEL	4,528.04	6,042.42
High Contour	4,528.10	6,525.00

APPENDIX C

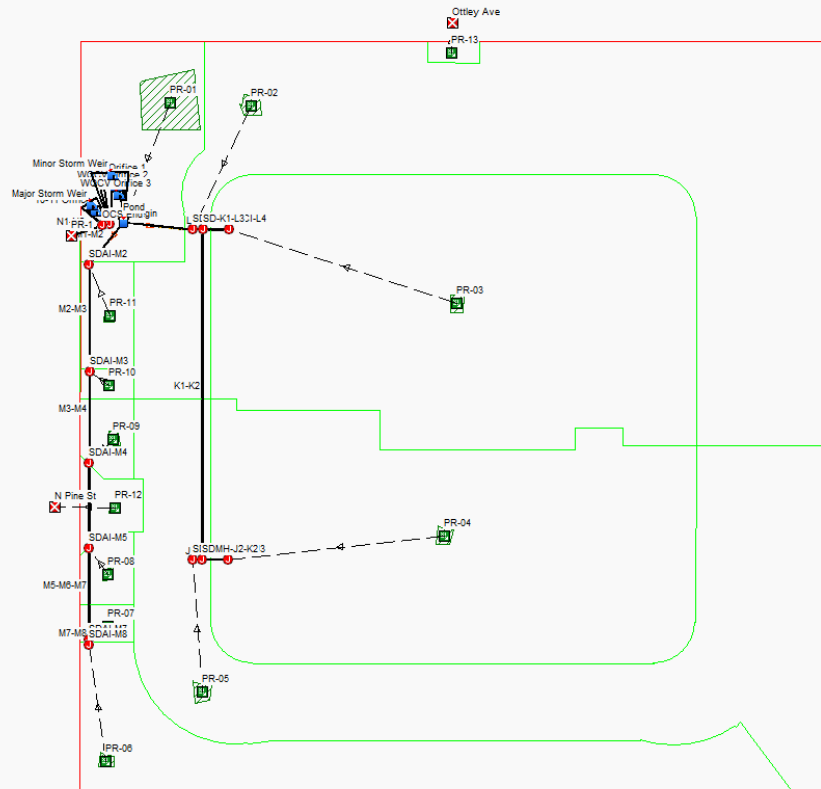
Hydrologic + Hydraulic Model Overview

- 1. SSA Existing Model Overview**
- 2. SSA Proposed Model Overview**

WEST CANYON SUBDIVISION
Existing Conditions Model

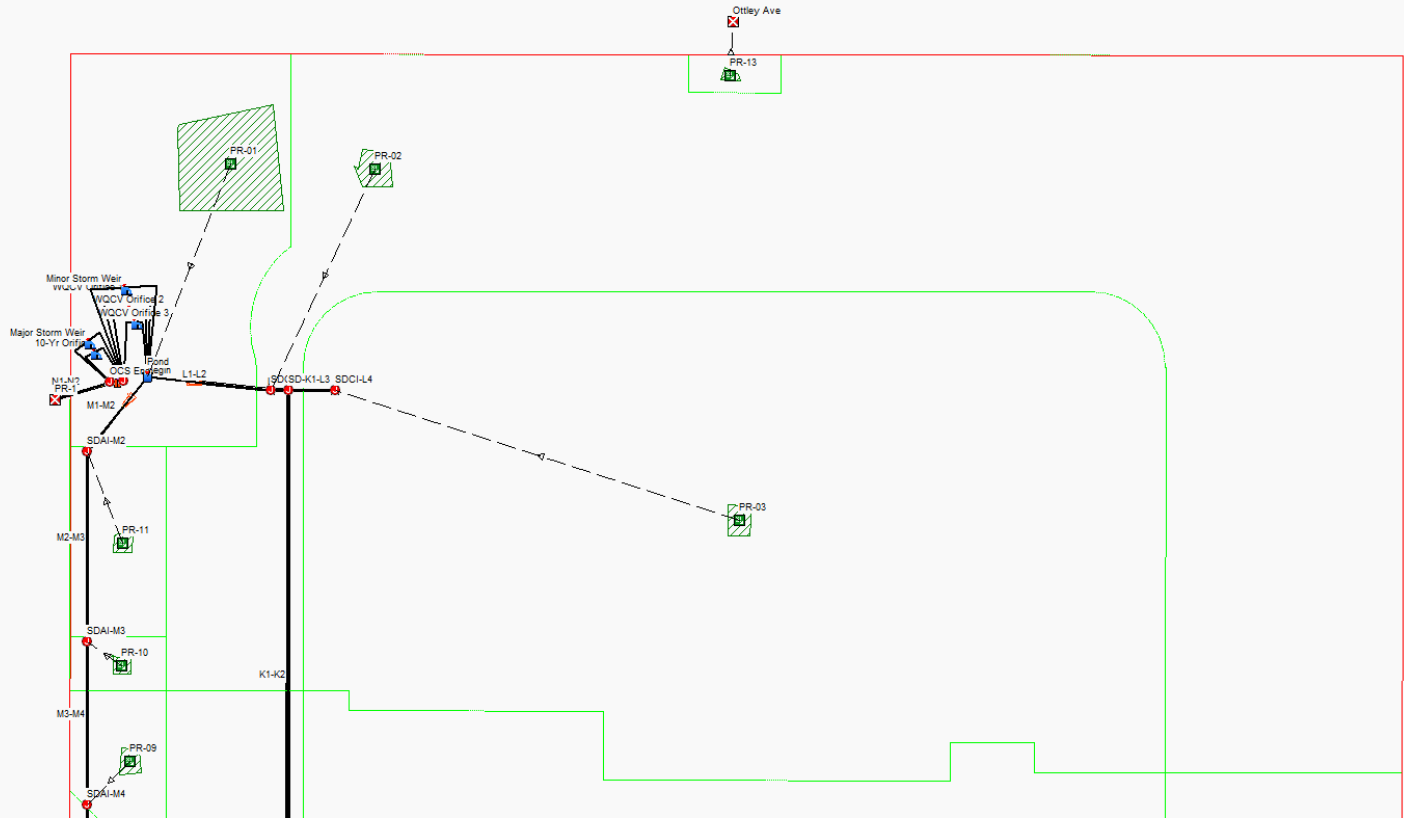


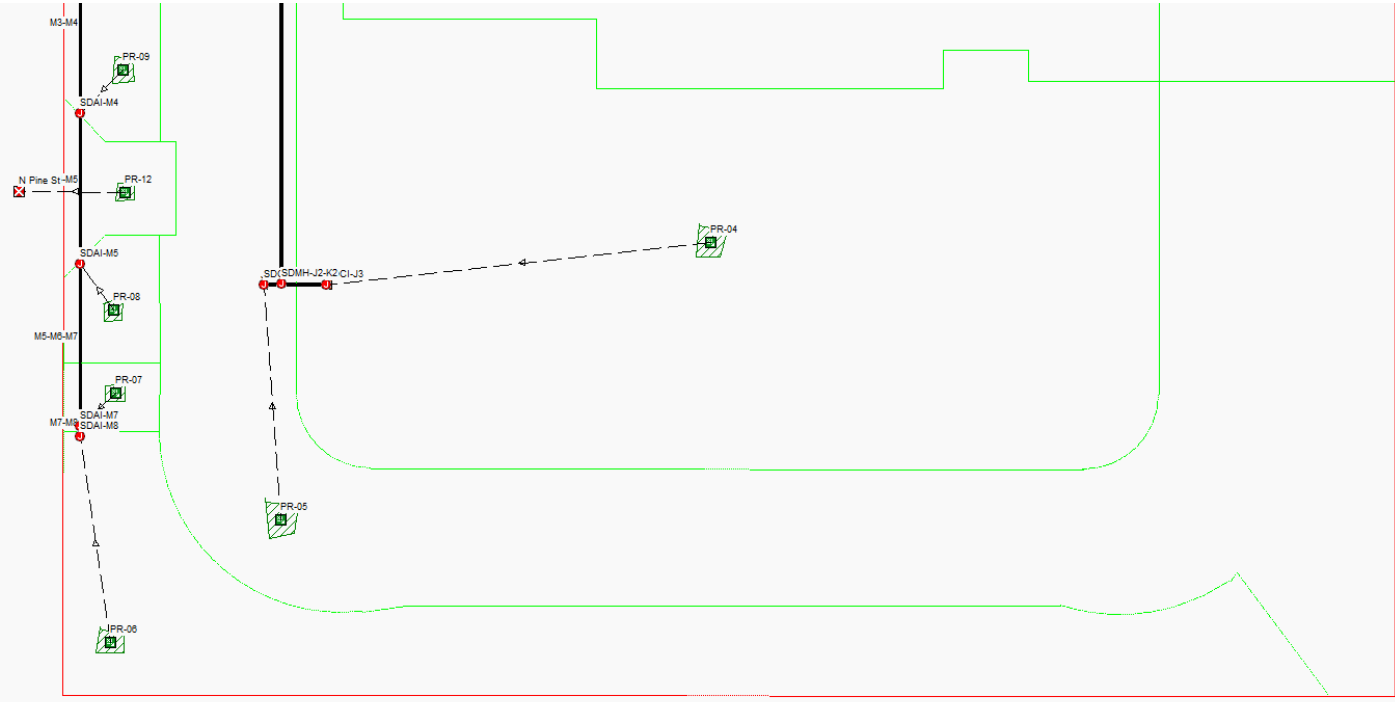
WEST CANYON SUBDIVISION Proposed Conditions Model

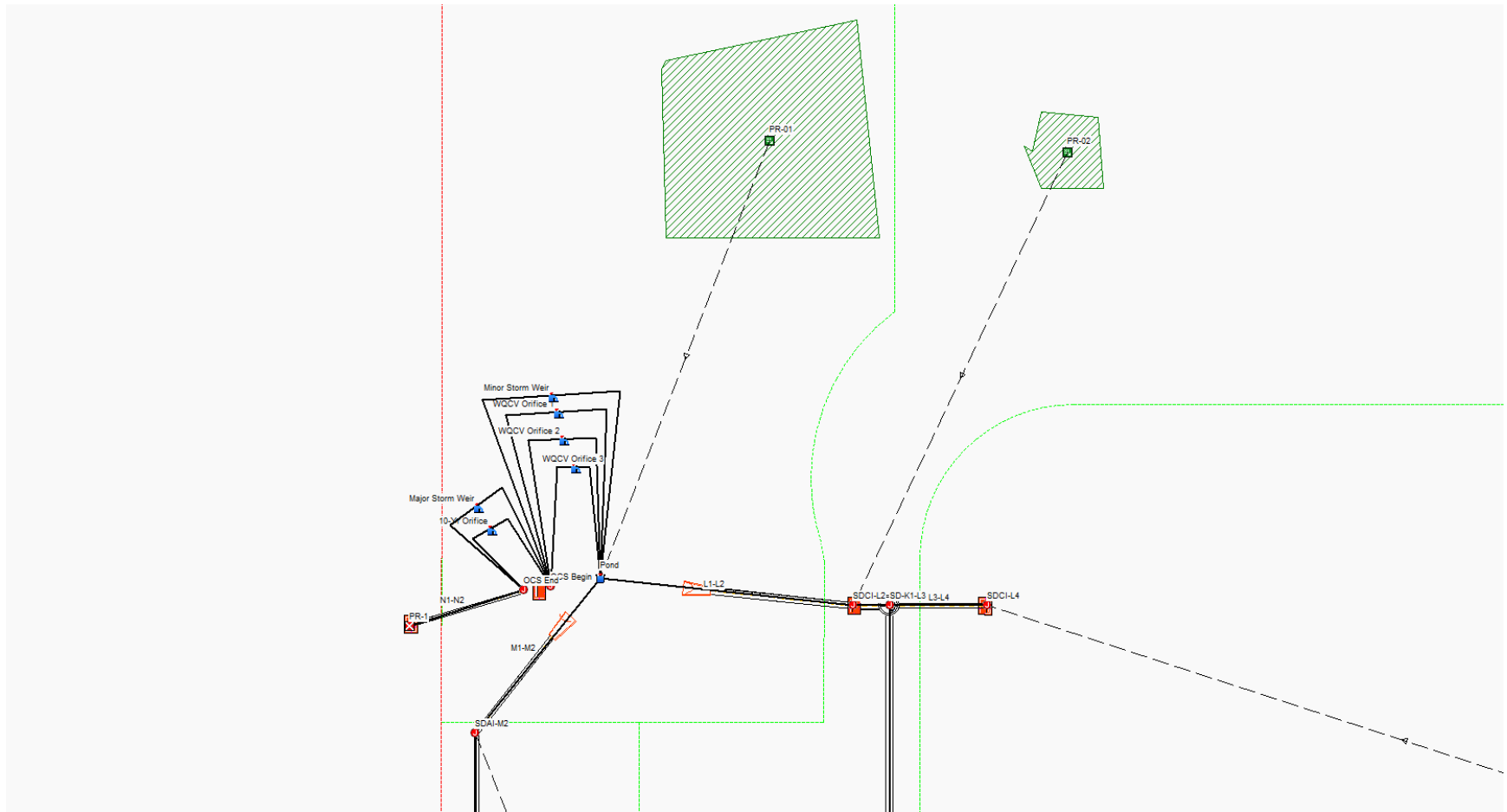


WEST CANYON SUBDIVISION

Proposed Conditions Model







APPENDIX D

Existing Minor and Major Storm Model Results

- 1. 2-year, 3-hour Existing Model Results**
- 2. 10-year, 3-hour Existing Model Results**
- 3. 100-year, 3-hour Existing Model Results**

Project Description

File Name 0208-029 EX Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method EPA SWMM
 EPA SWMM Infiltration Method SCS Curve Number
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On 00:00:00 0:00:00
 End Analysis On 00:00:00 0:00:00
 Start Reporting On 00:00:00 0:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:00:30 days hh:mm:ss
 Reporting Time Step 0 00:00:30 days hh:mm:ss
 Routing Time Step 5 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	1
Nodes.....	1
<i>Junctions</i>	0
<i>Outfalls</i>	1
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	0
Links.....	0
<i>Channels</i>	0
<i>Pipes</i>	0
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	2-yr 3-hr	Cumulative	inches					User Defined

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Equivalent Width	Impervious Area	Pervious Area	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ac)	(%)		(%)	(ft)	Manning's Roughness	Manning's Roughness	(in)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	EX-01	9.11	4.00	79.00	1.1000	1510.00	0.0150	0.1300	0.47	0.4030	0.02	0.15	0.40	0 01:02:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	EX-1	Outfall	4526.00					0.00	0.00					

Subbasin Hydrology

Subbasin : EX-01

Input Data

Area (ac) 9.11
 Impervious Area (%) 4
 Weighted Curve Number 79
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.1
 Equivalent Width (ft) 1510
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.13
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Fair	9.11	C	79
Composite Area & Weighted CN	9.11		79

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.403
 Total Runoff (in) 0.02
 Peak Runoff (cfs) 0.4
 Weighted Curve Number 79
 Time of Concentration (days hh:mm:ss) 0 01:02:00

Project Description

File Name 0208-029 EX Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method EPA SWMM
 EPA SWMM Infiltration Method SCS Curve Number
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On 00:00:00 0:00:00
 End Analysis On 00:00:00 0:00:00
 Start Reporting On 00:00:00 0:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:00:30 days hh:mm:ss
 Reporting Time Step 0 00:00:30 days hh:mm:ss
 Routing Time Step 5 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	1
Nodes.....	1
<i>Junctions</i>	0
<i>Outfalls</i>	1
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	0
Links.....	0
<i>Channels</i>	0
<i>Pipes</i>	0
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	10-yr 3-hr	Cumulative	inches					User Defined

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Equivalent Width	Impervious Area	Pervious Area	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ac)	(%)		(%)	(ft)	Manning's Roughness	Manning's Roughness	(in)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	EX-01	9.11	4.00	79.00	1.1000	1510.00	0.0150	0.1300	0.77	0.6910	0.03	0.26	0.65	0 00:50:53

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	EX-1	Outfall	4526.00					0.00	0.00					

Subbasin Hydrology

Subbasin : EX-01

Input Data

Area (ac) 9.11
 Impervious Area (%) 4
 Weighted Curve Number 79
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.1
 Equivalent Width (ft) 1510
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.13
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Fair	9.11	C	79
Composite Area & Weighted CN	9.11		79

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.691
 Total Runoff (in) 0.03
 Peak Runoff (cfs) 0.65
 Weighted Curve Number 79
 Time of Concentration (days hh:mm:ss) 0 00:50:53

Project Description

File Name 0208-029 EX Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method EPA SWMM
 EPA SWMM Infiltration Method SCS Curve Number
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On 00:00:00 0:00:00
 End Analysis On 00:00:00 0:00:00
 Start Reporting On 00:00:00 0:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:00:30 days hh:mm:ss
 Reporting Time Step 0 00:00:30 days hh:mm:ss
 Routing Time Step 5 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	1
Nodes.....	1
<i>Junctions</i>	0
<i>Outfalls</i>	1
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	0
Links.....	0
<i>Channels</i>	0
<i>Pipes</i>	0
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	100-yr 3-hr	Cumulative	inches					User Defined

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Equivalent Width	Impervious Area	Pervious Area	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ac)	(%)		(%)	(ft)	Manning's Roughness	Manning's Roughness	(in)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	EX-01	9.11	4.00	79.00	1.1000	1510.00	0.0150	0.1300	1.44	1.1000	0.29	2.64	2.12	0 00:39:36

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	EX-1	Outfall	4526.00					0.00	0.00					

Subbasin Hydrology

Subbasin : EX-01

Input Data

Area (ac) 9.11
 Impervious Area (%) 4
 Weighted Curve Number 79
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.1
 Equivalent Width (ft) 1510
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.13
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Fair	9.11	C	79
Composite Area & Weighted CN	9.11		79

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 1.1
 Total Runoff (in) 0.29
 Peak Runoff (cfs) 2.12
 Weighted Curve Number 79
 Time of Concentration (days hh:mm:ss) 0 00:39:36

APPENDIX E

Proposed Minor Storm Model Results

- 1. 2-year, 3-hour Proposed Model Results**
- 2. 10-year, 3-hour Proposed Model Results**

