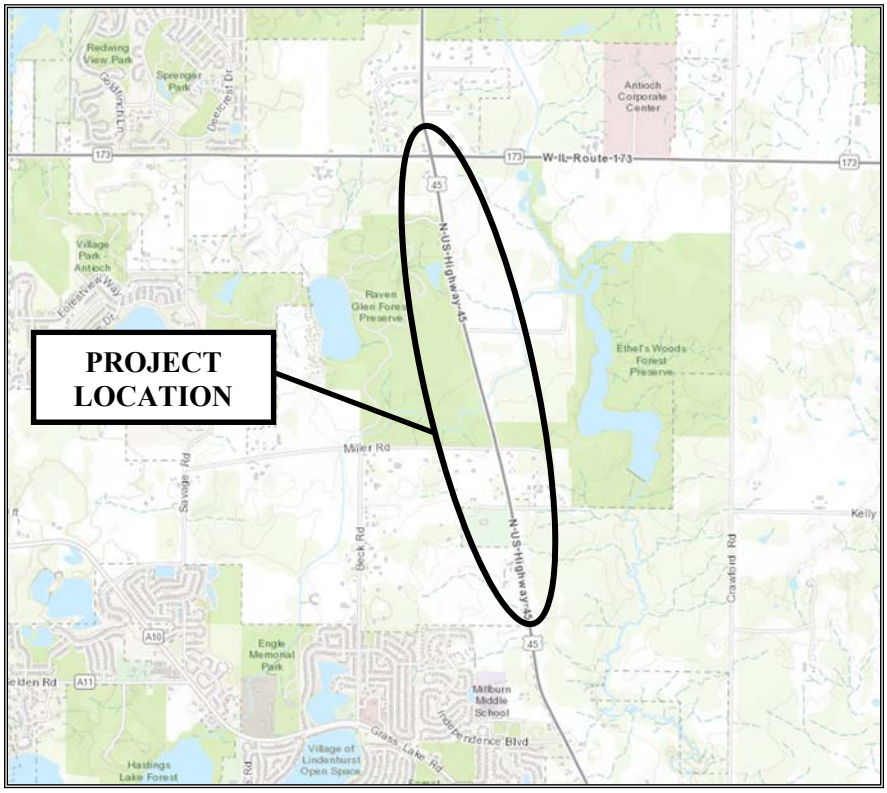
Illinois Department of Transportation

DESIGN REPORT

U.S. Route 45
Millburn Bypass to Illinois Route 173



P-91-388-10

Lake County, Illinois

IDOT – Division of Highways – District One

July 2019

Volume V
Location Drainage Study

Contact Information

Job Number: P-91-388-10

Project: U.S. Route 45

Location: Millburn Bypass to Illinois Route 173

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LOCATION DRAINAGE STUDY

Illinois Department of Transportation

Location Drainage Study

PROJECT ROUTE: U.S. Route 45 – (Millburn Bypass to IL Route 173)
LIMITS: Station 165+98 (North of Independence Blvd) to Station 312+93.7(IL RT 173)

MUNICIPALITY/COUNTY: Village of Lindenhurst, Village of Old Mill Creek, Village of Antioch, and Unincorporated Lake County

JOB NUMBER: P-91-388-10

Volume 2

PREPARED FOR: IDOT District One
201 W. Center Court
Schaumburg, IL 60196
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Hydraulics Section

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Rosemont, IL 60018

DATE: January 2019

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5-00 Appendix D: Supporting Documents

Volume 1

- Detention Analysis Calculations
- Restrictor Sizing Calculations

Volume 2

- For the major drainage crossings of the proposed U.S. Route 45, the following backup calculations are included:
- Crossing DA11 Calculations
- Crossing DA12 Calculations
- RWA Culvert Design Summary Memorandum: Hydrology for Major Drainage Features – US Route 45 North Segment

Crossing DA13 Station 185+75 (Existing Outlet No. 13)

- Drainage Area Location Exhibit
- Time of Concentration (Tc)
- Runoff Curve Number (CN)
- Existing Detention Calculations
- Existing Orifice Calculations
- Soils Map
- 500 – Year Storm Event Flow Calculation
- TR-20 Schematic
- TR-20 Model
- HY-8 Output

- Crossing DA19 at Station 310+38 (Existing Outlet No. 19)
  - Drainage Area Location Exhibit
  - Time of Concentration (Tc)
  - Runoff Curve Number (CN)
  - TR-20 Model
  - Soils Map
  - 500 – Year Storm Event Flow Calculation
  - TR-20 Schematic
  - HY-8 Output

- Storm Sewer Sizing Calculations.
- Floodplain Fill and Compensatory Storage Calculations

CROSSING DA11 CULVERT SUPPORTING CALCULATIONS

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 45 cfs

Maximum Flow: 87 cfs

Table 1 - Summary of Culvert Flows at Crossing: EX Crossing G (STA 170+65)

Headwater Elevation (ft)	Total Discharge (cfs)	Dbl 4'x2' RCBC Discharge (cfs)	Roadway Discharge (cfs)	Iterations
736.20	0.00	0.00	0.00	1
736.77	8.70	8.70	0.00	1
737.11	17.40	17.40	0.00	1
737.40	26.10	26.10	0.00	1
737.66	34.80	34.80	0.00	1
737.89	43.50	43.50	0.00	1
737.93	45.00	45.00	0.00	1
738.34	60.90	60.90	0.00	1
738.58	69.60	69.60	0.00	1
738.87	78.30	78.30	0.00	1
739.18	87.00	87.00	0.00	1
740.50	120.82	120.82	0.00	Overtopping

Rating Curve Plot for Crossing: EX Crossing G (STA 170+65)

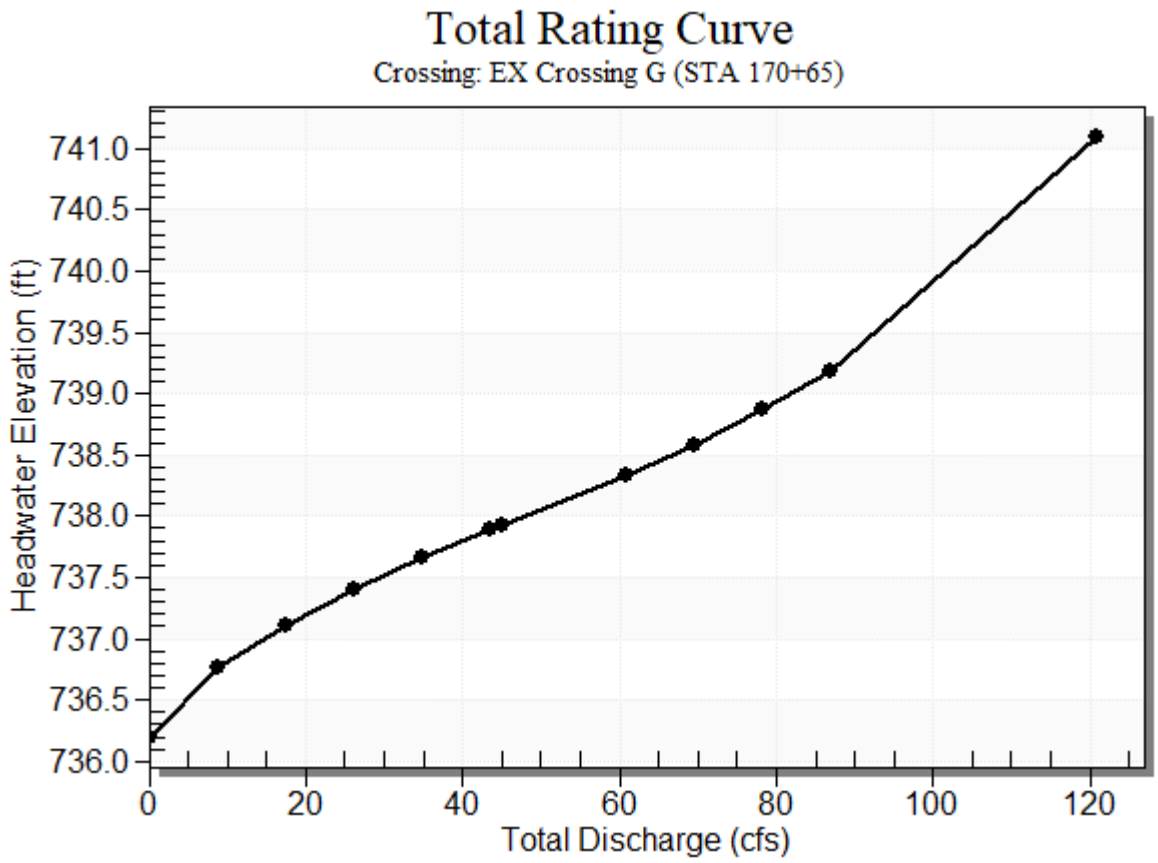


Table 2 - Culvert Summary Table: Dbl 4'x2' RCBC

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	736.20	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
8.70	8.70	736.77	0.568	0.322	1-S2n	0.294	0.332	0.294	0.942	3.698	1.914
17.40	17.40	737.11	0.902	0.906	1-S1t	0.459	0.528	1.163	1.293	1.870	2.289
26.10	26.10	737.40	1.175	1.198	1-S1t	0.599	0.691	1.418	1.548	2.301	2.538
34.80	34.80	737.66	1.417	1.458	1-S1t	0.726	0.838	1.625	1.755	2.677	2.730
43.50	43.50	737.89	1.640	1.693	1-S1t	0.844	0.972	1.802	1.932	3.018	2.889
45.00	45.00	737.93	1.677	1.732	1-S1t	0.864	0.994	1.830	1.960	3.074	2.913
60.90	60.90	738.34	2.064	2.135	1-S1f	1.065	1.216	2.000	2.229	3.806	3.145
69.60	69.60	738.58	2.278	2.384	1-S1f	1.170	1.330	2.000	2.358	4.350	3.252
78.30	78.30	738.87	2.502	2.672	4-FFf	1.272	1.438	2.000	2.478	4.894	3.350
87.00	87.00	739.18	2.739	2.977	4-FFf	1.372	1.543	2.000	2.589	5.438	3.440

****

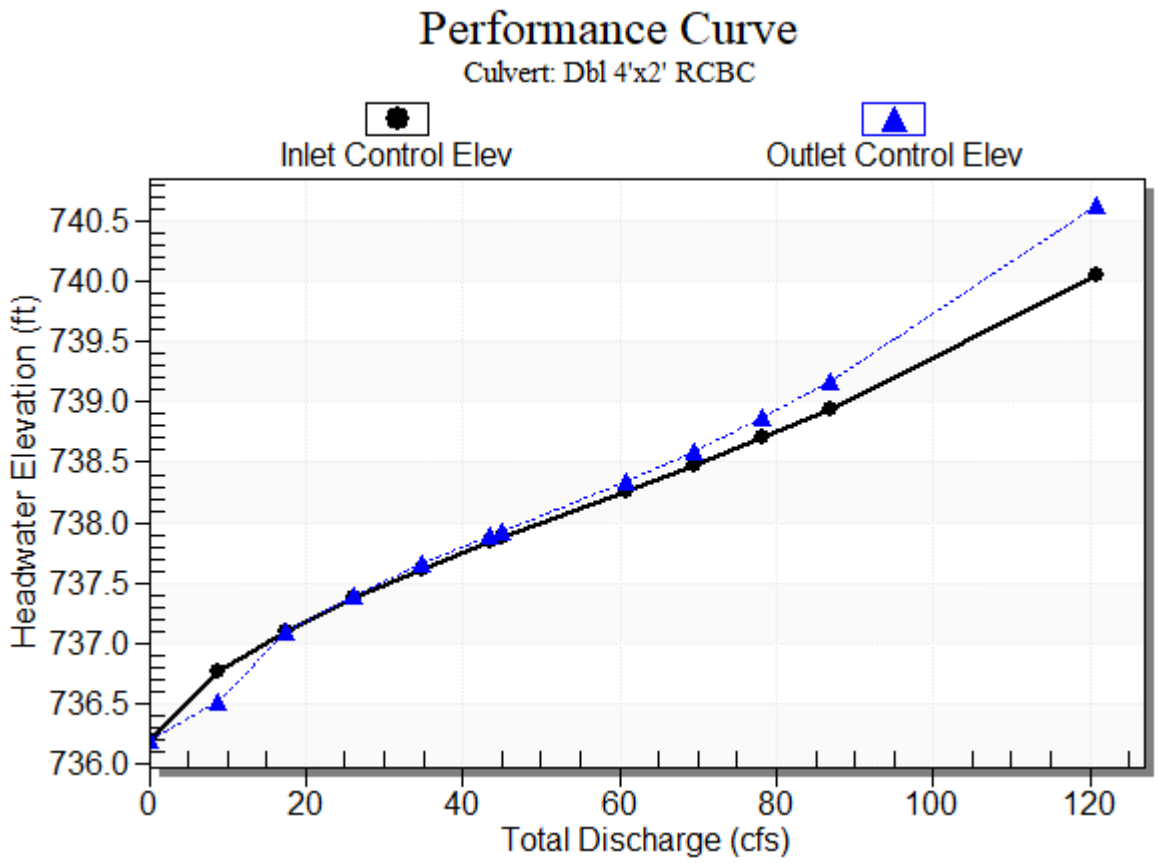
Straight Culvert

Inlet Elevation (invert): 736.20 ft, Outlet Elevation (invert): 735.70 ft

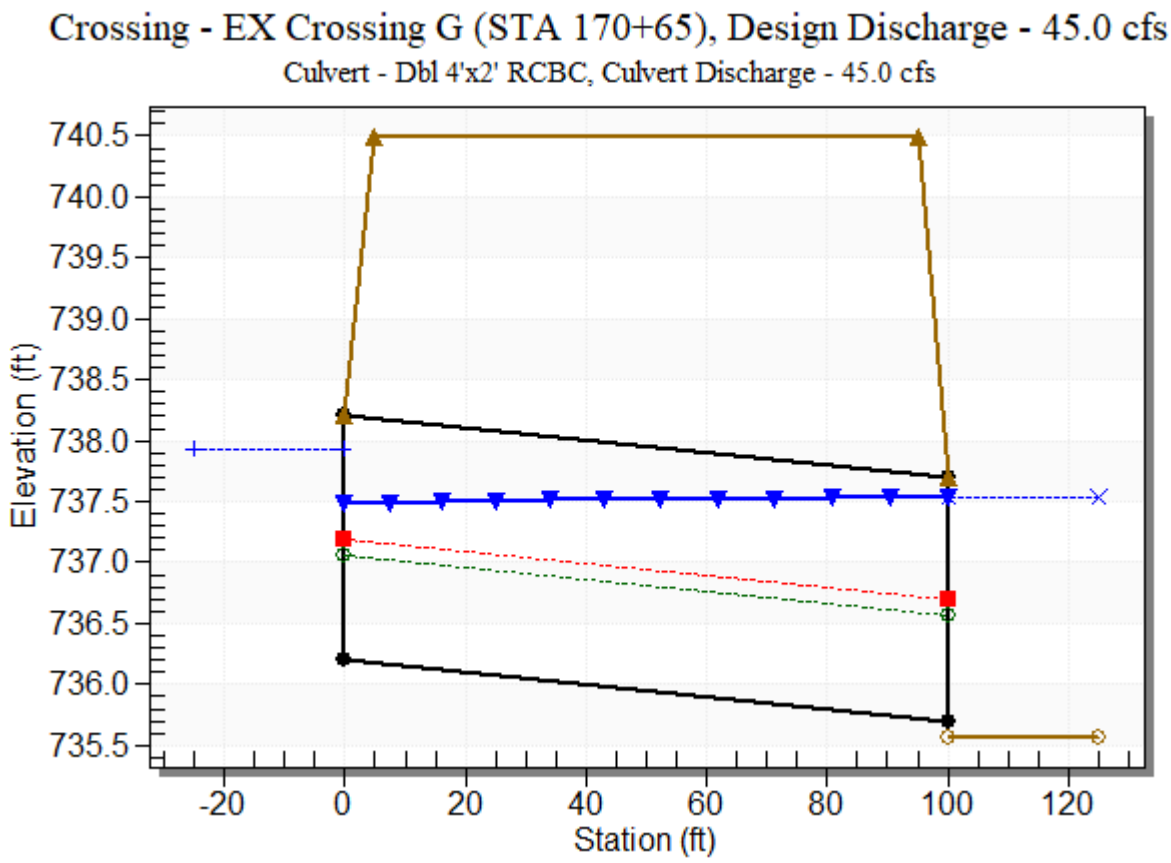
Culvert Length: 100.00 ft, Culvert Slope: 0.0050

****

Culvert Performance Curve Plot: Dbl 4'x2' RCBC



Water Surface Profile Plot for Culvert: Dbl 4'x2' RCBC



Site Data - Dbl 4'x2' RCBC

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 736.20 ft

Outlet Station: 100.00 ft

Outlet Elevation: 735.70 ft

Number of Barrels: 2

Culvert Data Summary - Dbl 4'x2' RCBC

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: EX Crossing G (STA 170+65))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	735.57	0.00	0.00	0.00	0.00
8.70	736.51	0.94	1.91	0.33	0.44
17.40	736.86	1.29	2.29	0.45	0.46
26.10	737.12	1.55	2.54	0.54	0.47
34.80	737.32	1.75	2.73	0.61	0.48
43.50	737.50	1.93	2.89	0.68	0.48
45.00	737.53	1.96	2.91	0.68	0.48
60.90	737.80	2.23	3.14	0.78	0.49
69.60	737.93	2.36	3.25	0.82	0.50
78.30	738.05	2.48	3.35	0.87	0.50
87.00	738.16	2.59	3.44	0.90	0.50

Tailwater Channel Data - EX Crossing G (STA 170+65)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0056

Channel Manning's n: 0.0400

Channel Invert Elevation: 735.57 ft

Roadway Data for Crossing: EX Crossing G (STA 170+65)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 740.50 ft

Roadway Surface: Paved

Roadway Top Width: 90.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 45 cfs

Maximum Flow: 87 cfs

Table 4 - Summary of Culvert Flows at Crossing: PR Crossing G (STA 170+65)

Headwater Elevation (ft)	Total Discharge (cfs)	Dbl 4'x2' RCBC Discharge (cfs)	Roadway Discharge (cfs)	Iterations
736.25	0.00	0.00	0.00	1
736.82	8.70	8.70	0.00	1
737.17	17.40	17.40	0.00	1
737.44	26.10	26.10	0.00	1
737.69	34.80	34.80	0.00	1
737.92	43.50	43.50	0.00	1
737.96	45.00	45.00	0.00	1
738.38	60.90	60.90	0.00	1
738.64	69.60	69.60	0.00	1
738.95	78.30	78.30	0.00	1
739.27	87.00	87.00	0.00	1
740.50	116.86	116.86	0.00	Overtopping

Rating Curve Plot for Crossing: PR Crossing G (STA 170+65)

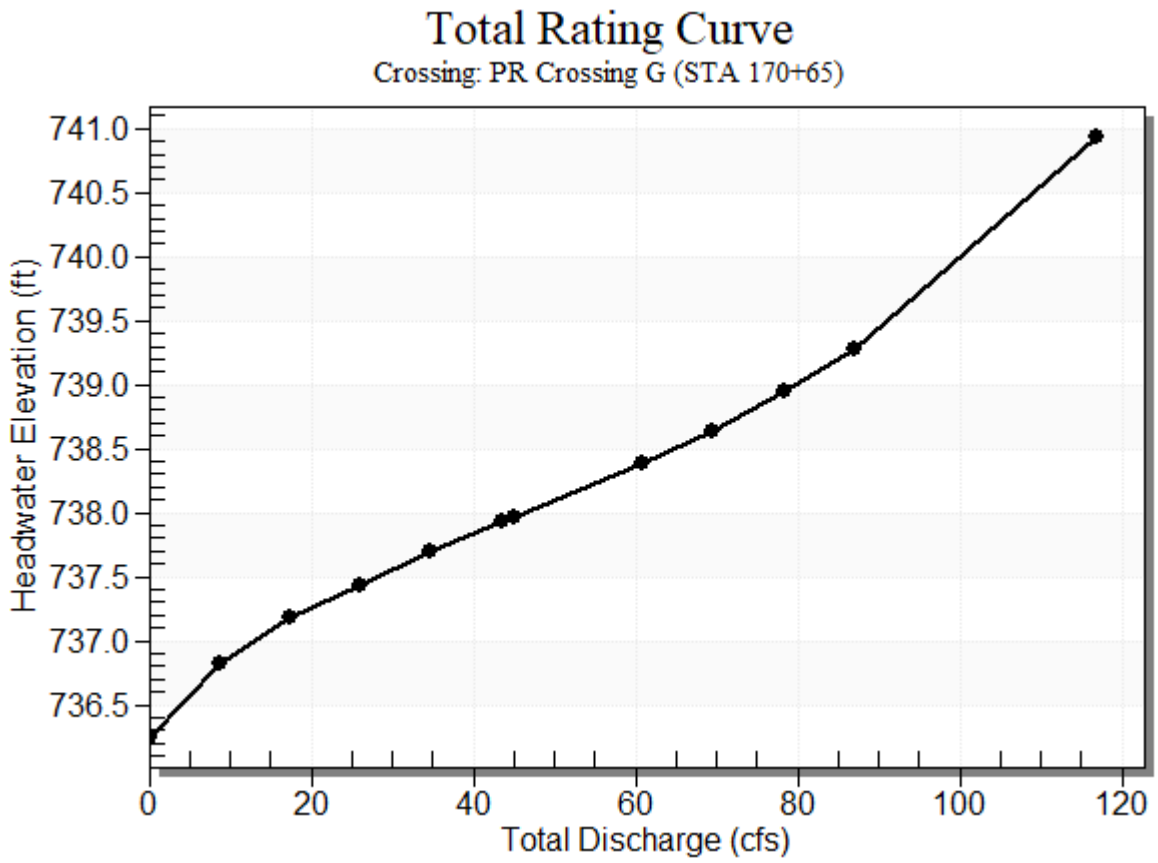


Table 5 - Culvert Summary Table: Dbl 4'x2' RCBC

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	736.25	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
8.70	8.70	736.82	0.568	0.273	1-S2n	0.288	0.332	0.298	0.942	3.655	1.914
17.40	17.40	737.17	0.901	0.924	1-S1t	0.450	0.528	1.293	1.293	1.682	2.289
26.10	26.10	737.44	1.175	1.188	1-S1t	0.587	0.691	1.548	1.548	2.108	2.538
34.80	34.80	737.69	1.417	1.441	1-S1t	0.711	0.838	1.755	1.755	2.479	2.730
43.50	43.50	737.92	1.640	1.674	1-S1t	0.827	0.972	1.932	1.932	2.815	2.889
45.00	45.00	737.96	1.677	1.713	1-S1t	0.846	0.994	1.960	1.960	2.870	2.913
60.90	60.90	738.38	2.063	2.133	1-S1f	1.043	1.216	2.000	2.229	3.806	3.145
69.60	69.60	738.64	2.278	2.393	1-S1f	1.145	1.330	2.000	2.358	4.350	3.252
78.30	78.30	738.95	2.501	2.697	4-FFf	1.245	1.438	2.000	2.478	4.894	3.350
87.00	87.00	739.27	2.739	3.019	4-FFf	1.342	1.543	2.000	2.589	5.438	3.440

****

Straight Culvert

Inlet Elevation (invert): 736.25 ft, Outlet Elevation (invert): 735.57 ft

Culvert Length: 128.00 ft, Culvert Slope: 0.0053

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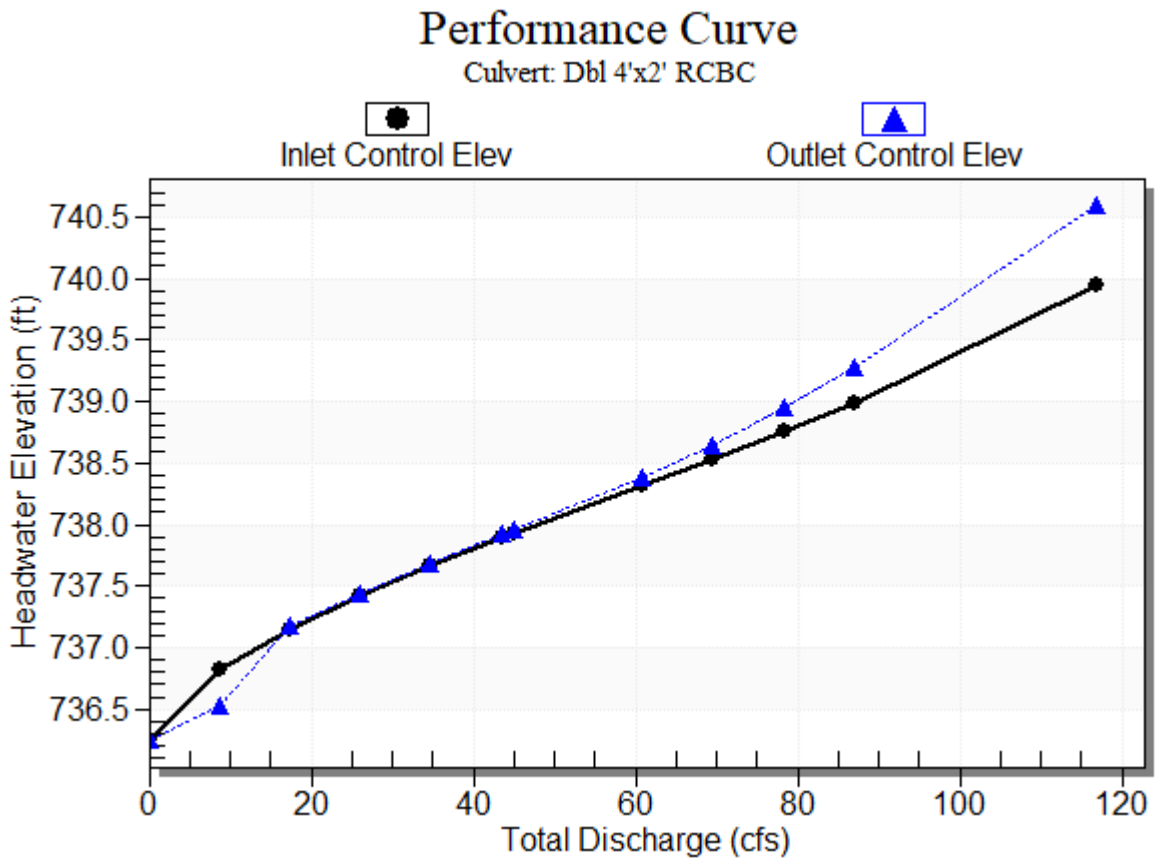
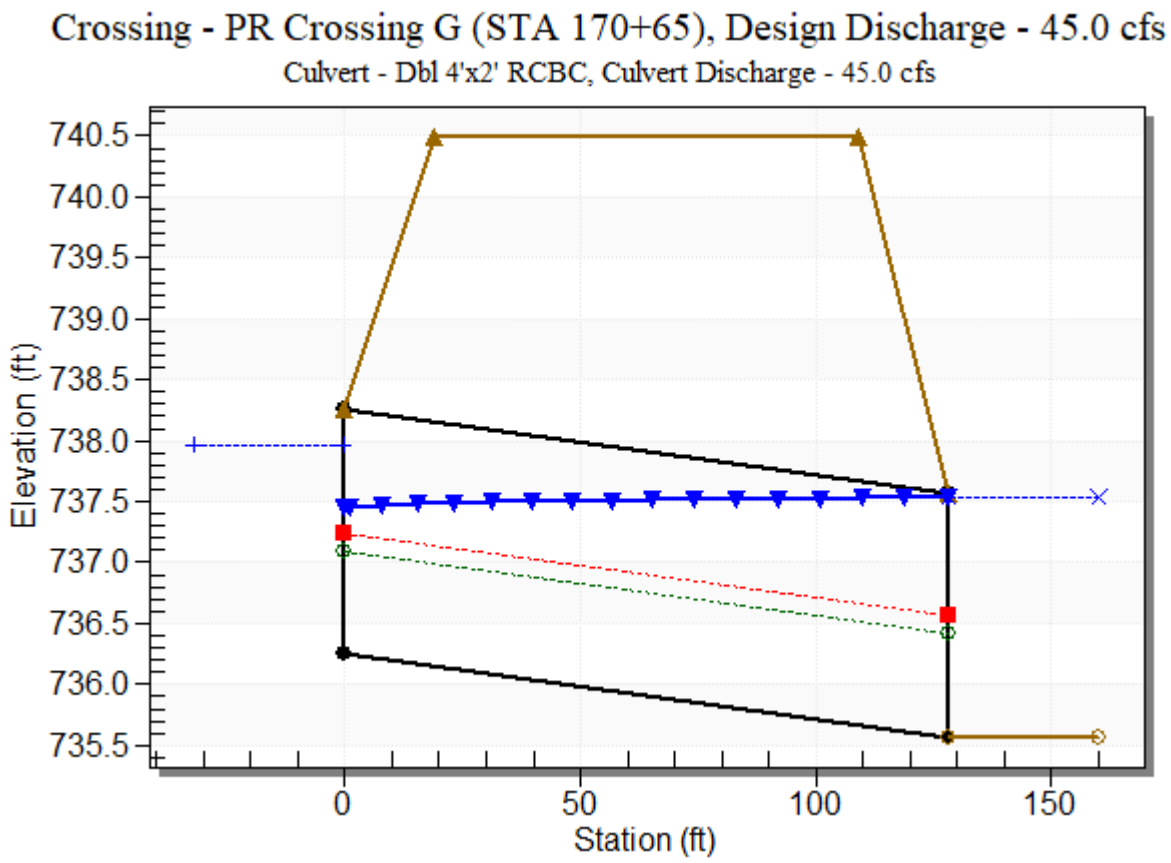
Culvert Performance Curve Plot: Dbl 4'x2' RCBC



Water Surface Profile Plot for Culvert: Dbl 4'x2' RCBC



Site Data - Dbl 4'x2' RCBC

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 736.25 ft

Outlet Station: 128.00 ft

Outlet Elevation: 735.57 ft

Number of Barrels: 2

Culvert Data Summary - Dbl 4'x2' RCBC

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: PR Crossing G (STA 170+65))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	735.57	0.00	0.00	0.00	0.00
8.70	736.51	0.94	1.91	0.33	0.44
17.40	736.86	1.29	2.29	0.45	0.46
26.10	737.12	1.55	2.54	0.54	0.47
34.80	737.32	1.75	2.73	0.61	0.48
43.50	737.50	1.93	2.89	0.68	0.48
45.00	737.53	1.96	2.91	0.68	0.48
60.90	737.80	2.23	3.14	0.78	0.49
69.60	737.93	2.36	3.25	0.82	0.50
78.30	738.05	2.48	3.35	0.87	0.50
87.00	738.16	2.59	3.44	0.90	0.50

Tailwater Channel Data - PR Crossing G (STA 170+65)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0056

Channel Manning's n: 0.0400

Channel Invert Elevation: 735.57 ft

Roadway Data for Crossing: PR Crossing G (STA 170+65)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 740.50 ft

Roadway Surface: Paved

Roadway Top Width: 90.00 ft

CROSSING DA12 CULVERT SUPPORTING CALCULATIONS

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 45 cfs

Maximum Flow: 87 cfs

Table 1 - Summary of Culvert Flows at Crossing: EX Crossing G (STA 170+65)

Headwater Elevation (ft)	Total Discharge (cfs)	Dbl 4'x2' RCBC Discharge (cfs)	Roadway Discharge (cfs)	Iterations
736.20	0.00	0.00	0.00	1
736.77	8.70	8.70	0.00	1
737.11	17.40	17.40	0.00	1
737.40	26.10	26.10	0.00	1
737.66	34.80	34.80	0.00	1
737.89	43.50	43.50	0.00	1
737.93	45.00	45.00	0.00	1
738.34	60.90	60.90	0.00	1
738.58	69.60	69.60	0.00	1
738.87	78.30	78.30	0.00	1
739.18	87.00	87.00	0.00	1
740.50	120.82	120.82	0.00	Overtopping

Rating Curve Plot for Crossing: EX Crossing G (STA 170+65)

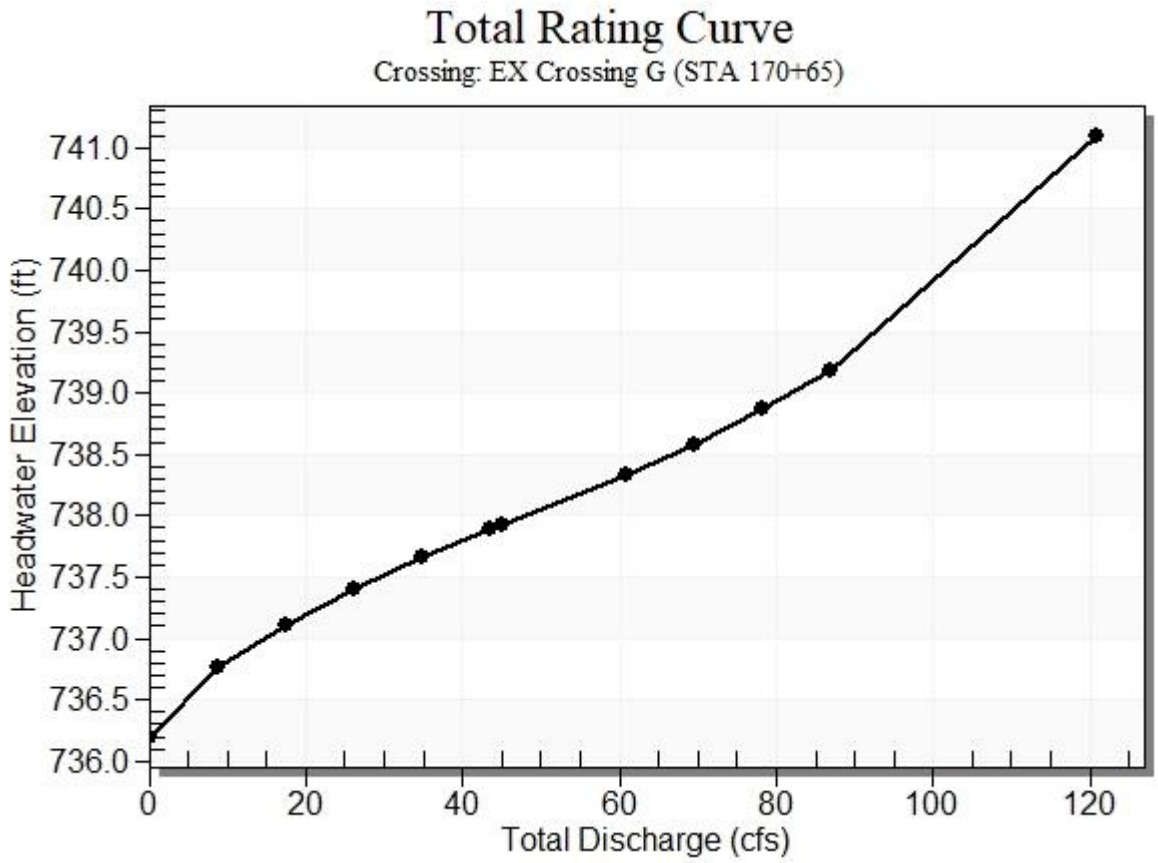


Table 2 - Culvert Summary Table: Dbl 4'x2' RCBC

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	736.20	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
8.70	8.70	736.77	0.568	0.322	1-S2n	0.294	0.332	0.294	0.942	3.698	1.914
17.40	17.40	737.11	0.902	0.906	1-S1t	0.459	0.528	1.163	1.293	1.870	2.289
26.10	26.10	737.40	1.175	1.198	1-S1t	0.599	0.691	1.418	1.548	2.301	2.538
34.80	34.80	737.66	1.417	1.458	1-S1t	0.726	0.838	1.625	1.755	2.677	2.730
43.50	43.50	737.89	1.640	1.693	1-S1t	0.844	0.972	1.802	1.932	3.018	2.889
45.00	45.00	737.93	1.677	1.732	1-S1t	0.864	0.994	1.830	1.960	3.074	2.913
60.90	60.90	738.34	2.064	2.135	1-S1f	1.065	1.216	2.000	2.229	3.806	3.145
69.60	69.60	738.58	2.278	2.384	1-S1f	1.170	1.330	2.000	2.358	4.350	3.252
78.30	78.30	738.87	2.502	2.672	4-FFf	1.272	1.438	2.000	2.478	4.894	3.350
87.00	87.00	739.18	2.739	2.977	4-FFf	1.372	1.543	2.000	2.589	5.438	3.440

****

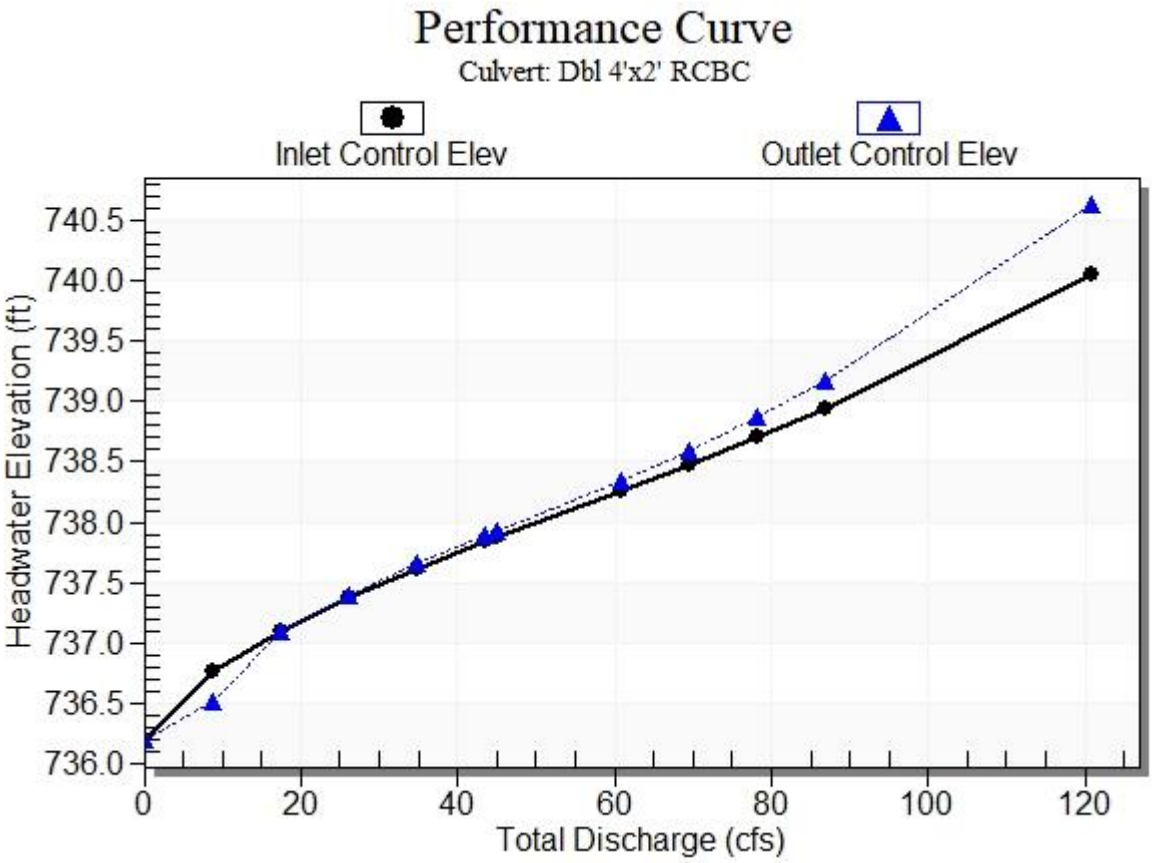
Straight Culvert

Inlet Elevation (invert): 736.20 ft, Outlet Elevation (invert): 735.70 ft

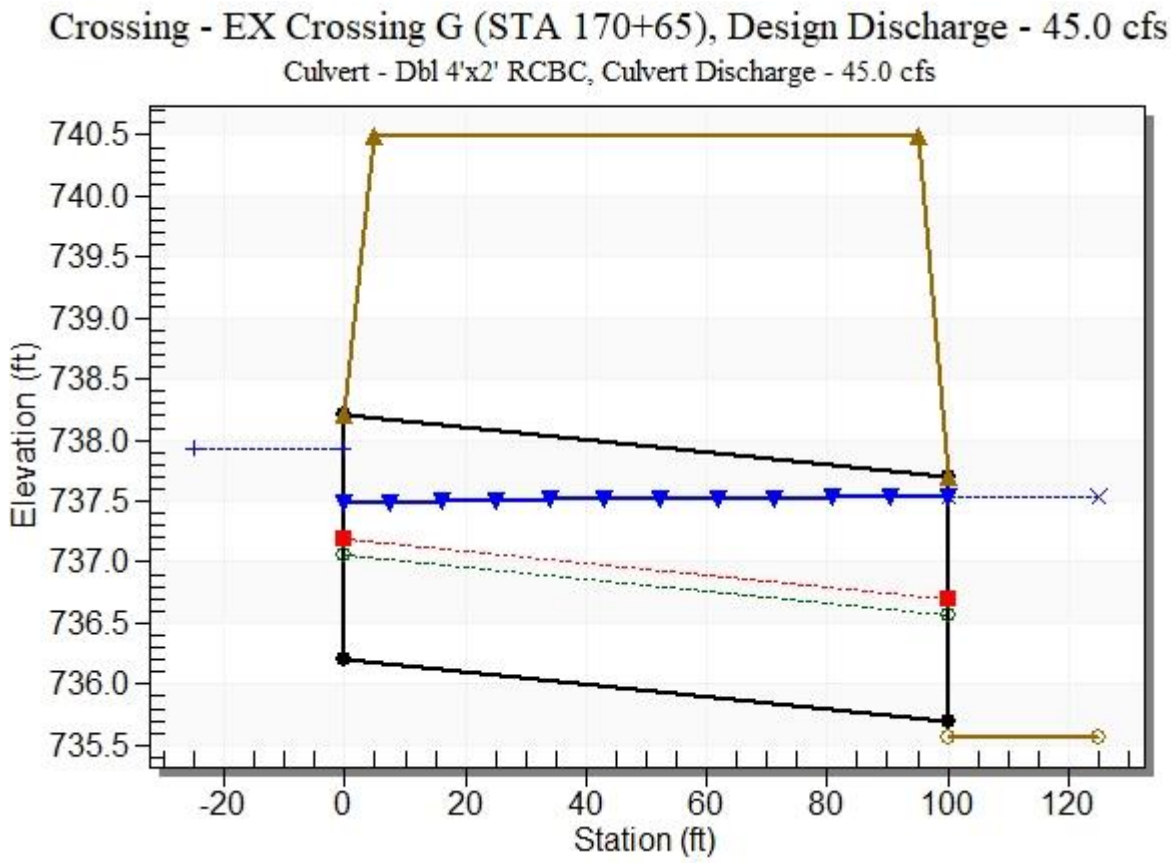
Culvert Length: 100.00 ft, Culvert Slope: 0.0050

****

Culvert Performance Curve Plot: Dbl 4'x2' RCBC



Water Surface Profile Plot for Culvert: Dbl 4'x2' RCBC



Site Data - Dbl 4'x2' RCBC

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 736.20 ft

Outlet Station: 100.00 ft

Outlet Elevation: 735.70 ft

Number of Barrels: 2

Culvert Data Summary - Dbl 4'x2' RCBC

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: EX Crossing G (STA 170+65))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	735.57	0.00	0.00	0.00	0.00
8.70	736.51	0.94	1.91	0.33	0.44
17.40	736.86	1.29	2.29	0.45	0.46
26.10	737.12	1.55	2.54	0.54	0.47
34.80	737.32	1.75	2.73	0.61	0.48
43.50	737.50	1.93	2.89	0.68	0.48
45.00	737.53	1.96	2.91	0.68	0.48
60.90	737.80	2.23	3.14	0.78	0.49
69.60	737.93	2.36	3.25	0.82	0.50
78.30	738.05	2.48	3.35	0.87	0.50
87.00	738.16	2.59	3.44	0.90	0.50

Tailwater Channel Data - EX Crossing G (STA 170+65)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0056

Channel Manning's n: 0.0400

Channel Invert Elevation: 735.57 ft

Roadway Data for Crossing: EX Crossing G (STA 170+65)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 740.50 ft

Roadway Surface: Paved

Roadway Top Width: 90.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 39 cfs

Maximum Flow: 80 cfs

Table 4 - Summary of Culvert Flows at Crossing: Pr. Outlet No. 12 (Sta 176+20)

Headwater Elevation (ft)	Total Discharge (cfs)	Dbl 4'x2' RCBC Discharge (cfs)	Roadway Discharge (cfs)	Iterations
732.18	0.00	0.00	0.00	1
732.72	8.00	8.00	0.00	1
733.04	16.00	16.00	0.00	1
733.30	24.00	24.00	0.00	1
733.54	32.00	32.00	0.00	1
733.73	39.00	39.00	0.00	1
733.96	48.00	48.00	0.00	1
734.16	56.00	56.00	0.00	1
734.34	64.00	64.00	0.00	1
734.52	72.00	72.00	0.00	1
734.73	80.00	80.00	0.00	1
737.30	150.17	150.17	0.00	Overtopping

Rating Curve Plot for Crossing: Pr. Outlet No. 12 (Sta 176+20)

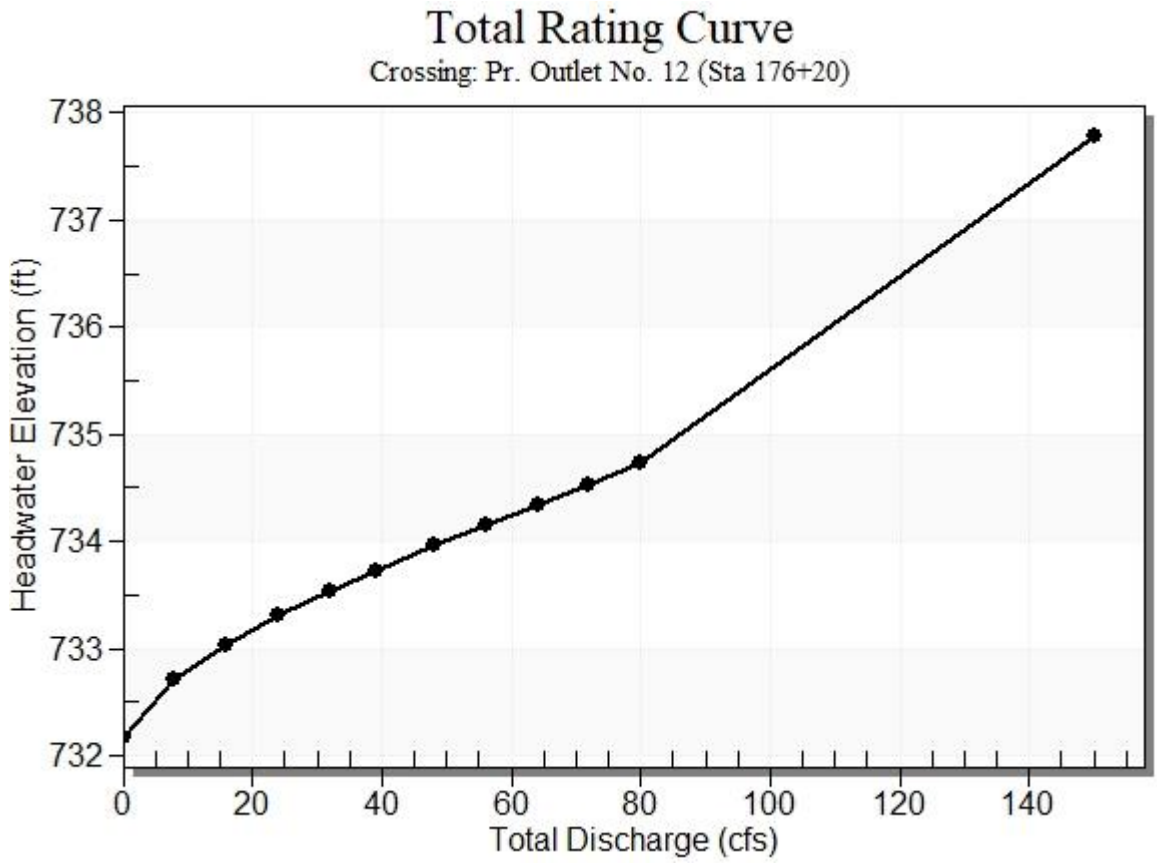


Table 5 - Culvert Summary Table: Dbl 4'x2' RCBC

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	732.18	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
8.00	8.00	732.72	0.538	0.541	3-M1t	0.329	0.314	0.605	0.605	1.654	3.470
16.00	16.00	733.04	0.854	0.857	3-M1t	0.515	0.499	0.845	0.845	2.366	4.172
24.00	24.00	733.30	1.115	1.123	3-M1t	0.673	0.654	1.022	1.022	2.936	4.636
32.00	32.00	733.54	1.344	1.360	3-M1t	0.818	0.792	1.166	1.166	3.431	4.994
39.00	39.00	733.73	1.528	1.552	3-M1t	0.936	0.904	1.275	1.275	3.825	5.254
48.00	48.00	733.96	1.753	1.783	3-M1t	1.082	1.038	1.398	1.398	4.291	5.541
56.00	56.00	734.16	1.947	1.976	3-M1t	1.206	1.150	1.497	1.497	4.676	5.762
64.00	64.00	734.34	2.141	2.160	7-M1t	1.326	1.257	1.588	1.588	5.039	5.961
72.00	72.00	734.52	2.341	2.337	7-M1t	1.443	1.360	1.671	1.671	5.385	6.142
80.00	80.00	734.73	2.549	2.507	7-M1t	1.558	1.459	1.750	1.750	5.716	6.308

****

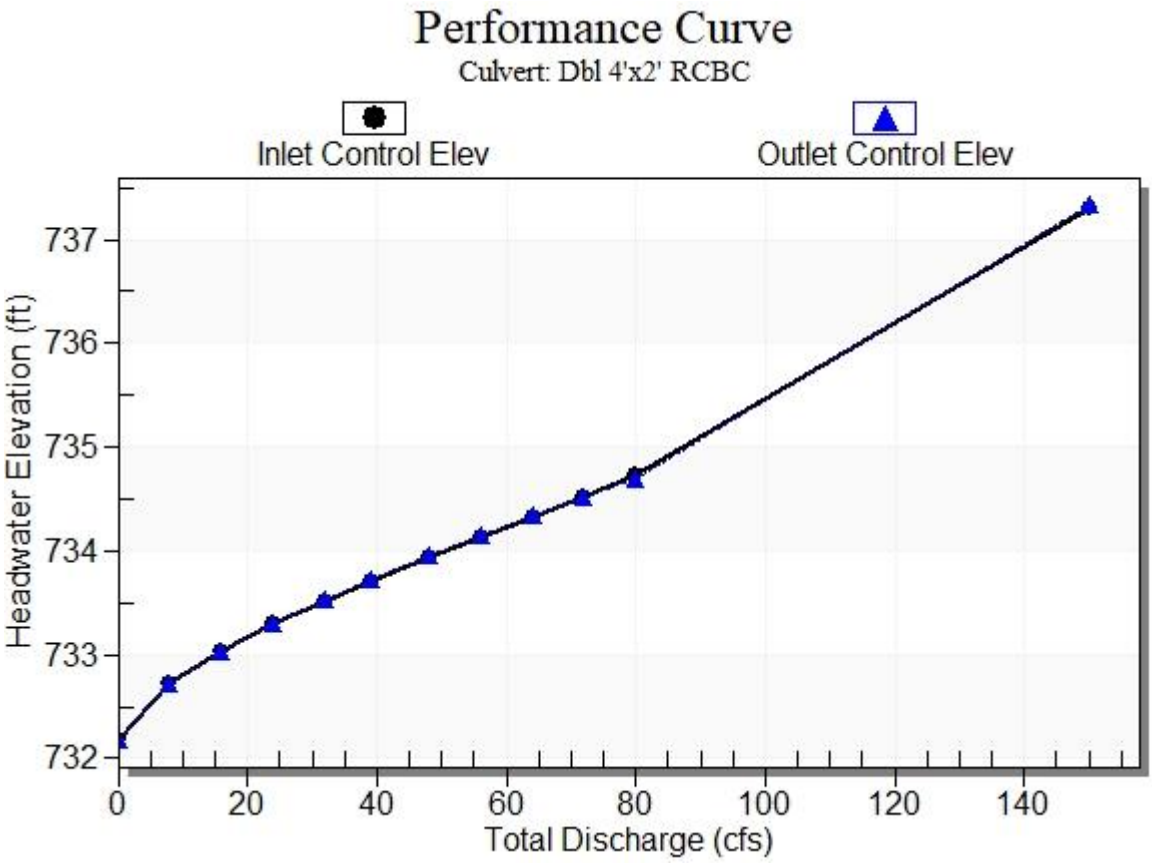
Straight Culvert

Inlet Elevation (invert): 732.18 ft, Outlet Elevation (invert): 731.85 ft

Culvert Length: 111.00 ft, Culvert Slope: 0.0030

****

Culvert Performance Curve Plot: Dbl 4'x2' RCBC



Water Surface Profile Plot for Culvert: Dbl 4'x2' RCBC

Site Data - Dbl 4'x2' RCBC

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 732.18 ft

Outlet Station: 111.00 ft

Outlet Elevation: 731.85 ft

Number of Barrels: 2

Culvert Data Summary - Dbl 4'x2' RCBC

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Pr. Outlet No. 12 (Sta 176+20))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	731.85	0.00	0.00	0.00	0.00
8.00	732.45	0.60	3.47	1.13	0.96
16.00	732.70	0.85	4.17	1.58	1.00
24.00	732.87	1.02	4.64	1.91	1.02
32.00	733.02	1.17	4.99	2.18	1.04
39.00	733.12	1.27	5.25	2.39	1.06
48.00	733.25	1.40	5.54	2.62	1.07
56.00	733.35	1.50	5.76	2.80	1.08
64.00	733.44	1.59	5.96	2.97	1.09
72.00	733.52	1.67	6.14	3.13	1.10
80.00	733.60	1.75	6.31	3.28	1.10

Tailwater Channel Data - Pr. Outlet No. 12 (Sta 176+20)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0300

Channel Manning's n: 0.0400

Channel Invert Elevation: 731.85 ft

Roadway Data for Crossing: Pr. Outlet No. 12 (Sta 176+20)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 737.30 ft

Roadway Surface: Paved

Roadway Top Width: 76.00 ft

CULVERT DESIGN SUMMARY

MEMORANDUM

US Route 45: IL Route 132 to IL Route 173 (PTB 155-011)

To:	CBBEL c/o Ilene Dailey
IDOT JOB NO:	P-91-388-10
PREPARED BY:	John Hilsen, Regina Webster & Associates, Inc and Edmund M. Burke (CBBEL)
DATE:	October 15, 2014
RE:	Hydrology for Major Drainage Features – North Segment

This is a memorandum summarizing the different methodologies used to determine peak flow rates to the Major Drainage Features along US Route 45. RWA has been scoped with the analysis of Crossings DA4, DA8, DA13, DA16, DA18, DA19 and DA20. The purpose of this memo is to summarize the different methodologies use for crossings DA 13 and DA 19 located in the northern segment of US 45. Discussions for Crossings DA 16 & DA 18 which are also located within the northern segment are included in the respective Hydrologic Report for that crossing.

DA 13:

Existing Culvert Station 185+75: 6' x 4' Box

Drainage Area = 261 Acres West of US Route 45

The Hydrologic analysis for the watershed tributary to Crossing DA 13 has been calculated utilizing both the USGS Regression Equation (USGS Stream Stats) and the TR-20 hydrologic model following the procedures recommended in the NRCS TR-55 Manual.

<u>USGS Regression Equation:</u>

The USGS Stream Stats website was utilized to determine peak flow rates to Crossing DA13. The tributary area was modified as necessary to match areas delineated from Lake County Aerial Topography. The Flow rates were then adjusted for Urbanization using the methodology outlined in Chapter 4 of the IDOT Drainage Manual. Results are provided in **Table 2**.

<u>TR-20:</u>

A critical duration TR-20 Model has been developed utilizing procedures recommended in the NRCS TR-55 Manual and the Illinois State Water Survey (ISWS) Bulletin 70 rainfall data for the Waukegan Station. The rainfall data is provided in **Table 1**. The area tributary to Crossing DA 13 has been divided into two (2) subareas, DA13A and DA13B. The drainage areas are delineated on the General Location Drainage Map for Outlet DA 13. The existing land use for each of the sub-areas has been summarized on the Runoff Curve Number worksheets. There is one (1) detention basin that exists within subarea DA13A. We have obtained record plans from the Village of Lindenhurst and incorporated this information into the TR-20 model in order to model this existing storage. Storage volumes and elevation discharge rating table have been developed based on record plan data. A summary of the TR-20 input parameters is summarized in **Table 3**. A summary of the peak flow rates is provided in **Table 2**.

Hydraulics & WIT:

Crossing DA13 has been analyzed using HY8 and TR-20 flow rates. It is recommended that the existing 6'x4' box culvert be replaced with a new 2-9'x4' box culvert. The new installation would allow for a 12" embedment which did not previously exist. The TR-20 WIT provides water surface elevations and head conditions for existing conditions and proposed conditions. The proposed culvert replacement will lower proposed head conditions proper freeboard.

TABLE 1: RAINFALL DEPTHS (IN) ISWS BULLETIN 70 – WAUKEGAN STATION

Rainfall Frequency	Duration (hr)					
	1	3	6	12	24	48
10 – Year	1.82	2.47	2.91	3.36	3.85	4.29
50 – Year	2.56	3.49	4.09	4.74	5.45	5.89
100 – Year	3.00	4.10	4.79	5.56	6.40	6.70

TABLE 2: DA 13 PEAK FLOW RATES

Rainfall Recurrence Interval	Adjusted Stream Stats (CFS)	TR-20 (CFS)
10 – Year	261	71
50 – Year	369	175
100 – Year	399	244
500 – Year	500	355

TABLE 3: DA 13 TR-20 Input Parameters

Subarea ID	Area		Composite Curve Number (CN)	Time of Concentration (hr)	Existing Detention Storage
	Acres	Sq. Mi.			
DA13A	110.46	0.1726	83	2.05	Heritage Trails Phase 3 Pond
DA13B	150.42	0.2350	84	1.95	No

DA 16:

Existing Culvert Station 240+10: 13' x 5' Box

Drainage Area = 6.1 Square Miles West of US Route 45

See Hydraulic Report for Hastings Creek

DA 18:

Existing Culvert Station 266+39: 36" CMP

Drainage Area = 1.0 Square Miles West of US Route 45

See Hydraulic Report for Tributary to Hastings Creek

DA 19:

Existing Culvert Station 310+43: 3' x 2' Box

Drainage Area = 133 Acres West of US Route 45

The Hydrologic analysis for the watershed tributary to Crossing DA 19 has been calculated utilizing both the USGS Regression Equation (USGS Stream Stats) and the TR-20 hydrologic model following the procedures recommended in the NRCS TR-55 Manual.

USGS Regression Equation:

The USGS Stream Stats website was utilized to determine peak flow rates to Crossing DA19. The tributary area was modified as necessary to match areas delineated from Lake County Aerial Topography. The Flow rates were then adjusted for Urbanization using the methodology outlined in Chapter 4 of the IDOT Drainage Manual. Results are provided in **Table 4**.

TR-20:

A critical duration TR-20 Model has been developed utilizing procedures recommended in the NRCS TR-55 Manual and the Illinois State Water Survey (ISWS) Bulletin 70 rainfall data for the Waukegan Station. The rainfall data is provided in **Table 1**. The drainage area for DA19 is delineated on the General Location Drainage Map for Outlets DA 18 & DA 19. The existing land use for DA 19 has been summarized on the Runoff Curve Number worksheet. No detention storage has been modeled within DA 19. A summary of the TR-20 input parameters is summarized in **Table 5**. A summary of the peak flow rates is provided in **Table 4**.

Hydraulics & WIT:

Crossing DA19 has been analyzed using HY8 and TR-20 flow rates. It is recommended that the existing 3'x2' box culvert be replaced with a new 7'x4' box culvert. The new installation would allow for a 12" embedment which did not previously exist. The TR-20 WIT provides water surface elevations and head conditions for existing conditions and proposed conditions. The proposed culvert replacement will lower proposed head conditions and reduce the frequency of roadway overtopping at this location.

TABLE 4: DA 19 PEAK FLOW RATES

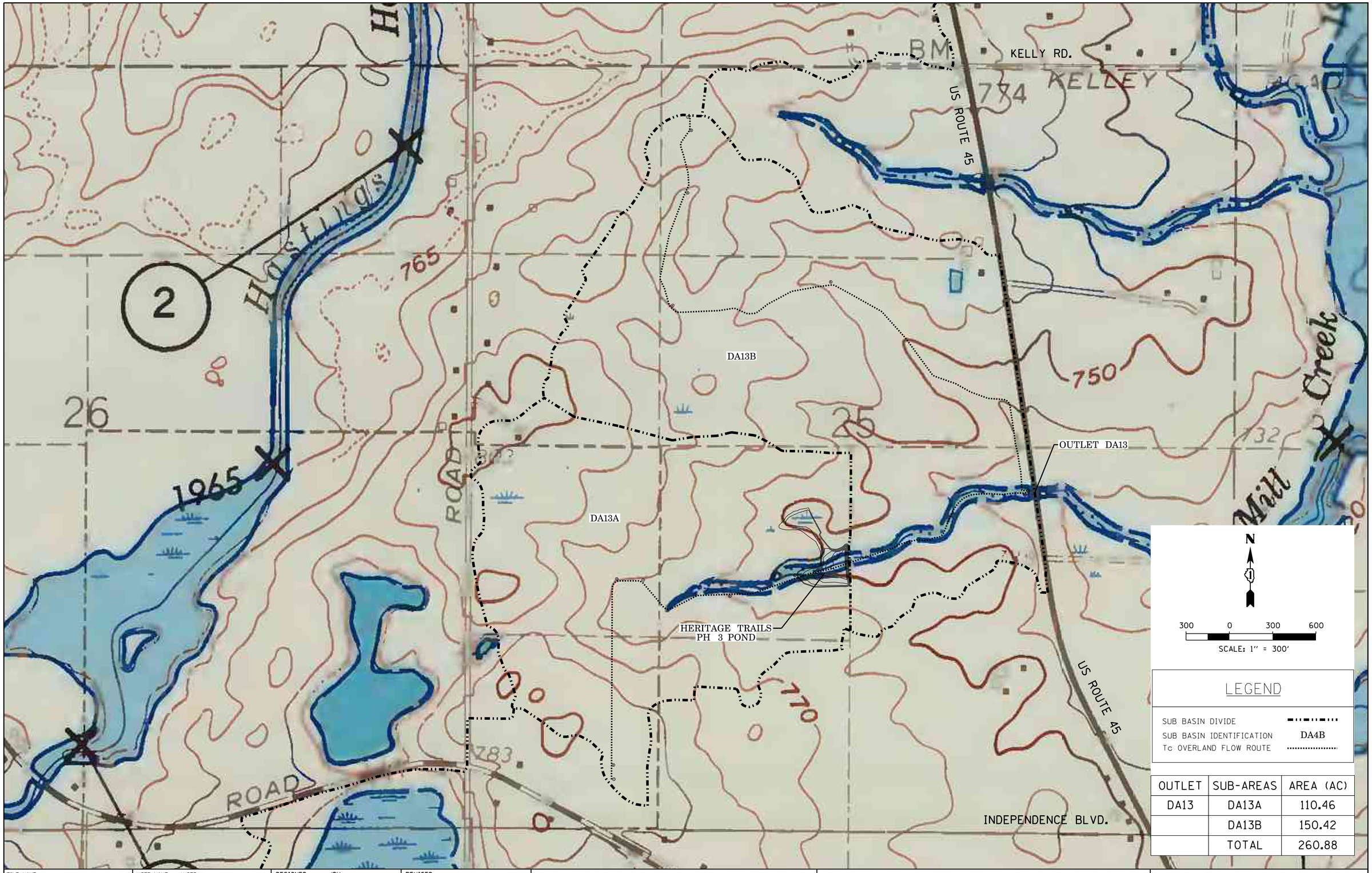
Rainfall Recurrence Interval	Adjusted Stream Stats (CFS)	TR-20 (CFS)
10 – Year	100	54
50 – Year	144	100
100 – Year	162	131
500 – Year	205	180

TABLE 5: DA 19 TR-20 Input Parameters

Subarea ID	Area		Composite Curve Number (CN)	Time of Concentration (hr)	Existing Detention Storage
	Acres	Sq. Mi.			
DA19	132.94	0.2077	82	1.65	No

CROSSING DA13 CULVERT SUPPORTING CALCULATIONS

CIVIL ENGINEERING CONSULTANTS
RWA
8619 W. Bryn Mawr Ave., Suite 602
Chicago, IL 60631-3551
773-283-2600 Fax: 773-283-2602
www.RWAengineers.com
Regina Webster & Associates, Inc.



LEGEND

SUB BASIN DIVIDE	
SUB BASIN IDENTIFICATION	DA4B
Tc OVERLAND FLOW ROUTE	

OUTLET	SUB-AREAS	AREA (AC)
DA13	DA13A	110.46
	DA13B	150.42
	TOTAL	260.88

FILE NAME = K:\Projects\11048\DesignCAD\Exhibits\gldn\DA13.dgn	USER NAME = $USER$	DESIGNED - JDH	REVISED -
	PLOT SCALE = $SCALE$	DRAWN - JDH	REVISED -
	PLOT DATE = 5/20/2014	CHECKED - DW	REVISED -
		DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

US ROUTE 45
EXISTING DRAINAGE AREAS – OUTLET DA13

SCALE: 1" = 300' | SHEET NO. 1 OF 1 SHEETS | STA. TO STA.

Time of Concentration (T_c) or Travel Time (T_t)

Project:	RWA #11048 / US Route 45 IDOT #P-91-338-10	By:	JDH	Date:	11/13/2013
Location:	Lindenhurst, IL	Checked:		Date:	
File:	K:\Projects\11048\Data\LDS\Tc\DA 13\[TC DA13A.xls]Tc				

Present / Developed

Tc through subarea DA13A

SHEET FLOW

	Segment ID	1-2				
Surface Description (table 3-1)		grass				
Manning's roughness coeff., n		0.24				
Flow Length, L (total L ≤ 300')	(ft)	100				
Two-yr 24-hr rainfall, P2	(in)	2.80				
Land slope, s	(ft/ft)	0.0075				
$T_t = (0.007(nL)^{0.8})/(P_2^{0.5}\, s^{0.4})$	(hr)	0.38	+		=	0.38 hr

SHALLOW CONCENTRATED FLOW

	Segment ID	2-3		3-4		4-5		5-6		
Surface Description (paved or unpaved)		unp.		paved		unp.		Flat Area		
Flow Length, L	(ft)	1300		170		700		890		
Watercourse slope, s	(ft/ft)	0.013		0.012		0.023				
Average velocity, V	(ft/s)	1.84		2.23		2.45		0.20		
T_t = L / 3600 V	(hr)	0.20	+	0.02	+	0.08	+	1.24	=	1.54 hr

CHANNEL FLOW

	Segment ID	6-7				
Cross-sectional flow area, a	(ft^2)					
Wetted perimeter, Pw	(ft)					
Hydraulic radius, r = a/Pw	(ft)					
Channel slope, s	(ft/ft)					
Manning's roughness coeff., n						
$V = (1.49\, r^{0.667}\, s^{0.5}) / n$	(ft/s)	3.00				
Flow length, L	(ft)	1420				
T_t = L / 3600 V	(hr)	0.13	+		=	0.13 hr

Watershed or subarea T_c or T_t = 2.05 hr

Time of Concentration (T_c) or Travel Time (T_t)

Project:	RWA #11048 / US Route 45 IDOT #P-91-338-10	By:	JDH	Date:	11/13/2013
Location:	Lindenhurst, IL	Checked:		Date:	
File:	K:\Projects\11048\Data\LDS\Tc\DA 13\[TC DA13B.xls]Tc				

Present / Developed

Tc through subarea DA13B

SHEET FLOW

	Segment ID	1-2				
Surface Description (table 3-1)		woods				
Manning's roughness coeff., n		0.4				
Flow Length, L (total L ≤ 300')	(ft)	100				
Two-yr 24-hr rainfall, P2	(in)	2.80				
Land slope, s	(ft/ft)	0.02				
$T_t = (0.007(nL)^{0.8})/(P_2^{0.5}\, s^{0.4})$	(hr)	0.38	+		=	0.38 hr

SHALLOW CONCENTRATED FLOW

	Segment ID	2-3		3-4		4-5				
Surface Description (paved or unpaved)		unp.		Flat Area		unp.				
Flow Length, L	(ft)	460		830		1300				
Watercourse slope, s	(ft/ft)	0.03				0.016				
Average velocity, V	(ft/s)	2.79		0.20		2.04				
$T_t = L / 3600\, V$	(hr)	0.05	+	1.15	+	0.18	+		=	1.38 hr

CHANNEL FLOW

	Segment ID	5-6					
Cross-sectional flow area, a	(ft^2)						
Wetted perimeter, Pw	(ft)						
Hydraulic radius, r = a/Pw	(ft)						
Channel slope, s	(ft/ft)						
Manning's roughness coeff., n							
$V = (1.49\, r^{0.667}\, s^{0.5}) / n$	(ft/s)	3.00			Assume		
Flow length, L	(ft)	2070					
$T_t = L / 3600\, V$	(hr)	0.19	+			=	0.19 hr

Watershed or subarea T_c or T_t = 1.95 hr

Runoff Curve Number

Project: RWA# 11048 / US Route 45 IDOT #P-91-338-1 By: JDH Date: 11/13/2013
Location: Lindenhurst, IL Checked: Date:
File: K:\Projects\11048\Data\LDS\CN\DA 13\[CN DA13A.xls]CN

Circle One: Present Developed Description: DA13A

Soil Name and Hydrologic Group (Appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	Curve Number Table 2-2	Curve Number Fig. 2-3	Curve Number Fig. 2-4	Area X acres / sq. mi. / %	Product of Curve Number and Area
B	Residential 1/4 Ac *	83			4.28	355.24
C	Residential 1/4 Ac	83			65.52	5438.16
D	Residential 1/4 Ac	87			26.5	2305.5
C	Woods	73			11.16	814.68
C	Open Space (Parks)	79			2.49	196.71
D	Open Space (Parks)	84			0.51	42.84
				Totals =	110.46	9153.13

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{9153.13}{110.46} = \underline{82.864}$$

Use CN = **83**

*Note: Residential 1/4 Ac Hydrologic Group B, Use CN for Hydrologic Group C since developed

Runoff Curve Number

Project: RWA# 11048 / US Route 45 IDOT #P-91-338-1 By: JDH Date: 11/13/2013
Location: Lindenhurst, IL Checked: Date:
File: K:\Projects\11048\Data\LDS\CN\DA 13\[CN DA13B.xls]CN

Circle One: Present Developed Description: DA13B

Soil Name and Hydrologic Group (Appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	Curve Number Table 2-2	Curve Number Fig. 2-3	Curve Number Fig. 2-4	Area [X] acres [ ] sq. mi. [ ] %	Product of Curve Number and Area
C & D	Impervious	98			2.82	276.36
C	Woods	73			17.36	1267.28
D	Woods	79			2.48	195.92
C	Woods-Grass Combination	76			5.43	412.68
D	Woods-Grass Combination	82			3.32	272.24
C	Farmsteads	82			6.3	516.6
B	Row Crops (SR)	78			1.92	149.76
C	Row Crops (SR)	85			83.74	7117.9
D	Row Crops (SR)	89			27.05	2407.45
				Totals =	150.42	12616.19

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{12616.19}{150.42} = \underline{83.873}$$

Use CN = **84**

*Note: Residential 1/4 Ac Hydrologic Group B, Use CN for Hydrologic Group C since developed

Existing Conditions - Based on Record Plans

ELEVATION-STORAGE RELATIONSHIP

POND: Existing Dry Bottom Pond - Heritage Trails Ph 3 Subdivision (DA13)
JOB NO. RWA #11048 / IDOT #P-91-338-10
PROJECT: US ROUTE 45
FILE: N:\Idot\100063\Consultants\RWA\RWA Drainage\DLZ_All Latest Info\LDS\Ex Det Storage Volumes\DA 13\[HERITAGE TRAILS BOTTOM POND_EX STORAGE VOL_DA13.xlsx]STO
DATE: 5-Nov-13

SIDE SLOPES: 4 :1 (H:V)

ELEVATION (ft)		AREA (s.f.)	AREA (ac)	AVERAGE AREA (ac)	Δ ELEVATION (ft)	INCREMENTAL STORAGE (ac-ft)	CUMULATIVE STORAGE (ac-ft)
744.00	BOT	8,740	0.201				0.00
				0.386	1.00	0.386	
745.00		24,861	0.571				0.39
				0.748	1.00	0.748	
746.00		40,297	0.925				1.13
				1.113	1.00	1.113	
747.00		56,632	1.300				2.25
				1.683	1.00	1.683	
748.00		89,956	2.065				3.93
				2.314	1.00	2.314	
749.00		111,665	2.563				6.24
				3.033	1.00	3.033	
750.00		152,558	3.502				9.28

NOTE:
POND VOLUMES HAVE BEEN CALCULATED FROM RECORD PLANS FOR HERITAGE TRAILS SUBDIVISION PH 3, LATEST REVISION DATE 9/12/97.

