

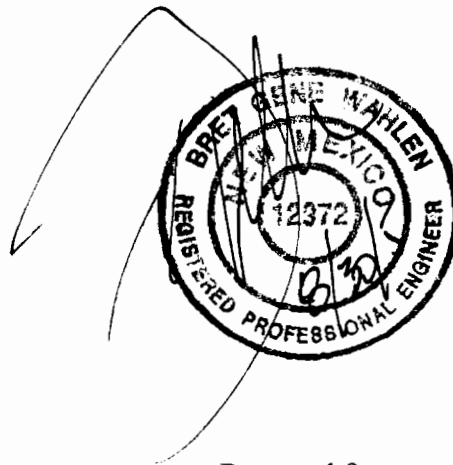
Storm Water Analysis

For

Smith's #463
Golf Course Road and McMahon Boulevard

Albuquerque, NM

August 30, 2005



Prepared for:
Smith's Food & Drug
1550 South Redwood Road
Salt Lake City, Utah 84104



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- Hydraulic Grade Line Calculations

I. Introduction

Smith's Food and Drug is proposing a new Grocery store at the southwest corner of Golf Course Road and McMahon Boulevard in Albuquerque, New Mexico. The purpose of this analysis is to determine the amount of storm water generated by this site, the appropriate infrastructure to convey these flows and the appropriate grading design of the site to protect the building and the site from flood damage. The City of Albuquerque has indicated that due to the proximity of the nearby arroyo, no detention is required on-site.

II. Existing Conditions

The proposed site consists of 8.0 acres. The site has existing severe slopes across the site with over 30-feet of fall from the corner of McMahon and Golf Course to the back of the site. Sparse vegetation currently covers the site. McMahon Boulevard borders the site on the north with Golf Course Road on the West. A commercial development borders the site on the west. There is no development south of the proposed grocery store, but it is our understanding that there will be some type of development there in the future. The Arroyo De Las Calabacillas is 750 feet south of the site. All existing and proposed drainage will discharge directly to the arroyo.

This site is located within Zone ~~2~~¹, designated as areas determined to be outside the 500 year flood plain as identified by the FIRM Map #35001C0108E effective November 19, 2003 (see Figure 1).

III. Hydrologic Analysis

The site falls within Zone 1 for rainfall depths as identified in Section 22.2 of the City of Albuquerque DPM. The site was divided into on-site drainage areas based on the proposed grading plan of the site. Following the procedures proscribed in section 22.2 each area was determined to be 90% impervious with 10% pervious area (see Figure 2). A peak flow rate per acre based on the 90/10 breakdown was then determined per section 22.2 (see Appendix A).

IV. Proposed Conditions and On-Site Storm Water Management Plan

The site has been designed to capture all on-site storm water, with the exception of ON4, in a storm drain system and pipe ^{which} flows to the arroyo. Area ON4 will drain 1.17 cfs in a 100-year event directly to Golf Course Road. The on-site piping system has been sized to accommodate the 100-year event. A hydraulic grade line analysis has been completed for each leg of the system. Figure 3 is the outfall line from the arroyo to the first split of the system at the back of Retail B. Figure 4 is the storm drain system from the back of Retail B to the inlet box in the front of the Smith's Fuel Center. Figure 5 is the storm drain system along the front of the grocery store and Figure 6 is the storm drain system along the back of the grocery store, this line also captures all of the storm water from the roof of the store. (See Appendix B for a complete printout of the HGL Analysis)

