Cleveland Innerbelt Bridge
Gateway Roadway Package

DRAINAGE DESIGN REPORT

February 09, 2015

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REVISION HISTORY		
Revision	**Date**	**Comments**
--	January 7, 2011	Original report included with interim Gateway Roadway Submittal.
1	August 4, 2011	Report included with final Gateway Roadway Submittal.
2	September 30, 2011	Report to HDR for Final Compliance.
3	October 3, 2011	Report to ODOT for Final Submittal.
4	November 4, 2011	Report to HDR for Re-Submittal Final
5	November 17, 2011	Report to HDR for Final Compliance
6	December 1, 2011	Report to ODOT for Final Re-Submittal
7	May 15, 2012	Post-design update NDC 0052. Changes to Pond Pack output in Appendix G only.
8	May 17, 2012	Post-design update for NDC 0050. Updates to inlet spacing and storm sewer calculations (D-93, D-136) in Appendix I.
9	February 9, 2015	CDSS calculations updated to reflect As-Built conditions. ODOT requested CDSS calculations be updated to reflect As-Built conditions.

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Revised By: Kevin Monroe 02/09/2015
Checked By: Erica Johnson 02/09/2015

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Table of Contents

List of Figures

List of Tables

List of Appendices

Appendix D	Drainage Calculations - Canal Outfall
Appendix E	Drainage Calculations – Central Viaduct Outfall
Appendix F	Drainage Calculations – Commercial Parking Lot Combined Sewer Outfall
Appendix G	Drainage Calculations – Ontario Outfall/Tri –C Outfall
Appendix H	Drainage Calculations - E. 9th Street Outfall
Appendix I	Drainage Calculations – Locations of Pavement Reconstruction along Ontario St. and Carnegie Ave.
Appendix J	BL-Unit 1, 2, 3, and Ramp A5 Scupper Calculations
Appendix K	Roadway Partial Resurfacing BL-Drainage Spread Calculations
Appendix L	Wall I/Ramp A3 BU1500 (For information only)

Introduction

The purpose of this report is to describe and document the design criteria and procedures used to complete the final design of the drainage and stormwater management facilities for the Gateway portion of the Innerbelt Bridge Project. A detailed description is provided for the drainage and stormwater management system design for each of the seven major outfalls within this portion of the Project. Anticipated maintenance requirements are provided for drainage and stormwater treatment facilities within each outfall drainage area. Design calculations are provided in the Appendices to this report.

Project Area

The project area of the Innerbelt Bridge extends over a distance of approximately 1.7 miles, with about 1.0 mile on the east bank of the Cuyahoga River, and the remaining 0.7 miles on the west bank of the river. The area within the project limits, about 80 acres, lies entirely within the City of Cleveland's combined sewer area. More specifically, the project area lies within five different sewersheds (CSO-80, CSO-90, CSO-94, CSO 95 and CSO-235). The northernmost portion of the project area, on the east bank of the Cuyahoga River, drains to Combined Sewer Overflows (CSO's) 94 and 95, which discharge to Lake Erie. The remainder of the project area on the east bank of the river and the entire project area on the west bank of the river, drain to CSO's 80, 90 and 235, which discharge to the Cuyahoga River.

Roadway construction documents for the Innerbelt Bridge Project were prepared in three parts: (1) the E. 9th Street Construction Package which covered the new streets proposed for the Commercial region of the east bank project area, (2) the Gateway Construction Package which covered the mainline portion of the east bank project area, and (3) the Tremont Construction Package which covered the entire west bank project area. The Gateway portion of the project area consists of seven major drainage areas, or "outfalls", and numerous locations of pavement reconstruction on local streets.

Drainage and Stormwater Management Requirements

Both stormwater quantity and quality control requirements were established for the Innerbelt Bridge Project. Regarding stormwater quantity control, areas within the project limits could remain connected to the combined sewer system. However, peak flows and runoff volumes to the combined sewer system from major outfalls were limited according to requirements of ODOT and the Northeast Ohio Regional Sewer District (NEORSD).

For this project, ODOT required that the post-construction 5-, 10- and 25-year peak flow rates at any point in the existing combined sewer system be limited to pre-construction rates. The sewer district required that there be no increase in stormwater runoff volume discharged to any individual combined sewer overflow (CSO) area during their control storm event. To control stormwater quality for the project, post-construction Best Management Practices (BMPs) were required for all proposed storm-only sewer systems to which the project drains. It was also required that installation of new storm-only drainage systems be implemented to the greatest extent possible. Outfall peak discharge rates are shown in Table 2, and impacts on the affected CSO areas are shown in Table 3.

In general, the design criteria contained in Volume 2 of the ODOT L&D Manual were used for the drainage and stormwater management facilities. City of Cleveland standards were used to design the storm sewers for the local streets. ODOT Form LD-35, which contains specific drainage design criteria, was completed for the Innerbelt Bridge Project and is included in

this report as Appendix A. Specific spread requirements for roads in the Gateway Region are shown in Table 1.

All drainage and stormwater management facilities constructed under the Gateway Construction Package within the mainline right-of-way will be owned and maintained by ODOT. The new drainage facilities associated with local street reconstruction will be owned and maintained by the City of Cleveland.

Table 1

Spread Requirements for Roads in the Gateway Region

Road Name	No. of Lanes	Lane Width (feet)	Shoulder Width (feet)	Allowable Spread on Traveled Lane (feet)	Total Allowable Spread (feet)	Design Storm	ADT
I-90							
Mainline/Ultimate	5	12	Varies	0	Varies	10-year	71,000
Mainline/Bi-direct.	5	12	Varies	0	Varies	10-year	71,000
Ramp A3	1	16	6RT, 3LT	0	6, 3	10-year	--
Ramp A4	2	12	Varies	0	Varies	10-year	--
Ramp A5	2	12	Varies	0	Varies	10-year	--
Central Viaduct Way	2	13	0	6	6	2-year	1,000[1]
Carnegie Avenue	6	9-13	5	8	13	5-year	24,000
Ontario Street	7	10.5-13	13	8	21	5-year	33,200
E. 9th Street	5	12	0	8	8	5-year	32,300

[1] Estimate made by comparing to similar nearby roadways and considering the traffic that feeds the roadway.

East Bank Outfall

The East Bank Outfall is at the Cuyahoga River under the east side of the new Innerbelt Bridge. As shown on Figure 3, this is the outfall for 2.59 acres of the new bridge deck between Piers 4 and 8. The bridge deck scupper and downspout at Pier 5 will discharge directly to an extended dry detention basin, East Bank Detention Basin A, for stormwater quality control. This detention basin was also designed to discharge the Water Quality Volume over a 48-hour period. This detention basin will discharge to a new separate storm sewer that discharges to the river. Due to the close proximity to salt storage piles, the portion of this basin directly adjacent to Pier 5 will be lined with an impermeable geomembrane.

The scuppers and downspouts at Piers 7 and 8 will also discharge to a new separate storm sewer, which leads to another extended dry detention basin, East Bank Detention Basin B, for stormwater quality control. In addition, the scupper and downspout at Pier 6 will also discharge to this basin directly. This detention basin was designed to discharge the Water Quality Volume over a 48-hour period. This detention basin will discharge back into the new separate storm sewer.

Peak discharge rates from the East Bank Outfall are shown in Table 2. Drainage design calculations for this outfall are provided in Appendix B. Anticipated maintenance requirements for the drainage and stormwater management system for the East Bank Outfall are:

1. Routine inspection and cleaning of scuppers and storm sewer system.
2. Mowing around perimeter of detention basins if necessary.
3. Routine inspection of detention basins, removal of woody vegetation and cleaning of outlet structures.

W. 3rd Street Outfall

The W. 3rd Street Outfall, as shown in Figure 3, is the discharge from bridge deck scuppers located at Pier 10. These scuppers will drain to an extended dry detention basin that discharges to the existing separate storm sewer in W. 3rd Street. Pre- and Post-construction peak flow rates at this outfall location are shown in Table 2. Pre- and post-construction drainage area boundaries are shown in Figures 1 and 2, respectively. The proposed peak 5-, 10- and 25-year flow rates into the existing separate storm sewer system at this location are less than existing conditions and will not require detention. The extended dry detention basin will provide the required stormwater quality control for discharge to a separate storm sewer system.

Drainage design calculations for this outfall are provided in Appendix C. Anticipated maintenance requirements for the drainage and stormwater management system for the W. 3rd Street Outfall are:

1. Routine inspection and cleaning of scuppers and storm sewer system.
2. Mowing around perimeter of water quality/detention basin.
3. Routine inspection of detention basin, removal of woody vegetation and cleaning of outlet structure.

Canal Outfall

The Canal Outfall is at Canal Road and lies within CSO-235. Flows from these areas are regulated by E-25 having dry weather flows and portions of wet weather flows routed to CSO SLPS via E-26/Stones Levee Pump Station. Overflow will occur if pump station capacity is exceeded. Excess wet weather flow will be diverted to CSO 235 if side weir at E-24 is overtopped. Flows that go through SLPS will be directed to CSO-093/090 and are shown in Table 3 as part of a larger total project analysis. As shown on Figure 3, this is the outfall for 3.32 acres of the new bridge deck and existing area to Canal Road. There was a slight increase in area from the new bridge deck, and the proposed C value went down due to some buildings being removed on the south side of Canal Rd. The scuppers and downspouts at

Pier 11 will discharge to new catch basinS located outside of the new pavement of Canal Road. Pre- and post-construction peak flow rates at this outfall location are shown in Table 2. Pre- and post-construction drainage area boundaries are shown in Figures 1 and 3, respectively. There is no stormwater quality control BMP provided for the Canal Outfall because it discharges to the existing combined sewer system.

Drainage design calculations for the Canal Outfall are provided in Appendix D. Anticipated maintenance requirements for the drainage system for the Canal Outfall consist of routine inspection and cleaning of bridge scuppers and the storm sewer system.

Central Viaduct Outfall

As shown in Figure 2, the Central Viaduct Outfall drains 2.03 acres of the reconstructed local streets between Carnegie Avenue and the southeast side of the new Innerbelt Bridge. The existing area was 2.54 acres and portions of this is being routed to Ontario outfall by the new bridge and parts are going to the Commercial Parking Lot connection. The storm sewer system draining this area lies within CSO-093/CSO-90 drainage boundary, and will discharge to the existing combined sewer system. Flows from this area are regulated by E-24 with dry weather flows and portions of wet weather flow are routed to CSO-093, and excess wet weather flow is diverted to CSO-090 once E-24 weir is overtopped. A portion of the existing drainage area will be covered up by the proposed Innerbelt Bridge and taken to the Ontario outfall. This reduction in area leaves a net 23.9% reduction of runoff. Pre- and post-construction peak flow rates at this outfall location are shown in Table 2. Pre- and post-construction drainage area boundaries are shown in Figures 1 and 3, respectively. There is no stormwater quality control BMP provided for the Central Viaduct Outfall because it discharges to the existing combined sewer system.

Drainage design calculations for the Central Viaduct Outfall are provided in Appendix E. Anticipated maintenance requirements for the drainage system for the Carnegie Outfall consist of routine inspection and cleaning of bridge scuppers and the storm sewer system.

Commercial Parking Lot Combined Sewer Outfall

The Commercial Combined Sewer Outfall is lies within CSO-235. Flows from these areas are regulated by E-25 having dry weather flows and portions of wet weather flows routed to CSO SLPS via E-26/Stones Levee Pump Station. Overflow will occur if pump station capacity is exceeded. Excess wet weather flow will be diverted to CSO 235 if side weir at E-24 is overtopped. Flows that go through SLPS will be directed to CSO-093/090 and are shown in Table 3 as part of a larger total project analysis. As shown on Figure 4, this is the outfall for 0.70 acres of the new bridge deck, and a portion of a parking lot on the north side of Commercial Road. This area was going to drain onto the GCRTA property, but will know be routed through a storm sewer to the existing combined sewer along Commercial Road, so that no water outfalls onto GCRTA property. Since the area drained to Central Viaduct Outfall under existing conditions, no existing conditions were calculated for this new connection.