Prepared by: JDH
File: HERITAGE TRAILS BOTTOM POND_EX STORAGE VOL_DA13.xlsx
Date Printed: 10/15/2014

EXISTING CONDITIONS - HERITAGE TRAILS DRY BOTTOM POND (DA13A)
ORIFICE/WEIR STRUCTURE RATING ANALYSIS

JOB NO.: RWA #11048 / IDOT #P-91-338-10
PROJECT NAME: US ROUTE 45
DESCRIPTION: HERITAGE TRAILS (PHASE 3) DRY BOTTOM POND - OUTLET
FILENAME: N:\Idot\100063\Consultants\RWA\RWA Drainage\DLZ_All Latest Info\LDS\Ex Det Restrictor Calculations\DA 13\[HERITAGE TRAILS DRY BOT POND_EX REST_DA13A.xls]ORIFICE
DATE: 6-Nov-13

OUTLET:

ORIFICE #1	10	IN. DIA. @ ELEV	742.70
ORIFICE #2	N/A	IN. DIA. @ ELEV	N/A
WEIR #1:	20	FEET WIDE @ ELEV	748.50
WEIR #2:	260	FEET WIDE @ ELEV	749

HYDRAULIC DIMENSIONS

	PIPE OUTLET # 1	#2	
STORM SEWER AREA (ft^2)	0.5454		
STORM SEWER DIAMETER (in)	10.0		
MANNINGS N	0.013		
DOWNSTREAM INV OVERFLOW SS	742.70		Invert per plan
LENGTH OF STORM SEWER	35.00		
TAILWATER ELEV. (ft-NGVD)	NA	NA	Assume no tailwater
WEIR LENGTH, L (ft)	20.00	260.00	
WEIR COEFFICIENT, C	2.5	2.5	
WEIR ELEV. (ft-NGVD)	748.50	749.0	Pond overtops weir at elevation 748.5 & TB at elevation 749.0 per record plan
SIDE SLOPE, Z (i.e., Z : 1) (ft)	5	5	

STORM SEWER OUTLET = Q = 1.486/n x A x R2/3 x s1/2
WEIR FLOW EQUATION: $Q = CL(H)^{1.5}$ or $Q = CA(H)^{0.5}$

ELEVATION-DISCHARGE RELATIONSHIP

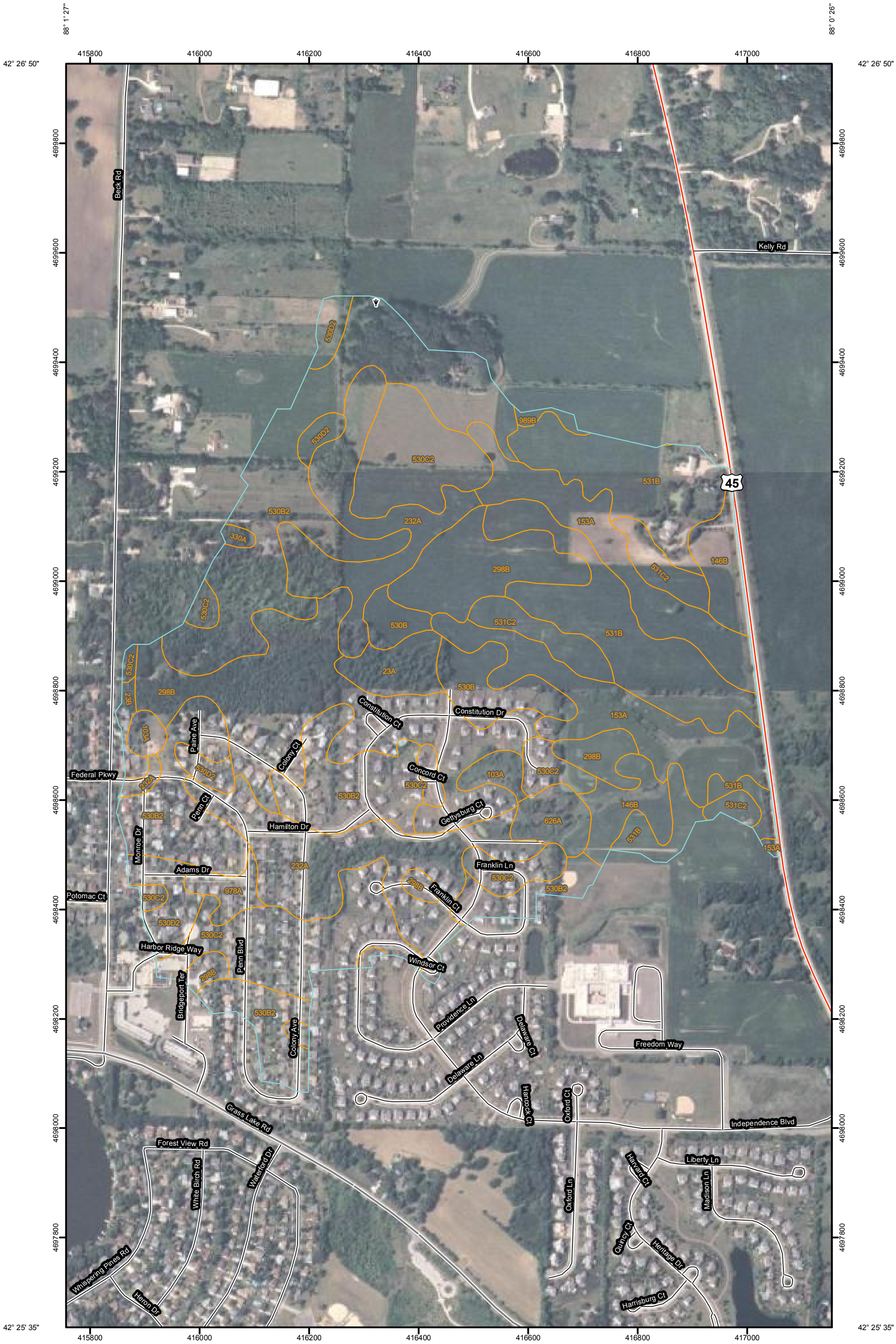
Elevation (feet)	$Q_{OUTLET\ \#1}$ (cfs)	$Q_{ORIFICE\ \#2}$ (cfs)	$Q_{WEIR\ \#1}$ (cfs)	$Q_{WEIR\ \#2}$ (cfs)	Q_{TOTAL} (cfs)
744.0	0.00	0.00	0.00	0.00	0.00
745.0	4.49	0.00	0.00	0.00	4.49
746.0	5.82	0.00	0.00	0.00	5.82
747.0	6.90	0.00	0.00	0.00	6.90
748.0	7.83	0.00	0.00	0.00	7.83
749.0	8.66	0.00	19.89	0.00	28.55
750.0	9.42	0.00	126.30	662.50	798.22

NOTES:

DATA FOR CONTROL STRUCTURE HAS BEEN OBTAINED FROM RECORD PLANS FOR HERITAGE TRAILS SUBDIVISION - PH 2 & 3, LATEST REVISION DATE 9/12/97. POND CONTROLLED BY 10" RCP. SEE SHEET 5 OF 19.

Prepared by: JDH
File: HERITAGE TRAILS DRY BOT POND_EX REST_DA13A.xls
Date Printed: 10/15/2014

Soil Map—Lake County, Illinois
(DA13)



Map Scale: 1:6,380 if printed on B size (11" x 17") sheet.

N

Meters
0 40 80 160 240

Feet
0 150 300 600 900

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:6,380 if printed on B size (11" × 17") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N NAD83

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

Soil Survey Area: Lake County, Illinois
Survey Area Data: Version 5, Feb 12, 2010

Date(s) aerial images were photographed: 7/31/2007

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

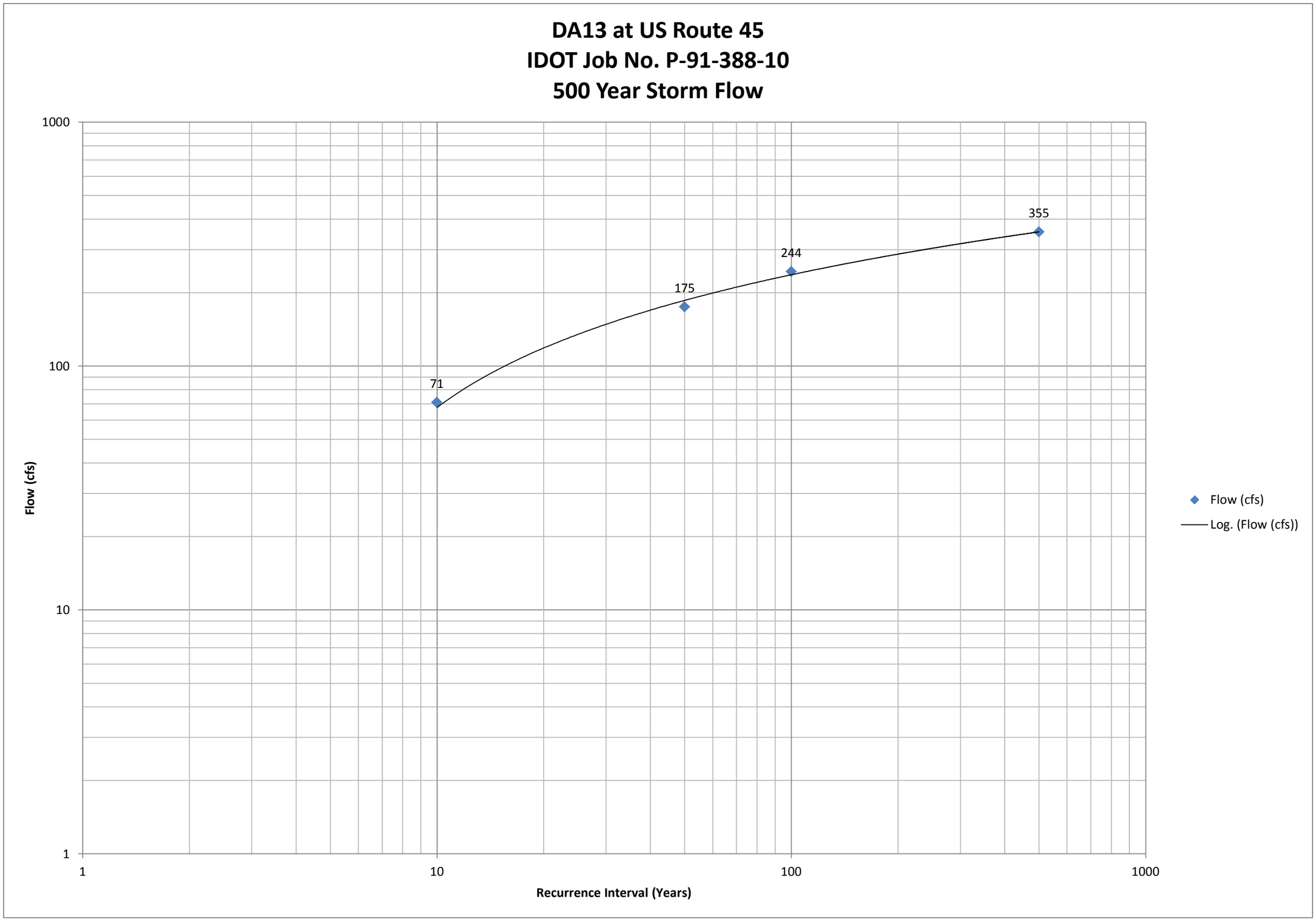
Map Unit Legend

Lake County, Illinois (IL097)				
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**	
23A	Blount silt loam, 0 to 2 percent slopes	4.0	C	1.5%
23B	Blount silt loam, 2 to 4 percent slopes	1.1	C	0.4%
103A	Houghton muck, 0 to 2 percent slopes	2.9	D	1.1%
146B	Elliott silt loam, 2 to 4 percent slopes	8.4	C	3.2%
153A	Pella silty clay loam, 0 to 2 percent slopes	24.7	D	9.5%
232A	Ashkum silty clay loam, 0 to 2 percent slopes	32.6	D	12.5%
298B	Beecher silt loam, 2 to 4 percent slopes	41.5	C	15.9%
330A	Peotone silty clay loam, 0 to 2 percent slopes	0.5	D	0.2%
530B	Ozaukee silt loam, 2 to 4 percent slopes	7.4	C	2.8%
530B2	Ozaukee silt loam, 2 to 4 percent slopes, eroded	55.4	C	21.2%
530C2	Ozaukee silt loam, 4 to 6 percent slopes, eroded	29.9	C	11.5%
530D2	Ozaukee silt loam, 6 to 12 percent slopes, eroded	7.5	C	2.9%
531B	Markham silt loam, 2 to 4 percent slopes	31.6	C	12.1%
531C2	Markham silt loam, 4 to 6 percent slopes, eroded	7.4	C	2.9%
626A	Kish loam, 0 to 2 percent slopes	3.3	B*	1.3%
978A	Wauconda and Beecher silt loams, 0 to 2 percent slopes	2.3	B*	0.9%
989B	Mundelein and Elliott silt loams, 2 to 4 percent slopes	0.6	B	0.2%
Totals for Area of Interest		**261.0**		**100.0%**

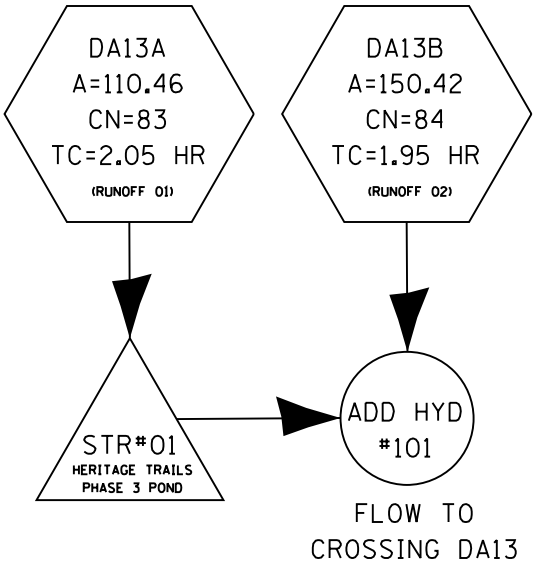
*ASSUME C IN DEVELOPED AREAS

DA13A:3.9% B, 71.6% C, 24.5% D
RESIDENTIAL 1/4 LOTS = 96.3 AC+/-
WOODS = 11.2 AC+/-
PARKS = 3.0 AC+/-

DA13B:1.3% B, 76.2% C, 22.5% D
WOODS = 19.8 AC+/-
ROW CROPS (SR) = 112.7 AC+/-
FARMSTEAD = 6.3 AC+/-
IMPERVIOUS = 2.8 AC+/-
WOODS-GRASS COMBO = 8.8 AC+/-


DA13 at US Route 45
IDOT Job No. P-91-388-10
500 Year Storm Flow
1000
100
10
1
Flow (cfs)
71
175
244
355
1
10
100
1000
Recurrence Interval (Years)
Flow (cfs)
Log. (Flow (cfs))

TR–20 HYDROLOGIC MODEL SCHEMATIC DA13



US ROUTE 45
IDOT #P-91-338-1

PREPARED BY: RWA Regina Webster & Associates, Inc.

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1



 *****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************


 JOB TR-20 11048E13.T20                            SUMMARY
 TITLE     US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS
 TITLE     RWA#11048  JDH 13NOV13 * DA13       (B-70)
  5 RAINFL 6             0.05                                          TIMELESS
  8           0.00       0.12        0.26        0.40        0.51       ISWS
  8           0.59       0.65        0.71        0.75        0.78       HUFF
  8           0.82       0.84        0.87        0.89        0.91       1ST QUAR
  8           0.93       0.95        0.96        0.97        0.99       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  5 RAINFL 7             0.05                                          TIMELESS
  8           0.00       0.04        0.09        0.14        0.19       ISWS
  8           0.25       0.32        0.40        0.52        0.61       HUFF
  8           0.68       0.73        0.78        0.82        0.86       2ND QUAR
  8           0.89       0.92        0.94        0.96        0.98       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  5 RAINFL 8             0.05                                          TIMELESS
  8           0.00       0.03        0.06        0.10        0.13       ISWS
  8           0.16       0.20        0.23        0.27        0.33       HUFF
  8           0.39       0.46        0.56        0.68        0.79       3RD QUAR
  8           0.85       0.89        0.92        0.95        0.98       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  5 RAINFL 9             0.05                                          TIMELESS
  8           0.00       0.02        0.05        0.08        0.10       ISWS
  8           0.13       0.16        0.18        0.21        0.24       HUFF
  8           0.28       0.32        0.35        0.40        0.44       4TH QUAR
  8           0.50       0.58        0.68        0.83        0.93       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  3 STRUCT      01
  8                      744.0         0.00        0.00
  8                      745.0         4.49        0.39
  8                      746.0         5.82        1.13
  8                      747.0         6.90        2.25
  8                      748.0         7.83        3.93
  8                      749.0        28.55        6.24
  8                      750.0       798.22        9.28
  9 ENDTBL
  6 RUNOFF 1  01       1 0.1726      83.         2.05        1 0 0 1 0 1 DA13A 11
  6 RESVOR 2    01 1   2 744.0                               1 0 0 1 0 1 HT PH3
  6 RUNOFF 1  02       3 0.2350      84.         1.95        1 0 0 1 0 1 DA13B 15
  6 ADDHYD 4 101   2 3 4                                     1 0 0 1 0 1
    ENDATA
  7 INCREM 6             0.0833
  7 COMPUT 7  01   101               1.82        1.0         6 2  01  10 1HR 10YR
    ENDCMP 1
  7 COMPUT 7  01   101               2.47        3.0         6 2  03  10 3HR 10YR
1



 *********************80-80 LIST OF INPUT DATA (CONTINUED)*********************

    ENDCMP 1
  7 COMPUT 7  01   101               2.91        6.0         6 2  06  10 6HR 10YR
    ENDCMP 1
  7 INCREM 6             0.167
  7 COMPUT 7  01   101               3.36        12.0        7 2  12  10 12H 10YR
    ENDCMP 1
  7 COMPUT 7  01   101               3.85        24.0        8 2  24  10 24H 10YR
    ENDCMP 1
  7 INCREM 6             0.25
  7 COMPUT 7  01   101               4.29        48.0        9 2  48  10 48H 10YR
    ENDCMP 1
  7 INCREM 6             0.0833
  7 COMPUT 7  01   101               2.56        1.0         6 2  01  50 1HR 50YR
    ENDCMP 1
  7 COMPUT 7  01   101               3.49        3.0         6 2  03  50 3HR 50YR
    ENDCMP 1
  7 COMPUT 7  01   101               4.09        6.0         6 2  06  50 6HR 50YR
    ENDCMP 1
  7 INCREM 6             0.167
  7 COMPUT 7  01   101               4.74        12.0        7 2  12  50 12H 50YR
    ENDCMP 1
  7 COMPUT 7  01   101               5.45        24.0        8 2  24  50 24H 50YR
    ENDCMP 1
  7 INCREM 6             0.25
  7 COMPUT 7  01   101               5.89        48.0        9 2  48  50 48H 50YR
    ENDCMP 1
  7 INCREM 6             0.0833
  7 COMPUT 7  01   101               3.00        1.0         6 2  01  99 1HR100YR
    ENDCMP 1
  7 COMPUT 7  01   101               4.10        3.0         6 2  03  99 3HR100YR
    ENDCMP 1
  7 COMPUT 7  01   101               4.79        6.0         6 2  06  99 6HR100YR
    ENDCMP 1
  7 INCREM 6             0.167
  7 COMPUT 7  01   101               5.56        12.0        7 2  12  99 12H100YR
    ENDCMP 1
  7 COMPUT 7  01   101               6.40        24.0        8 2  24  99 24H100YR
    ENDCMP 1
  7 INCREM 6             0.25
  7 COMPUT 7  01   101               6.70        48.0        9 2  48  99 48H100YR
    ENDJOB 2

 ******************************END OF 80-80 LIST******************************

 *** WARNING - UNEXPECTED RECORD(S) ENCOUNTERED WHEN LOOKING FOR "JOB" RECORD.
               IMAGES OF FIRST 10 RECORDS IGNORED FOLLOW:                  ***
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1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   1   JOB NO.   1                     PAGE   1
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 --------    NOTE - TR-20 USER NOTE FILE (TR20NOTE.TEX) NOT FOUND.     --------
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   1   JOB NO.   1                     PAGE   2


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .083 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        1HR 10YR
    STARTING TIME =   .00       RAIN DEPTH =  1.82       RAIN DURATION =  1.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
    ALTERNATE NO. = 1           STORM NO. =10            RAIN TABLE NO. = 6


 OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        1.70                          35.6                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                     .58 WATERSHED INCHES;      64 CFS-HRS;       5.3 ACRE-FEET.

    DURATION(HRS)   2      4      5
    FLOW(CFS)      12      2      0


 OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        3.24                           7.6                        747.75

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                     .57 WATERSHED INCHES;      64 CFS-HRS;       5.3 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12
    FLOW(CFS)       7      7      6      5      2      0


 OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        1.63                          54.3                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                     .62 WATERSHED INCHES;      94 CFS-HRS;       7.8 ACRE-FEET.

    DURATION(HRS)   2      4      5
    FLOW(CFS)      17      2      0


 OPERATION ADDHYD   XSECTION 101
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   1   JOB NO.   1                     PAGE   3


    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        1.65                          60.5                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                     .60 WATERSHED INCHES;     158 CFS-HRS;      13.1 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     12
    FLOW(CFS)      23      9      7      6      3      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   1


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        3HR 10YR
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    STARTING TIME =   .00       RAIN DEPTH =  2.47       RAIN DURATION =  3.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
    ALTERNATE NO. = 3           STORM NO. =10            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.26                          43.2                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.03 WATERSHED INCHES;     115 CFS-HRS;       9.5 ACRE-FEET.

    DURATION(HRS)   2      4      6      6
    FLOW(CFS)      28      7      1      0


  OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        3.93                          21.1                         748.64

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.03 WATERSHED INCHES;     115 CFS-HRS;       9.5 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     15
    FLOW(CFS)      15      8      7      6      5      4      1      0


  OPERATION RUNOFF   XSECTION   2
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS   2   JOB NO.   1                     PAGE   4


    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.16                          64.0                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.09 WATERSHED INCHES;     166 CFS-HRS;      13.7 ACRE-FEET.

    DURATION(HRS)   2      4      6      6
    FLOW(CFS)      41      8      1      0


  OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.18                          71.0                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.07 WATERSHED INCHES;     281 CFS-HRS;      23.2 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     15
    FLOW(CFS)      56     22      8      7      6      5      1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   2


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        6HR 10YR
    STARTING TIME =   .00       RAIN DEPTH =  2.91       RAIN DURATION =  6.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
    ALTERNATE NO. = 6           STORM NO. =10            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.76                          39.8                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.37 WATERSHED INCHES;     153 CFS-HRS;      12.7 ACRE-FEET.

    DURATION(HRS)   2      4      6      8      9
    FLOW(CFS)      29     18      7      1      0


  OPERATION RESVOR   STRUCTURE  1
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS   3   JOB NO.   1                     PAGE   5


    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        4.88                          22.6                         748.71

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.37 WATERSHED INCHES;     153 CFS-HRS;      12.6 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      20     14      8      7      6      5      4      1

    DURATION(HRS)  17
    FLOW(CFS)       0


  OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.65                          58.4                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.44 WATERSHED INCHES;     219 CFS-HRS;      18.1 ACRE-FEET.
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   DURATION(HRS)   2      4      6      8      9
   FLOW(CFS)      43     25     10      1      0


 OPERATION ADDHYD   XSECTION 101

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       2.68                          65.5                       (NULL)
       3.52                          63.1                       (NULL)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  1.41 WATERSHED INCHES;     372 CFS-HRS;      30.7 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     14     16
   FLOW(CFS)      59     43     22      8      7      6      5      1

   DURATION(HRS)  17
   FLOW(CFS)       0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   3


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .167 HOURS
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   4   JOB NO.   1                     PAGE   6



 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        12H 10YR
   STARTING TIME =   .00       RAIN DEPTH =  3.36       RAIN DURATION = 12.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
   ALTERNATE NO. =12           STORM NO. =10            RAIN TABLE NO. = 7


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       6.30                          33.2                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  1.74 WATERSHED INCHES;     194 CFS-HRS;      16.0 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     13
   FLOW(CFS)      28     21     15     11      5      1      0


 OPERATION RESVOR   STRUCTURE  1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       8.73                          22.2                        748.69

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  1.74 WATERSHED INCHES;     194 CFS-HRS;      16.0 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     14     16
   FLOW(CFS)      21     17     12      8      7      7      6      5

   DURATION(HRS)  18     20     20
   FLOW(CFS)       2      1      0


 OPERATION RUNOFF   XSECTION   2

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       6.20                          48.0                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  1.82 WATERSHED INCHES;     275 CFS-HRS;      22.8 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     13
   FLOW(CFS)      39     29     21     15      6      1      0


 OPERATION ADDHYD   XSECTION 101
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   4   JOB NO.   1                     PAGE   7


   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       6.25                          55.4                       (NULL)
       7.26                          57.7                       (NULL)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  1.78 WATERSHED INCHES;     469 CFS-HRS;      38.8 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     14     16
   FLOW(CFS)      55     48     36     26     13      8      7      6

   DURATION(HRS)  18     20     21
   FLOW(CFS)       4      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   4


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        24H 10YR
   STARTING TIME =   .00       RAIN DEPTH =  3.85       RAIN DURATION = 24.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
   ALTERNATE NO. =24           STORM NO. =10            RAIN TABLE NO. = 8
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 OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       17.02                          30.1                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.16 WATERSHED INCHES;     240 CFS-HRS;      19.8 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      27     20     14     11      9      9      6      4

    DURATION(HRS)  18     20     21
    FLOW(CFS)       2      1      0


 OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       18.19                          24.6                        748.81

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.16 WATERSHED INCHES;     240 CFS-HRS;      19.8 ACRE-FEET.
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   5   JOB NO.   1                     PAGE   8


    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)      19     12      8      7      6      6      5      2

    DURATION(HRS)  27     28
    FLOW(CFS)       1      0


 OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.96                          42.3                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.24 WATERSHED INCHES;     339 CFS-HRS;      28.1 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      37     28     20     16     13     12      9      5

    DURATION(HRS)  18     20     22     22
    FLOW(CFS)       4      2      0      0


 OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       17.38                          63.8                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.20 WATERSHED INCHES;     580 CFS-HRS;      47.9 ACRE-FEET.

    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)      48     33     25     20     12      8      6      5

    DURATION(HRS)  27     30
    FLOW(CFS)       2      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   5


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .250 HOURS
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   6   JOB NO.   1                     PAGE   9



 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        48H 10YR
    STARTING TIME =   .00       RAIN DEPTH =  4.29       RAIN DURATION = 48.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .250 HOURS
    ALTERNATE NO. =48           STORM NO. =10            RAIN TABLE NO. = 9


 OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       43.55                          23.3                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.54 WATERSHED INCHES;     283 CFS-HRS;      23.4 ACRE-FEET.

    DURATION(HRS)   4      8     12     16     20     24     28     32
    FLOW(CFS)      18     13      9      6      4      4      2      2

    DURATION(HRS)  36     39
    FLOW(CFS)       1      0


 OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       44.92                          19.8                        748.58

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.54 WATERSHED INCHES;     283 CFS-HRS;      23.4 ACRE-FEET.

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    DURATION(HRS)   4      8     12     16     20     24     28     32
    FLOW(CFS)      16      8      7      6      5      5      4      3

    DURATION(HRS)  36     40     44     46
    FLOW(CFS)       2      1      1      0


  OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       26.61                          5.8                        (RUNOFF)
       31.72                          8.2                        (RUNOFF)
       43.50                         32.6                        (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   2.63 WATERSHED INCHES;     398 CFS-HRS;      32.9 ACRE-FEET.
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS   6   JOB NO.   1                     PAGE  10


    DURATION(HRS)   4      8     12     16     20     24     28     32
    FLOW(CFS)      25     18     12      8      6      5      3      2

    DURATION(HRS)  36     40     41
    FLOW(CFS)       2      1      0


  OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       26.84                          9.5                        (NULL)
       43.93                         50.0                        (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   2.59 WATERSHED INCHES;     681 CFS-HRS;      56.3 ACRE-FEET.

    DURATION(HRS)   6     12     18     24     30     36     42     48
    FLOW(CFS)      33     19     12      9      7      5      3      1

    DURATION(HRS)  49
    FLOW(CFS)       0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   6


  EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .083 HOURS


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        1HR 50YR
     STARTING TIME =   .00       RAIN DEPTH =  2.56       RAIN DURATION =  1.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 1           STORM NO. =50            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        1.66                         68.0                        (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   1.10 WATERSHED INCHES;     123 CFS-HRS;      10.1 ACRE-FEET.

    DURATION(HRS)   2      4      6
    FLOW(CFS)      24      3      0
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS   7   JOB NO.   1                     PAGE  11



  OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.72                         27.6                         748.96

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   1.10 WATERSHED INCHES;     123 CFS-HRS;      10.1 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14
    FLOW(CFS)      17      8      7      6      5      2      0


  OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        1.60                        101.8                        (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   1.16 WATERSHED INCHES;     176 CFS-HRS;      14.6 ACRE-FEET.

    DURATION(HRS)   2      4      6
    FLOW(CFS)      30      4      0


  OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        1.61                        109.2                        (NULL)
        1.80                        107.5                        (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   1.14 WATERSHED INCHES;     299 CFS-HRS;      24.7 ACRE-FEET.
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    DURATION(HRS)   2      4      6      8     10     12     14     14
    FLOW(CFS)      54     16      8      7      6      3      1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   7


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        3HR 50YR
     STARTING TIME =   .00       RAIN DEPTH =  3.49       RAIN DURATION =  3.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 3           STORM NO. =50            RAIN TABLE NO. = 6
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS   8   JOB NO.   1                     PAGE  12



  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.17                          78.5                       (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.85 WATERSHED INCHES;     206 CFS-HRS;      17.0 ACRE-FEET.

     DURATION(HRS)   2      4      6      7
     FLOW(CFS)      50     11      1      0


  OPERATION RESVOR   STRUCTURE  1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.60                          73.1                        749.06

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.85 WATERSHED INCHES;     206 CFS-HRS;      17.0 ACRE-FEET.

     DURATION(HRS)   2      4      6      8     10     12     14     15
     FLOW(CFS)      28     13      7      7      6      5      1      0


  OPERATION RUNOFF   XSECTION   2

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.07                         114.9                       (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.93 WATERSHED INCHES;     292 CFS-HRS;      24.2 ACRE-FEET.

     DURATION(HRS)   2      4      6      7
     FLOW(CFS)      71     15      2      0


  OPERATION ADDHYD   XSECTION 101

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.55                         174.6                       (NULL)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.89 WATERSHED INCHES;     498 CFS-HRS;      41.1 ACRE-FEET.

     DURATION(HRS)   2      4      6      8     10     12     14     16
     FLOW(CFS)     102     35     10      7      6      5      2      0
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS   9   JOB NO.   1                     PAGE  13



  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   8


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        6HR 50YR
     STARTING TIME =   .00       RAIN DEPTH =  4.09       RAIN DURATION =  6.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 6           STORM NO. =50            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.63                          70.8                       (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.36 WATERSHED INCHES;     263 CFS-HRS;      21.8 ACRE-FEET.

     DURATION(HRS)   2      4      6      8      9
     FLOW(CFS)      51     30     13      2      0


  OPERATION RESVOR   STRUCTURE  1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         3.08                          66.9                        749.05

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.36 WATERSHED INCHES;     263 CFS-HRS;      21.7 ACRE-FEET.

     DURATION(HRS)   2      4      6      8     10     12     14     16
     FLOW(CFS)      36     25     12      7      7      6      5      2

     DURATION(HRS)  17
     FLOW(CFS)       0
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 OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.53                         102.6                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.45 WATERSHED INCHES;     372 CFS-HRS;      30.7 ACRE-FEET.
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS   9   JOB NO.   1                     PAGE  14


    DURATION(HRS)   2      4      6      8      9
    FLOW(CFS)      71     41     17      2      0


 OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        3.04                         164.3                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.41 WATERSHED INCHES;     635 CFS-HRS;      52.4 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)     107     66     36     10      7      6      5      2

    DURATION(HRS)  18
    FLOW(CFS)       0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   9


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .167 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        12H 50YR
    STARTING TIME =   .00       RAIN DEPTH =  4.74       RAIN DURATION = 12.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
    ALTERNATE NO. =12           STORM NO. =50            RAIN TABLE NO. = 7


 OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        6.20                          56.5                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.94 WATERSHED INCHES;     327 CFS-HRS;      27.1 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14
    FLOW(CFS)      46     34     24     17      9      2      0


 OPERATION RESVOR   STRUCTURE  1
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS  10   JOB NO.   1                     PAGE  15


    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        6.53                          56.8                        749.04

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.94 WATERSHED INCHES;     328 CFS-HRS;      27.1 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      38     28     22     15      8      7      6      6

    DURATION(HRS)  18     20     22
    FLOW(CFS)       5      1      0


 OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        6.10                          80.3                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.03 WATERSHED INCHES;     460 CFS-HRS;      38.0 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     14
    FLOW(CFS)      64     47     34     24     14      3      0      0


 OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        6.49                         134.2                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.99 WATERSHED INCHES;     788 CFS-HRS;      65.1 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      98     74     56     43     24     10      7      6

    DURATION(HRS)  18     20     22     22
    FLOW(CFS)       5      3      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  10
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1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS  11   JOB NO.   1                     PAGE  16



 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        24H 50YR
    STARTING TIME =   .00       RAIN DEPTH =  5.45       RAIN DURATION = 24.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
    ALTERNATE NO. =24           STORM NO. =50            RAIN TABLE NO. = 8


 OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.94                         47.6                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.58 WATERSHED INCHES;     399 CFS-HRS;      33.0 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      42     32     23     19     15     14     11      7

    DURATION(HRS)  18     20     22     23
    FLOW(CFS)       6      3      1      0


 OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       15.93                         46.3                        749.02
       16.99                         47.6                        749.02

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.59 WATERSHED INCHES;     399 CFS-HRS;      33.0 ACRE-FEET.

    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)      33     22     16      9      7      7      6      5

    DURATION(HRS)  27     30     31
    FLOW(CFS)       2      1      0


 OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.87                         66.3                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.68 WATERSHED INCHES;     559 CFS-HRS;      46.2 ACRE-FEET.
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS  11   JOB NO.   1                     PAGE  17


    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      60     44     32     26     21     19     15     11

    DURATION(HRS)  18     20     22     24
    FLOW(CFS)       8      4      2      0


 OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.92                        113.8                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.64 WATERSHED INCHES;     958 CFS-HRS;      79.2 ACRE-FEET.

    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)      81     52     38     32     20     14      8      6

    DURATION(HRS)  27     30     32
    FLOW(CFS)       5      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  11


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .250 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        48H 50YR
    STARTING TIME =   .00       RAIN DEPTH =  5.89       RAIN DURATION = 48.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .250 HOURS
    ALTERNATE NO. =48           STORM NO. =50            RAIN TABLE NO. = 9


 OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       26.59                          6.9                       (RUNOFF)
       31.76                          9.3                       (RUNOFF)
       43.54                         34.5                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.99 WATERSHED INCHES;     444 CFS-HRS;      36.7 ACRE-FEET.
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS  12   JOB NO.   1                     PAGE  18
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    DURATION(HRS)   4      8     12     16     20     24     28     32
    FLOW(CFS)      26     19     14      9      7      6      4      3

    DURATION(HRS)  36     40     42
    FLOW(CFS)       2      1      0


  OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       43.74                          34.7                        749.01

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.99 WATERSHED INCHES;     444 CFS-HRS;      36.7 ACRE-FEET.

    DURATION(HRS)   6     12     18     24     30     36     42     48
    FLOW(CFS)      22      9      7      6      5      4      2      1

    DURATION(HRS)  50
    FLOW(CFS)       0


  OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       26.52                           9.8                       (RUNOFF)
       31.68                          13.1                       (RUNOFF)
       43.49                          47.9                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    4.09 WATERSHED INCHES;     620 CFS-HRS;      51.3 ACRE-FEET.

    DURATION(HRS)   4      8     12     16     20     24     28     32
    FLOW(CFS)      36     27     19     13     10      9      6      4

    DURATION(HRS)  36     40     44
    FLOW(CFS)       3      2      0


  OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       15.09                           6.1                       (NULL)
       26.74                          15.0                       (NULL)
       31.80                          19.3                       (NULL)
       43.67                          82.3                       (NULL)
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                   PASS  12   JOB NO.   1                     PAGE  19


    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    4.05 WATERSHED INCHES;    1064 CFS-HRS;      88.0 ACRE-FEET.

    DURATION(HRS)   6     12     18     24     30     36     42     48
    FLOW(CFS)      52     28     19     14     10      7      6      2

    DURATION(HRS)  52
    FLOW(CFS)       0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  12


  EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .083 HOURS


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        1HR100YR
     STARTING TIME =   .00       RAIN DEPTH =  3.00       RAIN DURATION =  1.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 1           STORM NO. =99            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        1.65                          89.2                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.45 WATERSHED INCHES;     161 CFS-HRS;      13.3 ACRE-FEET.

    DURATION(HRS)   2      4      6
    FLOW(CFS)      31      4      0


  OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.11                          76.6                        749.06

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.44 WATERSHED INCHES;     161 CFS-HRS;      13.3 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     14
    FLOW(CFS)      22      8      7      6      5      3      1      0
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                   PASS  13   JOB NO.   1                     PAGE  20



  OPERATION RUNOFF   XSECTION   2

```

```
     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         1.59                         132.6                       (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.52 WATERSHED INCHES;     230 CFS-HRS;      19.0 ACRE-FEET.

     DURATION(HRS)   2      4      6
     FLOW(CFS)      41      5      0


  OPERATION ADDHYD   XSECTION 101

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         1.77                         148.7                       (NULL)
         2.07                         178.1                       (NULL)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.49 WATERSHED INCHES;     391 CFS-HRS;      32.3 ACRE-FEET.

     DURATION(HRS)   2      4      6      8     10     12     14     14
     FLOW(CFS)      64     18      8      7      6      4      1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  13


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        3HR100YR
     STARTING TIME =   .00       RAIN DEPTH =  4.10       RAIN DURATION =  3.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 3           STORM NO. =99            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.13                         101.5                       (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.37 WATERSHED INCHES;     264 CFS-HRS;      21.8 ACRE-FEET.

     DURATION(HRS)   2      4      6      7
     FLOW(CFS)      62     16      2      0
 1
  TR20 ------------------------------------------------------------------ SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS  14   JOB NO.   1                     PAGE  21



  OPERATION RESVOR   STRUCTURE  1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.29                         101.7                          749.10

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.37 WATERSHED INCHES;     264 CFS-HRS;      21.8 ACRE-FEET.

     DURATION(HRS)   2      4      6      8     10     12     14     16
     FLOW(CFS)      36     16      8      7      6      5      2      0


  OPERATION RUNOFF   XSECTION   2

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.03                         147.8                       (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.46 WATERSHED INCHES;     373 CFS-HRS;      30.8 ACRE-FEET.

     DURATION(HRS)   2      4      6      7
     FLOW(CFS)      88     19      2      0


  OPERATION ADDHYD   XSECTION 101

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.27                         244.1                       (NULL)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.42 WATERSHED INCHES;     637 CFS-HRS;      52.6 ACRE-FEET.

     DURATION(HRS)   2      4      6      8     10     12     14     16
     FLOW(CFS)     133     40     12      7      7      5      2      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  14


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        6HR100YR
     STARTING TIME =   .00       RAIN DEPTH =  4.79       RAIN DURATION =  6.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 6           STORM NO. =99            RAIN TABLE NO. = 6
 1
  TR20 ------------------------------------------------------------------ SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS  15   JOB NO.   1                     PAGE  22



  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.58                          90.6                       (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.98 WATERSHED INCHES;     332 CFS-HRS;      27.5 ACRE-FEET.
```

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    DURATION(HRS)   2      4      6      8      9
    FLOW(CFS)      65     36     16      2      0


  OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.75                         89.8                        749.08

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.99 WATERSHED INCHES;     333 CFS-HRS;      27.5 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      50     28     15      8      7      6      5      2

    DURATION(HRS)  18
    FLOW(CFS)       0


  OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.48                         130.7                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.08 WATERSHED INCHES;     467 CFS-HRS;      38.6 ACRE-FEET.

    DURATION(HRS)   2      4      6      8      9
    FLOW(CFS)      91     50     22      3      0


  OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        2.70                         219.9                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.04 WATERSHED INCHES;     800 CFS-HRS;      66.1 ACRE-FEET.
 1
  TR20 ------------------------------------------------------------------ SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                   PASS  15   JOB NO.   1                     PAGE  23


    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)     135     82     43     13      7      7      6      3

    DURATION(HRS)  18     18
    FLOW(CFS)       1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  15


  EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .167 HOURS


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        12H100YR
     STARTING TIME =   .00       RAIN DEPTH =  5.56       RAIN DURATION = 12.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
     ALTERNATE NO. =12           STORM NO. =99            RAIN TABLE NO. = 7


  OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        6.16                         70.8                        (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.68 WATERSHED INCHES;     410 CFS-HRS;      33.9 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     14
    FLOW(CFS)      57     42     30     21     13      3      1      0


  OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        5.92                         75.6                        749.06
        6.22                         71.0                        749.06

  *** WARNING - STRUCTURE  1, MAIN TIME INCREMENT TOO LARGE, COMPUTED PEAK
                (    75.62) EXCEEDS ADJACENT COORDINATE (    70.67) BY  6 %. ***

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.67 WATERSHED INCHES;     409 CFS-HRS;      33.8 ACRE-FEET.
 1
  TR20 ------------------------------------------------------------------ SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                   PASS  16   JOB NO.   1                     PAGE  24


    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)      52     34     26     18      8      7      7      6

    DURATION(HRS)  18     20     22     22
    FLOW(CFS)       5      2      1      0


  OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        6.07                         100.1                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
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                    3.78 WATERSHED INCHES;     574 CFS-HRS;      47.4 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     14
    FLOW(CFS)      80     59     42     29     18      5      1      0


  OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        6.16                        170.8                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    3.74 WATERSHED INCHES;     983 CFS-HRS;      81.2 ACRE-FEET.

    DURATION(HRS)   2      4      6      8     10     12     14     16
    FLOW(CFS)     124     92     65     51     30     13      8      7

    DURATION(HRS)  18     20     22     23
    FLOW(CFS)       6      4      1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  16


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        24H100YR
    STARTING TIME =   .00       RAIN DEPTH =  6.40       RAIN DURATION = 24.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
    ALTERNATE NO. =24           STORM NO. =99            RAIN TABLE NO. = 8


  OPERATION RUNOFF   XSECTION   1
1
  TR20 ---------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS  17   JOB NO.   1                     PAGE  25


    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.91                         58.0                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    4.46 WATERSHED INCHES;     497 CFS-HRS;      41.1 ACRE-FEET.

    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)      46     29     21     17     11      8      3      0

    DURATION(HRS)  24
    FLOW(CFS)       0


  OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.96                         58.0                        749.04

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    4.46 WATERSHED INCHES;     497 CFS-HRS;      41.1 ACRE-FEET.

    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)      46     27     20     14      8      7      6      5

    DURATION(HRS)  27     30     31
    FLOW(CFS)       4      1      0


  OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.84                         80.5                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    4.57 WATERSHED INCHES;     693 CFS-HRS;      57.3 ACRE-FEET.

    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)      63     40     29     23     16     11      4      1

    DURATION(HRS)  24
    FLOW(CFS)       0


  OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       16.89                        138.4                       (NULL)
1
  TR20 ---------------------------------------------------------------- SCS -
  11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
  13:35:30                    PASS  17   JOB NO.   1                     PAGE  26


    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    4.52 WATERSHED INCHES;    1190 CFS-HRS;      98.3 ACRE-FEET.

    DURATION(HRS)   3      6      9     12     15     18     21     24
    FLOW(CFS)     109     64     46     39     25     18      9      7

    DURATION(HRS)  27     30     32
    FLOW(CFS)       6      2      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  17


  EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .250 HOURS
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 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION 101        48H100YR
    STARTING TIME =   .00       RAIN DEPTH =  6.70       RAIN DURATION = 48.00
    ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .250 HOURS
    ALTERNATE NO. =48           STORM NO. =99            RAIN TABLE NO. = 9


 OPERATION RUNOFF   XSECTION   1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       14.81                          3.4                       (RUNOFF)
       26.56                          8.4                       (RUNOFF)
       31.74                         11.2                       (RUNOFF)
       43.53                         40.1                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   4.74 WATERSHED INCHES;     528 CFS-HRS;      43.6 ACRE-FEET.

    DURATION(HRS)   4      8     12     16     20     24     28     32
    FLOW(CFS)      30     23     16     11      8      7      5      4

    DURATION(HRS)  36     40     44
    FLOW(CFS)       3      2      0


 OPERATION RESVOR   STRUCTURE  1

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       42.83                         40.0                        749.01
       43.36                         40.2                        749.02
       43.67                         40.1                        749.02
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    PASS  18   JOB NO.   1                     PAGE  27


    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   4.74 WATERSHED INCHES;     528 CFS-HRS;      43.6 ACRE-FEET.

    DURATION(HRS)   6     12     18     24     30     36     42     48
    FLOW(CFS)      25     15      7      7      6      5      3      1

    DURATION(HRS)  51
    FLOW(CFS)       0


 OPERATION RUNOFF   XSECTION   2

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       14.72                          5.1                       (RUNOFF)
       26.50                         11.9                       (RUNOFF)
       31.67                         15.7                       (RUNOFF)
       43.49                         55.6                       (RUNOFF)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   4.85 WATERSHED INCHES;     736 CFS-HRS;      60.8 ACRE-FEET.

    DURATION(HRS)   4      8     12     16     20     24     28     32
    FLOW(CFS)      42     31     22     15     12     11      8      5

    DURATION(HRS)  36     40     44     46
    FLOW(CFS)       4      2      1      0


 OPERATION ADDHYD   XSECTION 101

    PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       15.00                          8.2                       (NULL)
       26.67                         17.8                       (NULL)
       31.78                         22.6                       (NULL)
       43.48                         95.5                       (NULL)

    RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   4.80 WATERSHED INCHES;    1264 CFS-HRS;     104.4 ACRE-FEET.

    DURATION(HRS)   6     12     18     24     30     36     42     48
    FLOW(CFS)      60     36     22     17     12      8      6      3

    DURATION(HRS)  54
    FLOW(CFS)       0
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                    SUMMARY, JOB NO.   1                       PAGE  28


                             SUMMARY TABLE 1
                             ---------------
    SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
    A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
 F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

 XSECTION/  STANDARD                                   PEAK DISCHARGE
 STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
    ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                         (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)

 RAINFALL OF   1.82 inches AND   1.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  6,    ARC 2
 MAIN TIME INCREMENT   .083 HOURS

    ALTERNATE    1   STORM   10
    --------------------------
 XSECTION   1  RUNOFF      .17      .58        ---      1.70       36    211.8
 STRUCTURE  1  RESVOR      .17      .57     747.75      3.24        8     47.1
 XSECTION   2  RUNOFF      .23      .62        ---      1.63       54    234.8
```

```
XSECTION 101  ADDHYD      .41      .60        ---      1.65       61    148.8

RAINFALL OF   2.47 inches AND   3.00 hr DURATION, BEGINS AT    .0 hrs.

   ALTERNATE    3   STORM   10
   ---------------------------
XSECTION   1  RUNOFF      .17     1.03        ---      2.26       43    252.9
STRUCTURE  1  RESVOR      .17     1.03     748.64      3.93       21    123.5
XSECTION   2  RUNOFF      .23     1.09        ---      2.16       64    278.3
XSECTION 101  ADDHYD      .41     1.07        ---      2.18       71    173.2

RAINFALL OF   2.91 inches AND   6.00 hr DURATION, BEGINS AT    .0 hrs.

   ALTERNATE    6   STORM   10
   ---------------------------
XSECTION   1  RUNOFF      .17     1.37        ---      2.76       40    235.3
STRUCTURE  1  RESVOR      .17     1.37     748.71      4.88       23    135.3
XSECTION   2  RUNOFF      .23     1.44        ---      2.65       58    252.2
XSECTION 101  ADDHYD      .41     1.41        ---      2.68       65    158.5

RAINFALL OF   3.36 inches AND  12.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  7,    ARC 2
MAIN TIME INCREMENT   .167 HOURS

   ALTERNATE   12   STORM   10
   ---------------------------
XSECTION   1  RUNOFF      .17     1.74        ---      6.30       33    194.1
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                      SUMMARY, JOB NO.   1                      PAGE  29


                              SUMMARY TABLE 1
                              ---------------
   SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
   A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

XSECTION/  STANDARD                                     PEAK DISCHARGE
STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
   ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                        (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)



   ALTERNATE   12   STORM   10
   ---------------------------
STRUCTURE  1  RESVOR      .17     1.74     748.69      8.73       22    129.4
XSECTION   2  RUNOFF      .23     1.82        ---      6.20       48    208.7
XSECTION 101  ADDHYD      .41     1.78        ---      7.26       58    141.5

RAINFALL OF   3.85 inches AND  24.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  8,    ARC 2

   ALTERNATE   24   STORM   10
   ---------------------------
XSECTION   1  RUNOFF      .17     2.16        ---     17.02       30    176.5
STRUCTURE  1  RESVOR      .17     2.16     748.81     18.19       25    147.1
XSECTION   2  RUNOFF      .23     2.24        ---     16.96       42    182.6
XSECTION 101  ADDHYD      .41     2.20        ---     17.38       64    156.1

RAINFALL OF   4.29 inches AND  48.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  9,    ARC 2
MAIN TIME INCREMENT   .250 HOURS

   ALTERNATE   48   STORM   10
   ---------------------------
XSECTION   1  RUNOFF      .17     2.54        ---     43.55       23    135.3
STRUCTURE  1  RESVOR      .17     2.54     748.58     44.92       20    117.6
XSECTION   2  RUNOFF      .23     2.63        ---     43.50       33    143.5
XSECTION 101  ADDHYD      .41     2.59        ---     43.93       50    122.0

RAINFALL OF   2.56 inches AND   1.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  6,    ARC 2
MAIN TIME INCREMENT   .083 HOURS

   ALTERNATE    1   STORM   50
   ---------------------------
XSECTION   1  RUNOFF      .17     1.10        ---      1.66       68    400.0
STRUCTURE  1  RESVOR      .17     1.10     748.96      2.72       28    164.7
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                      SUMMARY, JOB NO.   1                      PAGE  30


                              SUMMARY TABLE 1
                              ---------------
   SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
   A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

XSECTION/  STANDARD                                     PEAK DISCHARGE
STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
   ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                        (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)



   ALTERNATE    1   STORM   50
   ---------------------------
XSECTION   2  RUNOFF      .23     1.16        ---      1.60      102    443.5
XSECTION 101  ADDHYD      .41     1.14        ---      1.61      109    265.9

RAINFALL OF   3.49 inches AND   3.00 hr DURATION, BEGINS AT    .0 hrs.
```

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   ALTERNATE    3   STORM   50
   ---------------------------
XSECTION   1  RUNOFF      .17     1.85        ---      2.17       79    464.7
STRUCTURE  1  RESVOR      .17     1.85     749.06      2.60       73    429.4
XSECTION   2  RUNOFF      .23     1.93        ---      2.07      115    500.0
XSECTION 101  ADDHYD      .41     1.89        ---      2.55      175    426.8

RAINFALL OF   4.09 inches AND   6.00 hr DURATION, BEGINS AT    .0 hrs.

   ALTERNATE    6   STORM   50
   ---------------------------
XSECTION   1  RUNOFF      .17     2.36        ---      2.63       71    417.6
STRUCTURE  1  RESVOR      .17     2.36     749.05      3.08       67    394.1
XSECTION   2  RUNOFF      .23     2.45        ---      2.53      103    447.8
XSECTION 101  ADDHYD      .41     2.41        ---      3.04      164    400.0

RAINFALL OF   4.74 inches AND  12.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  7,    ARC 2
MAIN TIME INCREMENT   .167 HOURS

   ALTERNATE   12   STORM   50
   ---------------------------
XSECTION   1  RUNOFF      .17     2.94        ---      6.20       57    335.3
STRUCTURE  1  RESVOR      .17     2.94     749.04      6.53       57    335.3
XSECTION   2  RUNOFF      .23     3.03        ---      6.10       80    347.8
XSECTION 101  ADDHYD      .41     2.99        ---      6.49      134    326.8
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                      SUMMARY, JOB NO.   1                      PAGE  31


                              SUMMARY TABLE 1
                              ---------------
   SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
   A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

XSECTION/  STANDARD                                     PEAK DISCHARGE
STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
   ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                        (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)


RAINFALL OF   5.45 inches AND  24.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  8,    ARC 2

   ALTERNATE   24   STORM   50
   ---------------------------
XSECTION   1  RUNOFF      .17     3.58        ---     16.94       48    282.4
STRUCTURE  1  RESVOR      .17     3.59     749.02     16.99       48    282.4
XSECTION   2  RUNOFF      .23     3.68        ---     16.87       66    287.0
XSECTION 101  ADDHYD      .41     3.64        ---     16.92      114    278.0

RAINFALL OF   5.89 inches AND  48.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  9,    ARC 2
MAIN TIME INCREMENT   .250 HOURS

   ALTERNATE   48   STORM   50
   ---------------------------
XSECTION   1  RUNOFF      .17     3.99        ---     43.54       34    200.0
STRUCTURE  1  RESVOR      .17     3.99     749.01     43.74       35    205.9
XSECTION   2  RUNOFF      .23     4.09        ---     43.49       48    208.7
XSECTION 101  ADDHYD      .41     4.05        ---     43.67       82    200.0

RAINFALL OF   3.00 inches AND   1.00 hr DURATION, BEGINS AT    .0 hrs.
RAINTABLE NUMBER  6,    ARC 2
MAIN TIME INCREMENT   .083 HOURS

   ALTERNATE    1   STORM   99
   ---------------------------
XSECTION   1  RUNOFF      .17     1.45        ---      1.65       89    523.5
STRUCTURE  1  RESVOR      .17     1.44     749.06      2.11       77    452.9
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                      SUMMARY, JOB NO.   1                      PAGE  32


                              SUMMARY TABLE 1
                              ---------------
   SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
   A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

XSECTION/  STANDARD                                     PEAK DISCHARGE
STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
   ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                        (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)



   ALTERNATE    1   STORM   99
   ---------------------------
XSECTION   2  RUNOFF      .23     1.52        ---      1.59      133    578.3
XSECTION 101  ADDHYD      .41     1.49        ---      2.07      178    434.1

RAINFALL OF   4.10 inches AND   3.00 hr DURATION, BEGINS AT    .0 hrs.

   ALTERNATE    3   STORM   99
   ---------------------------
XSECTION   1  RUNOFF      .17     2.37        ---      2.13      101    594.1
STRUCTURE  1  RESVOR      .17     2.37     749.10      2.29      102    600.0
XSECTION   2  RUNOFF      .23     2.46        ---      2.03      148    643.5
XSECTION 101  ADDHYD      .41     2.42        ---      2.27      244    595.1
```

```

 RAINFALL OF   4.79 inches AND   6.00 hr DURATION, BEGINS AT    .0 hrs.

    ALTERNATE    6   STORM   99
    --------------------------
 XSECTION   1  RUNOFF      .17     2.98        ---      2.58       91    535.3
 STRUCTURE  1  RESVOR      .17     2.99     749.08      2.75       90    529.4
 XSECTION   2  RUNOFF      .23     3.08        ---      2.48      131    569.6
 XSECTION 101  ADDHYD      .41     3.04        ---      2.70      220    536.6

 RAINFALL OF   5.56 inches AND  12.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  7,    ARC 2
 MAIN TIME INCREMENT   .167 HOURS

    ALTERNATE   12   STORM   99
    ---------------------------
 XSECTION   1  RUNOFF      .17     3.68        ---      6.16       71    417.6
 STRUCTURE  1  RESVOR      .17     3.67     749.06      5.92       76    447.1
 XSECTION   2  RUNOFF      .23     3.78        ---      6.07      100    434.8
 XSECTION 101  ADDHYD      .41     3.74        ---      6.16      171    417.1
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                     SUMMARY, JOB NO.   1                      PAGE  33


                              SUMMARY TABLE 1
                              ---------------
    SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
    A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
 F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

 XSECTION/  STANDARD                                   PEAK DISCHARGE
 STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
    ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                         (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)


 RAINFALL OF   6.40 inches AND  24.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  8,    ARC 2

    ALTERNATE   24   STORM   99
    ---------------------------
 XSECTION   1  RUNOFF      .17     4.46        ---     16.91       58    341.2
 STRUCTURE  1  RESVOR      .17     4.46     749.04     16.96       58    341.2
 XSECTION   2  RUNOFF      .23     4.57        ---     16.84       80    347.8
 XSECTION 101  ADDHYD      .41     4.52        ---     16.89      138    336.6

 RAINFALL OF   6.70 inches AND  48.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  9,    ARC 2
 MAIN TIME INCREMENT   .250 HOURS

    ALTERNATE   48   STORM   99
    --------------------------
 XSECTION   1  RUNOFF      .17     4.74        ---     43.53       40    235.3
 STRUCTURE  1  RESVOR      .17     4.74     749.01     42.83       40    235.3
 XSECTION   2  RUNOFF      .23     4.85        ---     43.49       56    243.5
 XSECTION 101  ADDHYD      .41     4.80        ---     43.48       95    231.7
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST
 13:35:30                     SUMMARY, JOB NO.   1                      PAGE  34


                              SUMMARY TABLE 3
                              ---------------
       STORM DISCHARGES (CFS) AT XSECTIONS AND STRUCTURES FOR ALL ALTERNATES
       QUESTION MARK (?) AFTER: OUTFLOW PEAK - RISING TRUNCATED HYDROGRAPH.

 XSECTION/          DRAINAGE
 STRUCTURE            AREA       STORM NUMBERS..........
   ID               (SQ MI)         10        50        99


 STRUCTURE   1          .17
 --------------------------
    ALTERNATE    1                    8        28        77
    ALTERNATE    3                   21        73       102
    ALTERNATE    6                   23        67        90
    ALTERNATE   12                   22        57        76
    ALTERNATE   24                   25        48        58

    ALTERNATE   48                   20        35        40

 XSECTION    1          .17
 --------------------------
    ALTERNATE    1                   36        68        89
    ALTERNATE    3                   43        79       101
    ALTERNATE    6                   40        71        91
    ALTERNATE   12                   33        57        71
    ALTERNATE   24                   30        48        58

    ALTERNATE   48                   23        34        40

 XSECTION    2          .23
 --------------------------
    ALTERNATE    1                   54       102       133
    ALTERNATE    3                   64       115       148
    ALTERNATE    6                   58       103       131
    ALTERNATE   12                   48        80       100
    ALTERNATE   24                   42        66        80

    ALTERNATE   48                   33        48        56

 XSECTION  101          .41
 --------------------------
```

```
     ALTERNATE    1                   61       109       178
     ALTERNATE    3                   71       175       244
     ALTERNATE    6                   65       164       220
     ALTERNATE   12                   58       134       171
     ALTERNATE   24                   64       114       138

     ALTERNATE   48                   50        82        95
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E13   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 11/13/**          RWA#11048  JDH 13NOV13 * DA13       (B-70)           2.04TEST



 END OF  1 JOBS IN THIS RUN









                      SCS  TR-20,  VERSION 2.04TEST
                             11048E13  FILES

     INPUT  = 11048E13.T20                           , GIVEN DATA FILE
     OUTPUT = 11048E13.OUT                           , DATED 11/13/**,13:35:30

              FILES GENERATED - DATED 11/13/**,13:35:30

                                NONE!