Arroyo discussion

- 100% easement

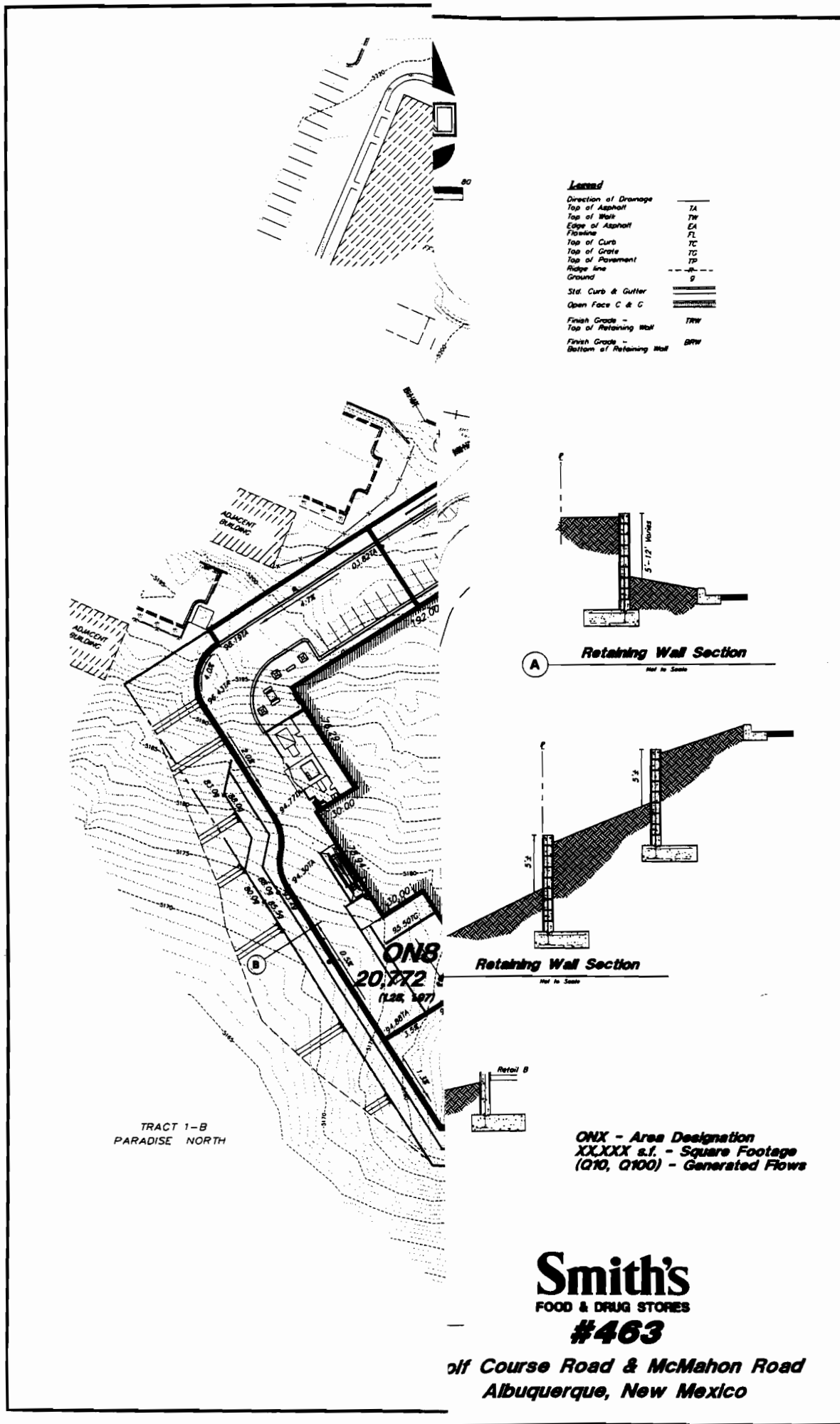
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The design plans for Golf Course Road by Wilson & Associates indicates that the pipe designated to accept flows from this particular site along with the site to the south of Smith's was anticipated to accept 24.6 cfs. The Smith's site itself will generate 32.6 cfs, though the HGL analysis shows the existing pipes capable of handling the flows.

US 3152
p2 6172

V. Conclusions

This drainage analysis has been completed in accordance with Section 22.2 of the DPM. The site has been designed with no detention per the City of Albuquerque's direction. The grading and drainage plan has been designed in such a way as to protect on-site structures from damage in the event of a storm larger than 100-years, or failure of the storm drain system.