Drainage design calculations for the Commercial Parking Lot Combined Sewer Outfall are provided in Appendix F. Anticipated maintenance requirements for the drainage system for the Outfall consist of routine inspection and cleaning of bridge scupper and storm sewer system.

Ontario Outfall

The Ontario Outfall is at the southeast corner of the intersection of Ontario Street and Carnegie Avenue, and lies within CSO-093/CSO-90 drainage boundary, and will discharge to the existing combined sewer system. Flows from this area are regulated by E-24 with dry weather flows and portions of wet weather flow are routed to CSO-093, and excess wet weather flow is diverted to CSO-090 once E-24 weir is overtopped. As shown on Figure 4, this is the outfall for 2.99 acres of the reconstructed I-90 roadway. The increase in area is from the new bridge bringing more area to this location from the GCRTA property, Central Viaduct & CSO-235 area around Commercial Parking Lot. Tri-C parking lot is also tributary to the Ontario system, and has addition parking being added during construction of Ramp A4. The new storm sewers draining this roadway area will discharge to an underground

detention facility consisting of a network of 72" corrugated steel spiral rib conduit. The outlet from this detention facility will discharge to the existing 15" sewer at the east side of this site. Pre- and post-construction peak flow rates without detention at this outfall location are shown in Table 1. Pre- and post-construction drainage area boundaries are shown in Figures 2 and 4, respectively. The new detention facility will provide 0.35 acre-feet of underground storage to limit post-construction peak flow rates in the existing combined sewer system to no more than the pre-construction rates. CSO volume for CSO-90 is evaluated by adding the increased area for Ontario & Tri-C outfalls, but removing the Commercial, Canal, and Central Viaduct drainage. This results in a net decrease to CSO-90 as seen in Table 3 during wet weather events. There is no stormwater quality control BMP provided for the Ontario Outfall because it discharges to the existing combined sewer system. However, runoff will be pretreated by structures with sumps and bar screens prior to entering the underground detention facility to prevent blockage from accumulated debris, and to minimize the frequency of cleaning. Drainage design calculations for the Ontario Outfall are provided in Appendix G. Anticipated maintenance requirements for the drainage and stormwater management system for the Ontario Outfall are:

1. Routine inspection and cleaning of the storm sewer system including the two pretreatment structures.
2. Landscape maintenance above and in the vicinity of the underground detention facility.
3. Routine inspection of the underground detention facility.
4. Cleaning (jet wash) as necessary of the underground detention facility.

E. 9th Street Outfall

The E. 9th Street Outfall is at the southeast corner of the intersection of E. 9th Street and Carnegie Avenue, and lies within CSO-94. As shown on Figure 7, this is the outfall for 1.76 acres of the reconstructed I-90 roadway. The existing area to this outfall was only 0.75 acres from the existing on-ramp, but the additional bridge pavement from the new bridge is creating the increase which in runoff and volume which will be offset by detention. The new

storm sewers draining this roadway area will discharge to a dry detention basin. The outlet from this detention facility will discharge to the existing 12" sewer that connects the E. 9th Street sewer main. Pre- and post-construction peak flow rates at this outfall location are shown in Table 2. Pre- and post-construction drainage area boundaries are shown in Figures 2 and 4, respectively. The new detention facility will provide 0.42 acre-feet of storage to limit post-construction peak flow rates in the existing combined sewer system to no more than the pre-construction rates. Orange/14th Street reconstruction areas were modeled with the 9th Street outfall since it is tributary to the 96" sewer main. Areas were removed from Orange/14th to make up for the increase in area to the 9th Street Outfall. There is no stormwater quality control BMP provided for the E. 9th Street Outfall because it discharges to the existing combined sewer system.

Three conditions were evaluated for the 9th Street Detention Basin. The first was for CCG1 contract where a proposed storm sewer from the new I-90 WB lanes is connected to the proposed detention basin. This storm sewer has 0.70 acre of pavement and 0.27 acres of steep sloped grass tributary to it. Calculations were also provided for CCG3 conditions where the grassed area will be converted into pavement shown in Appendix H for future I-90 WB lanes. The third calculation shows a temporary connection from the existing I-90 sag to the proposed storm sewer. Due to the construction phasing and sequencing, this temporary connection will need to take three barrier inlets off an existing No. 4 brick sewer (33") and route it to the 9th Street basin before the 33" is grouted. The fill height on the pipe will be exceeded with the construction of Walls G & H. This connection will remove 1.13 acres of pavement that was tributary to CSO-090 and route it to CSO-094. The detention basin will be constructed with the storm sewer so that flow rates will be reduced to existing rates for CCG1, CCG3, and the temporary connection. An increase in CSO volume to CSO-094 during this connection, and reduction in CSO-090 will occur between construction phases 3 and 6 which is to last one year. Once traffic is moved to the new bridge (BL16/17) over Ontario, the existing 1.13 acres will be able to sheet flow down to an existing grassed loop area and enter back into the CSO-090 sewer system through an area inlet.

Additional outfalls that lie within CSO 94 and are nearby to the proposed E9th detention facility are CB UNK, CB-14323, and CB-14387. These calculations are shown in Tables 2-4. Table 4 also includes the bi-directional condition for CB-14323 in which case the PCB allows for additional bridge flow to enter this outlet.

Drainage design calculations for the E. 9th Street Outfall are provided in Appendix H. Anticipated maintenance requirements for the drainage and stormwater management system for the E. 9th Street Outfall are:

1. Routine inspection and cleaning of the storm sewer system including the two outlet structures.
2. Landscape maintenance of the site.

Locations of Pavement Reconstruction

In addition to the proposed drainage system for the major outfalls from the Gateway Region, there are 14 relatively small areas of pavement reconstruction along Carnegie and Ontario, as shown in Figure 6. Since these areas have similar runoff coefficients for existing and proposed conditions, and drainage areas were not changing CSO boundaries; only the proposed conditions were calculated with CDSS for spread/SS requirements. These areas are tributary to CSO-093/CSO-90's, and will discharge to the existing combined sewer system. Flows from this area are regulated by E-24 with dry weather flows and portions of wet weather flow are routed to CSO-093, and excess wet weather flow is diverted to CSO-090 once E-24 weir is overtopped. The drainage calculations for these areas of pavement reconstruction are shown in Appendix I. Drainage boundaries, areas, and runoff coefficients used in the calculations are shown in Figure 6.

Table 2

Outfall Peak Discharge Rates

Drainage Area ID	Existing Drainage Area (acres)	Proposed Drainage Area (acres)	Existing Coef. of Runoff, C	Prop. Coef. of Runoff, C	Inc. in C	Exist. Time of Conc. (min)	Prop. Time of Conc. (min)	Intensity, I, (in/hr)						Peak Flow, Q (cfs)						Receiving Pipe	
								Existing			Proposed			Existing			Proposed				
								5-yr	10-yr	25-yr	5-yr	10-yr	25-yr	5-yr	10-yr	25-yr	5-yr	10-yr	25-yr	Size	Cap. (cfs)
East Bank Outfall[1]	--	2.59	--	0.90	--	--	18.70	--	--	--	--	3.73	4.47	--	--	--	--	8.7	10.4	--	--
W. 3rd St. Outfall[1,2]	3.20	3.70	0.74	0.66	-0.08	4.07	10.20	5.75	6.57	7.51	4.04	4.55	5.22	13.66	15.61	17.85	9.88 - 0.04	11.13 - 0.12	12.77 - 0.51	--	--
Canal Outfall[1,3]	3.29	3.32	.85	.78	-0.07	5.89	5.89	6.04	6.91	7.63	6.04	6.91	7.63	16.87	19.29	21.33	15.58 - 2.40	17.82 - 2.80	19.70 - 3.40	--	--
Cen. Via. Outfall[3]	2.54	2.03	.86	.82	-0.04	7.61	8.33	4.88	5.53	6.34	4.70	5.32	6.10	10.72	12.14	13.92	7.80	8.83	10.12	--	--
Commercial Parking Lot Outfall[3]	--	0.70	--	0.83	0.83	--	3.00	--	--	--	6.01	6.89	7.86	--	--	--	3.51	4.02	4.59	36"	22
Ontario Outfall[3,4]	1.45	2.99	.85	.88	.03	10.80	8.65	--	--	--	--	--	--	--	--	--	3.23	3.57	4.06	--	--
E. 9th St. Outfall[3,4]	0.85	1.76	0.57	.70	.13	3.72	5.88	--	--	--	--	--	--	---	---	---	4.58	5.67	8.53	--	--
Tri-C Outfall[3]	0.85	1.21	0.83	0.85	.02	5.80	5.11	5.32	6.06	6.94	5.49	6.27	7.16	3.75	4.27	4.89	5.65	6.45	7.37	33"	18
Pier 7B[3]	0.25	0.39	.90	.81	-.09	4.58	7.04	5.62	6.42	7.34	5.02	5.70	7.04	1.27	1.45	1.66	1.58	1.80	2.22	12"	3
CB UNK[3]	1.08	0.98	0.60	0.86	0.16	6.1	6.1	5.25	5.98	6.84	5.25	5.98	6.84	3.4	3.9	4.4	4.4	5.0	5.8	12"	3
CB 13487[3]	0.92	0.53	0.79	0.70	-.09	6.3	6.7	5.20	5.92	6.77	5.10	5.80	6.64	3.70	4.30	4.90	1.90	2.10	2.40		
CB 13423[3]	0.56	0.91	0.80	0.84	.04	3.2	5.7	5.96	6.83	7.79	5.35	6.09	6.97	2.70	3.10	3.50	4.10	4.60	5.30	12"	3

[1]Two proposed flows shown, first is overall area tributary, second is connection flow
[2]Discharges to an existing storm sewer.
[3]Discharges to an existing combined sewer.
[4]Results obtained from PondPack Software.

Table 3 - Impacts on CSO Areas

Combined Sewer System ID[1]	Project Drainage Area ID	Existing Drainage Area (A in acres)	Proposed Drainage Area (A in acres)	Existing Coefficient of Runoff (C)	Proposed Coefficient of Runoff (C)	Existing C x A	Proposed C x A	Percent Change in Runoff Volume
CSO-235	Canal Outfall	3.29	3.32	0.85	0.78	2.80	2.59	-7.5%
	Commercial Combined Sewer System[1]	6.57	3.28	0.77	0.79	5.06	2.59	-48.8%
	Commercial Parking Lot	--	0.70	--	0.83	--	0.58	New Connection
	Total	**9.86**	**7.30**	**0.80**	**0.79**	**7.86**	**5.76**	**-26.7%**
CSO-90[2]	Canal Outfall	3.29	3.32	0.85	0.78	2.80	2.59	-7.5%
	Central Viaduct Outfall	2.54	2.03	.86	.82	2.18	1.66	-23.9%
	Commercial Parking Lot	--	0.70	--	0.83	--	0.58	New Connection
	Ontario Outfall	1.45	2.99	0.85	0.88	1.23	2.63	122.8%
	Tri-C Parking Lot	0.85	1.21	0.83	0.85	0.71	1.03	45.1%
	Pier 7B	0.25	0.39	0.90	0.81	0.23	0.32	-60.9%
	Commercial Combined Sewer System[1]	6.57	3.28	0.77	0.79	5.06	2.59	-48.8%
	E. 22nd Street	0.76	0.79	0.65	0.69	0.50	0.55	10.0%
	Total	**15.71**	**14.71**	**0.81**	**0.81**	**12.70**	**11.95**	**-5.91%**
CSO-94	E. 9th St. Outfall	0.75	1.76	0.57	0.70	0.43	1.23	186.1%
	E. 9th St. Outfall Temp[4]	0.75	2.89	0.57	0.78	0.43	2.25	423.0%
	CB UNK	1.08	0.98	0.60	0.86	0.65	0.84	30.1%
	CB 13487	0.92	0.53	0.79	0.70	0.73	0.37	-49.0%
	CB 13423	0.56	0.91	0.80	0.84	0.45	0.76	70.6%
	14th & Orange[3]	9.93	8.46	0.71	0.68	7.05	5.75	-18.4%
	Total	**13.24**	**12.64**	**0.70**	**0.71**	**9.30**	**8.96**	**-3.6%**
	Total (Temp. Connection at D-EXA50)	**10.68**	**13.11**	**0.70**	**0.73**	**9.30**	**9.99**	**7.4%**

[1]From Table 2, Drainage Design Report, E. 9th Street Roadway Package.
[2]CSO-235 system drains to CSO-90 system.
[3]Area diverted to CSO-94 from CSO-235.
[4]Area included in temporary total only.