Project Description

File Name 0208-029 PR Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method EPA SWMM
 EPA SWMM Infiltration Method SCS Curve Number
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On 00:00:00 0:00:00
 End Analysis On 00:00:00 0:00:00
 Start Reporting On 00:00:00 0:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:00:30 days hh:mm:ss
 Reporting Time Step 0 00:00:30 days hh:mm:ss
 Routing Time Step 5 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	13
Nodes.....	18
<i>Junctions</i>	14
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	1
Links.....	19
<i>Channels</i>	0
<i>Pipes</i>	13
<i>Pumps</i>	0
<i>Orifices</i>	4
<i>Weirs</i>	2
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	2-yr 3-hr	Cumulative	inches					User Defined

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Equivalent Width	Impervious Area	Pervious Area	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ac)	(%)		(%)	(ft)	Manning's Roughness	Manning's Roughness	(in)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	PR-01	0.41	3.00	74.35	4.0000	330.00	0.0150	0.4000	0.47	0.4070	0.01	0.00	0.01	0 00:32:12
2	PR-02	2.15	61.00	88.86	0.7000	1180.00	0.0150	0.4000	0.47	0.1640	0.25	0.54	1.26	0 00:39:31
3	PR-03	2.02	64.00	89.63	0.9000	790.00	0.0150	0.4000	0.47	0.1510	0.26	0.53	1.16	0 00:42:49
4	PR-04	1.81	64.00	89.64	0.9000	810.00	0.0150	0.4000	0.47	0.1510	0.26	0.47	1.08	0 00:39:29
5	PR-05	1.69	63.00	89.20	0.7000	1120.00	0.0150	0.4000	0.47	0.1550	0.26	0.44	1.06	0 00:34:12
6	PR-06	0.69	46.00	86.32	0.7000	920.00	0.0150	0.4000	0.47	0.2270	0.19	0.13	0.34	0 00:28:07
7	PR-07	0.03	45.00	84.59	2.6000	90.00	0.0150	0.4000	0.47	0.2310	0.19	0.01	0.02	0 00:12:45
8	PR-08	0.06	47.00	84.98	1.2000	120.00	0.0150	0.4000	0.47	0.2230	0.19	0.01	0.03	0 00:18:26
9	PR-09	0.07	46.00	84.91	3.0000	50.00	0.0150	0.4000	0.47	0.2270	0.19	0.01	0.03	0 00:25:37
10	PR-10	0.03	45.00	84.67	3.5000	50.00	0.0150	0.4000	0.47	0.2310	0.19	0.00	0.01	0 00:14:28
11	PR-11	0.09	45.00	84.68	3.0000	40.00	0.0150	0.4000	0.47	0.2310	0.19	0.02	0.05	0 00:36:33
12	PR-12	0.06	89.00	96.10	1.9000	70.00	0.0150	0.4000	0.47	0.0410	0.37	0.02	0.06	0 00:08:59
13	PR-13	0.02	91.00	96.53	0.9000	20.00	0.0150	0.4000	0.47	0.0320	0.38	0.01	0.02	0 00:09:58

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	OCS Begin	Junction	4526.20	4531.30	4526.20	4531.30	5000.00	0.33	4527.49	0.00	3.81	0 00:00	0.00	0.00
2	OCS End	Junction	4526.20	4531.30	4526.20	4531.30	5000.00	0.32	4526.46	0.00	4.84	0 00:00	0.00	0.00
3	SDAI-M2	Junction	4527.94	4531.62	4527.94	4531.62	10.00	0.47	4528.27	0.00	3.35	0 00:00	0.00	0.00
4	SDAI-M3	Junction	4528.30	4531.96	4528.30	4531.96	10.00	0.43	4528.59	0.00	3.37	0 00:00	0.00	0.00
5	SDAI-M4	Junction	4528.61	4532.00	4528.61	4532.00	10.00	0.42	4528.90	0.00	3.10	0 00:00	0.00	0.00
6	SDAI-M5	Junction	4528.89	4532.09	4528.89	4532.09	10.00	0.39	4529.17	0.00	2.92	0 00:00	0.00	0.00
7	SDAI-M7	Junction	4529.20	4531.52	4529.20	4531.52	10.00	0.36	4529.46	0.00	2.06	0 00:00	0.00	0.00
8	SDAI-M8	Junction	4529.22	4531.34	4529.22	4531.34	10.00	0.34	4529.54	0.00	1.80	0 00:00	0.00	0.00
9	SDCI-J1	Junction	4528.97	4531.60	4528.97	4531.60	10.00	1.06	4529.55	0.00	2.05	0 00:00	0.00	0.00
10	SDCI-J3	Junction	4528.97	4531.60	4528.97	4531.60	10.00	1.08	4529.58	0.00	2.02	0 00:00	0.00	0.00
11	SDCI-L2	Junction	4527.99	4531.55	4527.99	4531.55	10.00	4.39	4528.81	0.00	2.74	0 00:00	0.00	0.00
12	SDCI-L4	Junction	4529.15	4531.55	4529.15	4531.55	10.00	1.16	4529.69	0.00	1.86	0 00:00	0.00	0.00
13	SD-K1-L3	Junction	4528.04	4531.94	4528.04	4531.94	10.00	3.23	4528.94	0.00	3.00	0 00:00	0.00	0.00
14	SDMH-J2-K2	Junction	4528.87	4531.98	4528.87	4531.98	10.00	2.12	4529.44	0.00	2.54	0 00:00	0.00	0.00
15	N Pine St	Outfall	0.00					0.06	0.00					
16	Ottley Ave	Outfall	0.00					0.02	0.00					
17	PR-1	Outfall	4526.00					0.32	4526.00					
18	Pond	Storage Node	4526.20	4531.66	4526.20		5000.00	4.87	4528.13				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	J1-J2	Pipe	SDCI-J1	SDMH-J2-K2	8.52	4528.97	4528.87	1.1700	12.000	0.0110	1.05	4.56	0.23	2.28	0.57	0.57	0.00	Calculated
2	J2-J3	Pipe	SDCI-J3	SDMH-J2-K2	22.47	4528.97	4528.87	0.4400	12.000	0.0110	1.08	2.81	0.38	2.26	0.59	0.59	0.00	Calculated
3	K1-K2	Pipe	SDMH-J2-K2	SD-K1-L3	276.99	4528.87	4528.04	0.3000	18.000	0.0110	2.07	6.80	0.30	2.46	0.73	0.49	0.00	Calculated
4	L1-L2	Pipe	SDCI-L2	Pond	32.68	4527.99	4527.83	0.5000	24.000	0.0110	4.39	18.90	0.23	4.18	0.74	0.37	0.00	Calculated
5	L2-L3	Pipe	SD-K1-L3	SDCI-L2	8.53	4528.04	4527.99	0.5000	24.000	0.0110	3.20	18.89	0.17	2.49	0.86	0.43	0.00	Calculated
6	L3-L4	Pipe	SDCI-L4	SD-K1-L3	22.47	4529.15	4529.04	0.5100	12.000	0.0110	1.16	3.00	0.39	3.09	0.48	0.48	0.00	Calculated
7	M1-M2	Pipe	SDAI-M2	Pond	28.04	4527.94	4527.83	0.4000	12.000	0.0110	0.46	2.66	0.17	2.29	0.30	0.31	0.00	Calculated
8	M2-M3	Pipe	SDAI-M3	SDAI-M2	89.69	4528.30	4527.94	0.4000	12.000	0.0110	0.43	2.66	0.16	2.11	0.31	0.31	0.00	Calculated
9	M3-M4	Pipe	SDAI-M4	SDAI-M3	77.18	4528.61	4528.30	0.4000	12.000	0.0110	0.41	2.66	0.16	2.24	0.29	0.29	0.00	Calculated
10	M4-M5	Pipe	SDAI-M5	SDAI-M4	71.20	4528.89	4528.61	0.4000	12.000	0.0110	0.38	2.66	0.14	2.12	0.28	0.28	0.00	Calculated
11	M5-M6-M7	Pipe	SDAI-M7	SDAI-M5	76.65	4529.20	4528.89	0.4000	12.000	0.0110	0.36	2.66	0.13	2.09	0.27	0.27	0.00	Calculated
12	M7-M8	Pipe	SDAI-M8	SDAI-M7	5.00	4529.22	4529.20	0.4000	12.000	0.0110	0.34	2.66	0.13	1.81	0.29	0.29	0.00	Calculated
13	N1-N2	Pipe	OCS End	PR-1	29.56	4526.20	4526.05	0.5000	12.000	0.0110	0.32	2.98	0.11	2.18	0.24	0.24	0.00	Calculated
14	10-Yr Orifice	Orifice	OCS Begin	OCS End		4526.20	4526.20		3.000		0.32							
15	WQCV Orifice 1	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.03							
16	WQCV Orifice 2	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.03							
17	WQCV Orifice 3	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.02							
18	Major Storm Weir	Weir	OCS Begin	OCS End		4526.20	4526.20				0.00							
19	Minor Storm Weir	Weir	Pond	OCS Begin		4526.20	4526.20				0.28							

Subbasin Hydrology

Subbasin : PR-01

Input Data

Area (ac) 0.41
 Impervious Area (%) 3
 Weighted Curve Number 74.35
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 4
 Equivalent Width (ft) 330
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Conc. Walks & V-pans	0.01	C	98
> 75% grass cover, Good	0.4	C	74
Composite Area & Weighted CN	0.41		74.35

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.407
 Total Runoff (in) 0.01
 Peak Runoff (cfs) 0.01
 Weighted Curve Number 74.35
 Time of Concentration (days hh:mm:ss) 0 00:32:12

Subbasin : PR-02

Input Data

Area (ac) 2.15
 Impervious Area (%) 61
 Weighted Curve Number 88.86
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 1180
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Paved roads with curbs & sewers	0.36	C	98
Conc. Walks & V-pans	0.16	C	98
Single-Family Attached (51.2% imperv.)	0.58	C	86
Single-Family Detached (54.2% imperv.)	0.95	C	87
> 75% grass cover, Good	0.09	C	74
Composite Area & Weighted CN	2.14		88.86

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.164
 Total Runoff (in) 0.25
 Peak Runoff (cfs) 1.26
 Weighted Curve Number 88.86
 Time of Concentration (days hh:mm:ss) 0 00:39:31

Subbasin : PR-03

Input Data

Area (ac)	2.02
Impervious Area (%)	64
Weighted Curve Number	89.63
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.9
Equivalent Width (ft)	790
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.4
Curb & Gutter Length (ft)	0
Rain Gage ID	*

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Paved roads with curbs & sewers	0.38	C	98
Conc Walks & V-pan	0.24	C	98
Single-Family Attached (51.2% imperv.)	0.63	C	86
Single-Family Detached (54.2% imperv.)	0.71	C	87
> 75% grass cover, Good	0.07	C	74
Composite Area & Weighted CN	2.03		89.63

Subbasin Runoff Results

Total Rainfall (in)	0.47
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.151
Total Runoff (in)	0.26
Peak Runoff (cfs)	1.16
Weighted Curve Number	89.63
Time of Concentration (days hh:mm:ss)	0 00:42:49

Subbasin : PR-04

Input Data

Area (ac) 1.81
 Impervious Area (%) 64
 Weighted Curve Number 89.64
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.9
 Equivalent Width (ft) 810
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.35	C	98
Conc. Walks & V-Pan	0.2	C	98
Single-Family Attached (51.2% imperv.)	0.63	C	86
Single-Family Detached (54.2% imperv.)	0.58	C	87
> 75% grass cover, Good	0.05	C	74
Composite Area & Weighted CN	1.81		89.64

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.151
 Total Runoff (in) 0.26
 Peak Runoff (cfs) 1.08
 Weighted Curve Number 89.64
 Time of Concentration (days hh:mm:ss) 0 00:39:29

Subbasin : PR-05

Input Data

Area (ac) 1.69
 Impervious Area (%) 63
 Weighted Curve Number 89.2
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 1120
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.33	C	98
Conc. Walks & V-pan	0.17	C	98
Single-Family Attached (51.2% imperv.)	1.14	C	86
> 75% grass cover, Good	0.05	C	74
Composite Area & Weighted CN	1.69		89.2

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.155
 Total Runoff (in) 0.26
 Peak Runoff (cfs) 1.06
 Weighted Curve Number 89.2
 Time of Concentration (days hh:mm:ss) 0 00:34:12

Subbasin : PR-06

Input Data

Area (ac) 0.69
 Impervious Area (%) 46
 Weighted Curve Number 86.32
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 920
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Conc. Walks & V-pan	0.03	C	98
Single-Family Attached (51.2% imperv.)	0.64	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.68		86.32

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.227
 Total Runoff (in) 0.19
 Peak Runoff (cfs) 0.34
 Weighted Curve Number 86.32
 Time of Concentration (days hh:mm:ss) 0 00:28:07

Subbasin : PR-07

Input Data

Area (ac) 0.03
 Impervious Area (%) 45
 Weighted Curve Number 84.59
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 2.6
 Equivalent Width (ft) 90
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Single-Family Attached (51.2% imperv.)	0.03	C	86
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.03		84.59

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.231
 Total Runoff (in) 0.19
 Peak Runoff (cfs) 0.02
 Weighted Curve Number 84.59
 Time of Concentration (days hh:mm:ss) 0 00:12:45

Subbasin : PR-08

Input Data

Area (ac) 0.06
 Impervious Area (%) 47
 Weighted Curve Number 84.98
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.2
 Equivalent Width (ft) 120
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.05	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.06		84.98

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.223
 Total Runoff (in) 0.19
 Peak Runoff (cfs) 0.03
 Weighted Curve Number 84.98
 Time of Concentration (days hh:mm:ss) 0 00:18:26

Subbasin : PR-09

Input Data

Area (ac) 0.07
 Impervious Area (%) 46
 Weighted Curve Number 84.91
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3
 Equivalent Width (ft) 50
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.06	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.07		84.91

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.227
 Total Runoff (in) 0.19
 Peak Runoff (cfs) 0.03
 Weighted Curve Number 84.91
 Time of Concentration (days hh:mm:ss) 0 00:25:37

Subbasin : PR-10

Input Data

Area (ac) 0.03
 Impervious Area (%) 45
 Weighted Curve Number 84.67
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3.5
 Equivalent Width (ft) 50
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.02	C	86
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.02		84.67

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.231
 Total Runoff (in) 0.19
 Peak Runoff (cfs) 0.01
 Weighted Curve Number 84.67
 Time of Concentration (days hh:mm:ss) 0 00:14:28

Subbasin : PR-11

Input Data

Area (ac) 0.09
 Impervious Area (%) 45
 Weighted Curve Number 84.68
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3
 Equivalent Width (ft) 40
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.08	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.09		84.68

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.231
 Total Runoff (in) 0.19
 Peak Runoff (cfs) 0.05
 Weighted Curve Number 84.68
 Time of Concentration (days hh:mm:ss) 0 00:36:33

Subbasin : PR-12

Input Data

Area (ac) 0.06
 Impervious Area (%) 89
 Weighted Curve Number 96.1
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.9
 Equivalent Width (ft) 70
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.03	C	98
Conc. Walks & V-pans	0.02	C	98
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.06		96.1

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.041
 Total Runoff (in) 0.37
 Peak Runoff (cfs) 0.06
 Weighted Curve Number 96.1
 Time of Concentration (days hh:mm:ss) 0 00:08:59

Subbasin : PR-13

Input Data

Area (ac) 0.02
 Impervious Area (%) 91
 Weighted Curve Number 96.53
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.9
 Equivalent Width (ft) 20
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
32			
Paved roads with curbs & sewers	0.01	C	98
Conc. Walks & V-pans	0.01	C	98
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.02		96.53

Subbasin Runoff Results

Total Rainfall (in) 0.47
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.032
 Total Runoff (in) 0.38
 Peak Runoff (cfs) 0.02
 Weighted Curve Number 96.53
 Time of Concentration (days hh:mm:ss) 0 00:09:58

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft ²)	Minimum Pipe Cover (in)
1	OCS Begin	4526.20	4531.30	5.10	4526.20	0.00	4531.30	0.00	5000.00	0.00
2	OCS End	4526.20	4531.30	5.10	4526.20	0.00	4531.30	0.00	5000.00	0.00
3	SDAI-M2	4527.94	4531.62	3.68	4527.94	0.00	4531.62	0.00	10.00	32.13
4	SDAI-M3	4528.30	4531.96	3.66	4528.30	0.00	4531.96	0.00	10.00	31.91
5	SDAI-M4	4528.61	4532.00	3.39	4528.61	0.00	4532.00	0.00	10.00	28.68
6	SDAI-M5	4528.89	4532.09	3.20	4528.89	0.00	4532.09	0.00	10.00	26.35
7	SDAI-M7	4529.20	4531.52	2.32	4529.20	0.00	4531.52	0.00	10.00	15.83
8	SDAI-M8	4529.22	4531.34	2.12	4529.22	0.00	4531.34	0.00	10.00	13.43
9	SDCI-J1	4528.97	4531.60	2.63	4528.97	0.00	4531.60	0.00	10.00	19.56
10	SDCI-J3	4528.97	4531.60	2.63	4528.97	0.00	4531.60	0.00	10.00	19.55
11	SDCI-L2	4527.99	4531.55	3.56	4527.99	0.00	4531.55	0.00	10.00	18.68
12	SDCI-L4	4529.15	4531.55	2.40	4529.15	0.00	4531.55	0.00	10.00	16.80
13	SD-K1-L3	4528.04	4531.94	3.90	4528.04	0.00	4531.94	0.00	10.00	22.85
14	SDMH-J2-K2	4528.87	4531.98	3.11	4528.87	0.00	4531.98	0.00	10.00	19.32