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Drainage Map	Golf Course Marketplace SWC Golf Course Rd. & McMahon Blvd. Albuquerque, New Mexico
22 Aug, 2005	SHEET NO. Fig 2
SMC463.drain	

Peak Flow Calculations
 Smith's #463 Golf Course & McMahon
 Albuquerque, NM 8/24/05

Treatment Type	Q cfs/acre 10-yr	Q cfs/acre 100-yr	(Zone 1)
B	0.76	2.03	
D	2.89	4.37	

ON1

	<u>S.F.</u>	<u>Acres</u>
Total Area =	83147	1.91
Landscape (10%)	8314.7	0.191
Hardsurface (90%)	74832.3	1.718
Q ₁₀ =	5.11	
Q ₁₀₀ =	7.89	

ON2

	<u>S.F.</u>	<u>Acres</u>
Total Area =	76629	1.759
Landscape (10%)	7662.9	0.176
Hardsurface (90%)	68966.1	1.583
Q ₁₀ =	4.71	
Q ₁₀₀ =	7.28	

ON3

	<u>S.F.</u>	<u>Acres</u>
Total Area =	38019	0.873
Landscape (10%)	3801.9	0.087
Hardsurface (90%)	34217.1	0.786
Q ₁₀ =	2.34	
Q ₁₀₀ =	3.61	

ON4

	<u>S.F.</u>	<u>Acres</u>
Total Area =	12325	0.283
Landscape (10%)	1232.5	0.028
Hardsurface (90%)	11092.5	0.255
Q ₁₀ =	0.76	
Q ₁₀₀ =	1.17	

ON5

	<u>S.F.</u>	<u>Acres</u>
Total Area =	16815	0.386
Landscape (10%)	1681.5	0.039
Hardsurface (90%)	15133.5	0.347
Q ₁₀ =	1.03	
Q ₁₀₀ =	1.60	

ON6

	<u>S.F.</u>	<u>Acres</u>
Total Area =	17422	0.400
Landscape (10%)	1742.2	0.040
Hardsurface (90%)	15679.8	0.360
Q ₁₀ =	1.07	
Q ₁₀₀ =	1.65	

ON7

	<u>S.F.</u>	<u>Acres</u>
Total Area =	18812	0.432
Landscape (10%)	1881.2	0.043
Hardsurface (90%)	16930.8	0.389
Q ₁₀ =	1.16	
Q ₁₀₀ =	1.79	

ON8

	<u>S.F.</u>	<u>Acres</u>
Total Area =	20772	0.477
Landscape (10%)	2077.2	0.048
Hardsurface (90%)	18694.8	0.429
Q ₁₀ =	1.28	
Q ₁₀₀ =	1.97	

Bldg1

	<u>S.F.</u>	<u>Acres</u>
Total Area =	57163	1.312
Landscape (0%)	0	0.000
Hardsurface (100%)	57163	1.312
Q ₁₀ =	3.79	
Q ₁₀₀ =	5.73	