Table 4 - Pre & Post Flow Calculations

HNTB		Made by: PNS			Date:		11/3/2011			
		Checked by: BH			Date:		11/3/2011			
Job Number: 49633										
Cleveland Innerbelt Gateway Roadway Pre and Post Drainage Areas and Runoff Coefficients										
	CN, Curve Number	79	98	98	74	77	94			
	C, Rational Coefficient	0.7	0.9	0.9	0.3	0.5	0.8			
	Terrain Description	Fair cond. ROW grass	Pavement	Parking Lot	grass with mild slope	Moderate Slope	Industrial/ Commercial	Area	CN	C
Drainage Area Outfall	**Canal Combined Sewer Outfall Pre EX MH 9925**	0.05	1.65				1.59	3.29	95.76	0.85
	Canal Combined Sewer Post EX MH 9925	0.05	1.70		0.48		1.09	3.32	92.93	0.78
	9th St Combined Sewer Outfall Pre EX-6820	0.08	0.28		0.39			0.75	83.56	0.57
	9th St Combined Sewer Outfall Post EX-6820 CCG1	0.27	0.99		0.50			1.76	88.27	0.70
	9th St Temporary Connection	0.27	2.12		0.50			2.89	92.07	0.78
	Existing Scupper Discharge Point EX-39 CB PIER 7B		0.25					0.25	98.00	0.90
	Proposed Discharge Point EX-39 CB PIER 7B	0.10	0.25			0.04		0.39	90.97	0.81
	Ontario Combined Sewer Outfall Pre D8025		0.82		0.63			1.45	87.57	0.85
	Ontario Combined Sewer Outfall Post D8025	0.27	2.69		0.03			2.99	96.04	0.88
	Tri - C Pre EX-1018		0.75		0.10			0.85	95.18	0.83
	Tri - C Post EX-1018		1.11		0.10			1.21	96.02	0.85
	3rd St Storm Sewer Outfall Pre EX-9305		2.36		0.84			3.20	91.69	0.74
	3rd St Storm Sewer Outfall Post EX-9305		2.23		1.48			3.70	88.42	0.66
	Central Viaduct Way Existing MH 8973		2.39		0.15			2.54	96.58	0.86
	Central Viaduct Way Proposed MH 8973		1.75		0.28			2.03	94.69	0.82
	Commercial Parking Lot Post EX-18020	0.24	0.46					0.70	91.53	0.83
	UNK-PRE	0.36	0.44		0.28			1.08	66.26	0.60
	UNK-POST	0.19	0.79					0.98	94.32	0.86
	CB INLET 13487 PRE	0.53	0.39					0.92	87.10	0.79
	CB INLET 13487 POST	0.53						0.53	79.00	0.70
	CB INLET 13423 PRE	0.28	0.28					0.56	88.50	0.80
	CB INLET 13423 POST	0.28	0.63					0.91	92.15	0.84
	CB INLET 13423 POST BIDIRECTIONAL	0.28	0.82					1.10	93.16	0.85

Table 4 - Pre & Post Flow Calculations (continue)

HNTB	Made by: PNS	Date: 11/03/2011													
	Checked by: BAH	Date: 11/03/2011													
Job Number: 49633															

Cleveland Innerbelt Gateway-Roadway Pre and Post Drainage Areas and Runoff Coefficients: TC CALCULATION

Analysis Condition	EXISTING CS	PROPOSED STORM SEWER	Temporary Connection	Existing CS	Proposed to EX CS	Existing Scupper Discharge Point EX-39 CB	Proposed Discharge Point EX-39 CB	Existing CS	Proposed to EX CS	Existing SS	Proposed to EX SS	Existing CS	Proposed to EX CS	Existing CS	Commerical Parking Lot Post
Outfall Name	9th St Outfall	9th St Outfall	9th St Outfall	Ontario Outfall	Ontario Outfall	Pier 7B	Pier 7B	Tri-C Parking Lot	Tri-C Parking Lot	3rd St Outfall D9305	3rd St Outfall D9305	CV Outfall D8973	CV Outfall D8973	EX - MH 9925	Ex-10820
Sheetflow	GRASS					pavement	grass					pavement	pavement	GRASS	pavement
Runoff Coeffiecient	0.70					0.90	0.70					0.90	0.90	0.70	0.90
length, ft (<100)	17.00					69.00	87.00					100.00	86.00	42.00	26.00
dz, ft	2.00					1.10	6.61					1.00	1.70	12.00	1.04
slope	0.12					0.016	0.076					0.01	0.02	0.29	0.04
Tt, min	1.31					2.56	3.42					3.60	2.66	1.53	1.16
Sheetflow	Pavement	Pavement	Pavement	Pavement	Pavement			Pavement	Pavement	Pavement	Pavement			GRASS	
Runoff Coeffiecient	0.90	0.90	0.90	0.90	0.90			0.90	0.90	0.90	0.90			0.70	
length, ft (<100)	83.00	30.00	64.00	100.00	100.00			100.00	100.00	100.00	10.00			43.00	
dz, ft	6.00	1.20	1.20	1.75	4.00			1.10	1.10	3.00	0.05			2.00	
slope ft/ft	0.07	0.04	0.02	0.02	0.04			0.01	0.01	0.03	0.01			0.05	
Tt, min	1.70	1.24	2.34	3.00	2.27			3.49	3.49	2.50	1.43			2.83	
Shallow Concentrated	Grass Row	Grass Row	Paved Shoulder	GUTTER FLOW	GUTTER FLOW	GUTTER FLOW	Grass	GUTTER FLOW	GUTTER FLOW	Gutter Flow	Gutter Flow	PAVEMENT	Gutter	PAVEMENT	Gutter
length, ft	88.00	400.00	500.00	1108.00	582.00	173.00	20.00	200.00	227.00	27.00	685.00	127.00	247.00	42.00	181.00
dz, ft	7.00	5.00	6.00	15.00	4.00	0.85	8.00	1.00	3.00	0.50	3.19	1.00	1.25	0.10	6.88
slope %	7.95	1.25	1.20	1.35	0.69	0.49	40.00	0.50	1.32	1.85	0.46	0.79	0.51	0.24	3.80
Intercept Coefficient, k	0.457	0.457	0.620	0.620	0.620	0.620	0.457	0.620	0.620	0.620	0.620	0.619	0.619	0.619	0.619
avg velocity, ft/s	4.23	1.68	2.23	2.37	1.69	1.43	9.48	1.44	2.34	2.77	1.39	1.80	1.44	0.99	3.96
Tt, min	0.35	3.98	3.74	7.80	5.75	2.02	0.04	2.32	1.62	0.16	8.23	1.17	2.85	0.71	0.76
Shallow Concentrated															
length, ft															
dz, ft															
slope															
Intercept Coefficient, k															
avg velocity, ft/s															
Tt, min															
Channel flow	GRASS SWALE	STORM SEWER	STORM SEWER		STORM SEWER		GRASS SWALE			STORM SEWER	STORM SEWER	STORM SEWER	STORM SEWER	STORM SEWER	STORM SEWER
side slope, X:1	4.00						3.00								
side slope, X:1	3.00						3.00								
bank full depth, ft	0.60	flowing full	flowing full		flowing full		0.60			flowing full	flowing full	flowing full	flowing full	flowing full	flowing full
dz, ft	2.00	20.00	12.00		27.00		0.41								
length, ft	44.00	444.00	458.00		452.00		170.00			338.00	470.00	610.00	605.00	547.00	428.00
manning's, n	0.070	0.015	0.015		0.015		0.040			0.015	0.015	0.015	0.015	0.015	0.015
cross-sectional area, ft^2	1.26	18 in average	12 in average		18 in average		1.08			15 in average	15 in average	18 in average	18 in average	24 in average	12 in
wetted perimeter, ft	4.37						3.79								
hydraulic radius, ft	0.29						0.28								
slope ft/ft	0.05	0.05	0.03		0.06		0.0024			1.00	1.00	0.01	0.01	0.03	0.06
velocity, ft/s	1.98	11.20	13.20		12.00		0.79			4.00	4.00	3.58	3.58	11.00	9.00
Tt, min	0.37	0.66	0.58		0.63		3.59			1.41	1.96	2.84	2.82	0.83	0.79
Total Tc, minimum 3 minute	3.72	5.88	6.65	10.80	8.65	4.58	7.04	5.80	5.11	4.07	11.62	7.61	8.33	5.89	2.71
Area, acres	0.75	1.76	2.89	1.45	2.99	0.25	0.39	0.85	1.21	3.20	3.70	2.54	2.03	3.29	0.70
C weighted	0.57	0.70	0.78	0.85	0.88	0.90	0.81	0.83	0.85	0.74	0.66	0.86	0.82	0.85	0.83
Intesities, in/hr	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD
I 5	5.83	5.30	5.11	4.17	4.62	5.62	5.02	5.32	5.49	5.75	4.04	4.88	4.70	6.04	6.01
I 10	6.68	6.04	5.81	4.70	5.23	6.42	5.70	6.06	6.27	6.57	4.55	5.53	5.32	6.91	6.89
I 25	7.62	6.91	6.65	5.39	6.00	7.34	7.04	6.94	7.16	7.51	5.22	6.34	6.10	7.63	7.86
Flows, cfs - NEORSD															
Q5	2.50	6.52	11.48	5.14	12.10	1.27	1.58	3.75	5.65	13.66	9.88	10.72	7.80	16.87	3.51
Q10	2.86	7.43	13.06	5.79	13.70	1.45	1.80	4.27	6.45	15.61	11.13	12.14	8.83	19.29	4.02
Q25	3.26	8.50	14.94	6.64	15.71	1.66	2.22	4.89	7.37	17.85	12.77	13.92	10.12	21.33	4.59
		*view pondpack	*view pondpack		*view pondpack										
		for reduced flows	for reduced flows		for reduced flows										

Table 4 - Pre & Post Flow Calculations (continue)