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	OCS Begin	0.33	0.00	4527.49	1.29	0.00	3.81	4526.30	0.10	0 02:14	0 00:00	0.00	0.00
2	OCS End	0.32	0.00	4526.46	0.26	0.00	4.84	4526.25	0.05	0 02:15	0 00:00	0.00	0.00
3	SDAI-M2	0.47	0.04	4528.27	0.33	0.00	3.35	4527.95	0.01	0 01:21	0 00:00	0.00	0.00
4	SDAI-M3	0.43	0.01	4528.59	0.29	0.00	3.37	4528.30	0.00	0 01:20	0 00:00	0.00	0.00
5	SDAI-M4	0.42	0.03	4528.90	0.29	0.00	3.10	4528.61	0.00	0 01:20	0 00:00	0.00	0.00
6	SDAI-M5	0.39	0.03	4529.17	0.28	0.00	2.92	4528.90	0.01	0 01:20	0 00:00	0.00	0.00
7	SDAI-M7	0.36	0.02	4529.46	0.26	0.00	2.06	4529.21	0.01	0 01:20	0 00:00	0.00	0.00
8	SDAI-M8	0.34	0.34	4529.54	0.32	0.00	1.80	4529.22	0.00	0 01:20	0 00:00	0.00	0.00
9	SDCI-J1	1.06	1.06	4529.55	0.58	0.00	2.05	4528.98	0.01	0 01:20	0 00:00	0.00	0.00
10	SDCI-J3	1.08	1.08	4529.58	0.61	0.00	2.02	4528.98	0.01	0 01:20	0 00:00	0.00	0.00
11	SDCI-L2	4.39	1.26	4528.81	0.82	0.00	2.74	4528.00	0.01	0 01:22	0 00:00	0.00	0.00
12	SDCI-L4	1.16	1.16	4529.69	0.54	0.00	1.86	4529.16	0.01	0 01:20	0 00:00	0.00	0.00
13	SD-K1-L3	3.23	0.00	4528.94	0.90	0.00	3.00	4528.05	0.01	0 01:22	0 00:00	0.00	0.00
14	SDMH-J2-K2	2.12	0.00	4529.44	0.57	0.00	2.54	4528.88	0.01	0 01:21	0 00:00	0.00	0.00

Pipe Input

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 J1-J2	8.52	4528.97	4528.87	0.10	1.1700	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
2 J2-J3	22.47	4528.97	4528.87	0.10	0.4400	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
3 K1-K2	276.99	4528.87	4528.04	0.83	0.3000	CIRCULAR	18.000	18.000	0.0110	0.5000	0.7000	0.0000	0.00	No	1
4 L1-L2	32.68	4527.99	4527.83	0.16	0.5000	CIRCULAR	24.000	24.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
5 L2-L3	8.53	4528.04	4527.99	0.04	0.5000	CIRCULAR	24.000	24.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
6 L3-L4	22.47	4529.15	4529.04	0.11	0.5100	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
7 M1-M2	28.04	4527.94	4527.83	0.11	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
8 M2-M3	89.69	4528.30	4527.94	0.36	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
9 M3-M4	77.18	4528.61	4528.30	0.31	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
10 M4-M5	71.20	4528.89	4528.61	0.28	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
11 M5-M6-M7	76.65	4529.20	4528.89	0.31	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
12 M7-M8	5.00	4529.22	4529.20	0.02	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
13 N1-N2	29.56	4526.20	4526.05	0.15	0.5000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.9000	0.0000	0.00	No	1

Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 J1-J2	1.05	0 01:20	4.56	0.23	2.28	0.06	0.57	0.57	0.00	0.07	Calculated
2 J2-J3	1.08	0 01:20	2.81	0.38	2.26	0.17	0.59	0.59	0.00	0.09	Calculated
3 K1-K2	2.07	0 01:21	6.80	0.30	2.46	1.88	0.73	0.49	0.00	0.11	Calculated
4 L1-L2	4.39	0 01:22	18.90	0.23	4.18	0.13	0.74	0.37	0.00	0.10	Calculated
5 L2-L3	3.20	0 01:22	18.89	0.17	2.49	0.06	0.86	0.43	0.00	0.11	Calculated
6 L3-L4	1.16	0 01:20	3.00	0.39	3.09	0.12	0.48	0.48	0.00	0.16	Calculated
7 M1-M2	0.46	0 01:21	2.66	0.17	2.29	0.20	0.30	0.31	0.00	0.02	Calculated
8 M2-M3	0.43	0 01:21	2.66	0.16	2.11	0.71	0.31	0.31	0.00	0.02	Calculated
9 M3-M4	0.41	0 01:20	2.66	0.16	2.24	0.57	0.29	0.29	0.00	0.05	Calculated
10 M4-M5	0.38	0 01:20	2.66	0.14	2.12	0.56	0.28	0.28	0.00	0.05	Calculated
11 M5-M6-M7	0.36	0 01:20	2.66	0.13	2.09	0.61	0.27	0.27	0.00	0.05	Calculated
12 M7-M8	0.34	0 01:20	2.66	0.13	1.81	0.05	0.29	0.29	0.00	0.05	Calculated
13 N1-N2	0.32	0 02:15	2.98	0.11	2.18	0.23	0.24	0.24	0.00	0.50	Calculated

Storage Nodes

Storage Node : Pond

Input Data

Invert Elevation (ft)	4526.2
Max (Rim) Elevation (ft)	4531.66
Max (Rim) Offset (ft)	5.46
Initial Water Elevation (ft)	4526.2
Initial Water Depth (ft)	0
Ponded Area (ft ²)	5000
Evaporation Loss	0

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient	
1	Minor Storm Weir	Rectangular	No	4528.04	1.84	2.92	3.26	3.33

Outflow Orifices

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	WQCV Orifice 1	Side	CIRCULAR	No	0.88		4526.20	0.61
2	WQCV Orifice 2	Side	CIRCULAR	No	0.88		4526.45	0.61
3	WQCV Orifice 3	Side	CIRCULAR	No	0.88		4526.70	0.61

Output Summary Results

Peak Inflow (cfs)	4.87
Peak Lateral Inflow (cfs)	0.01
Peak Outflow (cfs)	0.33
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4528.13
Max HGL Depth Attained (ft)	1.93
Average HGL Elevation Attained (ft)	4526.8
Average HGL Depth Attained (ft)	0.6
Time of Max HGL Occurrence (days hh:mm)	0 02:10
Total Exfiltration Volume (1000-ft ³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name 0208-029 PR Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method EPA SWMM
 EPA SWMM Infiltration Method SCS Curve Number
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On 00:00:00 0:00:00
 End Analysis On 00:00:00 0:00:00
 Start Reporting On 00:00:00 0:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:00:30 days hh:mm:ss
 Reporting Time Step 0 00:00:30 days hh:mm:ss
 Routing Time Step 5 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	13
Nodes.....	18
<i>Junctions</i>	14
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	1
Links.....	19
<i>Channels</i>	0
<i>Pipes</i>	13
<i>Pumps</i>	0
<i>Orifices</i>	4
<i>Weirs</i>	2
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	10-yr 3-hr	Cumulative	inches					User Defined

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Equivalent Width	Impervious Area	Pervious Area	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ac)	(%)		(%)	(ft)	Manning's Roughness	Manning's Roughness	(in)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	PR-01	0.41	3.00	74.35	4.0000	330.00	0.0150	0.4000	0.77	0.6980	0.02	0.01	0.02	0 00:26:26
2	PR-02	2.15	61.00	88.86	0.7000	1180.00	0.0150	0.4000	0.77	0.2540	0.46	0.99	2.26	0 00:32:26
3	PR-03	2.02	64.00	89.63	0.9000	790.00	0.0150	0.4000	0.77	0.2300	0.48	0.98	2.17	0 00:35:08
4	PR-04	1.81	64.00	89.64	0.9000	810.00	0.0150	0.4000	0.77	0.2290	0.49	0.88	1.97	0 00:32:25
5	PR-05	1.69	63.00	89.20	0.7000	1120.00	0.0150	0.4000	0.77	0.2370	0.48	0.80	1.86	0 00:28:04
6	PR-06	0.69	46.00	86.32	0.7000	920.00	0.0150	0.4000	0.77	0.3690	0.35	0.24	0.56	0 00:23:04
7	PR-07	0.03	45.00	84.59	2.6000	90.00	0.0150	0.4000	0.77	0.3840	0.33	0.01	0.03	0 00:10:28
8	PR-08	0.06	47.00	84.98	1.2000	120.00	0.0150	0.4000	0.77	0.3690	0.35	0.02	0.05	0 00:15:08
9	PR-09	0.07	46.00	84.91	3.0000	50.00	0.0150	0.4000	0.77	0.3780	0.34	0.02	0.05	0 00:21:01
10	PR-10	0.03	45.00	84.67	3.5000	50.00	0.0150	0.4000	0.77	0.3840	0.33	0.01	0.02	0 00:11:52
11	PR-11	0.09	45.00	84.68	3.0000	40.00	0.0150	0.4000	0.77	0.3890	0.33	0.03	0.08	0 00:29:59
12	PR-12	0.06	89.00	96.10	1.9000	70.00	0.0150	0.4000	0.77	0.0450	0.67	0.04	0.10	0 00:07:22
13	PR-13	0.02	91.00	96.53	0.9000	20.00	0.0150	0.4000	0.77	0.0320	0.68	0.01	0.03	0 00:08:11

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	OCS Begin	Junction	4526.20	4531.30	4526.20	4531.30	5000.00	1.20	4528.73	0.00	2.57	0 00:00	0.00	0.00
2	OCS End	Junction	4526.20	4531.30	4526.20	4531.30	5000.00	0.47	4526.52	0.00	4.78	0 00:00	0.00	0.00
3	SDAI-M2	Junction	4527.94	4531.62	4527.94	4531.62	10.00	0.78	4528.71	0.00	2.91	0 00:00	0.00	0.00
4	SDAI-M3	Junction	4528.30	4531.96	4528.30	4531.96	10.00	0.71	4528.71	0.00	3.25	0 00:00	0.00	0.00
5	SDAI-M4	Junction	4528.61	4532.00	4528.61	4532.00	10.00	0.69	4528.99	0.00	3.01	0 00:00	0.00	0.00
6	SDAI-M5	Junction	4528.89	4532.09	4528.89	4532.09	10.00	0.64	4529.26	0.00	2.83	0 00:00	0.00	0.00
7	SDAI-M7	Junction	4529.20	4531.52	4529.20	4531.52	10.00	0.59	4529.55	0.00	1.97	0 00:00	0.00	0.00
8	SDAI-M8	Junction	4529.22	4531.34	4529.22	4531.34	10.00	0.56	4529.64	0.00	1.70	0 00:00	0.00	0.00
9	SDCI-J1	Junction	4528.97	4531.60	4528.97	4531.60	10.00	1.85	4529.86	0.00	1.74	0 00:00	0.00	0.00
10	SDCI-J3	Junction	4528.97	4531.60	4528.97	4531.60	10.00	1.97	4529.91	0.00	1.69	0 00:00	0.00	0.00
11	SDCI-L2	Junction	4527.99	4531.55	4527.99	4531.55	10.00	7.94	4529.17	0.00	2.38	0 00:00	0.00	0.00
12	SDCI-L4	Junction	4529.15	4531.55	4529.15	4531.55	10.00	2.17	4529.97	0.00	1.58	0 00:00	0.00	0.00
13	SD-K1-L3	Junction	4528.04	4531.94	4528.04	4531.94	10.00	5.84	4529.33	0.00	2.61	0 00:00	0.00	0.00
14	SDMH-J2-K2	Junction	4528.87	4531.98	4528.87	4531.98	10.00	3.81	4529.71	0.00	2.27	0 00:00	0.00	0.00
15	N Pine St	Outfall	0.00					0.10	0.00					
16	Ottley Ave	Outfall	0.00					0.03	0.00					
17	PR-1	Outfall	4526.00					0.46	4526.00					
18	Pond	Storage Node	4526.20	4531.66	4526.20		5000.00	8.73	4528.71				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	J1-J2	Pipe	SDCI-J1	SDMH-J2-K2	8.52	4528.97	4528.87	1.1700	12.000	0.0110	1.84	4.56	0.40	2.62	0.86	0.86	0.00	Calculated
2	J2-J3	Pipe	SDCI-J3	SDMH-J2-K2	22.47	4528.97	4528.87	0.4400	12.000	0.0110	1.96	2.81	0.70	2.68	0.88	0.88	0.00	Calculated
3	K1-K2	Pipe	SDMH-J2-K2	SD-K1-L3	276.99	4528.87	4528.04	0.3000	18.000	0.0110	3.69	6.80	0.54	2.78	1.06	0.71	0.00	Calculated
4	L1-L2	Pipe	SDCI-L2	Pond	32.68	4527.99	4527.83	0.5000	24.000	0.0110	7.94	18.90	0.42	4.82	1.04	0.52	0.00	Calculated
5	L2-L3	Pipe	SD-K1-L3	SDCI-L2	8.53	4528.04	4527.99	0.5000	24.000	0.0110	5.80	18.89	0.31	2.85	1.23	0.62	0.00	Calculated
6	L3-L4	Pipe	SDCI-L4	SD-K1-L3	22.47	4529.15	4529.04	0.5100	12.000	0.0110	2.16	3.00	0.72	3.54	0.72	0.73	0.00	Calculated
7	M1-M2	Pipe	SDAI-M2	Pond	28.04	4527.94	4527.83	0.4000	12.000	0.0110	0.78	2.66	0.29	2.61	0.83	0.83	0.00	Calculated
8	M2-M3	Pipe	SDAI-M3	SDAI-M2	89.69	4528.30	4527.94	0.4000	12.000	0.0110	0.71	2.66	0.27	2.33	0.59	0.59	0.00	Calculated
9	M3-M4	Pipe	SDAI-M4	SDAI-M3	77.18	4528.61	4528.30	0.4000	12.000	0.0110	0.69	2.66	0.26	2.50	0.38	0.38	0.00	Calculated
10	M4-M5	Pipe	SDAI-M5	SDAI-M4	71.20	4528.89	4528.61	0.4000	12.000	0.0110	0.64	2.66	0.24	2.36	0.38	0.38	0.00	Calculated
11	M5-M6-M7	Pipe	SDAI-M7	SDAI-M5	76.65	4529.20	4528.89	0.4000	12.000	0.0110	0.59	2.66	0.22	2.33	0.36	0.36	0.00	Calculated
12	M7-M8	Pipe	SDAI-M8	SDAI-M7	5.00	4529.22	4529.20	0.4000	12.000	0.0110	0.56	2.66	0.21	2.02	0.38	0.38	0.00	Calculated
13	N1-N2	Pipe	OCS End	PR-1	29.56	4526.20	4526.05	0.5000	12.000	0.0110	0.46	2.98	0.16	2.39	0.30	0.30	0.00	Calculated
14	10-Yr Orifice	Orifice	OCS Begin	OCS End		4526.20	4526.20		3.000		0.47							
15	WQCV Orifice 1	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.03							
16	WQCV Orifice 2	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.03							
17	WQCV Orifice 3	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.02							
18	Major Storm Weir	Weir	OCS Begin	OCS End		4526.20	4526.20				0.00							
19	Minor Storm Weir	Weir	Pond	OCS Begin		4526.20	4526.20				1.19							

Subbasin Hydrology

Subbasin : PR-01

Input Data

Area (ac) 0.41
 Impervious Area (%) 3
 Weighted Curve Number 74.35
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 4
 Equivalent Width (ft) 330
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Conc. Walks & V-pans	0.01	C	98
> 75% grass cover, Good	0.4	C	74
Composite Area & Weighted CN	0.41		74.35

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.698
 Total Runoff (in) 0.02
 Peak Runoff (cfs) 0.02
 Weighted Curve Number 74.35
 Time of Concentration (days hh:mm:ss) 0 00:26:26

Subbasin : PR-02

Input Data

Area (ac) 2.15
 Impervious Area (%) 61
 Weighted Curve Number 88.86
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 1180
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.36	C	98
Conc. Walks & V-pans	0.16	C	98
Single-Family Attached (51.2% imperv.)	0.58	C	86
Single-Family Detached (54.2% imperv.)	0.95	C	87
> 75% grass cover, Good	0.09	C	74
Composite Area & Weighted CN	2.14		88.86

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.254
 Total Runoff (in) 0.46
 Peak Runoff (cfs) 2.26
 Weighted Curve Number 88.86
 Time of Concentration (days hh:mm:ss) 0 00:32:26

Subbasin : PR-03

Input Data

Area (ac) 2.02
 Impervious Area (%) 64
 Weighted Curve Number 89.63
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.9
 Equivalent Width (ft) 790
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Paved roads with curbs & sewers	0.38	C	98
Conc Walks & V-pan	0.24	C	98
Single-Family Attached (51.2% imperv.)	0.63	C	86
Single-Family Detached (54.2% imperv.)	0.71	C	87
> 75% grass cover, Good	0.07	C	74
Composite Area & Weighted CN	2.03		89.63

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.23
 Total Runoff (in) 0.48
 Peak Runoff (cfs) 2.17
 Weighted Curve Number 89.63
 Time of Concentration (days hh:mm:ss) 0 00:35:08

Subbasin : PR-04

Input Data

Area (ac) 1.81
 Impervious Area (%) 64
 Weighted Curve Number 89.64
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.9
 Equivalent Width (ft) 810
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.35	C	98
Conc. Walks & V-Pan	0.2	C	98
Single-Family Attached (51.2% imperv.)	0.63	C	86
Single-Family Detached (54.2% imperv.)	0.58	C	87
> 75% grass cover, Good	0.05	C	74
Composite Area & Weighted CN	1.81		89.64

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.229
 Total Runoff (in) 0.49
 Peak Runoff (cfs) 1.97
 Weighted Curve Number 89.64
 Time of Concentration (days hh:mm:ss) 0 00:32:25

Subbasin : PR-05

Input Data

Area (ac) 1.69
 Impervious Area (%) 63
 Weighted Curve Number 89.2
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 1120
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
32			
Paved roads with curbs & sewers	0.33	C	98
Conc. Walks & V-pan	0.17	C	98
Single-Family Attached (51.2% imperv.)	1.14	C	86
> 75% grass cover, Good	0.05	C	74
Composite Area & Weighted CN	1.69		89.2

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.237
 Total Runoff (in) 0.48
 Peak Runoff (cfs) 1.86
 Weighted Curve Number 89.2
 Time of Concentration (days hh:mm:ss) 0 00:28:04

Subbasin : PR-06

Input Data

Area (ac) 0.69
 Impervious Area (%) 46
 Weighted Curve Number 86.32
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 920
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Conc. Walks & V-pan	0.03	C	98
Single-Family Attached (51.2% imperv.)	0.64	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.68		86.32

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.369
 Total Runoff (in) 0.35
 Peak Runoff (cfs) 0.56
 Weighted Curve Number 86.32
 Time of Concentration (days hh:mm:ss) 0 00:23:04