           TOTAL NUMBER OF WARNINGS =   2,  MESSAGES =   0

                     *** TR-20 RUN COMPLETED ***
```

Existing DA 13
6’ x 4’ RCBC
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 71 cfs

Design Flow: 175 cfs

Maximum Flow: 355 cfs

Table 1 - Summary of Culvert Flows at Crossing: Existing DA13 TR-20

Headwater Elevation (ft)	Total Discharge (cfs)	Ex 72"x48" Box Discharge (cfs)	Roadway Discharge (cfs)	Iterations
732.34	71.00	71.00	0.00	1
732.74	99.40	99.40	0.00	1
733.20	127.80	127.80	0.00	1
733.74	156.20	156.20	0.00	1
734.14	175.00	175.00	0.00	1
734.90	213.00	206.28	6.53	13
735.01	241.40	208.47	32.35	8
735.09	269.80	209.23	59.93	6
735.15	298.20	209.42	88.16	5
735.20	326.60	209.36	116.97	5
735.24	355.00	209.10	145.38	4
734.76	201.41	201.41	0.00	Overtopping

Rating Curve Plot for Crossing: Existing DA13 TR-20

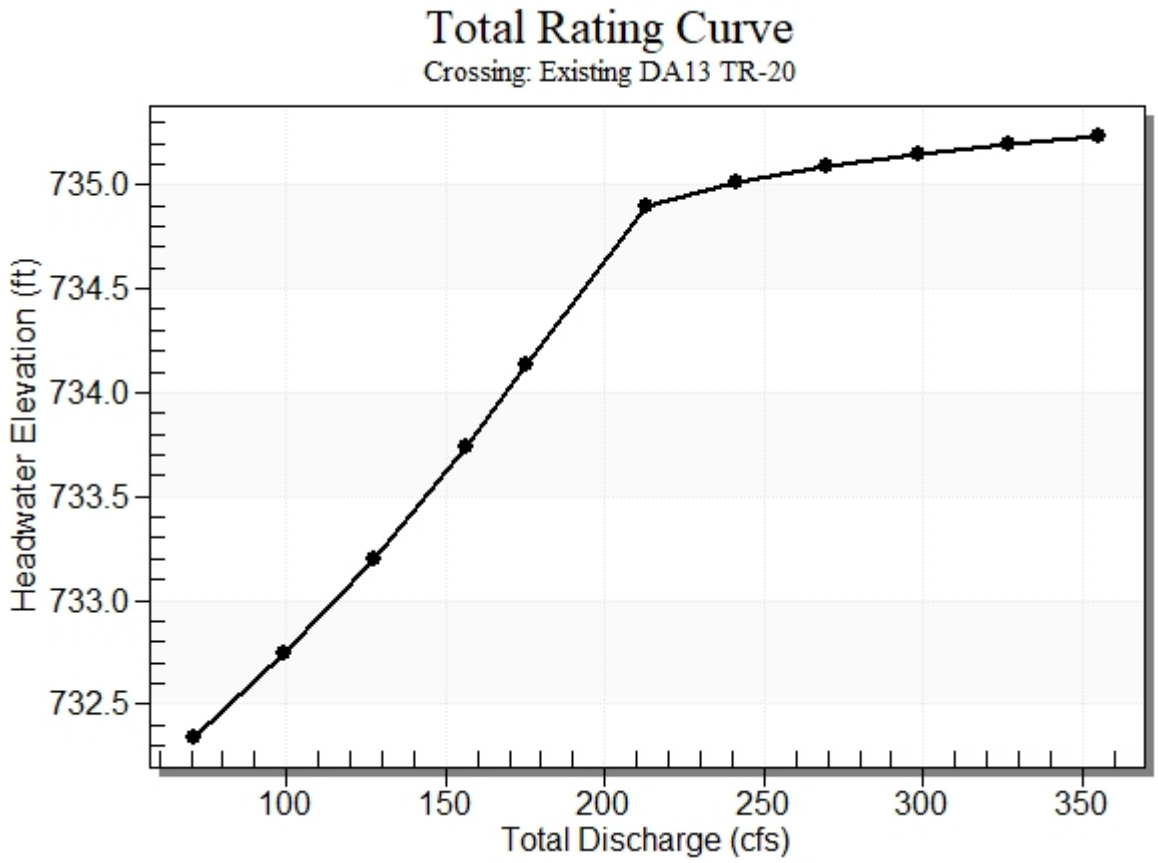


Table 2 - Culvert Summary Table: Ex 72"x48" Box

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
71.00	71.00	732.34	2.516	3.894	6-FFt	1.606	1.639	3.800	2.050	3.114	1.828
99.40	99.40	732.74	3.168	4.293	4-FFf	1.999	2.034	3.830	2.176	4.758	1.413
127.80	127.80	733.20	3.814	4.752	4-FFf	2.329	2.409	3.830	2.271	6.117	1.340
156.20	156.20	733.74	4.612	5.289	4-FFf	2.627	2.755	3.830	2.352	7.477	1.329
175.00	175.00	734.14	5.173	5.689	4-FFf	2.815	2.969	3.830	2.401	8.377	1.335
213.00	206.28	734.90	6.155	6.451	4-FFf	3.108	3.316	3.830	2.490	9.874	1.358
241.40	208.47	735.01	6.242	6.564	4-FFf	3.128	3.340	3.830	2.551	9.979	1.380
269.80	209.23	735.09	6.271	6.639	4-FFf	3.135	3.348	3.830	2.609	10.015	1.403
298.20	209.42	735.15	6.279	6.697	4-FFf	3.137	3.350	3.830	2.663	10.025	1.427
326.60	209.36	735.20	6.277	6.747	4-FFf	3.136	3.349	3.830	2.714	10.022	1.451
355.00	209.10	735.24	6.266	6.790	4-FFf	3.134	3.346	3.830	2.763	10.009	1.474

****

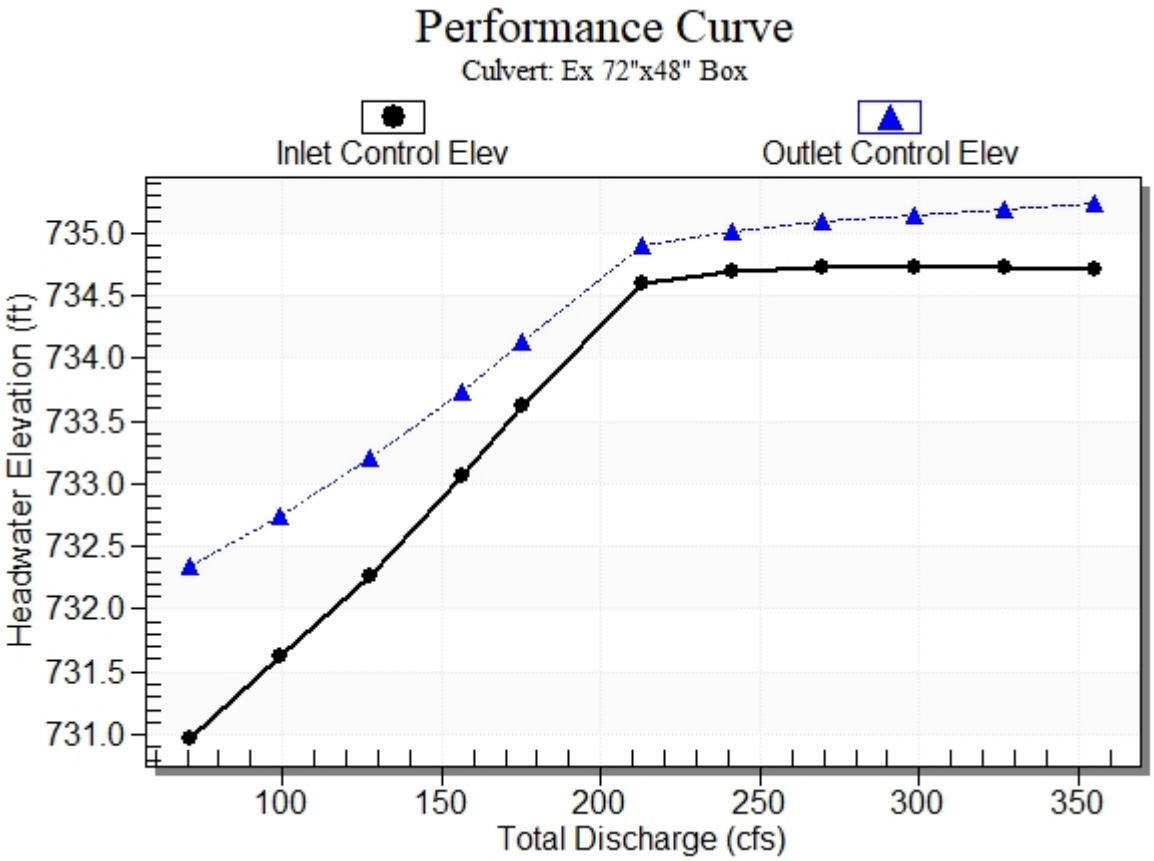
Straight Culvert

Inlet Elevation (invert): 728.45 ft, Outlet Elevation (invert): 728.26 ft

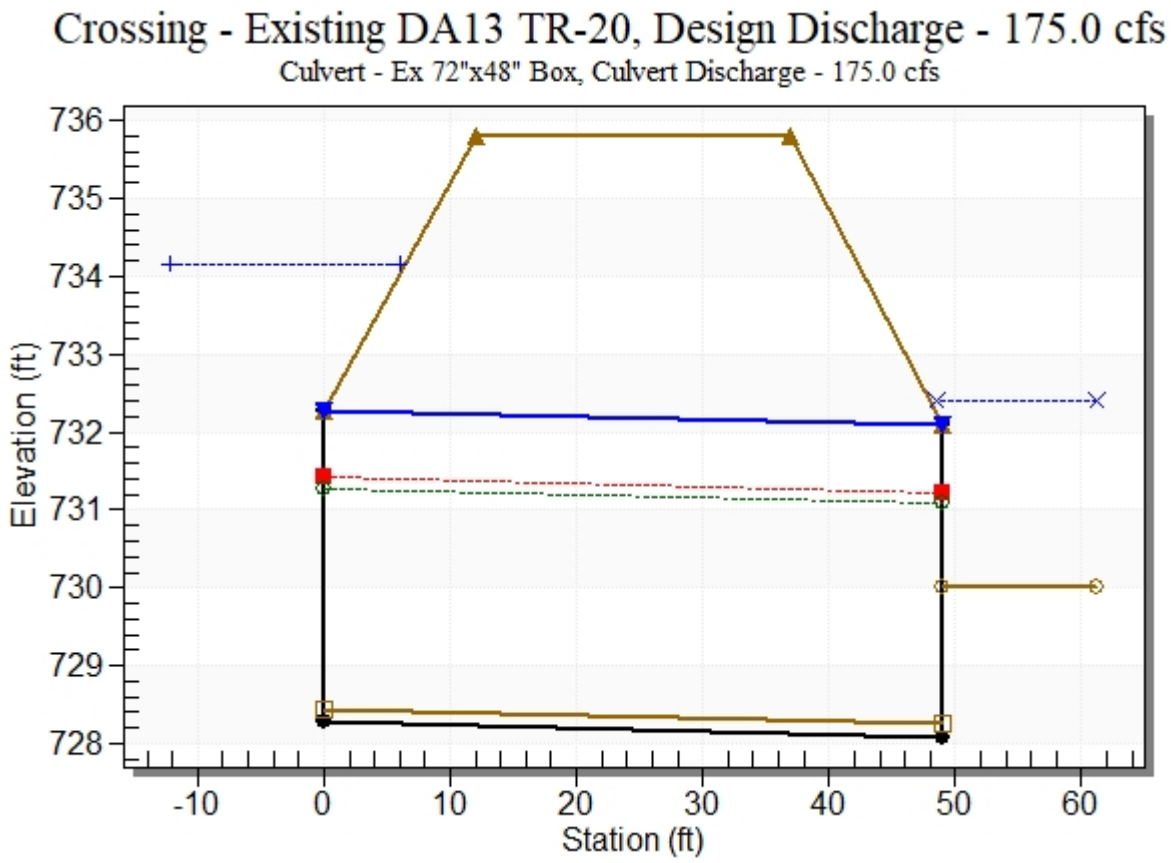
Culvert Length: 49.00 ft, Culvert Slope: 0.0039

****

Culvert Performance Curve Plot: Ex 72"x48" Box



Water Surface Profile Plot for Culvert: Ex 72"x48" Box



Site Data - Ex 72"x48" Box

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 728.28 ft

Outlet Station: 49.00 ft

Outlet Elevation: 728.09 ft

Number of Barrels: 1

Culvert Data Summary - Ex 72"x48" Box

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 2.04 in

Barrel Manning's n: 0.0130 (top and sides)

Manning's n: 0.0130 (bottom)

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Existing DA13 TR-20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
71.00	732.06	2.05	1.83	0.96	0.81
99.40	732.19	2.18	1.41	1.02	0.48
127.80	732.28	2.27	1.34	1.06	0.40
156.20	732.36	2.35	1.33	1.10	0.36
175.00	732.41	2.40	1.33	1.12	0.35
213.00	732.50	2.49	1.36	1.17	0.33
241.40	732.56	2.55	1.38	1.19	0.32
269.80	732.62	2.61	1.40	1.22	0.31
298.20	732.67	2.66	1.43	1.25	0.31
326.60	732.72	2.71	1.45	1.27	0.30
355.00	732.77	2.76	1.47	1.29	0.30

Tailwater Channel Data - Existing DA13 TR-20

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0075

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	-271.00	734.00	0.1000
2	-239.00	733.00	0.1000
3	-171.00	732.00	0.1000
4	-8.50	732.00	0.0500
5	0.00	730.01	0.0500
6	8.00	731.00	0.0500
7	16.00	732.00	0.1000
8	66.00	732.00	0.1000
9	109.00	733.00	0.1000
10	120.00	734.00	0.1000

Roadway Data for Crossing: Existing DA13 TR-20

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	18200.00	735.81
1	18250.00	735.56
2	18300.00	735.31
3	18350.00	735.09
4	18400.00	734.87
5	18450.00	734.87
6	18500.00	734.76
7	18550.00	734.95
8	18600.00	735.16
9	18650.00	735.28
10	18700.00	735.51
11	18750.00	735.81

Roadway Surface: Paved

Roadway Top Width: 25.00 ft

Proposed DA 13
Dual 9’ x 4’ RCBC
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 71 cfs

Design Flow: 175 cfs

Maximum Flow: 355 cfs

Table 1 - Summary of Culvert Flows at Crossing: Proposed DA13 TR20 2-9x4 Box

Headwater Elevation (ft)	Total Discharge (cfs)	Pr. 2-9x4' Conc. Box Discharge (cfs)	Roadway Discharge (cfs)	Iterations
732.14	71.00	71.00	0.00	1
732.34	99.40	99.40	0.00	1
732.54	127.80	127.80	0.00	1
732.75	156.20	156.20	0.00	1
732.90	175.00	175.00	0.00	1
733.22	213.00	213.00	0.00	1
733.49	241.40	241.40	0.00	1
733.78	269.80	269.80	0.00	1
734.09	298.20	298.20	0.00	1
734.42	326.60	326.60	0.00	1
734.78	355.00	355.00	0.00	1
735.20	386.30	386.30	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed DA13 TR20 2-9x4 Box

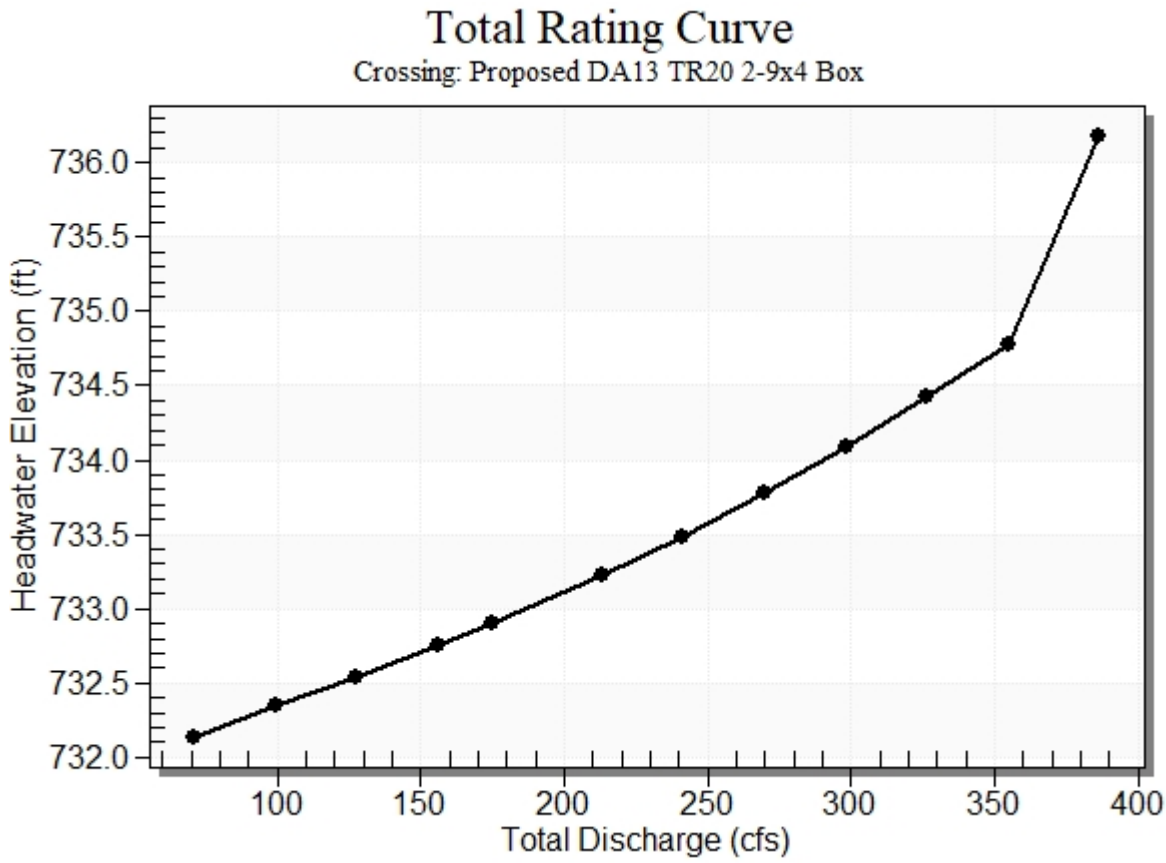


Table 2 - Culvert Summary Table: Pr. 2-9x4' Conc. Box

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
71.00	71.00	732.14	1.210	3.340	4-FFf	1.385	0.794	3.000	2.050	1.446	1.828
99.40	99.40	732.34	1.513	3.543	4-FFf	1.694	0.989	3.000	2.176	2.025	1.413
127.80	127.80	732.54	1.784	3.740	4-FFf	1.970	1.168	3.000	2.271	2.603	1.340
156.20	156.20	732.75	2.055	3.950	4-FFf	2.223	1.336	3.000	2.352	3.182	1.329
175.00	175.00	732.90	2.227	4.097	4-FFf	2.380	1.440	3.000	2.401	3.565	1.335
213.00	213.00	733.22	2.535	4.421	4-FFf	2.679	1.623	3.000	2.490	4.339	1.358
241.40	241.40	733.49	2.765	4.687	4-FFf	3.000	1.769	3.000	2.551	4.917	1.380
269.80	269.80	733.78	3.032	4.976	4-FFf	3.000	1.901	3.000	2.609	5.496	1.403
298.20	298.20	734.09	3.333	5.286	4-FFf	3.000	2.035	3.000	2.663	6.074	1.427
326.60	326.60	734.42	3.634	5.619	4-FFf	3.000	2.160	3.000	2.714	6.653	1.451
355.00	355.00	734.78	3.950	5.976	4-FFf	3.000	2.288	3.000	2.763	7.231	1.474

****

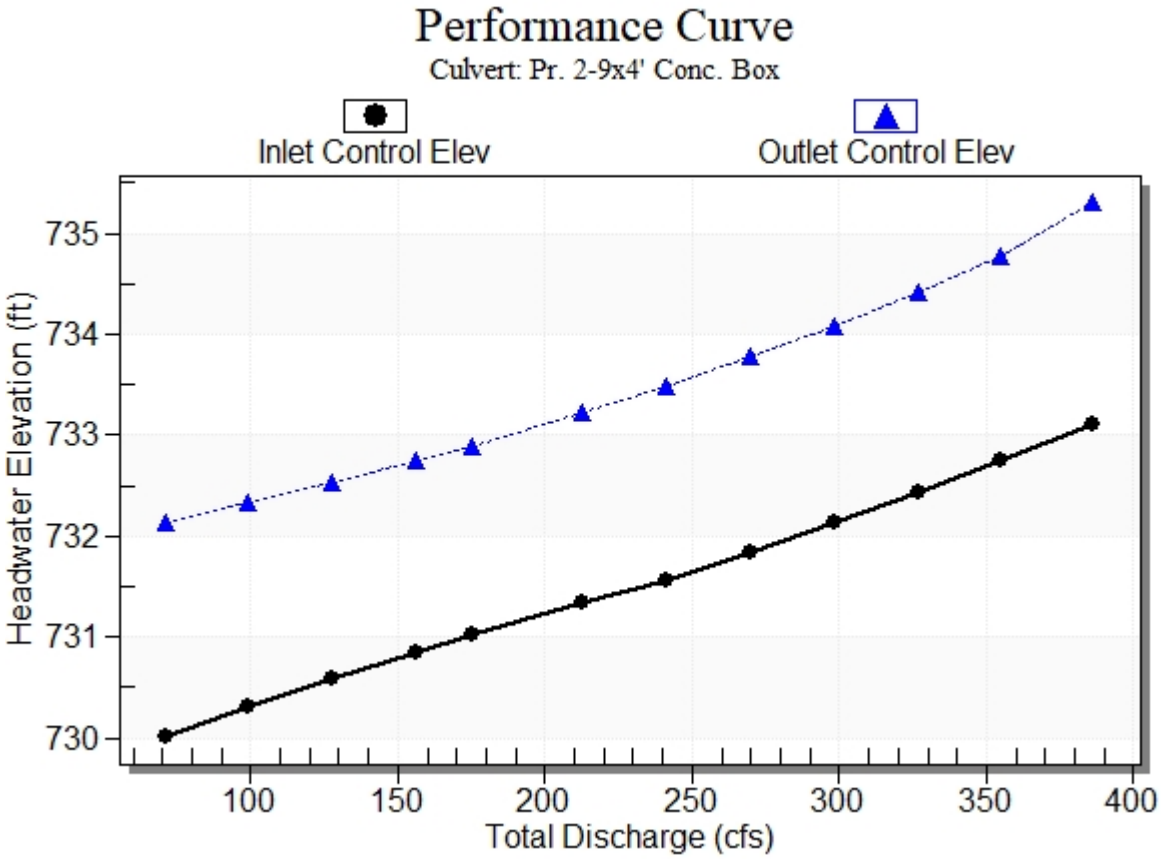
Straight Culvert

Inlet Elevation (invert): 728.80 ft, Outlet Elevation (invert): 728.50 ft

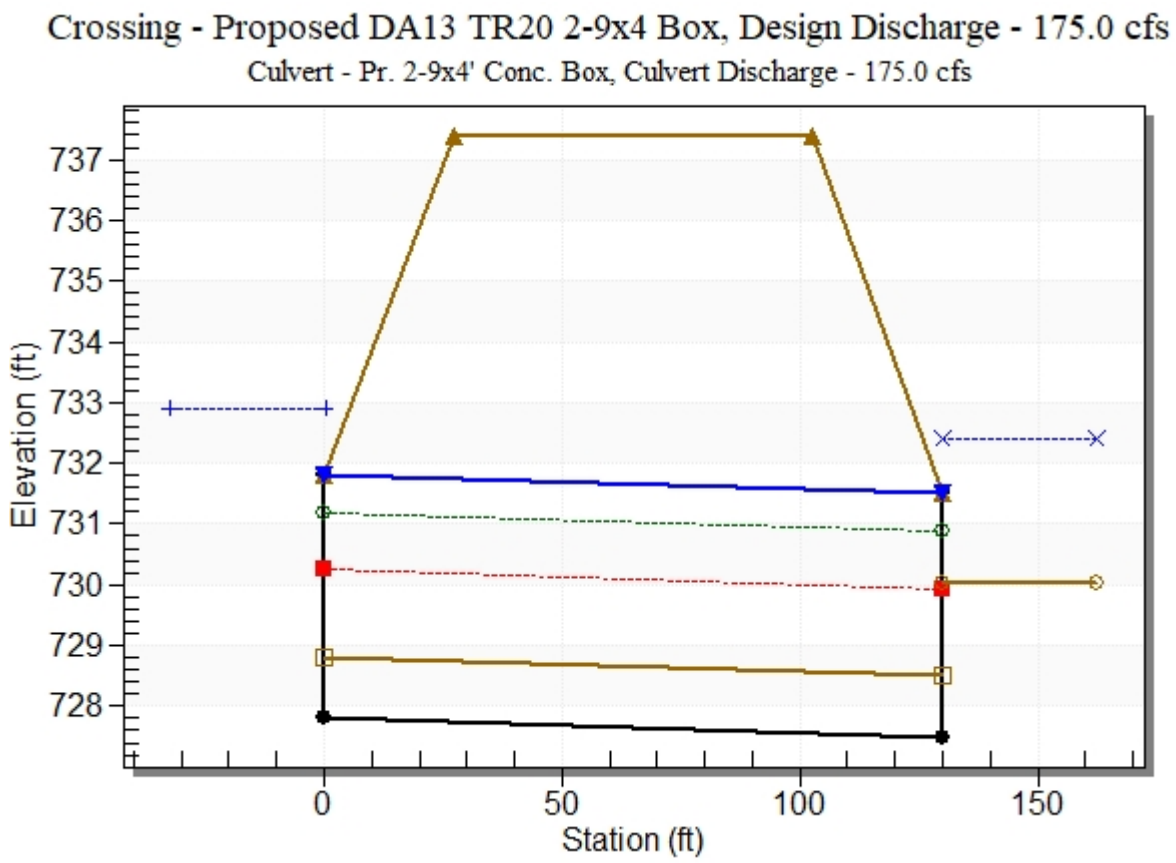
Culvert Length: 130.00 ft, Culvert Slope: 0.0023

****

Culvert Performance Curve Plot: Pr. 2-9x4' Conc. Box



Water Surface Profile Plot for Culvert: Pr. 2-9x4' Conc. Box



Site Data - Pr. 2-9x4' Conc. Box

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 727.80 ft

Outlet Station: 130.00 ft

Outlet Elevation: 727.50 ft

Number of Barrels: 2

Culvert Data Summary - Pr. 2-9x4' Conc. Box

Barrel Shape: Concrete Box

Barrel Span: 9.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 12.00 in

Barrel Manning's n: 0.0130 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Proposed DA13 TR20 2-9x4 Box)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
71.00	732.06	2.05	1.83	0.96	0.81
99.40	732.19	2.18	1.41	1.02	0.48
127.80	732.28	2.27	1.34	1.06	0.40
156.20	732.36	2.35	1.33	1.10	0.36
175.00	732.41	2.40	1.33	1.12	0.35
213.00	732.50	2.49	1.36	1.17	0.33
241.40	732.56	2.55	1.38	1.19	0.32
269.80	732.62	2.61	1.40	1.22	0.31
298.20	732.67	2.66	1.43	1.25	0.31
326.60	732.72	2.71	1.45	1.27	0.30
355.00	732.77	2.76	1.47	1.29	0.30

Tailwater Channel Data - Proposed DA13 TR20 2-9x4 Box

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0075

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	-271.00	734.00	0.1000
2	-239.00	733.00	0.1000
3	-171.00	732.00	0.1000
4	-8.50	732.00	0.0500
5	0.00	730.01	0.0500
6	8.00	731.00	0.0500
7	16.00	732.00	0.1000
8	66.00	732.00	0.1000
9	109.00	733.00	0.1000
10	120.00	734.00	0.1000

Roadway Data for Crossing: Proposed DA13 TR20 2-9x4 Box

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

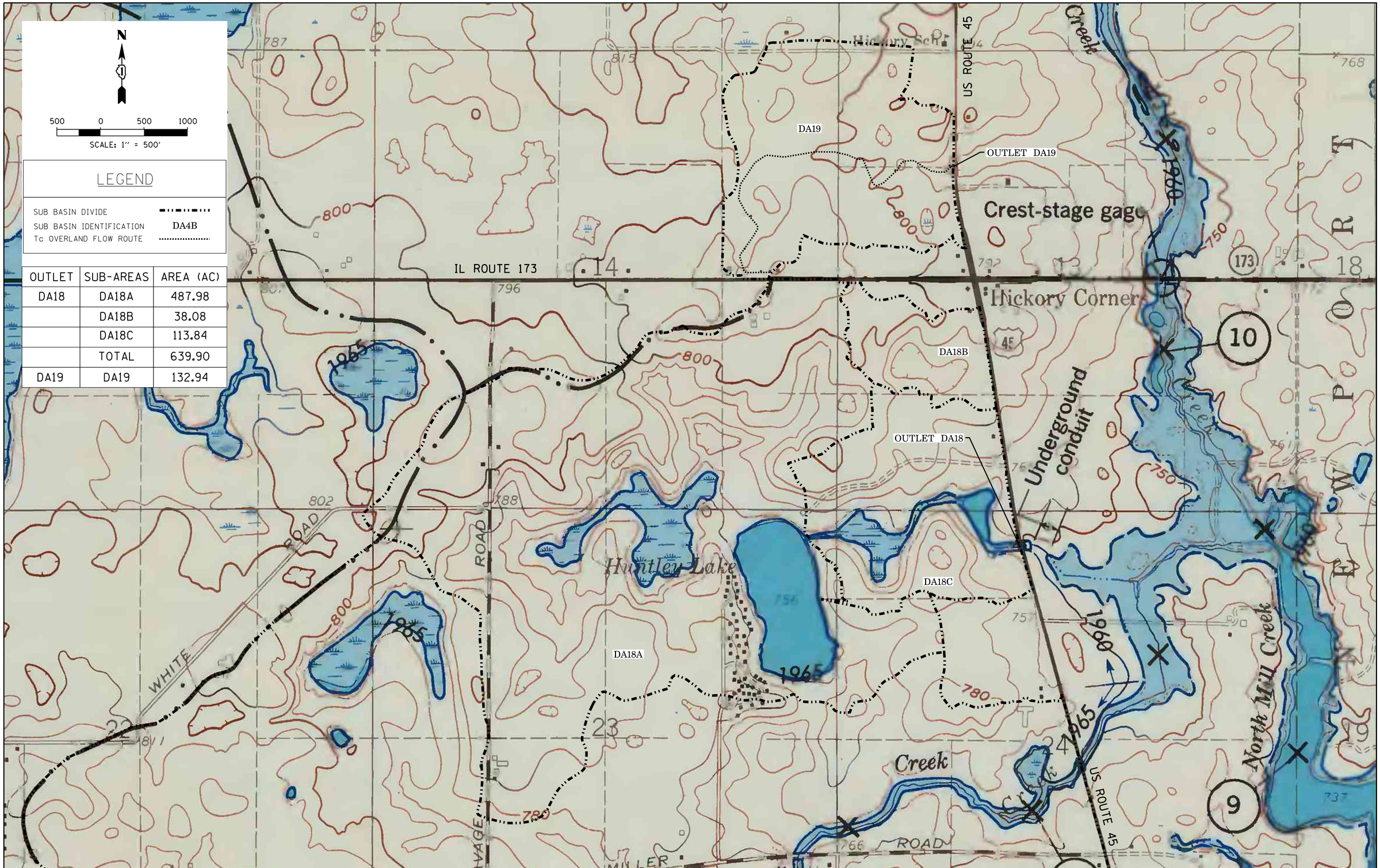
Coord No.	Station (ft)	Elevation (ft)
0	18100.00	737.40
1	18200.00	736.89
2	18300.00	736.37
3	18400.00	735.88
4	18500.00	735.33
5	18568.15	735.20
6	18600.00	735.34
7	18700.00	735.79
8	18800.00	736.87

Roadway Surface: Paved

Roadway Top Width: 75.00 ft

CROSSING DA19 CULVERT SUPPORTING CALCULATIONS

CIVIL ENGINEERING CONSULTANTS
RWA
Regina Webster & Associates, Inc.
8619 W. Bryn Mawr Ave., Suite 602
Chicago, IL 60631-3551
773-283-2600 Fax: 773-283-2602
www.RWAengineers.com



LEGEND

SUB BASIN DIVIDE	
SUB BASIN IDENTIFICATION	DA4B
Tc OVERLAND FLOW ROUTE	

OUTLET	SUB-AREAS	AREA (AC)
DA18	DA18A	487.98
	DA18B	38.08
	DA18C	113.84
	TOTAL	639.90
DA19	DA19	132.94

FILE NAME = K:\Projects\11048\DesignCAD\Exhibits\gldn	USER NAME = $USER$	DESIGNED - JDH	REVISED -
DA18&19.dgn		DRAWN - JDH	REVISED -
	PLOT SCALE = $SCALE$	CHECKED - DW	REVISED -
	PLOT DATE = 5/20/2014	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

US ROUTE 45
EXISTING DRAINAGE AREAS – OUTLETS DA18 & DA19

SCALE: 1" = 500' | SHEET NO. 1 OF 1 SHEETS | STA. | TO STA.

Time of Concentration (T_c) or Travel Time (T_t)

Project:	RWA #11048 / US Route 45 IDOT #P-91-338-10	By:	JDH	Date:	1/19/2012
Location:	Antioch TWP, Lake Co., IL	Checked:		Date:	
File:	K:\Projects\11048\Data\LDS\Tc\DA 19\[TC DA19.xls]Tc				

Present / Developed

Tc through subarea DA19

SHEET FLOW

	Segment ID	1-2				
Surface Description (table 3-1)		woods				
Manning's roughness coeff., n		0.4				
Flow Length, L (total L ≤ 300')	(ft)	100				
Two-yr 24-hr rainfall, P2	(in)	2.80				
Land slope, s	(ft/ft)	0.02				
$T_t = (0.007(nL)^{0.8})/(P_2^{0.5}\, s^{0.4})$	(hr)	0.38	+		=	0.38 hr

SHALLOW CONCENTRATED FLOW

	Segment ID	2-3		3-4		4-5				
Surface Description (paved or unpaved)		unp.		Flat Area		unp.				
Flow Length, L	(ft)	490		430		2645				
Watercourse slope, s	(ft/ft)	0.02				0.007				
Average velocity, V	(ft/s)	2.28		0.20		1.35				
$T_t = L / 3600\, V$	(hr)	0.06	+	0.60	+	0.54	+		=	1.20 hr

CHANNEL FLOW

	Segment ID	5-6					
Cross-sectional flow area, a	(ft^2)						
Wetted perimeter, Pw	(ft)						
Hydraulic radius, r = a/Pw	(ft)						
Channel slope, s	(ft/ft)						
Manning's roughness coeff., n							
$V = (1.49\, r^{0.667}\, s^{0.5}) / n$	(ft/s)	3.00			Assume		
Flow length, L	(ft)	730					
$T_t = L / 3600\, V$	(hr)	0.07	+			=	0.07 hr

Watershed or subarea T_c or T_t = 1.65 hr

Runoff Curve Number

Project: RWA# 11048 / US Route 45 IDOT #P-91-338-1 By: JDH Date: 1/18/2012
Location: Antioch TWP, Lake Co., IL Checked: Date:
File: K:\Projects\11048\Data\LDS\CN\DA 19\[CN DA19.xls]CN

Circle One: Present Developed Description: DA19

Soil Name and Hydrologic Group (Appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	Curve Number Table 2-2	Curve Number Fig. 2-3	Curve Number Fig. 2-4	Area [X] acres [ ] sq. mi. [ ] %	Product of Curve Number and Area
	Water	98			0.8	78.4
C & D	Impervious	98			1.5	147
C	Residential 2 Ac	77			43.2	3326.4
D	Residential 2 Ac	82			16.25	1332.5
C	Woods	73			12.2	890.6
C	Row Crops (SR)	85			38.34	3258.9
D	Row Crops (SR)	89			20.65	1837.85
				Totals =	132.94	10871.65

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{10871.65}{132.94} = \underline{81.779}$$

Use CN = **82**

Map Scale: 1:4,620 if printed on B size (11" x 17") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 300, 600, 1,200, 1,800

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:4,620 if printed on B size (11" × 17") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

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 accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N NAD83

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

Soil Survey Area: Lake County, Illinois
Survey Area Data: Version 5, Feb 12, 2010

Date(s) aerial images were photographed: 7/31/2007

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

Map Unit Legend

Lake County, Illinois (IL097)				
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**	
103A	Houghton muck, 0 to 2 percent slopes	1.9	D	1.4%
153A	Pella silty clay loam, 0 to 2 percent slopes	31.8	D	23.9%
298A	Beecher silt loam, 0 to 2 percent slopes	0.5	C	0.4%
330A	Peotone silty clay loam, 0 to 2 percent slopes	4.2	D	3.2%
530B	Ozaukee silt loam, 2 to 4 percent slopes	83.6	C	62.9%
530C	Ozaukee silt loam, 4 to 6 percent slopes	4.8	C	3.6%
530C2	Ozaukee silt loam, 4 to 6 percent slopes, eroded	6.1	C	4.6%
Totals for Area of Interest		**132.9**		**100.0%**

DA19: 71.5% C, 28.5% D

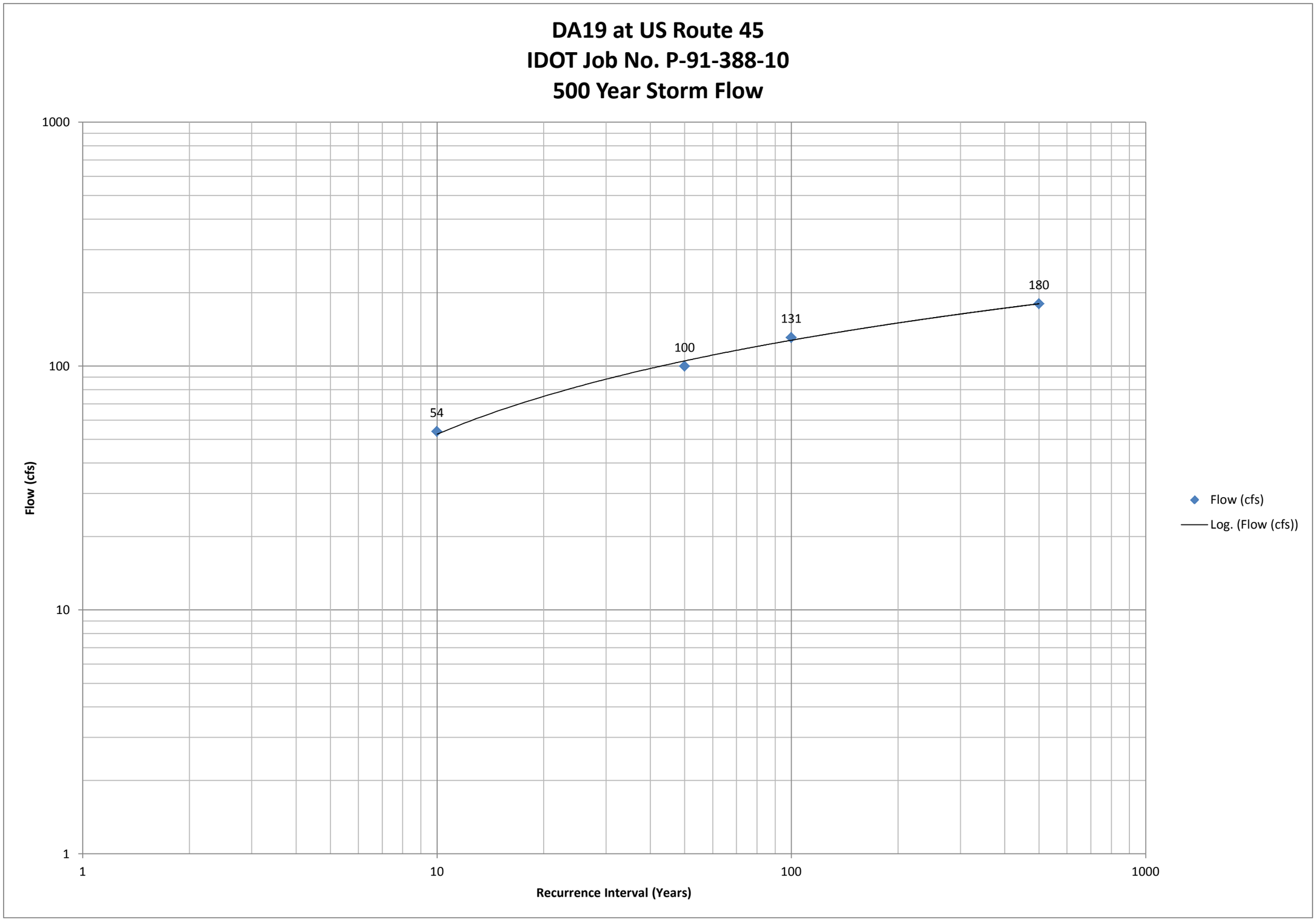
WATER = 0.8 AC+/-

IMPERVIOUS = 1.5 AC+/-

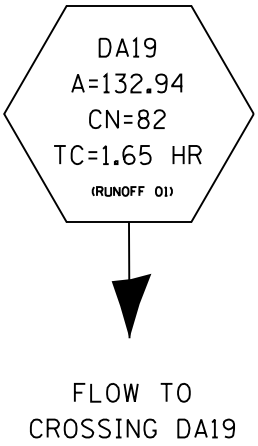
RESIDENTIAL 2 AC LOTS = 59.5 AC+/-

ROW CROPS (SR) = 59.0 AC+/-

WOODS = 12.2 AC+/-


DA19 at US Route 45
IDOT Job No. P-91-388-10
500 Year Storm Flow
1000
100
10
1
Flow (cfs)
54
100
131
180
1
10
100
1000
Recurrence Interval (Years)
Flow (cfs)
Log. (Flow (cfs))

TR–20 HYDROLOGIC MODEL SCHEMATIC DA19



US ROUTE 45
IDOT #P-91-338-1

PREPARED BY: RWA Regina Webster & Associates, Inc.

```
1



 *****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************


 JOB TR-20 11048E19.T20                              SUMMARY
 TITLE     US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS
 TITLE     RWA#11048  JDH 19JAN12 * DA19      (B-70)
  5 RAINFL 6             0.05                                          TIMELESS
  8           0.00       0.12        0.26        0.40        0.51       ISWS
  8           0.59       0.65        0.71        0.75        0.78       HUFF
  8           0.82       0.84        0.87        0.89        0.91       1ST QUAR
  8           0.93       0.95        0.96        0.97        0.99       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  5 RAINFL 7             0.05                                          TIMELESS
  8           0.00       0.04        0.09        0.14        0.19       ISWS
  8           0.25       0.32        0.40        0.52        0.61       HUFF
  8           0.68       0.73        0.78        0.82        0.86       2ND QUAR
  8           0.89       0.92        0.94        0.96        0.98       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  5 RAINFL 8             0.05                                          TIMELESS
  8           0.00       0.03        0.06        0.10        0.13       ISWS
  8           0.16       0.20        0.23        0.27        0.33       HUFF
  8           0.39       0.46        0.56        0.68        0.79       3RD QUAR
  8           0.85       0.89        0.92        0.95        0.98       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  5 RAINFL 9             0.05                                          TIMELESS
  8           0.00       0.02        0.05        0.08        0.10       ISWS
  8           0.13       0.16        0.18        0.21        0.24       HUFF
  8           0.28       0.32        0.35        0.40        0.44       4TH QUAR
  8           0.50       0.58        0.68        0.83        0.93       POINT
  8           1.00       1.00        1.00        1.00        1.00
  9 ENDTBL
  6 RUNOFF 1   1       1 0.20772     82.         1.65        1 0 0 1 0 1 DA19 133
    ENDATA
  7 INCREM 6             0.0833
  7 COMPUT 7   1   1                 1.82        1.0         6 2  01  10 1HR 10YR
    ENDCMP 1
  7 COMPUT 7   1   1                 2.47        3.0         6 2  03  10 3HR 10YR
    ENDCMP 1
  7 COMPUT 7   1   1                 2.91        6.0         6 2  06  10 6HR 10YR
    ENDCMP 1
  7 INCREM 6             0.167
  7 COMPUT 7   1   1                 3.36        12.0        7 2  12  10 12H 10YR
    ENDCMP 1
  7 COMPUT 7   1   1                 3.85        24.0        8 2  24  10 24H 10YR
    ENDCMP 1
  7 INCREM 6             0.25
  7 COMPUT 7   1   1                 4.29        48.0        9 2  48  10 48H 10YR
    ENDCMP 1
  7 INCREM 6             0.0833
1



 *********************80-80 LIST OF INPUT DATA (CONTINUED)**********************

  7 COMPUT 7   1   1                 2.56        1.0         6 2  01  50 1HR 50YR
    ENDCMP 1
  7 COMPUT 7   1   1                 3.49        3.0         6 2  03  50 3HR 50YR
    ENDCMP 1
  7 COMPUT 7   1   1                 4.09        6.0         6 2  06  50 6HR 50YR
    ENDCMP 1
  7 INCREM 6             0.167
  7 COMPUT 7   1   1                 4.74        12.0        7 2  12  50 12H 50YR
    ENDCMP 1
  7 COMPUT 7   1   1                 5.45        24.0        8 2  24  50 24H 50YR
    ENDCMP 1
  7 INCREM 6             0.25
  7 COMPUT 7   1   1                 5.89        48.0        9 2  48  50 48H 50YR
    ENDCMP 1
  7 INCREM 6             0.0833
  7 COMPUT 7   1   1                 3.00        1.0         6 2  01  99 1HR100YR
    ENDCMP 1
  7 COMPUT 7   1   1                 4.10        3.0         6 2  03  99 3HR100YR
    ENDCMP 1
  7 COMPUT 7   1   1                 4.79        6.0         6 2  06  99 6HR100YR
    ENDCMP 1
  7 INCREM 6             0.167
  7 COMPUT 7   1   1                 5.56        12.0        7 2  12  99 12H100YR
    ENDCMP 1
  7 COMPUT 7   1   1                 6.40        24.0        8 2  24  99 24H100YR
    ENDCMP 1
  7 INCREM 6             0.25
  7 COMPUT 7   1   1                 6.70        48.0        9 2  48  99 48H100YR
    ENDJOB 2

 ******************************END OF 80-80 LIST*******************************

 *** WARNING - UNEXPECTED RECORD(S) ENCOUNTERED WHEN LOOKING FOR "JOB" RECORD.
               IMAGES OF FIRST 10 RECORDS IGNORED FOLLOW:                  ***

1
 TR20 ------------------------------------------------------------------ SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                    PASS   1   JOB NO.   1                     PAGE   1



 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .083 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        1HR 10YR
```

```
   STARTING TIME =   .00       RAIN DEPTH =  1.82       RAIN DURATION =  1.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
   ALTERNATE NO. = 1           STORM NO. =10            RAIN TABLE NO. = 6


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       1.47                         47.2                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    .53 WATERSHED INCHES;      71 CFS-HRS;       5.9 ACRE-FEET.

   DURATION(HRS)   2      4      4
   FLOW(CFS)      11      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   1


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        3HR 10YR
   STARTING TIME =   .00       RAIN DEPTH =  2.47       RAIN DURATION =  3.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
   ALTERNATE NO. = 3           STORM NO. =10            RAIN TABLE NO. = 6


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       1.96                         53.9                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    .98 WATERSHED INCHES;     131 CFS-HRS;      10.8 ACRE-FEET.

   DURATION(HRS)   2      4      6
   FLOW(CFS)      32      5      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   2
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                    PASS   3   JOB NO.   1                     PAGE   2



 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        6HR 10YR
   STARTING TIME =   .00       RAIN DEPTH =  2.91       RAIN DURATION =  6.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
   ALTERNATE NO. = 6           STORM NO. =10            RAIN TABLE NO. = 6


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       2.49                         48.7                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   1.31 WATERSHED INCHES;     175 CFS-HRS;      14.5 ACRE-FEET.

   DURATION(HRS)   2      4      6      8      8
   FLOW(CFS)      35     20      7      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   3


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .167 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        12H 10YR
   STARTING TIME =   .00       RAIN DEPTH =  3.36       RAIN DURATION = 12.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
   ALTERNATE NO. =12           STORM NO. =10            RAIN TABLE NO. = 7


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       6.02                         39.9                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                   1.67 WATERSHED INCHES;     223 CFS-HRS;      18.5 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     12
   FLOW(CFS)      32     24     17     12      5      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   4
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                    PASS   5   JOB NO.   1                     PAGE   3



 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        24H 10YR
   STARTING TIME =   .00       RAIN DEPTH =  3.85       RAIN DURATION = 24.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
   ALTERNATE NO. =24           STORM NO. =10            RAIN TABLE NO. = 8


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
      16.85                         35.9                       (RUNOFF)

```

```
     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.07 WATERSHED INCHES;     278 CFS-HRS;      23.0 ACRE-FEET.

     DURATION(HRS)   2      4      6      8     10     12     14     16
     FLOW(CFS)      31     23     16     13     11     10      7      4

     DURATION(HRS)  18     20     21
     FLOW(CFS)       3      1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   5


  EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .250 HOURS


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        48H 10YR
     STARTING TIME =   .00       RAIN DEPTH =  4.29       RAIN DURATION = 48.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .250 HOURS
     ALTERNATE NO. =48           STORM NO. =10            RAIN TABLE NO. = 9


  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
        26.51                          4.5                        (RUNOFF)
        43.38                         28.2                        (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    2.45 WATERSHED INCHES;     329 CFS-HRS;      27.1 ACRE-FEET.
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)             2.04TEST
  18:07:53                    PASS   6   JOB NO.   1                      PAGE   4


     DURATION(HRS)   4      8     12     16     20     24     28     32
     FLOW(CFS)      21     15     10      7      5      4      2      2

     DURATION(HRS)  36     38
     FLOW(CFS)       1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   6


  EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .083 HOURS


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        1HR 50YR
     STARTING TIME =   .00       RAIN DEPTH =  2.56       RAIN DURATION =  1.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 1           STORM NO. =50            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         1.44                          92.0                        (RUNOFF)

     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.04 WATERSHED INCHES;     140 CFS-HRS;      11.5 ACRE-FEET.

     DURATION(HRS)   2      4      5
     FLOW(CFS)      21      1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   7


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        3HR 50YR
     STARTING TIME =   .00       RAIN DEPTH =  3.49       RAIN DURATION =  3.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 3           STORM NO. =50            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         1.86                         100.4                        (RUNOFF)
 1
  TR20 ------------------------------------------------------------------- SCS -
  11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
  01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)             2.04TEST
  18:07:53                    PASS   8   JOB NO.   1                      PAGE   5


     RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                    1.77 WATERSHED INCHES;     238 CFS-HRS;      19.6 ACRE-FEET.

     DURATION(HRS)   2      4      6      6
     FLOW(CFS)      58     10      1      0


  EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   8


  EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        6HR 50YR
     STARTING TIME =   .00       RAIN DEPTH =  4.09       RAIN DURATION =  6.00
     ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
     ALTERNATE NO. = 6           STORM NO. =50            RAIN TABLE NO. = 6


  OPERATION RUNOFF   XSECTION   1

     PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
         2.33                          88.2                        (RUNOFF)

```

```
   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  2.28 WATERSHED INCHES;     306 CFS-HRS;      25.3 ACRE-FEET.

   DURATION(HRS)   2      4      6      8      9
   FLOW(CFS)      59     33     14      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS   9


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .167 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        12H 50YR
   STARTING TIME =   .00       RAIN DEPTH =  4.74       RAIN DURATION = 12.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
   ALTERNATE NO. =12           STORM NO. =50            RAIN TABLE NO. = 7


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
       5.91                         68.8                       (RUNOFF)
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                    PASS  10   JOB NO.   1                     PAGE   6


   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  2.85 WATERSHED INCHES;     381 CFS-HRS;      31.5 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     13
   FLOW(CFS)      53     39     28     20     10      2      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  10


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        24H 50YR
   STARTING TIME =   .00       RAIN DEPTH =  5.45       RAIN DURATION = 24.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
   ALTERNATE NO. =24           STORM NO. =50            RAIN TABLE NO. = 8


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
      16.77                         57.1                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  3.48 WATERSHED INCHES;     467 CFS-HRS;      38.6 ACRE-FEET.

   DURATION(HRS)   2      4      6      8     10     12     14     16
   FLOW(CFS)      51     38     27     22     18     16     13      8

   DURATION(HRS)  18     20     22     23
   FLOW(CFS)       6      3      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  11


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .250 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        48H 50YR
   STARTING TIME =   .00       RAIN DEPTH =  5.89       RAIN DURATION = 48.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .250 HOURS
   ALTERNATE NO. =48           STORM NO. =50            RAIN TABLE NO. = 9


 OPERATION RUNOFF   XSECTION   1
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                    PASS  12   JOB NO.   1                     PAGE   7


   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
      26.44                          8.0                       (RUNOFF)
      31.51                         11.1                       (RUNOFF)
      43.38                         41.9                       (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  3.88 WATERSHED INCHES;     520 CFS-HRS;      43.0 ACRE-FEET.

   DURATION(HRS)   4      8     12     16     20     24     28     32
   FLOW(CFS)      30     23     16     11      8      7      5      3

   DURATION(HRS)  36     40     41
   FLOW(CFS)       2      1      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  12


 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .083 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        1HR100YR
   STARTING TIME =   .00       RAIN DEPTH =  3.00       RAIN DURATION =  1.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
   ALTERNATE NO. = 1           STORM NO. =99            RAIN TABLE NO. = 6


 OPERATION RUNOFF   XSECTION   1
```

```
437
438      PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
439          1.42                         121.6                       (RUNOFF)
440
441      RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
442                     1.38 WATERSHED INCHES;     185 CFS-HRS;      15.3 ACRE-FEET.
443
444      DURATION(HRS)   2      4      5
445      FLOW(CFS)      28      2      0
446
447
448   EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  13
449  1
450   TR20 ------------------------------------------------------------------- SCS -
451   11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
452   01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)             2.04TEST
453   18:07:53                    PASS  14   JOB NO.   1                      PAGE   8
454
455
456
457   EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        3HR100YR
458      STARTING TIME =   .00       RAIN DEPTH =  4.10       RAIN DURATION =  3.00
459      ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
460      ALTERNATE NO. = 3           STORM NO. =99            RAIN TABLE NO. = 6
461
462
463   OPERATION RUNOFF   XSECTION   1
464
465      PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
466          1.83                         130.9                       (RUNOFF)
467
468      RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
469                     2.29 WATERSHED INCHES;     307 CFS-HRS;      25.3 ACRE-FEET.
470
471      DURATION(HRS)   2      4      6      6
472      FLOW(CFS)      73     13      1      0
473
474
475   EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  14
476
477
478   EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        6HR100YR
479      STARTING TIME =   .00       RAIN DEPTH =  4.79       RAIN DURATION =  6.00
480      ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .083 HOURS
481      ALTERNATE NO. = 6           STORM NO. =99            RAIN TABLE NO. = 6
482
483
484   OPERATION RUNOFF   XSECTION   1
485
486      PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
487          2.27                         113.7                       (RUNOFF)
488
489      RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
490                     2.89 WATERSHED INCHES;     388 CFS-HRS;      32.0 ACRE-FEET.
491
492      DURATION(HRS)   2      4      6      8      9
493      FLOW(CFS)      76     41     17      1      0
494
495
496   EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  15
497
498
499   EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .167 HOURS
500  1
501   TR20 ------------------------------------------------------------------- SCS -
502   11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
503   01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)             2.04TEST
504   18:07:53                    PASS  16   JOB NO.   1                      PAGE   9
505
506
507
508   EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        12H100YR
509      STARTING TIME =   .00       RAIN DEPTH =  5.56       RAIN DURATION = 12.00
510      ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
511      ALTERNATE NO. =12           STORM NO. =99            RAIN TABLE NO. = 7
512
513
514   OPERATION RUNOFF   XSECTION   1
515
516      PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
517          5.88                          86.8                       (RUNOFF)
518
519      RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
520                     3.58 WATERSHED INCHES;     480 CFS-HRS;      39.7 ACRE-FEET.
521
522      DURATION(HRS)   2      4      6      8     10     12     14
523      FLOW(CFS)      67     49     36     24     14      3      0
524
525
526   EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  16
527
528
529   EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        24H100YR
530      STARTING TIME =   .00       RAIN DEPTH =  6.40       RAIN DURATION = 24.00
531      ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .167 HOURS
532      ALTERNATE NO. =24           STORM NO. =99            RAIN TABLE NO. = 8
533
534
535   OPERATION RUNOFF   XSECTION   1
536
537      PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
538         16.70                         69.7                       (RUNOFF)
539
540      RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
541                     4.35 WATERSHED INCHES;     584 CFS-HRS;      48.2 ACRE-FEET.
542
543      DURATION(HRS)   2      4      6      8     10     12     14     16
544      FLOW(CFS)      63     47     34     28     22     20     16     11
545
```

```
   DURATION(HRS)  18     20     22     24
   FLOW(CFS)       8      4      2      0


 EXECUTIVE CONTROL ENDCMP    COMPUTATIONS COMPLETED FOR PASS  17
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                    PASS  18   JOB NO.   1                     PAGE  10



 EXECUTIVE CONTROL INCREM    MAIN TIME INCREMENT =   .250 HOURS


 EXECUTIVE CONTROL COMPUT    FROM XSECTION   1  TO XSECTION   1        48H100YR
   STARTING TIME =   .00       RAIN DEPTH =  6.70       RAIN DURATION = 48.00
   ANT. RUNOFF COND. = 2       MAIN TIME INCREMENT =   .250 HOURS
   ALTERNATE NO. =48           STORM NO. =99            RAIN TABLE NO. = 9


 OPERATION RUNOFF   XSECTION   1

   PEAK TIME(HRS)             PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
      26.43                          9.8                        (RUNOFF)
      31.50                         13.4                        (RUNOFF)
      43.37                         48.8                        (RUNOFF)

   RUNOFF ABOVE BASEFLOW  (BASEFLOW =    .00 CFS)
                  4.63 WATERSHED INCHES;     621 CFS-HRS;      51.3 ACRE-FEET.

   DURATION(HRS)   4      8     12     16     20     24     28     32
   FLOW(CFS)      36     27     19     13     10      9      6      4

   DURATION(HRS)  36     40     43
   FLOW(CFS)       3      2      0
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                     SUMMARY, JOB NO.   1                      PAGE  11


                            SUMMARY TABLE 1
                            ---------------
   SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
   A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
 F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

 XSECTION/  STANDARD                                  PEAK DISCHARGE
 STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
   ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                        (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)

 RAINFALL OF   1.82 inches AND   1.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  6,    ARC 2
 MAIN TIME INCREMENT   .083 HOURS

   ALTERNATE    1   STORM   10
   ---------------------------
 XSECTION   1  RUNOFF      .21      .53        ---      1.47       47    223.8

 RAINFALL OF   2.47 inches AND   3.00 hr DURATION, BEGINS AT    .0 hrs.

   ALTERNATE    3   STORM   10
   ---------------------------
 XSECTION   1  RUNOFF      .21      .98        ---      1.96       54    257.1

 RAINFALL OF   2.91 inches AND   6.00 hr DURATION, BEGINS AT    .0 hrs.

   ALTERNATE    6   STORM   10
   ---------------------------
 XSECTION   1  RUNOFF      .21     1.31        ---      2.49       49    233.3

 RAINFALL OF   3.36 inches AND  12.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  7,    ARC 2
 MAIN TIME INCREMENT   .167 HOURS

   ALTERNATE   12   STORM   10
   ---------------------------
 XSECTION   1  RUNOFF      .21     1.67        ---      6.02       40    190.5

 RAINFALL OF   3.85 inches AND  24.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  8,    ARC 2

   ALTERNATE   24   STORM   10
   ---------------------------
 XSECTION   1  RUNOFF      .21     2.07        ---     16.85       36    171.4
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                     SUMMARY, JOB NO.   1                      PAGE  12


                            SUMMARY TABLE 1
                            ---------------
   SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
   A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
 F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

 XSECTION/  STANDARD                                  PEAK DISCHARGE
 STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
   ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                        (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)


 RAINFALL OF   4.29 inches AND  48.00 hr DURATION, BEGINS AT    .0 hrs.
```

```
 RAINTABLE NUMBER  9,    ARC 2
 MAIN TIME INCREMENT   .250 HOURS

    ALTERNATE   48   STORM   10
    ---------------------------
 XSECTION   1  RUNOFF      .21     2.45        ---     43.38       28    133.3

 RAINFALL OF   2.56 inches AND   1.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  6,    ARC 2
 MAIN TIME INCREMENT   .083 HOURS

    ALTERNATE    1   STORM   50
    ---------------------------
 XSECTION   1  RUNOFF      .21     1.04        ---      1.44       92    438.1

 RAINFALL OF   3.49 inches AND   3.00 hr DURATION, BEGINS AT    .0 hrs.

    ALTERNATE    3   STORM   50
    ---------------------------
 XSECTION   1  RUNOFF      .21     1.77        ---      1.86      100    476.2

 RAINFALL OF   4.09 inches AND   6.00 hr DURATION, BEGINS AT    .0 hrs.

    ALTERNATE    6   STORM   50
    ---------------------------
 XSECTION   1  RUNOFF      .21     2.28        ---      2.33       88    419.0
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                     SUMMARY, JOB NO.   1                      PAGE  13


                             SUMMARY TABLE 1
                             ---------------
    SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
    A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
 F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

 XSECTION/  STANDARD                                   PEAK DISCHARGE
 STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
    ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                         (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)


 RAINFALL OF   4.74 inches AND  12.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  7,    ARC 2
 MAIN TIME INCREMENT   .167 HOURS

    ALTERNATE   12   STORM   50
    ---------------------------
 XSECTION   1  RUNOFF      .21     2.85        ---      5.91       69    328.6

 RAINFALL OF   5.45 inches AND  24.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  8,    ARC 2

    ALTERNATE   24   STORM   50
    ---------------------------
 XSECTION   1  RUNOFF      .21     3.48        ---     16.77       57    271.4

 RAINFALL OF   5.89 inches AND  48.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  9,    ARC 2
 MAIN TIME INCREMENT   .250 HOURS

    ALTERNATE   48   STORM   50
    ---------------------------
 XSECTION   1  RUNOFF      .21     3.88        ---     43.38       42    200.0
1
 TR20 ------------------------------------------------------------------- SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                     SUMMARY, JOB NO.   1                      PAGE  14


                             SUMMARY TABLE 1
                             ---------------
    SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
    A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
 F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

 XSECTION/  STANDARD                                   PEAK DISCHARGE
 STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
    ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                         (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)


 RAINFALL OF   3.00 inches AND   1.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  6,    ARC 2
 MAIN TIME INCREMENT   .083 HOURS

    ALTERNATE    1   STORM   99
    ---------------------------
 XSECTION   1  RUNOFF      .21     1.38        ---      1.42      122    581.0

 RAINFALL OF   4.10 inches AND   3.00 hr DURATION, BEGINS AT    .0 hrs.

    ALTERNATE    3   STORM   99
    ---------------------------
 XSECTION   1  RUNOFF      .21     2.29        ---      1.83      131    623.8

 RAINFALL OF   4.79 inches AND   6.00 hr DURATION, BEGINS AT    .0 hrs.

    ALTERNATE    6   STORM   99
    ---------------------------
 XSECTION   1  RUNOFF      .21     2.89        ---      2.27      114    542.9

 RAINFALL OF   5.56 inches AND  12.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  7,    ARC 2
 MAIN TIME INCREMENT   .167 HOURS
```

```
   ALTERNATE   12   STORM   99
   ---------------------------
 XSECTION   1  RUNOFF      .21     3.58        ---      5.88       87    414.3
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                     SUMMARY, JOB NO.   1                      PAGE  15


                             SUMMARY TABLE 1
                             ---------------
   SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.
   A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:
 F-FLAT TOP HYDROGRAPH   T-TRUNCATED HYDROGRAPH   R-RISING TRUNCATED HYDROGRAPH

 XSECTION/  STANDARD                                  PEAK DISCHARGE
 STRUCTURE   CONTROL    DRAINAGE   RUNOFF   ------------------------------------
    ID      OPERATION     AREA     AMOUNT   ELEVATION   TIME     RATE    RATE
                        (SQ MI)    (IN)      (FT)      (HR)     (CFS)   (CSM)


 RAINFALL OF   6.40 inches AND  24.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  8,    ARC 2

   ALTERNATE   24   STORM   99
   ---------------------------
 XSECTION   1  RUNOFF      .21     4.35        ---     16.70       70    333.3

 RAINFALL OF   6.70 inches AND  48.00 hr DURATION, BEGINS AT    .0 hrs.
 RAINTABLE NUMBER  9,    ARC 2
 MAIN TIME INCREMENT   .250 HOURS

   ALTERNATE   48   STORM   99
   ---------------------------
 XSECTION   1  RUNOFF      .21     4.63        ---     43.37       49    233.3
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST
 18:07:53                     SUMMARY, JOB NO.   1                      PAGE  16


                             SUMMARY TABLE 3
                             ---------------
     STORM DISCHARGES (CFS) AT XSECTIONS AND STRUCTURES FOR ALL ALTERNATES
     QUESTION MARK (?) AFTER: OUTFLOW PEAK - RISING TRUNCATED HYDROGRAPH.

 XSECTION/          DRAINAGE
 STRUCTURE            AREA       STORM NUMBERS..........
   ID               (SQ MI)         10        50        99


 XSECTION    1          .21
 ---------------------------
   ALTERNATE    1                   47        92       122
   ALTERNATE    3                   54       100       131
   ALTERNATE    6                   49        88       114
   ALTERNATE   12                   40        69        87
   ALTERNATE   24                   36        57        70

   ALTERNATE   48                   28        42        49
1
 TR20 ------------------------------------------------------------------ SCS -
 11048E19   US ROUTE 45: IDOT p-91-338-10 ANTIOCH, IL EX. CONDITIONS     VERSION
 01/19/**          RWA#11048  JDH 19JAN12 * DA19      (B-70)            2.04TEST




 END OF  1 JOBS IN THIS RUN



                     SCS  TR-20,  VERSION 2.04TEST
                            11048E19  FILES

    INPUT  = 11048E19.T20                          , GIVEN DATA FILE
    OUTPUT = 11048E19.OUT                          , DATED 01/19/**,18:07:53

             FILES GENERATED - DATED 01/19/**,18:07:53

                              NONE!