HNTB	Made by:						
	Checked by: BH	11/3/2011					
Job Number: 49633							
E9th St Pre/Post calcs taken from Bridge 7 and 8 Drainage Report							
Analysis Condition	UK PRE	UK POST	CB INLET 13487 PRE	CB INLET 13487 POST	CB INLET 13423 PRE	CB INLET 13423 POST	CB INLET 13423 POST BIDIRECTIONAL
Outfall Name							
Sheetflow	Pavement	Pavement	Pavement	Pavement	Pavement	Pavement	Pavement
Runoff Coeffiecient	0.900	0.900	0.900	0.900	0.900	0.900	0.900
length, ft (<100)	240.000	240.000	225.000	170.000	78.000	225.000	360.000
dz, ft	3.000	3.000	4.000	1.750	3.000	4.000	6.000
slope	0.013	0.013	0.018	0.010	0.038	0.018	0.017
Tt, min	5.177	5.177	4.458	4.649	2.029	4.458	5.761
Sheetflow					GRASS		
Runoff Coeffiecient					0.900		
length, ft (<100)					12.000		
dz, ft					2.000		
slope					0.167		
Tt, min					0.488		
Shallow Concentrated							
length, ft							
dz, ft							
slope							
Intercept Coefficient, k							
avg velocity, ft/s							
Tt, min							
Shallow Concentrated							
length, ft							
dz, ft							
slope							
Intercept Coefficient, k							
avg velocity, ft/s							
Tt, min							
Channel flow	GUTTER	GUTTER	GUTTER		GRASS SWALE	GUTTER	
side slope, X:1	0.010	0.010	0.010		6.000	0.010	
side slope, X:1	62.500	62.500	25.000		3.000	25.000	
bank full depth, ft	0.120	0.120	0.200		0.250	0.200	
dz, ft	0.750	0.750	1.500		15.000	3.400	
length, ft	45.000	45.000	71.000		128.000	192.000	
manning's, n	0.015	0.015	0.015		0.040	0.015	
cross-sectional area, ft^2	0.450	0.450	0.500		0.281	0.500	
wetted perimeter, ft	7.621	7.621	5.204		2.311	5.204	
hydraulic radius, ft	0.059	0.059	0.096		0.122	0.096	
slope	0.017	0.017	0.021		0.117	0.018	
velocity, ft/s	1.945	1.945	3.030		3.131	2.774	
Tt, min	0.386	0.386	0.391		0.681	1.154	
Channel flow	CONCRETE SWALE	CONCRETE SWALE	GRASS SWALE	GRASS SWALE		PIPE FLOW	PIPE FLOW
side slope, X:1	2.000	2.000	4.000	4.000			
side slope, X:1	4.000	4.000	4.000	4.000			
bank full depth, ft	1.000	1.000	1.000	1.000		1.250	1.250
dz, ft	1.000	1.000	0.650	1.050		19.000	19.000
length, ft	77.000	77.000	140.000	206.000		73.000	73.000
manning's, n	0.015	0.015	0.040	0.040		0.015	0.015
cross-sectional area, ft^2	3.000	3.000	4.000	4.000			
wetted perimeter, ft	6.359	6.359	8.246	8.246			
hydraulic radius, ft	0.472	0.472	0.485	0.485			
slope	0.013	0.013	0.005	0.005		0.260	0.260
velocity, ft/s	6.860	6.860	1.567	1.642		30.000	30.000
Tt, min	0.187	0.187	1.489	2.091		0.041	0.041
Channel flow	GRASS SWALE	GRASS SWALE					
side slope, X:1	4.000	4.000					
side slope, X:1	4.000	4.000					
bank full depth, ft	1.000	1.000					
dz, ft	1.750	1.750					
length, ft	76.000	76.000					
manning's, n	0.040	0.040					
cross-sectional area, ft^2	4.000	4.000					
wetted perimeter, ft	8.246	8.246					
hydraulic radius, ft	0.485	0.485					
slope	0.023	0.023					
velocity, ft/s	3.490	3.490					
Tt, min	0.363	0.363					
Total Tc, min	6.1	6.1	6.3	6.7	3.2	5.7	5.8
Area, acres	1.080	0.980	0.918	0.527	0.560	0.910	1.100
C weighted	0.60	0.86	0.79	0.70	0.80	0.84	0.85
Intesities, in/hr	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD	NEORSD
I 5	5.249	5.249	5.200	5.102	5.961	5.348	5.323
I 10	5.977	5.977	5.918	5.800	6.831	6.094	6.065
I 25	6.837	6.837	6.771	6.639	7.794	6.969	6.936
Flows, cfs							
Q5	3.4	4.4	3.7	1.9	2.7	4.1	5.0
Q10	3.9	5.0	4.3	2.1	3.1	4.6	5.7
Q25	4.4	5.8	4.9	2.4	3.5	5.3	6.5

$date$ $time$
Model: $model$
File: $file$

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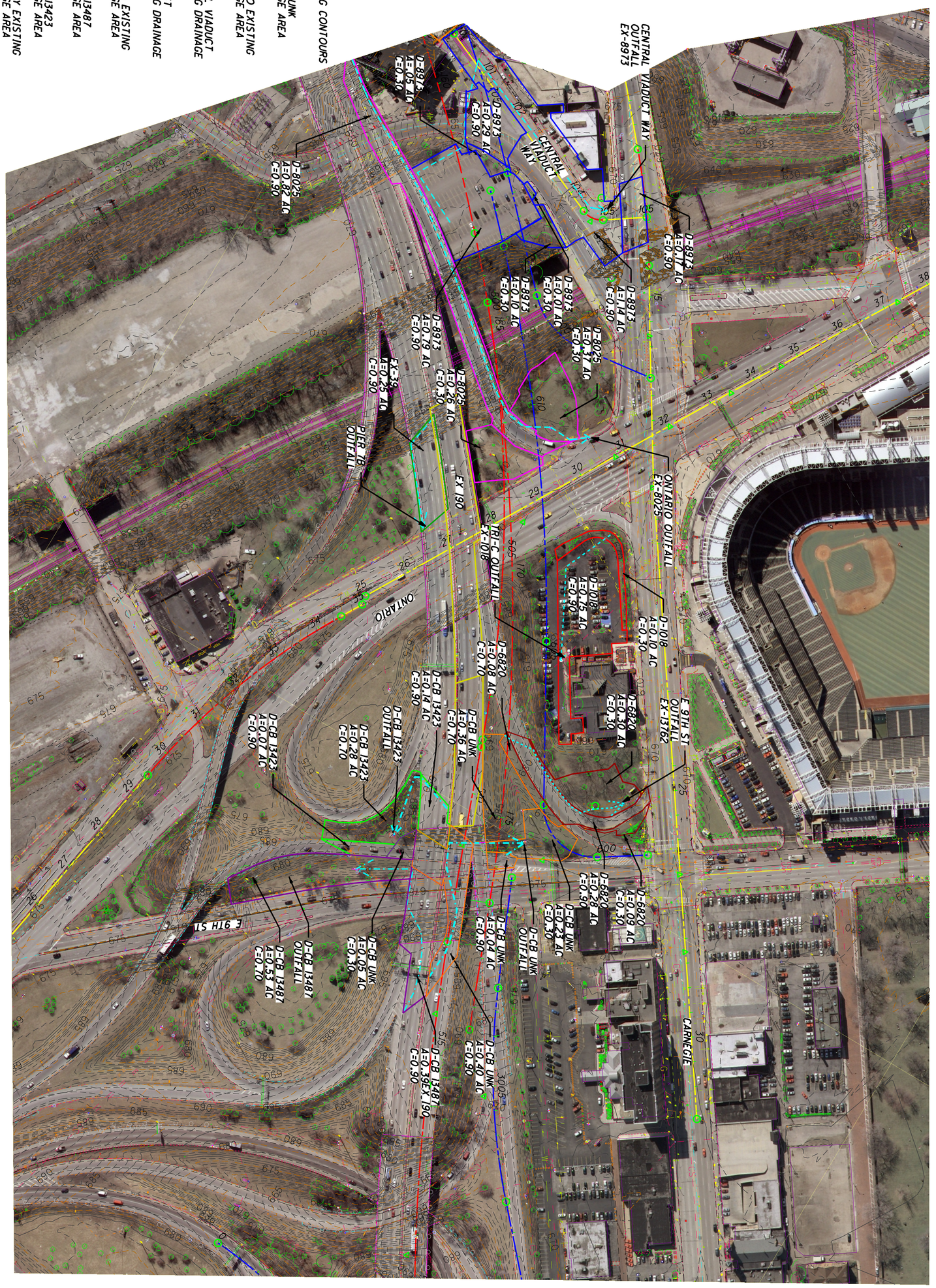
CHECK PRINT (INITIAL & DATE)	CHECKED BY:	CORRECTED BY:
MADE BY:	BACKCHECKED BY:	VERIFIED BY:

DESIGNED JSB CHECKED PNS	0 50 100 200 HORIZONTAL SCALE IN FEET	CLEVELAND'S INNERBELT BRIDGE I-90 OHIO DEPARTMENT OF TRANSPORTATION	DESIGN AGENCY WALSH CONSTRUCTION HNTB	NO.	REVISIONS	DATE
9 / 1	DWG. NO. AM-0-001 CUY-90-14.90	FIGURE 1 EXISTING DRAINAGE AREA MAP 3RD STREET & CANAL ROAD				

$date$ $time$
Model: $model$
File: $file$

(TO BE TURNED OFF AT AFC SUBMITTAL)

CHECK PRINT (INITIAL & DATE)	CHECKED BY:	CORRECTED BY:
MADE BY:	BACKCHECKED BY:	VERIFIED BY:



DESIGNED	0 100		CLEVELAND'S INNERBELT BRIDGE 90 OHIO DEPARTMENT OF TRANSPORTATION	DESIGN AGENCY WALSH CONSTRUCTION HNTB	NO.	REVISIONS	DATE
JSB	50 200						
CHECKED	HORIZONTAL SCALE IN FEET						
PNS							
6 2	DWG. NO. AM-002	CUY-90-14.90	FIGURE 2 EXISTING DRAINAGE AREA MAP CVW, ONTARIO, TRI C, & E. 9TH ST.				

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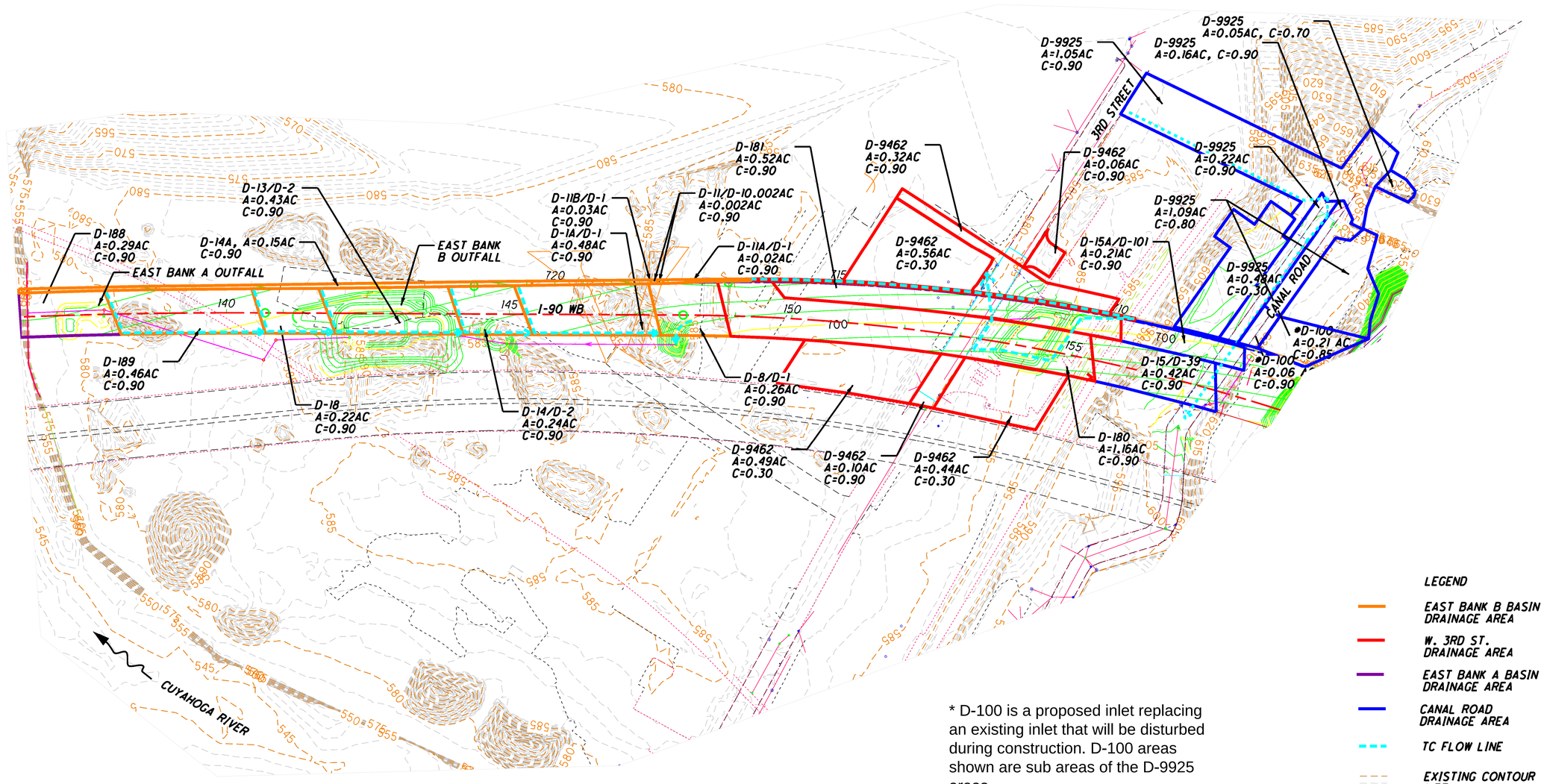

* D-100 is a proposed inlet replacing an existing inlet that will be disturbed during construction. D-100 areas shown are sub areas of the D-9925 areas.