Subbasin : PR-07

Input Data

Area (ac) 0.03
 Impervious Area (%) 45
 Weighted Curve Number 84.59
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 2.6
 Equivalent Width (ft) 90
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Single-Family Attached (51.2% imperv.)	0.03	C	86
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.03		84.59

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.384
 Total Runoff (in) 0.33
 Peak Runoff (cfs) 0.03
 Weighted Curve Number 84.59
 Time of Concentration (days hh:mm:ss) 0 00:10:28

Subbasin : PR-08

Input Data

Area (ac) 0.06
 Impervious Area (%) 47
 Weighted Curve Number 84.98
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.2
 Equivalent Width (ft) 120
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.05	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.06		84.98

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.369
 Total Runoff (in) 0.35
 Peak Runoff (cfs) 0.05
 Weighted Curve Number 84.98
 Time of Concentration (days hh:mm:ss) 0 00:15:08

Subbasin : PR-09

Input Data

Area (ac) 0.07
 Impervious Area (%) 46
 Weighted Curve Number 84.91
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3
 Equivalent Width (ft) 50
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.06	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.07		84.91

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.378
 Total Runoff (in) 0.34
 Peak Runoff (cfs) 0.05
 Weighted Curve Number 84.91
 Time of Concentration (days hh:mm:ss) 0 00:21:01

Subbasin : PR-10

Input Data

Area (ac) 0.03
 Impervious Area (%) 45
 Weighted Curve Number 84.67
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3.5
 Equivalent Width (ft) 50
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Single-Family Attached (51.2% imperv.)	0.02	C	86
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.02		84.67

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.384
 Total Runoff (in) 0.33
 Peak Runoff (cfs) 0.02
 Weighted Curve Number 84.67
 Time of Concentration (days hh:mm:ss) 0 00:11:52

Subbasin : PR-11

Input Data

Area (ac) 0.09
 Impervious Area (%) 45
 Weighted Curve Number 84.68
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3
 Equivalent Width (ft) 40
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Single-Family Attached (51.2% imperv.)	0.08	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.09		84.68

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.389
 Total Runoff (in) 0.33
 Peak Runoff (cfs) 0.08
 Weighted Curve Number 84.68
 Time of Concentration (days hh:mm:ss) 0 00:29:59

Subbasin : PR-12

Input Data

Area (ac) 0.06
 Impervious Area (%) 89
 Weighted Curve Number 96.1
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.9
 Equivalent Width (ft) 70
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.03	C	98
Conc. Walks & V-pans	0.02	C	98
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.06		96.1

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.045
 Total Runoff (in) 0.67
 Peak Runoff (cfs) 0.1
 Weighted Curve Number 96.1
 Time of Concentration (days hh:mm:ss) 0 00:07:22

Subbasin : PR-13

Input Data

Area (ac) 0.02
 Impervious Area (%) 91
 Weighted Curve Number 96.53
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.9
 Equivalent Width (ft) 20
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.01	C	98
Conc. Walks & V-pans	0.01	C	98
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.02		96.53

Subbasin Runoff Results

Total Rainfall (in) 0.77
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.032
 Total Runoff (in) 0.68
 Peak Runoff (cfs) 0.03
 Weighted Curve Number 96.53
 Time of Concentration (days hh:mm:ss) 0 00:08:11

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft ²)	Minimum Pipe Cover (in)
1	OCS Begin	4526.20	4531.30	5.10	4526.20	0.00	4531.30	0.00	5000.00	0.00
2	OCS End	4526.20	4531.30	5.10	4526.20	0.00	4531.30	0.00	5000.00	0.00
3	SDAI-M2	4527.94	4531.62	3.68	4527.94	0.00	4531.62	0.00	10.00	32.13
4	SDAI-M3	4528.30	4531.96	3.66	4528.30	0.00	4531.96	0.00	10.00	31.91
5	SDAI-M4	4528.61	4532.00	3.39	4528.61	0.00	4532.00	0.00	10.00	28.68
6	SDAI-M5	4528.89	4532.09	3.20	4528.89	0.00	4532.09	0.00	10.00	26.35
7	SDAI-M7	4529.20	4531.52	2.32	4529.20	0.00	4531.52	0.00	10.00	15.83
8	SDAI-M8	4529.22	4531.34	2.12	4529.22	0.00	4531.34	0.00	10.00	13.43
9	SDCI-J1	4528.97	4531.60	2.63	4528.97	0.00	4531.60	0.00	10.00	19.56
10	SDCI-J3	4528.97	4531.60	2.63	4528.97	0.00	4531.60	0.00	10.00	19.55
11	SDCI-L2	4527.99	4531.55	3.56	4527.99	0.00	4531.55	0.00	10.00	18.68
12	SDCI-L4	4529.15	4531.55	2.40	4529.15	0.00	4531.55	0.00	10.00	16.80
13	SD-K1-L3	4528.04	4531.94	3.90	4528.04	0.00	4531.94	0.00	10.00	22.85
14	SDMH-J2-K2	4528.87	4531.98	3.11	4528.87	0.00	4531.98	0.00	10.00	19.32

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	OCS Begin	1.20	0.00	4528.73	2.53	0.00	2.57	4526.44	0.24	0 02:14	0 00:00	0.00	0.00
2	OCS End	0.47	0.00	4526.52	0.32	0.00	4.78	4526.27	0.07	0 02:15	0 00:00	0.00	0.00
3	SDAI-M2	0.78	0.08	4528.71	0.77	0.00	2.91	4527.99	0.05	0 02:15	0 00:00	0.00	0.00
4	SDAI-M3	0.71	0.02	4528.71	0.41	0.00	3.25	4528.32	0.02	0 02:14	0 00:00	0.00	0.00
5	SDAI-M4	0.69	0.05	4528.99	0.38	0.00	3.01	4528.62	0.01	0 01:20	0 00:00	0.00	0.00
6	SDAI-M5	0.64	0.05	4529.26	0.37	0.00	2.83	4528.90	0.01	0 01:20	0 00:00	0.00	0.00
7	SDAI-M7	0.59	0.03	4529.55	0.35	0.00	1.97	4529.21	0.01	0 01:20	0 00:00	0.00	0.00
8	SDAI-M8	0.56	0.56	4529.64	0.42	0.00	1.70	4529.23	0.01	0 01:19	0 00:00	0.00	0.00
9	SDCI-J1	1.85	1.85	4529.86	0.89	0.00	1.74	4528.98	0.01	0 01:20	0 00:00	0.00	0.00
10	SDCI-J3	1.97	1.97	4529.91	0.94	0.00	1.69	4528.98	0.01	0 01:20	0 00:00	0.00	0.00
11	SDCI-L2	7.94	2.26	4529.17	1.18	0.00	2.38	4528.04	0.05	0 01:20	0 00:00	0.00	0.00
12	SDCI-L4	2.17	2.17	4529.97	0.82	0.00	1.58	4529.16	0.01	0 01:20	0 00:00	0.00	0.00
13	SD-K1-L3	5.84	0.00	4529.33	1.29	0.00	2.61	4528.07	0.03	0 01:20	0 00:00	0.00	0.00
14	SDMH-J2-K2	3.81	0.00	4529.71	0.84	0.00	2.27	4528.88	0.01	0 01:20	0 00:00	0.00	0.00

Pipe Input

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 J1-J2	8.52	4528.97	4528.87	0.10	1.1700	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
2 J2-J3	22.47	4528.97	4528.87	0.10	0.4400	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
3 K1-K2	276.99	4528.87	4528.04	0.83	0.3000	CIRCULAR	18.000	18.000	0.0110	0.5000	0.7000	0.0000	0.00	No	1
4 L1-L2	32.68	4527.99	4527.83	0.16	0.5000	CIRCULAR	24.000	24.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
5 L2-L3	8.53	4528.04	4527.99	0.04	0.5000	CIRCULAR	24.000	24.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
6 L3-L4	22.47	4529.15	4529.04	0.11	0.5100	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
7 M1-M2	28.04	4527.94	4527.83	0.11	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
8 M2-M3	89.69	4528.30	4527.94	0.36	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
9 M3-M4	77.18	4528.61	4528.30	0.31	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
10 M4-M5	71.20	4528.89	4528.61	0.28	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
11 M5-M6-M7	76.65	4529.20	4528.89	0.31	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
12 M7-M8	5.00	4529.22	4529.20	0.02	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
13 N1-N2	29.56	4526.20	4526.05	0.15	0.5000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.9000	0.0000	0.00	No	1

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 J1-J2	1.84	0 01:20	4.56	0.40	2.62	0.05	0.86	0.86	0.00	0.08	Calculated
2 J2-J3	1.96	0 01:20	2.81	0.70	2.68	0.14	0.88	0.88	0.00	0.10	Calculated
3 K1-K2	3.69	0 01:20	6.80	0.54	2.78	1.66	1.06	0.71	0.00	0.07	Calculated
4 L1-L2	7.94	0 01:20	18.90	0.42	4.82	0.11	1.04	0.52	0.00	0.07	Calculated
5 L2-L3	5.80	0 01:20	18.89	0.31	2.85	0.05	1.23	0.62	0.00	0.08	Calculated
6 L3-L4	2.16	0 01:20	3.00	0.72	3.54	0.11	0.72	0.73	0.00	0.15	Calculated
7 M1-M2	0.78	0 01:20	2.66	0.29	2.61	0.18	0.83	0.83	0.00	0.02	Calculated
8 M2-M3	0.71	0 01:20	2.66	0.27	2.33	0.64	0.59	0.59	0.00	0.02	Calculated
9 M3-M4	0.69	0 01:20	2.66	0.26	2.50	0.51	0.38	0.38	0.00	0.03	Calculated
10 M4-M5	0.64	0 01:20	2.66	0.24	2.36	0.50	0.38	0.38	0.00	0.05	Calculated
11 M5-M6-M7	0.59	0 01:20	2.66	0.22	2.33	0.55	0.36	0.36	0.00	0.05	Calculated
12 M7-M8	0.56	0 01:19	2.66	0.21	2.02	0.04	0.38	0.38	0.00	0.05	Calculated
13 N1-N2	0.46	0 02:15	2.98	0.16	2.39	0.21	0.30	0.30	0.00	0.54	Calculated

Storage Nodes

Storage Node : Pond

Input Data

Invert Elevation (ft)	4526.2
Max (Rim) Elevation (ft)	4531.66
Max (Rim) Offset (ft)	5.46
Initial Water Elevation (ft)	4526.2
Initial Water Depth (ft)	0
Ponded Area (ft ²)	5000
Evaporation Loss	0

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1 Minor Storm Weir	Rectangular	No	4528.04	1.84	2.92	3.26	3.33

Outflow Orifices

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1 WQCV Orifice 1	Side	CIRCULAR	No	0.88			4526.20	0.61
2 WQCV Orifice 2	Side	CIRCULAR	No	0.88			4526.45	0.61
3 WQCV Orifice 3	Side	CIRCULAR	No	0.88			4526.70	0.61

Output Summary Results

Peak Inflow (cfs)	8.73
Peak Lateral Inflow (cfs)	0.02
Peak Outflow (cfs)	1.2
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4528.71
Max HGL Depth Attained (ft)	2.51
Average HGL Elevation Attained (ft)	4526.91
Average HGL Depth Attained (ft)	0.71
Time of Max HGL Occurrence (days hh:mm)	0 02:15
Total Exfiltration Volume (1000-ft ³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

APPENDIX F

Proposed Major Storm Results

- 1. 100-year, 3-hour Proposed Model Results**
- 2. 100-year Event Drain Down Time**
- 3. Profiles Views of Proposed Storm Drain**

Project Description

File Name 0208-029 PR Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method EPA SWMM
 EPA SWMM Infiltration Method SCS Curve Number
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On 00:00:00 0:00:00
 End Analysis On 00:00:00 0:00:00
 Start Reporting On 00:00:00 0:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:00:30 days hh:mm:ss
 Reporting Time Step 0 00:00:30 days hh:mm:ss
 Routing Time Step 5 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	13
Nodes.....	18
<i>Junctions</i>	14
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	1
Links.....	19
<i>Channels</i>	0
<i>Pipes</i>	13
<i>Pumps</i>	0
<i>Orifices</i>	4
<i>Weirs</i>	2
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	100-yr 3-hr	Cumulative	inches					User Defined

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Equivalent Width	Impervious Area	Pervious Area	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ac)	(%)		(%)	(ft)	Manning's Roughness	Manning's Roughness	(in)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	PR-01	0.41	3.00	74.35	4.0000	330.00	0.0150	0.4000	1.44	1.1590	0.23	0.09	0.11	0 00:20:34
2	PR-02	2.15	61.00	88.86	0.7000	1180.00	0.0150	0.4000	1.44	0.3320	1.05	2.26	4.33	0 00:25:15
3	PR-03	2.02	64.00	89.63	0.9000	790.00	0.0150	0.4000	1.44	0.2970	1.09	2.19	4.23	0 00:27:21
4	PR-04	1.81	64.00	89.64	0.9000	810.00	0.0150	0.4000	1.44	0.2960	1.09	1.97	3.81	0 00:25:14
5	PR-05	1.69	63.00	89.20	0.7000	1120.00	0.0150	0.4000	1.44	0.3090	1.08	1.81	3.53	0 00:21:51
6	PR-06	0.69	46.00	86.32	0.7000	920.00	0.0150	0.4000	1.44	0.5010	0.89	0.61	1.05	0 00:17:57
7	PR-07	0.03	45.00	84.59	2.6000	90.00	0.0150	0.4000	1.44	0.5300	0.86	0.03	0.05	0 00:08:09
8	PR-08	0.06	47.00	84.98	1.2000	120.00	0.0150	0.4000	1.44	0.5080	0.88	0.05	0.09	0 00:11:46
9	PR-09	0.07	46.00	84.91	3.0000	50.00	0.0150	0.4000	1.44	0.5220	0.86	0.06	0.10	0 00:16:22
10	PR-10	0.03	45.00	84.67	3.5000	50.00	0.0150	0.4000	1.44	0.5300	0.86	0.02	0.04	0 00:09:14
11	PR-11	0.09	45.00	84.68	3.0000	40.00	0.0150	0.4000	1.44	0.5410	0.85	0.08	0.14	0 00:23:20
12	PR-12	0.06	89.00	96.10	1.9000	70.00	0.0150	0.4000	1.44	0.0450	1.33	0.08	0.20	0 00:05:44
13	PR-13	0.02	91.00	96.53	0.9000	20.00	0.0150	0.4000	1.44	0.0320	1.34	0.02	0.06	0 00:06:22

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	OCS Begin	Junction	4526.20	4531.30	4526.20	4531.30	5000.00	12.62	4530.46	0.00	0.84	0 00:00	0.00	0.00
2	OCS End	Junction	4526.20	4531.30	4526.20	4531.30	5000.00	0.76	4526.62	0.00	4.68	0 00:00	0.00	0.00
3	SDAI-M2	Junction	4527.94	4531.62	4527.94	4531.62	10.00	1.47	4530.42	0.00	1.20	0 00:00	0.00	0.00
4	SDAI-M3	Junction	4528.30	4531.96	4528.30	4531.96	10.00	1.33	4530.42	0.00	1.54	0 00:00	0.00	0.00
5	SDAI-M4	Junction	4528.61	4532.00	4528.61	4532.00	10.00	1.30	4530.43	0.00	1.57	0 00:00	0.00	0.00
6	SDAI-M5	Junction	4528.89	4532.09	4528.89	4532.09	10.00	1.20	4530.42	0.00	1.67	0 00:00	0.00	0.00
7	SDAI-M7	Junction	4529.20	4531.52	4529.20	4531.52	10.00	1.10	4530.44	0.00	1.08	0 00:00	0.00	0.00
8	SDAI-M8	Junction	4529.22	4531.34	4529.22	4531.34	10.00	1.05	4530.42	0.00	0.92	0 00:00	0.00	0.00
9	SDCI-J1	Junction	4528.97	4531.60	4528.97	4531.60	10.00	3.53	4531.95	0.35	0.00	0 01:17	0.00	3.00
10	SDCI-J3	Junction	4528.97	4531.60	4528.97	4531.60	10.00	3.81	4532.14	0.54	0.00	0 01:17	0.00	4.00
11	SDCI-L2	Junction	4527.99	4531.55	4527.99	4531.55	10.00	15.82	4530.43	0.00	1.12	0 00:00	0.00	0.00
12	SDCI-L4	Junction	4529.15	4531.55	4529.15	4531.55	10.00	4.23	4530.89	0.00	0.66	0 00:00	0.00	0.00
13	SD-K1-L3	Junction	4528.04	4531.94	4528.04	4531.94	10.00	11.50	4530.42	0.00	1.52	0 00:00	0.00	0.00
14	SDMH-J2-K2	Junction	4528.87	4531.98	4528.87	4531.98	10.00	7.29	4531.49	0.00	0.49	0 00:00	0.00	0.00
15	N Pine St	Outfall	0.00					0.20	0.00					
16	Ottley Ave	Outfall	0.00					0.06	0.00					
17	PR-1	Outfall	4526.00					0.75	4526.00					
18	Pond	Storage Node	4526.20	4531.66	4526.20		5000.00	17.27	4530.38				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Reported (min)	Surcharged Condition
1	J1-J2	Pipe	SDCI-J1	SDMH-J2-K2	8.52	4528.97	4528.87	1.1700	12.000	0.0110	3.50	4.56	0.77	4.46	1.00	1.00	247.00	SURCHARGED
2	J2-J3	Pipe	SDCI-J3	SDMH-J2-K2	22.47	4528.97	4528.87	0.4400	12.000	0.0110	3.79	2.81	1.35	4.82	1.00	1.00	247.00	SURCHARGED
3	K1-K2	Pipe	SDMH-J2-K2	SD-K1-L3	276.99	4528.87	4528.04	0.3000	18.000	0.0110	7.29	6.80	1.07	4.13	1.50	1.00	56.00	SURCHARGED
4	L1-L2	Pipe	SDCI-L2	Pond	32.68	4527.99	4527.83	0.5000	24.000	0.0110	15.77	18.90	0.83	5.56	2.00	1.00	207.00	SURCHARGED
5	L2-L3	Pipe	SD-K1-L3	SDCI-L2	8.53	4528.04	4527.99	0.5000	24.000	0.0110	11.50	18.89	0.61	3.66	2.00	1.00	196.00	SURCHARGED
6	L3-L4	Pipe	SDCI-L4	SD-K1-L3	22.47	4529.15	4529.04	0.5100	12.000	0.0110	4.23	3.00	1.41	5.38	1.00	1.00	162.00	SURCHARGED
7	M1-M2	Pipe	SDAI-M2	Pond	28.04	4527.94	4527.83	0.4000	12.000	0.0110	1.46	2.66	0.55	3.10	1.00	1.00	565.00	SURCHARGED
8	M2-M3	Pipe	SDAI-M3	SDAI-M2	89.69	4528.30	4527.94	0.4000	12.000	0.0110	1.33	2.66	0.50	2.63	1.00	1.00	443.00	SURCHARGED
9	M3-M4	Pipe	SDAI-M4	SDAI-M3	77.18	4528.61	4528.30	0.4000	12.000	0.0110	1.29	2.66	0.49	2.80	1.00	1.00	336.00	SURCHARGED
10	M4-M5	Pipe	SDAI-M5	SDAI-M4	71.20	4528.89	4528.61	0.4000	12.000	0.0110	1.20	2.66	0.45	2.65	1.00	1.00	242.00	SURCHARGED
11	M5-M6-M7	Pipe	SDAI-M7	SDAI-M5	76.65	4529.20	4528.89	0.4000	12.000	0.0110	1.10	2.66	0.41	2.62	1.00	1.00	139.00	SURCHARGED
12	M7-M8	Pipe	SDAI-M8	SDAI-M7	5.00	4529.22	4529.20	0.4000	12.000	0.0110	1.05	2.66	0.40	2.34	1.00	1.00	130.00	SURCHARGED
13	N1-N2	Pipe	OCS End	PR-1	29.56	4526.20	4526.05	0.5000	12.000	0.0110	0.75	2.98	0.25	2.69	0.38	0.39	0.00	Calculated
14	10-Yr Orifice	Orifice	OCS Begin	OCS End		4526.20	4526.20		3.000									
15	WQCV Orifice 1	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.03							
16	WQCV Orifice 2	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.03							
17	WQCV Orifice 3	Orifice	Pond	OCS Begin		4526.20	4526.20		0.875		0.02							
18	Major Storm Weir	Weir	OCS Begin	OCS End		4526.20	4526.20				0.15							
19	Minor Storm Weir	Weir	Pond	OCS Begin		4526.20	4526.20				12.83							