          TOTAL NUMBER OF WARNINGS =   1,  MESSAGES =   0

                     *** TR-20 RUN COMPLETED ***
```

Existing DA19
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 54 cfs

Design Flow: 100 cfs

Maximum Flow: 180 cfs

Table 1 - Summary of Culvert Flows at Crossing: Existing DA19

Headwater Elevation (ft)	Total Discharge (cfs)	Ex. 3'x2' Box Discharge (cfs)	Roadway Discharge (cfs)	Iterations
784.32	54.00	50.32	3.41	34
784.43	66.60	50.24	16.06	8
784.49	79.20	50.00	28.98	6
784.54	91.80	49.77	41.80	5
784.57	100.00	49.60	50.10	4
784.62	117.00	49.14	67.52	4
784.66	129.60	49.02	80.44	4
784.69	142.20	48.90	92.81	3
784.72	154.80	48.81	105.58	3
784.75	167.40	48.72	118.52	3
784.77	180.00	48.65	131.27	3
784.19	49.58	49.58	0.00	Overtopping

Rating Curve Plot for Crossing: Existing DA19

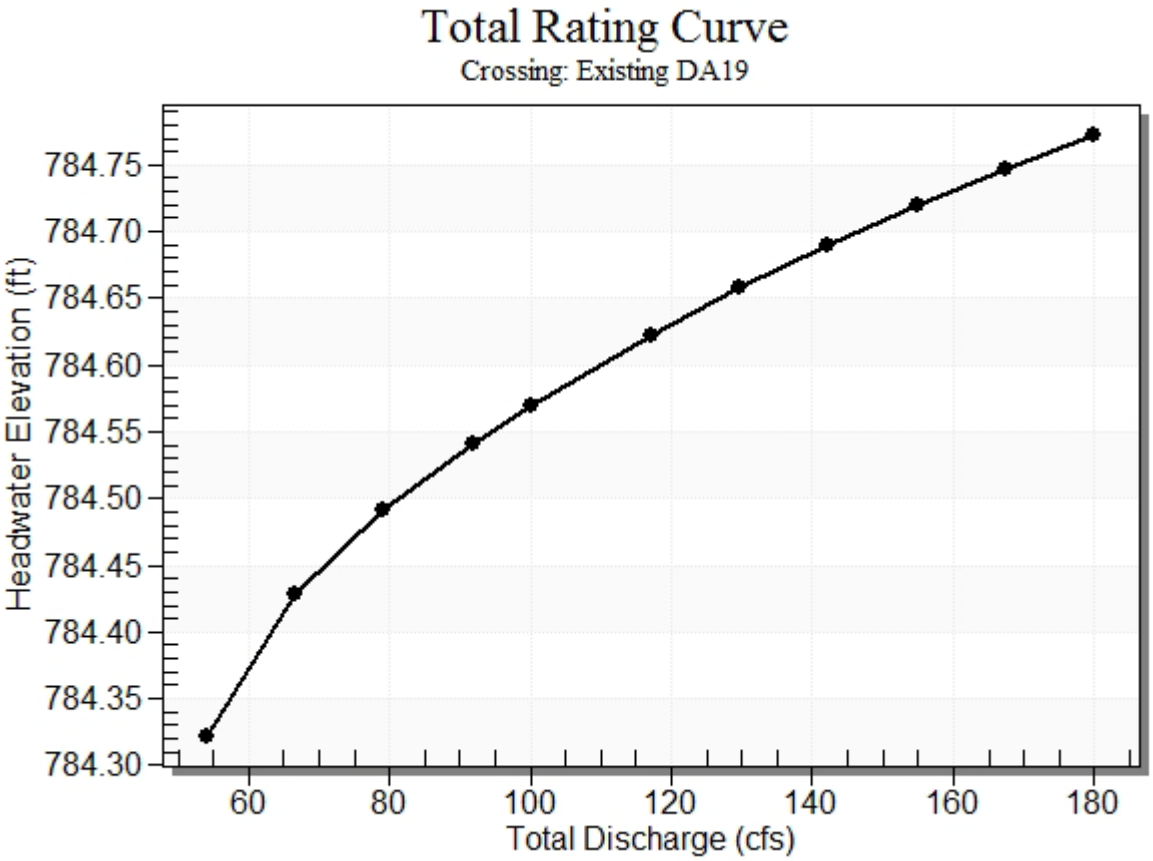


Table 2 - Culvert Summary Table: Ex. 3'x2' Box

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
54.00	50.32	784.32	7.087	7.122	4-FFf	-1.000	1.680	1.680	2.110	10.983	2.228
66.60	50.24	784.43	7.066	7.228	4-FFf	-1.000	1.680	1.680	2.231	10.965	2.342
79.20	50.00	784.49	7.008	7.290	4-FFf	-1.000	1.680	1.680	2.335	10.913	2.449
91.80	49.77	784.54	6.950	7.340	4-FFf	-1.000	1.680	1.680	2.428	10.862	2.549
100.00	49.60	784.57	6.908	7.368	4-FFf	-1.000	1.680	1.680	2.486	10.824	2.600
117.00	49.14	784.62	6.796	7.422	4-FFf	-1.000	1.680	1.680	2.621	10.724	2.571
129.60	49.02	784.66	6.767	7.457	4-FFf	-1.000	1.680	1.680	2.677	10.699	2.640
142.20	48.90	784.69	6.740	7.489	4-FFf	-1.000	1.680	1.680	2.729	10.674	2.707
154.80	48.81	784.72	6.718	7.519	4-FFf	-1.000	1.680	1.680	2.775	10.653	2.743
167.40	48.72	784.75	6.696	7.547	4-FFf	-1.000	1.680	1.680	2.818	10.634	2.750
180.00	48.65	784.77	6.678	7.572	4-FFf	-1.000	1.680	1.680	2.857	10.617	2.736

****

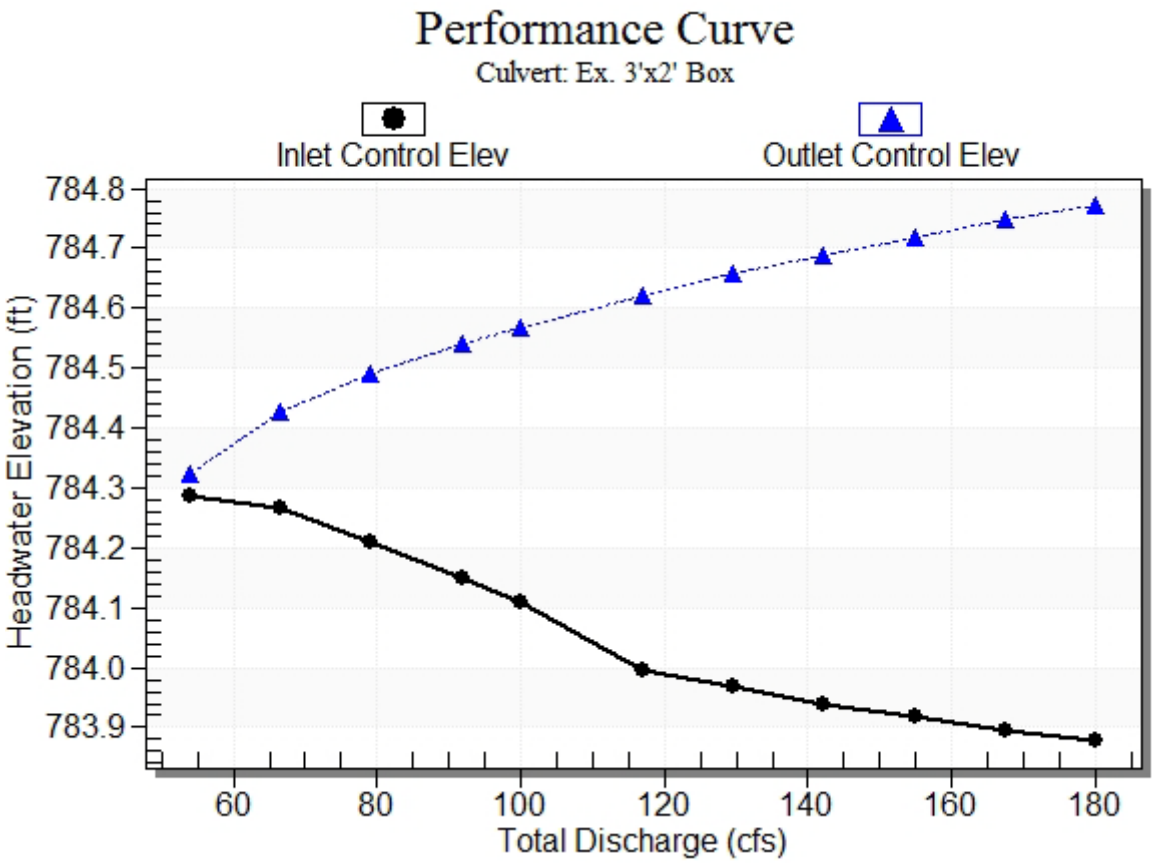
Straight Culvert

Inlet Elevation (invert): 777.20 ft, Outlet Elevation (invert): 777.62 ft

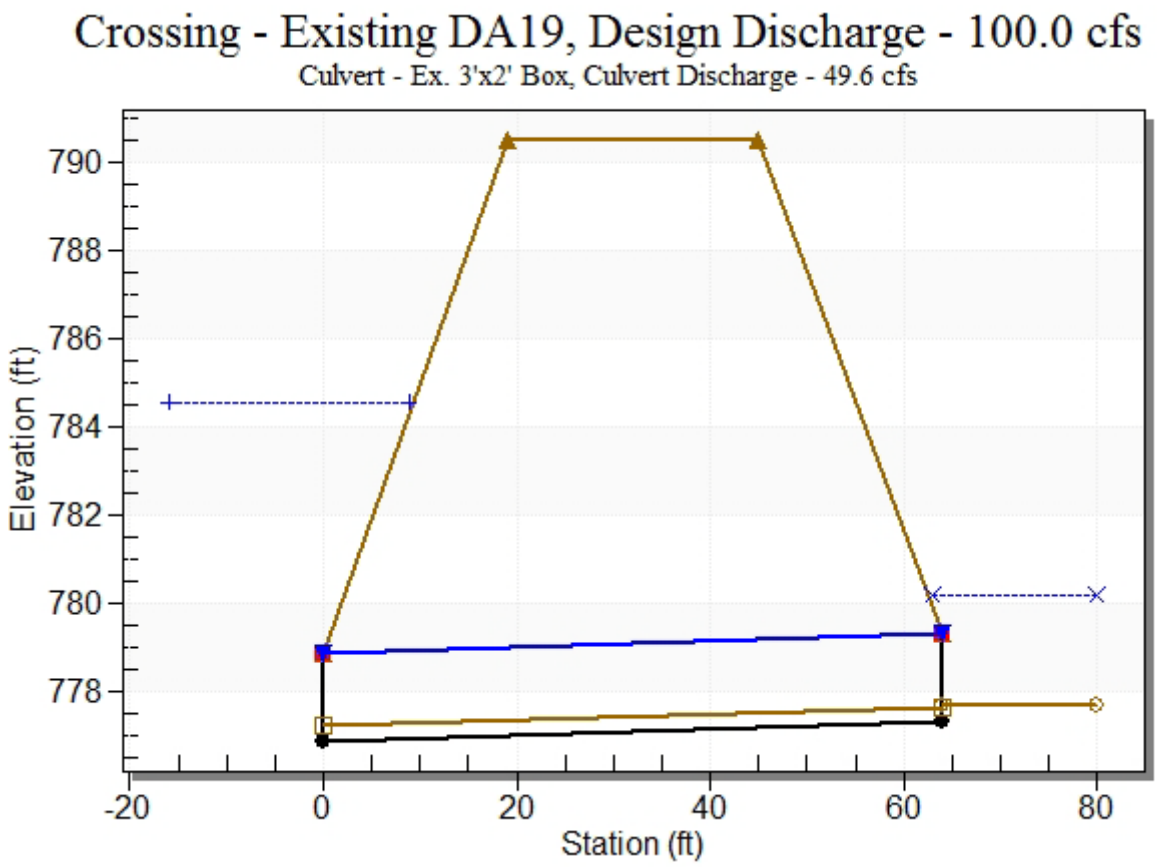
Culvert Length: 64.00 ft, Culvert Slope: -0.0065

****

Culvert Performance Curve Plot: Ex. 3'x2' Box



Water Surface Profile Plot for Culvert: Ex. 3'x2' Box



Site Data - Ex. 3'x2' Box

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 776.88 ft

Outlet Station: 64.00 ft

Outlet Elevation: 777.30 ft

Number of Barrels: 1

Culvert Data Summary - Ex. 3'x2' Box

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 3.84 in

Barrel Manning's n: 0.0130 (top and sides)

Manning's n: 0.0250 (bottom)

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Existing DA19)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
54.00	779.79	2.11	2.23	1.92	0.46
66.60	779.91	2.23	2.34	2.03	0.47
79.20	780.02	2.34	2.45	2.13	0.47
91.80	780.11	2.43	2.55	2.21	0.48
100.00	780.17	2.49	2.60	2.27	0.48
117.00	780.30	2.62	2.57	2.39	0.53
129.60	780.36	2.68	2.64	2.44	0.53
142.20	780.41	2.73	2.71	2.49	0.57
154.80	780.46	2.78	2.74	2.53	0.62
167.40	780.50	2.82	2.75	2.57	0.67
180.00	780.54	2.86	2.74	2.60	0.68

Tailwater Channel Data - Existing DA19

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0146

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	-29.00	781.30	0.1000
2	-20.00	779.00	0.1000
3	-9.00	779.04	0.1000
4	-3.60	778.57	0.0500
5	0.00	777.87	0.0500
6	0.60	777.68	0.0500
7	0.90	780.52	0.1000
8	21.70	780.49	0.1000
9	61.00	780.39	0.1000
10	62.00	779.33	0.0330
11	78.00	780.16	0.0330
12	98.00	780.31	0.0330
13	123.00	781.11	0.0000

<u>Assumptions for Manning's "n" value for downstream channel:</u>

Channel Bottom: Clean bottom, brush on sides -> n = 0.05

Channel Overbanks: Medium to dense brush and heavy trees -> n = 0.10

Channel Overbanks – more than 62' right: turf grass mowed -> n= 0.033

Roadway Data for Crossing: Existing DA19

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	30738.00	790.54
1	30820.00	788.36
2	30939.00	785.01
3	30990.00	784.36
4	31039.00	784.34
5	31055.00	784.19
6	31087.00	784.27
7	31145.00	784.72
8	31320.00	789.41

Roadway Surface: Paved

Roadway Top Width: 26.00 ft

Proposed DA 19
7’ x 4’ RCBC
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 54 cfs

Design Flow: 100 cfs

Maximum Flow: 180 cfs

Table 1 - Summary of Culvert Flows at Crossing: Proposed DA19 TR-20

Headwater Elevation (ft)	Total Discharge (cfs)	Pr. 84" x 48" Box Discharge (cfs)	Roadway Discharge (cfs)	Iterations
780.38	54.00	54.00	0.00	1
780.68	66.60	66.60	0.00	1
780.95	79.20	79.20	0.00	1
781.21	91.80	91.80	0.00	1
781.39	100.00	100.00	0.00	1
781.85	117.00	117.00	0.00	1
782.19	129.60	129.60	0.00	1
782.56	142.20	142.20	0.00	1
782.94	154.80	154.80	0.00	1
783.39	167.40	167.40	0.00	1
783.90	180.00	180.00	0.00	1
784.19	189.85	189.85	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed DA19 TR-20

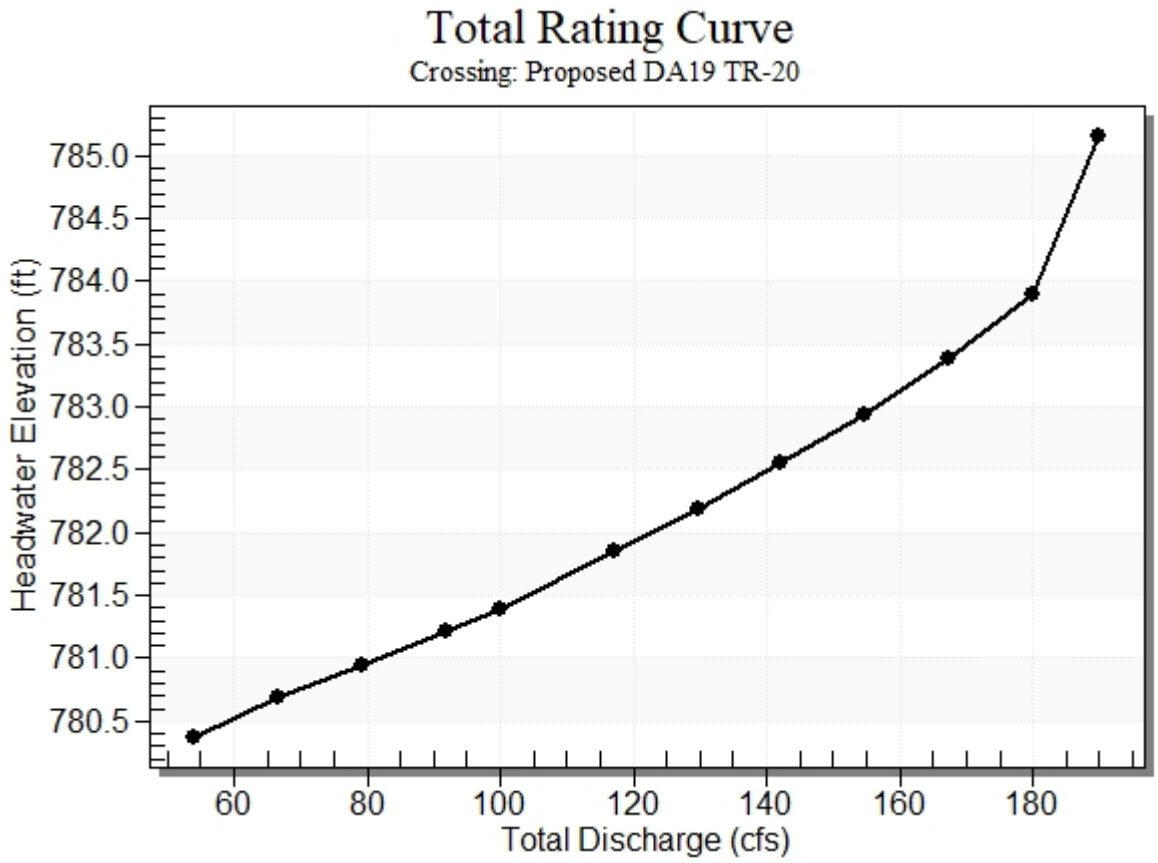


Table 2 - Culvert Summary Table: Pr. 84" x 48" Box

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
54.00	54.00	780.38	1.878	1.551	6-FFt	1.338	1.233	2.090	2.110	3.691	2.228
66.60	66.60	780.68	2.185	1.808	6-FFt	1.515	1.416	2.211	2.231	4.303	2.342
79.20	79.20	780.95	2.447	2.077	6-FFt	1.683	1.578	2.315	2.335	4.887	2.449
91.80	91.80	781.21	2.710	2.362	6-FFt	1.839	1.738	2.408	2.428	5.447	2.549
100.00	100.00	781.39	2.887	2.561	6-FFt	1.937	1.843	2.466	2.486	5.792	2.600
117.00	117.00	781.85	3.349	3.026	6-FFt	2.128	2.047	2.601	2.621	6.427	2.571
129.60	129.60	782.19	3.692	3.360	6-FFt	2.262	2.194	2.657	2.677	6.968	2.640
142.20	142.20	782.56	4.062	3.719	6-FFt	2.393	2.333	2.709	2.729	7.500	2.707
154.80	154.80	782.94	4.439	4.100	6-FFt	2.518	2.467	2.755	2.775	8.026	2.743
167.40	167.40	783.39	4.834	4.506	6-FFt	2.639	2.603	2.798	2.818	8.769	2.750
180.00	180.00	783.90	5.314	4.937	6-FFt	3.000	2.732	2.837	2.857	9.429	2.736

****

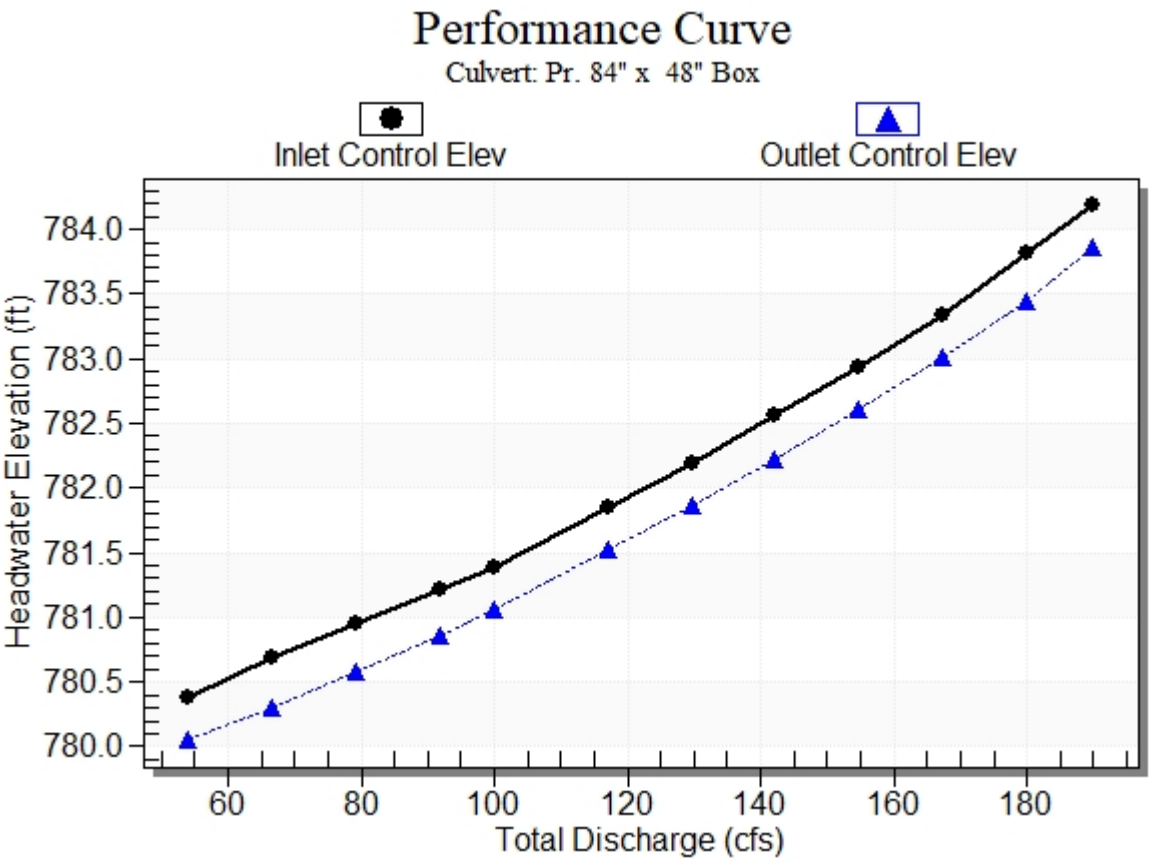
Straight Culvert

Inlet Elevation (invert): 778.50 ft, Outlet Elevation (invert): 777.70 ft

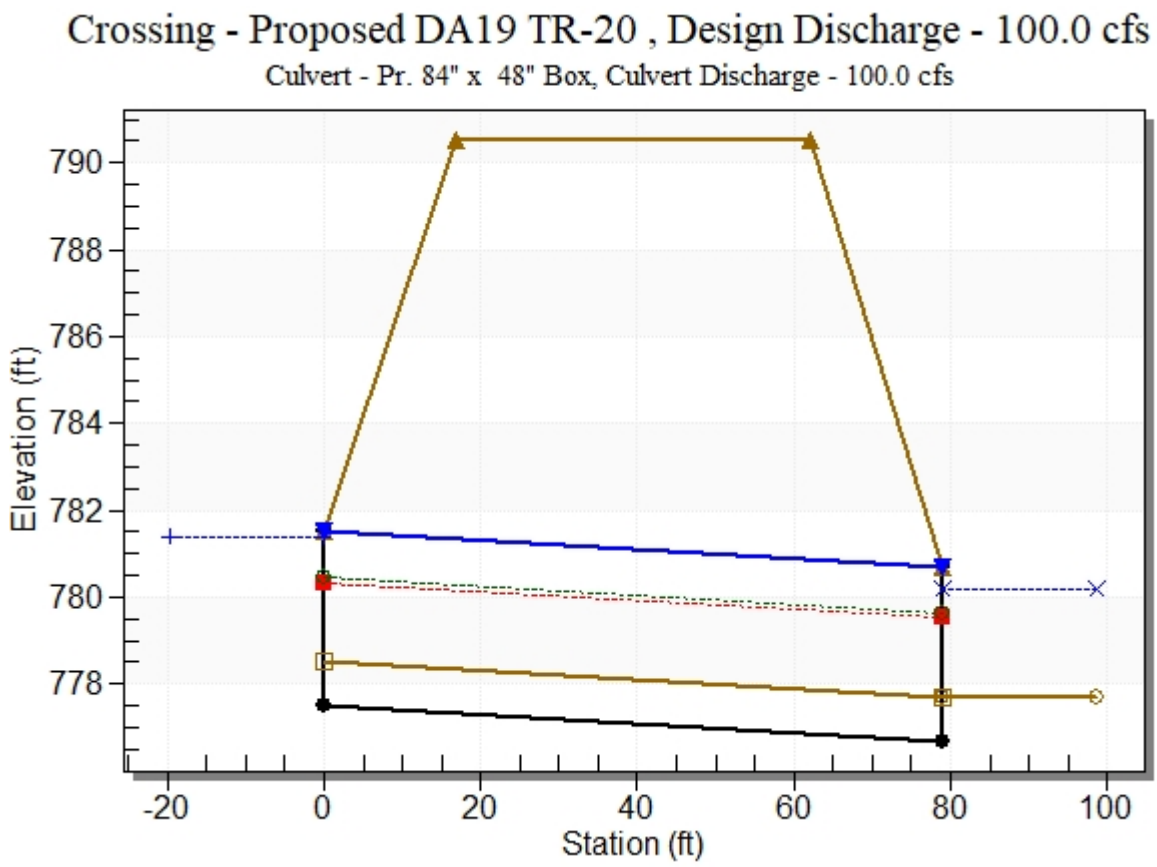
Culvert Length: 79.00 ft, Culvert Slope: 0.0101

****

Culvert Performance Curve Plot: Pr. 84" x 48" Box



Water Surface Profile Plot for Culvert: Pr. 84" x 48" Box



Site Data - Pr. 84" x 48" Box

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 777.50 ft

Outlet Station: 79.00 ft

Outlet Elevation: 776.70 ft

Number of Barrels: 1

Culvert Data Summary - Pr. 84" x 48" Box

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 12.00 in

Barrel Manning's n: 0.0130 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Proposed DA19 TR-20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
54.00	779.79	2.11	2.23	1.92	0.46
66.60	779.91	2.23	2.34	2.03	0.47
79.20	780.02	2.34	2.45	2.13	0.47
91.80	780.11	2.43	2.55	2.21	0.48
100.00	780.17	2.49	2.60	2.27	0.48
117.00	780.30	2.62	2.57	2.39	0.53
129.60	780.36	2.68	2.64	2.44	0.53
142.20	780.41	2.73	2.71	2.49	0.57
154.80	780.46	2.78	2.74	2.53	0.62
167.40	780.50	2.82	2.75	2.57	0.67
180.00	780.54	2.86	2.74	2.60	0.68

Tailwater Channel Data - Proposed DA19 TR-20

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0146

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	-29.00	781.30	0.1000
2	-20.00	779.00	0.1000
3	-9.00	779.04	0.1000
4	-3.60	778.57	0.0500
5	0.00	777.87	0.0500
6	0.60	777.68	0.0500
7	0.90	780.52	0.1000
8	21.70	780.49	0.1000
9	61.00	780.39	0.1000
10	62.00	779.33	0.0330
11	78.00	780.16	0.0330
12	98.00	780.31	0.0330
13	123.00	781.11	0.0000

Roadway Data for Crossing: Proposed DA19 TR-20

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

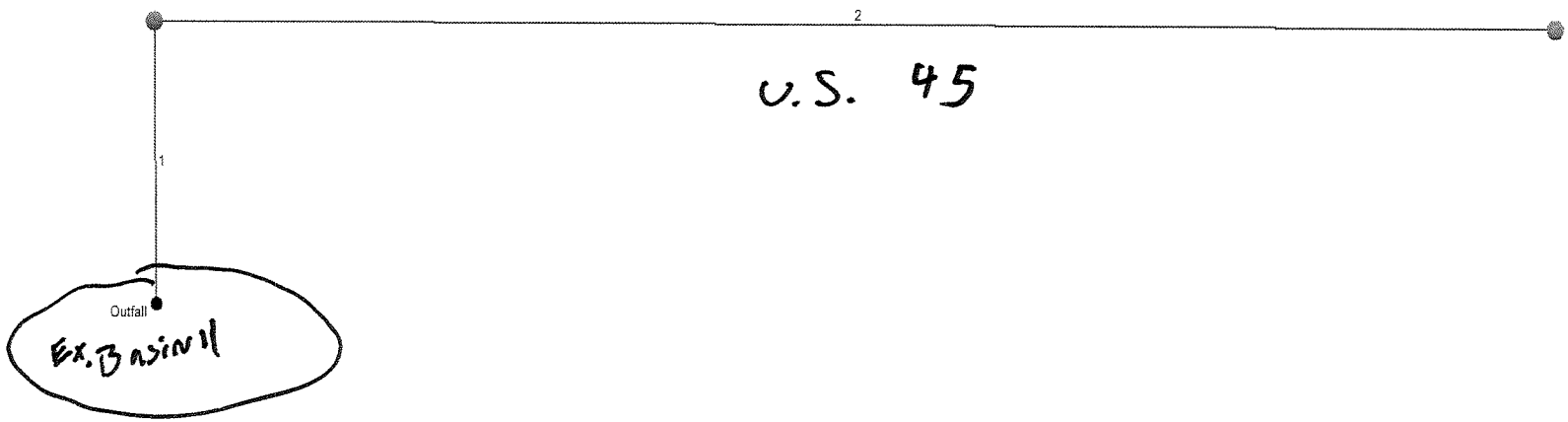
Coord No.	Station (ft)	Elevation (ft)
0	30738.00	790.54
1	30820.00	788.36
2	30939.00	785.01
3	30990.00	784.36
4	31039.00	784.34
5	31055.00	784.19
6	31087.00	784.27
7	31145.00	784.72
8	31320.00	789.41

Roadway Surface: Paved

Roadway Top Width: 45.00 ft

STORMSEWER SIZING CALCULATIONS

Hydraflow Plan View



Project File: 168+50 to 170+25.stm	No. Lines: 2	10-15-2014

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	32.0	-90.5	MH	0.00	0.44	0.90	5.0	736.00	1.56	736.50	15	Cir	0.013	1.00	744.58	168+50
2	1	174.0	90.7	MH	0.00	0.29	0.90	5.0	736.75	0.49	737.60	12	Cir	0.013	1.00	741.57	170+25

Project File: 168+50 to 170+25.stm | Number of lines: 2 | Date: 10-15-2014

Hydraflow Storm Sewers 2005

10 Year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	168+50	4.04	15 c	32.0	736.00	736.50	1.563	736.80	737.30	n/a	737.30 j	End
2	170+25	1.69	12 c	174.0	736.75	737.60	0.488	737.60	738.17	0.21	738.38	1

Project File: 168+50 to 170+25.stm | Number of lines: 2 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	32.0	0.44	0.73	0.90	0.40	0.66	5.0	6.3	6.2	4.04	8.07	4.84	15	1.56	736.50	736.00	737.30	736.80	744.58	0.00	168+50
2	1	174.0	0.29	0.29	0.90	0.26	0.26	5.0	5.0	6.5	1.69	2.49	3.01	12	0.49	737.60	736.75	738.17	737.60	741.57	744.58	170+25

Project File: 168+50 to 170+25.stm

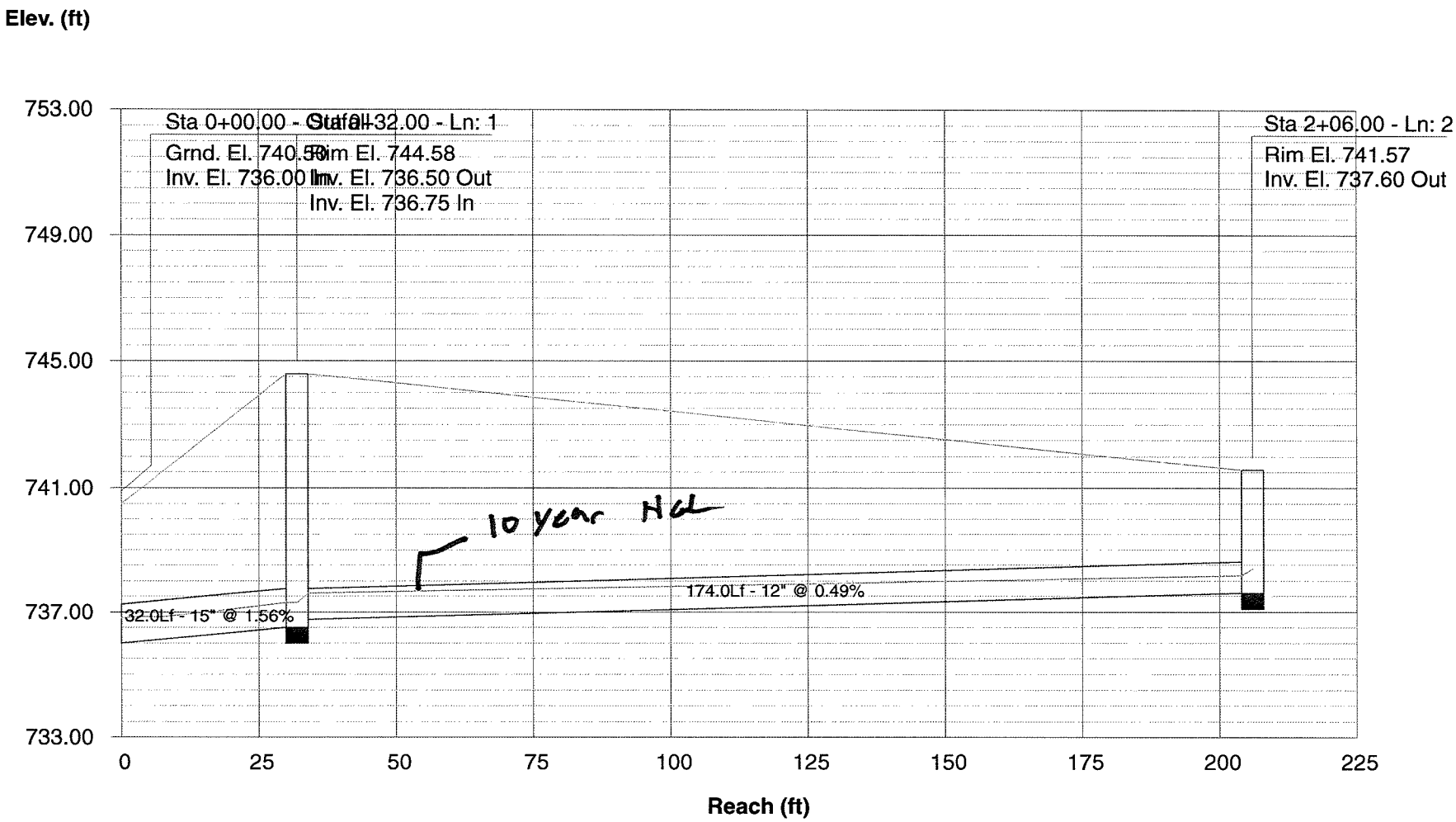
Number of lines: 2

Run Date: 10-15-2014

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

Storm Sewer Profile

Proj. file: 168+50 to 170+25.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	32.0	-90.5	MH	0.00	0.44	0.90	5.0	736.00	1.56	736.50	15	Cir	0.013	1.00	744.58	168+50
2	1	174.0	90.7	MH	0.00	0.29	0.90	5.0	736.75	0.49	737.60	12	Cir	0.013	1.00	741.57	170+25

Project File: 168+50 to 170+25.stm | Number of lines: 2 | Date: 10-15-2014

50-year HGL

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	168+50	5.93	15 c	32.0	736.00	736.50	1.563	736.97	737.47	n/a	737.47 j	End
2	170+25	2.44	12 c	174.0	736.75	737.60	0.488	737.84	738.58	0.15	738.73	1

Project File: 168+50 to 170+25.stm | Number of lines: 2 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	32.0	0.44	0.73	0.90	0.40	0.66	5.0	5.9	9.0	5.93	8.07	5.78	15	1.56	736.50	736.00	737.47	736.97	744.58	0.00	168+50
2	1	174.0	0.29	0.29	0.90	0.26	0.26	5.0	5.0	9.4	2.44	2.49	3.12	12	0.49	737.60	736.75	738.58	737.84	741.57	744.58	170+25

Project File: 168+50 to 170+25.stm

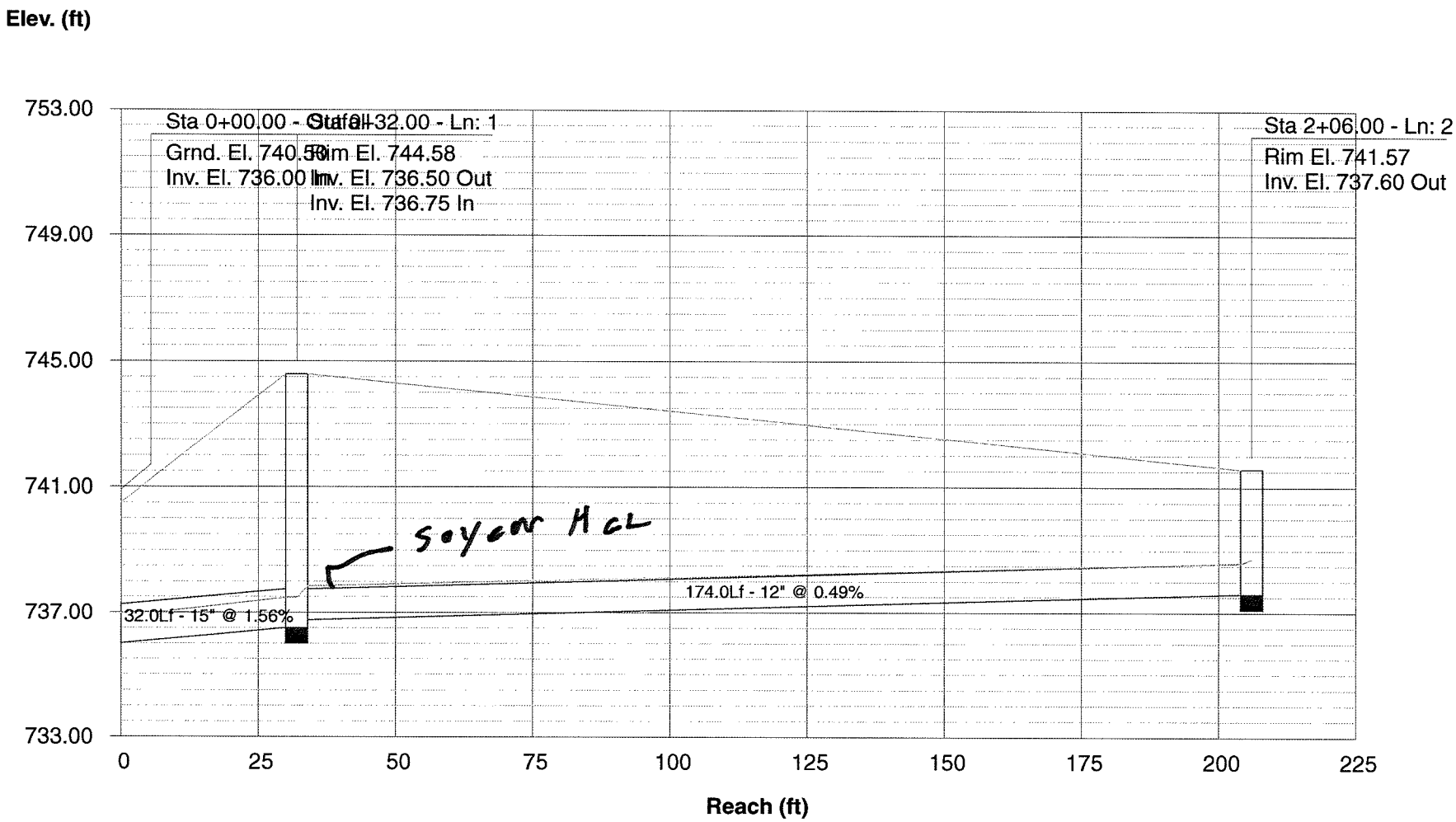
Number of lines: 2

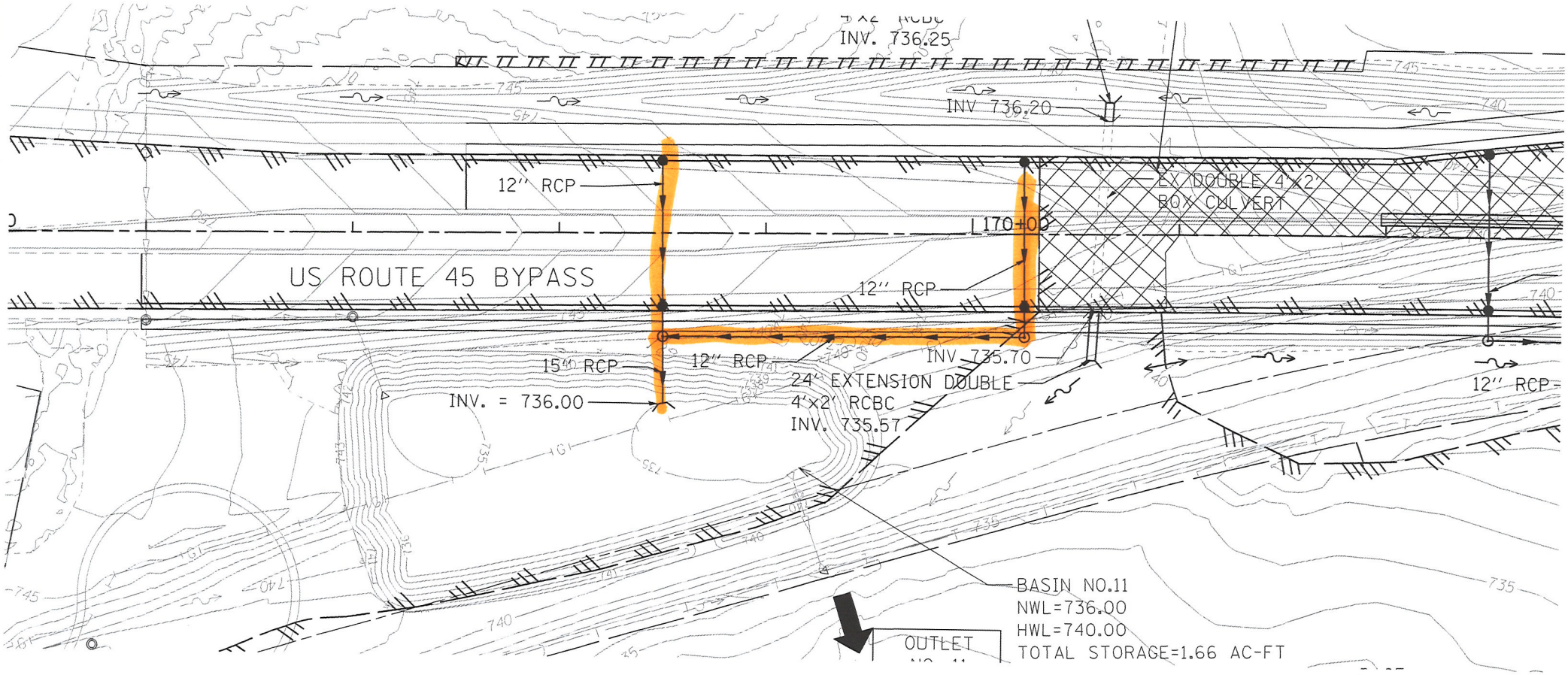
Run Date: 10-15-2014

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

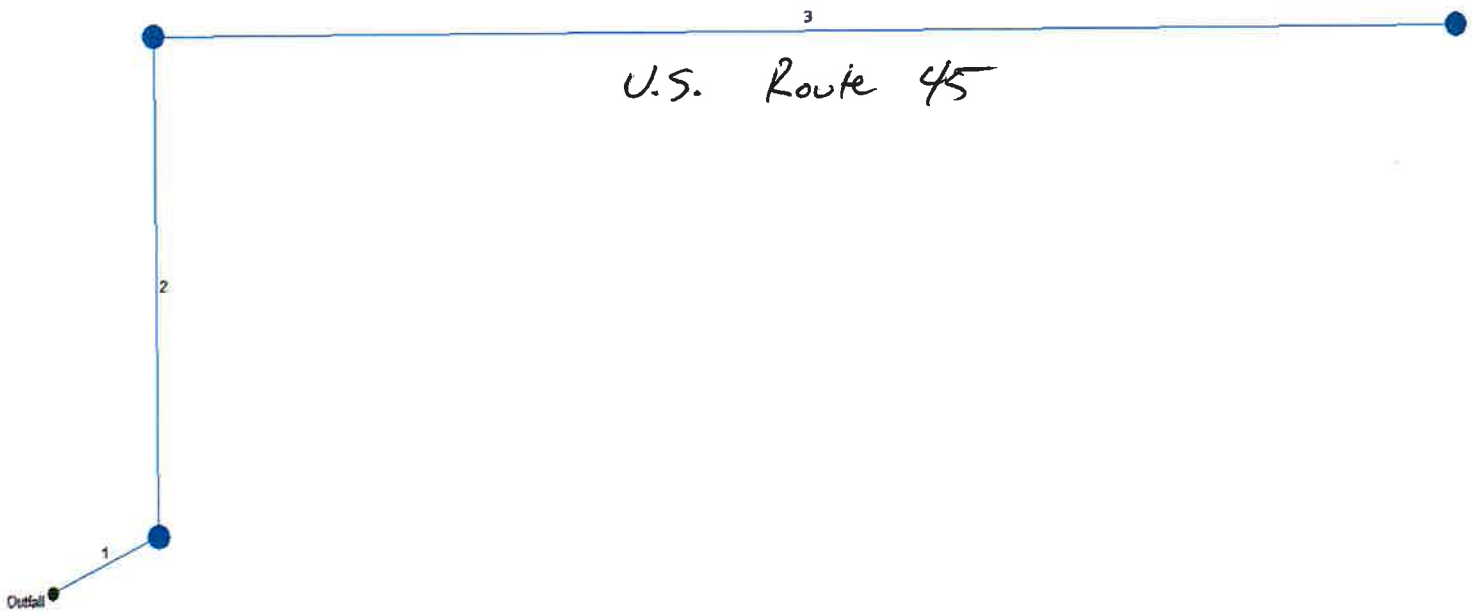
Storm Sewer Profile

Proj. file: 168+50 to 170+25.stm




INV. 736.25
INV 736.20
12" RCP
EX. DOUBLE 4'x2'
BOX CULVERT
L 170+00
US ROUTE 45 BYPASS
12" RCP
15" RCP
12" RCP
INV. = 736.00
INV 735.70
24" EXTENSION DOUBLE
4'x2' RCBC
INV. 735.57
12" RCP
BASIN NO.11
NWL=736.00
HWL=740.00
TOTAL STORAGE=1.66 AC-FT
OUTLET

Hydraflow Plan View



Project File: Station 171+00 to 173+25.stm	No. Lines: 3	12-28-2017

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	22.0	-26.0	MH	0.00	0.06	0.90	5.0	735.65	0.47	735.75	12	Cir	0.013	0.92	741.17	170+90
2	1	85.0	-64.6	MH	0.00	0.06	0.90	5.0	735.75	0.47	736.15	12	Cir	0.013	1.00	741.17	170+90
3	2	245.0	90.1	MH	0.00	0.22	0.90	5.0	736.15	0.47	737.30	12	Cir	0.013	1.00	740.32	173+32

Project File: Station 171+00 to 173+25.stm | Number of lines: 3 | Date: 12-28-2017

Hydraflow Storm Sewers 2005

10 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	170+90	1.76	12 c	22.0	735.65	735.75	0.472	736.28	736.38	0.16	736.55	End
2	170+90	1.49	12 c	85.0	735.75	736.15	0.468	736.67	736.81	0.12	736.92	1
3	173+32	1.28	12 c	245.0	736.15	737.30	0.468	737.00	737.78	0.18	737.96	2

Project File: Station 171+00 to 173+25.stm | Number of lines: 3 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	22.0	0.06	0.34	0.90	0.05	0.31	5.0	8.2	5.8	1.76	2.45	3.39	12	0.47	735.75	735.65	736.38	736.28	741.17	741.00	170+90
2	1	85.0	0.06	0.28	0.90	0.05	0.25	5.0	7.5	5.9	1.49	2.44	2.35	12	0.47	736.15	735.75	736.81	736.67	741.17	741.17	170+90
3	2	245.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	6.5	1.28	2.44	2.61	12	0.47	737.30	736.15	737.78	737.00	740.32	741.17	173+32

Project File: Station 171+00 to 173+25.stm

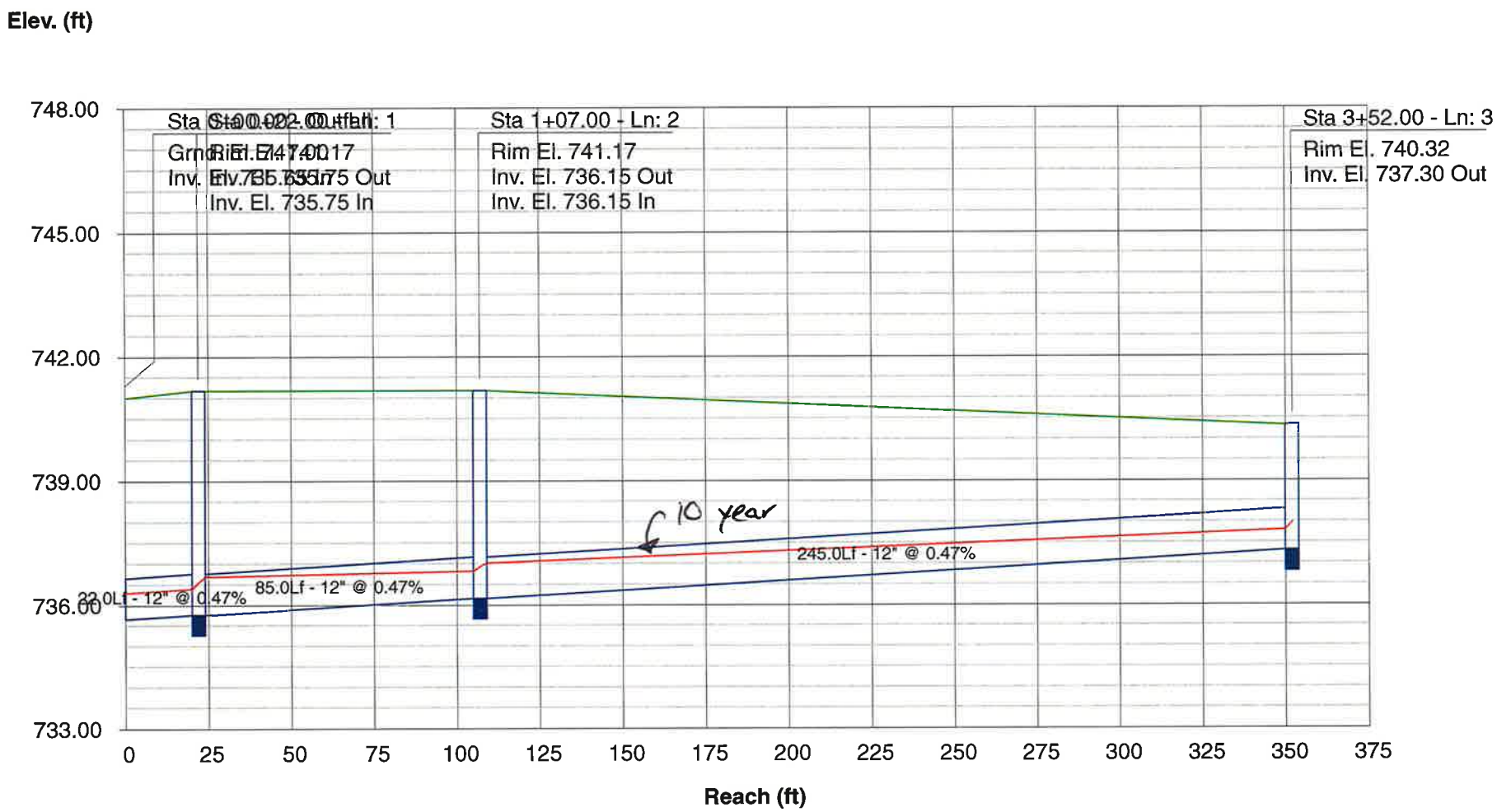
Number of lines: 3

Run Date: 12-28-2017

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

Storm Sewer Profile

Proj. file: Station 171+00 to 173+25.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	22.0	-26.0	MH	0.00	0.06	0.90	5.0	735.65	0.47	735.75	12	Cir	0.013	0.92	741.17	170+90
2	1	85.0	-64.6	MH	0.00	0.06	0.90	5.0	735.75	0.47	736.15	12	Cir	0.013	1.00	741.17	170+90
3	2	245.0	90.1	MH	0.00	0.22	0.90	5.0	736.15	0.47	737.30	12	Cir	0.013	1.00	740.32	173+32

Project File: Station 171+00 to 173+25.stm | Number of lines: 3 | Date: 12-28-2017

50 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	170+90	2.64	12 c	22.0	735.65	735.75	0.472	736.34	736.59	0.20	736.79	End
2	170+90	2.21	12 c	85.0	735.75	736.15	0.468	736.89*	737.22*	0.12	737.34	1
3	173+32	1.85	12 c	245.0	736.15	737.30	0.468	737.38	738.05	0.13	738.19	2

Project File: Station 171+00 to 173+25.stm | Number of lines: 3 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

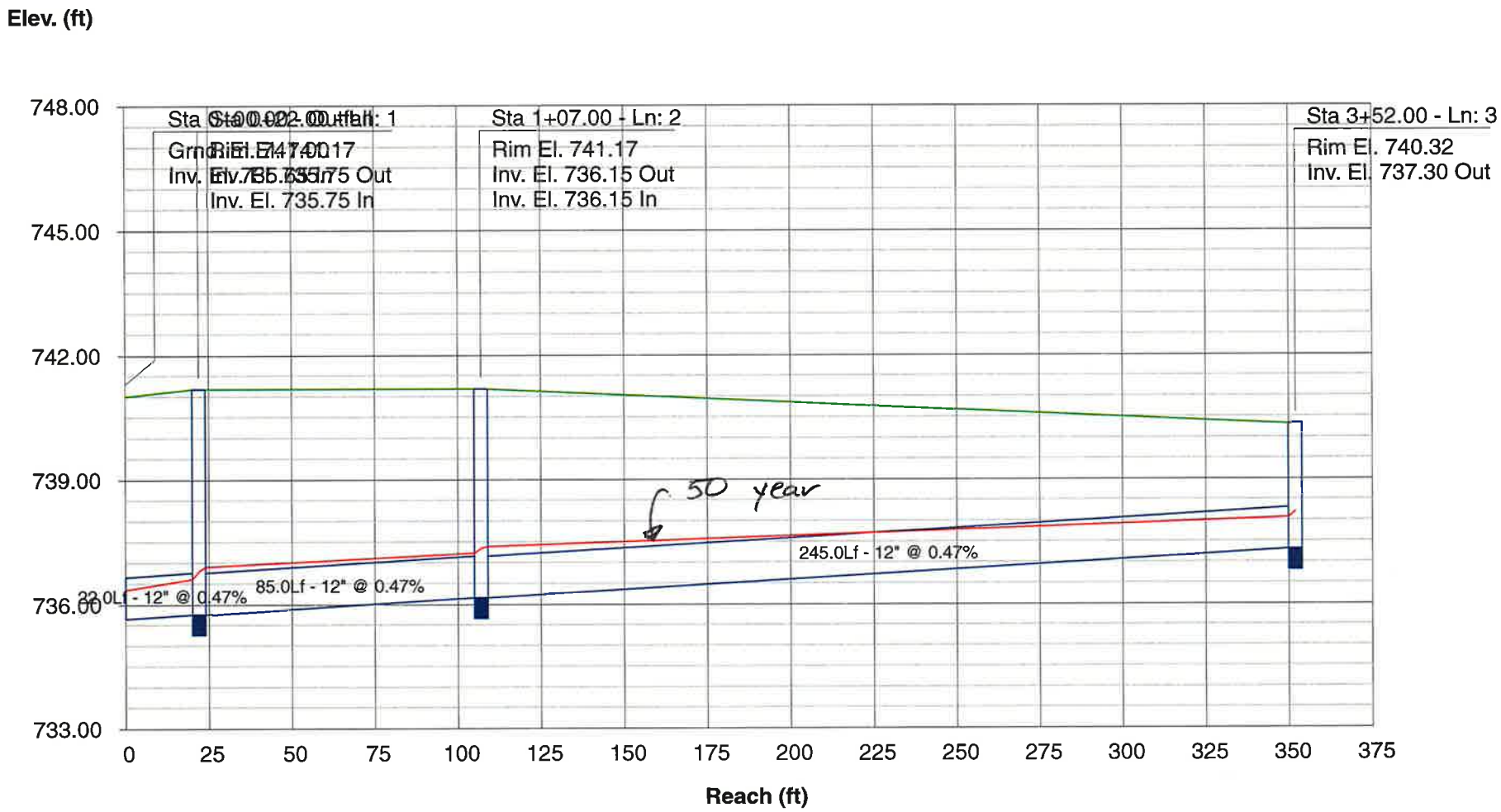
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	22.0	0.06	0.34	0.90	0.05	0.31	5.0	7.2	8.6	2.64	2.45	4.16	12	0.47	735.75	735.65	736.59	736.34	741.17	741.00	170+90
2	1	85.0	0.06	0.28	0.90	0.05	0.25	5.0	6.7	8.8	2.21	2.44	2.81	12	0.47	736.15	735.75	737.22	736.89	741.17	741.17	170+90
3	2	245.0	0.22	0.22	0.90	0.20	0.20	5.0	5.0	9.4	1.85	2.44	2.64	12	0.47	737.30	736.15	738.05	737.38	740.32	741.17	173+32

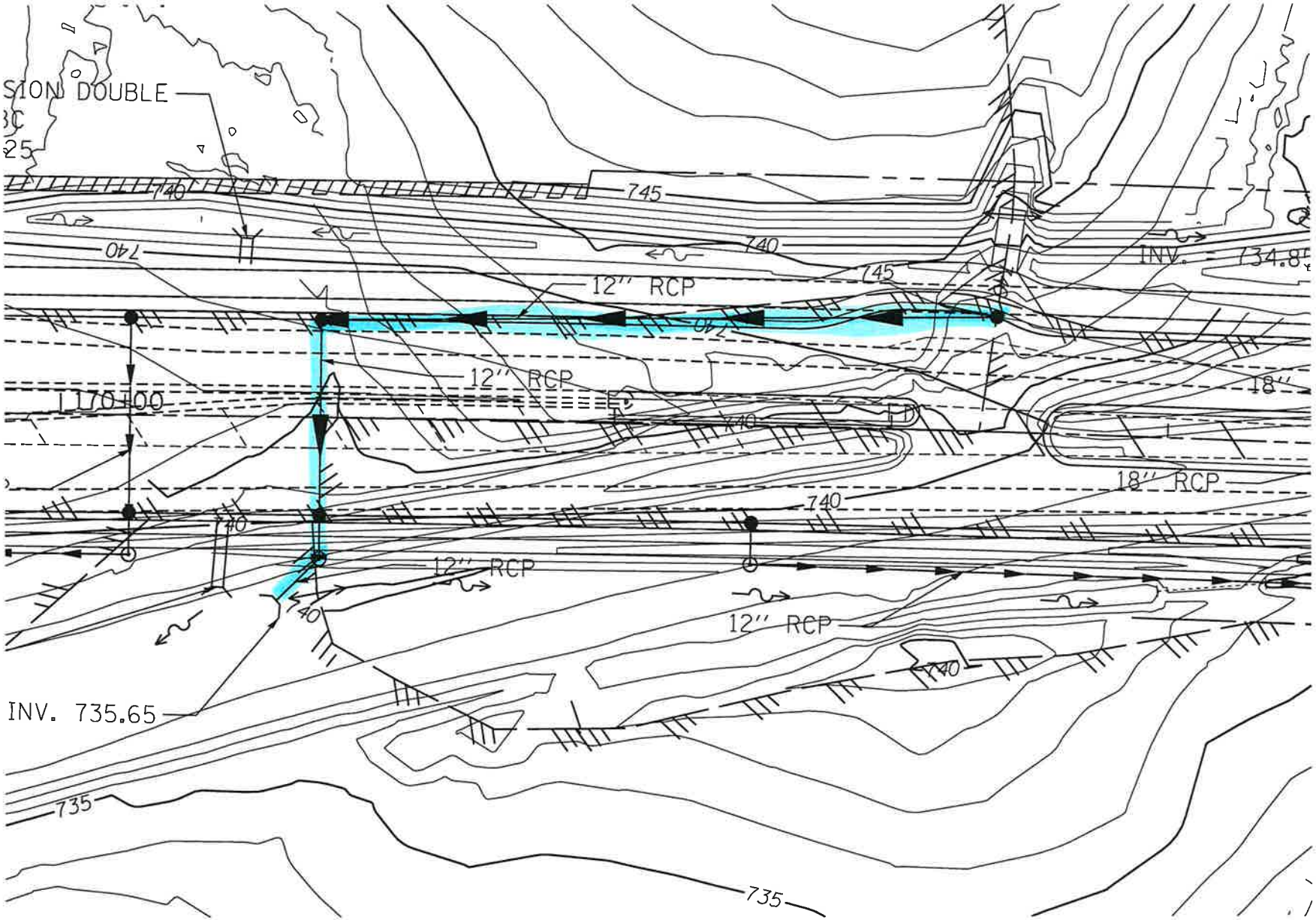
Project File: Station 171+00 to 173+25.stm | Number of lines: 3 | Run Date: 12-28-2017

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

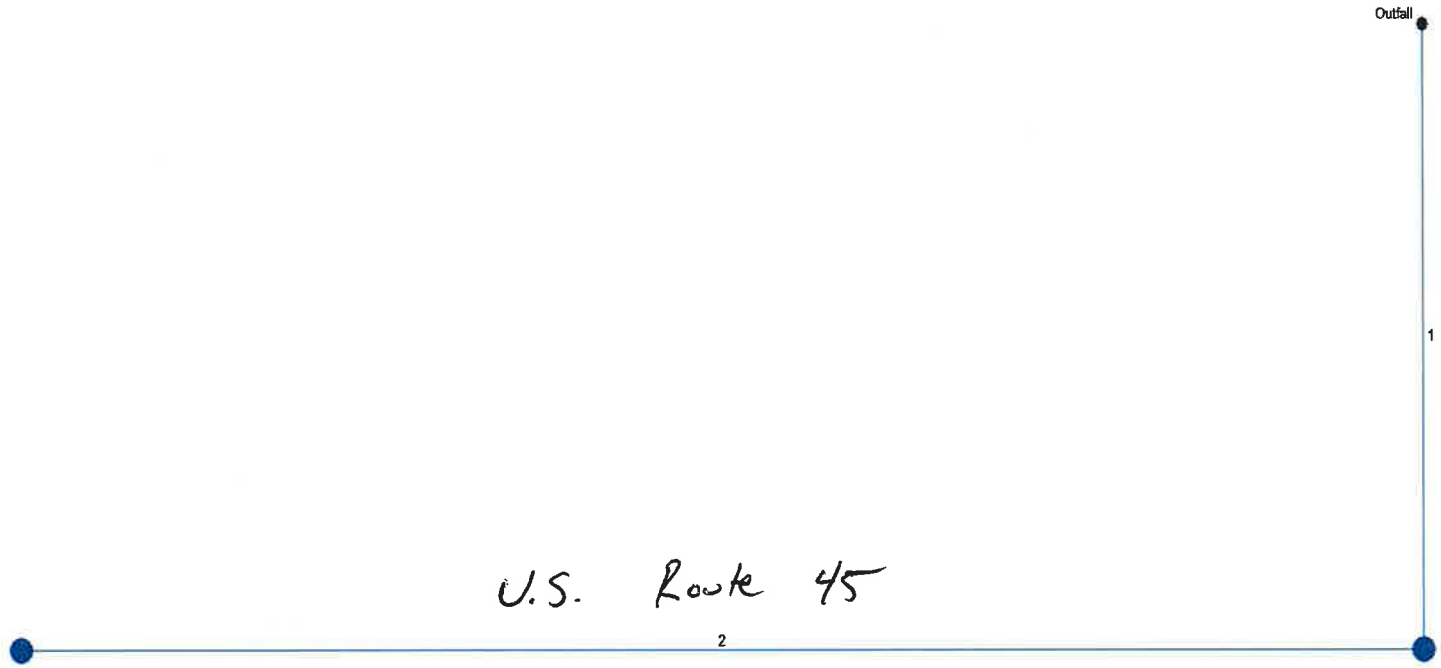
Storm Sewer Profile

Proj. file: Station 171+00 to 173+25.stm




SION DOUBLE
745
740
12" RCP
12" RCP
INV. 734.85
18"
18" RCP
L170+00
12" RCP
12" RCP
INV. 735.65
735
735

Hydraflow Plan View



Sta 172+50 to 176+00	No. Lines: 2	12-28-2017

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	100.5	90.0	MH	0.00	0.46	0.90	5.0	734.60	0.35	734.95	18	Cir	0.013	1.00	738.99	175+00
2	1	249.0	90.0	MH	0.00	0.13	0.90	5.0	735.45	0.46	736.60	12	Cir	0.013	1.00	740.24	172+50

Sta 172+50 to 176+00 | Number of lines: 2 | Date: 12-28-2017

10 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	175+00	2.94	18 c	100.5	734.60	734.95	0.348	735.33	735.68	0.19	735.86	End
2	172+50	0.76	12 c	249.0	735.45	736.60	0.462	736.04	736.97	n/a	736.97 j	1

Sta 172+50 to 176+00 | Number of lines: 2 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

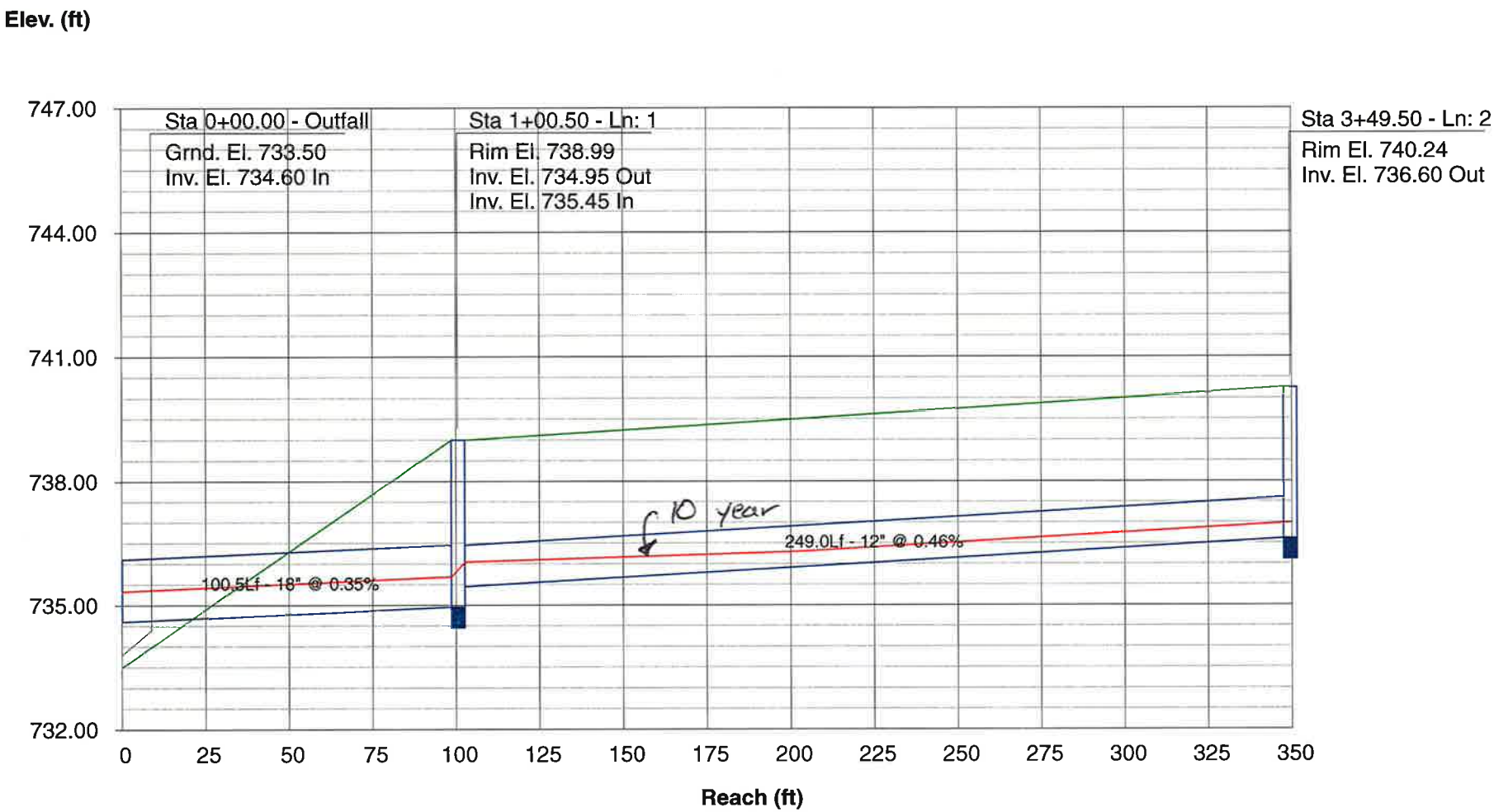
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	100.5	0.46	0.59	0.90	0.41	0.53	5.0	9.3	5.5	2.94	6.20	3.46	18	0.35	734.95	734.60	735.68	735.33	738.99	733.50	175+00
2	1	249.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	6.5	0.76	2.42	2.23	12	0.46	736.60	735.45	736.97	736.04	740.24	738.99	172+50

Sta 172+50 to 176+00 | Number of lines: 2 | Run Date: 12-28-2017

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

Storm Sewer Profile

Proj. file: Sta 172+50 to 176+00.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	100.5	90.0	MH	0.00	0.46	0.90	5.0	734.60	0.35	734.95	18	Cir	0.013	1.00	738.99	175+00
2	1	249.0	90.0	MH	0.00	0.13	0.90	5.0	735.45	0.46	736.60	12	Cir	0.013	1.00	740.24	172+50

Sta 172+50 to 176+00 | Number of lines: 2 | Date: 12-28-2017

Hydraflow Storm Sewers 2005

50 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	175+00	4.45	18 c	100.5	734.60	734.95	0.348	735.54	735.89	0.23	736.12	End
2	172+50	1.09	12 c	249.0	735.45	736.60	0.462	736.31	737.04	n/a	737.04	1

Sta 172+50 to 176+00 | Number of lines: 2 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs.

Storm Sewer Tabulation

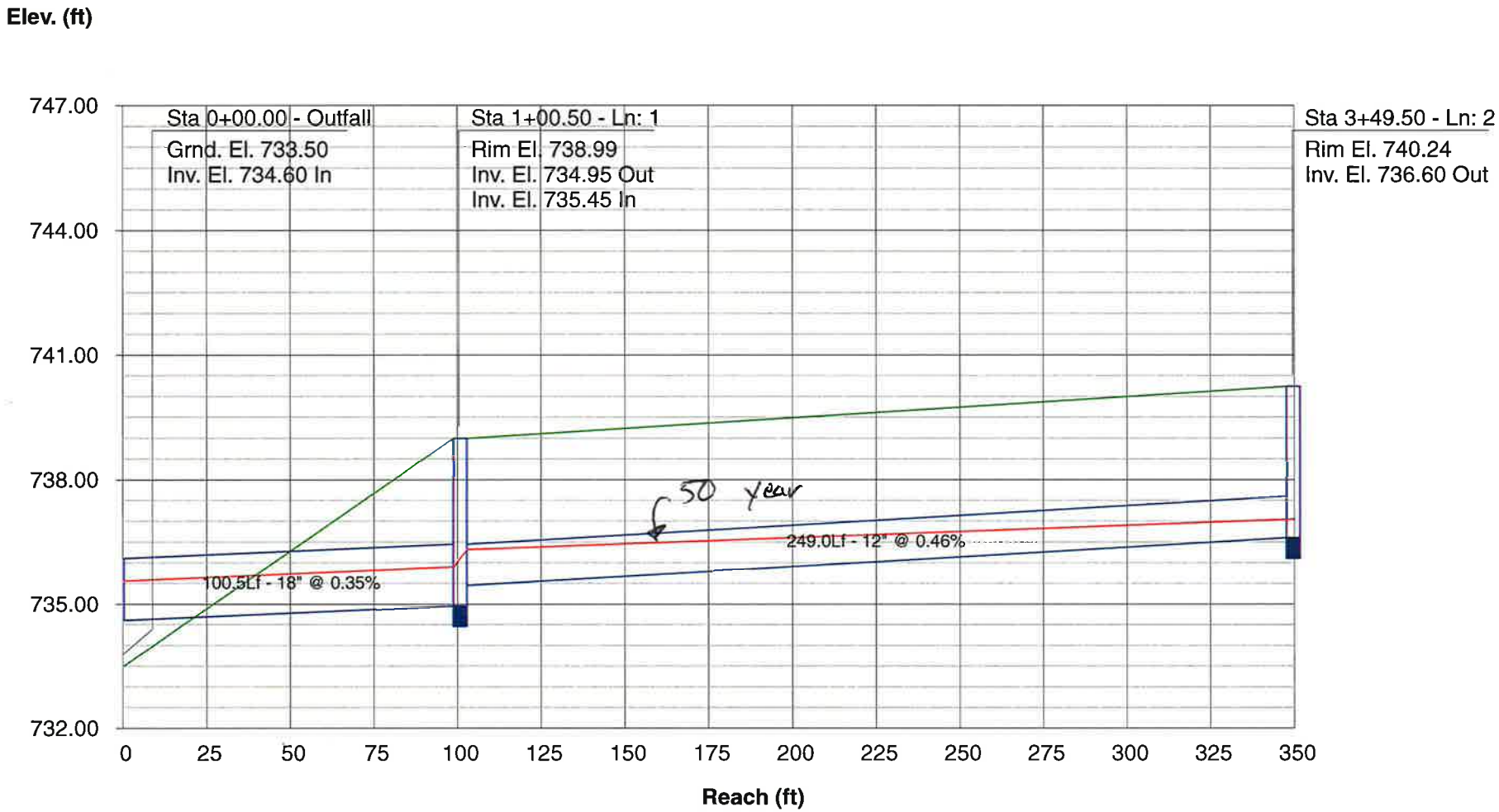
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	100.5	0.46	0.59	0.90	0.41	0.53	5.0	8.0	8.4	4.45	6.20	3.81	18	0.35	734.95	734.60	735.89	735.54	738.99	733.50	175+00
2	1	249.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	9.4	1.09	2.42	2.39	12	0.46	736.60	735.45	737.04	736.31	740.24	738.99	172+50

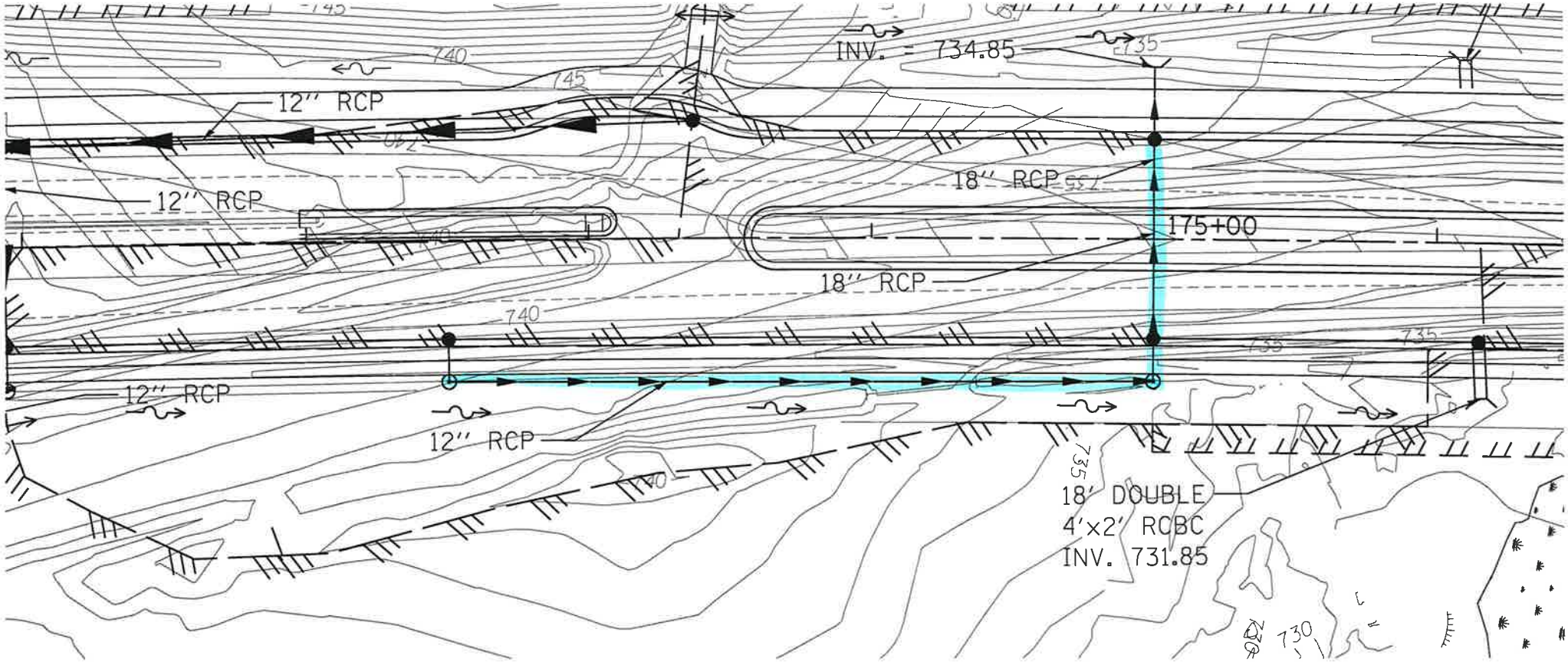
Sta 172+50 to 176+00 | Number of lines: 2 | Run Date: 12-28-2017

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

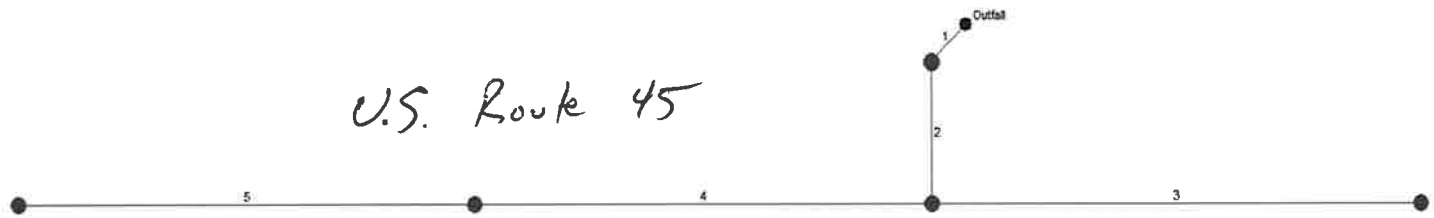
Storm Sewer Profile

Proj. file: Sta 172+50 to 176+00.stm




INV. = 734.85
12'' RCP
12'' RCP
18'' RCP
175+00
18'' RCP
12'' RCP
12'' RCP
18' DOUBLE
4'x2' RCBC
INV. 731.85
740
745
740
740
740
735
735
735
730

Hydraflow Plan View



Project File: Sta 177+50 to 185+75.stm	No. Lines: 5	12-28-2017

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	27.0	135.0	MH	0.00	0.00	0.90	5.0	729.75	0.19	729.80	30	Cir	0.013	0.75	735.22	183+00
2	1	70.0	-45.0	MH	0.00	0.43	0.90	5.0	729.80	0.14	729.90	30	Cir	0.013	1.00	735.22	183+00
3	2	268.0	-90.0	MH	0.00	0.52	0.90	5.0	729.90	0.22	730.50	24	Cir	0.013	1.00	734.09	185+75
4	2	250.0	90.0	MH	0.00	0.43	0.90	5.0	730.90	0.44	732.00	18	Cir	0.013	0.15	736.47	180+50
5	4	250.0	0.0	MH	0.00	0.11	0.90	5.0	732.25	0.52	733.55	15	Cir	0.013	1.00	737.80	177+50

Project File: Sta 177+50 to 185+75.stm | Number of lines: 5 | Date: 12-28-2017

Hydraflow Storm Sewers 2005

10 - Year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	183+00	6.06	30 c	27.0	729.75	729.80	0.185	730.76	730.81	0.12	730.93	End
2	183+00	6.18	30 c	70.0	729.80	729.90	0.143	730.93	731.02	0.13	731.15	1
3	185+75	3.03	24 c	268.0	729.90	730.50	0.224	731.27	731.40	0.08	731.47	2
4	180+50	2.40	18 c	250.0	730.90	732.00	0.440	731.51	732.61	0.03	732.64	2
5	177+50	0.64	15 c	250.0	732.25	733.55	0.520	732.83	733.87	n/a	733.87	4

Project File: Sta 177+50 to 185+75.stm | Number of lines: 5 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	27.0	0.00	1.49	0.90	0.00	1.34	5.0	16.2	4.5	6.06	17.65	3.26	30	0.19	729.80	729.75	730.81	730.76	735.22	728.80	183+00
2	1	70.0	0.43	1.49	0.90	0.39	1.34	5.0	15.4	4.6	6.18	15.50	2.87	30	0.14	729.90	729.80	731.02	730.93	735.22	735.22	183+00
3	2	268.0	0.52	0.52	0.90	0.47	0.47	5.0	5.0	6.5	3.03	10.70	1.77	24	0.22	730.50	729.90	731.40	731.27	734.09	735.22	185+75
4	2	250.0	0.43	0.54	0.90	0.39	0.49	5.0	13.0	4.9	2.40	6.97	3.58	18	0.44	732.00	730.90	732.61	731.51	736.47	735.22	180+50
5	4	250.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.5	0.64	4.66	1.86	15	0.52	733.55	732.25	733.87	732.83	737.80	736.47	177+50

Project File: Sta 177+50 to 185+75.stm

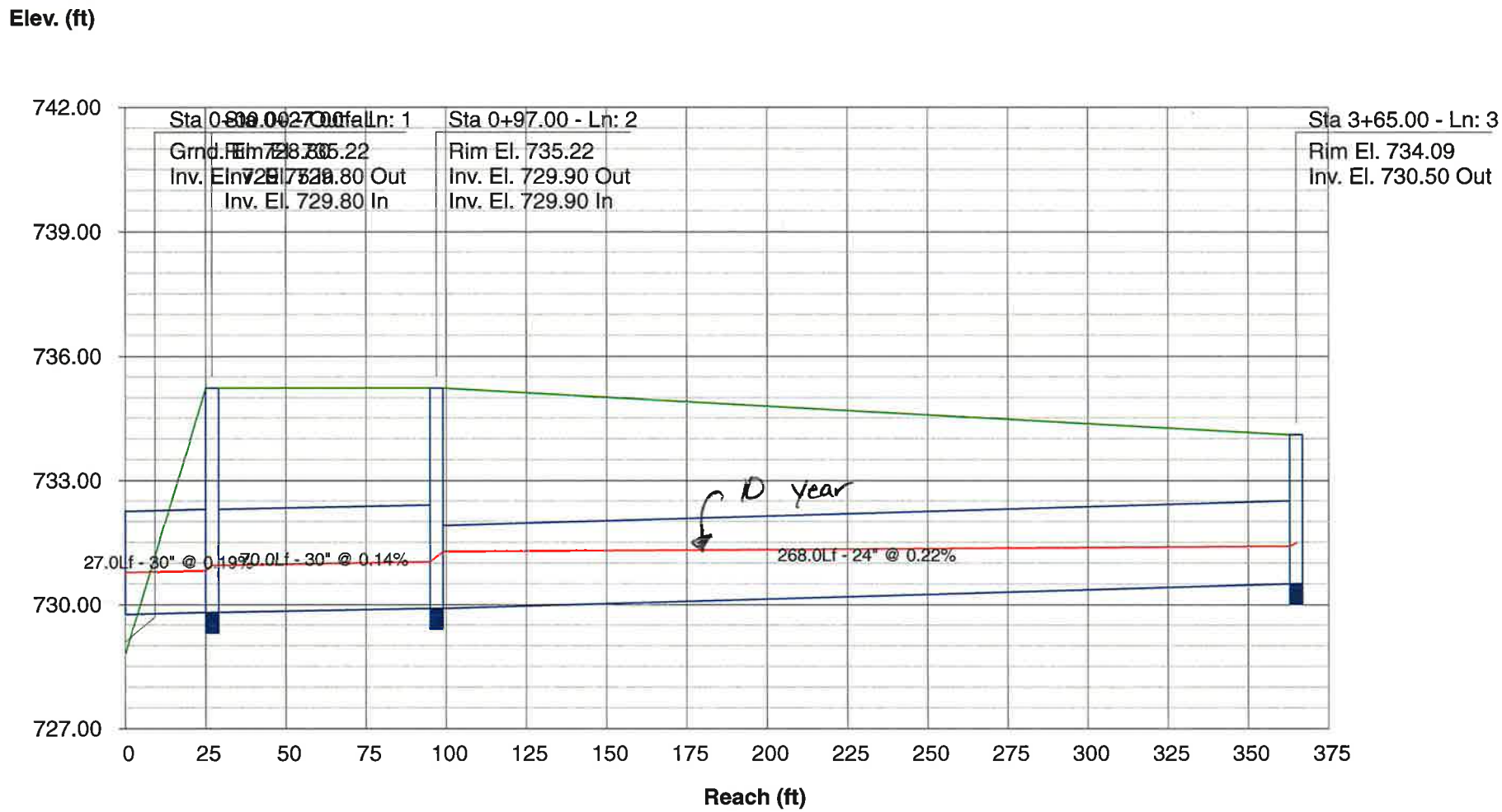
Number of lines: 5

Run Date: 12-28-2017

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

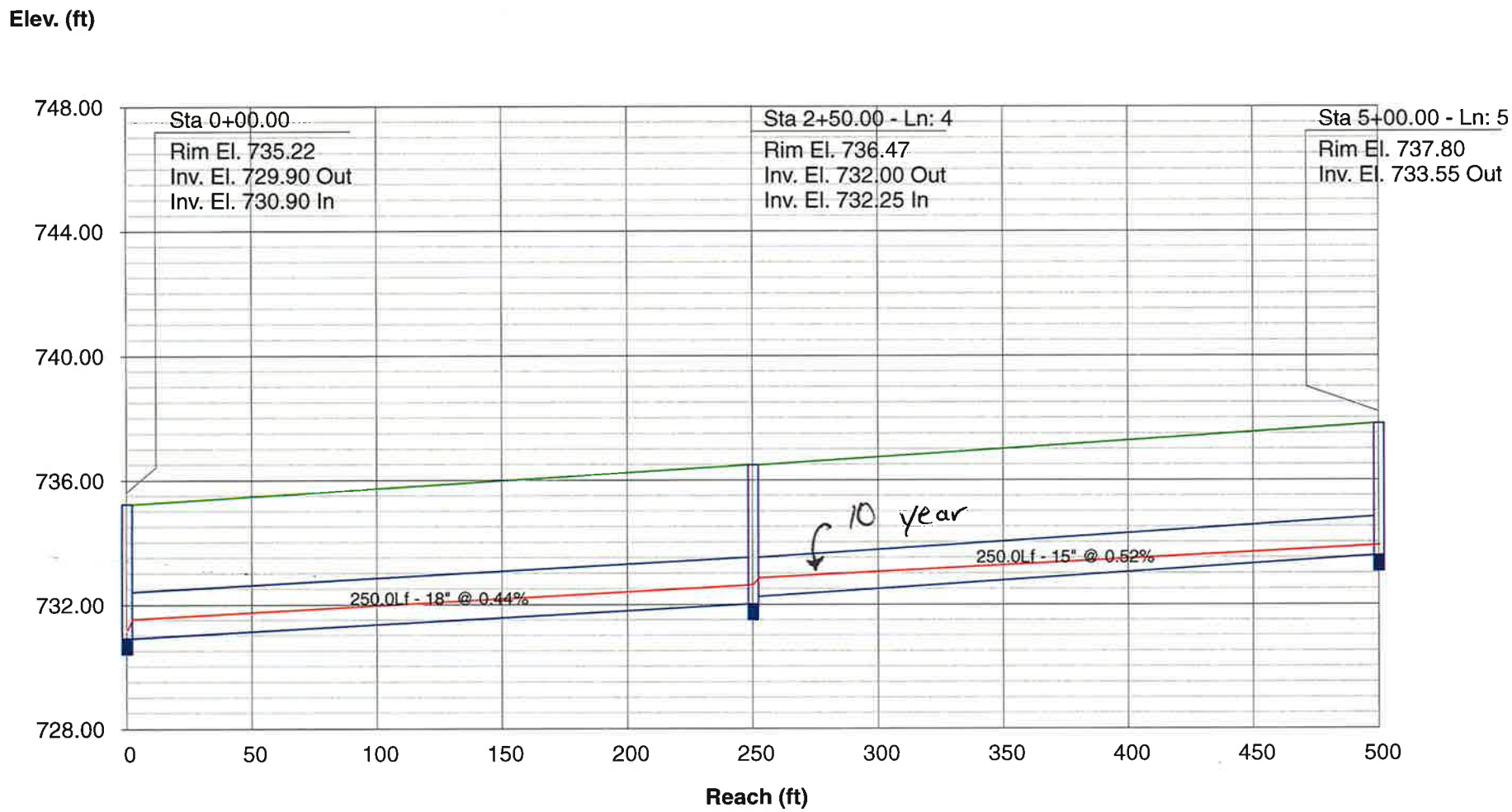
Storm Sewer Profile

Proj. file: Sta 177+50 to 185+75.stm



Storm Sewer Profile

Proj. file: Sta 177+50 to 185+75.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	27.0	135.0	MH	0.00	0.00	0.90	5.0	729.75	0.19	729.80	30	Cir	0.013	0.75	735.22	183+00
2	1	70.0	-45.0	MH	0.00	0.43	0.90	5.0	729.80	0.14	729.90	30	Cir	0.013	1.00	735.22	183+00
3	2	268.0	-90.0	MH	0.00	0.52	0.90	5.0	729.90	0.22	730.50	24	Cir	0.013	1.00	734.09	185+75