LEGEND

- EAST BANK B BASIN DRAINAGE AREA
- W. 3RD ST. DRAINAGE AREA
- EAST BANK A BASIN DRAINAGE AREA
- CANAL ROAD DRAINAGE AREA
- TC FLOW LINE
- EXISTING CONTOUR 1 FT.
- PROPOSED CONTOUR 1 FT.
- EXISTING PIPES

NO.	REVISIONS	DATE

DESIGN AGENCY: WALSH HNTB (WALSH CONSTRUCTION)

CLEVELAND'S INNERBELT BRIDGE — OHIO DEPARTMENT OF TRANSPORTATION

FIGURE 3
PROPOSED DRAINAGE AREA MAP
EAST BANK, 3RD STREET, & CANAL ROAD

0 50 100 200 HORIZONTAL SCALE IN FEET

CUY-90-14.90

DWG. NO. AM-003

DESIGNED JSB | CHECKED PNS

3 / 6

$date$ $time$
Model:$model$
File:$file$

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CHECK PRINT (INITIAL & DATE)	CHECKED BY:	CORRECTED BY:
MADE BY:	BACKCHECKED BY:	VERIFIED BY:

ONTARIO ST.

9TH ST.

CARNEGIE AVE.

D-179
A=0.06AC
C=0.90

D-179
A=0.03AC
C=0.30

D-56, A=0.10AC, C=0.30

D-178
A=0.01AC
C=0.90

D-179
A=0.07AC
C=0.70

D-179
A=0.20AC
C=0.70

ONTARIO OUTFALL
EX-8025

9TH STREET OUTFALL
D-119

D-56
A=0.29AC
C=0.90

D-55
A=0.82AC
C=0.90

TRI-CITY OUTFALL
EX-1018

D-120
A=0.50AC
C=0.30

D-120
A=0.29AC
C=0.90

D-164
A=0.10AC
C=0.90

D-164
A=0.14AC
C=0.70

D-19
A=0.12AC
C=0.90

D-178
A=0.44AC
C=0.90

D-171
A=0.10AC
C=0.90

D-190, A=.10AC
C=0.90

D-164, A=0.50AC, C=0.90

D-44, A=0.25AC, C=0.90

D-162
A=0.03
C=0.90

D-162
A=0.13
C=0.90

EX CB-UNK
OUTFALL

D-125
A=1.31AC
C=0.90

D-126, A=0.05AC
C=0.90

D-98/EX-39
A=0.05AC
C=0.70

D-162
A=0.05
C=0.90

D-162
A=0.01
C=0.70

D-162
A=0.14
C=0.90

D-162
A=0.08
C=0.70

D-162
A=0.14
C=0.70

D-162
A=0.04
C=0.90

D-21, A=0.28
C=0.90

D-162
A=0.11
C=0.90

D-126
A=0.15AC
C=0.90

D-98/EX-39
A=0.05AC
C=0.70

D-98/EX-39
A=0.03AC
C=0.30

EX-39
A=0.25AC
C=0.90

D-122
A=0.47AC
C=0.90

D-190
A=0.11
C=0.90

D-EXA50
A=0.75
C=0.90

D-EXA50
A=0.38
C=0.90

D-32
A=0.48AC
C=0.90

D-166
A=0.19 (4 SCUPPER AREAS)

EX CB-13423
OUTFALL

D-CB 13487
OUTFALL

D-166
A=0.05
C=0.70

D-CB 13487
A=0.53 AC
C=0.70

LEGEND

- CB EX CB-UNK DRAINAGE AREA
- CB EX 13487 DRAINAGE AREA
- EX CB-13423 DRAINAGE AREA
- E9TH TEMPORARY DRAINAGE AREA
- TRI-C PARKING LOT DRAINAGE AREA
- 9TH STREET DRAINAGE AREA
- ONTARIO DRAINAGE AREA
- TC FLOW LINE
- EXISTING CONTOUR 1 FT.
- PROPOSED CONTOUR 1 FT.
- EXISTING PIPES

$date$ $time$
Model:$model$
File:$file$

NO.	REVISIONS	DATE

DESIGN AGENCY
WALSH HNTB
WALSH CONSTRUCTION

CLEVELAND'S INNERBELT BRIDGE
OHIO DEPARTMENT OF TRANSPORTATION
90

FIGURE 4
PROPOSED DRAINAGE AREA MAP
ONTARIO, COMMERCIAL LOT, D-98 & E. 9TH

HORIZONTAL SCALE IN FEET
0 50 100 200

CUY-90-14.90

DWG. NO.
AM-004

DESIGNED JSB
CHECKED PNS

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Model: $model$
File: $file$

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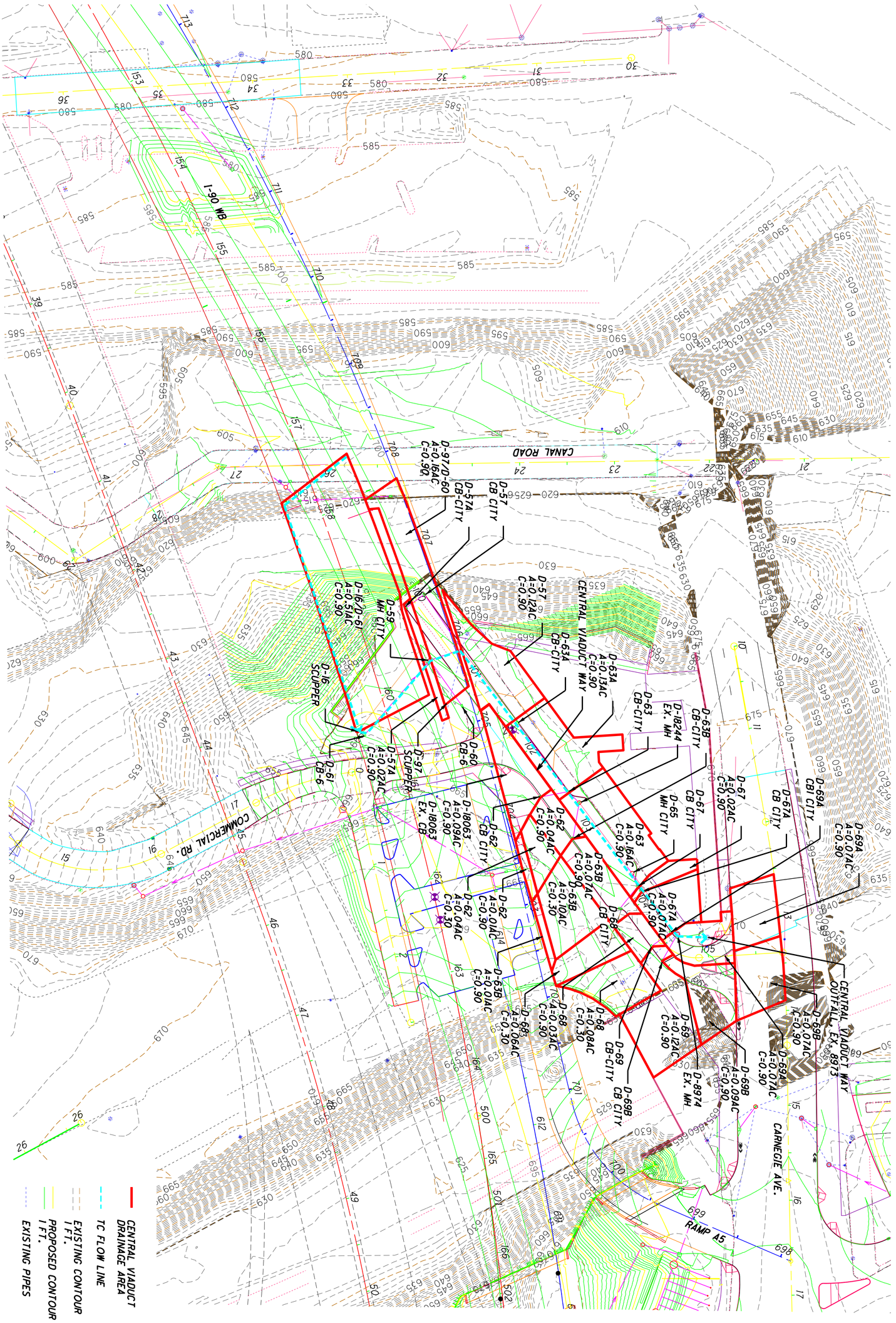
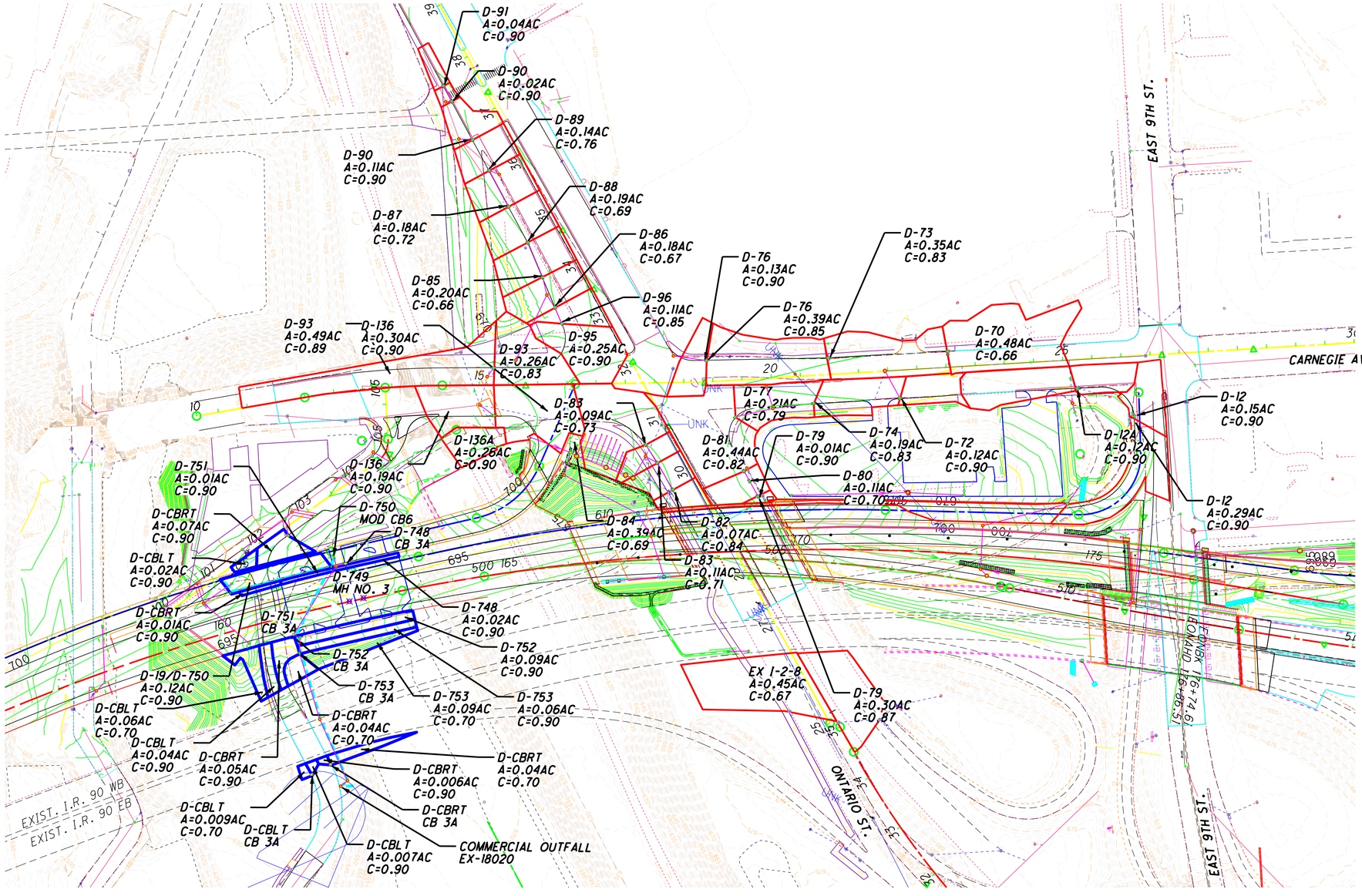


DESIGNED JSB	0 50 100 HORIZONTAL SCALE IN FEET		CLEVELAND'S INNERBELT BRIDGE I-90 OHIO DEPARTMENT OF TRANSPORTATION	DESIGN AGENCY WALSH WALSH CONSTRUCTION HNTB	NO. / REVISIONS / DATE
CHECKED PNS					
6 5	DWG. NO. AM-005	CUY-90-14.90	FIGURE 5 PROPOSED DRAINAGE AREA MAP CENTRAL VIADUCT WAY		



EXISTING PIPES

PROPOSED COMMERCIAL PARKING LOT DRAINAGE AREAS

PROPOSED RESURFACING DRAINAGE AREAS

PROPOSED CONTOURS
1 FT

EXISTING CONTOURS
1 FT

NOTE:

COMPOSITE RUNOFF COEFFICIENTS SHOWN FOR CLARITY.