Subbasin Hydrology

Subbasin : PR-01

Input Data

Area (ac) 0.41
 Impervious Area (%) 3
 Weighted Curve Number 74.35
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 4
 Equivalent Width (ft) 330
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Conc. Walks & V-pans	0.01	C	98
> 75% grass cover, Good	0.4	C	74
Composite Area & Weighted CN	0.41		74.35

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 1.159
 Total Runoff (in) 0.23
 Peak Runoff (cfs) 0.11
 Weighted Curve Number 74.35
 Time of Concentration (days hh:mm:ss) 0 00:20:34

Subbasin : PR-02

Input Data

Area (ac) 2.15
 Impervious Area (%) 61
 Weighted Curve Number 88.86
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 1180
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Paved roads with curbs & sewers	0.36	C	98
Conc. Walks & V-pans	0.16	C	98
Single-Family Attached (51.2% imperv.)	0.58	C	86
Single-Family Detached (54.2% imperv.)	0.95	C	87
> 75% grass cover, Good	0.09	C	74
Composite Area & Weighted CN	2.14		88.86

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.332
 Total Runoff (in) 1.05
 Peak Runoff (cfs) 4.33
 Weighted Curve Number 88.86
 Time of Concentration (days hh:mm:ss) 0 00:25:15

Subbasin : PR-03

Input Data

Area (ac)	2.02
Impervious Area (%)	64
Weighted Curve Number	89.63
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.9
Equivalent Width (ft)	790
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.4
Curb & Gutter Length (ft)	0
Rain Gage ID	*

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Paved roads with curbs & sewers	0.38	C	98
Conc Walks & V-pan	0.24	C	98
Single-Family Attached (51.2% imperv.)	0.63	C	86
Single-Family Detached (54.2% imperv.)	0.71	C	87
> 75% grass cover, Good	0.07	C	74
Composite Area & Weighted CN	2.03		89.63

Subbasin Runoff Results

Total Rainfall (in)	1.44
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.297
Total Runoff (in)	1.09
Peak Runoff (cfs)	4.23
Weighted Curve Number	89.63
Time of Concentration (days hh:mm:ss)	0 00:27:21

Subbasin : PR-04

Input Data

Area (ac)	1.81
Impervious Area (%)	64
Weighted Curve Number	89.64
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.9
Equivalent Width (ft)	810
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.4
Curb & Gutter Length (ft)	0
Rain Gage ID	*

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Paved roads with curbs & sewers	0.35	C	98
Conc. Walks & V-Pan	0.2	C	98
Single-Family Attached (51.2% imperv.)	0.63	C	86
Single-Family Detached (54.2% imperv.)	0.58	C	87
> 75% grass cover, Good	0.05	C	74
Composite Area & Weighted CN	1.81		89.64

Subbasin Runoff Results

Total Rainfall (in)	1.44
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.296
Total Runoff (in)	1.09
Peak Runoff (cfs)	3.81
Weighted Curve Number	89.64
Time of Concentration (days hh:mm:ss)	0 00:25:14

Subbasin : PR-05

Input Data

Area (ac) 1.69
 Impervious Area (%) 63
 Weighted Curve Number 89.2
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 1120
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.33	C	98
Conc. Walks & V-pan	0.17	C	98
Single-Family Attached (51.2% imperv.)	1.14	C	86
> 75% grass cover, Good	0.05	C	74
Composite Area & Weighted CN	1.69		89.2

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.309
 Total Runoff (in) 1.08
 Peak Runoff (cfs) 3.53
 Weighted Curve Number 89.2
 Time of Concentration (days hh:mm:ss) 0 00:21:51

Subbasin : PR-06

Input Data

Area (ac) 0.69
 Impervious Area (%) 46
 Weighted Curve Number 86.32
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.7
 Equivalent Width (ft) 920
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Conc. Walks & V-pan	0.03	C	98
Single-Family Attached (51.2% imperv.)	0.64	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.68		86.32

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.501
 Total Runoff (in) 0.89
 Peak Runoff (cfs) 1.05
 Weighted Curve Number 86.32
 Time of Concentration (days hh:mm:ss) 0 00:17:57

Subbasin : PR-07

Input Data

Area (ac) 0.03
 Impervious Area (%) 45
 Weighted Curve Number 84.59
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 2.6
 Equivalent Width (ft) 90
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.03	C	86
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.03		84.59

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.53
 Total Runoff (in) 0.86
 Peak Runoff (cfs) 0.05
 Weighted Curve Number 84.59
 Time of Concentration (days hh:mm:ss) 0 00:08:09

Subbasin : PR-08

Input Data

Area (ac) 0.06
 Impervious Area (%) 47
 Weighted Curve Number 84.98
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.2
 Equivalent Width (ft) 120
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Single-Family Attached (51.2% imperv.)	0.05	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.06		84.98

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.508
 Total Runoff (in) 0.88
 Peak Runoff (cfs) 0.09
 Weighted Curve Number 84.98
 Time of Concentration (days hh:mm:ss) 0 00:11:46

Subbasin : PR-09

Input Data

Area (ac) 0.07
 Impervious Area (%) 46
 Weighted Curve Number 84.91
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3
 Equivalent Width (ft) 50
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Single-Family Attached (51.2% imperv.)	0.06	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.07		84.91

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.522
 Total Runoff (in) 0.86
 Peak Runoff (cfs) 0.1
 Weighted Curve Number 84.91
 Time of Concentration (days hh:mm:ss) 0 00:16:22

Subbasin : PR-10

Input Data

Area (ac) 0.03
 Impervious Area (%) 45
 Weighted Curve Number 84.67
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3.5
 Equivalent Width (ft) 50
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Single-Family Attached (51.2% imperv.)	0.02	C	86
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.02		84.67

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.53
 Total Runoff (in) 0.86
 Peak Runoff (cfs) 0.04
 Weighted Curve Number 84.67
 Time of Concentration (days hh:mm:ss) 0 00:09:14

Subbasin : PR-11

Input Data

Area (ac) 0.09
 Impervious Area (%) 45
 Weighted Curve Number 84.68
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 3
 Equivalent Width (ft) 40
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Single-Family Attached (51.2% imperv.)	0.08	C	86
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.09		84.68

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.541
 Total Runoff (in) 0.85
 Peak Runoff (cfs) 0.14
 Weighted Curve Number 84.68
 Time of Concentration (days hh:mm:ss) 0 00:23:20

Subbasin : PR-12

Input Data

Area (ac) 0.06
 Impervious Area (%) 89
 Weighted Curve Number 96.1
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 1.9
 Equivalent Width (ft) 70
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.03	C	98
Conc. Walks & V-pans	0.02	C	98
> 75% grass cover, Good	0.01	C	74
Composite Area & Weighted CN	0.06		96.1

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.045
 Total Runoff (in) 1.33
 Peak Runoff (cfs) 0.2
 Weighted Curve Number 96.1
 Time of Concentration (days hh:mm:ss) 0 00:05:44

Subbasin : PR-13

Input Data

Area (ac) 0.02
 Impervious Area (%) 91
 Weighted Curve Number 96.53
 Conductivity (in/hr) 0.15
 Drying Time (days) 7
 Average Slope (%) 0.9
 Equivalent Width (ft) 20
 Impervious Area
 Manning's Roughness 0.015
 Pervious Area
 Manning's Roughness 0.4
 Curb & Gutter Length (ft) 0
 Rain Gage ID *

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
Paved roads with curbs & sewers	0.01	C	98
Conc. Walks & V-pans	0.01	C	98
> 75% grass cover, Good	0	C	74
Composite Area & Weighted CN	0.02		96.53

Subbasin Runoff Results

Total Rainfall (in) 1.44
 Total Runon (in) 0
 Total Evaporation (in) 0
 Total Infiltration (in) 0.032
 Total Runoff (in) 1.34
 Peak Runoff (cfs) 0.06
 Weighted Curve Number 96.53
 Time of Concentration (days hh:mm:ss) 0 00:06:22

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft ²)	Minimum Pipe Cover (in)
1	OCS Begin	4526.20	4531.30	5.10	4526.20	0.00	4531.30	0.00	5000.00	0.00
2	OCS End	4526.20	4531.30	5.10	4526.20	0.00	4531.30	0.00	5000.00	0.00
3	SDAI-M2	4527.94	4531.62	3.68	4527.94	0.00	4531.62	0.00	10.00	32.13
4	SDAI-M3	4528.30	4531.96	3.66	4528.30	0.00	4531.96	0.00	10.00	31.91
5	SDAI-M4	4528.61	4532.00	3.39	4528.61	0.00	4532.00	0.00	10.00	28.68
6	SDAI-M5	4528.89	4532.09	3.20	4528.89	0.00	4532.09	0.00	10.00	26.35
7	SDAI-M7	4529.20	4531.52	2.32	4529.20	0.00	4531.52	0.00	10.00	15.83
8	SDAI-M8	4529.22	4531.34	2.12	4529.22	0.00	4531.34	0.00	10.00	13.43
9	SDCI-J1	4528.97	4531.60	2.63	4528.97	0.00	4531.60	0.00	10.00	19.56
10	SDCI-J3	4528.97	4531.60	2.63	4528.97	0.00	4531.60	0.00	10.00	19.55
11	SDCI-L2	4527.99	4531.55	3.56	4527.99	0.00	4531.55	0.00	10.00	18.68
12	SDCI-L4	4529.15	4531.55	2.40	4529.15	0.00	4531.55	0.00	10.00	16.80
13	SD-K1-L3	4528.04	4531.94	3.90	4528.04	0.00	4531.94	0.00	10.00	22.85
14	SDMH-J2-K2	4528.87	4531.98	3.11	4528.87	0.00	4531.98	0.00	10.00	19.32

Junction Results

SN	Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1	OCS Begin	12.62	0.00	4530.46	4.26	0.00	0.84	4526.91	0.71	0 02:05	0 00:00	0.00	0.00
2	OCS End	0.76	0.00	4526.62	0.42	0.00	4.68	4526.32	0.12	0 02:02	0 00:00	0.00	0.00
3	SDAI-M2	1.47	0.14	4530.42	2.48	0.00	1.20	4528.23	0.29	0 03:00	0 00:00	0.00	0.00
4	SDAI-M3	1.33	0.04	4530.42	2.12	0.00	1.54	4528.51	0.21	0 02:56	0 00:00	0.00	0.00
5	SDAI-M4	1.30	0.10	4530.43	1.82	0.00	1.57	4528.77	0.16	0 02:45	0 00:00	0.00	0.00
6	SDAI-M5	1.20	0.09	4530.42	1.53	0.00	1.67	4529.01	0.12	0 03:17	0 00:00	0.00	0.00
7	SDAI-M7	1.10	0.05	4530.44	1.24	0.00	1.08	4529.28	0.08	0 02:54	0 00:00	0.00	0.00
8	SDAI-M8	1.05	1.05	4530.42	1.20	0.00	0.92	4529.30	0.08	0 03:12	0 00:00	0.00	0.00
9	SDCI-J1	3.53	3.53	4531.95	2.98	0.35	0.00	4529.09	0.12	0 01:20	0 01:17	0.00	3.00
10	SDCI-J3	3.81	3.81	4532.14	3.17	0.54	0.00	4529.10	0.13	0 01:20	0 01:17	0.00	4.00
11	SDCI-L2	15.82	4.33	4530.43	2.44	0.00	1.12	4528.28	0.29	0 02:54	0 00:00	0.00	0.00
12	SDCI-L4	4.23	4.23	4530.89	1.74	0.00	0.66	4529.25	0.10	0 01:20	0 00:00	0.00	0.00
13	SD-K1-L3	11.50	0.00	4530.42	2.38	0.00	1.52	4528.31	0.27	0 03:04	0 00:00	0.00	0.00
14	SDMH-J2-K2	7.29	0.00	4531.49	2.62	0.00	0.49	4529.01	0.14	0 01:20	0 00:00	0.00	0.00

Pipe Input

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 J1-J2	8.52	4528.97	4528.87	0.10	1.1700	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
2 J2-J3	22.47	4528.97	4528.87	0.10	0.4400	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
3 K1-K2	276.99	4528.87	4528.04	0.83	0.3000	CIRCULAR	18.000	18.000	0.0110	0.5000	0.7000	0.0000	0.00	No	1
4 L1-L2	32.68	4527.99	4527.83	0.16	0.5000	CIRCULAR	24.000	24.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
5 L2-L3	8.53	4528.04	4527.99	0.04	0.5000	CIRCULAR	24.000	24.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
6 L3-L4	22.47	4529.15	4529.04	0.11	0.5100	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
7 M1-M2	28.04	4527.94	4527.83	0.11	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
8 M2-M3	89.69	4528.30	4527.94	0.36	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
9 M3-M4	77.18	4528.61	4528.30	0.31	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
10 M4-M5	71.20	4528.89	4528.61	0.28	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
11 M5-M6-M7	76.65	4529.20	4528.89	0.31	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
12 M7-M8	5.00	4529.22	4529.20	0.02	0.4000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
13 N1-N2	29.56	4526.20	4526.05	0.15	0.5000	CIRCULAR	12.000	12.000	0.0110	0.5000	0.9000	0.0000	0.00	No	1

Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 J1-J2	3.50	0 01:20	4.56	0.77	4.46	0.03	1.00	1.00	247.00	0.02	SURCHARGED
2 J2-J3	3.79	0 01:20	2.81	1.35	4.82	0.08	1.00	1.00	247.00	0.03	SURCHARGED
3 K1-K2	7.29	0 01:20	6.80	1.07	4.13	1.12	1.50	1.00	56.00	0.03	SURCHARGED
4 L1-L2	15.77	0 01:20	18.90	0.83	5.56	0.10	2.00	1.00	207.00	0.04	SURCHARGED
5 L2-L3	11.50	0 01:20	18.89	0.61	3.66	0.04	2.00	1.00	196.00	0.03	SURCHARGED
6 L3-L4	4.23	0 01:20	3.00	1.41	5.38	0.07	1.00	1.00	162.00	0.06	SURCHARGED
7 M1-M2	1.46	0 01:20	2.66	0.55	3.10	0.15	1.00	1.00	565.00	0.02	SURCHARGED
8 M2-M3	1.33	0 01:20	2.66	0.50	2.63	0.57	1.00	1.00	443.00	0.01	SURCHARGED
9 M3-M4	1.29	0 01:20	2.66	0.49	2.80	0.46	1.00	1.00	336.00	0.02	SURCHARGED
10 M4-M5	1.20	0 01:20	2.66	0.45	2.65	0.45	1.00	1.00	242.00	0.02	SURCHARGED
11 M5-M6-M7	1.10	0 01:20	2.66	0.41	2.62	0.49	1.00	1.00	139.00	0.02	SURCHARGED
12 M7-M8	1.05	0 01:20	2.66	0.40	2.34	0.04	1.00	1.00	130.00	0.02	SURCHARGED
13 N1-N2	0.75	0 02:02	2.98	0.25	2.69	0.18	0.38	0.39	0.00	0.65	Calculated

Storage Nodes

Storage Node : Pond

Input Data

Invert Elevation (ft)	4526.2
Max (Rim) Elevation (ft)	4531.66
Max (Rim) Offset (ft)	5.46
Initial Water Elevation (ft)	4526.2
Initial Water Depth (ft)	0
Ponded Area (ft ²)	5000
Evaporation Loss	0

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient	
1	Minor Storm Weir	Rectangular	No	4528.04	1.84	2.92	3.26	3.33