4	2	250.0	90.0	MH	0.00	0.43	0.90	5.0	730.90	0.44	732.00	18	Cir	0.013	0.15	736.47	180+50
5	4	250.0	0.0	MH	0.00	0.11	0.90	5.0	732.25	0.52	733.55	15	Cir	0.013	1.00	737.80	177+50

Project File: Sta 177+50 to 185+75.stm | Number of lines: 5 | Date: 12-28-2017

Hydraflow Storm Sewers 2005

50 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	183+00	9.66	30 c	27.0	729.75	729.80	0.185	731.07	731.12	0.16	731.28	End
2	183+00	9.80	30 c	70.0	729.80	729.90	0.143	731.29	731.38	0.16	731.54	1
3	185+75	4.38	24 c	268.0	729.90	730.50	0.224	731.60	731.72	0.07	731.79	2
4	180+50	3.75	18 c	250.0	730.90	732.00	0.440	731.68	732.78	0.04	732.82	2
5	177+50	0.93	15 c	250.0	732.25	733.55	0.520	733.06	733.94	n/a	733.94 j	4

Project File: Sta 177+50 to 185+75.stm | Number of lines: 5 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	27.0	0.00	1.49	0.90	0.00	1.34	5.0	12.7	7.2	9.66	17.65	3.68	30	0.19	729.80	729.75	731.12	731.07	735.22	728.80	183+00
2	1	70.0	0.43	1.49	0.90	0.39	1.34	5.0	12.2	7.3	9.80	15.50	3.23	30	0.14	729.90	729.80	731.38	731.29	735.22	735.22	183+00
3	2	268.0	0.52	0.52	0.90	0.47	0.47	5.0	5.0	9.4	4.38	10.70	1.86	24	0.22	730.50	729.90	731.72	731.60	734.09	735.22	185+75
4	2	250.0	0.43	0.54	0.90	0.39	0.49	5.0	10.5	7.7	3.75	6.97	4.01	18	0.44	732.00	730.90	732.78	731.68	736.47	735.22	180+50
5	4	250.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	9.4	0.93	4.66	1.99	15	0.52	733.55	732.25	733.94	733.06	737.80	736.47	177+50

Project File: Sta 177+50 to 185+75.stm

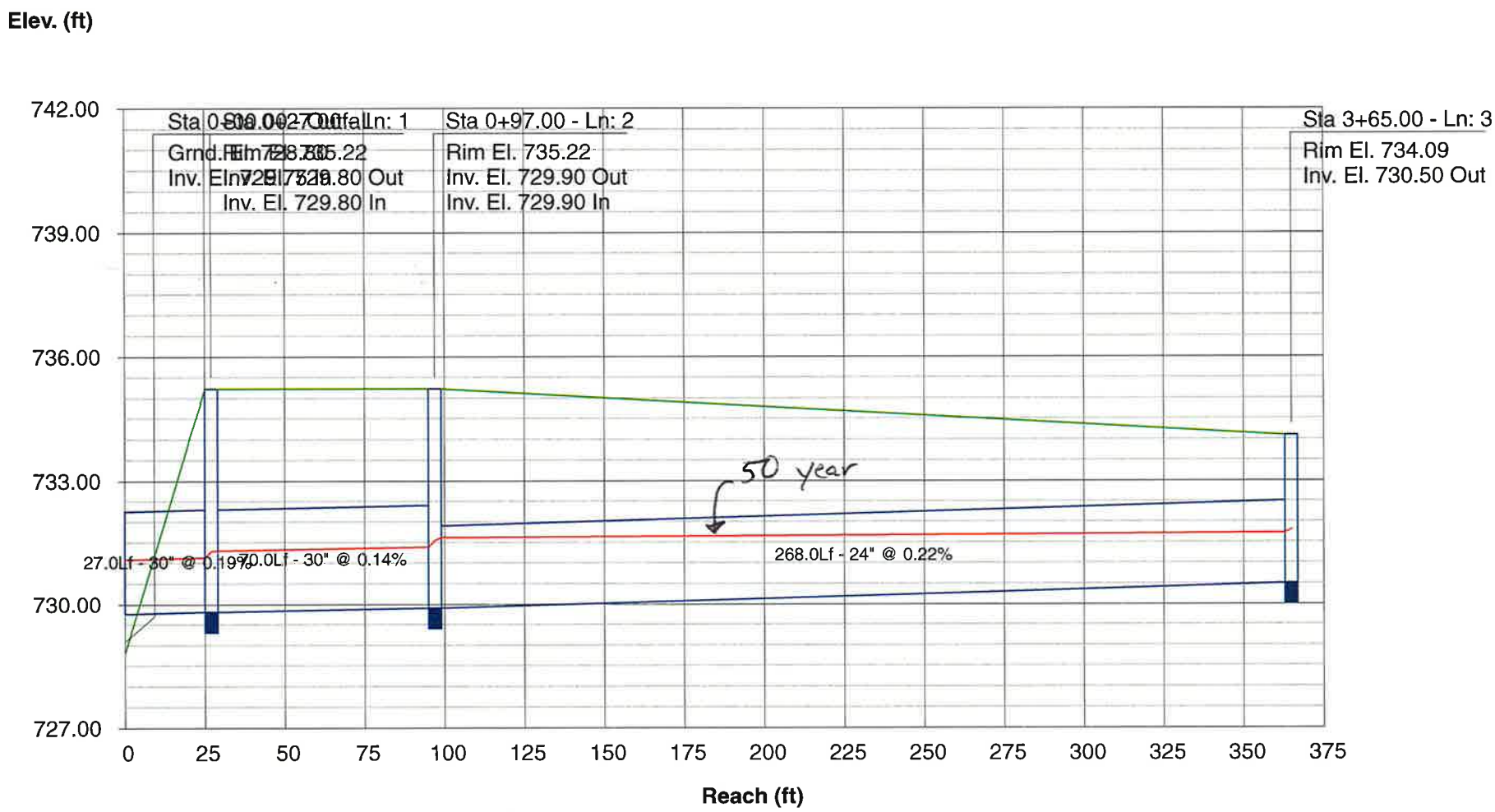
Number of lines: 5

Run Date: 12-28-2017

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

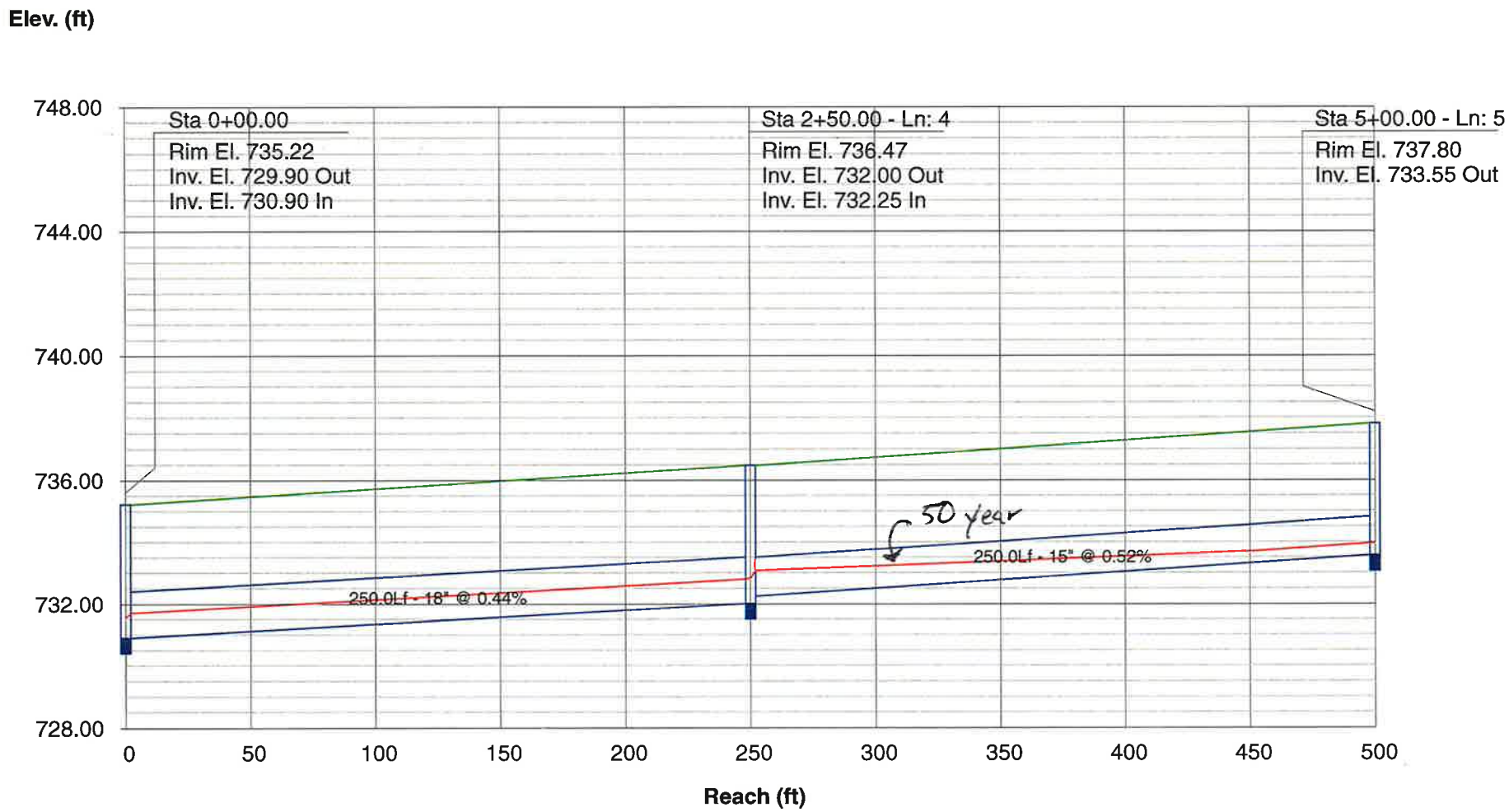
Storm Sewer Profile

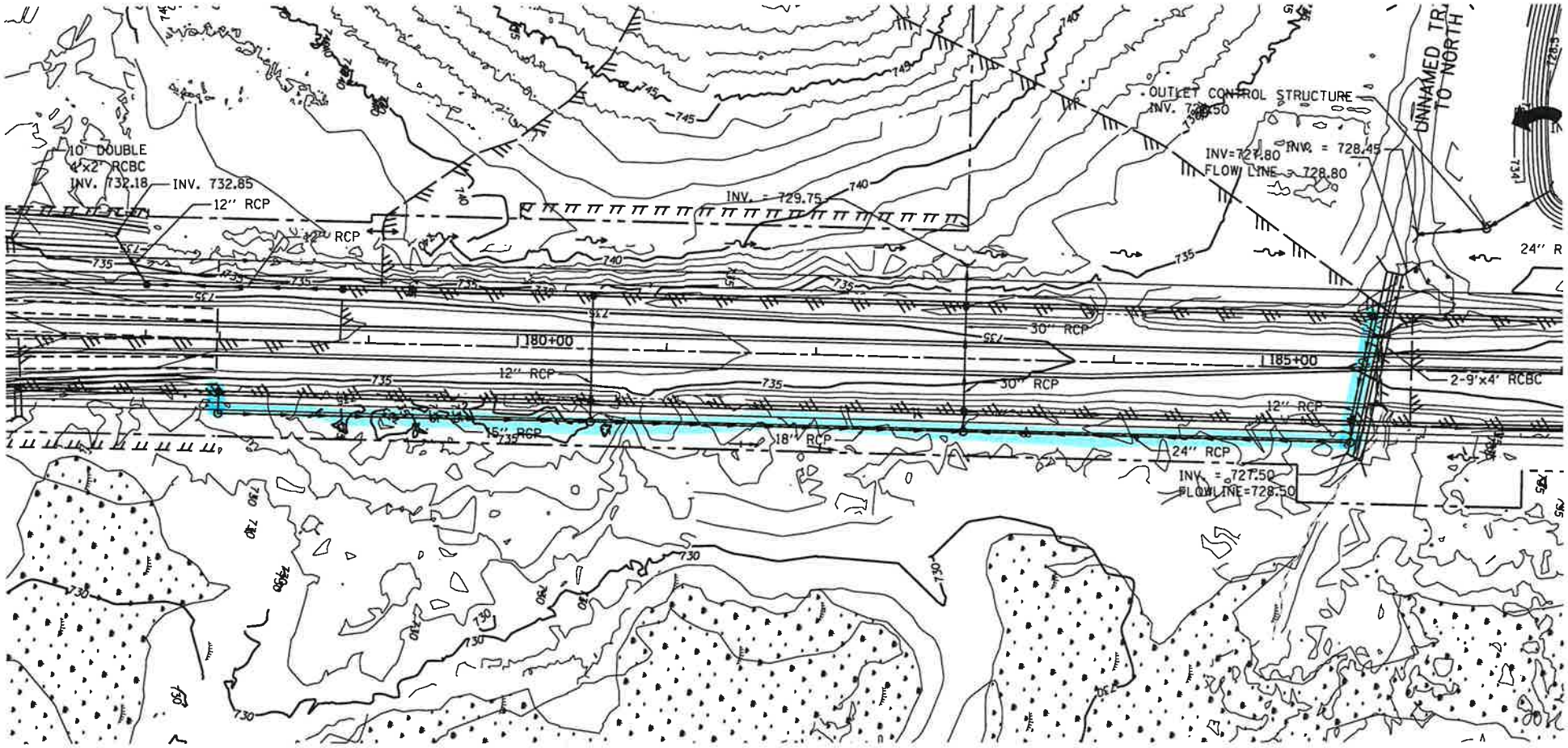
Proj. file: Sta 177+50 to 185+75.stm



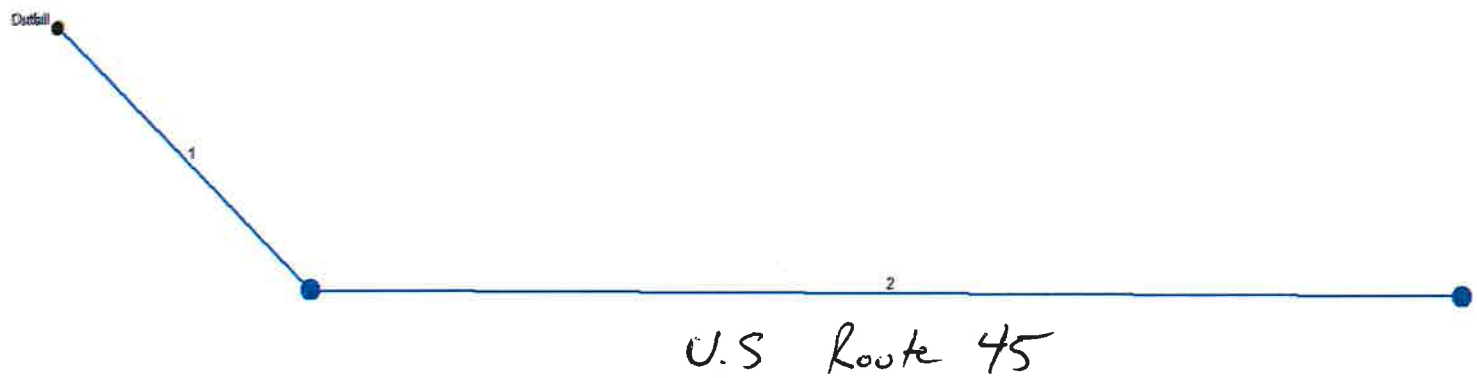
Storm Sewer Profile

Proj. file: Sta 177+50 to 185+75.stm




10' DOUBLE
4'x2' RCBC
INV. 732.18
INV. 732.85
12" RCP
RCP
INV. = 729.75
OUTLET CONTROL STRUCTURE
INV. 730.50
INV=727.80
FLOW LINE = 728.80
INV. = 728.45
UNNAMED TR
TO NORTH
24" R
180+00
185+00
30" RCP
12" RCP
30" RCP
2-9'x4' RCBC
12" RCP
15" RCP
18" RCP
24" RCP
INV. = 727.50
FLOWLINE=728.50

Hydraflow Plan View



Project File: Sta 178+00 to Sta 179+00.stm	No. Lines: 2	12-28-2017

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	39.0	43.4	MH	0.00	0.17	0.90	5.0	732.85	0.51	733.05	12	Cir	0.013	0.73	738.21	178+00
2	1	130.0	-43.0	MH	0.00	0.11	0.90	5.0	733.05	0.46	733.65	12	Cir	0.013	1.00	737.71	179+00

Project File: Sta 178+00 to Sta 179+00.stm | Number of lines: 2 | Date: 12-28-2017

10 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	178+00	1.48	12 c	39.0	732.85	733.05	0.508	733.40	733.60	0.13	733.72	End
2	179+00	0.64	12 c	130.0	733.05	733.65	0.462	733.89	734.04	0.08	734.12	1

Project File: Sta 178+00 to Sta 179+00.stm | Number of lines: 2 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	39.0	0.17	0.28	0.90	0.15	0.25	5.0	7.7	5.9	1.48	2.54	3.35	12	0.51	733.05	732.85	733.60	733.40	738.21	0.00	178+00
2	1	130.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	6.5	0.64	2.42	1.58	12	0.46	733.65	733.05	734.04	733.89	737.71	738.21	179+00

Project File: Sta 178+00 to Sta 179+00.stm

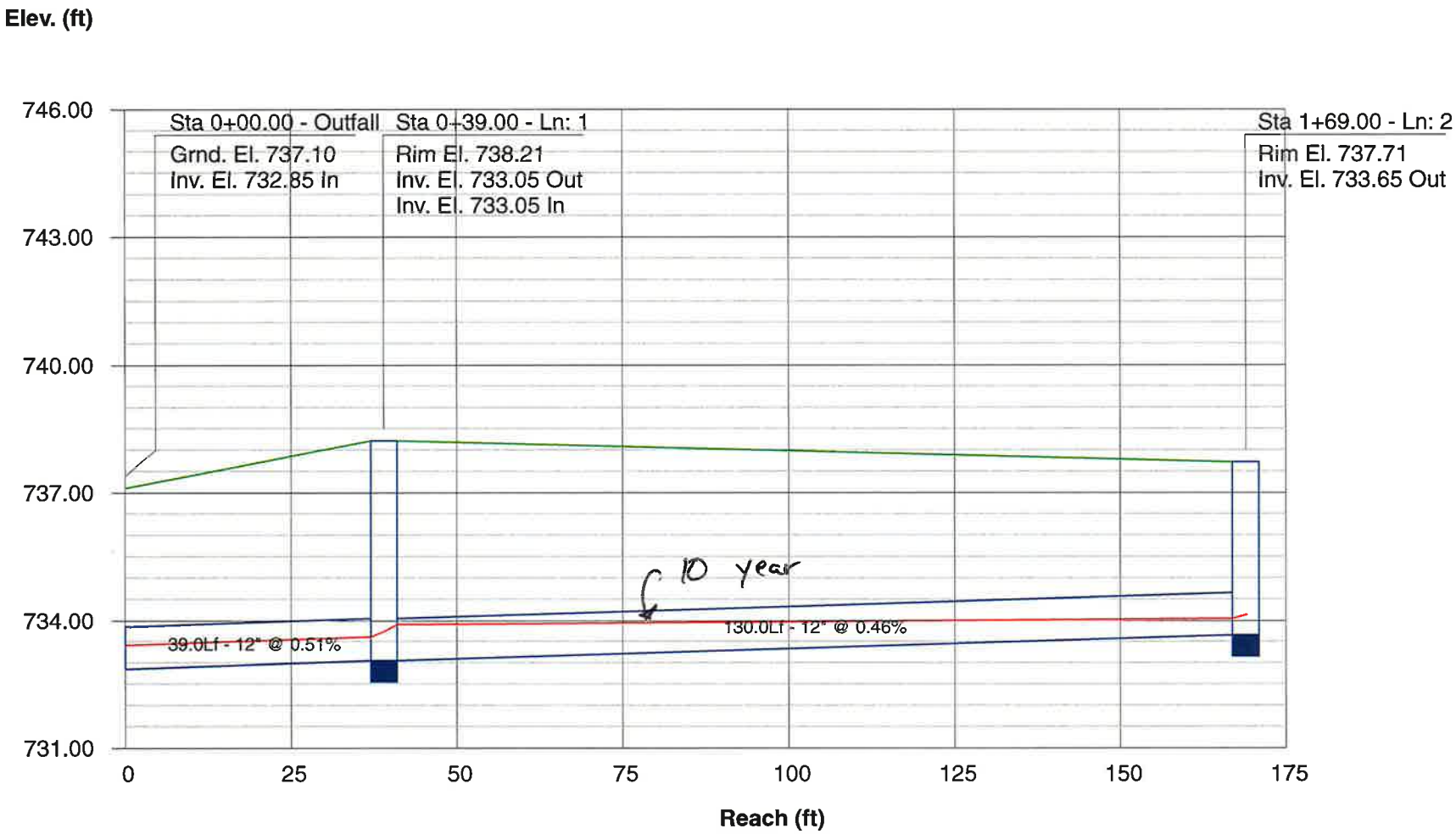
Number of lines: 2

Run Date: 12-28-2017

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

Storm Sewer Profile

Proj. file: Sta 178+00 to Sta 179+00.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	39.0	43.4	MH	0.00	0.17	0.90	5.0	732.85	0.51	733.05	12	Cir	0.013	0.73	738.21	178+00
2	1	130.0	-43.0	MH	0.00	0.11	0.90	5.0	733.05	0.46	733.65	12	Cir	0.013	1.00	737.71	179+00

Project File: Sta 178+00 to Sta 179+00.stm | Number of lines: 2 | Date: 12-28-2017

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	178+00	2.20	12 c	39.0	732.85	733.05	0.508	733.57	733.77	0.15	733.92	End
2	179+00	0.93	12 c	130.0	733.05	733.65	0.462	734.10	734.22	0.06	734.28	1

Project File: Sta 178+00 to Sta 179+00.stm | Number of lines: 2 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	39.0	0.17	0.28	0.90	0.15	0.25	5.0	6.8	8.7	2.20	2.54	3.64	12	0.51	733.05	732.85	733.77	733.57	738.21	0.00	178+00
2	1	130.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	9.4	0.93	2.42	1.59	12	0.46	733.65	733.05	734.22	734.10	737.71	738.21	179+00

Project File: Sta 178+00 to Sta 179+00.stm

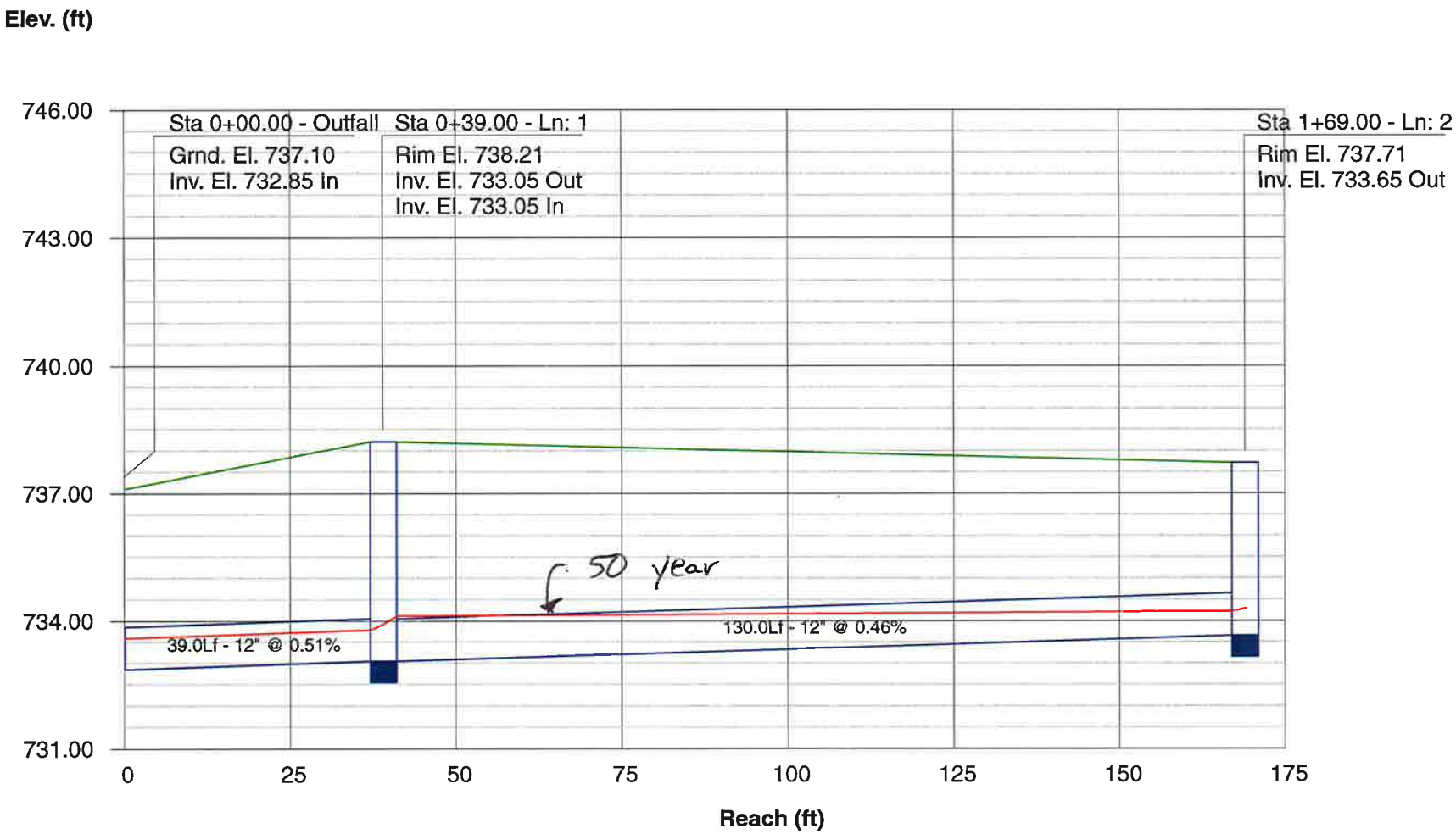
Number of lines: 2

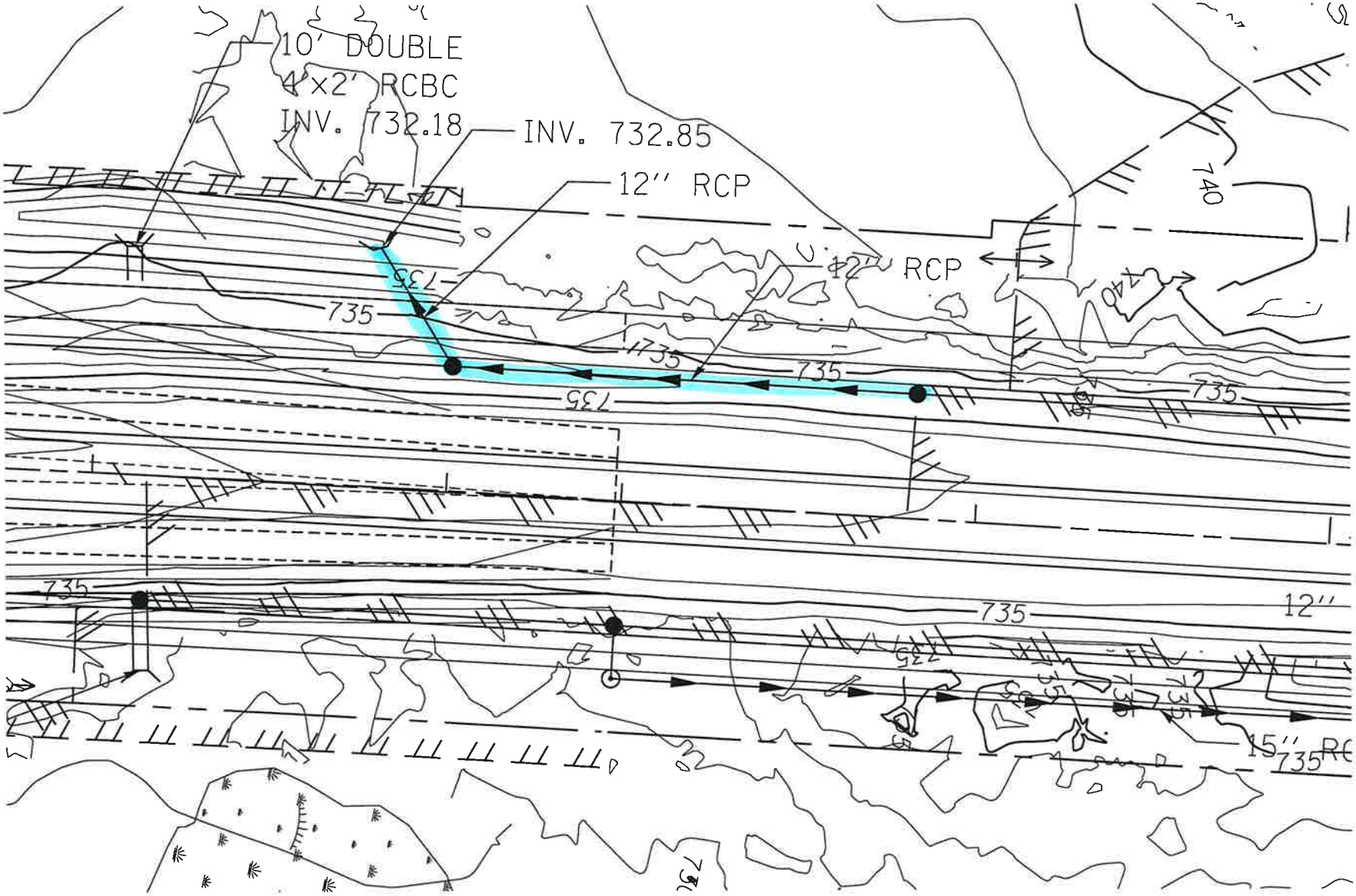
Run Date: 12-28-2017

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

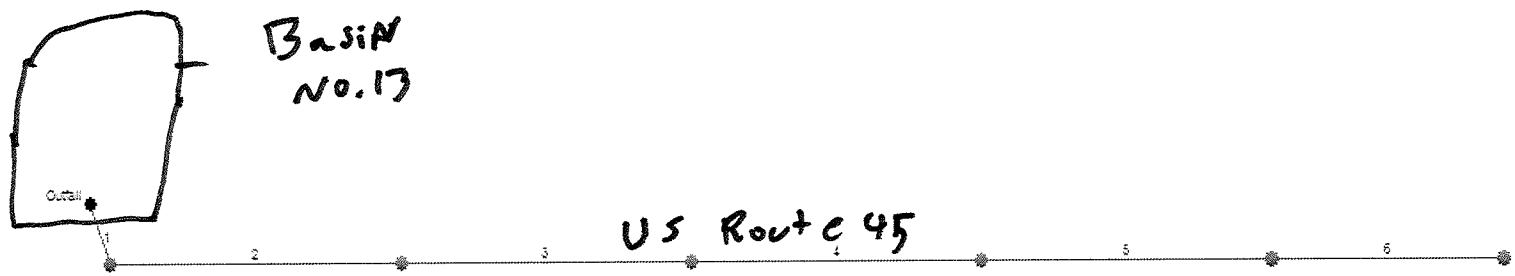
Storm Sewer Profile

Proj. file: Sta 178+00 to Sta 179+00.stm




10' DOUBLE
4'×2' RCBC
INV. 732.18
INV. 732.85
12'' RCP
12'' RCP
735
735
735
735
735
735
735
735
740
740
12''
15''

Hydraflow Plan View



Sta 188+00 to 200+00	No. Lines: 6	10-15-2014

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	50.0	70.0	MH	0.00	0.48	0.90	5.0	729.00	0.20	729.10	24	Cir	0.013	0.95	735.71	188+00
2	1	250.5	-70.0	MH	0.00	0.43	0.90	5.0	731.20	2.06	736.35	18	Cir	0.013	0.15	740.88	190+50
3	2	250.0	0.0	MH	0.00	0.43	0.90	5.0	736.35	2.40	742.35	18	Cir	0.013	0.15	746.86	193+00
4	3	250.0	0.0	MH	0.00	0.43	0.90	5.0	742.60	2.38	748.55	15	Cir	0.013	0.15	752.84	195+50
5	4	250.0	0.0	MH	0.00	0.35	0.90	5.0	748.80	2.36	754.70	12	Cir	0.013	0.15	758.82	198+00
6	5	200.0	0.0	MH	0.00	0.43	0.90	5.0	754.80	2.20	759.20	12	Cir	0.013	1.00	763.25	200+00

Sta 188+00 to 200+00 | Number of lines: 6 | Date: 10-15-2014

Hydraflow Storm Sewers 2005

10 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	188+00	12.76	24 c	50.0	729.00	729.10	0.200	730.60	730.79	0.30	731.09	End
2	190+50	10.62	18 c	250.5	731.20	736.35	2.056	732.13	737.59	n/a	737.59 j	1
3	193+00	8.68	18 c	250.0	736.35	742.35	2.400	737.93	743.47	n/a	743.47 j	2
4	195+50	6.59	15 c	250.0	742.60	748.55	2.380	743.61	749.58	n/a	749.58 j	3
5	198+00	4.37	12 c	250.0	748.80	754.70	2.360	749.68	755.58	n/a	755.58 j	4
6	200+00	2.51	12 c	200.0	754.80	759.20	2.200	755.98	759.87	n/a	759.87 j	5

Sta 188+00 to 200+00 | Number of lines: 6 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

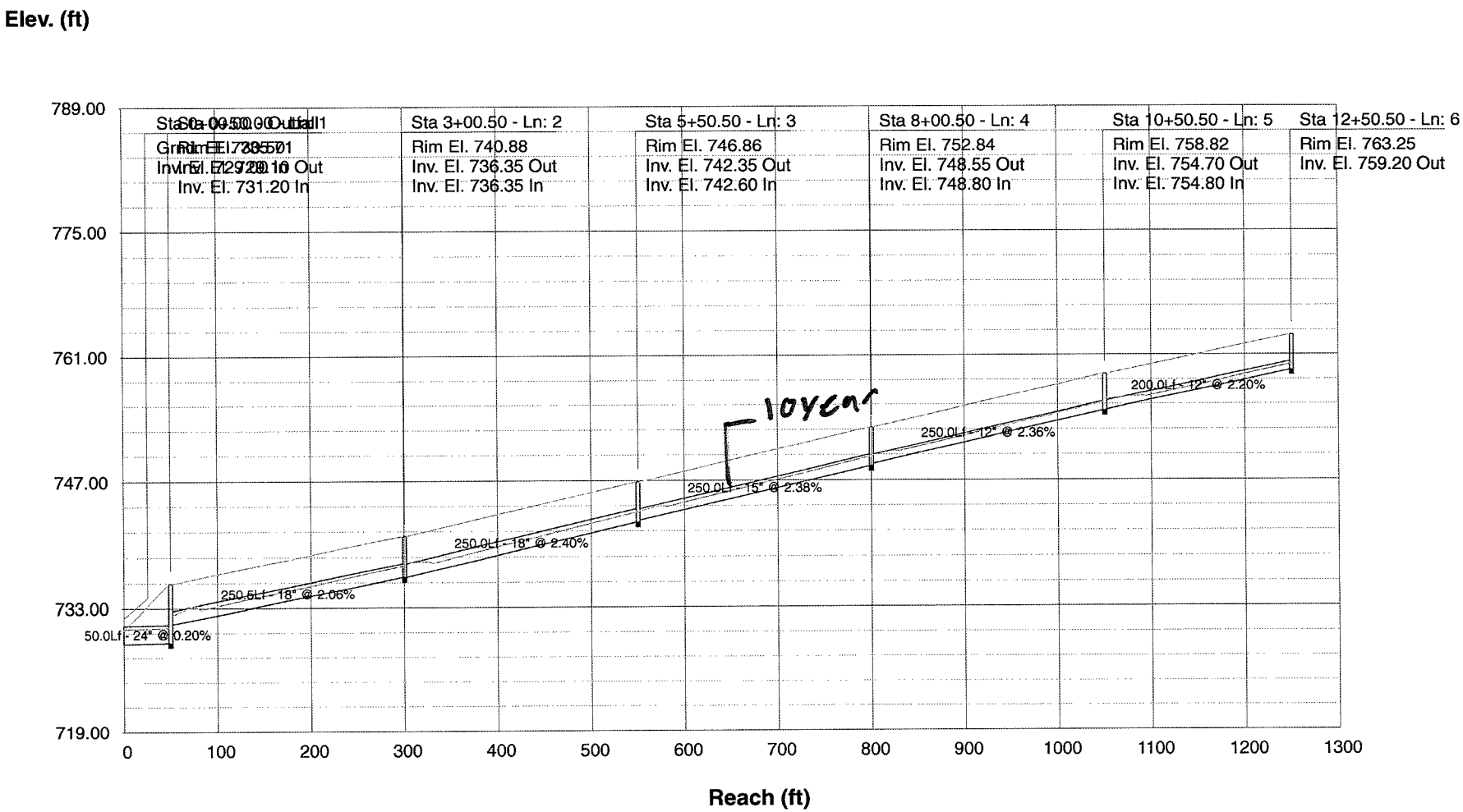
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	50.0	0.48	2.55	0.90	0.43	2.30	5.0	9.2	5.6	12.76	10.11	4.62	24	0.20	729.10	729.00	730.79	730.60	735.71	730.50	188+00
2	1	250.5	0.43	2.07	0.90	0.39	1.86	5.0	8.5	5.7	10.62	15.06	8.00	18	2.06	736.35	731.20	737.59	732.13	740.88	735.71	190+50
3	2	250.0	0.43	1.64	0.90	0.39	1.48	5.0	7.6	5.9	8.68	16.27	5.51	18	2.40	742.35	736.35	743.47	737.93	746.86	740.88	193+00
4	3	250.0	0.43	1.21	0.90	0.39	1.09	5.0	6.8	6.1	6.59	9.96	6.17	15	2.38	748.55	742.60	749.58	743.61	752.84	746.86	195+50
5	4	250.0	0.35	0.78	0.90	0.32	0.70	5.0	6.0	6.2	4.37	5.47	5.98	12	2.36	754.70	748.80	755.58	749.68	758.82	752.84	198+00
6	5	200.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	6.5	2.51	5.28	3.83	12	2.20	759.20	754.80	759.87	755.98	763.25	758.82	200+00

Sta 188+00 to 200+00 | Number of lines: 6 | Run Date: 10-15-2014

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

Storm Sewer Profile

Proj. file: Sta 188+00 to 200+00.stm



Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	50.0	70.0	MH	0.00	0.48	0.90	5.0	729.00	0.20	729.10	24	Cir	0.013	0.95	735.71	188+00
2	1	250.5	-70.0	MH	0.00	0.43	0.90	5.0	731.20	2.06	736.35	18	Cir	0.013	0.15	740.88	190+50
3	2	250.0	0.0	MH	0.00	0.43	0.90	5.0	736.35	2.40	742.35	18	Cir	0.013	0.15	746.86	193+00
4	3	250.0	0.0	MH	0.00	0.43	0.90	5.0	742.60	2.38	748.55	15	Cir	0.013	0.15	752.84	195+50
5	4	250.0	0.0	MH	0.00	0.35	0.90	5.0	748.80	2.36	754.70	12	Cir	0.013	0.15	758.82	198+00
6	5	200.0	0.0	MH	0.00	0.43	0.90	5.0	754.80	2.20	759.20	12	Cir	0.013	1.00	763.25	200+00

Sta 188+00 to 200+00 | Number of lines: 6 | Date: 10-15-2014

Hydraflow Storm Sewers 2005

50 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	188+00	19.29	24 c	50.0	729.00	729.10	0.200	730.60*	731.18*	0.56	731.74	End
2	190+50	15.94	18 c	250.5	731.20	736.35	2.056	732.53	737.81	0.19	738.00	1
3	193+00	12.91	18 c	250.0	736.35	742.35	2.400	738.46	743.70	n/a	743.70 j	2
4	195+50	9.72	15 c	250.0	742.60	748.55	2.380	743.70	749.73	n/a	749.73 j	3
5	198+00	6.39	12 c	250.0	748.80	754.70	2.360	749.80*	757.85*	0.15	758.00	4
6	200+00	3.62	12 c	200.0	754.80	759.20	2.200	758.70*	760.77*	0.33	761.10	5

Sta 188+00 to 200+00 | Number of lines: 6 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

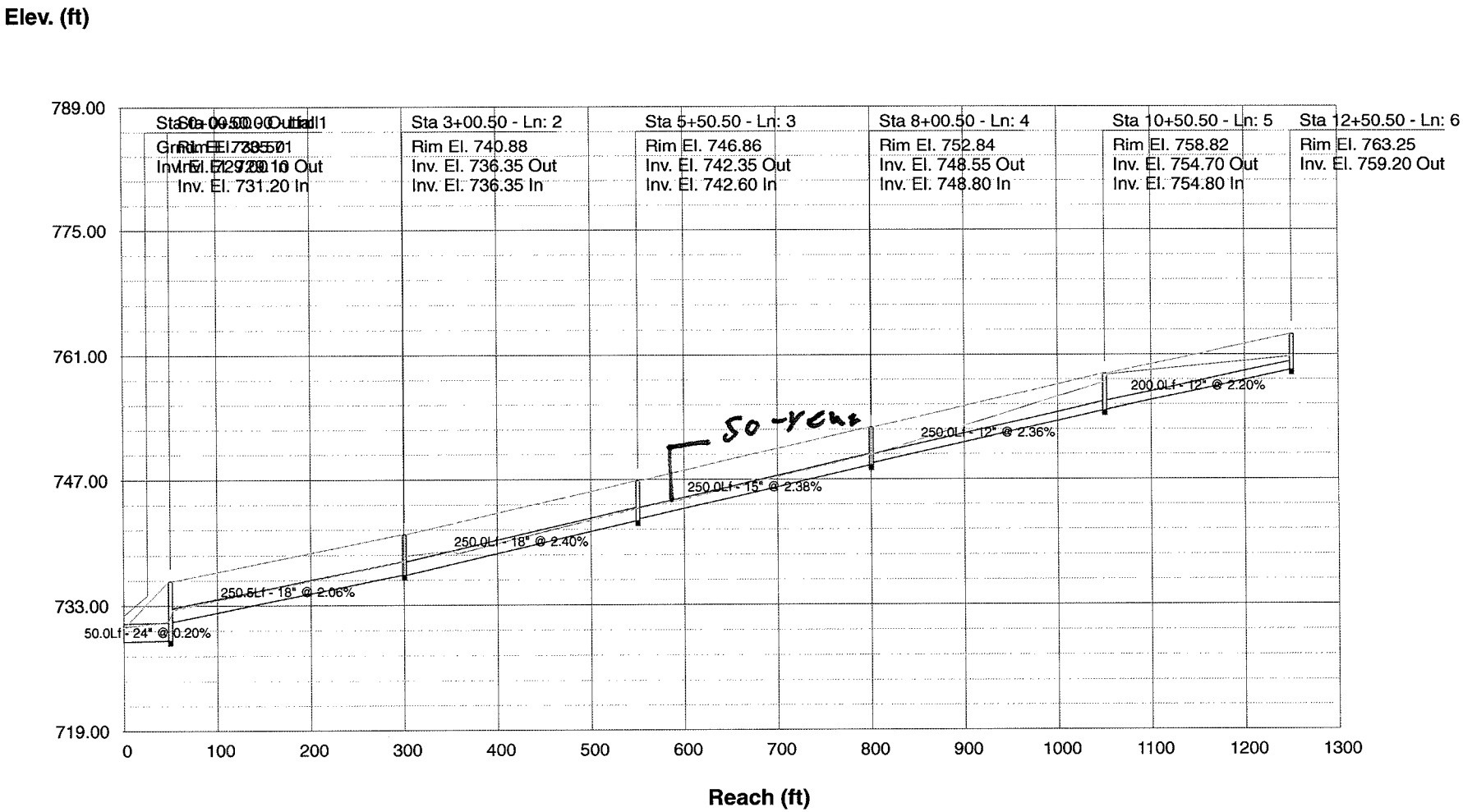
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	50.0	0.48	2.55	0.90	0.43	2.30	5.0	7.9	8.4	19.29	10.11	6.65	24	0.20	729.10	729.00	731.18	730.60	735.71	730.50	188+00
2	1	250.5	0.43	2.07	0.90	0.39	1.86	5.0	7.4	8.6	15.94	15.06	9.35	18	2.06	736.35	731.20	737.81	732.53	740.88	735.71	190+50
3	2	250.0	0.43	1.64	0.90	0.39	1.48	5.0	6.8	8.7	12.91	16.27	7.51	18	2.40	742.35	736.35	743.70	738.46	746.86	740.88	193+00
4	3	250.0	0.43	1.21	0.90	0.39	1.09	5.0	6.2	8.9	9.72	9.96	8.30	15	2.38	748.55	742.60	749.73	743.70	752.84	746.86	195+50
5	4	250.0	0.35	0.78	0.90	0.32	0.70	5.0	5.7	9.1	6.39	5.47	8.14	12	2.36	754.70	748.80	757.85	749.80	758.82	752.84	198+00
6	5	200.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	9.4	3.62	5.28	4.61	12	2.20	759.20	754.80	760.77	758.70	763.25	758.82	200+00

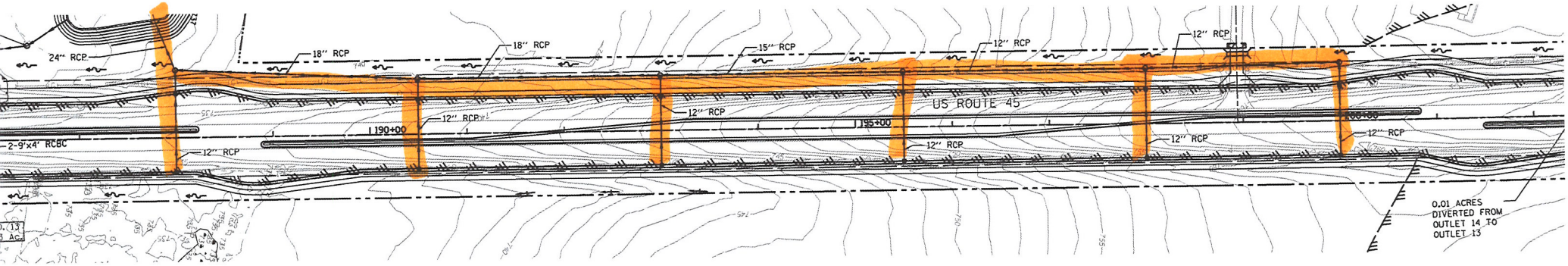
Sta 188+00 to 200+00 | Number of lines: 6 | Run Date: 10-15-2014

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

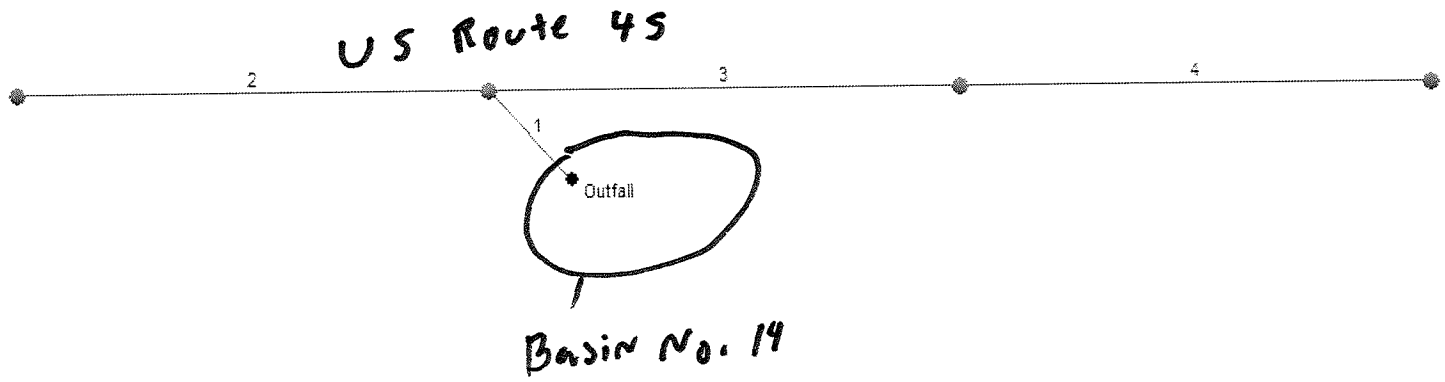
Storm Sewer Profile

Proj. file: Sta 188+00 to 200+00.stm




24" RCP
18" RCP
18" RCP
15" RCP
12" RCP
12" RCP
US ROUTE 45
12" RCP
12" RCP
12" RCP
12" RCP
12" RCP
12" RCP
12" RCP
2-9'x4' RCBC
0.01 ACRES
DIVERTED FROM
OUTLET 14 TO
OUTLET 13

Hydraflow Plan View



Sta 205+00 to 212+50	No. Lines: 4	10-15-2014

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	61.5	-135.0	MH	0.00	0.86	0.90	5.0	757.50	0.73	757.95	24	Cir	0.013	1.00	762.78	207+50
2	1	250.5	-45.0	MH	0.00	0.43	0.90	5.0	758.95	0.50	760.20	12	Cir	0.013	1.00	764.00	205+00
3	1	250.5	135.0	MH	0.00	0.43	0.90	5.0	758.80	0.94	761.15	15	Cir	0.013	0.15	765.41	210+00
4	3	250.5	0.0	MH	0.00	0.61	0.90	5.0	761.40	2.53	767.75	12	Cir	0.013	1.00	771.85	212+50

Sta 205+00 to 212+50

Number of lines: 4

Date: 10-15-2014

Hydraflow Storm Sewers 2005

10-year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	207+50	12.68	24 c	61.5	757.50	757.95	0.732	758.76	759.21	n/a	759.21 j	End
2	205+00	2.51	12 c	250.5	758.95	760.20	0.499	759.77	761.02	0.21	761.22	1
3	210+00	5.85	15 c	250.5	758.80	761.15	0.938	759.76	762.12	n/a	762.20 j	1
4	212+50	3.56	12 c	250.5	761.40	767.75	2.535	762.39	768.55	n/a	768.55 j	3

Sta 205+00 to 212+50 | Number of lines: 4 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	61.5	0.86	2.33	0.90	0.77	2.10	5.0	6.8	6.0	12.68	19.35	6.08	24	0.73	757.95	757.50	759.21	758.76	762.78	757.50	207+50
2	1	250.5	0.43	0.43	0.90	0.39	0.39	5.0	5.0	6.5	2.51	2.52	3.65	12	0.50	760.20	758.95	761.02	759.77	764.00	762.78	205+00
3	1	250.5	0.43	1.04	0.90	0.39	0.94	5.0	5.9	6.3	5.85	6.25	5.76	15	0.94	761.15	758.80	762.12	759.76	765.41	762.78	210+00
4	3	250.5	0.61	0.61	0.90	0.55	0.55	5.0	5.0	6.5	3.56	5.67	4.91	12	2.53	767.75	761.40	768.55	762.39	771.85	765.41	212+50

Sta 205+00 to 212+50

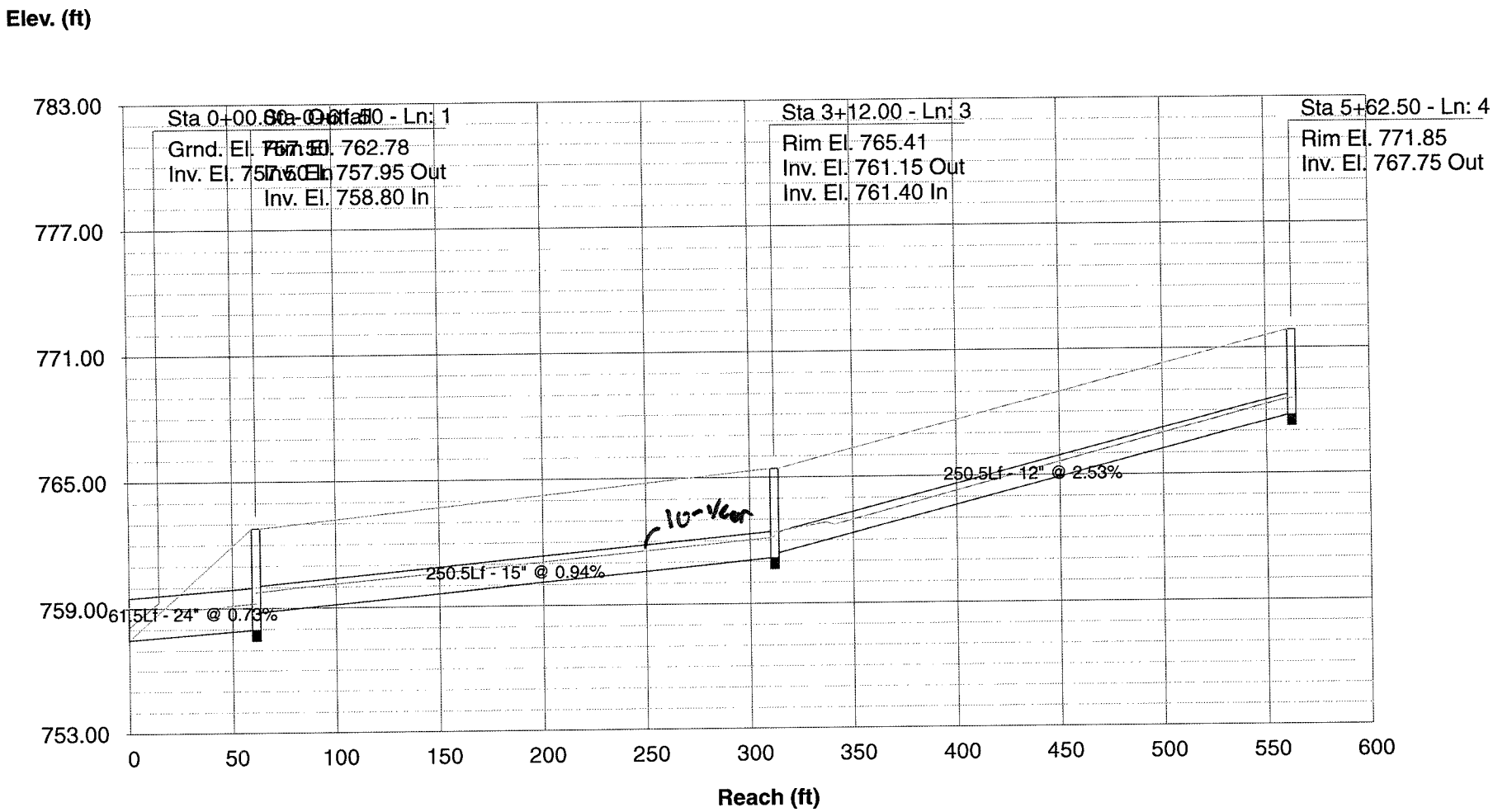
Number of lines: 4

Run Date: 10-15-2014

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

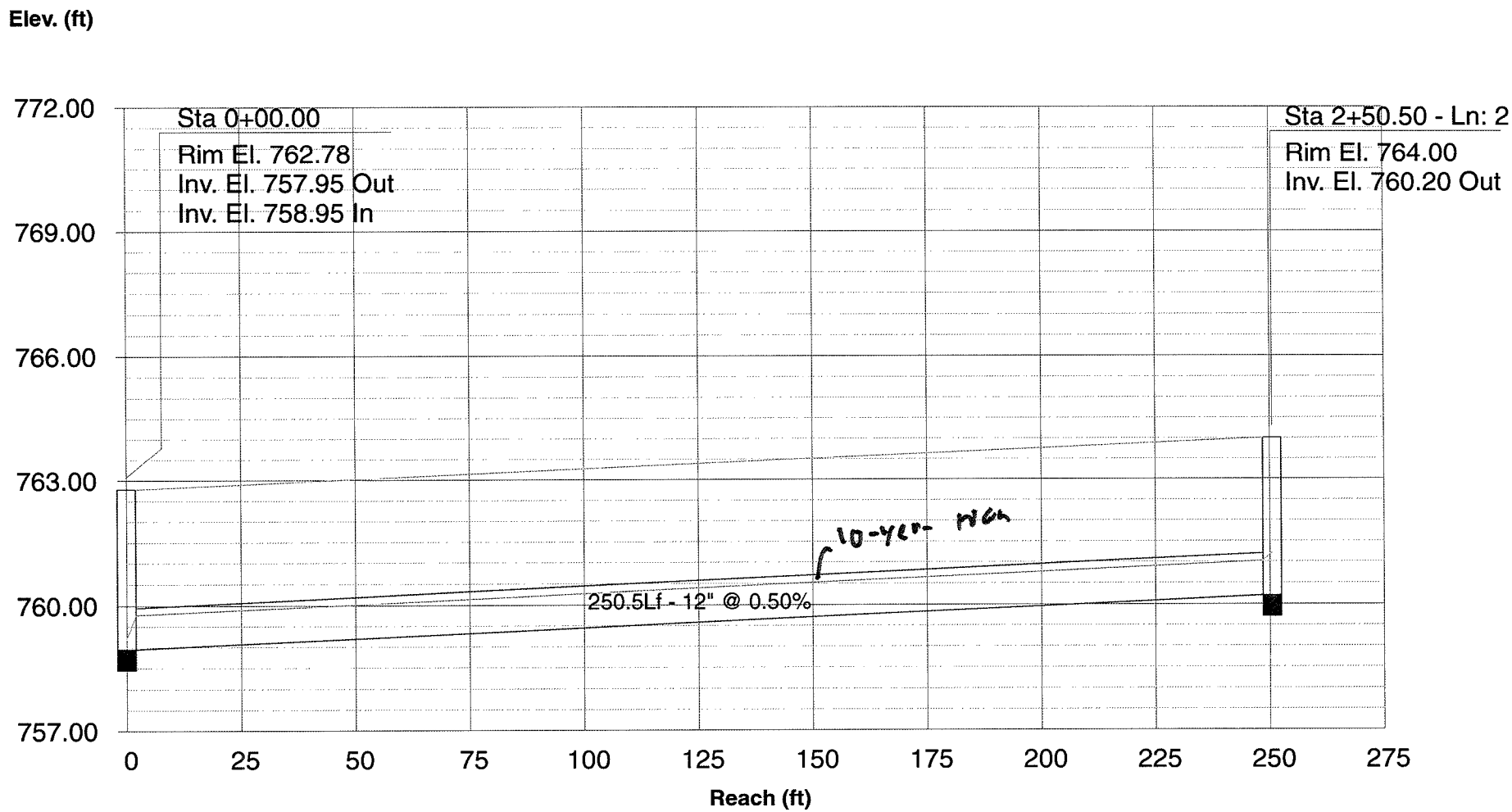
Storm Sewer Profile

Proj. file: Sta 205+00 to 212+50.stm



Storm Sewer Profile

Proj. file: Sta 205+00 to 212+50.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	61.5	-135.0	MH	0.00	0.86	0.90	5.0	757.50	0.73	757.95	24	Cir	0.013	1.00	762.78	207+50
2	1	250.5	-45.0	MH	0.00	0.43	0.90	5.0	758.95	0.50	760.20	12	Cir	0.013	1.00	764.00	205+00
3	1	250.5	135.0	MH	0.00	0.43	0.90	5.0	758.80	0.94	761.15	15	Cir	0.013	0.15	765.41	210+00
4	3	250.5	0.0	MH	0.00	0.61	0.90	5.0	761.40	2.53	767.75	12	Cir	0.013	1.00	771.85	212+50

Sta 205+00 to 212+50 | Number of lines: 4 | Date: 10-15-2014

Hydraflow Storm Sewers 2005

50 -year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	207+50	18.71	24 c	61.5	757.50	757.95	0.732	759.03	759.58	0.73	760.30	End
2	205+00	3.62	12 c	250.5	758.95	760.20	0.499	760.70*	763.29*	0.33	763.62	1
3	210+00	8.55	15 c	250.5	758.80	761.15	0.938	760.30*	764.69*	0.11	764.81	1
4	212+50	5.14	12 c	250.5	761.40	767.75	2.535	764.89*	770.11*	0.67	770.78	3

Sta 205+00 to 212+50 | Number of lines: 4 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

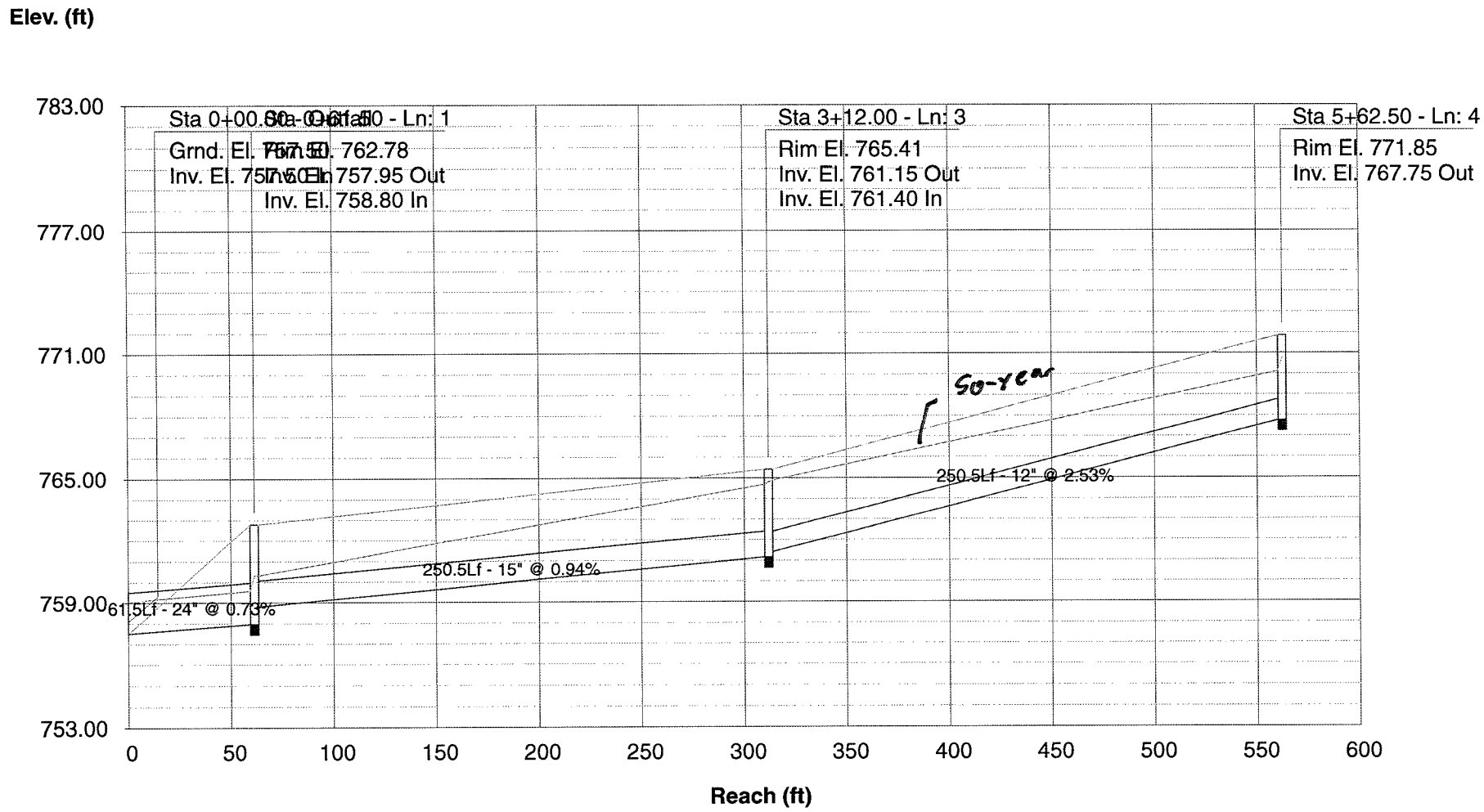
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	61.5	0.86	2.33	0.90	0.77	2.10	5.0	6.3	8.9	18.71	19.35	7.04	24	0.73	757.95	757.50	759.58	759.03	762.78	757.50	207+50
2	1	250.5	0.43	0.43	0.90	0.39	0.39	5.0	5.0	9.4	3.62	2.52	4.61	12	0.50	760.20	758.95	763.29	760.70	764.00	762.78	205+00
3	1	250.5	0.43	1.04	0.90	0.39	0.94	5.0	5.6	9.1	8.55	6.25	6.97	15	0.94	761.15	758.80	764.69	760.30	765.41	762.78	210+00
4	3	250.5	0.61	0.61	0.90	0.55	0.55	5.0	5.0	9.4	5.14	5.67	6.54	12	2.53	767.75	761.40	770.11	764.89	771.85	765.41	212+50

Sta 205+00 to 212+50 | Number of lines: 4 | Run Date: 10-15-2014

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

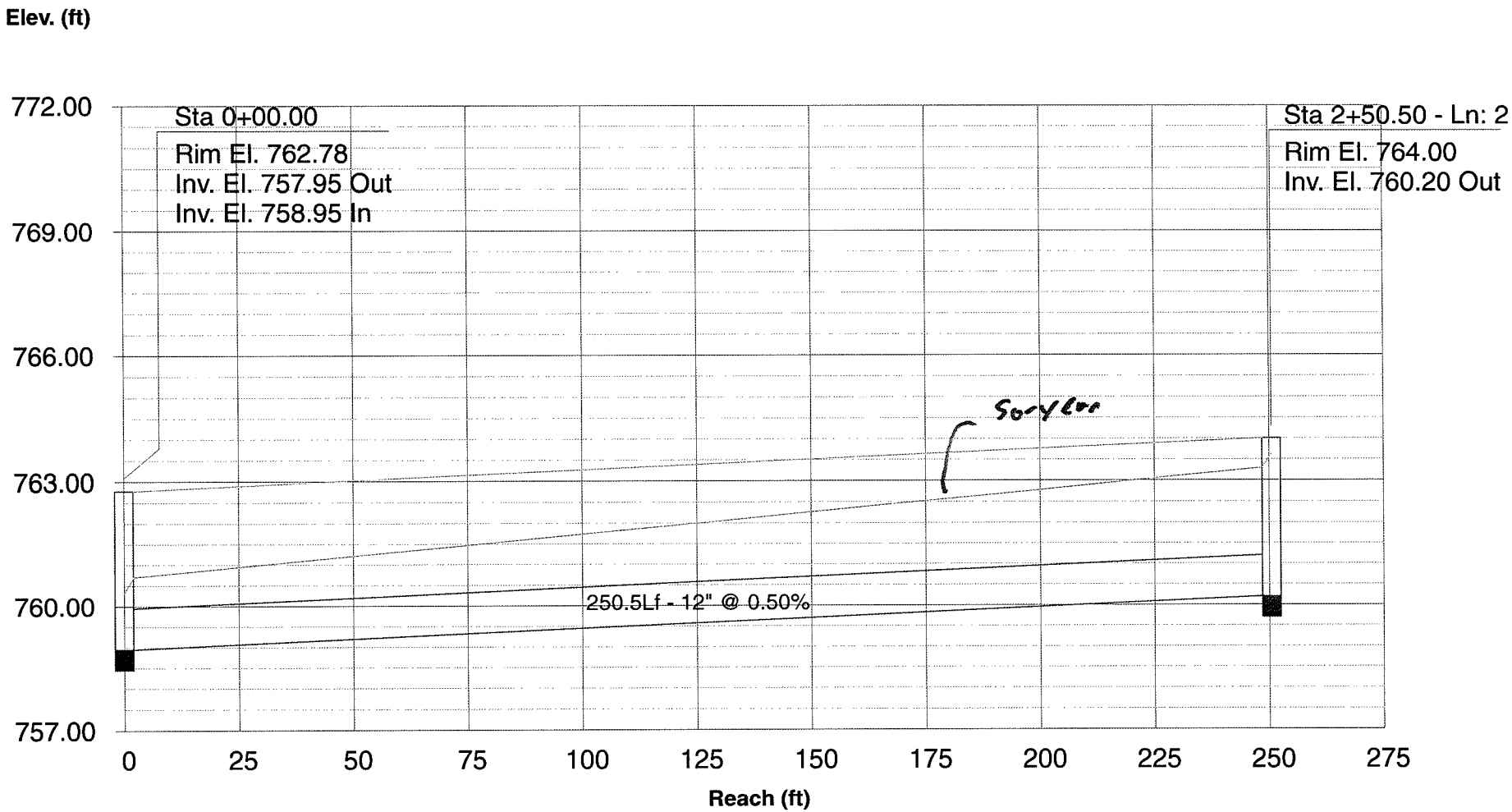
Storm Sewer Profile

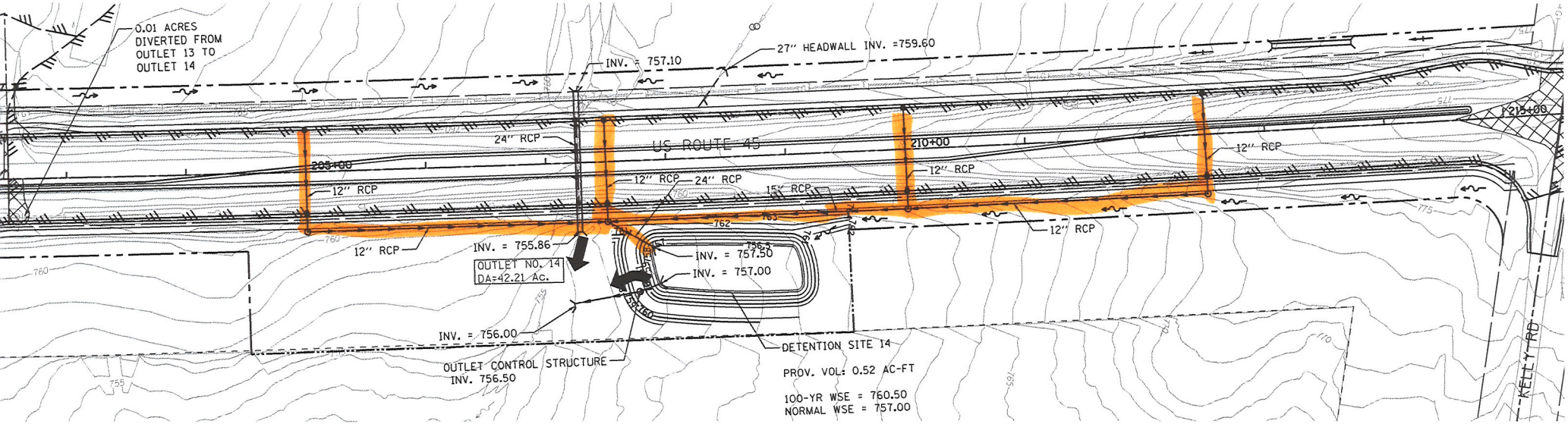
Proj. file: Sta 205+00 to 212+50.stm



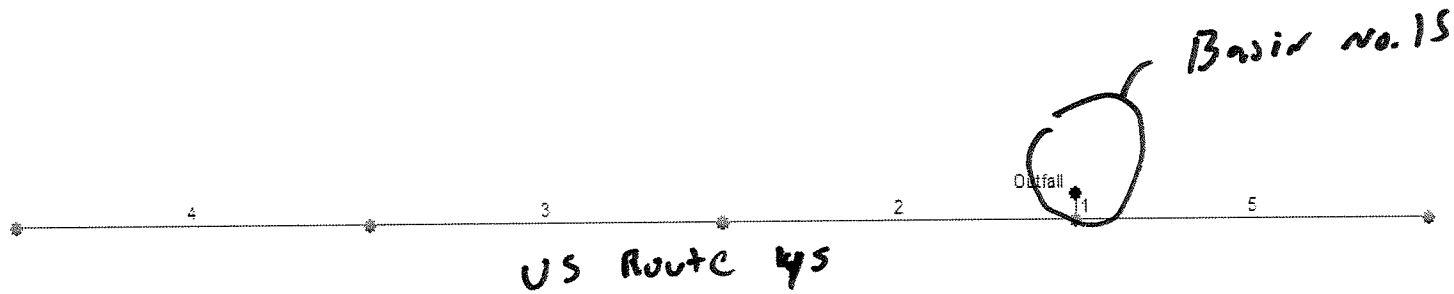
Storm Sewer Profile

Proj. file: Sta 205+00 to 212+50.stm




0.01 ACRES
DIVERTED FROM
OUTLET 13 TO
OUTLET 14
INV. = 757.10
27" HEADWALL INV. =759.60
24" RCP
US ROUTE 45
203+00
210+00
215+00
12" RCP
12" RCP
24" RCP
15" RCP
12" RCP
12" RCP
12" RCP
12" RCP
INV. = 755.86
OUTLET NO. 14
DA=42.21 Ac.
INV. = 757.50
INV. = 757.00
INV. = 756.00
OUTLET CONTROL STRUCTURE
INV. 756.50
DETENTION SITE 14
PROV. VOL: 0.52 AC-FT
100-YR WSE = 760.50
NORMAL WSE = 757.00
KELLY RD

Hydraflow Plan View



Project File: Sta 218+00 to 230+50.stm	No. Lines: 5	10-15-2014

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	16.0	90.0	MH	0.00	0.90	0.45	5.0	764.00	1.87	764.30	24	Cir	0.013	1.00	771.28	225+50
2	1	250.0	90.0	MH	0.00	0.90	0.45	5.0	765.50	0.80	767.50	18	Cir	0.013	0.15	772.53	223+00
3	2	250.0	0.0	MH	0.00	0.90	0.45	5.0	767.60	0.36	768.50	18	Cir	0.013	0.15	773.00	220+50
4	3	250.0	0.0	MH	0.00	0.90	0.46	5.0	768.75	0.62	770.30	15	Cir	0.013	1.00	774.55	218+00
5	1	250.0	-90.0	MH	0.00	0.90	0.50	5.0	765.40	0.38	766.36	15	Cir	0.013	1.00	770.03	228+00

Project File: Sta 218+00 to 230+50.stm | Number of lines: 5 | Date: 10-15-2014

10-year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	225+50	11.49	24 c	16.0	764.00	764.30	1.875	766.06	766.07	0.24	766.31	End
2	223+00	7.00	18 c	250.0	765.50	767.50	0.800	766.47	768.51	n/a	768.51 j	1
3	220+50	4.94	18 c	250.0	767.60	768.50	0.360	768.86	769.49	0.04	769.53	2
4	218+00	2.68	15 c	250.0	768.75	770.30	0.620	769.70	770.96	0.26	770.96	3
5	228+00	2.92	15 c	250.0	765.40	766.36	0.384	766.46	767.12	0.21	767.34	1

Project File: Sta 218+00 to 230+50.stm | Number of lines: 5 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	16.0	0.90	4.50	0.45	0.41	2.08	5.0	9.4	5.5	11.49	30.97	3.78	24	1.87	764.30	764.00	766.07	766.06	771.28	0.00	225+50
2	1	250.0	0.90	2.70	0.45	0.41	1.22	5.0	8.4	5.7	7.00	9.39	5.67	18	0.80	767.50	765.50	768.51	766.47	772.53	771.28	223+00
3	2	250.0	0.90	1.80	0.45	0.41	0.82	5.0	6.9	6.0	4.94	6.30	3.55	18	0.36	768.50	767.60	769.49	768.86	773.00	772.53	220+50
4	3	250.0	0.90	0.90	0.46	0.41	0.41	5.0	5.0	6.5	2.68	5.08	3.40	15	0.62	770.30	768.75	770.96	769.70	774.55	773.00	218+00
5	1	250.0	0.90	0.90	0.50	0.45	0.45	5.0	5.0	6.5	2.92	4.00	3.17	15	0.38	766.36	765.40	767.12	766.46	770.03	771.28	228+00

Project File: Sta 218+00 to 230+50.stm

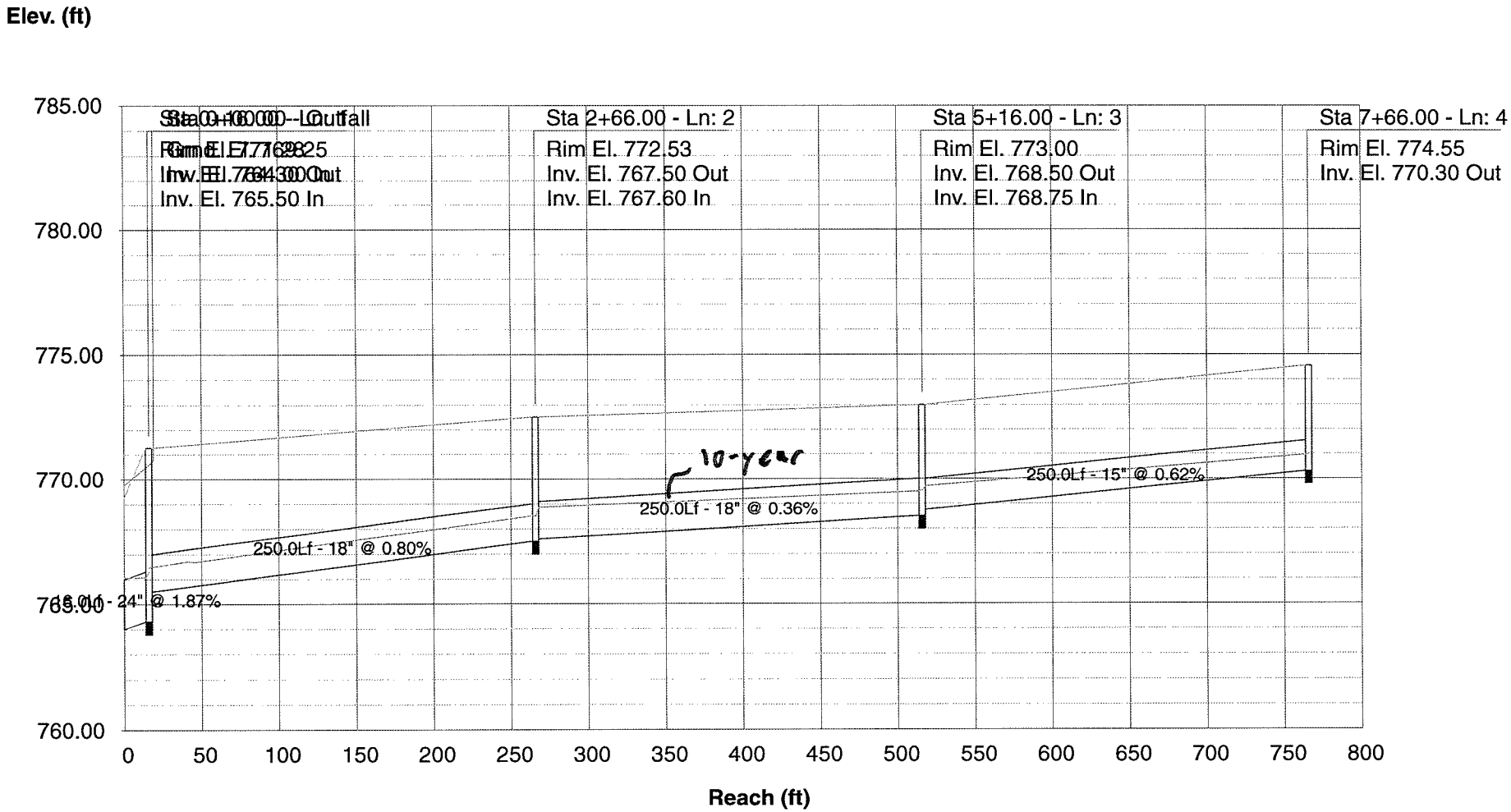
Number of lines: 5

Run Date: 10-15-2014

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

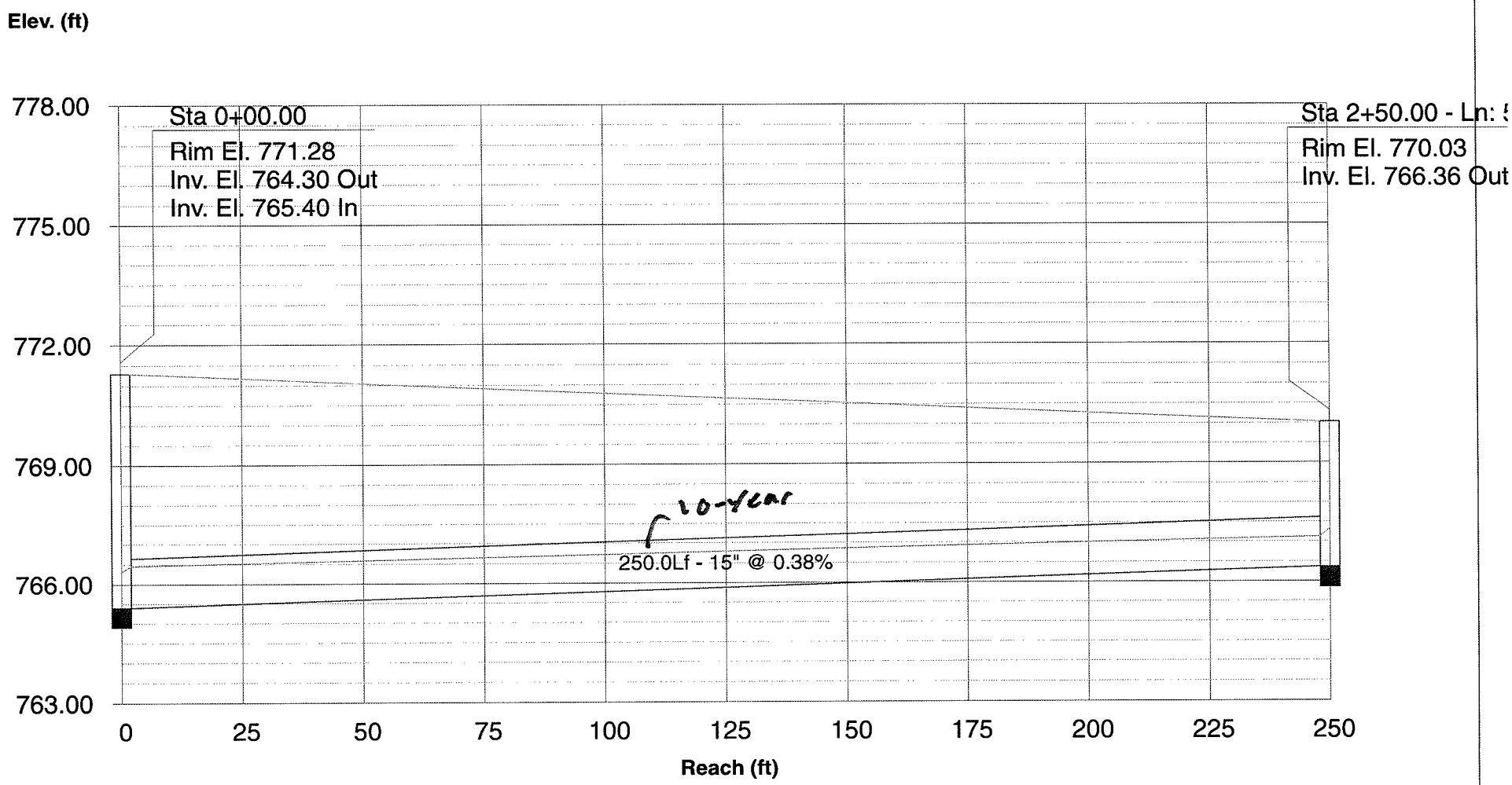
Storm Sewer Profile

Proj. file: Sta 218+00 to 230+50.stm



Storm Sewer Profile

Proj. file: Sta 218+00 to 230+50.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	16.0	90.0	MH	0.00	0.90	0.45	5.0	764.00	1.87	764.30	24	Cir	0.013	1.00	771.28	225+50
2	1	250.0	90.0	MH	0.00	0.90	0.45	5.0	765.50	0.80	767.50	18	Cir	0.013	0.15	772.53	223+00
3	2	250.0	0.0	MH	0.00	0.90	0.45	5.0	767.60	0.36	768.50	18	Cir	0.013	0.15	773.00	220+50
4	3	250.0	0.0	MH	0.00	0.90	0.46	5.0	768.75	0.62	770.30	15	Cir	0.013	1.00	774.55	218+00
5	1	250.0	-90.0	MH	0.00	0.90	0.50	5.0	765.40	0.38	766.36	15	Cir	0.013	1.00	770.03	228+00

Project File: Sta 218+00 to 230+50.stm | Number of lines: 5 | Date: 10-15-2014

Hydraflow Storm Sewers 2005

50- Year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	225+50	17.40	24 c	16.0	764.00	764.30	1.875	766.06	766.09	0.53	766.63	End
2	223+00	10.50	18 c	250.0	765.50	767.50	0.800	767.00*	769.50*	0.08	769.58	1
3	220+50	7.29	18 c	250.0	767.60	768.50	0.360	769.87*	771.07*	0.04	771.11	2
4	218+00	3.87	15 c	250.0	768.75	770.30	0.620	771.22*	772.12*	0.15	772.28	3
5	228+00	4.21	15 c	250.0	765.40	766.36	0.384	766.98*	768.04*	0.18	768.22	1

Project File: Sta 218+00 to 230+50.stm | Number of lines: 5 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	16.0	0.90	4.50	0.45	0.41	2.08	5.0	8.0	8.4	17.40	30.97	5.70	24	1.87	764.30	764.00	766.09	766.06	771.28	0.00	225+50
2	1	250.0	0.90	2.70	0.45	0.41	1.22	5.0	7.3	8.6	10.50	9.39	5.94	18	0.80	767.50	765.50	769.50	767.00	772.53	771.28	223+00
3	2	250.0	0.90	1.80	0.45	0.41	0.82	5.0	6.3	8.9	7.29	6.30	4.13	18	0.36	768.50	767.60	771.07	769.87	773.00	772.53	220+50
4	3	250.0	0.90	0.90	0.46	0.41	0.41	5.0	5.0	9.4	3.87	5.08	3.16	15	0.62	770.30	768.75	772.12	771.22	774.55	773.00	218+00
5	1	250.0	0.90	0.90	0.50	0.45	0.45	5.0	5.0	9.4	4.21	4.00	3.43	15	0.38	766.36	765.40	768.04	766.98	770.03	771.28	228+00

Project File: Sta 218+00 to 230+50.stm

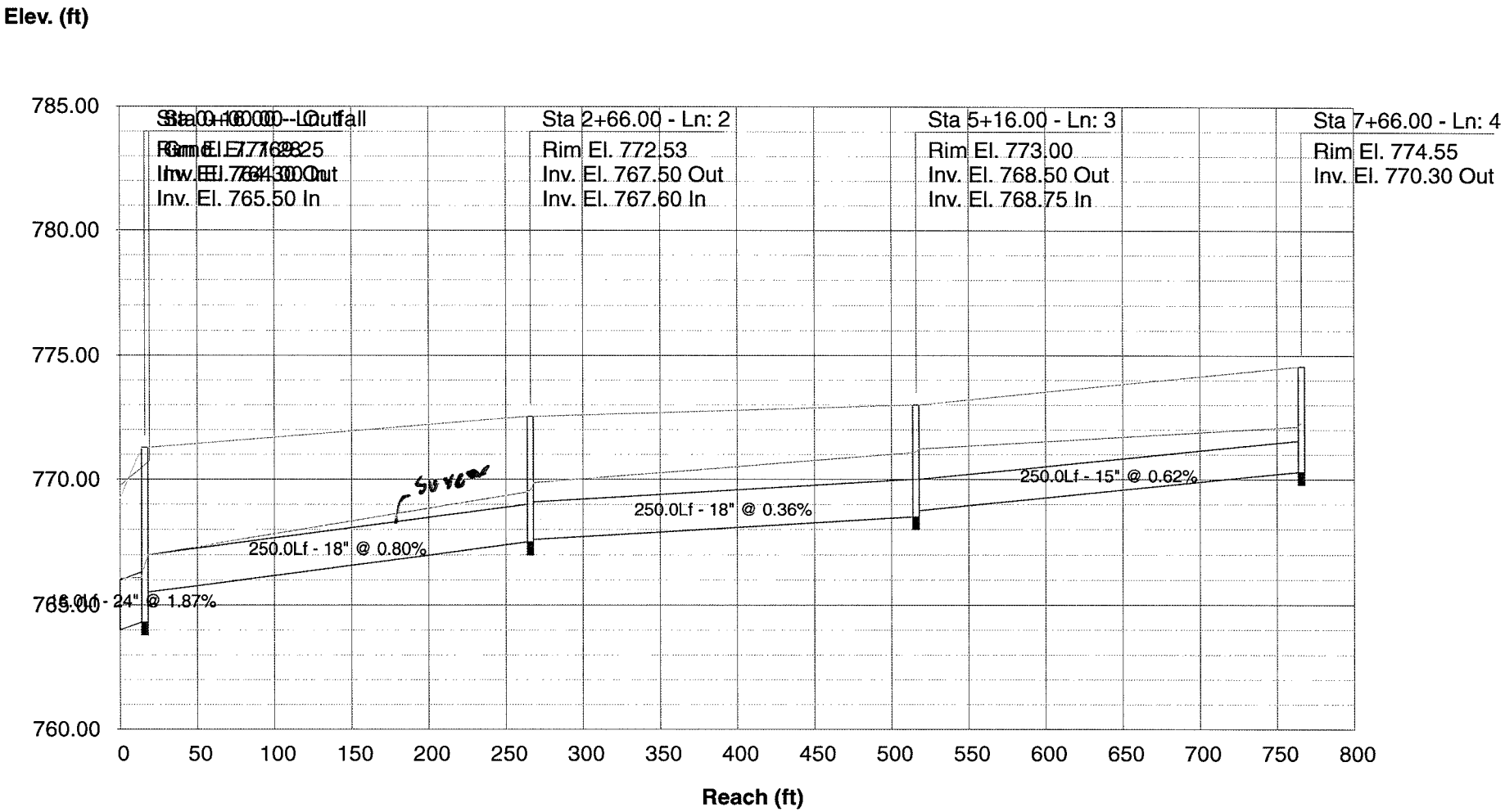
Number of lines: 5

Run Date: 10-15-2014

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

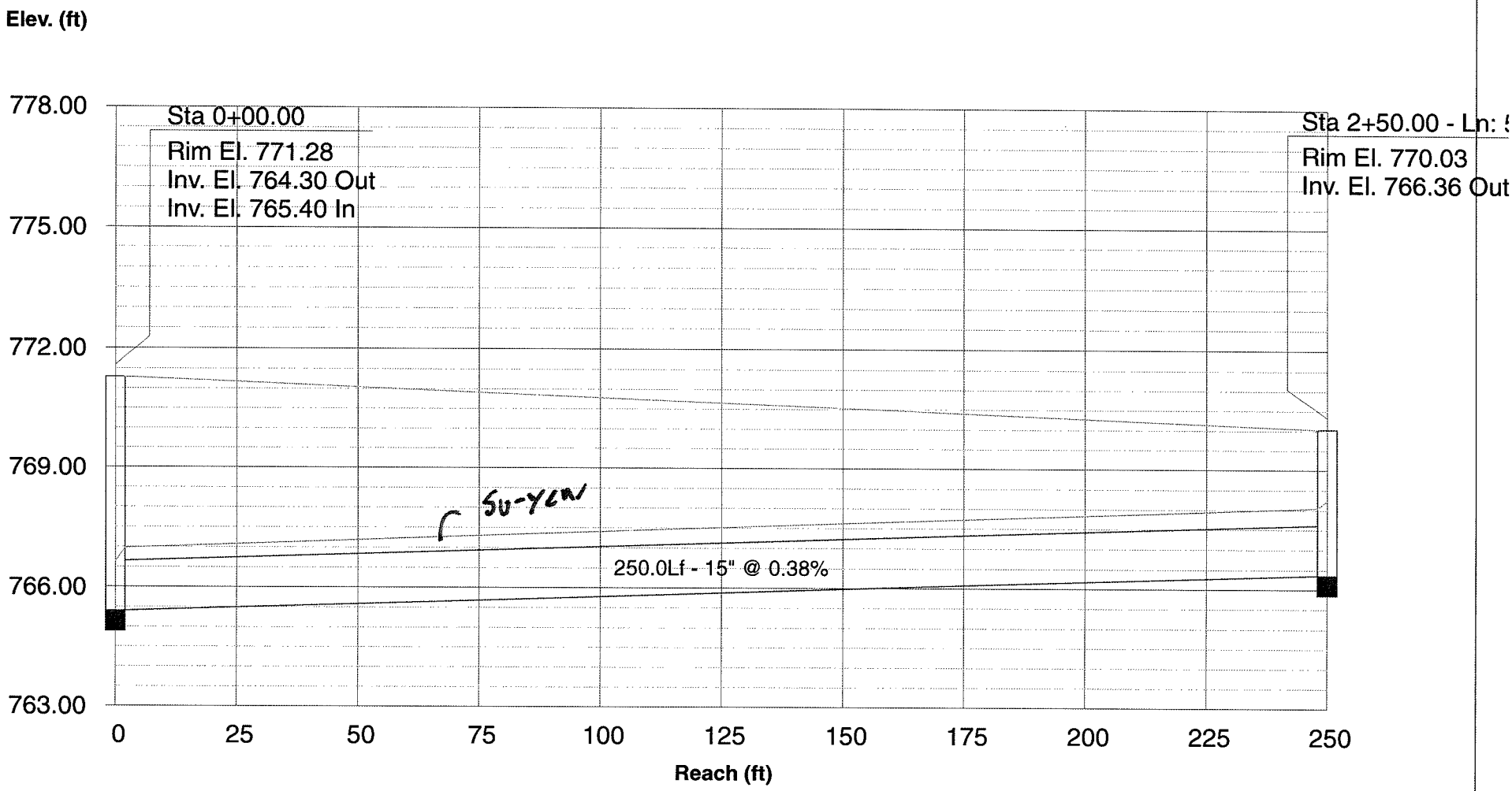
Storm Sewer Profile

Proj. file: Sta 218+00 to 230+50.stm

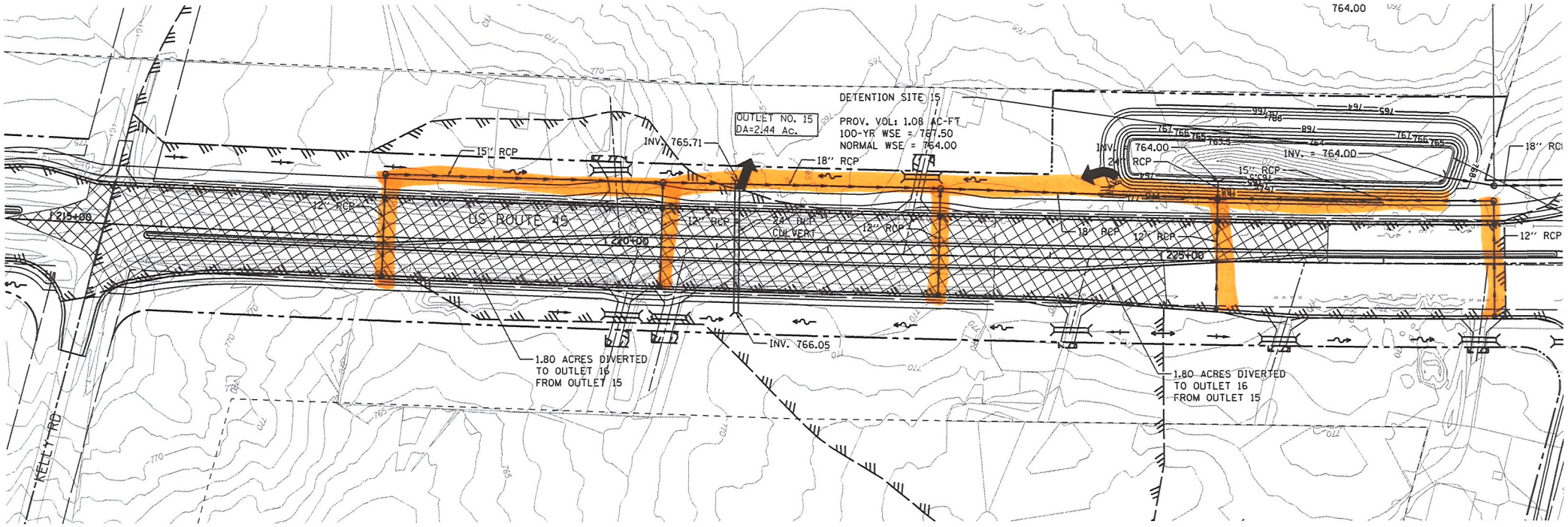


Storm Sewer Profile

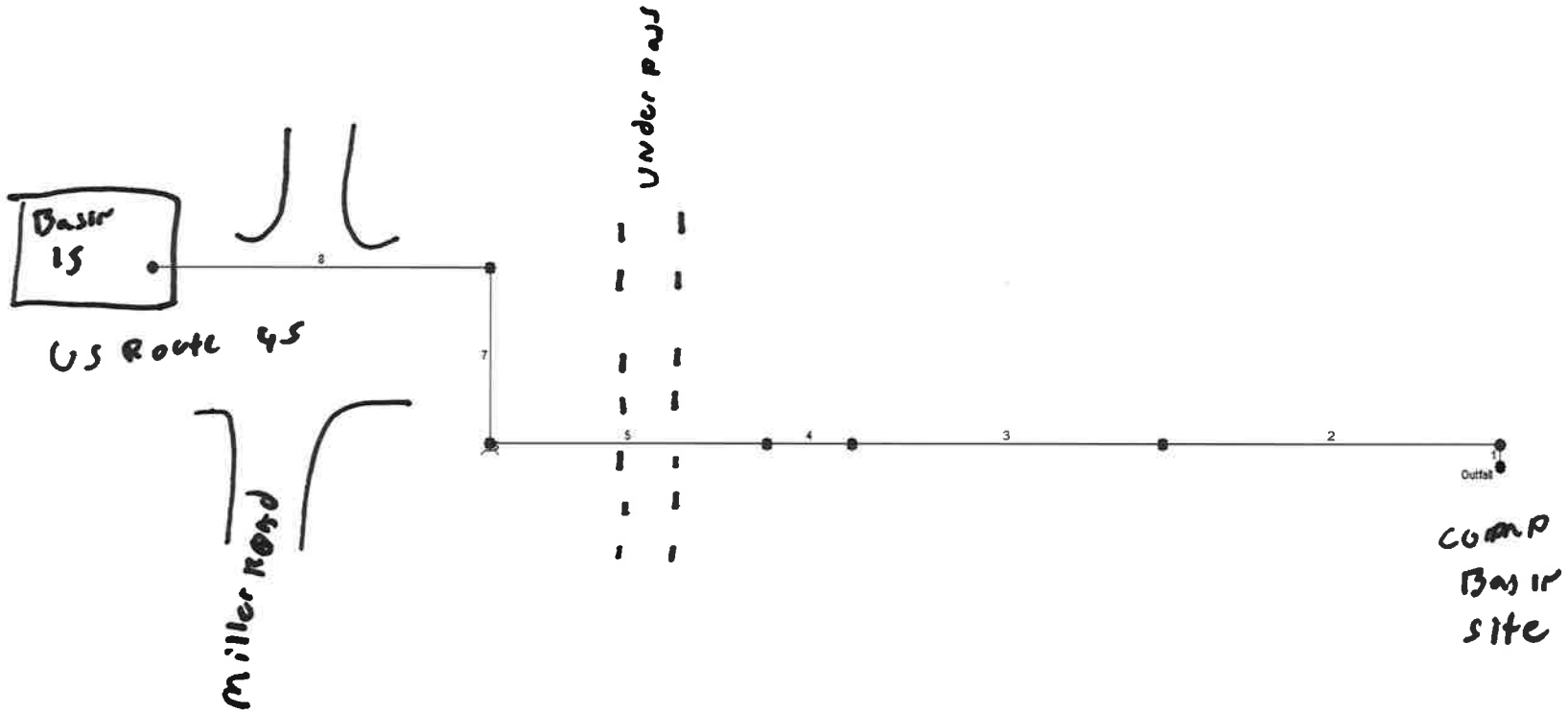
Proj. file: Sta 218+00 to 230+50.stm



Hydraflow Storm Sewers 2005


764.00
DETENTION SITE 15
OUTLET NO. 15
DA=2.44 Ac.
PROV. VOL: 1.08 AC-FT
100-YR WSE = 767.50
NORMAL WSE = 764.00
INV. 765.71
15" RCP
18" RCP
12" RCP
US ROUTE 45
24" RCP
CULVERT
12" RCP
18" RCP
12" RCP
INV. = 764.00
24" RCP
15" RCP
INV. = 764.00
18" RCP
12" RCP
215+00
220+00
225+00
INV. 766.05
1.80 ACRES DIVERTED
TO OUTLET 16
FROM OUTLET 15
1.80 ACRES DIVERTED
TO OUTLET 16
FROM OUTLET 15
KELLY RD

Hydraflow Plan View



Project File: Underpass NEW.stm	No. Lines: 8	01-02-2019