NO.	REVISIONS	DATE

DESIGN AGENCY
WALSH HNTB
WALSH CONSTRUCTION

CLEVELAND'S MEMORIAL SHORELINE DRIVE
OHIO DEPARTMENT OF TRANSPORTATION
90

FIGURE 6-PROPOSED DRAINAGE AREA MAP COMMERCIAL PARKING LOT, ONTARIO, CARNEGIE & E9TH

N

0 50 100 200
HORIZONTAL SCALE IN FEET

CUY-90-14.90

DWG. NO. DM-004

DESIGNED BM
CHECKED BH

6/6

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MADE BY: | BACKCHECKED BY: | VERIFIED BY:

ITO BE TURNED OFF AT AFC SUBMITTAL)

$date$ $time$
Model:$model$
File:$file$

APPENDIX A

Form LD-35
Revised January 2006

GENERAL PROJECT INFORMATION

CUY	90	14.90
County	Route	Section

Attach Typical Section)

AFFECTED ROADWAYS:	Route	Average Daily Traffic	Rural / Urban
INTERSTATE OR OTHER L/A FACILITIES	I-90 Innerbelt Bridge	71,000	Urban Interstate
ARTERIALS AND COLLECTORS	Orange Ave	23,300	Urban Arterial
	Fairfield Ave	1,500	Urban Collector
	Abbey Ave	1,200	Urban Collector
	Canal Rd	--	Urban Collector
	Ontario St	33,200	Urban Arterial
	Carnegie Ave	24,000	Urban Arterial
	E. 9th St	32,300/3,600	Urban Arterial Under I-90, Future Urban Collector (extension)
	Broadway	12,400	Urban Arterial
	E. 14th St	19,100	Urban Arterial, Future Urban Collector (extension)
	W. 14th St	3,600	Urban Collector (extension)
	W. 13th St	8,700	Urban Collector
LOCALS	Starkweather Ave	2,000[1]	Urban Local
	Kenilworth Ave	2,000[1]	Urban Local
	Central Viaduct Way	1,000[1]	Urban Local
	Commercial Rd	1,000[1]	Urban Collector, Future Urban Local (realigned portion)
CLEAR ZONE	See L&D Manual, Vol. 1, Section 600.2		

[1] Estimate made by comparing to similar nearby roadways and considering the traffic that feeds the roadway.

All Units are English:

PIPE POLICY:

The Pipe Policy of ODOT and the City of Cleveland will be used for this project. (See Section 1002 for additional information)

If a policy other than ODOT's is being used, the following material types are permitted:

For drainage conduit owned and maintained by the city of Cleveland:

1. Use Vitrified Clay Pipe (VCP), Extra Strength (ES), C-700, with premium joints, ODOT item 706.08 for all proposed main sewer pipe 18" and smaller.

2. Use Reinforced Concrete Pipe (RCP) with premium joints, ODOT Item 706.02 for all proposed main sewer pipe 21" and larger.

3. Ductile Iron Pipe (DIP) may be used if approved by the WPC engineer.

(Please attach a copy of the written pipe policy. In lieu of a written policy, documentation of locally funded construction practices may be provided)
See Attachment A.

POST CONSTRUCTION BMP POLICY:

The Post Construction BMP Policy of ODOT will be used for this project.

If a policy other than ODOT's is being used, the following BMP's are permitted:

_____

_____

_____

PROJECT SPECIFIC INFORMATION AFFECTING DRAINAGE:

See Attachment B - Project Scope, Central Viaduct, CUY-90-14.90, Innerbelt Bridge, Section 13, Drainage

Section A. Roadway Culverts (Type A Conduits)

1. DESIGN STORM FREQUENCY (1004.2):

   a. Mainline 50- Year

   b. Crossroads 10- Year

2. BANKFULL DESIGN Yes No (Circle yes if at least one culvert has bankfull design) *attach a list of culverts with bankfull designs* Culvert across driveway entrance on south side of proposed E. 9th Street extension.

3. FLOOD PLAIN CULVERT(S) NEEDED? Yes No (Circle yes if at least one culvert has flood plain culverts) *attach a list of culverts with flood plain culverts*

4. DURABILITY SERVICE LIFE _____50_____ Year *attach a list of culverts with their durability service life if multiple culverts have different frequencies.*

5. ABRASIVE SITE? Yes No (Circle yes if at least one culvert has an abrasive site) *attach a list of culverts with their abrasive site assumptions if multiple culverts are different*

6. MAXIMUM ALLOWABLE HEADWATER FOR DESIGN STORM (1006.2):

   a. 2 feet below the near, low edge of the pavement for drainage areas 1000 acres or greater and 1 foot below for culverts draining less than 1000 acres.

   b. 2 feet above the inlet crown of the culvert or above a tailwater elevation that submerges the inlet crown in flat to rolling terrain.

   c. 4 feet above the inlet crown of a culvert in a deep ravine.

   d. 1 foot below the near edge of pavement for bicycle pathways.

7. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):

a. For rural streams, use USGS Water Resources Investigations Report 89-4126 "Techniques for Estimating Flood-Peak Discharges of Rural Unregulated Streams in Ohio".

b. For urban streams, use USGS Open File Report 93-135 "Estimation of Peak-Frequency Relations, Flood Hydrographs, and Volume–Duration–Frequency Relations of Ungaged Small Urban Streams in Ohio".

8. SCALE OF TOPOGRAPHIC MAPPING USED TO DELINEATE DRAINAGE AREAS (1101.1):

a. >100 acres: 1" = 2000'

b. < 100 acres: 1" = 50 to 800'

9. MANNING'S "n" USED FOR (1105.6.5):

a. Smooth pipe 0.012

b. Corrugated pipe:

2-$^{2}/_{3}$" x $^{1}/_{2}$":	Full flow	0.0225-0.0250
3" x 1":	Full flow	0.0260-0.0281
6" x 2":	Full flow	~~0.0300-0.0332~~

Section A. Roadway Culverts - Continued

10. ENTRANCE LOSS COEFFICIENT (k_e) (1105.6.6, table 1105-1):

a.	Corrugated pipe:	HW-4 Headwall 0.90	Full Headwall 0.25*
b.	Smooth Concrete pipe	HW-4 Headwall 0.20	Full Headwall 0.20
d.	Box Shape	Full Headwall _____	*with beveled entrance

11. MINIMUM COVER (top of pipe to subgrade) FOR (1008):

a. Rigid pipe 9"

b. Flexible pipe 12"

12. MAXIMUM COVER FOR (1008):

a. Rigid pipe See Figures 1008-10 to 1008-14, L&D Vol.2

b. Flexible pipe Thermoplastic - 20'; Corrugated Steel – See Figures 1008-1 - 1008-9 and 1008-15 – 1008-21

13. MAXIMUM ALLOWABLE CULVERT OUTLET VELOCITY (1002.2.2) :

a. Bare earth channel 5 fps

b. Rock channel protection 20 fps

c. Use energy dissipator for velocities in excess of 20 f.p.s.

14. HEADWALL TYPE (1106.2):

a. Half-Height Headwall – Std Dwg HW-2.1 and 2.2

b. Full-Height Headwall – Std Dwg HW-1.1

c. Concrete Apron – provide special detail drawing

15. CONTACT WILL BE MADE WITH COUNTY ENGINEER TO ESTABLISH:

a. Contact shall be made with the County Engineer at the beginning of the design process to ascertain ditch cleanout grades and watersheds, and the design shall be based on that information.

b. Form LD-33 (available in the L&D, Vol 2, Appendix) shall be used to document approval.

16. MINIMUM PIPE SIZE (1002.3.1, Figure 1002-1) :

a. Freeway or limited access facility 24”

b. Other highways 15”

Section B. Storm Sewers (Type B & C Conduits)

1. DESIGN FREQUENCY (Just Full) (1104.4.1) - 10-year, ODOT and City

2. HYDRAULIC GRADIENT SHALL NOT EXCEED (1104.4.2):

a. 12 inches below edge of pavement for 25- year frequency storm (ODOT only).

b. Pavement catch basin grate or lip of inlet for 25- year frequency storm (ODOT only).

c. A point in a depressed pavement sag that would result in an impassible highway for a 50- year frequency storm (ODOT only).

d. Other: Storm sewers for all highways shall satisfy a 50-yr check to preclude flooding of buildings or extensive flooding of private property. One-directional lane of a multiple-lane highway or one-half of a lane on a two-lane highway shall be passable when the sewer system is discharging the 50-year storm.

e. The above is based on:

i. A pipe roughness “n” = 0.015 for pipe sizes 60" and under and 0.013 for larger sizes.

ii. _____

3. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):

a. Rational Method for pavement drainage, storm sewer and ditches.

i. Use ODOT rainfall data for design of pavement drainage and storm sewers.

ii. Use NEORSD rainfall data to compute discharge rates to the existing combined sewer system (Attachment C).

b. TR-55 for detention analysis.

i. Use ODOT rainfall data for detention facilities discharging to surface waters.

ii. Use NEORSD rainfall data for detention facilities discharging to the combined sewer system.

4. COEFFICIENT OF RUNOFF "C" FOR (1101.2.3):

   a. Pavement and paved shoulders 0.9

   b. Berms and slopes (4:1 and flatter) 0.5

   c. Berms and slopes (steeper than 4:1) 0.7

   d. Contributing areas:

   Residential 0.3 – 0.5 (single family), 0.4-0.7(multi-family) Woods 0.3 Cultivated 0.3 – 0.6
   Grassed Terrace (adjacent to sidewalks) 0.30

5. METHOD USED TO DETERMINE TIME TO FIRST CATCH BASIN OR PAVEMENT INLET (1101.2):

   a. The summation of the time of overland flow, the time of shallow concentrated flow and the time of pipe or open channel flow.

6. MINIMUM TIME TO (1104.4.4):

   a. Ditch catch basin 15 minutes

   b. Pavement inlet or catch basin 10 minutes

   c. When connecting to combined sewer, actual Tc calculated for pre/post flow analysis.