Outflow Orifices

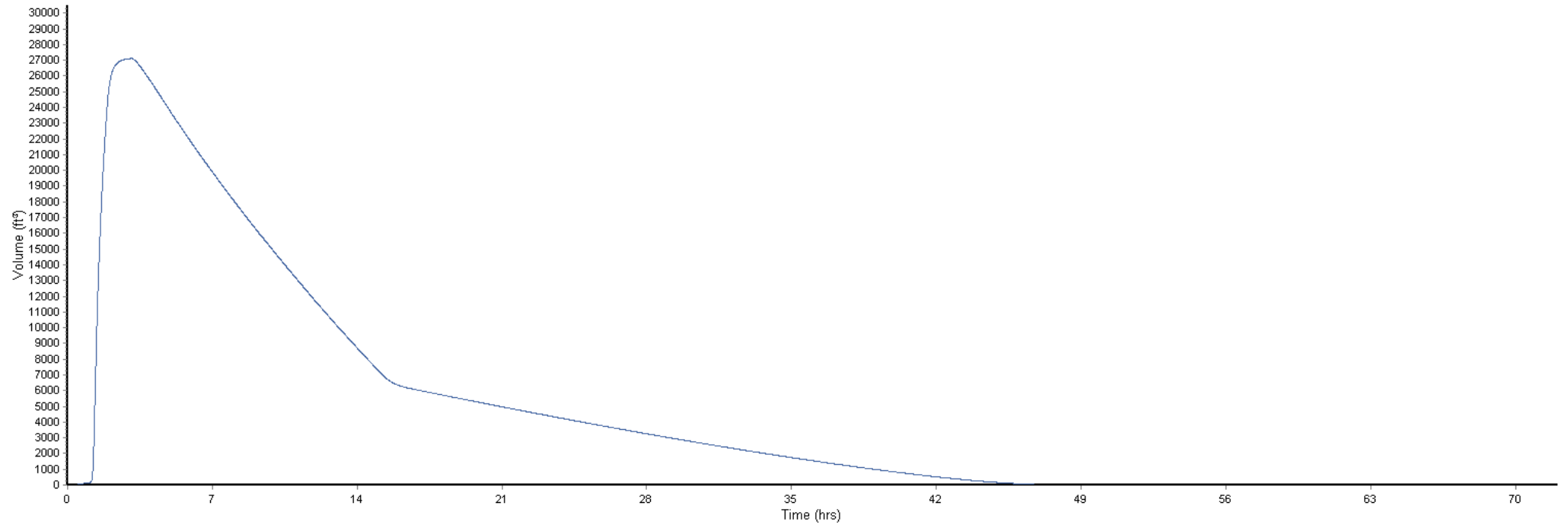
SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	WQCV Orifice 1	Side	CIRCULAR	No	0.88		4526.20	0.61
2	WQCV Orifice 2	Side	CIRCULAR	No	0.88		4526.45	0.61
3	WQCV Orifice 3	Side	CIRCULAR	No	0.88		4526.70	0.61

Output Summary Results

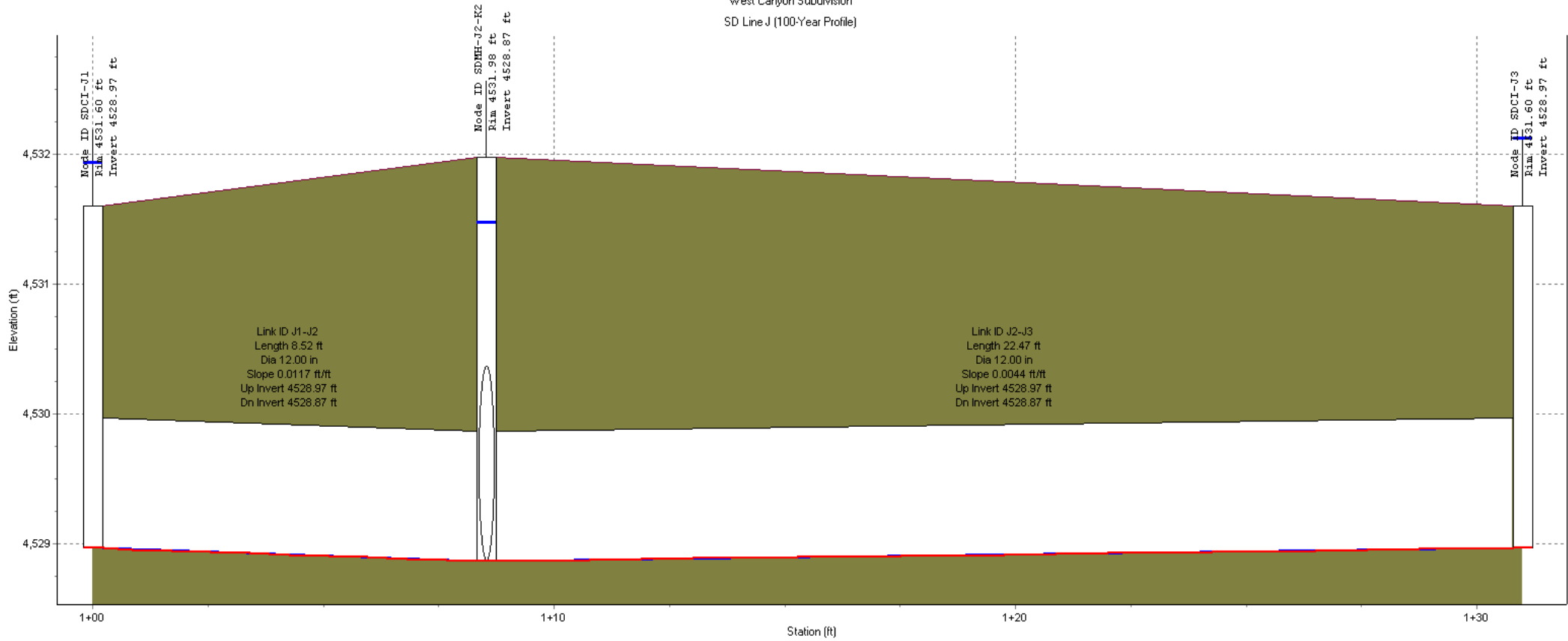
Peak Inflow (cfs)	17.27
Peak Lateral Inflow (cfs)	0.11
Peak Outflow (cfs)	12.62
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4530.38
Max HGL Depth Attained (ft)	4.18
Average HGL Elevation Attained (ft)	4527.38
Average HGL Depth Attained (ft)	1.18
Time of Max HGL Occurrence (days hh:mm)	0 02:58
Total Exfiltration Volume (1000-ft ³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Pond Drain Time 100yr (Full Buildout)

Volume: Node - Pond (0208-029 PR Model 2023-11-26 22:02:52)

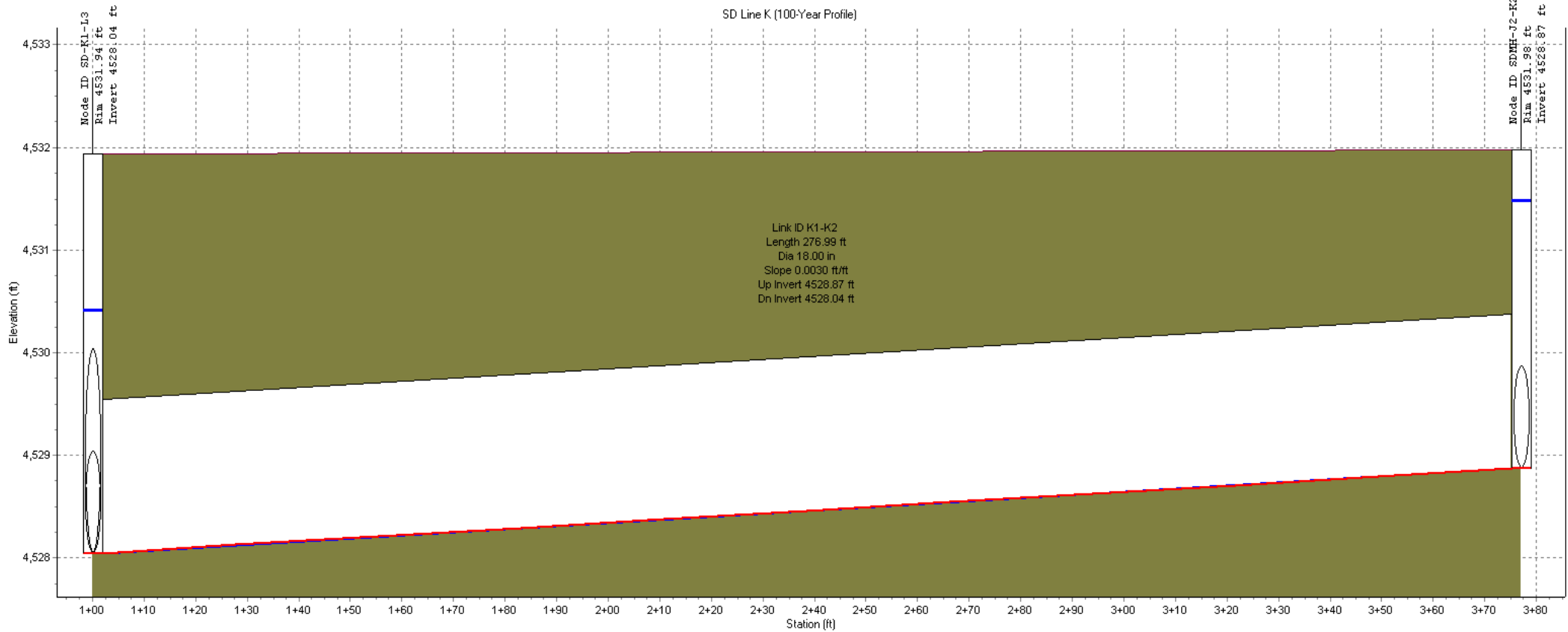


West Canyon Subdivision
SD Line J (100-Year Profile)



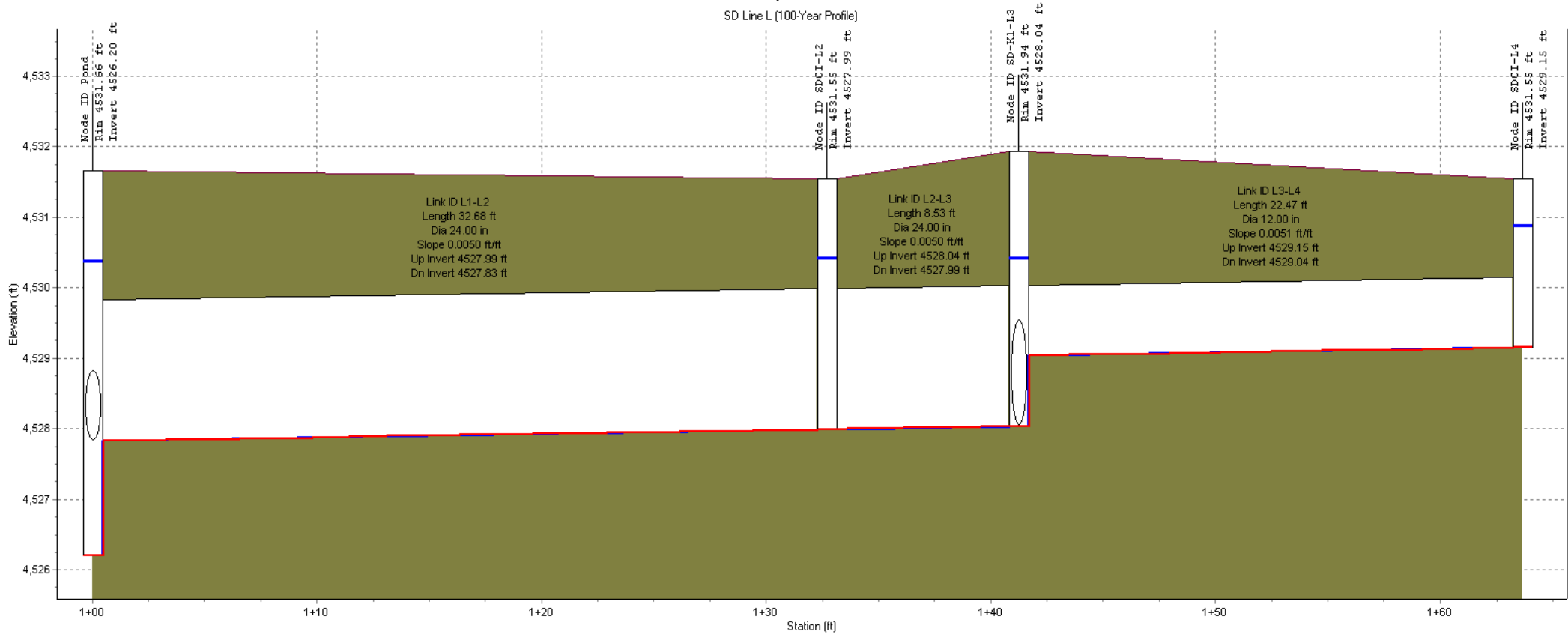
Node ID:	SDCI-J1	SDMH-J2-K2	SDCI-J3
Rim (ft):	4531.60	4531.98	4531.60
Invert (ft):	4528.97	4528.87	4528.97
Min Pipe Cover (ft):	1.63	1.61	1.63
Max HGL (ft):	4531.94	4531.49	4532.13
Link ID:	J1-J2		J2-J3
Length (ft):	8.52		22.47
Dia (in):	12.00		12.00
Slope (ft/ft):	0.0117		0.0044
Up Invert (ft):	4528.97		4528.97
Dn Invert (ft):	4528.87		4528.87
Max Q (cfs):	3.50		3.79
Max Vel (ft/s):	4.46		4.82
Max Depth (ft):	1.00		1.00

West Canyon Subdivision
SD Line K (100-Year Profile)



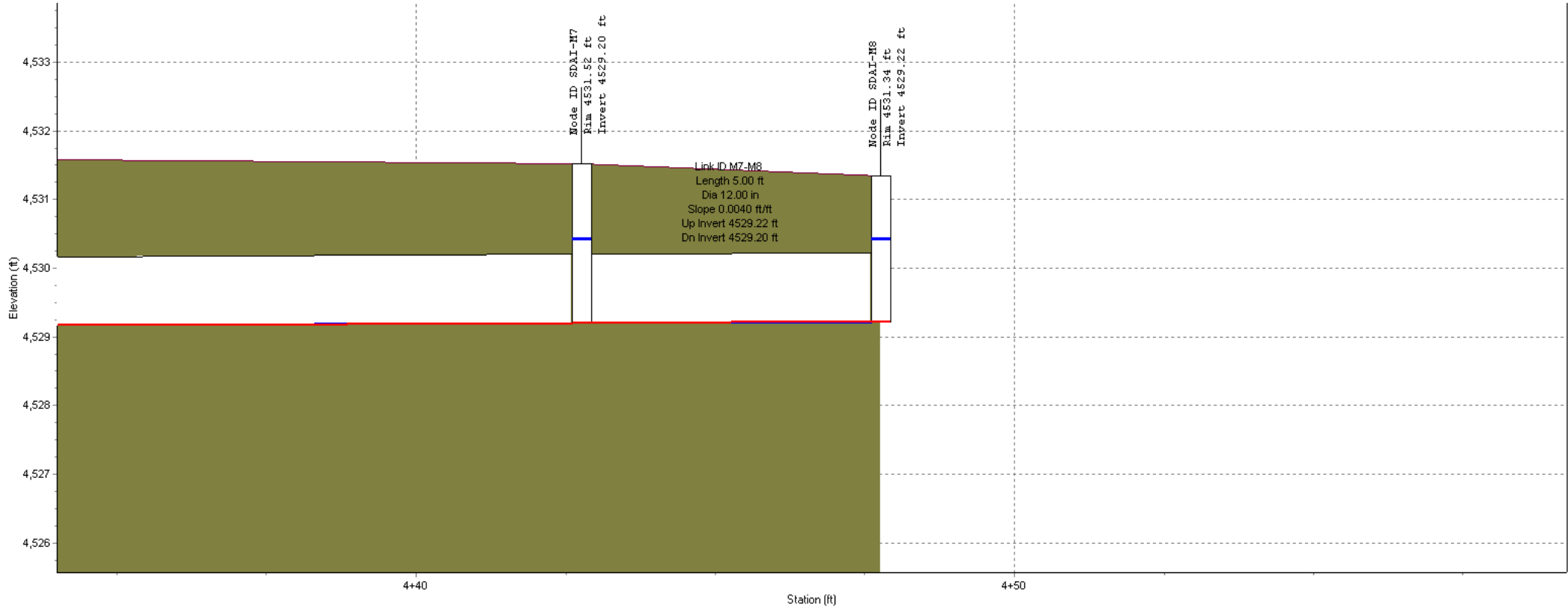
Node ID:	SD-K1-L3	SDMH-J2-K2
Rim (ft):	4531.94	4531.98
Invert (ft):	4528.04	4528.87
Min Pipe Cover (ft):	1.90	1.61
Max HGL (ft):	4530.42	4531.49
Link ID:	K1-K2	
Length (ft):	276.99	
Dia (in):	18.00	
Slope (ft/ft):	0.0030	
Up Invert (ft):	4528.87	
Dn Invert (ft):	4528.04	
Max Q (cfs):	7.29	
Max Vel (ft/s):	4.13	
Max Depth (ft):	1.50	

West Canyon Subdivision
SD Line L (100-Year Profile)