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	15.0	-90.0	MH	0.00	0.45	0.90	5.0	746.50	3.33	747.00	30	Cir	0.013	1.00	756.00	238+00
2	1	250.0	-90.0	MH	0.00	0.45	0.90	5.0	750.35	1.32	753.65	30	Cir	0.013	0.15	759.47	235+50
3	2	230.0	0.0	MH	0.00	0.50	0.90	5.0	753.75	1.78	757.85	30	Cir	0.013	0.15	763.51	233+20
4	3	63.0	0.0	MH	0.00	0.00	0.00	0.0	757.95	3.41	760.10	30	Cir	0.013	0.15	765.60	232+55
5	4	205.0	0.0	MH	0.00	0.28	0.90	5.0	761.90	0.22	762.35	24 38	Ellip	0.013	1.00	767.80	230+50 RT
6	5	5.0	-90.0	Hdwl	0.00	2.67	0.37	18.0	764.35	0.80	764.39	18	Cir	0.013	1.00	764.39	230+50 off Site ar
7	5	118.0	90.0	MH	0.00	0.32	0.90	5.0	762.90	0.34	763.30	24	Cir	0.013	1.00	767.80	230+50 LT
8	7	250.0	-90.0	MH	8.50	0.00	0.00	0.0	763.40	0.24	764.00	24	Cir	0.013	1.00	769.22	Pond Outlet

Project File: Underpass NEW.stm 50-Year Number of lines: 8 Date: 05-20-2019

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	238+00	24.61	30 c	15.0	746.50	747.00	3.333	748.16	748.66	n/a	748.66	End
2	235+50	22.57	30 c	250.0	750.35	753.65	1.320	751.57	755.24	0.11	755.24	1
3	233+20	20.44	30 c	230.0	753.75	757.85	1.783	755.70	759.36	n/a	759.36 j	2
4	232+55	17.79	30 c	63.0	757.95	760.10	3.412	759.83	761.51	n/a	761.51 j	3
5	230+50 RT	18.02	24 x 38 e	205.0	761.90	762.35	0.219	763.20	763.85	0.32	764.17	4
6	230+50 off Site area	6.16	18 c	5.0	764.35	764.39	0.801	765.24	765.40	0.36	765.77	5
7	230+50 LT	11.20	24 c	118.0	762.90	763.30	0.339	764.32	764.72	0.34	765.06	5
8	Pond Outlet	8.50	24 c	250.0	763.40	764.00	0.240	765.29	765.59	0.16	765.75	7

Project File: Underpass NEW.stm | Number of lines: 8 | Run Date: 05-20-2019

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	15.0	0.45	4.67	0.90	0.41	2.79	5.0	21.1	5.8	24.61	74.88	7.12	30	3.33	747.00	746.50	748.66	748.16	756.00	0.00	238+00
2	1	250.0	0.45	4.22	0.90	0.41	2.38	5.0	20.2	5.9	22.57	47.12	8.18	30	1.32	753.65	750.35	755.24	751.57	759.47	756.00	235+50
3	2	230.0	0.50	3.77	0.90	0.45	1.98	5.0	19.3	6.0	20.44	54.76	5.78	30	1.78	757.85	753.75	759.36	755.70	763.51	759.47	233+20
4	3	63.0	0.00	3.27	0.00	0.00	1.53	0.0	19.0	6.1	17.79	75.76	5.36	30	3.41	760.10	757.95	761.51	759.83	765.60	763.51	232+55
5	4	205.0	0.28	3.27	0.90	0.25	1.53	5.0	18.0	6.2	18.02	19.22	4.92	24 38 e	0.22	762.35	761.90	763.85	763.20	767.80	765.60	230+50 RT
6	5	5.0	2.67	2.67	0.37	0.99	0.99	18.0	18.0	6.2	6.16	9.40	5.25	18	0.80	764.39	764.35	765.40	765.24	764.39	767.80	230+50 off Site ar
7	5	118.0	0.32	0.32	0.90	0.29	0.29	5.0	5.0	9.4	11.20	13.17	4.70	24	0.34	763.30	762.90	764.72	764.32	767.80	767.80	230+50 LT
8	7	250.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	8.50	11.08	2.97	24	0.24	764.00	763.40	765.59	765.29	769.22	767.80	Pond Outlet

Project File: Underpass NEW.stm

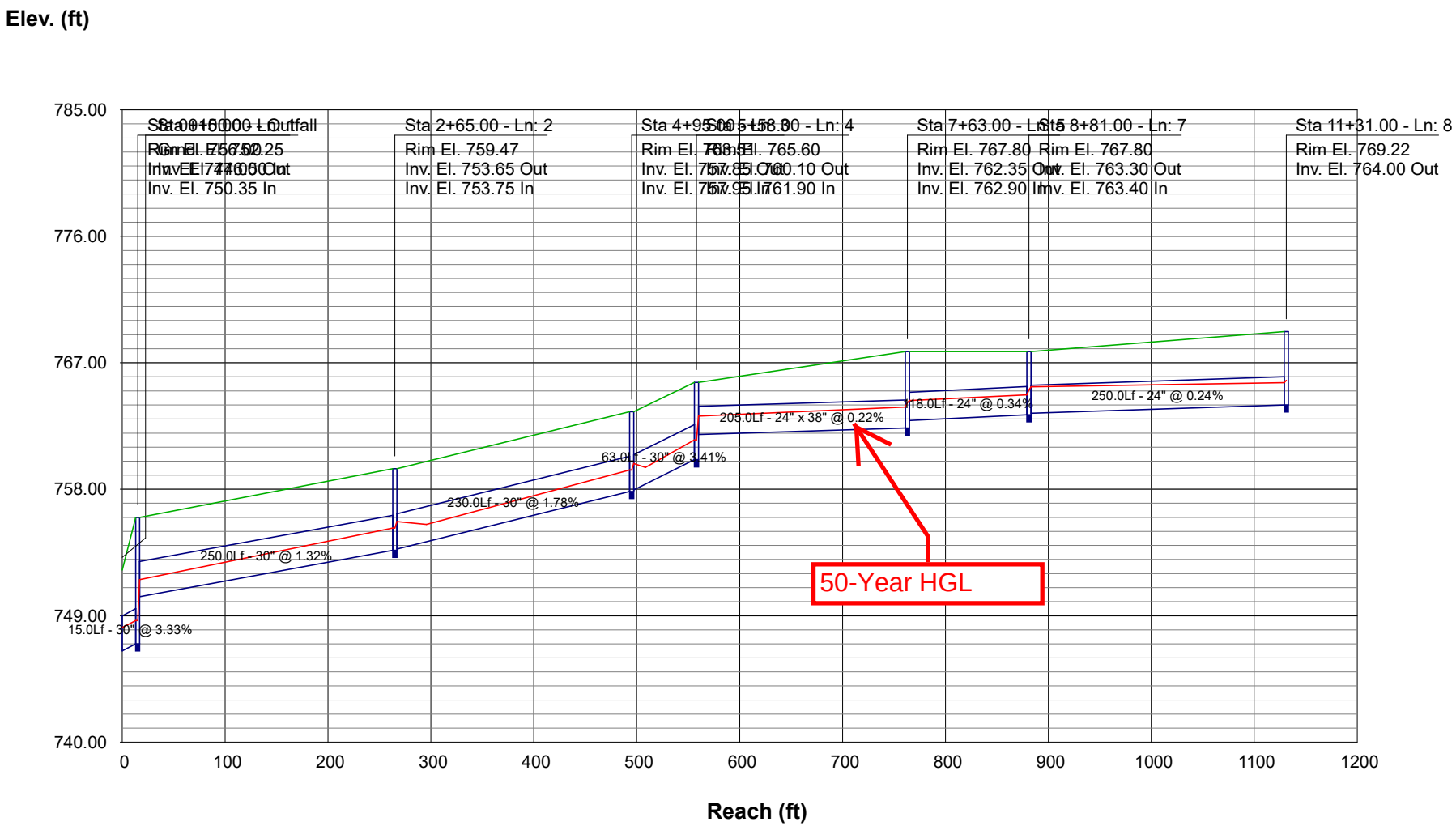
Number of lines: 8

Run Date: 05-20-2019

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

Storm Sewer Profile

Proj. file: Underpass NEW.stm



Time of Concentration (Tc) or Travel Time (Tt)

Project: 10-63
Location: Offsite Area Station 23050
File:

By: EMB
Checked:

Date: 9/24/2014
Date:

Present / Developed Tc through subarea: Ex Conditions to basin 8.1 restrictor

SHEET FLOW

Segment ID		I			
Surface Description (table 3-1)		grass			
Manning's roughness coeff., n		0.24			
Flow Length, L (total L =< 100')	(ft)	100			
Two-yr 24-hr rainfall, P2	(in)	6.46			
Land slope, s	(ft/ft)	0.011			
Tc = (0.007(nL)^0.8)/(P2^0.5 x s^0.4)	(hr)	0.21	+	0.00	= 0.21 hr

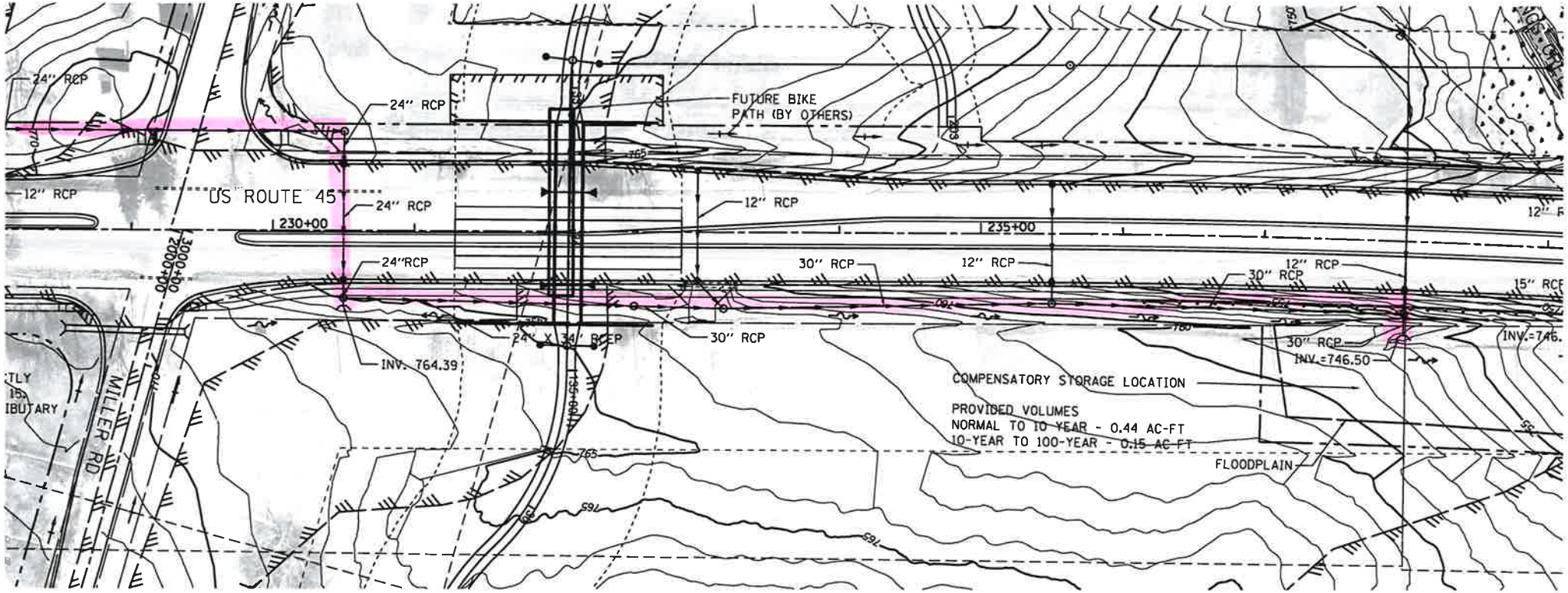
SHALLOW CONCENTRATED FLOW

Segment ID		II		III						
Surface Description (paved or unpaved)		unp.		unp.						
Flow Length, L	(ft)	154		400						
Watercourse slope, s	(ft/ft)	0.03247		0.007						
Average velocity, V	(ft/s)	2.91		1.35						
Tt = L / 3600 V	(hr)	0.01	+	0.08	+	0.00	+	0.00	=	0.09 hr

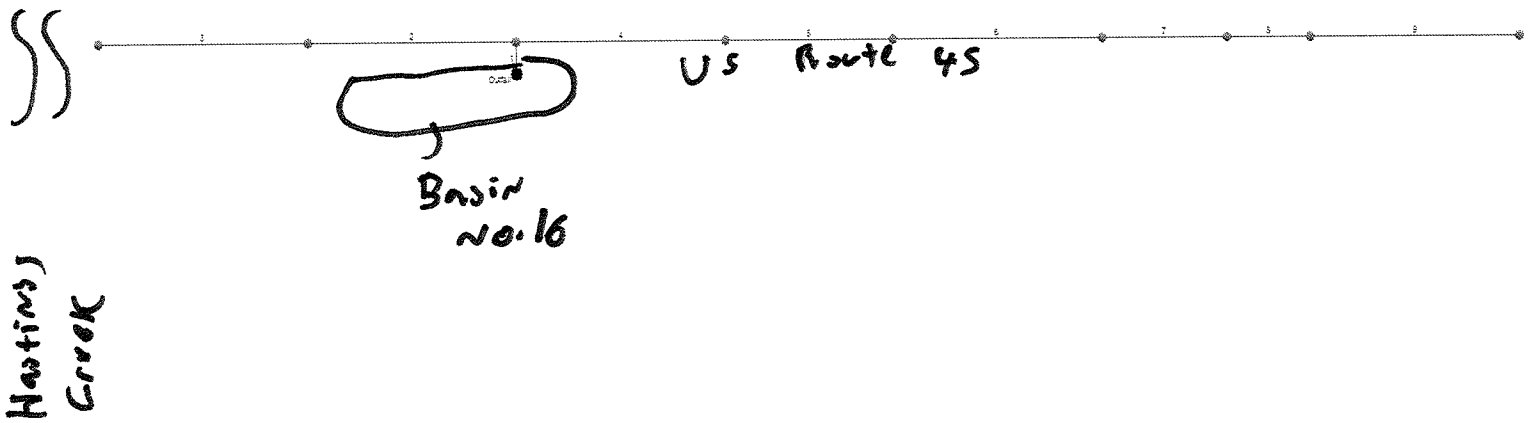
CHANNEL FLOW

Segment ID					
Cross-sectional flow area, a	(ft^2)				
Wetted perimeter, Pw	(ft)				
Hydraulic radius, r = a/Pw	(ft)				
Channel slope, s	(ft/ft)				
Manning's roughness coeff., n					
V = (1.49 * r^0.667 * s^0.5) / n	(ft/s)	2.00		0.00	
Flow length, L	(ft)				
Tt = L / 3600 V	(hr)	0.00	+		= 0.00 hr

Watershed or subarea Tc or Tt = 0.30 hr
= 18.00 min


24" RCP
24" RCP
FUTURE BIKE
PATH (BY OTHERS)
12" RCP
US ROUTE 45
24" RCP
12" RCP
230+00
235+00
24"RCP
30" RCP
12" RCP
12" RCP
30" RCP
15" RCP
INV. 764.39
24" X 34" RCEP
30" RCP
30" RCP
INV.=746.50
COMPENSATORY STORAGE LOCATION
PROVIDED VOLUMES
NORMAL TO 10-YEAR - 0.44 AC-FT
10-YEAR TO 100-YEAR - 0.15 AC-FT
FLOODPLAIN
MILLER RD
765
760
755

Hydraflow Plan View



Project File: Sta 246+50 to 258+50.stm	No. Lines: 9	10-15-2014

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	35.0	-90.0	MH	0.00	0.43	0.90	5.0	746.00	0.14	746.05	30	Cir	0.013	1.00	757.05	246+50
2	1	250.0	-90.0	MH	0.00	0.41	0.90	5.0	746.20	0.20	746.70	24	Cir	0.013	0.15	752.81	244+00
3	2	250.0	0.0	MH	0.00	0.78	0.90	5.0	747.20	0.26	747.85	18	Cir	0.013	1.00	751.00	241+50
4	1	250.0	90.0	MH	0.00	0.00	0.00	0.0	746.55	0.20	747.05	24	Cir	0.013	0.15	757.00	249+00
5	4	200.0	0.0	MH	0.00	0.39	0.00	0.0	747.15	0.20	747.55	24	Cir	0.013	0.15	757.93	251+00
6	5	250.0	0.0	MH	0.00	0.43	0.90	5.0	747.65	0.80	749.65	24	Cir	0.013	0.15	756.68	253+50
7	6	150.0	0.0	MH	0.00	0.43	0.90	5.0	750.15	0.70	751.20	18	Cir	0.013	0.15	756.12	255+00
8	7	100.0	0.0	MH	0.00	0.46	0.90	5.0	753.00	0.30	753.30	18	Cir	0.013	0.15	756.43	256+00
9	8	250.0	0.0	MH	0.00	0.43	0.90	5.0	753.55	0.34	754.40	15	Cir	0.013	1.00	757.63	258+50

Project File: Sta 246+50 to 258+50.stm | Number of lines: 9 | Date: 01-10-2018

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	246+50	15.23	30 c	35.0	746.00	746.05	0.143	747.78	747.85	0.25	748.10	End
2	244+00	6.52	24 c	250.0	746.20	746.70	0.200	748.25	748.44	0.01	748.45	1
3	241+50	4.55	18 c	250.0	747.20	747.85	0.260	748.45	748.94	0.17	749.11	2
4	249+00	8.30	24 c	250.0	746.55	747.05	0.199	748.25	748.57	0.02	748.60	1
5	251+00	8.62	24 c	200.0	747.15	747.55	0.201	748.64	748.99	0.03	749.02	4
6	253+50	9.05	24 c	250.0	747.65	749.65	0.802	749.09	750.72	n/a	750.72 j	5
7	255+00	6.97	18 c	150.0	750.15	751.20	0.696	751.17	752.21	n/a	752.28 j	6
8	256+00	4.80	18 c	100.0	753.00	753.30	0.300	754.05	754.35	0.03	754.38	7
9	258+50	2.51	15 c	250.0	753.55	754.40	0.339	754.52	755.11	0.18	755.30	8

Project File: Sta 246+50 to 258+50.stm | Number of lines: 9 | Run Date: 01-10-2018

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	35.0	0.43	3.76	0.90	0.39	3.03	5.0	12.4	5.0	15.23	15.50	4.05	30	0.14	746.05	746.00	747.85	747.78	757.05	0.00	246+50
2	1	250.0	0.41	1.19	0.90	0.37	1.07	5.0	6.6	6.1	6.52	10.11	2.16	24	0.20	746.70	746.20	748.44	748.25	752.81	757.05	244+00
3	2	250.0	0.78	0.78	0.90	0.70	0.70	5.0	5.0	6.5	4.55	5.35	3.10	18	0.26	747.85	747.20	748.94	748.45	751.00	752.81	241+50
4	1	250.0	0.00	2.14	0.00	0.00	1.58	0.0	10.9	5.3	8.30	10.09	3.08	24	0.20	747.05	746.55	748.57	748.25	757.00	757.05	249+00
5	4	200.0	0.39	2.14	0.00	0.00	1.58	0.0	9.7	5.5	8.62	10.14	3.49	24	0.20	747.55	747.15	748.99	748.64	757.93	757.00	251+00
6	5	250.0	0.43	1.75	0.90	0.39	1.58	5.0	8.3	5.7	9.05	20.25	4.53	24	0.80	749.65	747.65	750.72	749.09	756.68	757.93	253+50
7	6	150.0	0.43	1.32	0.90	0.39	1.19	5.0	7.6	5.9	6.97	8.76	5.49	18	0.70	751.20	750.15	752.21	751.17	756.12	756.68	255+00
8	7	100.0	0.46	0.89	0.90	0.41	0.80	5.0	7.0	6.0	4.80	5.75	3.64	18	0.30	753.30	753.00	754.35	754.05	756.43	756.12	256+00
9	8	250.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	6.5	2.51	3.76	2.95	15	0.34	754.40	753.55	755.11	754.52	757.63	756.43	258+50

Project File: Sta 246+50 to 258+50.stm

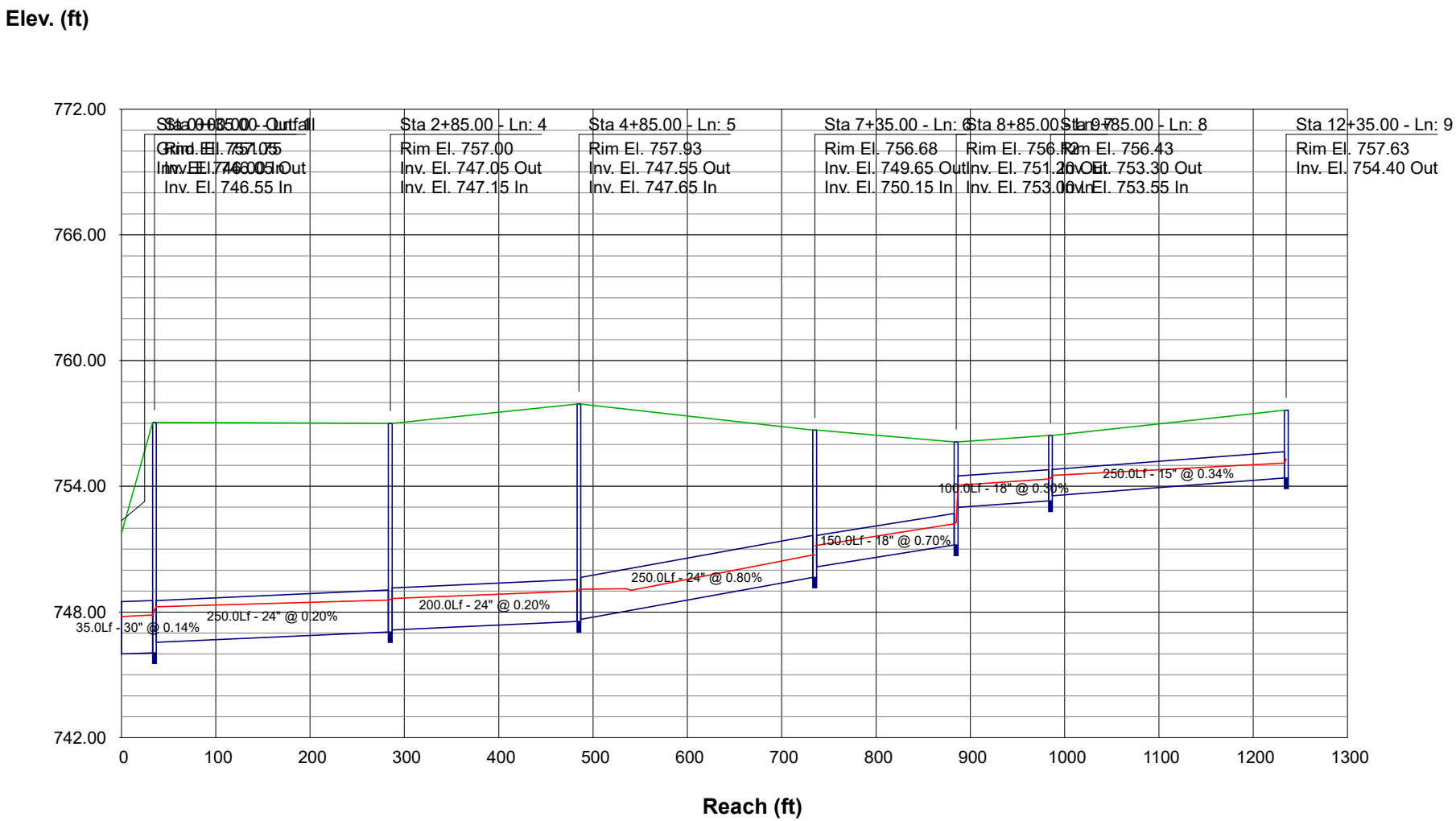
Number of lines: 9

Run Date: 01-10-2018

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

Storm Sewer Profile

Proj. file: Sta 246+50 to 258+50.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	35.0	-90.0	MH	0.00	0.43	0.90	5.0	746.00	0.14	746.05	30	Cir	0.013	1.00	757.05	246+50
2	1	250.0	-90.0	MH	0.00	0.41	0.90	5.0	746.20	0.20	746.70	24	Cir	0.013	0.15	752.81	244+00
3	2	250.0	0.0	MH	0.00	0.78	0.90	5.0	747.20	0.26	747.85	18	Cir	0.013	1.00	751.00	241+50
4	1	250.0	90.0	MH	0.00	0.00	0.00	0.0	746.55	0.20	747.05	24	Cir	0.013	0.15	757.00	249+00
5	4	200.0	0.0	MH	0.00	0.39	0.00	0.0	747.15	0.20	747.55	24	Cir	0.013	0.15	757.93	251+00
6	5	250.0	0.0	MH	0.00	0.43	0.90	5.0	747.65	0.80	749.65	24	Cir	0.013	0.15	756.68	253+50
7	6	150.0	0.0	MH	0.00	0.43	0.90	5.0	750.15	0.70	751.20	18	Cir	0.013	0.15	756.12	255+00
8	7	100.0	0.0	MH	0.00	0.46	0.90	5.0	753.00	0.30	753.30	18	Cir	0.013	0.15	756.43	256+00
9	8	250.0	0.0	MH	0.00	0.43	0.90	5.0	753.55	0.34	754.40	15	Cir	0.013	1.00	757.63	258+50

Project File: Sta 246+50 to 258+50.stm | Number of lines: 9 | Date: 01-11-2018

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	246+50	23.67	30 c	35.0	746.00	746.05	0.143	747.78	748.05	0.49	748.54	End
2	244+00	9.60	24 c	250.0	746.20	746.70	0.200	748.89*	749.34*	0.02	749.36	1
3	241+50	6.57	18 c	250.0	747.20	747.85	0.260	749.36*	750.34*	0.21	750.55	2
4	249+00	12.73	24 c	250.0	746.55	747.05	0.199	748.70*	749.49*	0.04	749.53	1
5	251+00	13.09	24 c	200.0	747.15	747.55	0.201	749.53*	750.20*	0.04	750.24	4
6	253+50	13.55	24 c	250.0	747.65	749.65	0.802	750.24	751.09	0.07	751.16	5
7	255+00	10.38	18 c	150.0	750.15	751.20	0.696	751.65*	753.12*	0.08	753.20	6
8	256+00	7.11	18 c	100.0	753.00	753.30	0.300	754.50*	754.96*	0.04	754.99	7
9	258+50	3.62	15 c	250.0	753.55	754.40	0.339	755.11*	755.90*	0.14	756.03	8

Project File: Sta 246+50 to 258+50.stm | Number of lines: 9 | Run Date: 01-11-2018

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	35.0	0.43	3.76	0.90	0.39	3.03	5.0	10.1	7.8	23.67	15.50	5.97	30	0.14	746.05	746.00	748.05	747.78	757.05	0.00	246+50
2	1	250.0	0.41	1.19	0.90	0.37	1.07	5.0	6.1	9.0	9.60	10.11	3.06	24	0.20	746.70	746.20	749.34	748.89	752.81	757.05	244+00
3	2	250.0	0.78	0.78	0.90	0.70	0.70	5.0	5.0	9.4	6.57	5.35	3.72	18	0.26	747.85	747.20	750.34	749.36	751.00	752.81	241+50
4	1	250.0	0.00	2.14	0.00	0.00	1.58	0.0	9.1	8.1	12.73	10.09	4.05	24	0.20	747.05	746.55	749.49	748.70	757.00	757.05	249+00
5	4	200.0	0.39	2.14	0.00	0.00	1.58	0.0	8.2	8.3	13.09	10.14	4.17	24	0.20	747.55	747.15	750.20	749.53	757.93	757.00	251+00
6	5	250.0	0.43	1.75	0.90	0.39	1.58	5.0	7.3	8.6	13.55	20.25	4.97	24	0.80	749.65	747.65	751.09	750.24	756.68	757.93	253+50
7	6	150.0	0.43	1.32	0.90	0.39	1.19	5.0	6.8	8.7	10.38	8.76	5.87	18	0.70	751.20	750.15	753.12	751.65	756.12	756.68	255+00
8	7	100.0	0.46	0.89	0.90	0.41	0.80	5.0	6.4	8.9	7.11	5.75	4.02	18	0.30	753.30	753.00	754.96	754.50	756.43	756.12	256+00
9	8	250.0	0.43	0.43	0.90	0.39	0.39	5.0	5.0	9.4	3.62	3.76	2.95	15	0.34	754.40	753.55	755.90	755.11	757.63	756.43	258+50

Project File: Sta 246+50 to 258+50.stm

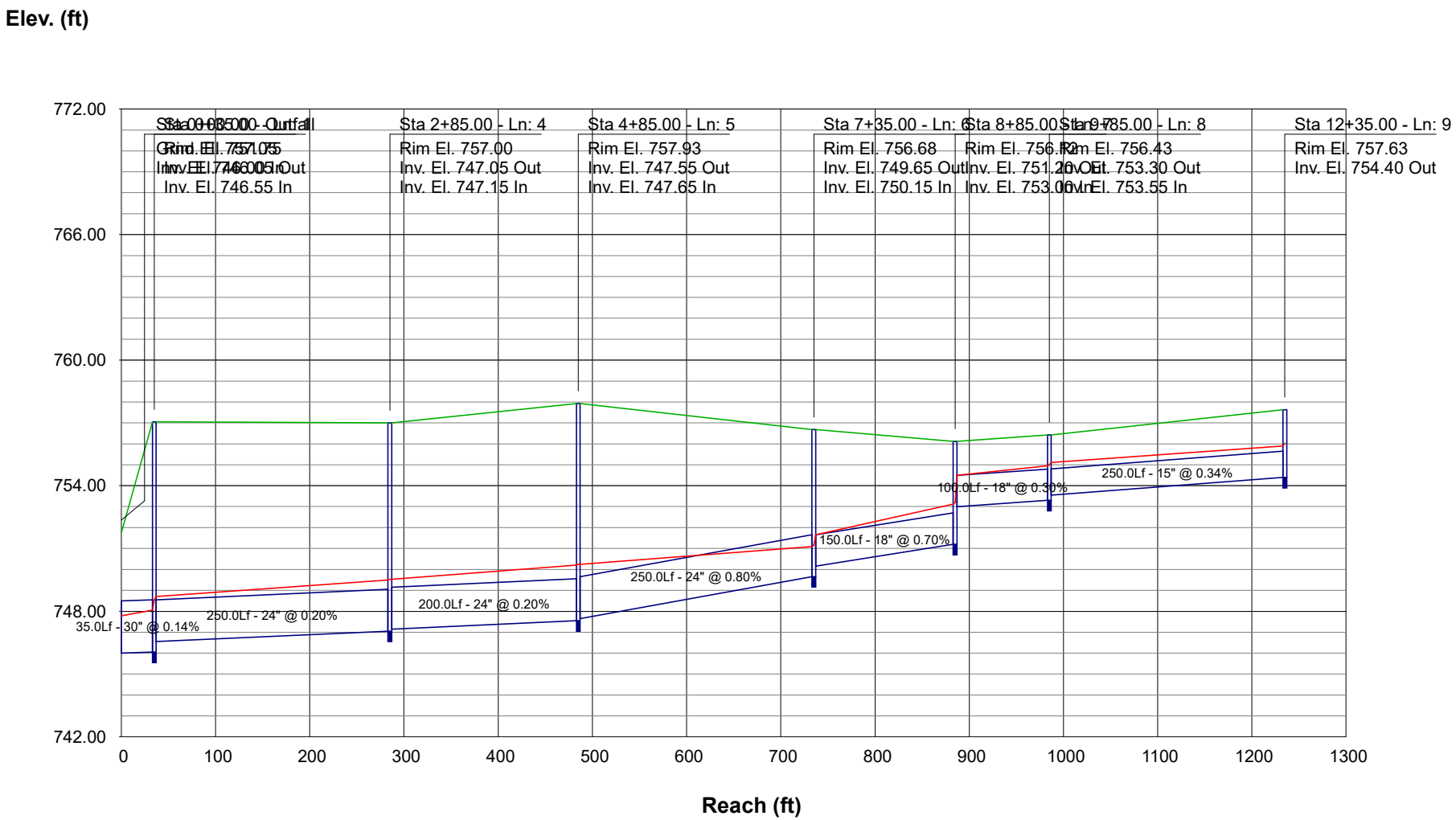
Number of lines: 9

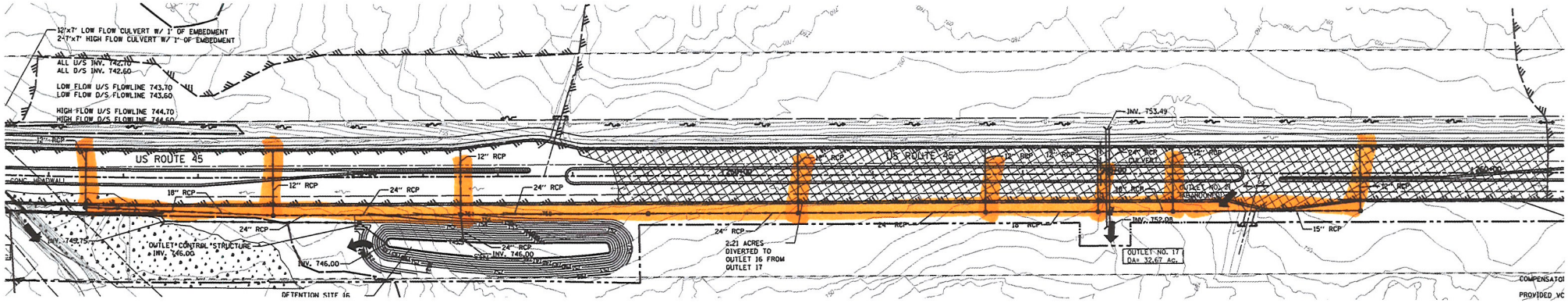
Run Date: 01-11-2018

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

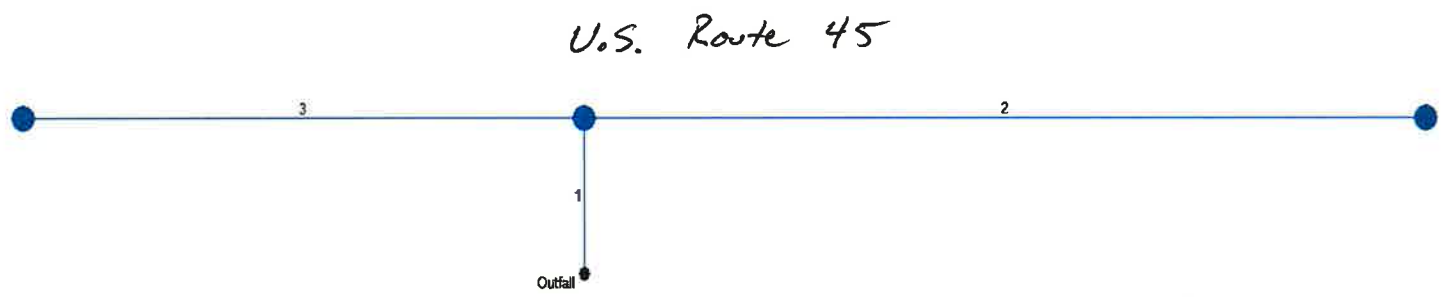
Storm Sewer Profile

Proj. file: Sta 246+50 to 258+50.stm




12'x7' LOW FLOW CULVERT W/ 1' OF EMBEDMENT
2-7'x7' HIGH FLOW CULVERT W/ 1' OF EMBEDMENT
ALL U/S INV. 742.70
ALL D/S INV. 742.60
LOW FLOW U/S FLOWLINE 743.70
LOW FLOW D/S FLOWLINE 743.60
HIGH FLOW U/S FLOWLINE 744.70
HIGH FLOW D/S FLOWLINE 744.60
12" RCP
US ROUTE 45
CONC. SIDEWALL
18" RCP
12" RCP
24" RCP
24" RCP
24" RCP
INV. 749.75
OUTLET CONTROL STRUCTURE
INV. 746.00
INV. 746.00
24" RCP
INV. 746.00
DETENTION SITE 16
12" RCP
12" RCP
US ROUTE 45
24" RCP
2.21 ACRES
DIVERTED TO
OUTLET 16 FROM
OUTLET 17
24" RCP
18" RCP
INV. 753.49
24" RCP
CULVERT
12" RCP
18" RCP
OUTLET NO. 21
ABANDONED
INV. 752.08
OUTLET NO. 17
DA= 32.67 AC.
12" RCP
15" RCP
COMPENSATO
PROVIDED VC

Hydraflow Plan View



Project File: Sta 263+75 to 266+25.stm	No. Lines: 3	12-28-2017

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	25.0	-20.0	MH	0.00	0.00	0.90	0.0	751.86	0.36	751.95	24	Cir	0.013	1.00	756.91	265+00
2	1	150.0	-160.0	MH	0.00	0.82	0.90	5.0	752.45	0.47	753.15	18	Cir	0.013	1.00	757.56	263+75
3	1	100.0	20.0	MH	0.00	0.47	0.90	5.0	752.71	0.34	753.05	15	Cir	0.013	1.00	756.51	266+25

Project File: Sta 263+75 to 266+25.stm | Number of lines: 3 | Date: 12-28-2017

Hydraflow Storm Sewers 2005

10 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	265+00	7.26	24 c	25.0	751.86	751.95	0.360	752.90	752.99	0.30	753.29	End
2	263+75	4.78	18 c	150.0	752.45	753.15	0.467	753.48	754.00	0.33	754.33	1
3	266+25	2.74	15 c	100.0	752.71	753.05	0.340	753.51	753.84	0.18	754.01	1

Project File: Sta 263+75 to 266+25.stm | Number of lines: 3 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	25.0	0.00	1.29	0.90	0.00	1.16	0.0	5.9	6.3	7.26	13.57	4.40	24	0.36	751.95	751.86	752.99	752.90	756.91	748.50	265+00
2	1	150.0	0.82	0.82	0.90	0.74	0.74	5.0	5.0	6.5	4.78	7.17	4.16	18	0.47	753.15	752.45	754.00	753.48	757.56	756.51	263+75
3	1	100.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	6.5	2.74	3.77	3.32	15	0.34	753.05	752.71	753.84	753.51	756.51	756.51	266+25

Project File: Sta 263+75 to 266+25.stm

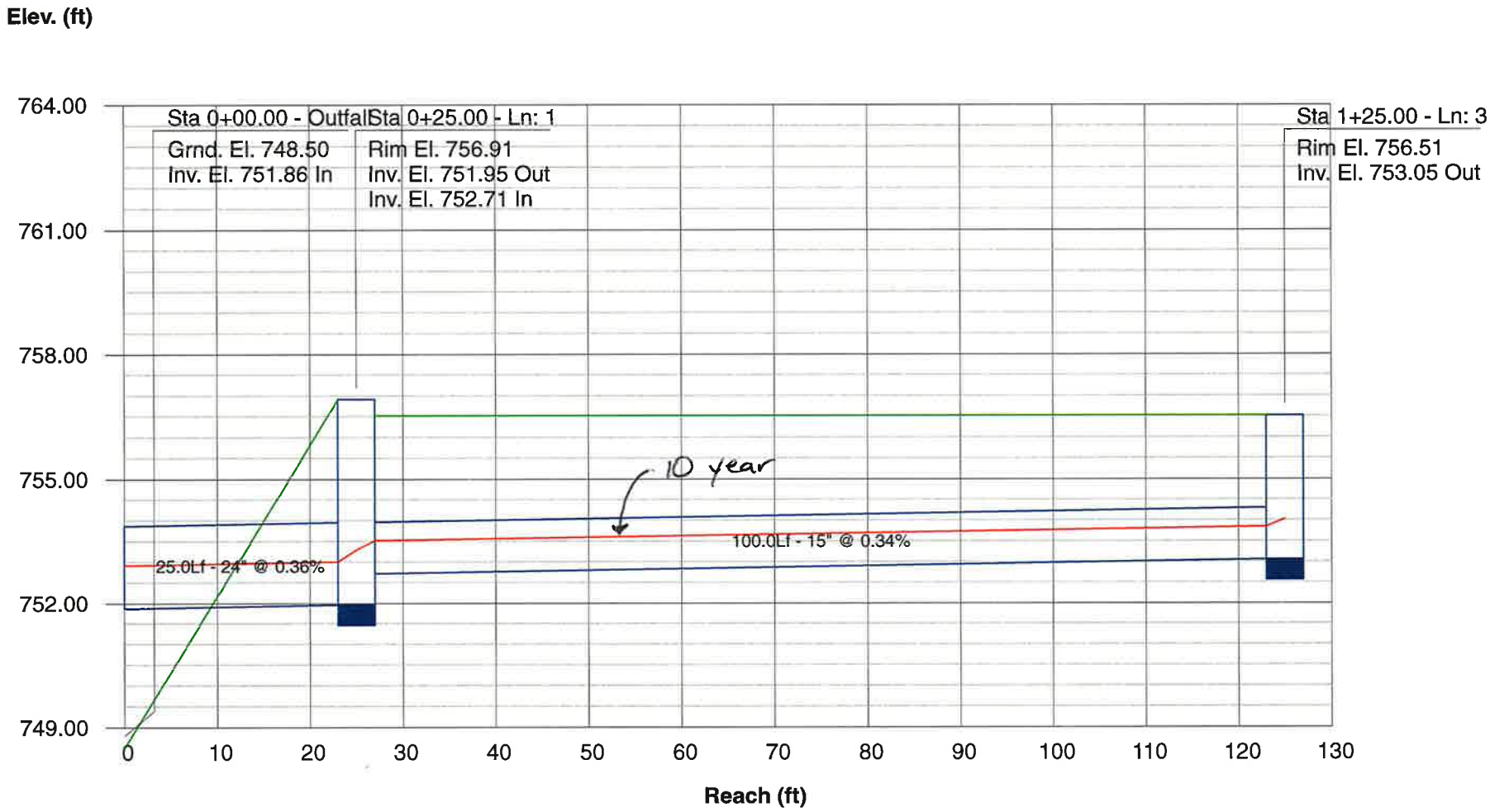
Number of lines: 3

Run Date: 12-28-2017

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

Storm Sewer Profile

Proj. file: Sta 263+75 to 266+25.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	25.0	-20.0	MH	0.00	0.00	0.90	0.0	751.86	0.36	751.95	24	Cir	0.013	1.00	756.91	265+00
2	1	150.0	-160.0	MH	0.00	0.82	0.90	5.0	752.45	0.47	753.15	18	Cir	0.013	1.00	757.56	263+75
3	1	100.0	20.0	MH	0.00	0.47	0.90	5.0	752.71	0.34	753.05	15	Cir	0.013	1.00	756.51	266+25

Project File: Sta 263+75 to 266+25.stm | Number of lines: 3 | Date: 12-28-2017

Hydraflow Storm Sewers 2005

50 year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	265+00	10.60	24 c	25.0	751.86	751.95	0.360	753.19	753.28	0.36	753.63	End
2	263+75	6.91	18 c	150.0	752.45	753.15	0.467	753.75	754.34	0.33	754.67	1
3	266+25	3.96	15 c	100.0	752.71	753.05	0.340	753.83	754.16	0.18	754.34	1

Project File: Sta 263+75 to 266+25.stm | Number of lines: 3 | Run Date: 12-28-2017

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	25.0	0.00	1.29	0.90	0.00	1.16	0.0	5.6	9.1	10.60	13.57	4.78	24	0.36	751.95	751.86	753.28	753.19	756.91	748.50	265+00
2	1	150.0	0.82	0.82	0.90	0.74	0.74	5.0	5.0	9.4	6.91	7.17	4.41	18	0.47	753.15	752.45	754.34	753.75	757.56	756.51	263+75
3	1	100.0	0.47	0.47	0.90	0.42	0.42	5.0	5.0	9.4	3.96	3.77	3.43	15	0.34	753.05	752.71	754.16	753.83	756.51	756.51	266+25

Project File: Sta 263+75 to 266+25.stm

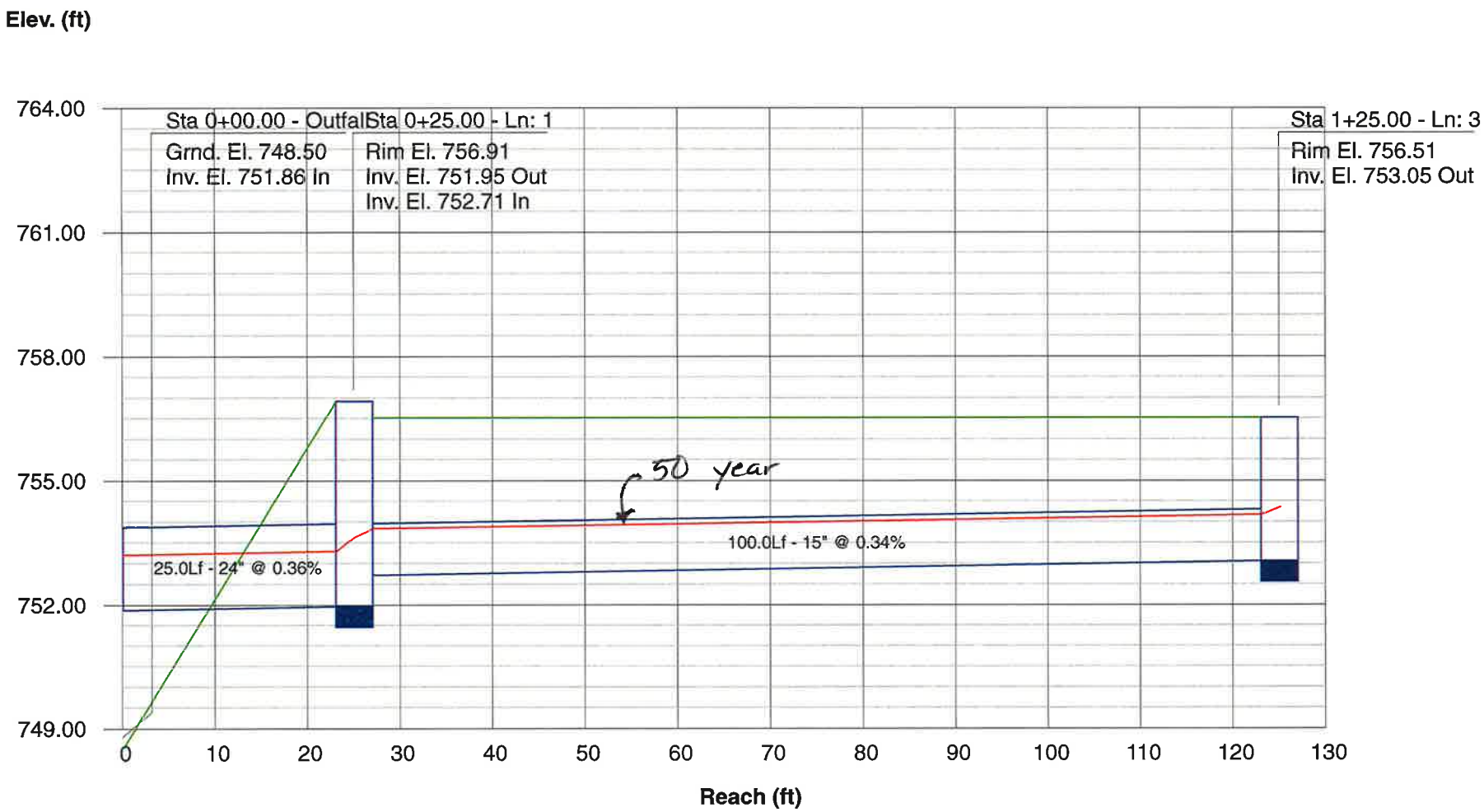
Number of lines: 3

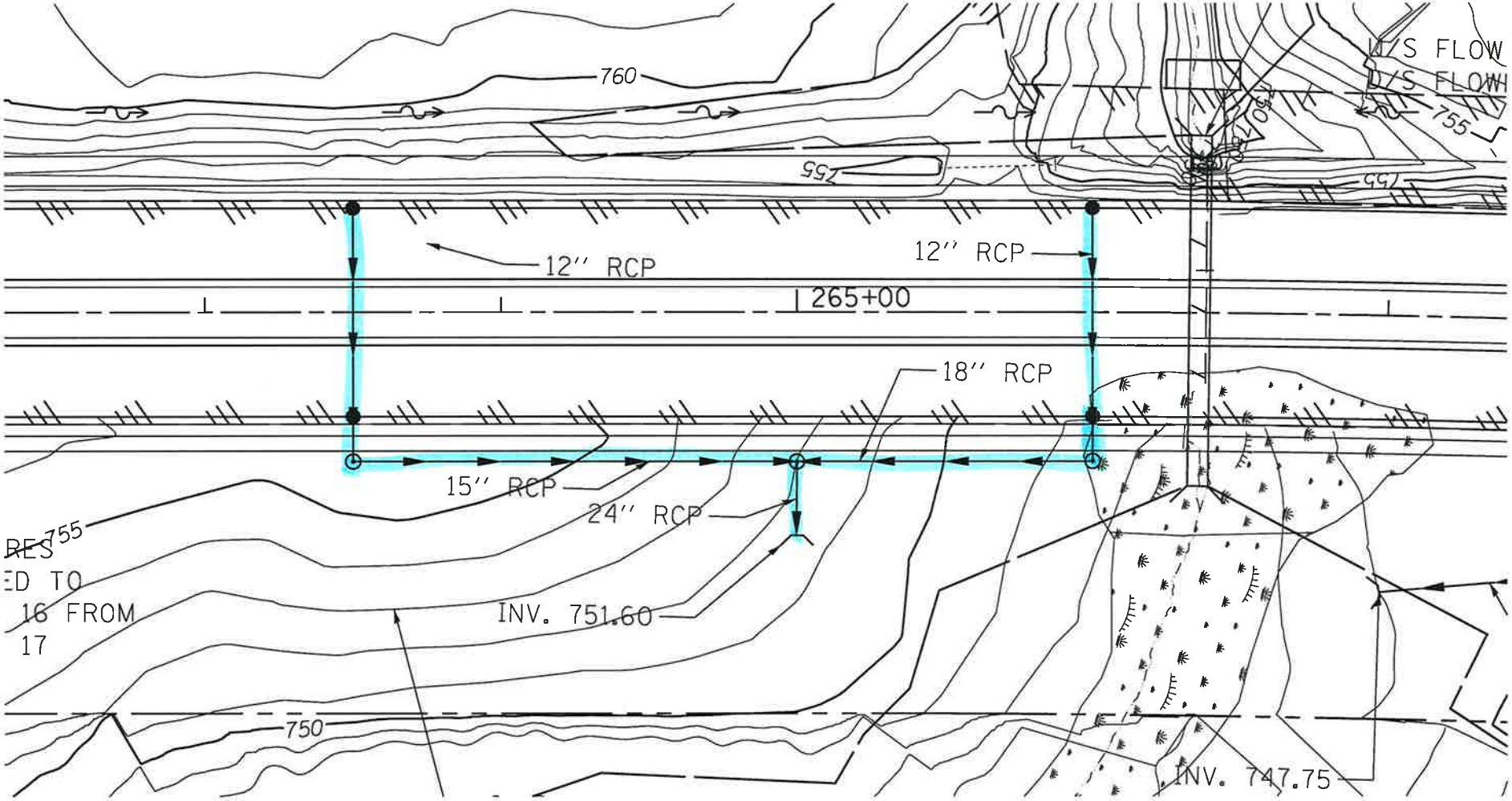
Run Date: 12-28-2017

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

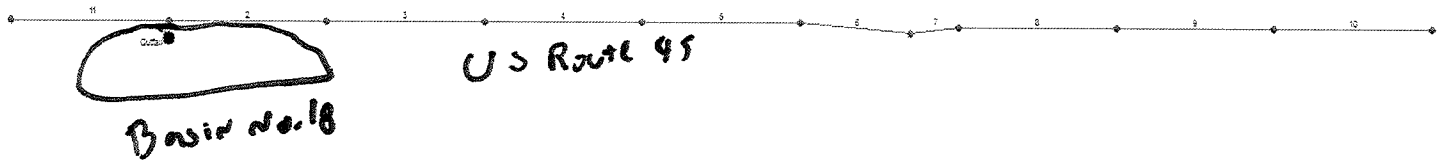
Storm Sewer Profile

Proj. file: Sta 263+75 to 266+25.stm




760
755
755
755
U/S FLOW
D/S FLOW
12'' RCP
12'' RCP
265+00
18'' RCP
15'' RCP
24'' RCP
INV. 751.60
750
INV. 747.75
RES
ED TO
16 FROM
17

Hydraflow Plan View



Project File: Sta 268+50 to 291+00.stm	No. Lines: 11	10-15-2014

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	25.0	-90.0	MH	0.00	0.43	0.90	5.0	748.50	11.80	751.45	30	Cir	0.013	1.00	757.00	271+00
2	1	249.0	90.0	MH	0.00	0.43	0.90	5.0	751.95	2.15	757.30	24	Cir	0.013	0.15	762.31	273+50
3	2	250.0	0.0	MH	0.00	0.43	0.90	5.0	757.30	1.86	761.95	24	Cir	0.013	0.15	766.93	276+00
4	3	250.0	0.0	MH	0.00	0.43	0.90	5.0	761.95	3.12	769.75	24	Cir	0.013	0.15	774.75	278+50
5	4	250.0	0.0	MH	0.00	0.52	0.90	5.0	769.75	1.80	774.25	24	Cir	0.013	0.15	779.25	281+00
6	5	175.0	5.0	MH	0.00	0.00	0.90	5.0	774.25	0.40	774.95	24	Cir	0.013	0.25	780.06	282+75
7	6	76.0	-12.0	MH	0.00	0.43	0.90	5.0	775.05	0.86	775.70	24	Cir	0.013	0.15	780.69	283+50
8	7	250.0	7.0	MH	0.00	0.43	0.90	5.0	776.20	0.56	777.60	18	Cir	0.013	0.15	782.23	286+00
9	8	250.0	0.0	MH	0.00	0.46	0.90	5.0	777.70	1.20	780.70	18	Cir	0.013	0.15	785.21	288+50
10	9	250.0	0.0	MH	0.00	0.46	0.90	5.0	780.95	2.06	786.10	15	Cir	0.013	1.00	790.33	291+00
11	1	250.0	-89.8	MH	0.00	0.42	0.90	5.0	752.95	0.30	753.70	15	Cir	0.013	1.00	757.00	268+50

Project File: Sta 268+50 to 291+00.stm | Number of lines: 11 | Date: 10-15-2014

Hydraflow Storm Sewers 2005

10-year

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	271+00	18.67	30 c	25.0	748.50	751.45	11.803	750.49	752.90	n/a	752.90 j	End
2	273+50	15.47	24 c	249.0	751.95	757.30	2.148	753.15	758.69	n/a	758.69 j	1
3	276+00	13.99	24 c	250.0	757.30	761.95	1.860	759.07	763.28	n/a	763.28 j	2
4	278+50	12.47	24 c	250.0	761.95	769.75	3.120	763.65	771.00	n/a	771.00 j	3
5	281+00	10.90	24 c	250.0	769.75	774.25	1.800	771.38	775.42	n/a	775.42 j	4
6	282+75	8.73	24 c	175.0	774.25	774.95	0.400	775.81	776.11	0.08	776.19	5
7	283+50	8.86	24 c	76.0	775.05	775.70	0.855	776.40	776.75	n/a	776.75 j	6
8	286+00	6.96	18 c	250.0	776.20	777.60	0.560	777.30	778.70	0.06	778.75	7
9	288+50	4.99	18 c	250.0	777.70	780.70	1.200	779.02	781.55	n/a	781.55 j	8
10	291+00	2.68	15 c	250.0	780.95	786.10	2.060	781.84	786.76	n/a	786.76 j	9
11	268+50	2.45	15 c	250.0	752.95	753.70	0.300	753.72	754.47	0.15	754.62	1

Project File: Sta 268+50 to 291+00.stm | Number of lines: 11 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	25.0	0.43	4.44	0.90	0.39	4.00	5.0	14.9	4.7	18.67	140.9	5.41	30	11.80	751.45	748.50	752.90	750.49	757.00	757.93	271+00
2	1	249.0	0.43	3.59	0.90	0.39	3.23	5.0	14.1	4.8	15.47	33.15	7.26	24	2.15	757.30	751.95	758.69	753.15	762.31	757.00	273+50
3	2	250.0	0.43	3.16	0.90	0.39	2.84	5.0	13.1	4.9	13.99	30.85	5.55	24	1.86	761.95	757.30	763.28	759.07	766.93	762.31	276+00
4	3	250.0	0.43	2.73	0.90	0.39	2.46	5.0	12.1	5.1	12.47	39.95	5.20	24	3.12	769.75	761.95	771.00	763.65	774.75	766.93	278+50
5	4	250.0	0.52	2.30	0.90	0.47	2.07	5.0	10.9	5.3	10.90	30.34	4.85	24	1.80	774.25	769.75	775.42	771.38	779.25	774.75	281+00
6	5	175.0	0.00	1.78	0.90	0.00	1.60	5.0	9.8	5.4	8.73	14.30	3.97	24	0.40	774.95	774.25	776.11	775.81	780.06	779.25	282+75
7	6	76.0	0.43	1.78	0.90	0.39	1.60	5.0	9.4	5.5	8.86	20.92	4.60	24	0.86	775.70	775.05	776.75	776.40	780.69	780.06	283+50
8	7	250.0	0.43	1.35	0.90	0.39	1.22	5.0	8.4	5.7	6.96	7.86	5.02	18	0.56	777.60	776.20	778.70	777.30	782.23	780.69	286+00
9	8	250.0	0.46	0.92	0.90	0.41	0.83	5.0	6.9	6.0	4.99	11.50	3.92	18	1.20	780.70	777.70	781.55	779.02	785.21	782.23	288+50
10	9	250.0	0.46	0.46	0.90	0.41	0.41	5.0	5.0	6.5	2.68	9.27	3.50	15	2.06	786.10	780.95	786.76	781.84	790.33	785.21	291+00
11	1	250.0	0.42	0.42	0.90	0.38	0.38	5.0	5.0	6.5	2.45	3.54	3.10	15	0.30	753.70	752.95	754.47	753.72	757.00	757.00	268+50

Project File: Sta 268+50 to 291+00.stm

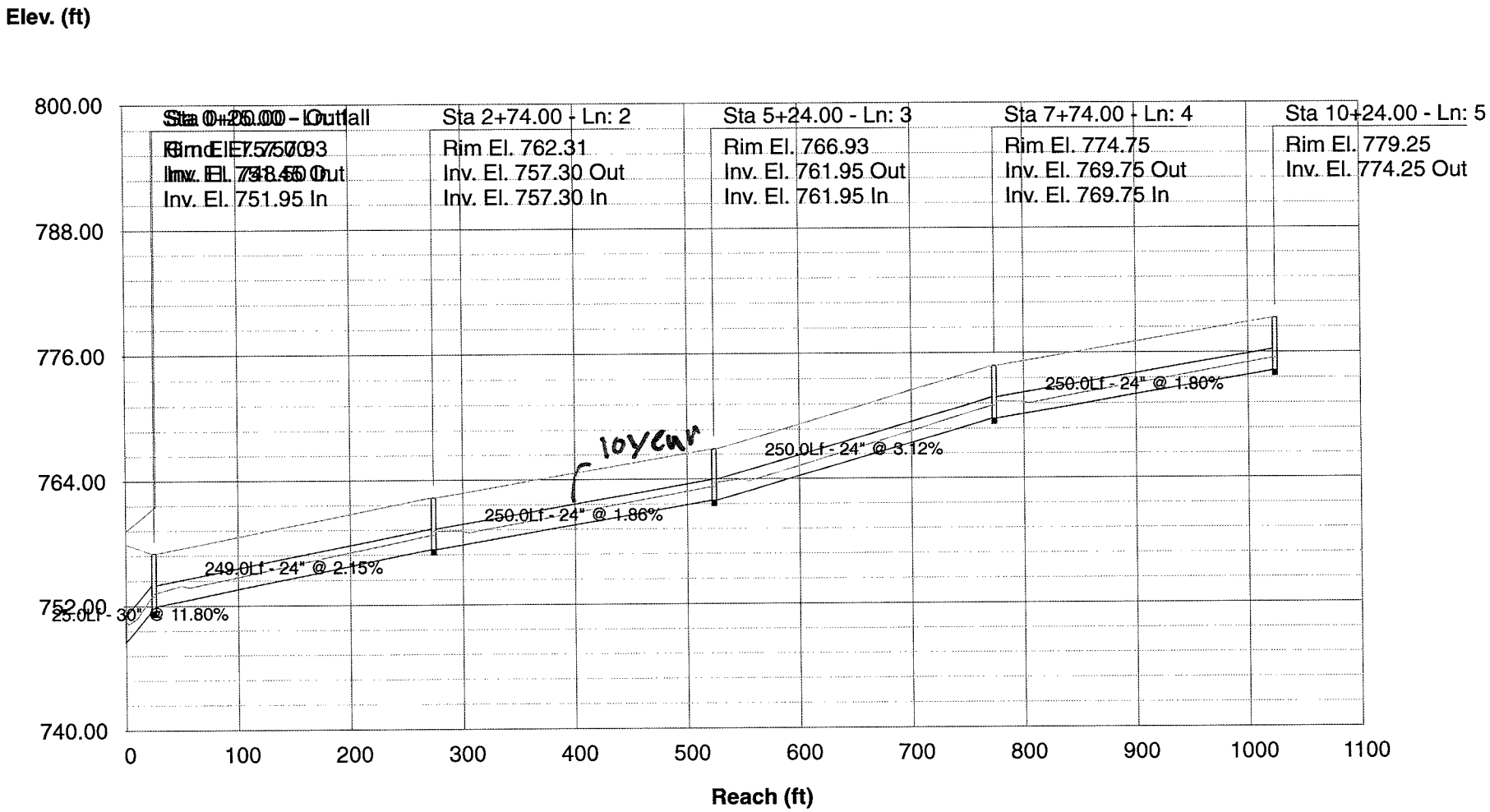
Number of lines: 11

Run Date: 10-15-2014

NOTES: Intensity = 132.25 / (Inlet time + 19.10) ^ 0.95; Return period = 10 Yrs.

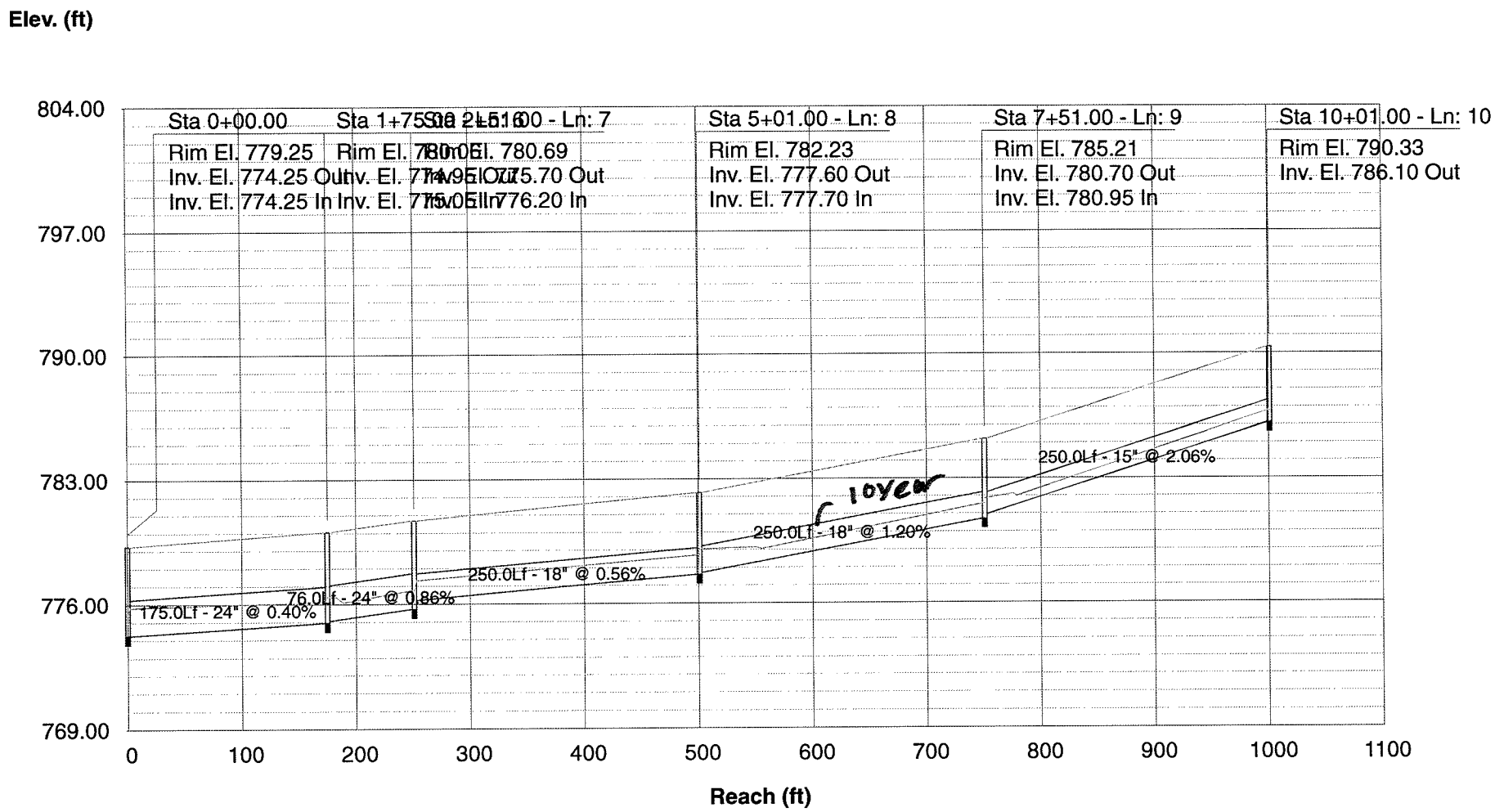
Storm Sewer Profile