Section B. Storm Sewers (Type B & C Conduits) - Continued

7. MINIMUM COVER OVER SEWERS (1104.2.1): (see Attachment B)

   a. Rigid pipe:

      i. Type B conduit (under pavement or paved shoulder) 9" (top of pipe to subgrade). In no installation shall the distance from the top of pipe to pavement surface be <15".

      ii. Type C conduit (beyond pavement or paved shoulder) 18" (top of pipe to finish grade)

   b. Flexible pipe:

      i. Type B conduit (under pavement or paved shoulder) 12" (top of pipe to subgrade). In no installation shall the distance from the top of pipe to pavement surface be <24".

      ii. Type C conduit (beyond pavement or paved shoulder) 24" (top of pipe to finish grade)

   c. City requirement: 3 feet for all main sewers

8. DESIRABLE MINIMUM VELOCITY FOR DESIGN FLOW 3 f.p.s (1104.2.1). City sewers 3 f.p.s.

9. MAXIMUM LENGTH BETWEEN MANHOLES OR SUITABLE CLEANOUT POINTS (1104.2.2) :

   a. ODOT: Under 36"diameter – 300' City: Under 42" diameter - 300'

   b. ODOT: 36" - 60" diameter - 500' City: 42" diameter and larger – 500'

   c. ODOT: Over 60" diameter - 750-1000'

10. MINIMUM PIPE SIZE UNDER PAVEMENT (1104.4.6):

a. Freeway or limited access facility 15 inches

d. Other highways 12 inches

e. City storm sewer pipe: 12 inches

11. PROCEDURE TO FOLLOW WHEN EXISTING PRIVATE DRAINS ARE CUT BY PROPOSED SEWERS OR DITCHES: Connect through the curb or into a drainage structure as per general note in construction plans.

Section C. Roadway Ditches

1. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):

a. Rational Method

b.

2. DESIGN FREQUENCY TO DETERMINE (1102.3.1 or 1102.4):

ADT >2000:

a. Depth of flow determination 10- year

b. Shear Stress determination (for protection and width of protection) 5- year

ADT <2000:

c. Depth of flow determination 5- year

d. Shear Stress determination (for protection and width of protection) 2- year

3. METHOD USED TO DETERMINE TIME OF FLOW TO DITCH (1101.2):

The summation of the time of overland flow, the time of shallow concentrated flow and the time of pipe or open channel flow.

4. ALLOWABLE SHEAR STRESS FOR DITCH LINING (1102.3):

Permanent Ditch Protection:

a. Seed lining 0.40 psf.

b. Sod or other temporary ditch protection 1.0 psf.

c. Turf Reinforcing Mat (SS836), Type 1 2.00 psf.

d. Turf Reinforcing Mat (SS836), Type 2 3.00 psf.

e. Turf Reinforcing Mat (SS836), Type 3 5.00 psf.

f. RCP, Type B 6 psf.

g. RCP, Type C 4 psf.

h. RCP, Type D 2 psf.

Temporary Ditch Protection (Item 670):

a. Mat, Type A 1.25 psf.

b. Mat, Type B 1.50 psf.

c. Mat, Type C 2.00 psf.

d. Mat, Type E 2.25 psf.

e. Mat, Type F 0.45 psf.

Section C. Roadway Ditches - Continued

f. Mat, Type G 1.75 psf.

Tied Concrete Block Mat (Item 601)

a. Type 1 3 psf.

b. Type 2 5 psf.

c. Type3 7 psf.

5. MANNING'S "n" USED FOR (1102.3):

a. Seed lining 0.03

b. Sod, jute, or other temporary linings 0.04

c. Turf reinforcing mats 0.04

d. Tied Concrete Block Matting 0.03

e. Rock channel protection 0.06 for ditches, 0.04 for large channels

6. DITCH CONFIGURATION (1102.2):

a. Std roadside ditch radius for roadway, with 12- inch minimum depth

b. Trapezoidal for toe of embankment, with 12- inch minimum depth

6. TYPE OF DITCH CATCH BASIN (1102.3.4):

a. ODOT Std No.2-2A and B, No.2-3, No.2-4, No.2-5, No.2-6, No.4, No.5, No.8 and side ditch inlets

8. MINIMUM LONGITUDINAL SLOPE OF DITCHES IN CUT SECTIONS (1102.1):

a. 0.50% desirable minimum

b. 0.25% absolute minimum

9. METHOD USED TO LOCATE EXISTING FARM TILE CROSSED BY HIGHWAYS?

a. Contact the appropriate County Engineer's office for assistance in locating existing farm tile.

b. Through field observations.

Section C. Roadway Ditches – Continued

10. MINIMUM WIDTH OF DITCH LININGS (1102.3.1) :

a. Sod 7.5 ft.

b. Temporary linings 7.5 ft.

c. Turf reinforcing mats 7.5 ft.

11. DESIGN FREQUENCY DEPTH SHALL NOT EXCEED (1102.3.1):

a. An elevation 1 foot below edge of pavement for the design discharge.

b. The depth of flow in toe of slope ditches shall be limited such that the design year discharge does not overtop the ditch bank.

Section D. Median Ditches NA

1. DITCH CONFIGURATIONS (1102.3):

a. Depressed _____

b. Type of barrier _____

2. WIDTH BETWEEN PAVEMENT EDGES _____ ft.

3. ALLOWABLE SHEAR STRESS FOR DITCH LINING (1102.3):

Permanent Ditch Protection:

a. Seed lining _____ psf.

i. Sod or other temporary ditch protection _____ psf.

j. Turf Reinforcing Mat (SS836), Type 1 _____ psf.

k. Turf Reinforcing Mat (SS836), Type 2 _____ psf.

l. Turf Reinforcing Mat (SS836), Type 3 _____ psf.

Temporary Ditch Protection (Item 670):

d. Mat, Type A _____ psf.

e. Mat, Type B _____ psf.

f. Mat, Type C _____ psf.

g. Mat, Type E _____ psf.

h. Mat, Type F _____ psf.

i. Mat, Type G _____ psf.

Tied Concrete Block Mat (Item 601)

a. Type 1 _____ psf.

b. Type 2 _____ psf.

c. Type 3 _____ psf.

4. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1101.2):
a.

b.

5. CATCH BASIN SPACING WILL BE DETERMINED BY HYDRAULIC ANALYSIS USING (1102.3.4):

a. _____ year frequency and "n" = _____ for velocity

b. _____ year frequency and "n" = _____ for depth

c. Controls:
i. Design frequency depth shall not exceed:

(1)

(2)

d. Catch basin spacing, depressed median, fill section:

	Median Width	84'	60'	40'
i.	Desirable maximum	_____		
ii.	Absolute maximum	_____		

5. TYPE OF MEDIAN CATCH BASIN OR INLET (1102.3.4):

a.

7. MINIMUM LONGITUDINAL SLOPE OF DEPRESSED EARTH MEDIAN:

Section E. Drainage for Curbed Pavements

1. CONTROLS FOR THE DETERMINATION OF INLET OR CATCH BASIN SPACING (1103):

a. Design storm frequency: 10- year ODOT, 5-year ADT Urban >9000, other 2-year

b. Check storm frequency: 50- year for freeways, high volume highways and high volume City streets; 25- year for other multi-lane highways and City streets (for underpasses or depressed roadways where the storm sewer is the only outlet)

c. METHOD USED TO DETERMINE TIME TO FIRST CATCH BASIN OR PAVEMENT INLET:

i. The summation of the time of overland flow, the time of shallow concentrated flow and the time of pipe or open channel flow.

ii. Absolute minimum time of concentration of 10 minutes

d. Maximum spread of flow into traveled lane (use ODOT L&D Manual Table 1103-1 and ADT):

i. Freeways 0 ft

ii. 2-lane City Streets 6 ft

iii. 4-lane City Streets 8 ft

Outside lane width greater than 12 feet 0 ft. (freeways)

Total allowable spread on pavement shoulder width ft. (freeways, see Table 1103-1 for other highway types)

e. Maximum depth of flow at curb 1 in below top of curb for the design discharge, 5 in max. depth. 6- in max. along barrier wall ODOT.

f. Manning's "n" for:

i. Reinforced concrete pavement 0.015

ii. Asphaltic concrete pavement 0.015

iii. Paved shoulders 0.015

2. TYPE OF INLET OR CATCH BASIN PROPOSED FOR (1103):

a. Continuous grades ODOT Std 6' pavement inlet or CB No.3A. City CB-1 on city streets.

c. Sags ODOT Std CB No.3. For drives, Std No.6 with flanking No.3A catch basins - see 1103.7. City sags use a CB-3(single CB-1 adjacent a IB-1)

3. INLET LIP OF CURB OPENING INLET WILL BE DEPRESSED 2.0 INCHES BELOW NORMAL GUTTER.

a. A local depression of 0.5 inches will be used to determine spacing of combination grate and curb opening catch basins for a curb pavement section.

b. A local depression of 0.0 inches will be used to determine spacing of combination grate and curb opening catch basins for a combination curb and gutter section.

4. BRIDGE DECK DRAINAGE

a. The design frequency of bridge deck drainage in the Scope of Work (14.2.4) and the L&D was intended to be the 10-year event for the Interim and Future condition and a 2-year event for the Bi-Directional Condition. Due to the poor condition of the deck on several existing bridges, these bridge decks or bridge superstructures will be replaced now. When Innerbelt Contract CCG-3 is constructed these bridges will be completely replaced or will no longer be needed. In an attempt to reduce the number of scuppers on bridges in accordance with ODOT's L&D Section 1103.1, it was agreed to use the 2-year storm for the design frequency for the re-decked bridges. That requirement is to confine the 2-year design storm to the Interim Condition shoulder width, and limit the extent to which the 10-year storm spread exceeds the shoulder width.

Attachment C – NEORSD Rainfall Data

Attachment C

Northeast Ohio
Regional Sewer District

Request for Connection Approval to Combined Sewer System

Submittal Guidelines for Review and Approval

Northeast Ohio Regional Sewer District
Protecting Your Health and Environment

December 6, 2010

Revised:

1.0 Purpose

The Title IV Combined Sewer Code of the Northeast Ohio Regional Sewer District (NEORSD) provides the NEORSD with the authority to control combined sewer overflows (CSOs) from the combined sewer system and control peak flows from local combined sewer systems at the point of connection into sewers owned by the NEORSD or member community. Therefore, the NEORSD has the authority to review all requests for connection approval to the combined sewer system.

The purpose of this document is to provide guidance to landowner, developers, and design engineers interested in developing land in the combined sewer service area and provide a uniform process for submitting construction plans to the NEORSD for review and approval. Design standards and criteria are also provided for use in developing stormwater management systems for sites where a connection is requested to be made to an existing combined sewer or CSO pipe.

2.0 Procedures for Submittal and Review

Requests for connection approval are required for all new development and redevelopment projects within the NEORSD service area seeking to connect to a combined sewer, CSO pipe, or separated storm sewer tributary to a combined sewer or CSO pipe. This section outlines the procedures that should be followed to ensure a complete submittal package is provided for review.

2.1 General Information

- Landowners, developers, and design engineers on behalf of the owner/developer may request approval to connect by submitting a set of construction plans with associated calculations supporting the stormwater management plan. For the sake of simplicity, the term "Designer" will be used throughout this document to refer to the landowner, developer and/or design engineer working on behalf of the owner/developer.

- Connection requests shall be made prior to the start of any work requiring approval from NEORSD. Work should only start after approval has been granted.

- As stated in the Title IV Combined Sewer Code of the NEORSD, the NEORSD has 15 business days upon receipt of a complete submittal package to review a connection request. The NEORSD will attempt to review these request in the shortest possible time. The Designer is encouraged to contact the NEORSD early in the design process to avoid delays in the project schedule. A definition of a complete submittal package is provided in section 2.2.

- Minimum design standards and criteria accepted by the NEORSD are provided in this document for designing stormwater management plans for sites within its service area. Depending on the location of the development site within the service area, there may be cases where a more restrictive design criterion is required due to downstream capacity issues. The Designer is encouraged to contact the NEORSD early in the design phase to determine whether the site is located in a critical area of the combined sewer system and subject to stricter design criteria.

- Construction plans showing the layout of the area intended to be developed shall be submitted to the NEORSD by the Designer. The plans shall be prepared under the direction of and sealed by a registered professional engineer.

- The NEORSD will review the plans for adequacy of stormwater management design to ensure that the proposed stormwater drainage system has the capacity to handle all contributing flow without diminution of the existing level of service in the combined sewer system.