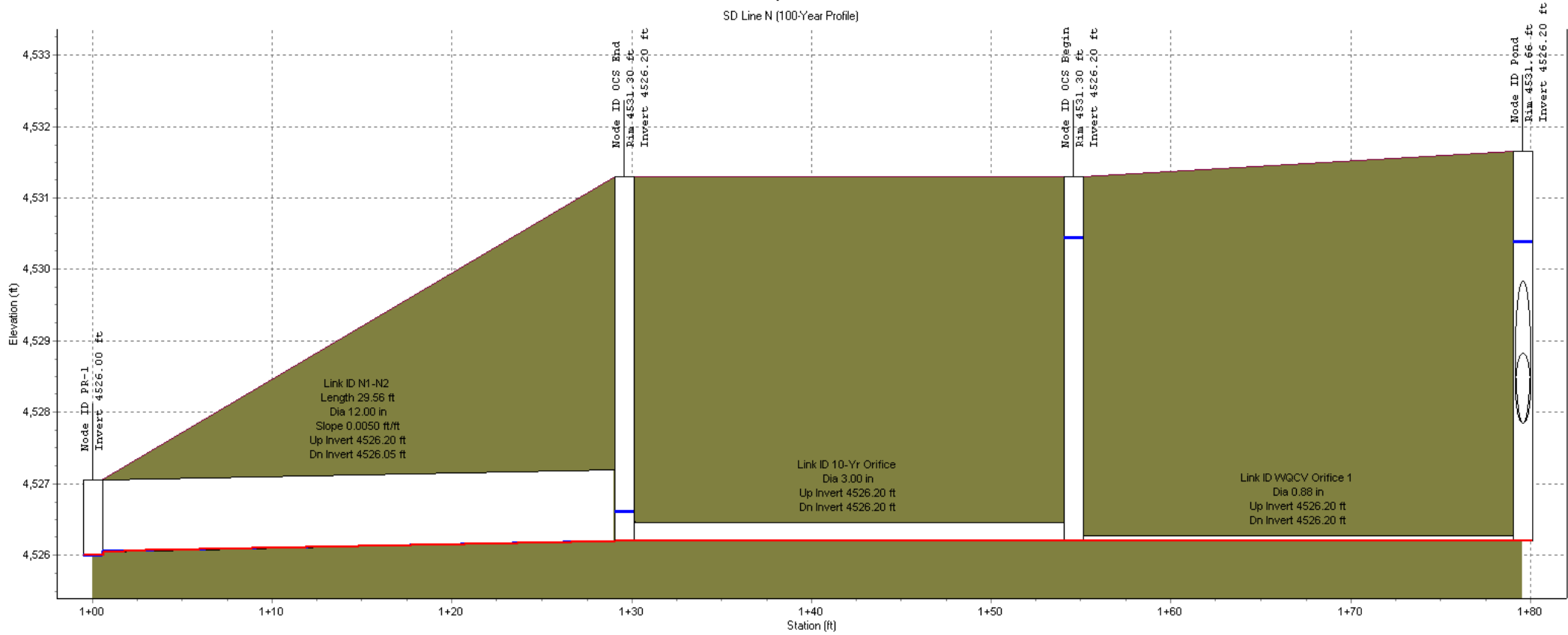
	1+00	1+30	1+40	1+60
Node ID:	Pond	SDCI-12	SD-K1-L3	SDCI-14
Rim (ft):	4531.66	4531.55	4531.94	4531.55
Invert (ft):	4526.20	4527.99	4528.04	4529.15
Min Pipe Cover (ft):		1.56	1.90	1.40
Max HGL (ft):	4530.38	4530.43	4530.42	4530.89
Link ID:	L1-L2	L2-L3	L3-L4	
Length (ft):	32.68	8.53	22.47	
Dia (in):	24.00	24.00	12.00	
Slope (ft/ft):	0.0050	0.0050	0.0051	
Up Invert (ft):	4527.99	4528.04	4529.15	
Dn Invert (ft):	4527.83	4527.99	4529.04	
Max Q (cfs):	15.77	11.50	4.23	
Max Vel (ft/s):	5.56	3.66	5.38	
Max Depth (ft):	2.00	2.00	1.00	

West Canyon Subdivision
SD Line M (100-Year Profile)



	SDAI-M7	SDAI-M8
Node ID:	SDAI-M7	SDAI-M8
Rim (ft):	4531.52	4531.34
Invert (ft):	4529.20	4529.22
Min Pipe Cover (ft):	1.32	1.12
Max HGL (ft):	4530.44	4530.42
Link ID:	M7-M8	
Length (ft):	5.00	
Dia (in):	12.00	
Slope (ft/ft):	0.0040	
Up Invert (ft):	4529.22	
Dn Invert (ft):	4529.20	
Max Q (cfs):	1.05	
Max Vel (ft/s):	2.34	
Max Depth (ft):	1.00	

West Canyon Subdivision
SD Line N (100-Year Profile)



Node ID:	PR-1	OCS End	OCS Begin	Pond
Rim (ft):		4531.30	4531.30	4531.66
Invert (ft):	4526.00	4526.20	4526.20	4526.20
Min Pipe Cover (ft):		0.00	0.00	
Max HGL (ft):	4526.00	4526.62	4530.46	4530.38
Link ID:	N1-N2	10-Yr Orifice	WGCV Orifice 1	
Length (ft):	29.56			
Dia (in):	12.00	3.00	0.88	
Slope (ft/ft):	0.0050			
Up Invert (ft):	4526.20	4526.20	4526.20	
Dn Invert (ft):	4526.05	4526.20	4526.20	
Max Q (cfs):	0.75	0.62	0.03	
Max Vel (ft/s):	2.69	0.00	0.00	
Max Depth (ft):	0.38	0.00	0.00	

APPENDIX G

Street and Inlet Capacity Checks & Riprap Sizing

- 1. Half-Street Flow Capacity**
- 2. Inlet Capacity – Sump Condition (Streets)**
- 3. Inlet Capacity – Area Inlets (Backlot)**
- 4. SWMM Table 805 & Riprap Calculations**

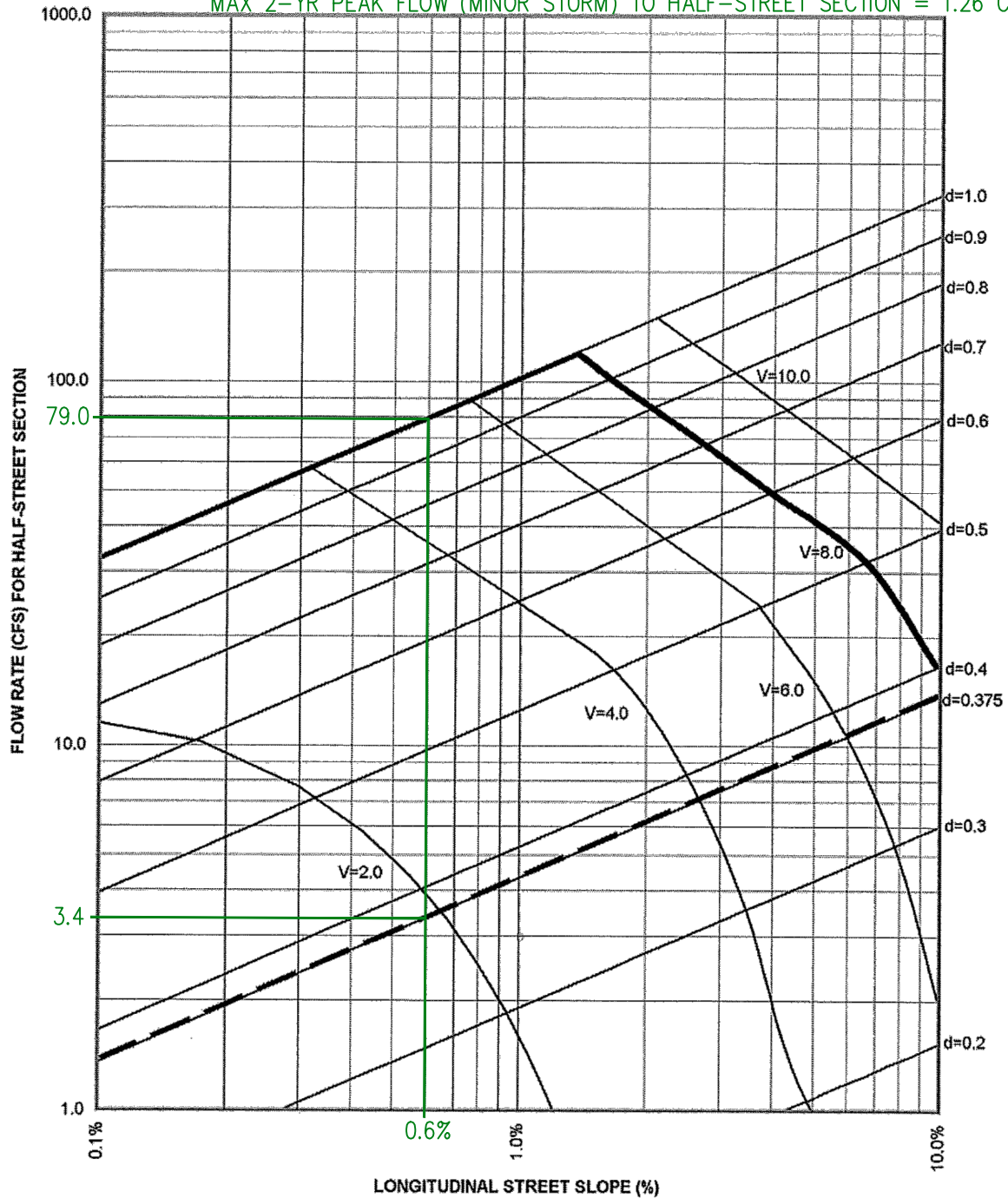
STORMWATER MANAGEMENT MANUAL

HALF-STREET FLOW CAPACITY
(RESIDENTIAL, MOUNTABLE CURB)

MINIMUM STREET SLOPE = 0.6%

MAX 100-YR PEAK FLOW (MAJOR STORM) TO HALF-STREET SECTION = 4.33 CFS

MAX 2-YR PEAK FLOW (MINOR STORM) TO HALF-STREET SECTION = 1.26 CFS



DESIGN LIMITS

- MINOR STORM
- MAJOR STORM

∴ STREET CAPACITY IS ADEQUATE

Revision	Date
ORIGINAL ISSUE	3/27/06

STORMWATER MANAGEMENT MANUAL

Maximum Inlet Capacities Sump or Sag Condition

	INLET TYPE	6-INCH VERTICAL CURB					
		SINGLE		DOUBLE		TRIPLE	
		2-YR	100-YR	2-YR	100-YR	2-YR	100-YR
2-INCH CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	9.8	12.4	14.7	20.1	19.6	27.8
	COMBINATION INLET (TYPE R GRATES)	9.8	11.1	14.7	18.8	19.6	26.5
	CURB-OPENING INLET CAPACITY	7.7	10.3	12.7	20.6	15.0	30.9
NO CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	6.4	9.3	9.5	14.2	12.7	19.1
	COMBINATION INLET (TYPE R GRATES)	5.1	8.1	9.5	13.0	12.7	17.9
	CURB-OPENING INLET CAPACITY	4.1	6.5	8.3	13.1	12.4	19.6

ALL CURB INLETS ARE SINGLE CURB INLETS IN SUMP CONDITION

	INLET TYPE	4.5-INCH MOUNTABLE CURB					
		SINGLE		DOUBLE		TRIPLE	
		2-YR	100-YR	2-YR	100-YR	2-YR	100-YR
2-INCH CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	7.2	10.8	10.8	16.8	14.4	22.7
	COMBINATION INLET (TYPE R GRATES)	7.2	9.4	10.8	15.4	14.4	21.4
	CURB-OPENING INLET CAPACITY	5.6	8.0	9.3	16.0	11.0	23.9
NO CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	4.1	7.8	6.2	10.9	8.3	14.1
	COMBINATION INLET (TYPE R GRATES)	4.1	6.5	6.2	9.7	8.3	12.8
	CURB-OPENING INLET CAPACITY	2.3	4.2	4.7	8.5	7.0	12.7

MAX 2-YR PEAK FLOW TO SINGLE CURB INLET IN SUMP = 1.26 CFS
 MAX 100-YR PEAK FLOW TO SINGLE CURB INLET IN SUMP = 4.33 CFS

See Chart Legend (Figure 1113) for standard inlet lengths.

Inlet capacities shown above are based upon the following:

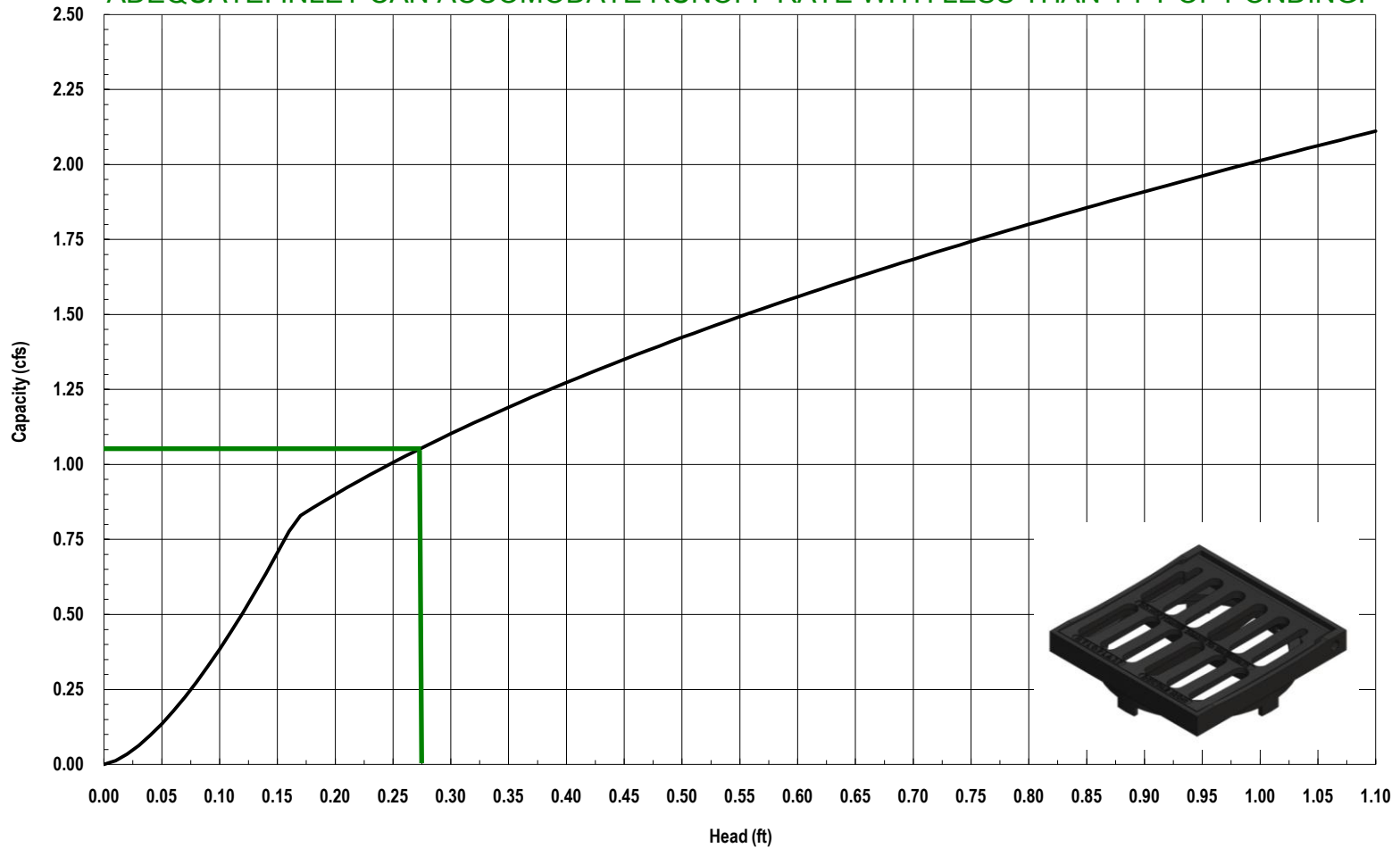
1. Type D grate used for calculation is Neenah model R-3577.
2. Type R grate used for calculation is Neenah model R-3289-C.
3. Angled- and curved-vane grates are not allowed for sump or sag design conditions.
4. Capacities shown are based upon maximum ponding depths for the 2-year and 100-year storm events:
 - a. 2-year event maximum ponding depth: curb height
 - b. 100-year event maximum ponding depth: 1.0 foot
5. Combination inlets are preferred for sump or sag conditions. Curb-opening inlets without grates are allowed.
6. Grate-only inlets are not allowed for sump or sag conditions.

∴ INLET CAPACITIES ARE ADEQUATE

Revision	Date
ORIGINAL ISSUE	3/27/06
REVISED CALCULATIONS	12/20/07

Nyloplast 12" Standard Grate Inlet Capacity Chart

MAX 100-YR PEAK FLOW TO SINGLE AREA INLET (SDAI-M8) = 1.05 CFS. INLET CAPACITY IS ADEQUATE. INLET CAN ACCOMODATE RUNOFF RATE WITH LESS THAN 1-FT OF PONDING.



Nyloplast[®]

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STORMWATER MANAGEMENT MANUAL

MAXIMUM PERMISSIBLE MEAN CHANNEL VELOCITY

MATERIAL / LINING	MAXIMUM PERMISSIBLE MEAN VELOCITY (FPS)
NATURAL AND IMPROVED UNLINED CHANNELS	
Erosive Soils:	
Loams, Sands, Noncolloidal Silts	3.0
Less Erosive Soils:	
Clays, Shales, Cobbles, Gravel	5.0
FULLY-LINED CHANNELS	
Unreinforced Vegetation	5.5
Loose Riprap	
Angular Rock	15.0
Semi-Angular Rock	12.0
Rounded Rock	See Note #4
Grouted Riprap	15.0
Gabions	15.0
Soil Cement	15.0
Concrete	20.0

NOTES:

1. For composite lined channels, us the lowest of the maximum mean velocities for the materials used in the composite lining.
2. Deviations from the above values are only allowed with appropriate engineering analysis and/or suitable agreements for maintenance responsibilities.
3. Maximum permissible velocities based upon non-clear water conditions.
4. Suitability of rounded rock as loose riprap material shall be determined by rock particle resistance to movement as a result of shear forces as calculated with a factor of safety of 1.5.