Proj. file: Sta 268+50 to 291+00.stm



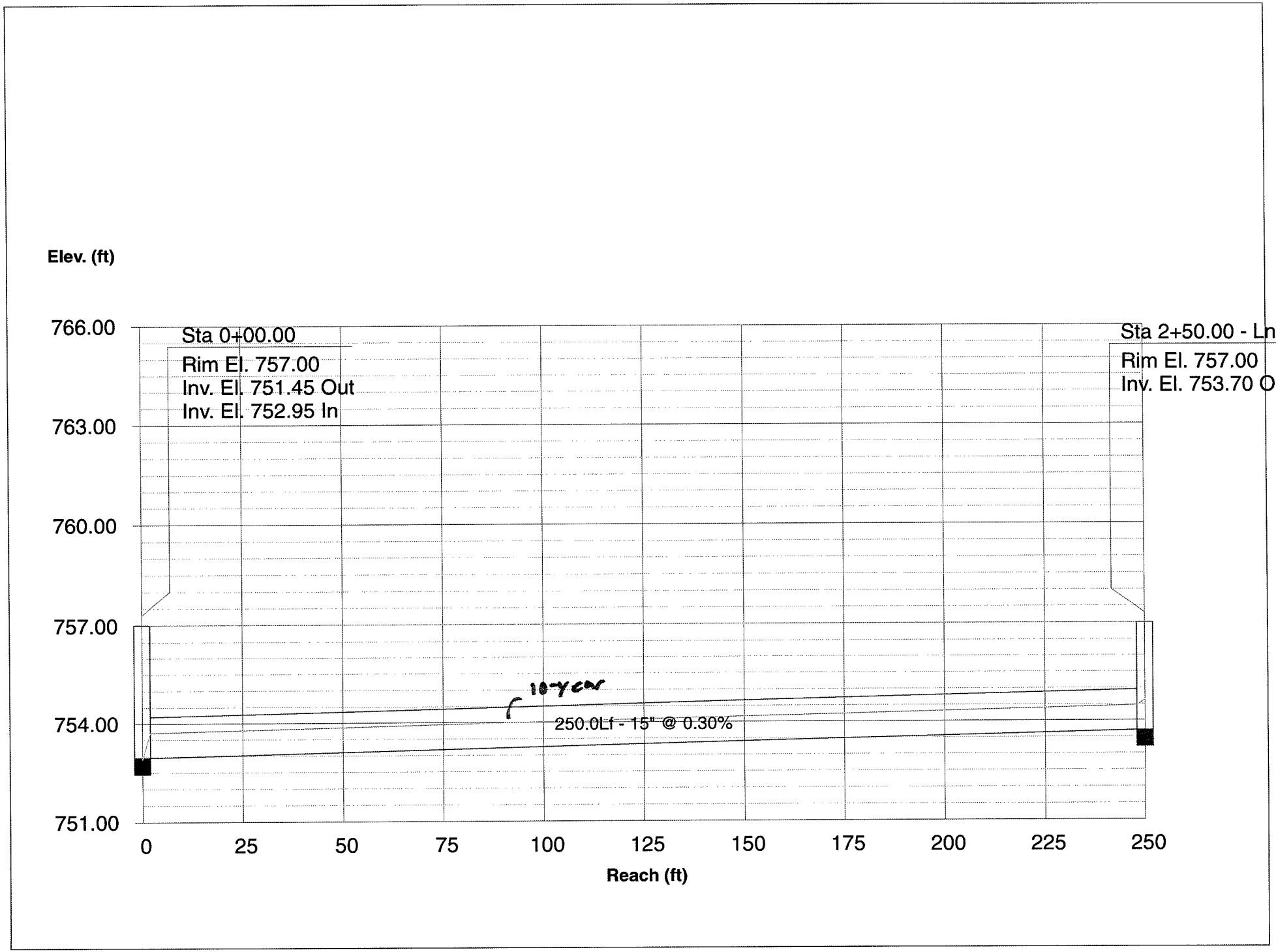
Storm Sewer Profile

Proj. file: Sta 268+50 to 291+00.stm



Storm Sewer Profile

Proj. file: Sta 268+50 to 291+00.stm



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	25.0	-90.0	MH	0.00	0.43	0.90	5.0	748.50	11.80	751.45	30	Cir	0.013	1.00	757.00	271+00
2	1	249.0	90.0	MH	0.00	0.43	0.90	5.0	751.95	2.15	757.30	24	Cir	0.013	0.15	762.31	273+50
3	2	250.0	0.0	MH	0.00	0.43	0.90	5.0	757.30	1.86	761.95	24	Cir	0.013	0.15	766.93	276+00
4	3	250.0	0.0	MH	0.00	0.43	0.90	5.0	761.95	3.12	769.75	24	Cir	0.013	0.15	774.75	278+50
5	4	250.0	0.0	MH	0.00	0.52	0.90	5.0	769.75	1.80	774.25	24	Cir	0.013	0.15	779.25	281+00
6	5	175.0	5.0	MH	0.00	0.00	0.90	5.0	774.25	0.40	774.95	24	Cir	0.013	0.25	780.06	282+75
7	6	76.0	-12.0	MH	0.00	0.43	0.90	5.0	775.05	0.86	775.70	24	Cir	0.013	0.15	780.69	283+50
8	7	250.0	7.0	MH	0.00	0.43	0.90	5.0	776.20	0.56	777.60	18	Cir	0.013	0.15	782.23	286+00
9	8	250.0	0.0	MH	0.00	0.46	0.90	5.0	777.70	1.20	780.70	18	Cir	0.013	0.15	785.21	288+50
10	9	250.0	0.0	MH	0.00	0.46	0.90	5.0	780.95	2.06	786.10	15	Cir	0.013	1.00	790.33	291+00
11	1	250.0	-89.8	MH	0.00	0.42	0.90	5.0	752.95	0.30	753.70	15	Cir	0.013	1.00	757.00	268+50

Project File: Sta 268+50 to 291+00.stm | Number of lines: 11 | Date: 10-15-2014

Hydraflow Storm Sewers 2005

So-Yew

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	271+00	29.54	30 c	25.0	748.50	751.45	11.803	750.49	753.27	n/a	753.27 j	End
2	273+50	24.33	24 c	249.0	751.95	757.30	2.148	753.27	759.05	n/a	759.05 j	1
3	276+00	21.86	24 c	250.0	757.30	761.95	1.860	759.38	763.61	n/a	763.61 j	2
4	278+50	19.33	24 c	250.0	761.95	769.75	3.120	763.98	771.31	n/a	771.31 j	3
5	281+00	16.73	24 c	250.0	769.75	774.25	1.800	771.71	775.70	n/a	775.70 j	4
6	282+75	13.27	24 c	175.0	774.25	774.95	0.400	776.15	776.65	0.08	776.73	5
7	283+50	13.41	24 c	76.0	775.05	775.70	0.855	776.79	777.00	n/a	777.00 j	6
8	286+00	10.43	18 c	250.0	776.20	777.60	0.560	777.70*	780.17*	0.08	780.25	7
9	288+50	7.37	18 c	250.0	777.70	780.70	1.200	780.52	781.77	0.07	781.84	8
10	291+00	3.87	15 c	250.0	780.95	786.10	2.060	782.15	786.89	n/a	786.89 j	9
11	268+50	3.54	15 c	250.0	752.95	753.70	0.300	754.07	754.74	0.16	754.91	1

Project File: Sta 268+50 to 291+00.stm | Number of lines: 11 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	25.0	0.43	4.44	0.90	0.39	4.00	5.0	11.9	7.4	29.54	140.9	7.39	30	11.80	751.45	748.50	753.27	750.49	757.00	757.93	271+00
2	1	249.0	0.43	3.59	0.90	0.39	3.23	5.0	11.3	7.5	24.33	33.15	9.72	24	2.15	757.30	751.95	759.05	753.27	762.31	757.00	273+50
3	2	250.0	0.43	3.16	0.90	0.39	2.84	5.0	10.6	7.7	21.86	30.85	7.41	24	1.86	761.95	757.30	763.61	759.38	766.93	762.31	276+00
4	3	250.0	0.43	2.73	0.90	0.39	2.46	5.0	9.9	7.9	19.33	39.95	6.76	24	3.12	769.75	761.95	771.31	763.98	774.75	766.93	278+50
5	4	250.0	0.52	2.30	0.90	0.47	2.07	5.0	9.1	8.1	16.73	30.34	6.11	24	1.80	774.25	769.75	775.70	771.71	779.25	774.75	281+00
6	5	175.0	0.00	1.78	0.90	0.00	1.60	5.0	8.3	8.3	13.27	14.30	4.48	24	0.40	774.95	774.25	776.65	776.15	780.06	779.25	282+75
7	6	76.0	0.43	1.78	0.90	0.39	1.60	5.0	8.0	8.4	13.41	20.92	5.42	24	0.86	775.70	775.05	777.00	776.79	780.69	780.06	283+50
8	7	250.0	0.43	1.35	0.90	0.39	1.22	5.0	7.3	8.6	10.43	7.86	5.90	18	0.56	777.60	776.20	780.17	777.70	782.23	780.69	286+00
9	8	250.0	0.46	0.92	0.90	0.41	0.83	5.0	6.3	8.9	7.37	11.50	4.81	18	1.20	780.70	777.70	781.77	780.52	785.21	782.23	288+50
10	9	250.0	0.46	0.46	0.90	0.41	0.41	5.0	5.0	9.4	3.87	9.27	3.98	15	2.06	786.10	780.95	786.89	782.15	790.33	785.21	291+00
11	1	250.0	0.42	0.42	0.90	0.38	0.38	5.0	5.0	9.4	3.54	3.54	3.14	15	0.30	753.70	752.95	754.74	754.07	757.00	757.00	268+50

Project File: Sta 268+50 to 291+00.stm

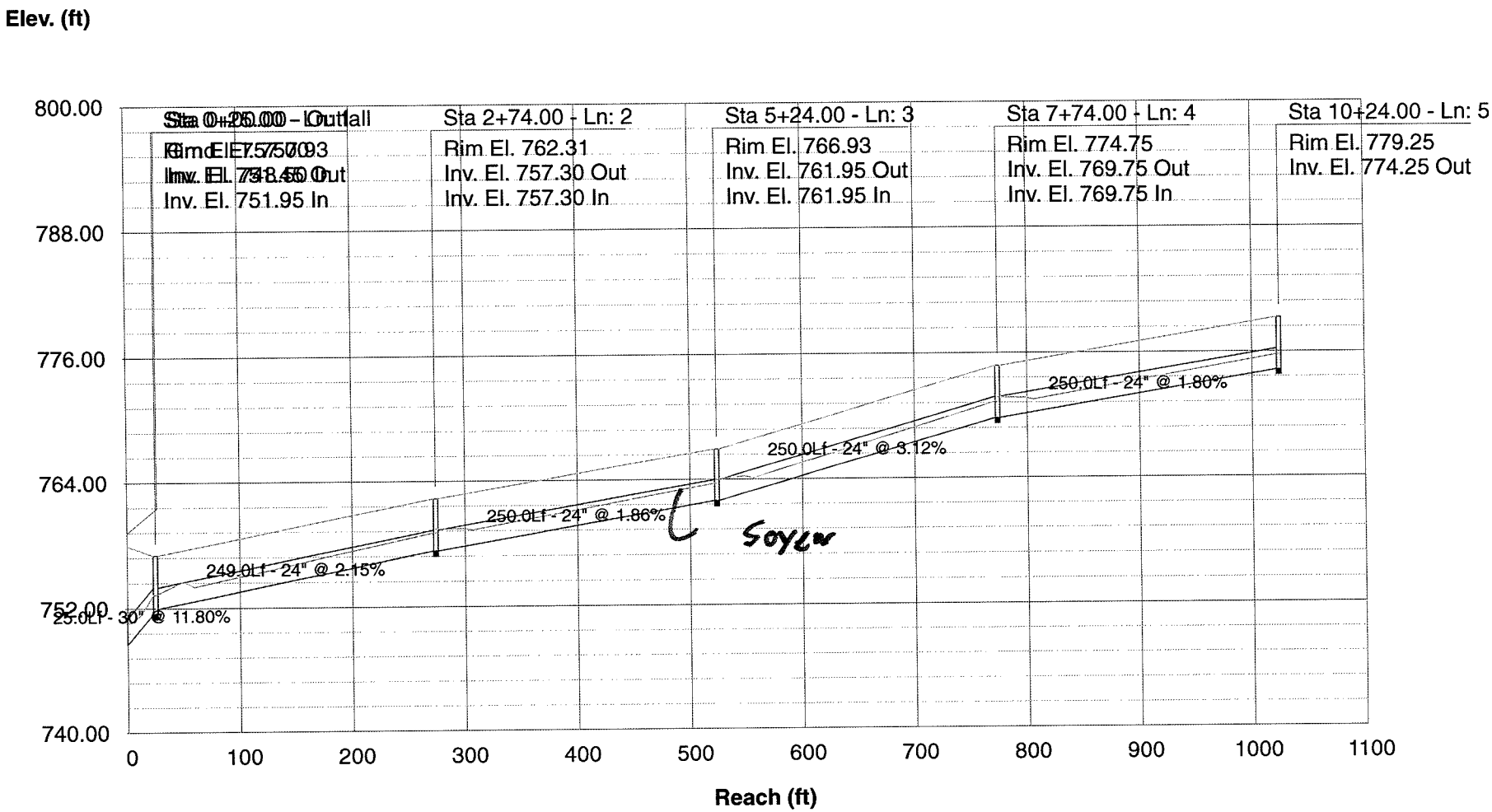
Number of lines: 11

Run Date: 10-15-2014

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

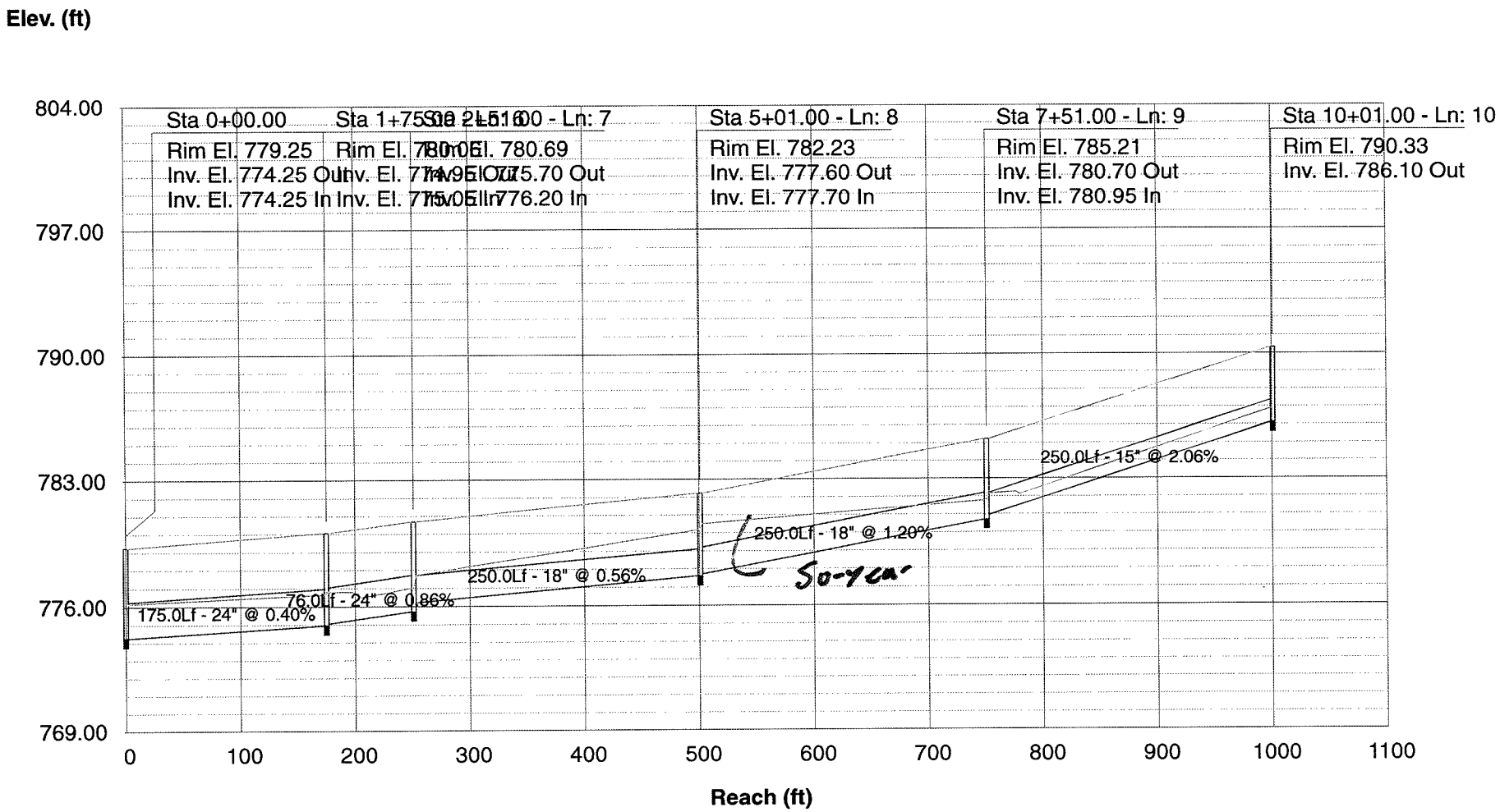
Storm Sewer Profile

Proj. file: Sta 268+50 to 291+00.stm



Storm Sewer Profile

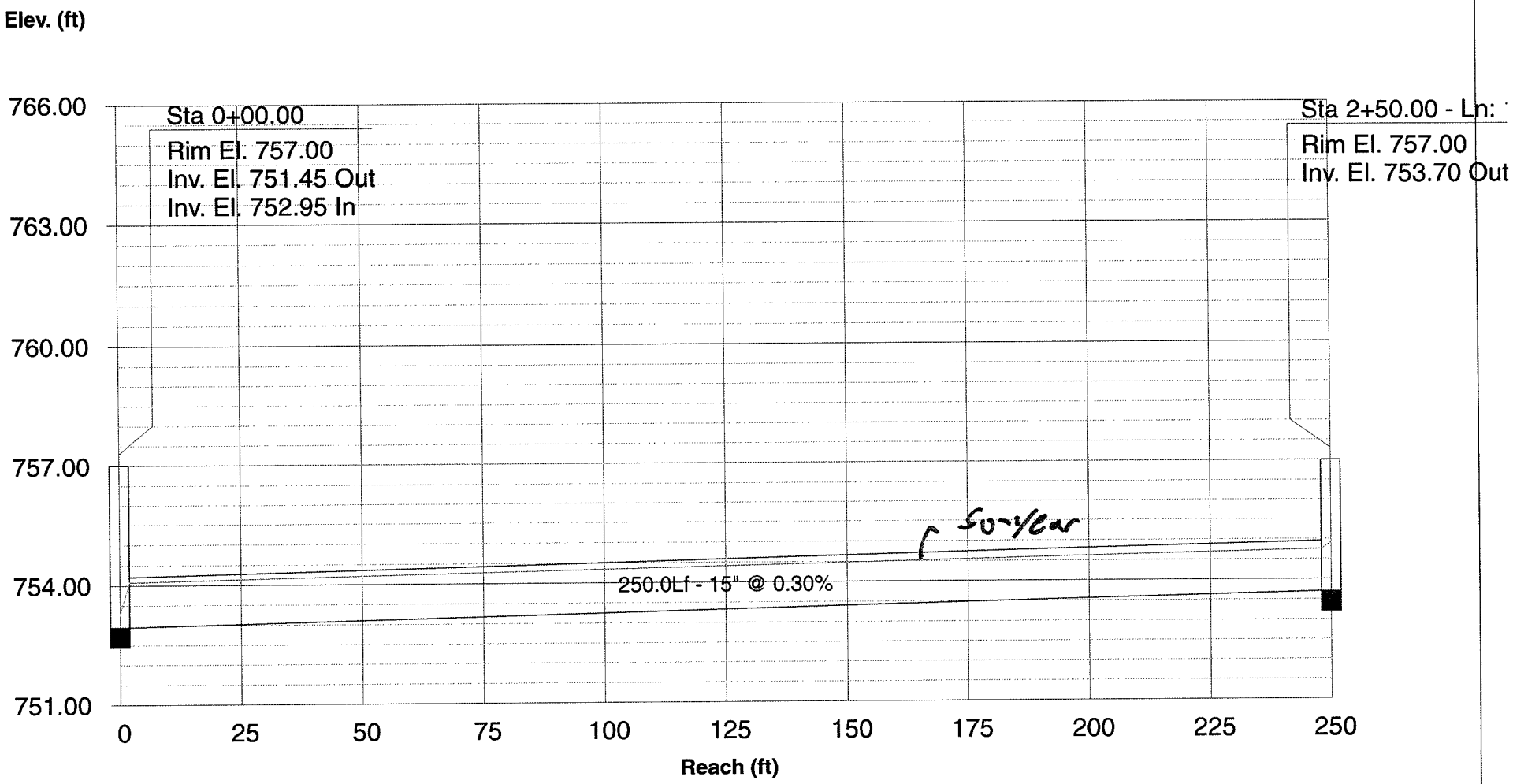
Proj. file: Sta 268+50 to 291+00.stm

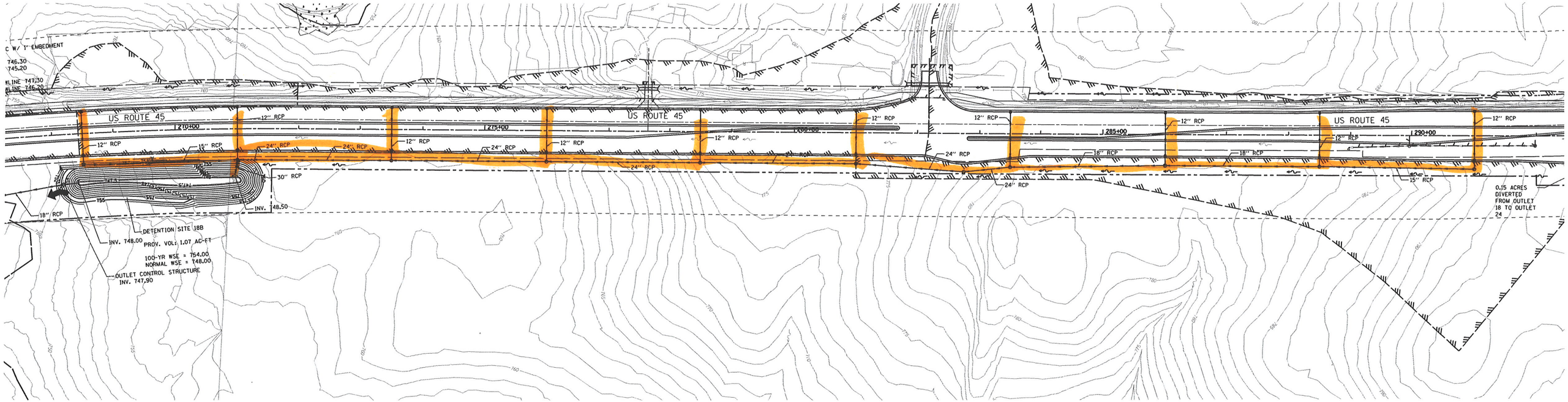


Hydraflow Storm Sewers 2005

Storm Sewer Profile

Proj. file: Sta 268+50 to 291+00.stm

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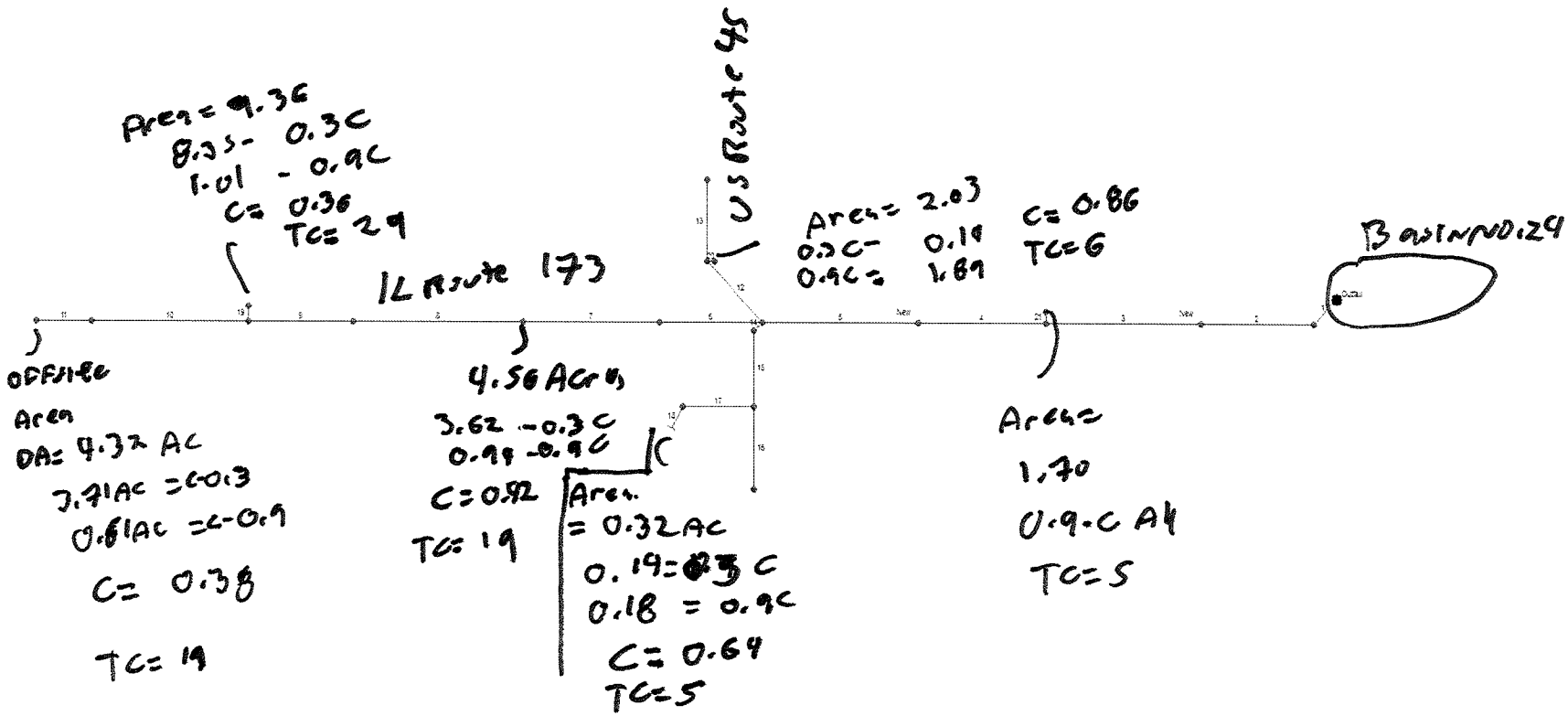
746.30
745.20
LINE 747.30
LINE 746.20
US ROUTE 45
1 270+00
1 275+00
1 280+00
1 285+00
1 290+00
12" RCP
15" RCP
24" RCP
18" RCP
30" RCP
INV. 748.50
DETENTION SITE 18B
INV. 748.00
PROV. VOL: 1.07 AC-FT
100-YR WSE = 754.00
NORMAL WSE = 748.00
OUTLET CONTROL STRUCTURE
INV. 747.90
0.15 ACRES
DIVERTED
FROM OUTLET
18 TO OUTLET
24

Hydraflow Plan View



Project File: IL-173 Sta 1212+00 - 50yr.stm	No. Lines: 21	10-15-2014

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	57.0	135.0	MH	0.00	0.00	0.00	0.0	765.50	6.49	769.20	42	Cir	0.013	0.75	778.14	1209+00
2	1	200.0	45.0	MH	0.00	0.00	0.00	0.0	769.30	3.20	775.70	42	Cir	0.013	0.15	784.04	1207+00
3	2	275.0	0.0	MH	0.00	0.39	0.88	5.0	775.80	1.60	780.20	42	Cir	0.013	1.00	789.30	1204+25
4	3	225.0	0.0	MH	0.00	0.56	0.85	5.0	780.30	0.80	782.10	42	Cir	0.013	0.15	791.45	1202+00
5	4	277.0	0.0	MH	0.00	0.00	0.00	0.0	782.20	0.40	783.30	42	Cir	0.013	0.75	793.40	1199+24
6	5	182.0	0.0	MH	0.00	1.37	0.89	5.0	783.85	0.14	784.10	42	Cir	0.013	0.15	792.30	1197+42
7	6	242.0	0.0	MH	0.00	4.56	0.42	19.0	784.10	0.37	785.00	42	Cir	0.013	0.15	792.00	1195+00
8	7	300.0	0.0	MH	0.00	0.00	0.00	0.0	786.00	1.02	789.05	30	Cir	0.013	0.15	796.00	1192+00
9	8	185.0	0.0	MH	0.00	0.00	0.00	0.0	789.15	1.32	791.60	30	Cir	0.013	1.00	800.00	1190+12
10	9	279.0	0.0	MH	0.00	0.00	0.00	0.0	792.15	1.34	795.90	24	Cir	0.013	0.15	802.05	1187+36
11	10	97.0	0.0	MH	0.00	4.32	0.38	17.0	796.40	0.82	797.20	24	Cir	0.013	1.00	802.23	1186+38
12	5	139.0	45.0	MH	0.00	0.78	0.90	5.0	784.90	1.08	786.40	30	Cir	0.013	1.00	792.77	299+00
13	12	135.0	45.0	MH	0.00	0.41	0.90	5.0	788.20	0.44	788.80	18	Cir	0.013	1.00	793.30	300+35
14	5	20.0	-45.0	MH	0.00	0.08	0.90	5.0	785.60	3.25	786.25	24	Cir	0.013	0.75	793.40	296+33
15	14	122.0	-45.0	MH	0.00	0.44	0.90	5.0	786.35	0.66	787.15	24	Cir	0.013	1.00	792.60	295+00
16	15	133.0	0.0	MH	0.00	0.81	0.80	5.0	787.50	0.17	787.72	24	Cir	0.013	1.00	792.67	295+00
17	15	126.0	90.0	MH	0.00	0.20	0.90	5.0	787.55	0.20	787.80	24	Cir	0.013	0.89	792.82	296+33 W
18	17	40.0	-60.0	Hdwl	0.00	0.32	0.64	5.0	788.50	5.38	790.65	15	Cir	0.013	1.00	790.68	296+00
19	9	25.0	90.0	MH	0.00	9.36	0.36	29.0	792.50	0.52	792.63	24	Cir	0.013	1.00	797.50	1190+12 Ditch
20	12	14.0	135.0	MH	0.00	2.03	0.86	6.0	787.70	0.71	787.80	24	Cir	0.013	1.00	792.80	298+85 Ditch
21	3	18.0	90.0	MH	0.00	1.70	0.90	5.0	784.25	0.83	784.40	24	Cir	0.013	1.00	790.50	1204+25 Parking

Project File: IL-173 Sta 1212+00 - 50yr.stm | Number of lines: 21 | Date: 10-15-2014

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1209+00	64.11	42 c	57.0	765.50	769.20	6.491	768.08	771.65	0.92	771.65	End
2	1207+00	64.70	42 c	200.0	769.30	775.70	3.200	772.18	778.16	n/a	778.16	1
3	1204+25	65.51	42 c	275.0	775.80	780.20	1.600	778.69	782.68	n/a	782.68	2
4	1202+00	57.90	42 c	225.0	780.30	782.10	0.800	783.37	784.43	n/a	784.43	3
5	1199+24	56.59	42 c	277.0	782.20	783.30	0.397	785.02	785.88	0.64	786.53	4
6	1197+42	37.53	42 c	182.0	783.85	784.10	0.137	787.10	787.31	0.04	787.35	5
7	1195+00	32.65	42 c	242.0	784.10	785.00	0.372	787.35	787.52	0.05	787.56	6
8	1192+00	24.09	30 c	300.0	786.00	789.05	1.017	787.56	790.69	n/a	790.69 j	7
9	1190+12	24.39	30 c	185.0	789.15	791.60	1.324	791.08	793.25	n/a	793.25 j	8
10	1187+36	10.37	24 c	279.0	792.15	795.90	1.344	793.86	797.04	n/a	797.04 j	9
11	1186+38	10.50	24 c	97.0	796.40	797.20	0.825	797.41	798.35	n/a	798.35 j	10
12	299+00	25.23	30 c	139.0	784.90	786.40	1.079	786.98	788.08	n/a	788.08 j	5
13	300+35	3.45	18 c	135.0	788.20	788.80	0.444	788.95	789.54	0.24	789.79	12
14	296+33	12.68	24 c	20.0	785.60	786.25	3.250	787.13	787.51	n/a	787.51 j	5
15	295+00	12.28	24 c	122.0	786.35	787.15	0.656	787.85	788.39	n/a	788.39 j	14
16	295+00	6.06	24 c	133.0	787.50	787.72	0.165	788.69	788.91	0.15	789.06	15
17	296+33 W	3.54	24 c	126.0	787.55	787.80	0.198	788.88	788.92	0.05	788.98	15
18	296+00	1.92	15 c	40.0	788.50	790.65	5.375	789.00	791.20	n/a	791.20 j	17
19	1190+12 Ditch	16.42	24 c	25.0	792.50	792.63	0.520	794.16	794.29	0.54	794.83	9
20	298+85 Ditch	15.73	24 c	14.0	787.70	787.80	0.714	789.08	789.21	0.69	789.90	12
21	1204+25 Parking	14.32	24 c	18.0	784.25	784.40	0.833	785.48	785.83	0.55	786.38	3

Project File: IL-173 Sta 1212+00 - 50yr.stm | Number of lines: 21 | Run Date: 10-15-2014

NOTES: c = cir; e = ellip; b = box; Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

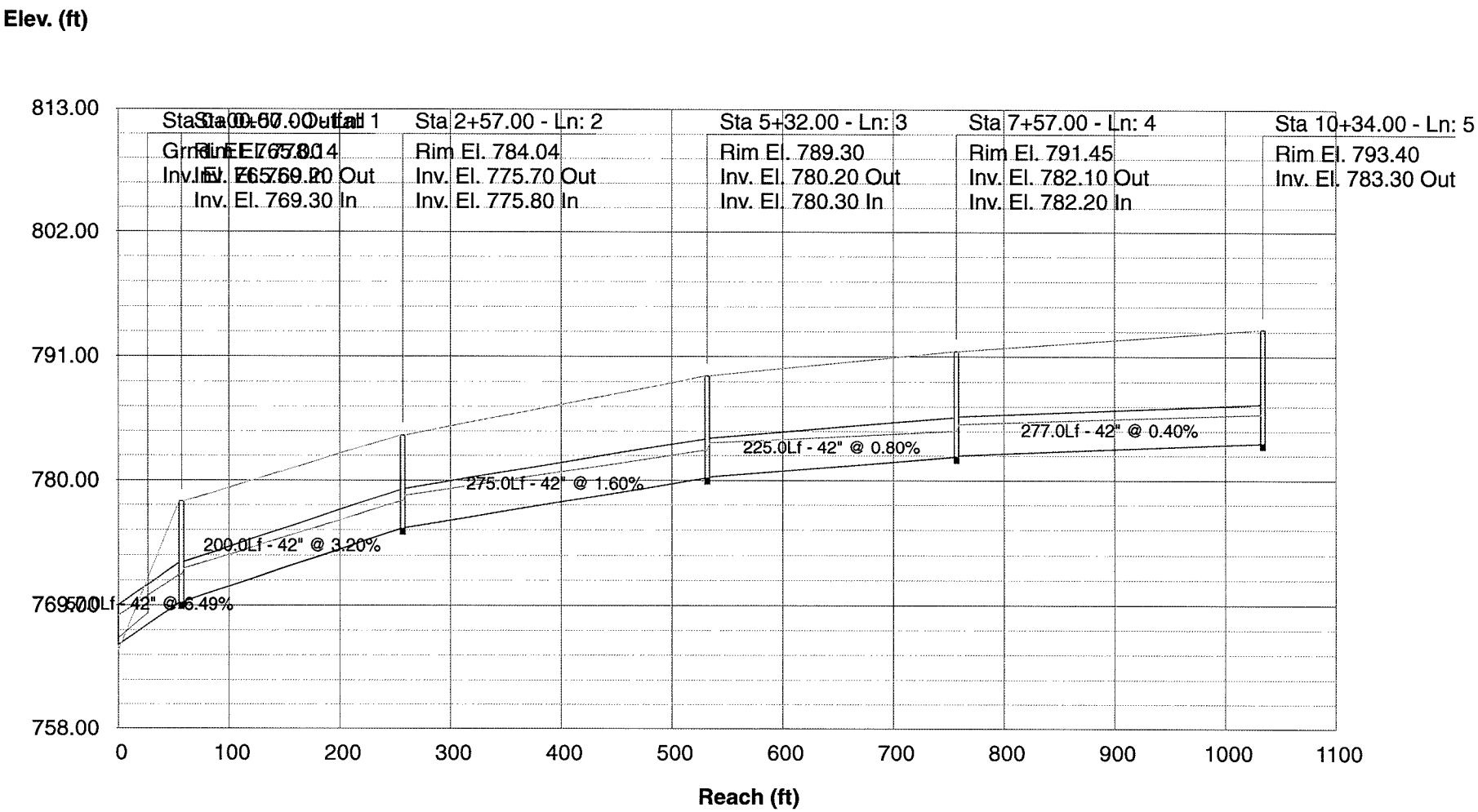
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	57.0	0.00	27.33	0.00	0.00	14.81	0.0	35.4	4.3	64.11	256.3	8.67	42	6.49	769.20	765.50	771.65	768.08	778.14	765.00	1209+00
2	1	200.0	0.00	27.33	0.00	0.00	14.81	0.0	34.9	4.4	64.70	180.0	8.29	42	3.20	775.70	769.30	778.16	772.18	784.04	778.14	1207+00
3	2	275.0	0.39	27.33	0.88	0.34	14.81	5.0	34.2	4.4	65.51	127.3	8.36	42	1.60	780.20	775.80	782.68	778.69	789.30	784.04	1204+25
4	3	225.0	0.56	25.24	0.85	0.48	12.94	5.0	33.5	4.5	57.90	89.99	7.49	42	0.80	782.10	780.30	784.43	783.37	791.45	789.30	1202+00
5	4	277.0	0.00	24.68	0.00	0.00	12.46	0.0	32.7	4.5	56.59	63.40	7.12	42	0.40	783.30	782.20	785.88	785.02	793.40	791.45	1199+24
6	5	182.0	1.37	19.61	0.89	1.22	8.15	5.0	31.9	4.6	37.53	37.29	4.05	42	0.14	784.10	783.85	787.31	787.10	792.30	793.40	1197+42
7	6	242.0	4.56	18.24	0.42	1.92	6.93	19.0	30.7	4.7	32.65	61.36	3.96	42	0.37	785.00	784.10	787.52	787.35	792.00	792.30	1195+00
8	7	300.0	0.00	13.68	0.00	0.00	5.01	0.0	29.7	4.8	24.09	41.35	7.26	30	1.02	789.05	786.00	790.69	787.56	796.00	792.00	1192+00
9	8	185.0	0.00	13.68	0.00	0.00	5.01	0.0	29.1	4.9	24.39	47.20	6.54	30	1.32	791.60	789.15	793.25	791.08	800.00	796.00	1190+12
10	9	279.0	0.00	4.32	0.00	0.00	1.64	0.0	17.5	6.3	10.37	26.22	4.61	24	1.34	795.90	792.15	797.04	793.86	802.05	800.00	1187+36
11	10	97.0	4.32	4.32	0.38	1.64	1.64	17.0	17.0	6.4	10.50	20.54	6.10	24	0.82	797.20	796.40	798.35	797.41	802.23	802.05	1186+38
12	5	139.0	0.78	3.22	0.90	0.70	2.82	5.0	6.2	9.0	25.23	42.60	6.49	30	1.08	786.40	784.90	788.08	786.98	792.77	793.40	299+00
13	12	135.0	0.41	0.41	0.90	0.37	0.37	5.0	5.0	9.4	3.45	7.00	3.95	18	0.44	788.80	788.20	789.54	788.95	793.30	792.77	300+35
14	5	20.0	0.08	1.85	0.90	0.07	1.50	5.0	7.8	8.4	12.68	40.77	5.49	24	3.25	786.25	785.60	787.51	787.13	793.40	793.40	296+33
15	14	122.0	0.44	1.77	0.90	0.40	1.43	5.0	7.3	8.6	12.28	18.32	5.43	24	0.66	787.15	786.35	788.39	787.85	792.60	793.40	295+00
16	15	133.0	0.81	0.81	0.80	0.65	0.65	5.0	5.0	9.4	6.06	9.20	3.12	24	0.17	787.72	787.50	788.91	788.69	792.67	792.60	295+00
17	15	126.0	0.20	0.52	0.90	0.18	0.38	5.0	5.4	9.2	3.54	10.07	1.77	24	0.20	787.80	787.55	788.92	788.88	792.82	792.60	296+33 W
18	17	40.0	0.32	0.32	0.64	0.20	0.20	5.0	5.0	9.4	1.92	14.97	3.93	15	5.38	790.65	788.50	791.20	789.00	790.68	792.82	296+00
19	9	25.0	9.36	9.36	0.36	3.37	3.37	29.0	29.0	4.9	16.42	16.30	5.91	24	0.52	792.63	792.50	794.29	794.16	797.50	800.00	1190+12 Ditch
20	12	14.0	2.03	2.03	0.86	1.75	1.75	6.0	6.0	9.0	15.73	19.11	6.71	24	0.71	787.80	787.70	789.21	789.08	792.80	792.77	298+85 Ditch
21	3	18.0	1.70	1.70	0.90	1.53	1.53	5.0	5.0	9.4	14.32	20.65	6.53	24	0.83	784.40	784.25	785.83	785.48	790.50	789.30	1204+25 Parking

Project File: IL-173 Sta 1212+00 - 50yr.stm | Number of lines: 21 | Run Date: 10-15-2014

NOTES: Intensity = 198.70 / (Inlet time + 19.50) ^ 0.96; Return period = 50 Yrs.

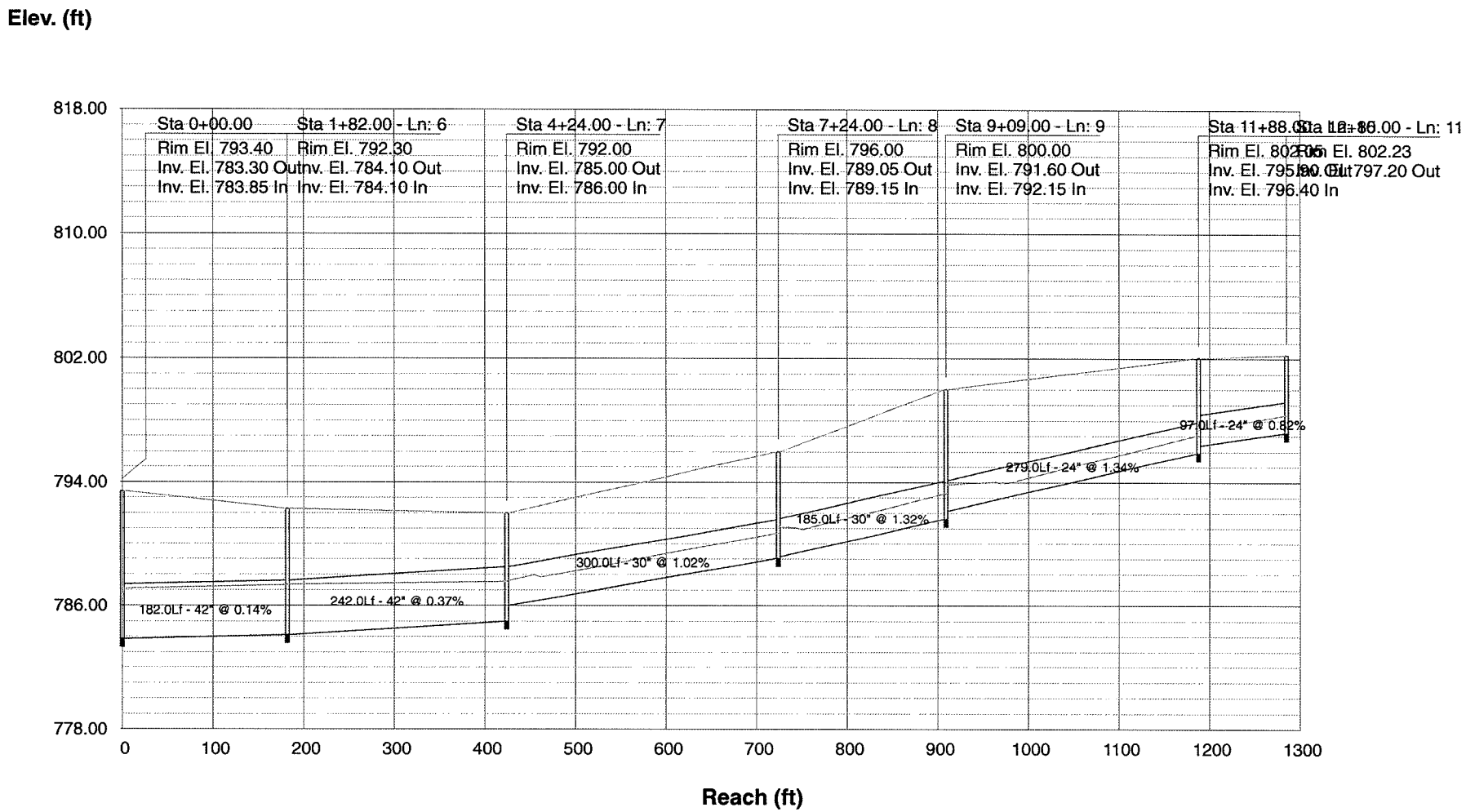
Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



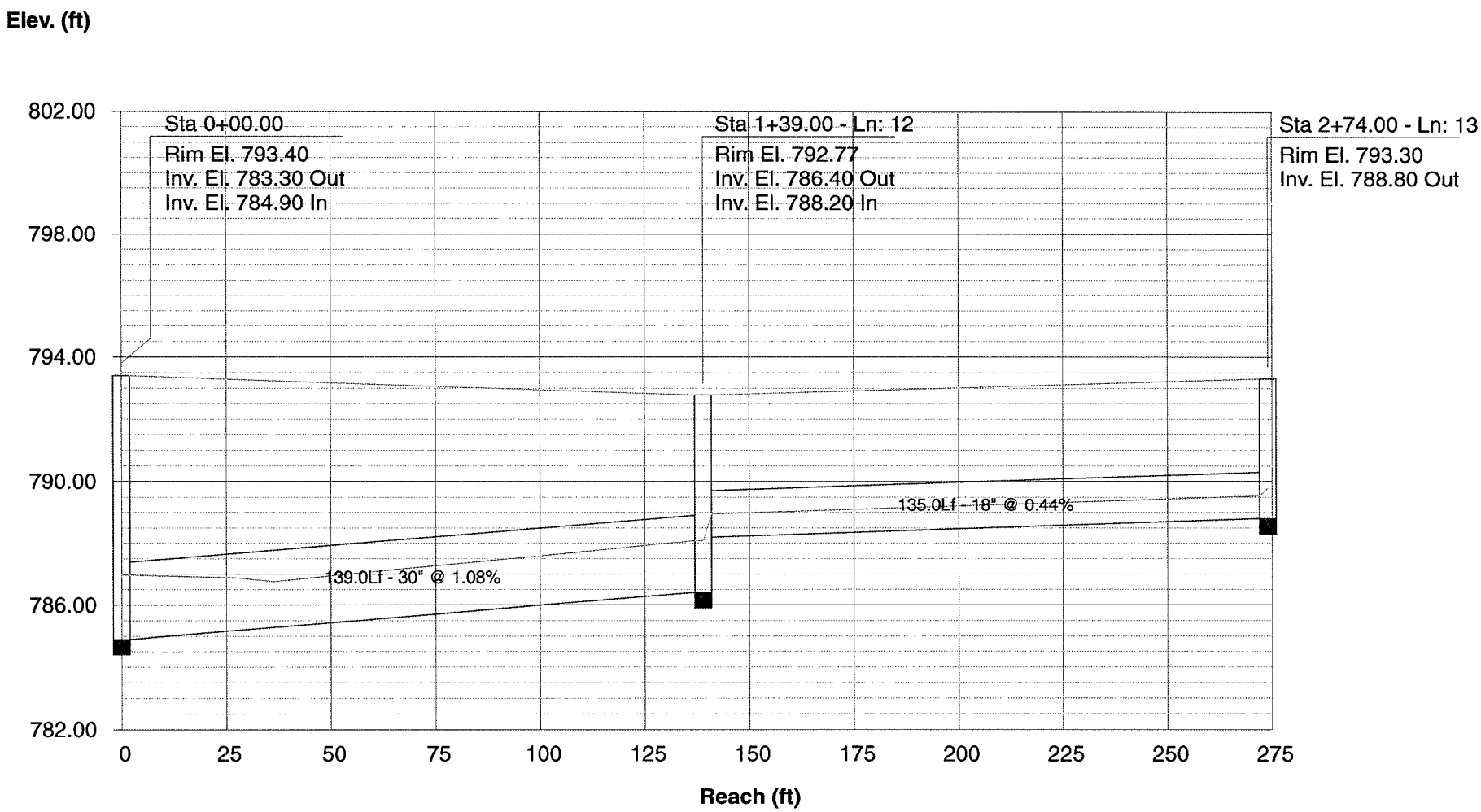
Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



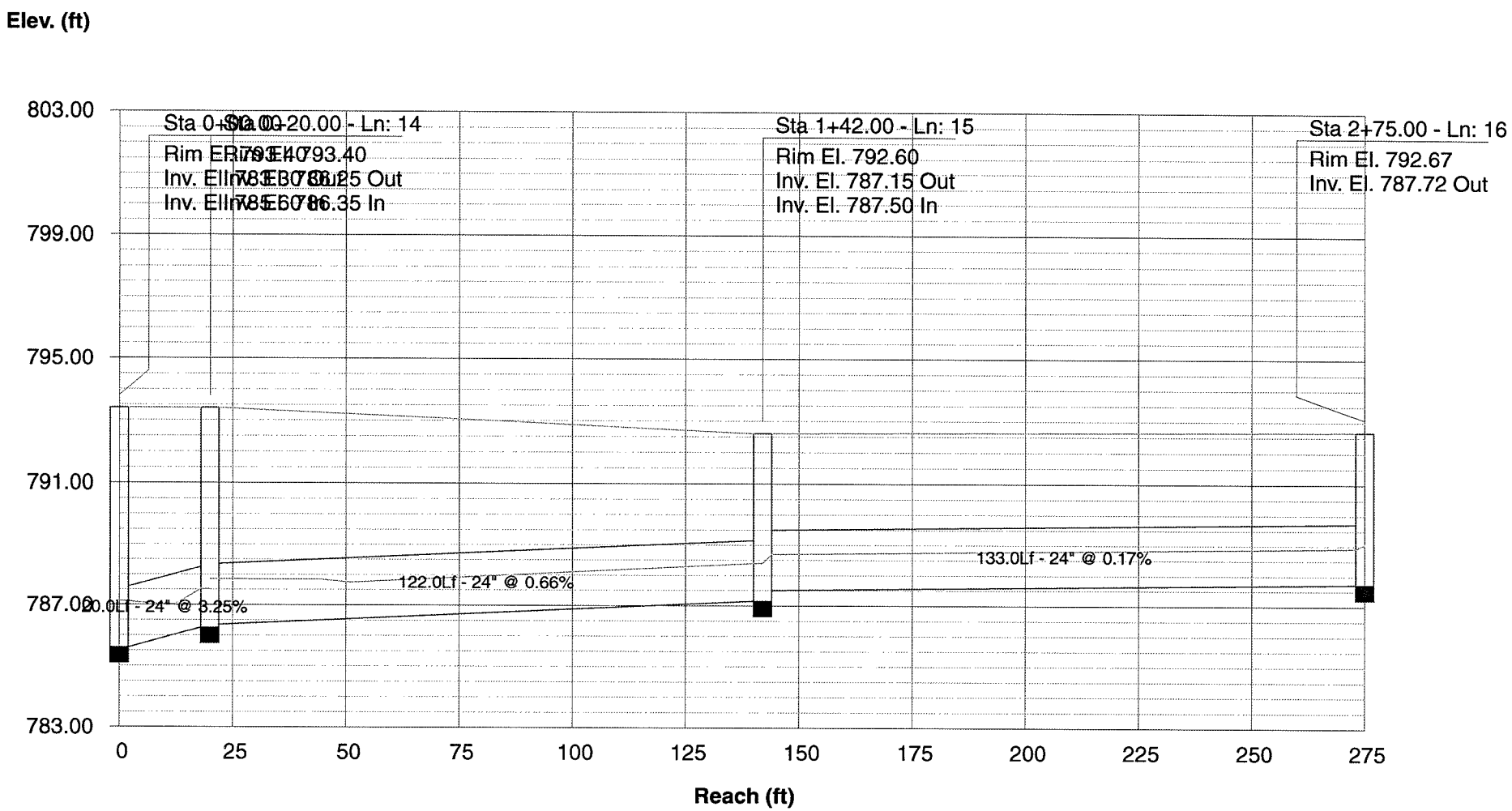
Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



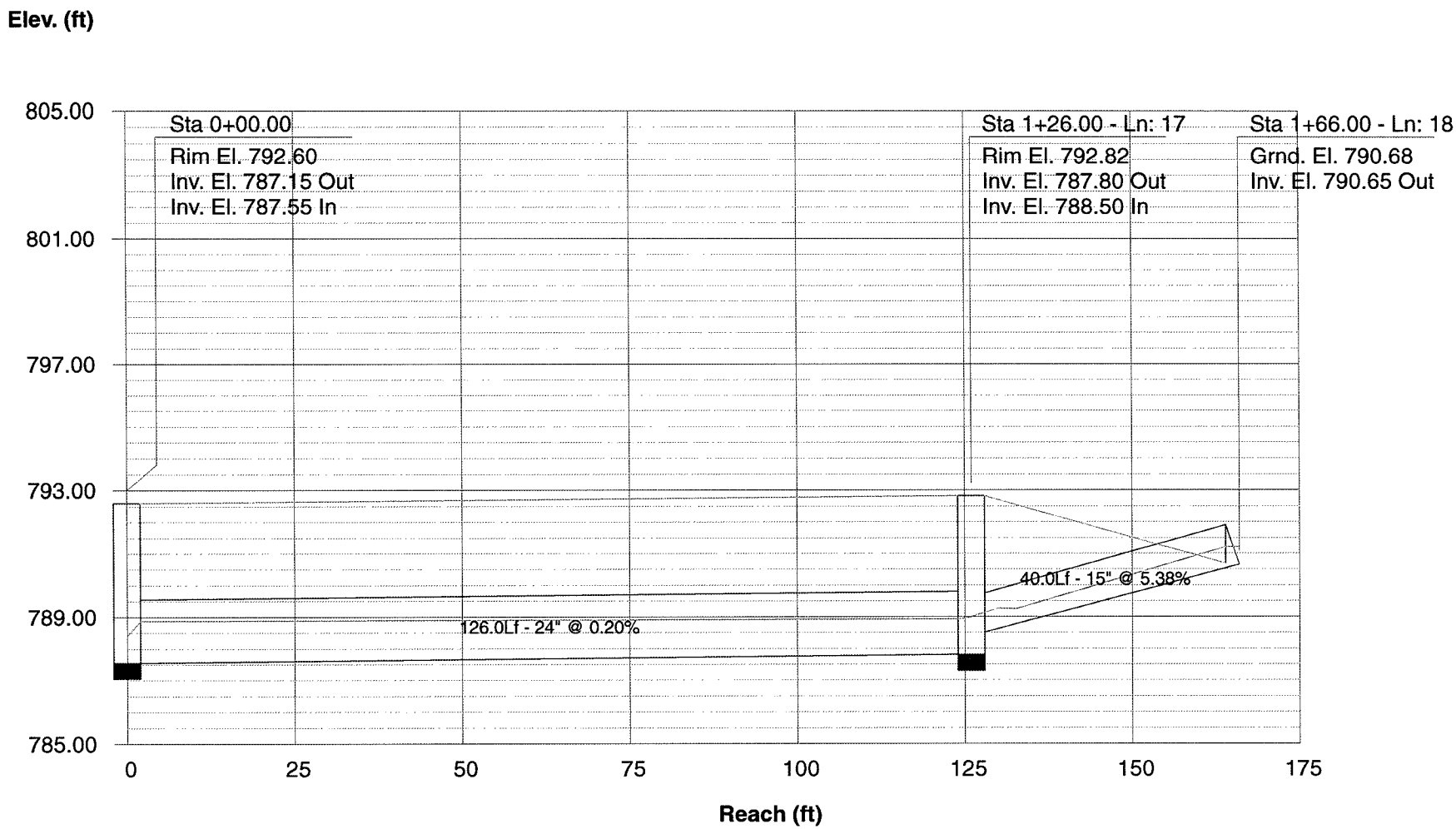
Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



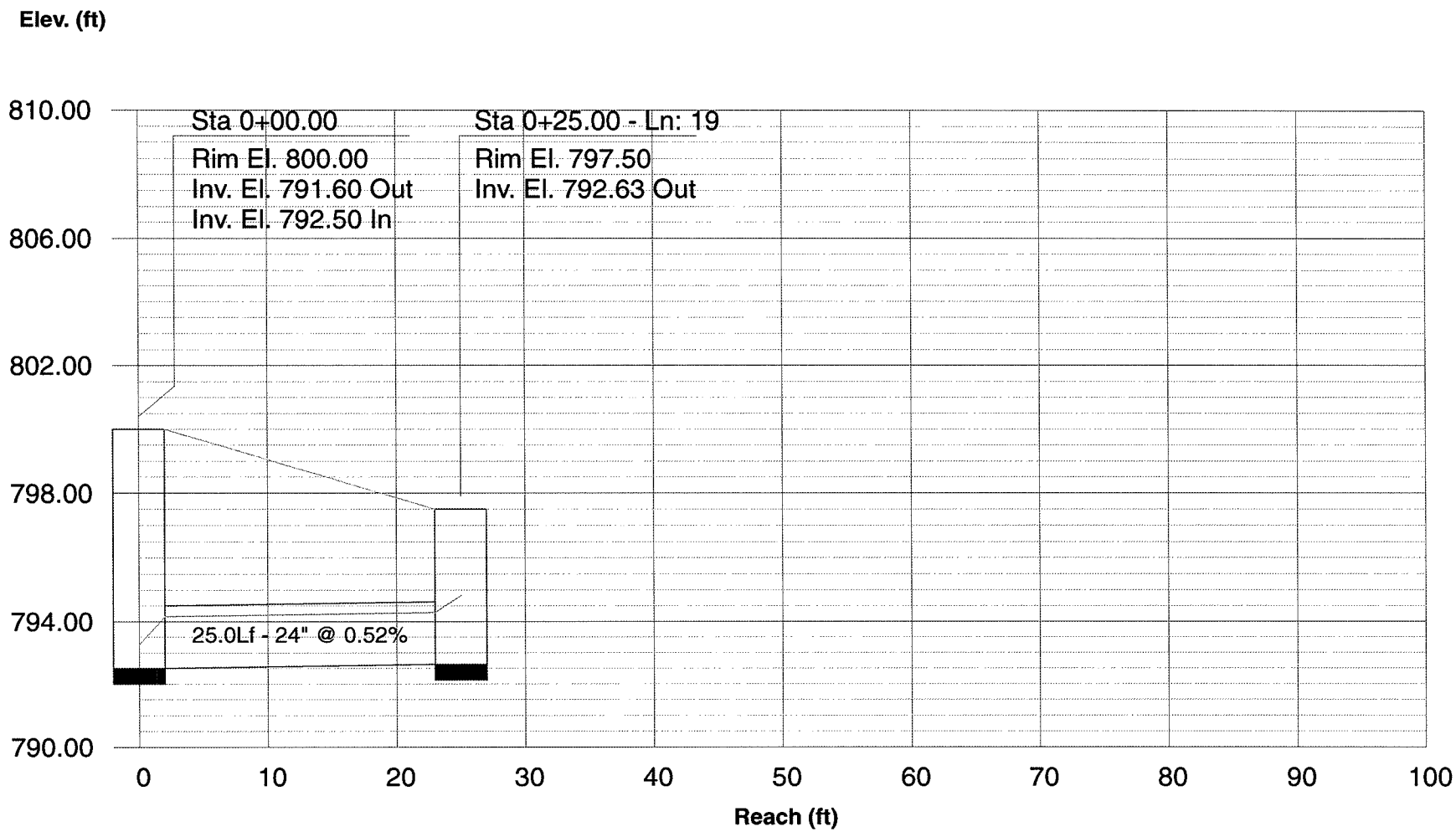
Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



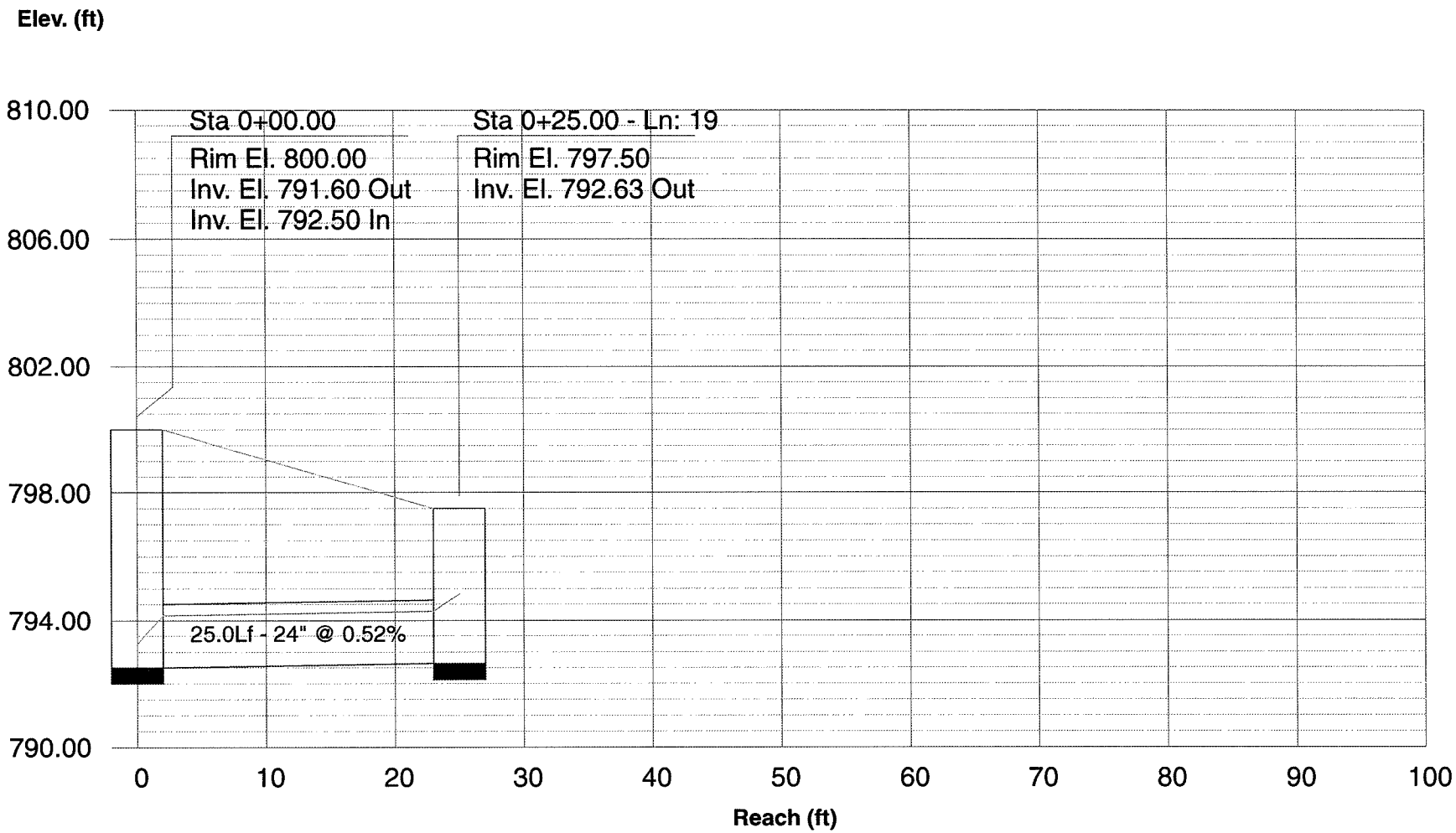
Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



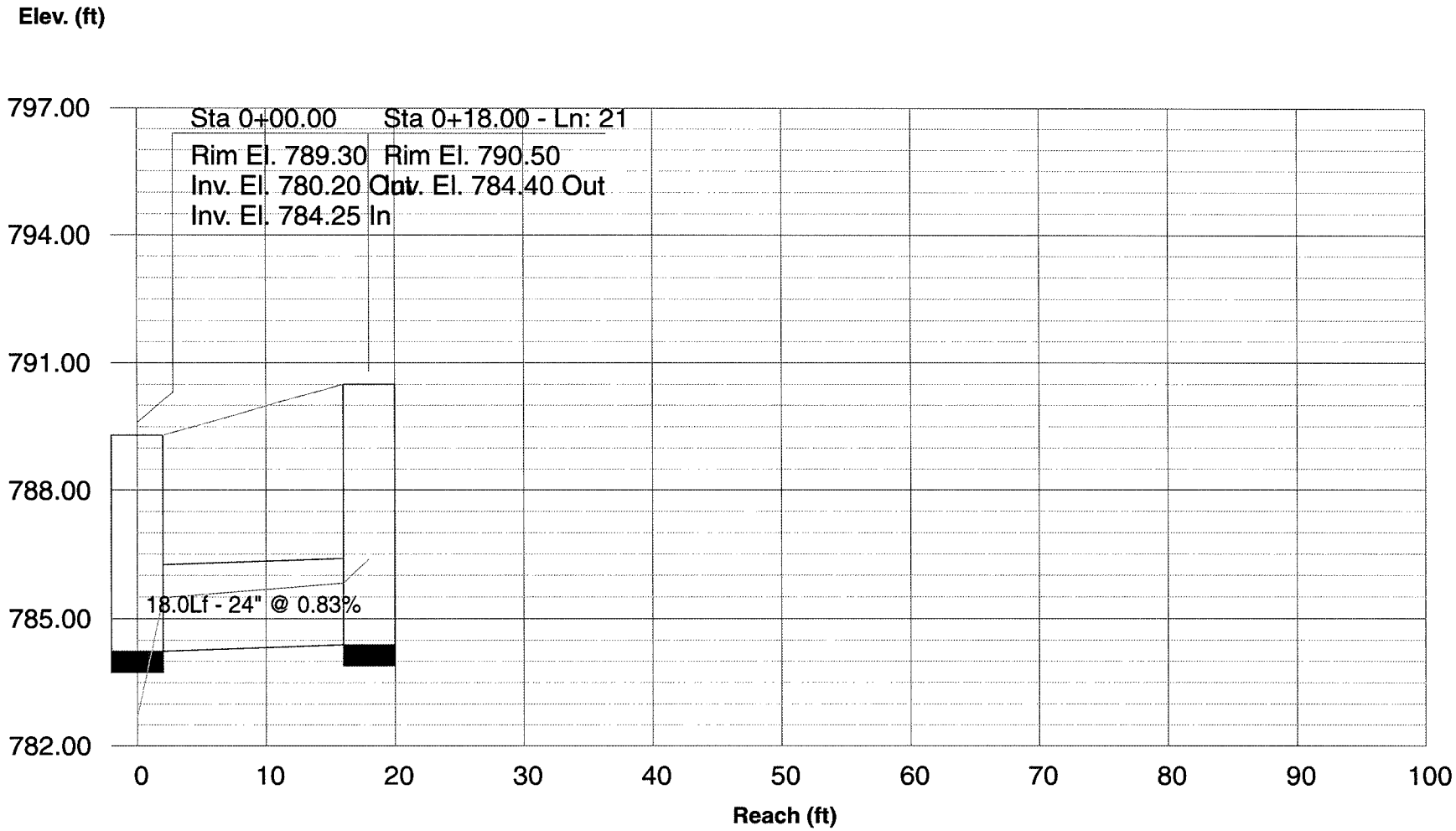
Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



Storm Sewer Profile

Proj. file: IL-173 Sta 1212+00 - 50yr.stm



Time of Concentration (T_c) or Travel Time (T_t)

Project:	IDOT - 100063	By:	DJK	Date:	4/8/2014
Location:	US-45 North at IL-173	Checked:	MB	Date:	4/24/2014
File:	N:\Idot\100063\Drain\Spreadsheets\Archive\[TC p				

(Present) / Developed — Outlet IL-173 Station 1212+25

Tc through subarea — Inlet @ Station 1194+30, Hydraflow Pipe 11

SHEET FLOW

	Segment ID	21A			
Surface Description (table 3-1)		grass			
Manning's roughness coeff., n		0.15			
Flow Length, L (total L ≤ 100')	(ft)	100			
Two-yr 24-hr rainfall, P2	(in)	3.04			
Land slope, s	(ft/ft)	0.034			
$T_t = (0.007(nL)^{0.8})/(P_2^{0.5}\, s^{0.4})$	(hr)	0.14	+		= 0.14 hr

SHALLOW CONCENTRATED FLOW

	Segment ID	21B				
Surface Description (paved or unpaved)		unpaved				
Flow Length, L (ft)		1072				
Watercourse slope, s(ft/ft)		0.0160				
Average velocity, V (ft/s)		2.04				
$T_t = L / 3600\ V$ (hr)		0.15	+			= 0.15 hr

CHANNEL FLOW

	Segment ID	III			
Cross-sectional flow area, a	(ft^2)				
Wetted perimeter, Pw	(ft)				
Hydraulic radius, r = a/Pw	(ft)				
Channel slope, s	(ft/ft)				
Manning's roughness coeff., n					
$V = (1.49\ r^{0.667}\ s^{0.5}) / n$	(ft/s)			0.00	
Flow length, L	(ft)	0			
$T_t = L / 3600\ V$	(hr)		+		= 0.00 hr

Watershed or subarea T_c or T_t = 0.29 hr

= 17 mn

Time of Concentration (T_c) or Travel Time (T_t)

Project:	IDOT - 100063	By:	DJK	Date:	4/8/2014
Location:	US-45 North at IL-173	Checked:	MB	Date:	4/24/2014
File:	N:\Idot\100063\Drain\Spreadsheets\Archive\[TC p				

(Present) / Developed — Outlet IL-173 Station 1212+25

Tc through subarea — Inlet @ Station 1190+12, Hydraflow Pipe 19

SHEET FLOW

	Segment ID	22A			
Surface Description (table 3-1)		grass			
Manning's roughness coeff., n		0.15			
Flow Length, L (total L ≤ 100')	(ft)	100			
Two-yr 24-hr rainfall, P2	(in)	3.04			
Land slope, s	(ft/ft)	0.0085			
$T_t = (0.007(nL)^{0.8})/(P_2^{0.5}\ s^{0.4})$	(hr)	0.24	+		= 0.24 hr

SHALLOW CONCENTRATED FLOW

	Segment ID	22B				
Surface Description (paved or unpaved)		unpaved				
Flow Length, L (ft)		1382				
Watercourse slope, s(ft/ft)		0.0094				
Average velocity, V (ft/s)		1.56				
$T_t = L / 3600\ V$ (hr)		0.25	+			= 0.25 hr

CHANNEL FLOW

	Segment ID	III			
Cross-sectional flow area, a	(ft^2)				
Wetted perimeter, Pw	(ft)				
Hydraulic radius, r = a/Pw	(ft)				
Channel slope, s	(ft/ft)				
Manning's roughness coeff., n					
$V = (1.49\ r^{0.667}\ s^{0.5}) / n$	(ft/s)			0.00	
Flow length, L	(ft)	0			
$T_t = L / 3600\ V$	(hr)		+		= 0.00 hr

Watershed or subarea T_c or T_t = 0.49 hr

= 29 mn

Time of Concentration (T_c) or Travel Time (T_t)

Project:	IDOT - 100063	By:	DJK	Date:	4/8/2014
Location:	US-45 North at IL-173	Checked:	MB	Date:	4/24/2014
File:	N:\Idot\100063\Drain\Spreadsheets\Archive\[TC p				

Present / Developed — Outlet IL-173 Station 1212+25

Tc through subarea — Inlet @ Station 1195+00, Hydraflow Pipe 7

SHEET FLOW

Segment ID		7A			
Surface Description (table 3-1)		grass			
Manning's roughness coeff., n		0.15			
Flow Length, L (total L ≤ 100')	(ft)	100			
Two-yr 24-hr rainfall, P2	(in)	3.04			
Land slope, s	(ft/ft)	0.01			
$T_t = (0.007(nL)^{0.8})/(P_2^{0.5}\, s^{0.4})$	(hr)	0.22	+		= 0.22 hr

SHALLOW CONCENTRATED FLOW

Segment ID		7B				
Surface Description (paved or unpaved)		unpaved				
Flow Length, L (ft)		799				
Watercourse slope, s(ft/ft)		0.0181				
Average velocity, V (ft/s)		2.17				
$T_t = L / 3600\ V$ (hr)		0.10	+			= 0.10 hr

CHANNEL FLOW

Segment ID		III			
Cross-sectional flow area, a	(ft^2)				
Wetted perimeter, Pw	(ft)				
Hydraulic radius, r = a/Pw	(ft)				
Channel slope, s	(ft/ft)				
Manning's roughness coeff., n					
$V = (1.49\ r^{0.667}\ s^{0.5}) / n$	(ft/s)			0.00	
Flow length, L	(ft)	0			
$T_t = L / 3600\ V$	(hr)		+		= 0.00 hr

Watershed or subarea T_c or T_t = 0.32 hr

= 19 mn

Time of Concentration (T_c) or Travel Time (T_t)

Project:	IDOT - 100063	By:	DJK	Date:	4/8/2014
Location:	US-45 North at IL-173	Checked:	MB	Date:	4/24/2014
File:	N:\Idot\100063\Drain\Spreadsheets\Archive\[TC p				

Present / Developed — Outlet IL-173 Station 1212+25

Tc through subarea — Inlet @ Station 298+85, Hydraflow Pipe 20

SHEET FLOW

	Segment ID	23A			
Surface Description (table 3-1)		Paved			
Manning's roughness coeff., n		0.011			
Flow Length, L (total L ≤ 100')	(ft)	100			
Two-yr 24-hr rainfall, P2	(in)	3.04			
Land slope, s	(ft/ft)	0.002			
$T_t = (0.007(nL)^{0.8})/(P_2^{0.5}\ s^{0.4})$	(hr)	0.05	+		= 0.05 hr

SHALLOW CONCENTRATED FLOW

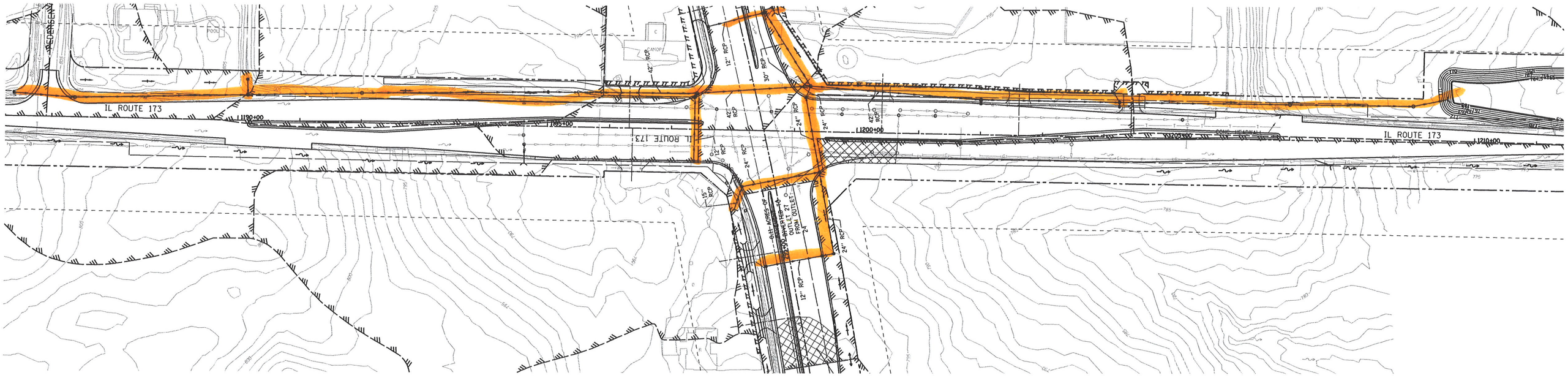
	Segment ID	23B					
Surface Description (paved or unpaved)		unpaved					
Flow Length, L (ft)		366					
Watercourse slope, s(ft/ft)		0.0167					
Average velocity, V (ft/s)		2.08					
$T_t = L / 3600\ V$ (hr)		0.05	+				= 0.05 hr

CHANNEL FLOW

	Segment ID	III			
Cross-sectional flow area, a	(ft^2)				
Wetted perimeter, Pw	(ft)				
Hydraulic radius, r = a/Pw	(ft)				
Channel slope, s	(ft/ft)				
Manning's roughness coeff., n					
$V = (1.49\ r^{0.667}\ s^{0.5}) / n$	(ft/s)			0.00	
Flow length, L	(ft)	0			
$T_t = L / 3600\ V$	(hr)		+		= 0.00 hr

Watershed or subarea T_c or T_t = 0.10 hr

= 6 mn


IL ROUTE 173
IL ROUTE 173
IL ROUTE 173
L1190+00
L1195+00
L1200+00
L1205+00
L1210+00
42" RCP
12" RCP
30" RCP
24" RCP
42" RCP
24" RCP
42" RCP
24" RCP
15" RCP
12" RCP
24" RCP
12" RCP
24" RCP
POOL
CANOP
SOME HEADWALL
OUTLET 27
FROM OUTLET
24"

COMPENSATORY STORAGE CALCULATIONS

Hastings Creek				
	Floodway		Floodplain	
	Normal - 10 Year	10 Year - 100 Year	Normal - 10 Year	10 Year - 100 Year
Fill (Cubic Yards)	254.0	164.5	668.7	641.2
Cut (Cubic Yards)	45.4	0.0	0.0	0.0
Culvert Cut (Cubic Yards)	78.3	87.5	78.3	87.5
Required Comp Storage (Cubic Yards)	253.96	164.48	802.43	769.40
Provided Comp (Cubic Yards)	922.53	345.30	-	-

10-Year Elevation	748.68
100-Year Elevation	749.44

Refer to plan and profile for station layout and floodway limits.
Provided Comp is the Sum of Calculated Compensatory Storage, Cut, and Culvert Cut

	Existing Culvert Opening	Proposed Culvert Opening		
	-	Low Flow	High Flow	Total
Flow Line (ft)	743.83	743.7	744.7	-
Total Width (ft)	9	8	16	-
Length (ft)	68	155	155	-
Normal Water Level (ft)	748	748	748	-
10 Year Elevation (ft)	748.68	748.68	748.68	-
10 Year - NWL Depth (ft)	0.68	0.68	0.68	-
10 Year - NWL Volume (ft3)	416.16	843.2	1686.4	2529.6
100 Year Elevation (ft)	749.44	749.44	749.44	
100 Year - 10 Year Depth (ft)	0.76	0.76	0.76	