Q₁₀₀ = 32.69

Q₁₀ = 32.69

Scenario: Base

Smith's

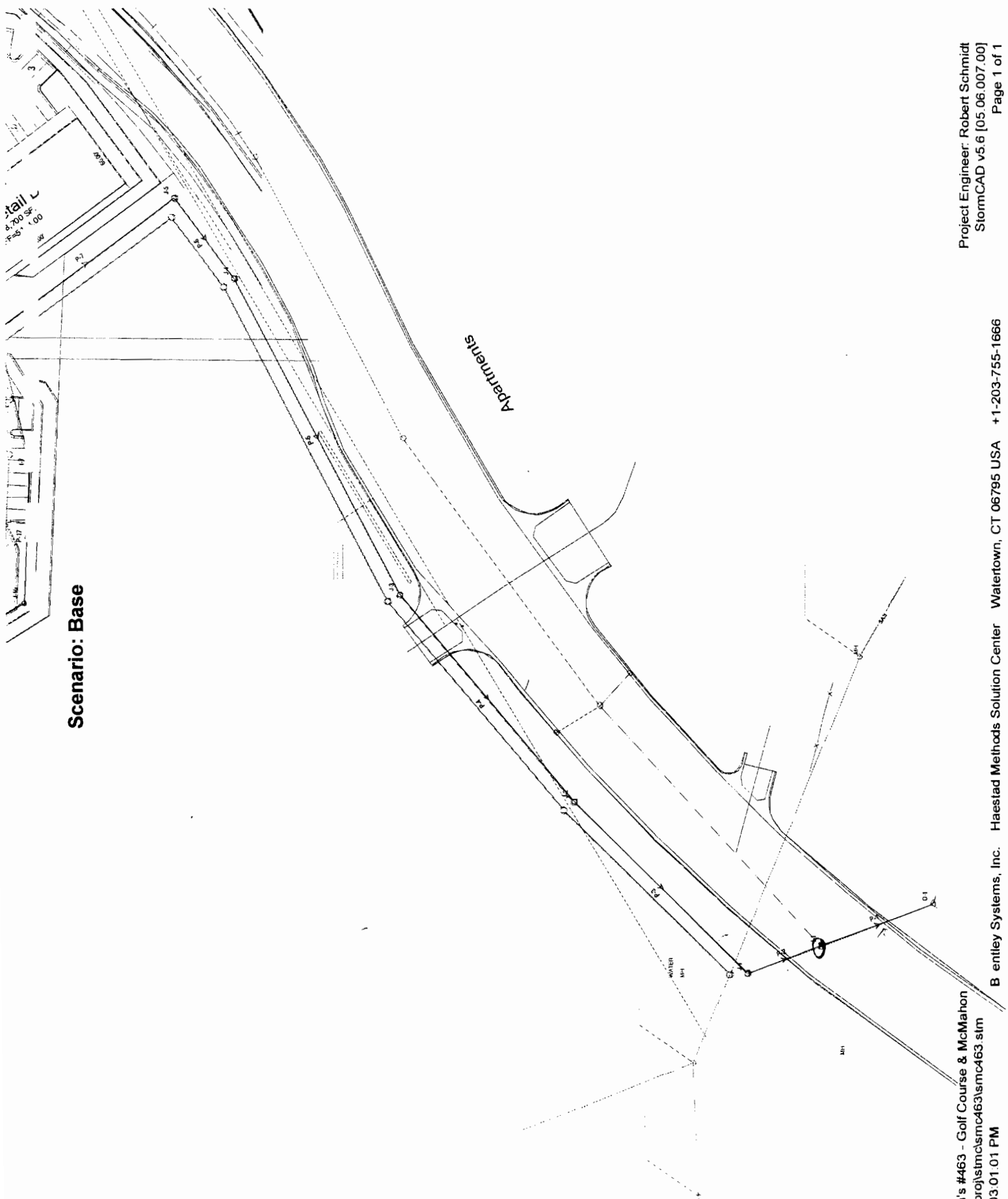
57,228 Sq. Ft.
R-Prob
FF=5200.00

Retail A

7,000 Sq. Ft.
FF=5199.00

Retail B

8,700 Sq. Ft.
FF=5194.00



Scenario: Base

Scenario: Base

Combined Pipe\Node Report

Label	Upstream Node	Downstream Node	Length (ft)	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	Upstream Inlet Rational Flow (cfs)	Section Size	Full Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Description
P-1	I-1	O-1	87.00	0.00	0.00	0.00	0.00	0.00	42 inch	130.33	13.55	42.90	41.44	0.016782	
P-2	J-1	I-1	57.00	N/A	N/A	N/A	0.00	N/A	30 inch	68.72	13.70	44.60	43.00	0.028070	
P-3	J-2	J-1	179.00	N/A	N/A	N/A	0.00	N/A	36 inch	32.31	5.21	45.02	44.60	0.002346	
P-4	J-3	J-2	200.00	N/A	N/A	N/A	0.00	N/A	36 inch	32.33	5.21	45.49	45.02	0.002350	
P-5	J-4	J-3	263.00	N/A	N/A	N/A	0.00	N/A	24 inch	36.27	13.00	54.33	47.57	0.025703	
P-6	J-5	J-4	74.00	N/A	N/A	N/A	0.00	N/A	24 inch	45.55	15.65	62.00	59.00	0.040541	
P-7	J-6	J-5	163.00	N/A	N/A	N/A	0.00	N/A	24 inch	70.87	21.90	78.00	62.00	0.098160	
P-8	I-2	J-6	32.00	0.00	0.00	0.00	0.00	0.00	24 inch	21.90	7.95	82.69	82.39	0.009375	
P-9	J-7	I-2	132.00	N/A	N/A	N/A	0.00	N/A	24 inch	22.45	6.49	83.99	82.69	0.009848	
P-10	J-8	J-7	120.00	N/A	N/A	N/A	0.00	N/A	15 inch	6.38	4.25	85.16	83.99	0.009750	
P-11	I-3	J-8	17.00	0.00	0.00	0.00	0.00	0.00	12 inch	3.35	2.04	85.31	85.16	0.008824	
P-12	J-9	J-8	50.00	N/A	N/A	N/A	0.00	N/A	12 inch	3.53	4.60	85.65	85.16	0.009800	
P-13	I-4	J-9	61.00	0.00	0.00	0.00	0.00	0.00	12 inch	3.50	4.60	86.24	85.65	0.009672	
P-14	I-5	J-7	50.00	0.00	0.00	0.00	0.00	0.00	18 inch	24.32	14.51	91.68	89.00	0.053600	
P-15	I-6	I-5	271.00	0.00	0.00	0.00	0.00	0.00	15 inch	6.44	6.43	94.37	91.68	0.009926	
P-16	I-7	J-6	105.00	0.00	0.00	0.00	0.00	0.00	15 inch	12.81	11.43	86.52	82.39	0.039333	
P-17	J-10	I-7	99.00	N/A	N/A	N/A	0.00	N/A	15 inch	7.79	6.27	87.96	86.52	0.014545	
P-18	I-8	J-10	187.00	0.00	0.00	0.00	0.00	0.00	15 inch	7.85	6.27	90.72	87.96	0.014759	