MAX DISCHARGE VELOCITY FROM PIPES:

Pipe (L1-L2)= 5.56 FT/S ∴ RIPRAP IS REQUIRED

Pipe (M1-M2)= 3.10 FT/S ∴ RIPRAP IS REQUIRED

Revision	Date
ORIGINAL ISSUE	3/27/06

West Canyon Subdivision
FES L1 Outfall to Detention Pond
RIP-RAP OUTLET PROTECTION SIZING

REQUIRED INFORMATION:

V =	5.56	ft/sec	Velocity (See Table 805 in the SWMM to verify rip-rap is required)
Q =	15.77	ft ³ /sec	Pipe Discharge
D_o =	2.00	ft	Maximum Inside Culvert Width
TW =	2.00	ft	Tailwater Depth (Use normal depth in pipe if unknown)

*See Figure 1209 of the SWMM for a Rip-Rap Mat Diagram

$D_{50} = (0.02 * Q^{4/3}) / (TW * D_o)$ D_{50} = Median rock size (ft)
 $D_{50} = 0.20$ ft 2.4 inches (Use minimum of 6 inch rock)

If $TW < D_o/2$:

DETERMINE REQUIRED APRON LENGTH, L_a :

$L_a = [(1.8 * Q) / (D_o^{3/2})] + 7D_o$
 $L_a = 24.04$

DETERMINE REQUIRED APRON TOP WIDTH, W_T :

$W_T = 3.0 * D_o$
 $W_T = 6.00$

DETERMINE REQUIRED APRON BOTTOM WIDTH, W_B :

$W_B = 3.0 * D_o + L_a$
 $W_B = 30.04$

D₅₀ =	6 inches
L_a =	31 feet
W_T =	6 feet
W_B =	19 feet

If $TW \geq D_o/2$:

DETERMINE REQUIRED APRON LENGTH, L_a :

$L_a = [(3.0 * Q) / (D_o^{3/2})] + 7D_o$
 $L_a = 30.73$

DETERMINE REQUIRED APRON TOP WIDTH, W_T :

$W_T = 3.0 * D_o$
 $W_T = 6.00$

DETERMINE REQUIRED APRON BOTTOM WIDTH, W_B :

$W_B = 3.0 * D_o + 0.4 * L_a$
 $W_B = 18.29$

Area=	387.50 ft ²
	= 43.06 yds ²
Volume=	14.35 yds ³

(Depth = 2 x D_{50})

West Canyon Subdivision
FES M1 Outfall to Detention Pond
RIP-RAP OUTLET PROTECTION SIZING

REQUIRED INFORMATION:

V =	3.1	ft/sec	Velocity (See Table 805 in the SWMM to verify rip-rap is required)
Q =	1.46	ft ³ /sec	Pipe Discharge
D_o =	1.00	ft	Maximum Inside Culvert Width
TW =	1.00	ft	Tailwater Depth (Use normal depth in pipe if unknown)

*See Figure 1209 of the SWMM for a Rip-Rap Mat Diagram

$D_{50} = (0.02 * Q^{4/3}) / (TW * D_o)$ D_{50} = Median rock size (ft)
 $D_{50} = 0.03$ ft 0.4 inches (Use minimum of 6 inch rock)

If $TW < D_o/2$:

DETERMINE REQUIRED APRON LENGTH, L_a :

$L_a = [(1.8 * Q) / (D_o^{3/2})] + 7D_o$
 $L_a = 9.63$

DETERMINE REQUIRED APRON TOP WIDTH, W_T :

$W_T = 3.0 * D_o$
 $W_T = 3.00$

DETERMINE REQUIRED APRON BOTTOM WIDTH, W_B :

$W_B = 3.0 * D_o + L_a$
 $W_B = 12.63$

D₅₀ =	6 inches
L_a =	12 feet
W_T =	3 feet
W_B =	8 feet

If $TW \geq D_o/2$:

DETERMINE REQUIRED APRON LENGTH, L_a :

$L_a = [(3.0 * Q) / (D_o^{3/2})] + 7D_o$
 $L_a = 11.38$

DETERMINE REQUIRED APRON TOP WIDTH, W_T :

$W_T = 3.0 * D_o$
 $W_T = 3.00$

DETERMINE REQUIRED APRON BOTTOM WIDTH, W_B :

$W_B = 3.0 * D_o + 0.4 * L_a$
 $W_B = 7.55$

Area=	66.00 ft ²
	= 7.33 yds ²
Volume=	2.44 yds ³

(Depth = 2 x D_{50})

APPENDIX H

SWMM Checklists

1. **Drainage Report Checklist**
2. **Drainage Plan Checklist**

Table 302
 Stormwater Management Manual
Drainage Report Checklist

- Instructions:**
1. Applicant to identify with a “check-mark” if information is provided with report. If applicant believes information is not required, indicate with “n/a” and attach separate sheet with explanation
 2. The reviewer will determine if information labeled “n/a” is required and whether information must be submitted.
 3. Those items noted with an “asterisk” are not typically required for conceptual/preliminary report. Applicant shall confirm this with local jurisdiction.
 4. Submit three (3) copies of report and include copy of check list bound with report.

TITLE PAGE

- A. Type of report (Conceptual/Preliminary or Final Drainage Report).
- B. Project Name.
- C. Preparer name, firm, address, number, and date.
- D. Professional Engineer’s seal of preparer.
- E. Certifications (see SWMM Section 303.1)

I. INTRODUCTION

- | | |
|---|--|
| <p>✓

 N/A
 _____</p> | <p>A. Background</p> <ol style="list-style-type: none"> 1. Identify report preparer and purpose. 2. Identify date of letter with previous County comments. |
| <p>✓

 ✓

 ✓
 _____</p> | <p>B. Project Location</p> <ol style="list-style-type: none"> 1. Identify Township, Range, and Section. 2. Identify adjacent street and subdivision names. 3. Reference to General Location Map. |
| <p>✓

 ✓

 ✓

 ✓

 ✓
 _____</p> | <p>C. Property Description</p> <ol style="list-style-type: none"> 1. Identify area in acres of entire contiguous ownership. 2. Describe existing ground cover, vegetation, soils, topography and slopes. 3. Describe existing drainage facilities, such as channels, detention areas, or structures. 4. Describe existing irrigation facilities, such as ditches, head-gates, or diversions. 5. Identify proposed types of land use and encumbrances. |
| <p>✓

 N/A
 _____</p> | <p>D. Previous Investigations</p> <ol style="list-style-type: none"> 1. Identify drainage master plans that include the project area, including floodplain studies. 2. Identify drainage reports for adjacent development. |

II. DRAINAGE SYSTEM DESCRIPTION

- | | |
|---|--|
| <p>✓

 ✓

 ✓
 _____</p> | <p>A. Existing Drainage Conditions</p> <ol style="list-style-type: none"> 1. Describe existing topography and provide map with contours extending a minimum of 100 feet beyond property limits. 2. Identify major drainageway or outfall drainageway and describe map showing location of proposed development within the drainageways. 3. Identify pre-developed drainage patterns and describe map showing pre-developed sub-basins and concentrated discharge locations. Provide calculations of pre-developed peak flows entering and leaving the site. |
| <p>✓

 N/A
 _____</p> | <p>B. Master Drainage Plan</p> <ol style="list-style-type: none"> 1. Describe location of the project relative to a previously prepared master drainage plan, including drainage plans prepared for adjacent development. |
| | <p>C. Offsite Tributary Area</p> |

WEST CANYON SUBDIVISION

✓

1. Identify all offsite drainage basins that are tributary to the project.
2. Identify assumptions regarding existing and future land use and effects of offsite detention on peak flows.

✓

D. Proposed Drainage System Description

✓

1. Identify how offsite stormwater is collected and conveyed through the site and ultimately to the receiving water(s).
2. Identify sub-basins and describe, in general terms, how onsite stormwater is collected and conveyed through the site for each location where stormwater is discharged from the site.

✓

3. Describe detention volumes, release rates and pool elevations.

✓ *

4. Identify the difference in elevation between pond invert and the groundwater table.

✓ *

5. Describe how stormwater is discharged from the site, including both concentrated and dispersed discharges and rates.

✓

6. Describe stormwater quality facilities.

✓

7. Describe maintenance access aspects of design.

✓ *

8. Describe easements and tracts for drainage purposes, including limitation on use.

✓ *

E. Drainage Facility Maintenance

✓ *

1. Identify responsible parties for maintenance of each drainage and water quality facility.

✓ *

2. Identify general maintenance activities and schedules.

III. DRAINAGE ANALYSIS AND DESIGN CRITERIA

A. Regulations

✓

1. Identify that analysis and design was prepared in accordance with the provisions of the Manual.

✓

2. Identify other regulations or criteria which have been used to prepare analysis and design.

B. Development Criteria

✓

1. Identify drainage constraints placed on the project, such as by a major drainage study, floodplain study or other drainage reports relevant to the project.

N/A

2. Identify drainage constraints placed on the project, such as from major street alignments, utilities, existing structures, and other developments.

C. Hydrologic Criteria

(If Manual was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information where the criteria used deviates from the Manual.)

✓

1. Identify developed storm runoff peak flows and volumes and how they were determined, including rainfall intensity or design storm.

✓

2. Identify which storm events were used for minor and major flood analysis and design.

✓

3. Identify how and why any other deviations from the Manual occurred.

D. Hydraulic Criteria

(If Manual was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information where the criteria used deviates from the Manual.)

✓ *

1. Identify type(s) of streets within and adjacent to development and source for allowable street capacity.

✓ *

2. Identify which type(s) of storm inlets were analyzed or designed and source for allowable capacity.

3. Identify which type of storm sewers which were analyzed or designed and

- ✓ *
 - ✓ *
 - N/A *
 - N/A *
 - ✓
 - ✓
 - ✓
4. Manning's n-values used.
 4. Identify which method was used to determine detention volume requirements and how allowable release rates were determined.
 5. Identify how the capacity of open channels and culverts were determined.
 6. Identify any special analysis or design requirements not contained with the Manual.
 7. Identify how and why any other deviations from the Manual occurred.
- E. Variance from Criteria
1. Identify any provisions of the Manual for which a variance is requested.
 2. Identify pre-existing conditions which cause the variance request.

***IV. POST CONSTRUCTION STORMWATER MANAGEMENT. See Manual Section 1600 for requirements.**

Note: This section of the Final Drainage Report identifies additional information required by Mesa County's, City of Grand Junction's, and Town of Palisade's, Permit for Stormwater Discharges Associated with Municipal Separate Storm Sewer Systems (MS4s), permit No. COR-090000. The Final Drainage Plan and the Construction SWMP (see SWMM Section 1500) meets the requirements of the MS4s Permit. In general, this section identifies permanent BMP practices to control the discharge of pollutants after construction is complete.

- *A. Stormwater Quality Control Measures
1. Describe the post-construction BMPs to control discharge of pollutants from the project site.
 2. If compensating detention is provided, discuss practices to address water quality from area not tributary to detention area.
 3. If underground detention is proposed, discuss how water quality facilities will be provided on the surface.
 4. If proprietary BMPs are proposed, provide the justification and sizing requirements (see SWMM Section 1603.3).
- *B. Calculations
1. Provide methods and calculations for WQCV, sediment storage, and water quality outlet structure.

- ✓ *
- N/A *
- N/A *
- N/A

V. CONCLUSIONS

- A. Compliance with Manual
Compliance with Manual and other approved documents, such as drainage plans and floodplain studies.
- B. Design Effectiveness
Effectiveness of drainage design to control impacts of storm runoff.
- C. Areas in Flood Hazard Zone
Meet requirements of Floodplain Regulations: Mesa County Land Development Code, Section 7.13; City of Grand Junction Zoning and Development Code, Section 7.1.
- D. Variances from Manual
Applicant shall identify any requested variances and provide basis for approving variance. If no variances are requested, applicant shall state that none are requested.

- ✓
- ✓
- ✓
- ✓

VII. REFERENCES

Provide a reference list of all criteria, master plans, drainage reports, and technical information used.

TABLES

Include copy of all tables prepared for report.

FIGURES

- A. General Location Map (See Section 303.2a)

- ✓
- ✓
- ✓
- ✓

WEST CANYON SUBDIVISION

- ✓ B. Flood Plain Information
- ✓ C. Drainage Plan (See Section 303.2b)
- ✓ D. Other pertinent figures.

APPENDICIES

- A. DESIGN CHARTS
 - ✓ 1. Provide copy of all design charts (i.e.: tables, figures, charts from other criteria) used for the report.
- B. HYDROLOGIC CALCULATIONS (see Manual Sections 600 and 700)
 - ✓ 1. Land use assumptions for off-site runoff calculations.
 - ✓ 2. Time of concentration and runoff coefficients for pre-existing and post development conditions.
 - ✓ 3. Pre-developed hydrologic computations.
 - ✓ 4. Developed conditions hydrologic computations.
- C. HYDRAULIC CALCULATIONS
 - N/A 1. Capacity of existing channels, streets, storm sewers, inlets, culverts and other facilities.
 - N/A 2. Calculations for existing storm sewer and open channel.
 - N/A 3. Irrigation ditch flows and ditch system capacity.
 - ✓* 4. Detention pond design (see Manual, Section 1400 for requirements).
 - ✓* a. Storage volume, release rates, and pool elevations for 10-year and 100-year storm.
 - ✓* b. Outlet structure dimensions, orifice diameter, weir lengths, pipe headwater and other data.
 - ✓* c. Outlet velocity and energy dissipation requirements.
 - ✓* d. Routing of outlet flows and emergency spillway flows.
 - ✓* 5. Street capacity calculations, if data in Manual not used (see Section 1100).
 - ✓* 6. Storm inlet capacity calculations, if data in Manual not used (see Section 1100).
 - ✓* 7. Storm sewer capacity calculations, if data in Manual not used (see Section 1000).
 - ✓* 8. Channel capacity calculations, if data in Manual not used (see Section 800).
 - N/A* 9. Culvert capacity calculations (see Manual, Section 1200).
 - N/A* 10. Other hydraulic structure calculations (see Manual, Section 900).
- D. STORMWATER QUALITY CALCULATIONS
 - ✓ 1. Water Quality Capture Volume (WQCV).
 - ✓* 2. Storage volume for sediment volume and pool elevations for WQCV.
 - ✓* 3. Outlet calculations for required area per row, diameter of individual holes, number of holes per row, and number of holes per column.

CERTIFICATION – PROFESSIONAL ENGINEER’S SEAL AND SIGNATURE

ACKNOWLEDGEMENTS

Drainage Report checklist was prepared by: Paul Southworth

Table 303
Stormwater Management Manual
Drainage Plan Checklist

- Instructions:**
1. Applicant to identify with a “check-mark” if information is provided. If applicant believes information is not required, indicate with “n/a”.
 2. County will determine if information labeled “n/a” is required and whether information must be submitted.

I. EXISTING FACILITIES

- ✓
- ✓(see plans)
- ✓
- ✓
- ✓
- ✓
- ✓

- A. Contours at two foot intervals, based on USGS datum. Contours to extend at least 50 feet past property line.
- B. Location and elevation of USGS benchmarks or benchmarks referenced to USGS.
- C. Property lines.
- D. Drainage easements.
- E. Street names.
- F. Major and minor channels and floodplains.
- G. A historic drainage plan including historic basin boundaries and flow paths.

II. PROPOSED FACILITIES

- ✓
- ✓
- ✓
- ✓
- ✓
- ✓(see plans)
- ✓

- A. Contours at two-foot intervals, based on USGS datum.
- B. Property lines.
- C. Drainage easements.
- D. Street names and grades.
- E. Right of way and easement.
- F. Finished floor elevations for protection from major storm run-off.
- G. Detention pond information:
 1. Location of each detention pond with site at 1”=50’ scale or larger with 2-foot contour intervals.
 2. Inlet and outlet structure, and trickle channel design details.
 3. Details of emergency spillway and channel.
 4. Landscape information, including side slopes, vegetation and planting requirements.
 5. Details of water quality outlet structure.

- ✓(see plans)
- ✓(see plans)
- ✓(see plans)

- H. Channel Information:
 1. Profiles with existing and proposed grades.
 2. Cross sections on 100-foot stations showing existing and proposed topography and required rights of way.
 3. Locations and size of all existing and proposed structures.
 4. Locations and profiles of adjacent utilities.
 5. Typical channel section and lining details.

- ✓(see plans)
- ✓(see plans)

N/A

- I. Storm sewer information:
 1. Alignment and location of manholes, inlets, and outlet structures.
 2. Profile of invert and pipe crown.
 3. Invert elevations at manholes and inlets.
 4. Lengths and grades between manholes and inlets.
 5. Locations and elevations of utilities adjacent to and crossing storm sewer.
 6. Easement and other O&M access geometry.
 7. Outlet details, such as end sections, headwall and wingwalls, erosion control, and vegetation.

- N/A
- ✓(see plans)

N/A

N/A

- ✓(see plans)
- ✓(see plans)
- ✓(see plans)
- ✓(see plans)
- ✓(see plans)
- ✓(see plans)

✓(see plans)

✓(see plans)

N/A

- J. Street cross sections with design 100-year flood depth.
- K. Other drainage related structures and facilities, including underdrains and sump pump discharge lines.
- L. Other permanent BMP measures to control pollutant discharges to the County’s MS4 system.

N/A

III. HYDRAULIC AND HYDROLOGIC INFORMATION

✓
 ✓(see plans)
 ✓
 ✓
 ✓
 ✓
 ✓
 ✓
 N/A
 N/A
 ✓
 ✓

- A. Routing and accumulative runoff peaks at upstream and downstream ends of the site and at various critical points onsite for initial and major storms. Inflow and outflow from each subbasin shall be shown for both initial and major storms.
- B. Street cross sections showing 100-year flood levels.
- C. Major and minor channels and floodplains.
- D. Detention pond data:
 - 1. Release rates for 10- and 100-year storm events.
 - 2. Required and provided volumes for 10- and 100-year storm events.
 - 3. Design depths for 10- and 100-year storm events.
 - 4. Water quality capture volume and pool elevation.
- E. Channel data:
 - 1. Water surface profiles.
 - 2. Representative 100-year flow velocity and Froude number.
- F. Storm sewer data:
 - 1. Profile of water surface for design flow rate.
 - 2. Peak flows for design flow, 2-year and 100-year storm events.

IV. STANDARD NOTES

✓
 ✓
 ✓
 ✓

- A. No building, structure, or fill will be placed in the detention areas and no changes or alterations affecting the hydraulic characteristics of the detention areas will be made without the approval of the County.
- B. Maintenance and operation of the detention and water quality areas is the responsibility of property owner. If owner fails in this responsibility, the County has the right to enter the property, maintain the detention areas, and be reimbursed for costs incurred.
- C. Detention pond volumes, all drainage appurtenances, and basin boundaries shall be verified. As-built drawings shall be prepared by a registered professional engineer prior to issuance of certificate of occupancy for any structure within the development.
- D. Permission to reproduce these plans is hereby given to Mesa County for County purposes associated with plan review, approval, permitting, inspection and construction of work.

V. PROFESSIONAL ENGINEER'S SEAL AND SIGNATURE

VI. OTHER

✓(see plans)

- A. Horizontal and vertical control information and ties to existing and proposed features.

ACKNOWLEDGEMENTS

Drainage Plan checklist was prepared by: Paul Southworth