10 Year - 100 Year Volume (ft3)	465.12	942.4	1884.8	2827.2

	Provided Cut (Cubic Feet)	**Provided Cut (Cubic Yards)**
NWL-10 Year	2113.44	78.28
10 Year-100 Year	2362.08	87.48

Proposed Conditions

FLOODPLAIN FILL VOLUME (Normal to 10 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		4.25	100.00	425.00		
239+00.00	8.50				425.00	15.74
		13.70	100.00	1,369.50		
240+00.00	18.89				1,794.50	66.46
		25.15	100.00	2,514.50		
240+03.51	Culvert Center Line Station					
241+00.00	31.40				4,309.00	159.59
		38.17	50.68	1,934.46		
241+50.68	44.94				6,243.46	231.24
		51.63	49.32	2,546.27		
242+00.00	58.32				8,789.72	325.55
		34.41	53.21	1,831.09		
242+53.21	10.51				10,620.81	393.36
		7.51	46.79	351.39		
243+00.00	4.51				10,972.21	406.38
		2.26	100.00	225.50		
244+00.00	0.00				11,197.71	414.73
		0.00	100.00	0.00		
245+00.00	0.00				11,197.71	414.73

FILL VOLUME = **414.73** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODPLAIN FILL VOLUME (10 YR to 100 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		7.24	100.00	723.50		
239+00.00	14.47				723.50	26.80
		12.56	100.00	1,256.00		
240+00.00	10.65				1,979.50	73.31
		17.84	100.00	1,784.00		
240+03.51	Culvert Center Line Station					
241+00.00	25.03				3,763.50	139.39
		33.11	50.68	1,677.76		
241+50.68	41.18				5,441.26	201.53
		41.05	49.32	2,024.34		
242+00.00	40.91				7,465.60	276.50
		35.33	53.21	1,879.64		
242+53.21	29.74				9,345.24	346.12
		29.56	46.79	1,382.88		
243+00.00	29.37				10,728.12	397.34
		18.06	100.00	1,805.50		
244+00.00	6.74				12,533.62	464.21
		3.37	100.00	337.00		
245+00.00	0.00				12,870.62	476.69

FILL VOLUME = **476.69** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODWAY FILL VOLUME (Normal to 10 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		4.50	100.00	450.00		
239+00.00	9.00				450.00	16.67
		27.73	100.00	2,773.00		
240+00.00	46.46				3,223.00	119.37
		31.93	100.00	3,193.00		
240+03.51	Culvert Center Line Station					
241+00.00	17.40				6,416.00	237.63
		8.70	50.68	440.92		
241+50.68	0.00				6,856.92	253.96
		0.00	49.32	0.00		
242+00.00	0.00				6,856.92	253.96
		0.00	53.21	0.00		
242+53.21	0.00				6,856.92	253.96
		0.00	46.79	0.00		
243+00.00	0.00				6,856.92	253.96
		0.00	100.00	0.00		
244+00.00	0.00				6,856.92	253.96
		0.00	100.00	0.00		
245+00.00	0.00				6,856.92	253.96

FILL VOLUME = **253.96** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODWAY FILL VOLUME (10 YR to 100 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		2.73	100.00	273.00		
239+00.00	5.46				273.00	10.11
		16.19	100.00	1,618.50		
240+00.00	26.91				1,891.50	70.06
		21.45	100.00	2,144.50		
240+03.51	Culvert Center Line Station					
241+00.00	15.98				4,036.00	149.48
		7.99	50.68	404.93		
241+50.68	0.00				4,440.93	164.48
		0.00	49.32	0.00		
242+00.00	0.00				4,440.93	164.48
		0.00	53.21	0.00		
242+53.21	0.00				4,440.93	164.48
		0.00	46.79	0.00		
243+00.00	0.00				4,440.93	164.48
		0.00	100.00	0.00		
244+00.00	0.00				4,440.93	164.48
		0.00	100.00	0.00		
245+00.00	0.00				4,440.93	164.48

FILL VOLUME = **164.48** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODPLAIN CUT VOLUME (Normal to 10 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
239+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
240+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
240+03.51	Culvert Center Line Station					
241+00.00	0.00				0.00	0.00
		0.00	50.68	0.00		
241+50.68	0.00				0.00	0.00
		0.00	49.32	0.00		
242+00.00	0.00				0.00	0.00
		0.00	53.21	0.00		
242+53.21	0.00				0.00	0.00
		0.00	46.79	0.00		
243+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
244+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
245+00.00	0.00				0.00	0.00

FILL VOLUME = **0.00** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODPLAIN CUT VOLUME (10 YR to 100 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
239+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
240+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
240+03.51	Culvert Center Line Station					
241+00.00	0.00				0.00	0.00
		0.00	50.68	0.00		
241+50.68	0.00				0.00	0.00
		0.00	49.32	0.00		
242+00.00	0.00				0.00	0.00
		0.00	53.21	0.00		
242+53.21	0.00				0.00	0.00
		0.00	46.79	0.00		
243+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
244+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
245+00.00	0.00				0.00	0.00

FILL VOLUME = **0.00** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODWAY CUT VOLUME (Normal to 10 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		6.13	100.00	612.50		
239+00.00	12.25				612.50	22.69
		6.13	100.00	612.50		
240+00.00	0.00				1,225.00	45.37
		0.00	100.00	0.00		
240+03.51	Culvert Center Line Station					
241+00.00	0.00				1,225.00	45.37
		0.00	50.68	0.00		
241+50.68	0.00				1,225.00	45.37
		0.00	49.32	0.00		
242+00.00	0.00				1,225.00	45.37
		0.00	53.21	0.00		
242+53.21	0.00				1,225.00	45.37
		0.00	46.79	0.00		
243+00.00	0.00				1,225.00	45.37
		0.00	100.00	0.00		
244+00.00	0.00				1,225.00	45.37
		0.00	100.00	0.00		
245+00.00	0.00				1,225.00	45.37

FILL VOLUME = **45.37** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODWAY CUT VOLUME (10 YR to 100 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
238+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
239+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
240+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
240+03.51	Culvert Center Line Station					
241+00.00	0.00				0.00	0.00
		0.00	50.68	0.00		
241+50.68	0.00				0.00	0.00
		0.00	49.32	0.00		
242+00.00	0.00				0.00	0.00
		0.00	53.21	0.00		
242+53.21	0.00				0.00	0.00
		0.00	46.79	0.00		
243+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
244+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
245+00.00	0.00				0.00	0.00

FILL VOLUME = **0.00** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

COMPENSATORY STORAGE (Normal to 10 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		28.98	100.00	2,897.50		
238+00.00	57.95				2,897.50	107.31
		107.85	100.00	10,785.00		
239+00.00	157.75				13,682.50	506.76
		78.88	100.00	7,887.50		
240+00.00	0.00				21,570.00	798.89
		0.00	100.00	0.00		
240+03.51	Culvert Center Line Station					
241+00.00	0.00				21,570.00	798.89
		0.00	50.68	0.00		
241+50.68	0.00				21,570.00	798.89
		0.00	49.32	0.00		
242+00.00	0.00				21,570.00	798.89
		0.00	53.21	0.00		
242+53.21	0.00				21,570.00	798.89
		0.00	46.79	0.00		
243+00.00	0.00				21,570.00	798.89
		0.00	100.00	0.00		
244+00.00	0.00				21,570.00	798.89
		0.00	100.00	0.00		
245+00.00	0.00				21,570.00	798.89

FILL VOLUME = **798.89** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

COMPENSATORY STORAGE (10 YR to 100 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\Idot\100063\Drain\Submittals\Submittal IDOT HR HAS_12 17\Update to HR Report\[Floodplain Fill Calculation
DATE: 2/15/2016

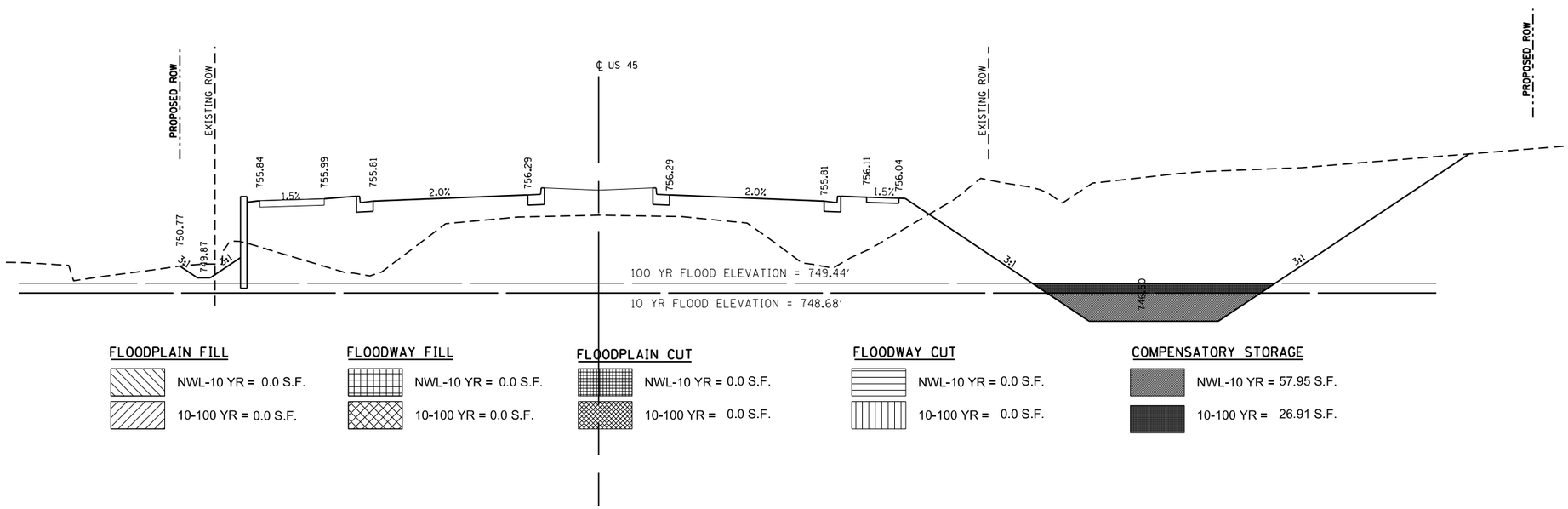
Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
236+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
237+00.00	0.00				0.00	0.00
		13.46	100.00	1,345.50		
238+00.00	26.91				1,345.50	49.83
		34.81	100.00	3,480.50		
239+00.00	42.70				4,826.00	178.74
		21.35	100.00	2,135.00		
240+00.00	0.00				6,961.00	257.81
		0.00	100.00	0.00		
240+03.51	Culvert Center Line Station					
241+00.00	0.00				6,961.00	257.81
		0.00	50.68	0.00		
241+50.68	0.00				6,961.00	257.81
		0.00	49.32	0.00		
242+00.00	0.00				6,961.00	257.81
		0.00	53.21	0.00		
242+53.21	0.00				6,961.00	257.81
		0.00	46.79	0.00		
243+00.00	0.00				6,961.00	257.81
		0.00	100.00	0.00		
244+00.00	0.00				6,961.00	257.81
		0.00	100.00	0.00		
245+00.00	0.00				6,961.00	257.81

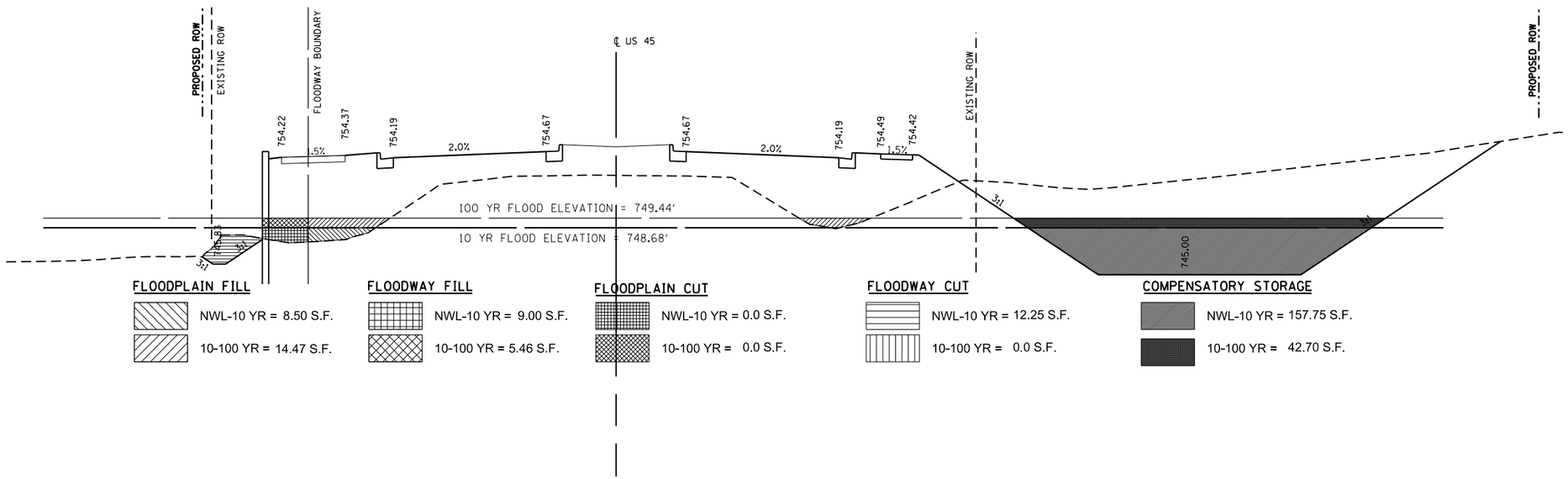
FILL VOLUME = **257.81** **cu-yd**

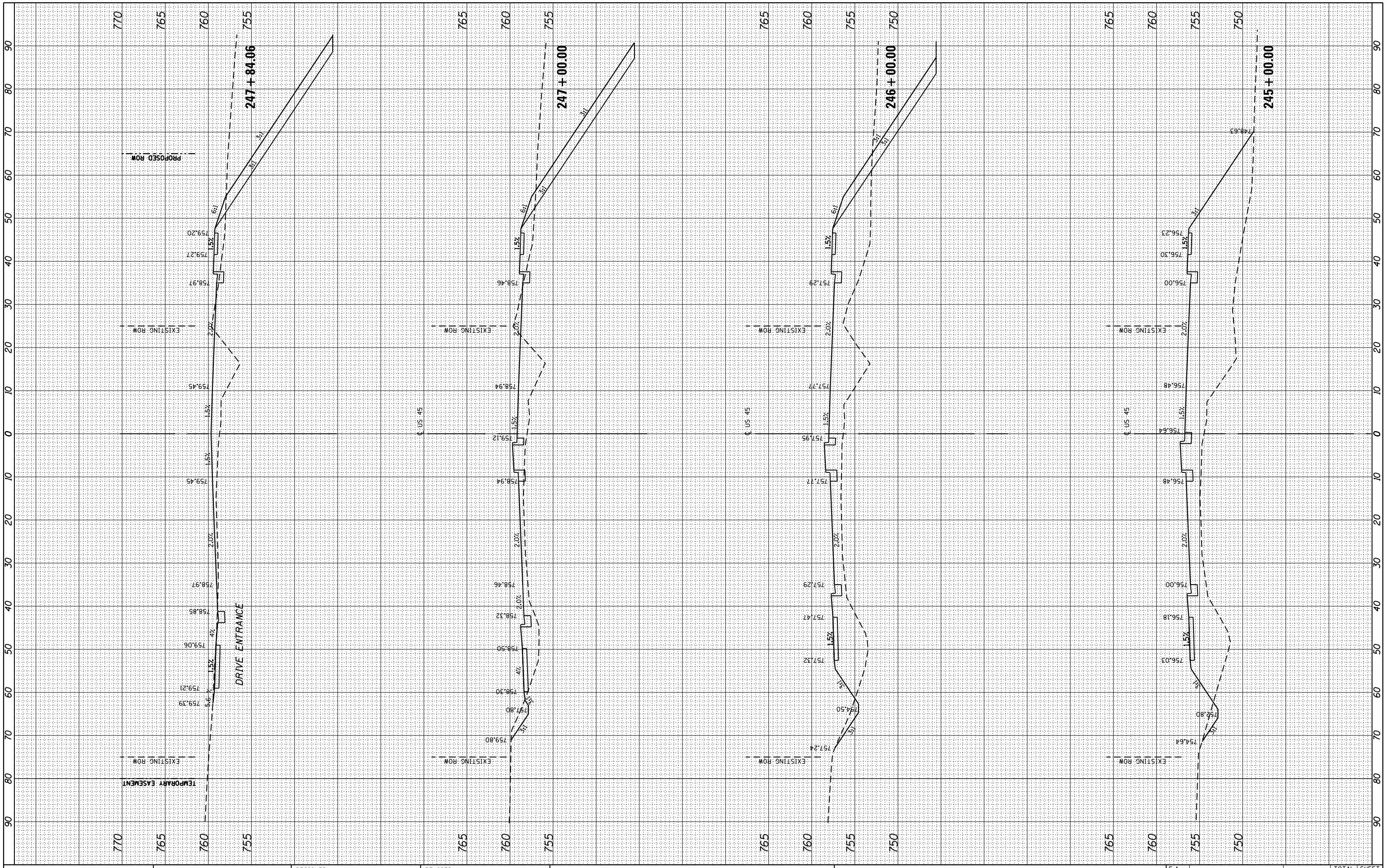
Calculated By: FDM 1/9/2018
Checked By:

Roadway Cross Section 238+00 showing compensatory storage site.
1:20 Scale



Roadway Cross Section 239+00 showing compensatory storage site.
1:20 Scale





FINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		
NOTE BOOK NO.		

ORIGINAL SURVEY	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		
NOTE BOOK NO.		

FILE NAME = N:\Idot\100063\Drain\Ref\DRAINFLOODPLAIN_XSC_Rte45_Sheets_Rev.dgn	USER NAME = fmartinez	DESIGNED -	REVISED -
		DRAWN -	REVISED -
	PLOT SCALE = 20'	CHECKED -	REVISED -
	PLOT DATE = 1/10/2018	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

ILLINOIS ROUTE 45
CROSS SECTIONS

SCALE: | SHEET NO. OF SHEETS | STA. 245+00.00 TO STA. 247+84.06

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.

CONTRACT NO.

ILLINOIS FED. AID PROJECT

ORIGINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	TEMPLATE		
NO.	AREAS		
	AREAS CHECKED		

FINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	TEMPLATE		
NO.	AREAS		
	AREAS CHECKED		

FILE NAME = N:\dot\100063\Drain\Ref\DRAINFLOODPLAIN_XSC_Rte45_Sheets_Rev.dgn

USER NAME = fmartinez

PLOT SCALE = 20'

PLOT DATE = 1/10/2018

DESIGNED -

DRAWN -

CHECKED -

DATE -

REVISED -

REVISED -

REVISED -

REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

ILLINOIS ROUTE 45
CROSS SECTIONS

SCALE:

SHEET NO. OF SHEETS

STA. 242+00.00 TO STA. 244+00.00

F.A. RTE.

SECTION

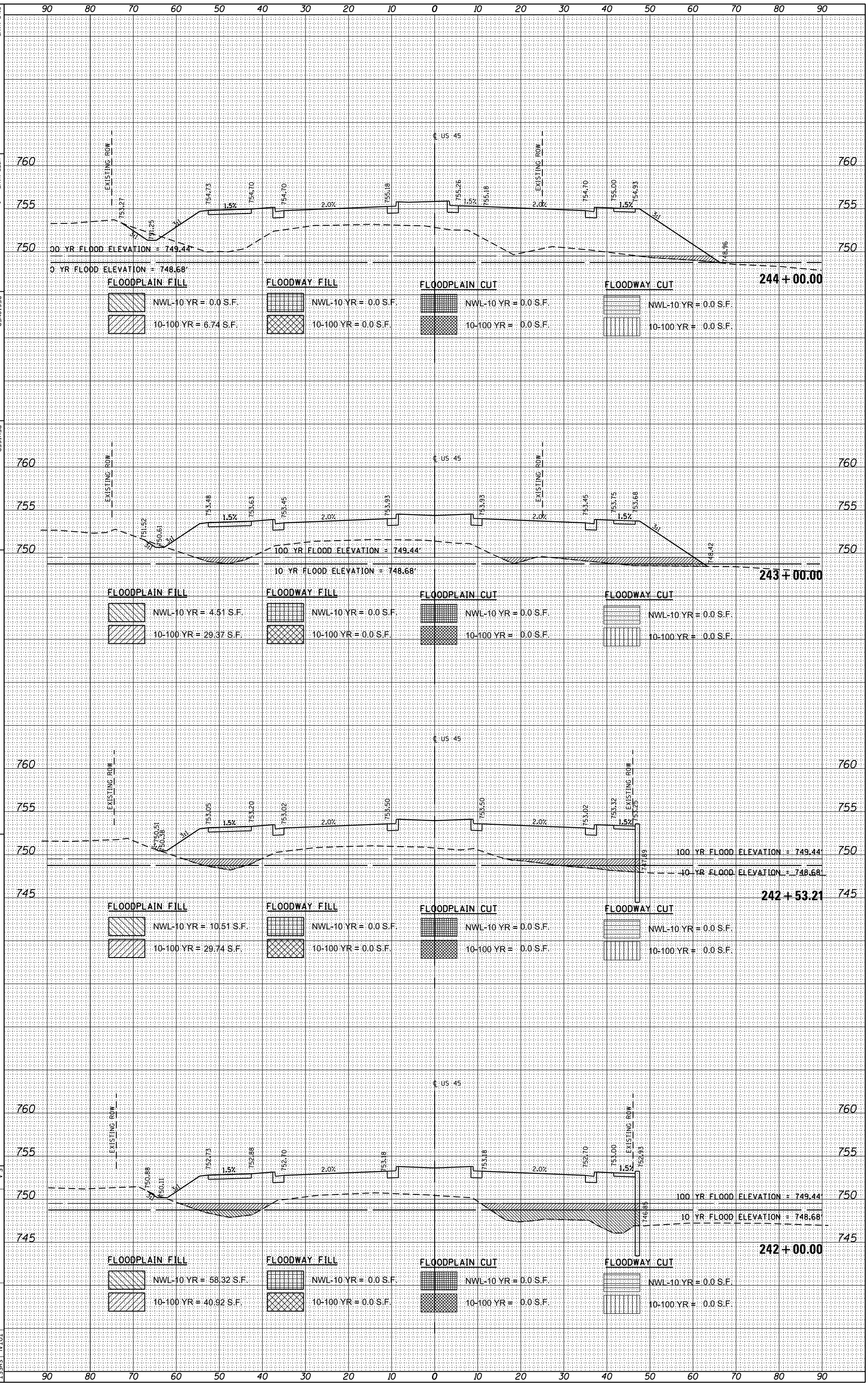
COUNTY

TOTAL SHEETS

SHEET NO.

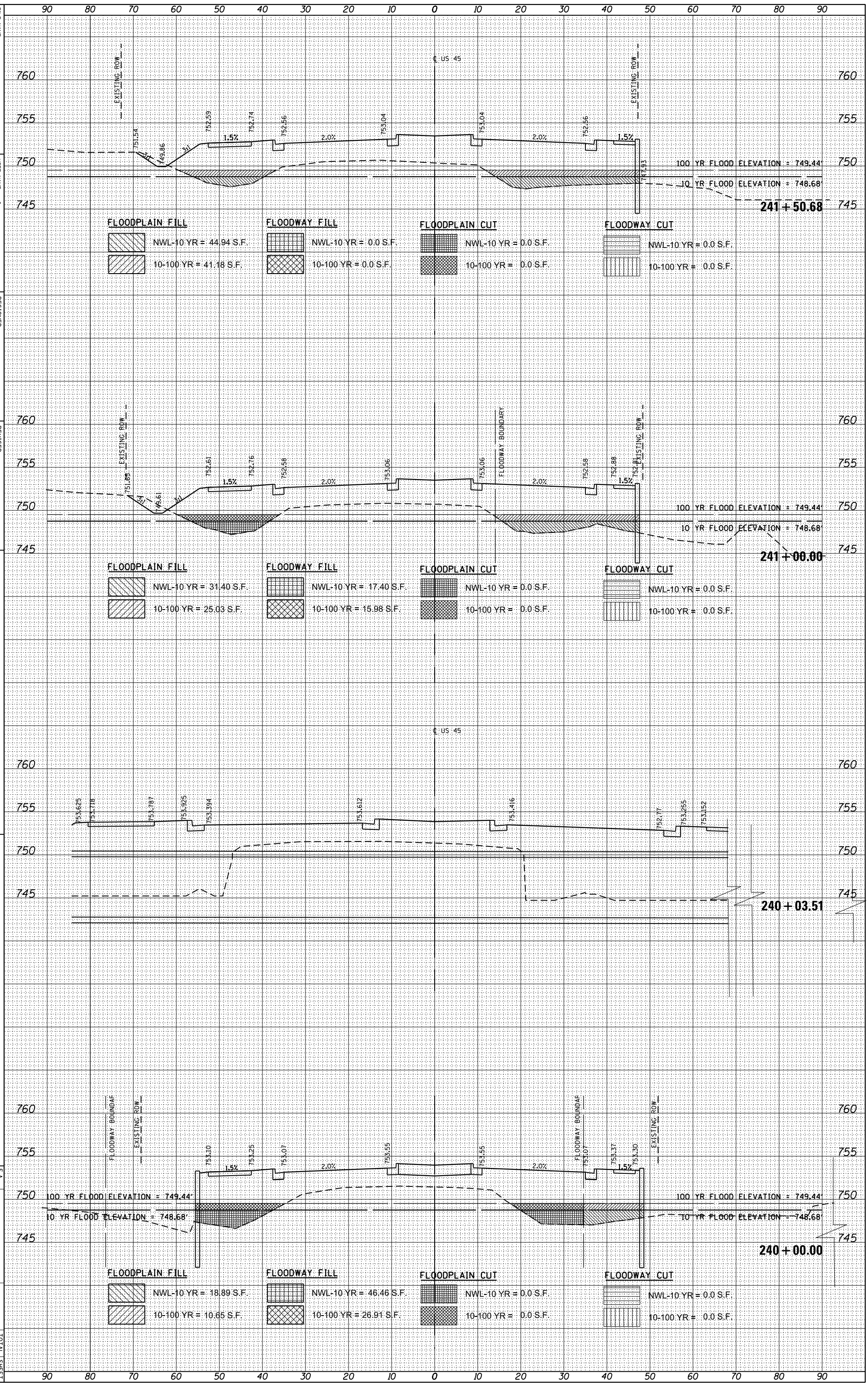
ILLINOIS FED. AID PROJECT

CONTRACT NO.



ORIGINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	TEMPLATE		
	AREAS		
NO.	AREAS CHECKED		

FINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	TEMPLATE		
	AREAS		
NO.	AREAS CHECKED		



FILE NAME = N:\dot\100063\Drain\Ref\DRAINFLOODPLAIN_XSC_Rte45_Sheets_Rev.dgn

USER NAME = fmartinez

PLOT SCALE = 20'

PLOT DATE = 1/10/2018

DESIGNED -

DRAWN -

CHECKED -

DATE -

REVISED -

REVISED -

REVISED -

REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

ILLINOIS ROUTE 45
CROSS SECTIONS

STA. 240+00.00 TO STA. 241+50.68

SCALE:

SHEET NO. OF SHEETS

F.A. RTE.

SECTION

COUNTY

TOTAL SHEETS

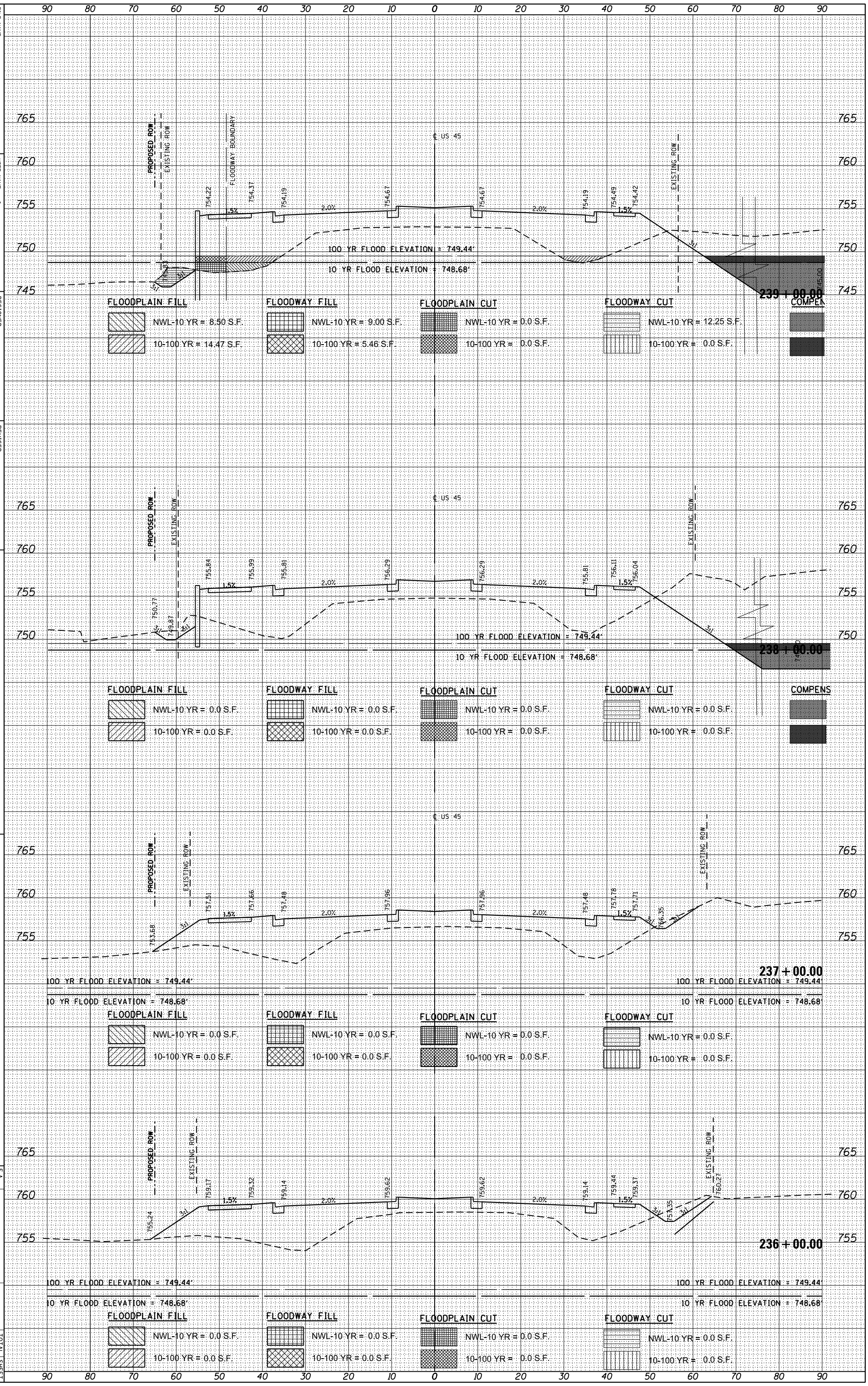
SHEET NO.

ILLINOIS FED. AID PROJECT

CONTRACT NO.

ORIGINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	TEMPLATE		
	AREAS		
NO.	AREAS CHECKED		

FINAL SURVEY		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	TEMPLATE		
	AREAS		
NO.	AREAS CHECKED		



FILE NAME = N:\dot\100063\Drain\Ref\DRAINFLOODPLAIN_XSC_Rte45_Sheets_Rev.dgn
USER NAME = fmartinez
PLOT SCALE = 20'
PLOT DATE = 1/10/2018

DESIGNED - | REVISED -
DRAWN - | REVISED -
CHECKED - | REVISED -
DATE - | REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

ILLINOIS ROUTE 45
CROSS SECTIONS

SCALE:
SHEET NO. OF SHEETS
STA. 236+00.00 TO STA. 239+00.00

F.A. RTE.
SECTION
COUNTY
TOTAL SHEETS
SHEET NO.
ILLINOIS FED. AID PROJECT
CONTRACT NO.

Tributary to Hastings Creek				
	Floodway[1]		Floodplain	
	Normal - 10 Year	10 Year - 100 Year	Normal - 10 Year	10 Year - 100 Year
Fill (Cubic Yards)	-	-	328.0	79.1
Cut (Cubic Yards)	-	-	0.0	0.0
Culvert Cut (Cubic Yards)	-	-	27.8	7.5
Required Comp Storage (Cubic Yards)	-	-	393.64	94.89
Provided Comp (Cubic Yards)	-	-	518.52	100.97

	U/S	D/S
10-Year Elevation	751.39	749.33
100-Year Elevation	751.75	749.66

Notes

[1] There is no mapped floodway at Tributary to Hastings Creek

Provided Comp is the sum of the calculated Compenstory Storage , cut, and culvert cut.

	Existing Culvert Cut	Proposed Culvert Cut
Flow Line (ft)	746.02	746.2
Total Width (ft)	36" Diameter	8
Length (ft)	77	118.1
Normal Water Level (ft)	747.76	747.76
10 Year Elevation (ft)	749.33	749.33
10 Year - NWL Area (ft)	2.814	12.56
10 Year - NWL Volume (ft3)	216.68	967.12
100 Year Elevation (ft)	749.66	749.66
100 Year - 10 Year Area (ft)	0	2.64
10 Year - 100 Year Volume (ft3)	0	203.28

	Provided Cut (Cubic Feet)	**Provided Cut (Cubic Yards)**
NWL-10 Year	750.44	27.79
10 Year-100 Year	203.28	7.53

Proposed Conditions

FLOODPLAIN FILL VOLUME (Normal to 10 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\ldot\100063\Drain\Spreadsheets\[Floodplain Fill Calculations by XS station Trib to Hastings.xlsx]Sum
DATE: 2/15/2016

Natural Elevations

10-YR Elevation: 751.39 U/S 749.33 D/S
100-YR Elevation: 751.75 U/S 749.66 D/S

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
263+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
264+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
265+00.00	0.00				0.00	0.00
		15.00	100.00	1,499.50		
266+00.00	29.99				1,499.50	55.54
		74.65	29.58	2,208.15		
266+29.58	119.31				3,707.65	137.32
		65.22	70.42	4,592.79		
266+39.04	Culvert Center Line Station					
267+00.00	11.13				8,300.44	307.42
		5.57	100.00	556.50		
268+00.00	0.00				8,856.94	328.03

FILL VOLUME = **328.03** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

FLOODPLAIN FILL VOLUME (10 YR to 100 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\ldot\100063\Drain\Spreadsheets\[Floodplain Fill Calculations by XS station Trib to Hastings.xlsx]Sum
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
263+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
264+00.00	0.00				0.00	0.00
		0.00	100.00	0.00		
265+00.00	0.00				0.00	0.00
		6.31	100.00	630.50		
266+00.00	12.61				630.50	23.35
		17.18	29.58	508.04		
266+29.58	21.74				1,138.54	42.17
		12.23	70.42	860.88		
266+39.04	Culvert Center Line Station					
267+00.00	2.71				1,999.42	74.05
		1.36	100.00	135.50		
268+00.00	0.00				2,134.92	79.07

FILL VOLUME = **79.07** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

COMPENSATORY STORAGE VOLUME (Normal to 10 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\ldot\100063\Drain\Spreadsheets\[Floodplain Fill Calculations by XS station Trib to Hastings.xlsx]Sum
DATE: 2/15/2016

Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
263+00.00	0.00				0.00	0.00
		24.06	100.00	2,406.00		
264+00.00	48.12				2,406.00	89.11
		53.74	100.00	5,373.50		
265+00.00	59.35				7,779.50	288.13
		40.86	100.00	4,085.50		
266+00.00	22.36				11,865.00	439.44
		21.72	29.58	642.48		
266+29.58	21.08				12,507.48	463.24
		10.54	70.42	742.23		
266+39.04	Culvert Center Line Station					
267+00.00	0.00				13,249.70	490.73
		0.00	100.00	0.00		
268+00.00	0.00				13,249.70	490.73

FILL VOLUME = **490.73** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

Proposed Conditions

COMPENSATORY STORAGE VOLUME (10 YR to 100 YR)

JOB NO. 10-0063
PROJECT: US Route 45 North
LOCATION: Lake County, IL
FILE: N:\ldot\100063\Drain\Spreadsheets\[Floodplain Fill Calculations by XS station Trib to Hastings.xlsx]Sum
DATE: 2/15/2016

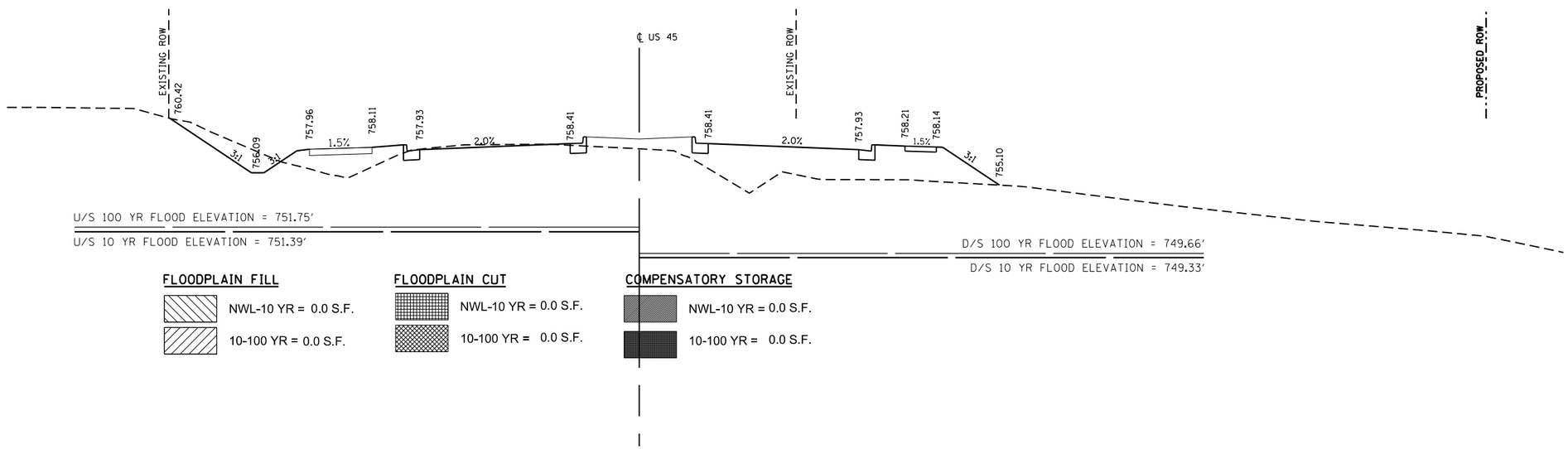
Natural Elevations
10-YR Elevation: 748.68
100-YR Elevation: 749.44

CROSS-SECTION (Sta.)	AREA (s.f.)	AVERAGE AREA (s.f.)	Δ DISTANCE (ft)	INCREMENTAL VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-ft)	CUMULATIVE VOLUME (cu-yd)
263+00.00	0.00				0.00	0.00
		6.13	100.00	613.00		
264+00.00	12.26				613.00	22.70
		12.62	100.00	1,261.50		
265+00.00	12.97				1,874.50	69.43
		6.49	100.00	648.50		
266+00.00	0.00				2,523.00	93.44
		0.00	29.58	0.00		
266+29.58	0.00				2,523.00	93.44
		0.00	70.42	0.00		
266+39.04	Culvert Center Line Station					
267+00.00	0.00				2,523.00	93.44
		0.00	100.00	0.00		
268+00.00	0.00				2,523.00	93.44

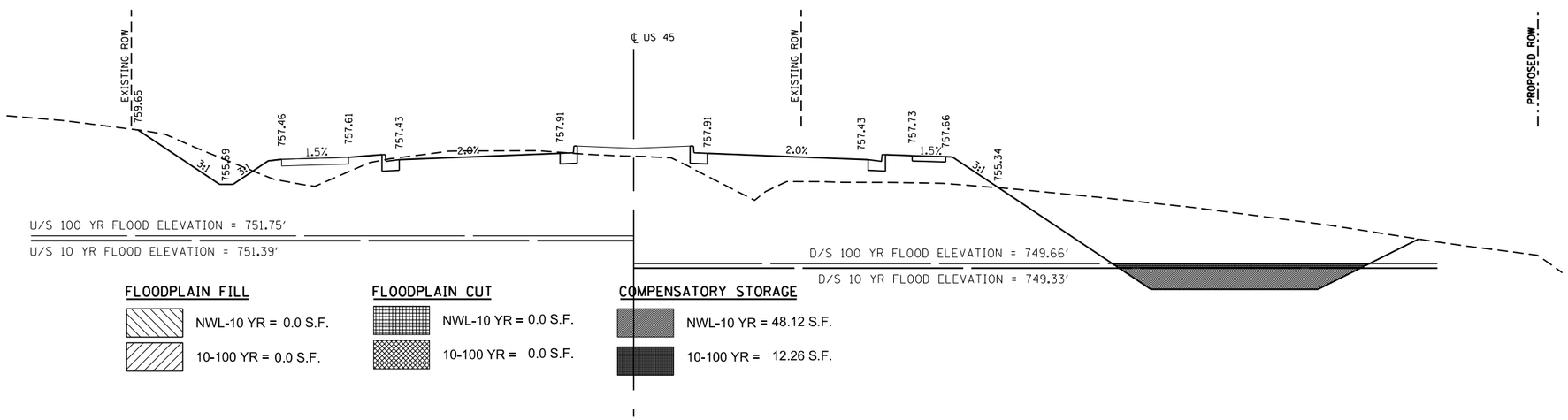
FILL VOLUME = **93.44** **cu-yd**

Calculated By: FDM 1/9/2018
Checked By:

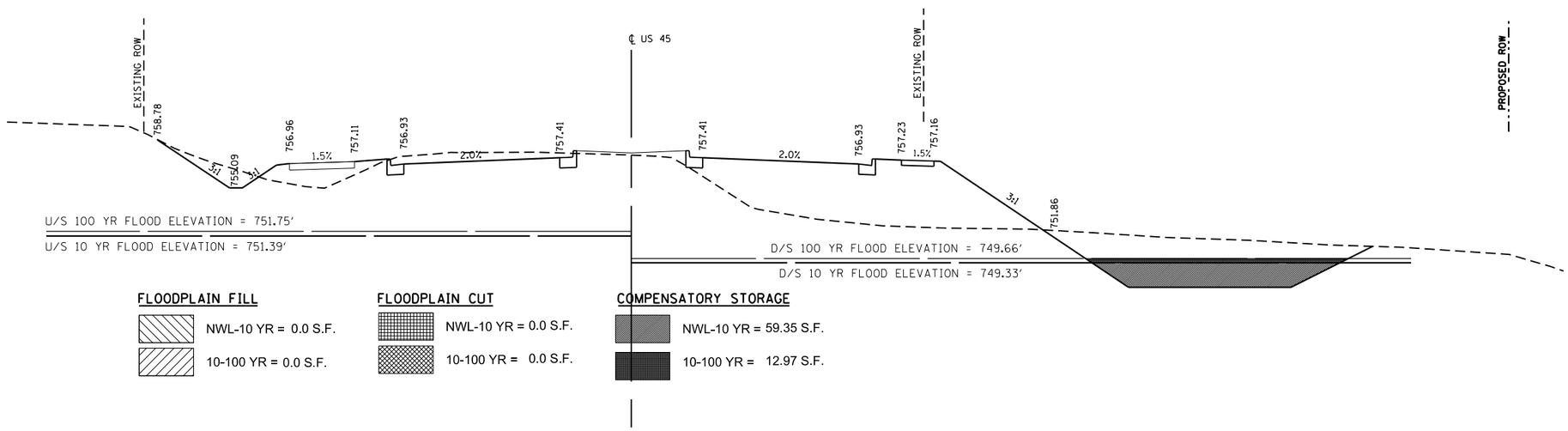
Roadway Cross Section 263+00
1:20 Scale



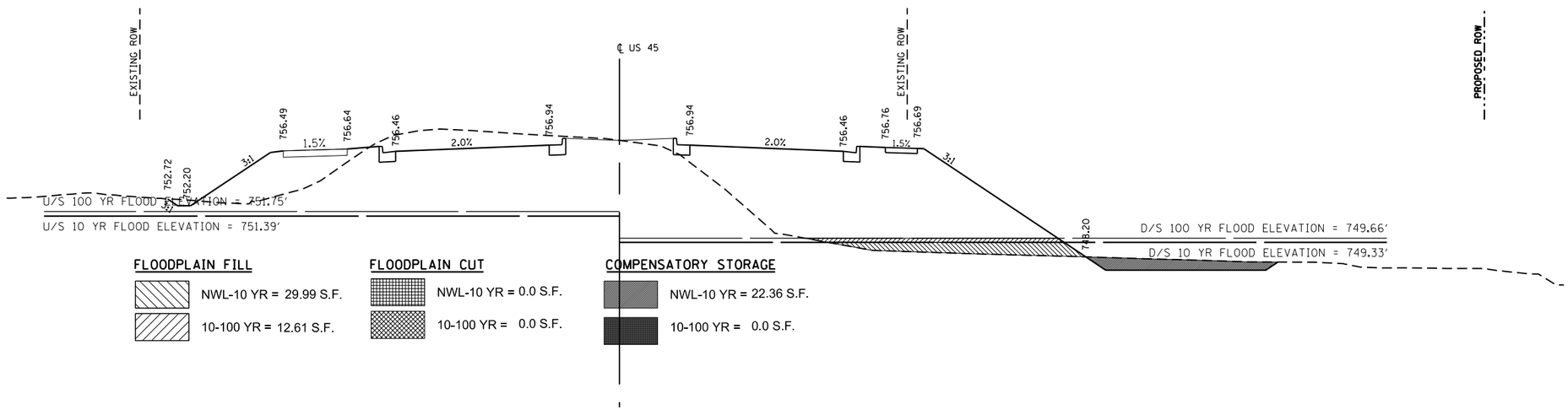
Roadway Cross Section 264+00 showing compensatory storage site.
1:20 Scale



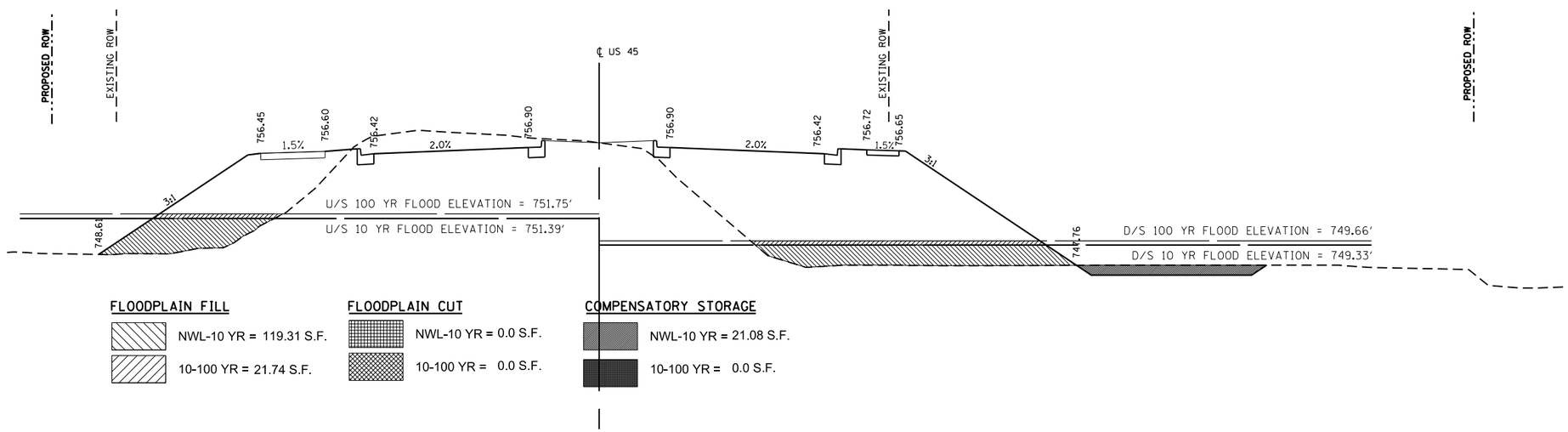
Roadway Cross Section 265+00 showing compensatory storage site.
1:20 Scale



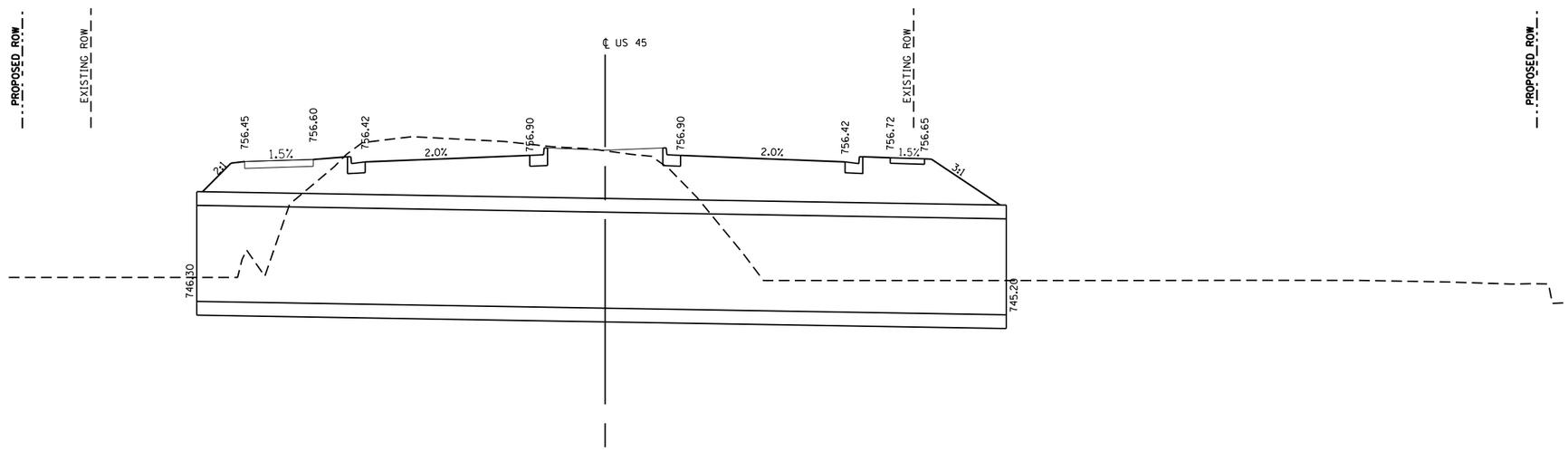
Roadway Cross Section 266+00 showing compensatory storage site.
1:20 Scale



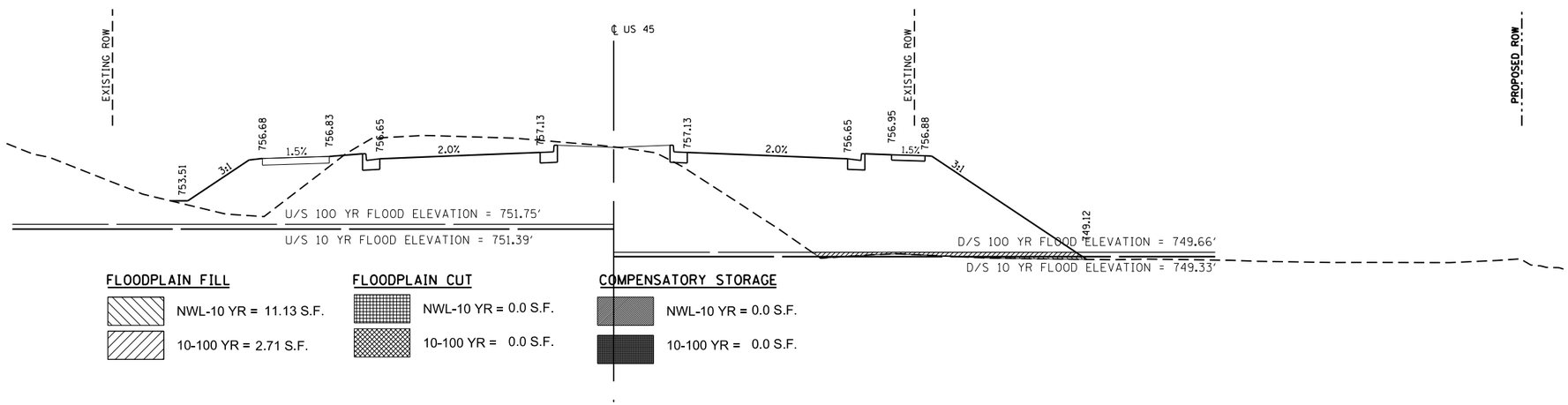
Roadway Cross Section 266+29.58 showing compensatory storage site.
1:20 Scale



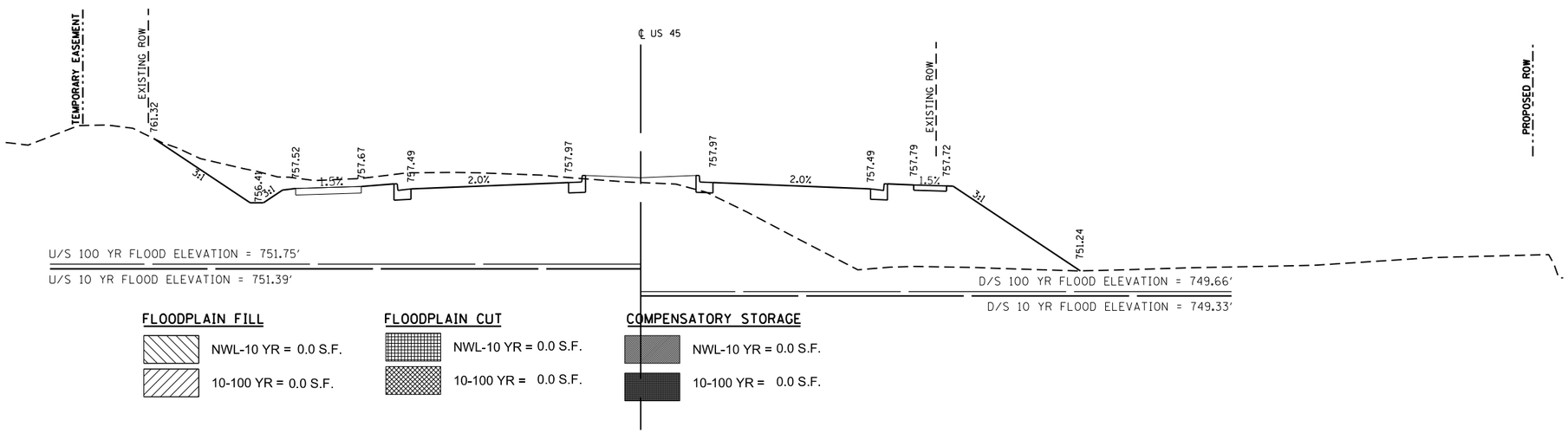
Roadway Cross Section 266+39.04
1:20 Scale



Roadway Cross Section 267+00
1:20 Scale



Roadway Cross Section 268+00
1:20 Scale



TAB E

5-00 Appendix E: Erosion and Sediment Control Data References

REQUIRED DATA	SOURCE LOCATION														
	LDS Exhibits				LDS Sections							LDS Appdx		Hydraulic	
	1-00A	1-00B	1-02A	2-00A	1-01	1-03	2-02	2-03	2-07	3-00	4-00	C	D	Report	Comment
Drainage patterns and areas	X	x					x	x	x	x	x		x		
Receiving waters	x	x	x	x			x	x	x	x	x		x		
Floodway and floodplain boundaries	x	x	x	x			x			x	x		x		
Identified areas of flooding															
Critical erosion and siltation areas															
Inlet(s) and Outlet(s)	X	x	x	x		x	x	x	x	x			x		
Off-site flow adjacent to site	x	x		x			x		x				x		
Bridge and culvert location & size	x	x	x	x		x	x		x				x		
Storm sewer and/or ditch system		x		x					x				x		
Subsurface drainage tile		x		x											
Detention facilities				x			x	x	x				x		
Existing erosion control facilities															
Compensatory storage area															
Potential erosion/scour problems															
Erosion/scour prevention measures															
High water elevation				x									x		
Normal water elevation				x									x		
Release rates								x					x		
Runoff coefficients													x		
Peak flows													x		
Velocities													x		
Commitments															

TAB F

5-0 Appendix F: Water Quality/Best Management Practices (BMPs) White Paper

Stormwater runoff will be collected through a system of storm sewers and conveyed to outside ditches and detention basins. Ditches extending more than 100 feet in length and vegetated will likely provide a reduction in suspended solids and heavy metals before discharge. The proposed conveyance of stormwater runoff into the detention basins provides an opportunity for settling of large sediment particles. The Village of Lindenhurst expressed desire to have the detention basins contain wetland characteristics and committed to investigate further in Phase II engineering when soils information is obtained. The detention basins are anticipated to retain a small portion of water to promote various types of vegetation. Further coordination with the local agencies will be required in Phase II to explore grading and vegetation options for the detention basins. The design intent is to meet the minimum requirements of IDOT and follow the Lake County Stormwater Management Commission standards where practical and feasible.

Additional right-of-way is proposed and is positioned near the outlets for stormwater BMPs. These BMPs will slow water velocity and allow settling and filtering of particulates. Vegetation on the right-of way will further remove pollutants through biological processes.