Scenario: Base

Pipe Report

Under Size
Miss. 5th
to Smith
36"

Label	Upstream Node	Downstream Node	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	System Intensity (in/hr)	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)
P-1	I-1	O-1	0.00	0.00	0.00	0.00	0.00	55.23	87.00	0.016782	42 inch	0.013	130.33
P-2	J-1	I-1	N/A	N/A	N/A	0.00	0.00	31.52	57.00	0.028070	30 inch	0.013	68.72
P-3	J-2	J-1	N/A	N/A	N/A	0.00	0.00	31.52	179.00	0.002346	36 inch	0.013	32.31
P-4	J-3	J-2	N/A	N/A	N/A	0.00	0.00	31.52	200.00	0.002350	36 inch	0.013	32.33
P-5	J-4	J-3	N/A	N/A	N/A	0.00	0.00	31.52	263.00	0.025703	24 inch	0.013	36.27
P-6	J-5	J-4	N/A	N/A	N/A	0.00	0.00	31.52	74.00	0.040541	24 inch	0.013	45.55
P-7	J-6	J-5	N/A	N/A	N/A	0.00	0.00	31.52	163.00	0.098160	24 inch	0.013	70.87
P-8	I-2	J-6	0.00	0.00	0.00	0.00	0.00	22.03	32.00	0.009375	24 inch	0.013	21.90
P-9	J-7	I-2	N/A	N/A	N/A	0.00	0.00	20.38	132.00	0.009848	24 inch	0.013	22.45
P-10	J-8	J-7	N/A	N/A	N/A	0.00	0.00	5.21	120.00	0.009750	15 inch	0.013	6.38
P-11	I-3	J-8	0.00	0.00	0.00	0.00	0.00	1.60	17.00	0.008824	12 inch	0.013	3.35
P-12	J-9	J-8	N/A	N/A	N/A	0.00	0.00	3.61	50.00	0.009800	12 inch	0.013	3.53
P-13	I-4	J-9	0.00	0.00	0.00	0.00	0.00	3.61	61.00	0.009672	12 inch	0.013	3.50
P-14	I-5	J-7	0.00	0.00	0.00	0.00	0.00	15.17	50.00	0.053600	18 inch	0.013	24.32
P-15	I-6	I-5	0.00	0.00	0.00	0.00	0.00	7.89	271.00	0.009926	15 inch	0.013	6.44
P-16	I-7	J-6	0.00	0.00	0.00	0.00	0.00	9.49	105.00	0.039333	15 inch	0.013	12.81
P-17	J-10	I-7	N/A	N/A	N/A	0.00	0.00	7.70	99.00	0.014545	15 inch	0.013	7.79
P-18	I-8	J-10	0.00	0.00	0.00	0.00	0.00	7.70	187.00	0.014759	15 inch	0.013	7.85

Scenario: Base

Pipe Report

Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Description
42.90	41.44	50.76	45.00	4.36	0.06	45.43	43.32	
44.60	43.00	51.00	50.76	3.90	5.26	46.51	46.38	
45.02	44.60	49.39	51.00	1.37	3.40	47.62	47.27	
45.49	45.02	51.40	49.39	2.91	1.37	48.21	47.84	
54.33	47.57	64.90	51.40	8.57	1.83	56.21	49.01	
62.00	59.00	67.50	64.90	3.50	3.90	63.88	60.31	
78.00	62.00	95.00	67.50	15.00	3.50	79.88	65.20	
82.69	82.39	93.22	95.00	8.53	10.61	84.37	84.04	
83.99	82.69	95.00	93.22	9.01	8.53	86.01	84.94	
85.16	83.99	88.56	95.00	2.15	9.76	87.38	86.60	
85.31	85.16	88.74	88.56	2.43	2.40	87.67	87.63	
85.65	85.16	91.31	88.56	4.66	2.40	88.14	87.63	
86.24	85.65	90.82	91.31	3.58	4.66	89.03	88.41	
91.68	89.00	95.56	95.00	2.38	4.50	93.09	89.92	
94.37	91.68	98.12	95.56	2.50	2.63	97.86	93.81	
86.52	82.39	92.57	95.00	4.80	11.36	87.69	83.19	
87.96	86.52	93.00	92.57	3.79	4.80	89.69	88.28	
90.72	87.96	94.22	93.00	2.25	3.79	92.71	90.05	

Scenario: Base

Outlet Report

Label	Station (ft)	Ground Elevation (ft)	Set Rim Equal to Ground Elevation?	Rim Elevation (ft)	Sump Elevation (ft)	Tailwater Condition	Tailwater Elevation (ft)	Description
O-1	0+00	45.00	true	45.00	41.44	Free Outfa		

Scenario: Base

Junction Report

Label	Calculated Station (ft)	Ground Elevation (ft)	Set Rim Equal to Ground Elevation?	Rim Elevation (ft)	Sump Elevation (ft)	Bolted Cover?	Structure Diameter (ft)	Description
J-10	12+27	93.00	true	93.00	87.96	false	4.00	
J-9	13+57	91.31	true	91.31	85.65	false	4.00	
J-8	13+07	88.56	true	88.56	85.16	false	4.00	
J-7	11+87	95.00	true	95.00	83.99	false	6.00	
J-6	10+23	95.00	true	95.00	78.00	false	6.00	
J-5	8+60	67.50	true	67.50	62.00	false	4.00	
J-4	7+86	64.90	true	64.90	54.33	false	5.00	
J-3	5+23	51.40	true	51.40	45.49	false	6.00	
J-2	3+23	49.39	true	49.39	45.02	false	6.00	
J-1	1+44	51.00	true	51.00	44.60	false	6.00	

Scenario: Base

Inlet Report

Label	Calculated Station (ft)	Ground Elevation (ft)	Set Rim Equal to Ground Elevation?	Rim Elevation (ft)	Sump Elevation (ft)	Area (acres)	Inlet C	Inlet CA (acres)	Time of Concentration (min)	External CA (acres)	External Time of Concentration (min)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Inlet	Inlet Location	Description
I-8	14+14	94.22	true	94.22	90.72	0.00	0.00	0.00	0.00	0.00	0.00	7.70	0.00	0.00	Generic Default 1d	In Sag	
I-7	11+28	92.57	true	92.57	86.52	0.00	0.00	0.00	0.00	0.00	0.00	1.79	0.00	0.00	Generic Default 1d	In Sag	
I-6	15+08	98.12	true	98.12	94.37	0.00	0.00	0.00	0.00	0.00	0.00	7.89	0.00	0.00	Generic Default 1d	In Sag	
I-5	12+37	95.56	true	95.56	91.68	0.00	0.00	0.00	0.00	0.00	0.00	7.28	0.00	0.00	Generic Default 1d	In Sag	
I-4	14+18	90.82	true	90.82	86.24	0.00	0.00	0.00	0.00	0.00	0.00	3.61	0.00	0.00	Generic Default 1d	In Sag	
I-3	13+24	88.74	true	88.74	85.31	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	Generic Default 1d	In Sag	
I-2	10+55	93.22	true	93.22	82.69	0.00	0.00	0.00	0.00	0.00	0.00	1.65	0.00	0.00	Generic Default 1d	In Sag	
I-1	0+87	50.76	true	50.76	42.90	0.00	0.00	0.00	0.00	0.00	0.00	33.71	0.00	0.00	Generic Default 1d	In Sag	