2.2 Submittal Requirements

A complete submittal package should include and clearly state, at minimum, the following:

1. Stormwater criteria and design standards used if other than the NEORSD Title IV Code of Regulation.
2. Site map(s) of showing project site location, total drainage area, land use/cover, amount of impervious area and longest flow paths for existing and proposed conditions.
3. Detailed topographical map showing existing topography and proposed grades of the entire area, as well as the topography of all adjacent property to the extent that off-site contributing flow can be determined. All off-site contributing flow must be accommodated. All existing watercourses, lakes, wetlands and floodplain (if applicable) should also be included on the map. Please specify the horizontal and vertical national datum used.
4. Location, size, and type of all existing storm sewers, channels, and/or structures located upstream and downstream of project area.
5. Location, size, and type of proposed storm sewers, channels, and/or structures to be built as part of the site's stormwater management design.
6. Plans, cross-section views and details of all SCMs. If an existing SCM on or off-site will be used then as-built information must be provided. Please identify drainage area unique to each SCM on plans.
7. Plans and details of the soil erosion and sedimentation control measures. Indicate which measures are temporary or permanent and the party responsible for maintaining the control measures.
8. Predominant soil type from USDA soil surveys or soil borings found at site.
9. Drainage breakup sheet indicating the number of acres and percent imperviousness contributing to each specific drainage structure or SCM.
10. Design data and criteria used for sizing all drainage structures, channels, and SCMs.
11. Hydrologic and hydraulic calculations, assumptions, and parameters used for quantifying peak flows for existing and post-development conditions. Longest flow paths used in quantifying time of concentration for each should be shown on a site map.
12. A plan and a proposed schedule for the perpetual maintenance of the complete storm drainage system. Indicate who will be responsible (i.e. municipality, landowner, or homeowners' association) for the maintenance. If the homeowners' association will be responsible for the system, the subdivision deed restrictions must have a section indicating such responsibility and a copy must be submitted to the NEORSD. If there is a maintenance agreement with the City, Village or Township, a copy of the agreement must be submitted to the NEORSD. The maintenance plan must be submitted prior to plan approval.

3.0 Design Criteria and Engineering Standards

The design criteria and engineering standards set forth herein are intended to guide designers to develop a stormwater management system that controls the quantity and quality of the stormwater discharge for a development site. The internal drainage for a site as well as the downstream conditions will be reviewed. Every site is part of an overall watershed and the system should be designed with this in mind. The system should conform to natural drainage patterns both on and off-site. These standards are the minimum requirements of the NEORSD and should not be construed as all-inclusive. The design engineer should consider many factors when planning the stormwater management system. In particular, Federal, State, and Local standards may be more strict than these standards. In the case where conflicting standards arise, the more stringent requirement will govern. Exceptions will be considered when conforming to a local community stormwater criteria or standard is required.

3.1 Title IV Design Criteria

The design criteria specified in the Title IV Combined Sewer Code of the NEORSD are outlined below based on the type of sewer that will be connected to (i.e., combined sewer or CSO pipe):

1. For connections to the combined sewer system, storage volume shall be provided based on the 5-year event using a maximum release rate as defined in section 3.4. For larger, less frequent design events greater than the 5-year event, the maximum release rate shall be defined as the existing conditions peak discharge of the corresponding storm frequency evaluated for post-development conditions.

2. For connections to a CSO pipe, directly or via a separated storm sewer, treatment of stormwater runoff shall be handled in accordance with Part III.G.2.e of the Ohio EPA's General Construction Permit OHC000003. It should be noted, however, that the NEORSD will only accept stormwater management designs that provide water quality treatment for 100% of the project area whether the project is considered a redevelopment project or not. Post-development peak flows shall not exceed existing conditions peak flows up to the 25-year design event.

The criteria are the minimum design standard accepted by the NEORSD. In addition to the Title IV criteria herein, the Designer must also abide by the rules, standards, specifications and master plan of the municipality where the site is located. In the case where conflicting standards arise, the more stringent requirements will govern.

3.2 Rainfall Intensity-Duration-Frequency

Rainfall intensity-duration-frequency (IDF) estimates provided in Appendix A shall be used to the design of the stormwater management plans. Other sources of rainfall IDF estimates may be used if required by another Federal, State, or local standard applicable to the development site. If a different rainfall IDF source is used to support the stormwater design as dictated by another Federal, State or local authority, it should be clearly documented in the submittal package for review.

3.3 Peak Stormwater Flows

There are no NEORSD restrictions on the type of engineering methodology or software that the designer may use to quantify stormwater runoff from the site at this time. It is the responsibility of the designer to select an appropriate methodology suitable for the nature of the site. Supporting documentation, clearly stating the methodology, assumptions, parameters, and computations must be submitted for review and approval. In addition, the basis for selecting critical parameters, i.e., runoff coefficients, curve number, time of concentration, etc., should also be documented and provided for review.

3.4 Maximum Release Rate

Typically the maximum release rate is defined as the existing conditions 6-month, 24-hour peak flow. There may be cases where a more restrictive allowable discharge rate is required due to downstream capacity issues. In this situation, the designer will be required to incorporate a more restrictive release rate criterion into the stormwater management design to protect existing connections by avoiding the increase risks in basement flooding and/or increase in CSO volume. The designer is encouraged to contact the NEORSD to determine whether the development site is located in a critical area of the combined sewer system that is subject to stricter release rate limits.

NOTE: Stormwater Design Discussion Group intends to replace the 6-month, 24-hour criteria with a figure/map that would show release rates based on CSO tributary areas.

3.5 Stormwater Storage Requirements

There are no NEORSD restrictions on the type of engineering methodology or software that the designer may use to quantify required storage volume at this time. It is the responsibility of the designer to select an appropriate methodology for site design. Supporting documentation, clearly stating the methodology, assumptions, parameters, and computations must be submitted for review and approval. Documentation

with supporting calculation on the maximum allowable discharge used to determine the required storage volume must be clearly stated and provided for review and approval.

3.6 Stormwater Conveyance

There are no NEORSD restrictions on the type of engineering methodology or software that the designer may use to size the stormwater conveyance system at this time. It is the responsibility of the designer to select an appropriate methodology for site design. Supporting documentation, clearly stating the methodology, assumptions, parameters, and computations must be submitted for review and approval.

3.7 Physical Connection

The following general conditions are required by the NEORSD regarding the physical connection to one of its facilities pending approval of all connection requests.

Connections to existing laterals

- The existing laterals to be used shall be instated by video camera, and a copy of the video shall be submitted to the NEORSD for review and approval prior to the connections being made. Upon review of the videotape by the NEORSD, if the existing lateral(s) needs to be cleaned and or repaired the work shall be performed at no cost to the NEORSD prior to the connections being made.
- The laterals shall be re-inspected after the cleaning and/or repair and a copy of the video shall be submitted to the NEORSD for review and approval prior to the connection being made. All laterals not approved for use shall be abandoned.
- The contractor shall provide a watertight connection to the existing lateral and encase the connection in concrete.

If an existing lateral cannot be used, a new lateral shall be installed and the contractor shall meet the following conditions. (lay permit)

- Provide pre-construction and post-construction video inspection of the interceptor showing footage measurement from either the upstream or the downstream manhole and extending a minimum of 20 feet past the connection point. The former shall be submitted to the NEORSD for approval prior to the commencement of work.
- The connection shall be made through a properly sized cored hole. If the connection is to a reinforced concrete or vitrified clay pipe, then the lateral shall be concreted to the sewer using a manufactured boot that makes a watertight connection. If the connection is to a brick sewer, then the lateral shall be connected by wrapping a waterstop material such as Volclay RX101 or equal around the lateralwith two (2) wraps minimum in accordance with the attached detail. If waterstop material is used, the annular space between the sewer wall and lateral shall be filled with hydraulic cement. Either type of connection shall then be encased in concrete. The owner shall warrant that the connection will be watertight for a period of one year.

The following conditions apply to either the use of an existing lateral or the construction of a new lateral.

- The owner shall warrant that the connection will be watertight for a period of one year.
- The contractor is responsible for any and all damage to the interceptor as determined by the NEORSD.
- The contractor shall prevent any debris from entering the sewer. Any debris entering the sewer shall be removed by the contractor.

- The contractor is responsible for obtaining any and all permits required for the work.
- A 72-hour notice shall be provided to Mr. Lyle Plummer or Mr. Brian Stapleton (216-641-6000) to schedule a NEORSD inspector for the connection.

APPENDIX A

Table A-1. Rainfall Depth-Duration.

Tc (min)	Rainfall Depth (in)											
	2-Month	3-Month	4-Month	6-Month	9-Month	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
5	**0.13**	**0.15**	**0.17**	**0.19**	**0.22**	**0.32**	**0.39**	**0.46**	**0.53**	**0.60**	**0.67**	**0.73**
10	**0.24**	**0.28**	**0.30**	**0.35**	**0.40**	**0.50**	**0.60**	**0.72**	**0.81**	**0.93**	**1.01**	**1.10**
15	**0.30**	**0.35**	**0.38**	**0.45**	**0.51**	**0.61**	**0.74**	**0.88**	**1.00**	**1.14**	**1.25**	**1.36**
20	0.34	0.39	0.43	0.50	0.57	0.68	0.82	0.99	1.12	1.29	1.42	1.56
25	0.37	0.44	0.47	0.56	0.63	0.74	0.90	1.10	1.25	1.45	1.60	1.76
30	**0.41**	**0.48**	**0.52**	**0.61**	**0.69**	**0.81**	**0.98**	**1.21**	**1.38**	**1.61**	**1.78**	**1.96**
35	0.43	0.50	0.55	0.64	0.72	0.84	1.01	1.26	1.44	1.69	1.87	2.07
40	0.45	0.52	0.57	0.67	0.75	0.87	1.05	1.31	1.51	1.77	1.97	2.18
45	0.47	0.55	0.60	0.70	0.79	0.90	1.09	1.36	1.57	1.85	2.06	2.29
50	0.49	0.57	0.62	0.72	0.82	0.93	1.13	1.41	1.63	1.93	2.16	2.40
55	0.51	0.59	0.65	0.75	0.85	0.96	1.17	1.46	1.69	2.01	2.25	2.51
60	**0.53**	**0.61**	**0.67**	**0.78**	**0.88**	**0.99**	**1.21**	**1.51**	**1.76**	**2.09**	**2.35**	**2.62**
65	0.54	0.62	0.68	0.80	0.90	1.00	1.22	1.53	1.78	2.12	2.39	2.67
70	0.55	0.64	0.70	0.81	0.92	1.01	1.24	1.55	1.81	2.15	2.43	2.72
75	0.56	0.65	0.71	0.83	0.93	1.03	1.25	1.57	1.83	2.18	2.47	2.76
80	0.57	0.66	0.72	0.84	0.95	1.04	1.27	1.59	1.86	2.22	2.51	2.81
85	0.58	0.67	0.74	0.86	0.97	1.05	1.28	1.61	1.88	2.25	2.55	2.86
90	0.59	0.69	0.75	0.87	0.99	1.07	1.30	1.64	1.91	2.28	2.59	2.91
95	0.60	0.70	0.76	0.89	1.00	1.08	1.31	1.66	1.93	2.31	2.63	2.95
100	0.61	0.71	0.78	0.90	1.02	1.09	1.33	1.68	1.96	2.35	2.67	3.00
105	0.62	0.72	0.79	0.92	1.04	1.11	1.34	1.70	1.98	2.38	2.71	3.05
110	0.63	0.74	0.80	0.93	1.06	1.12	1.36	1.72	2.01	2.41	2.75	3.10
115	0.64	0.75	0.82	0.95	1.07	1.13	1.37	1.74	2.03	2.44	2.79	3.14
120	**0.65**	**0.76**	**0.83**	**0.96**	**1.09**	**1.15**	**1.39**	**1.76**	**2.06**	**2.48**	**2.83**	**3.19**
180	**0.72**	**0.84**	**0.92**	**1.06**	**1.21**	**1.23**	**1.49**	**1.89**	**2.21**	**2.68**	**3.06**	**3.48**
360	**0.84**	**0.98**	**1.07**	**1.24**	**1.41**	**1.45**	**1.75**	**2.21**	**2.61**	**3.20**	**3.70**	**4.25**
720	**0.97**	**1.13**	**1.24**	**1.43**	**1.63**	**1.67**	**2.01**	**2.52**	**2.96**	**3.61**	**4.17**	**4.79**
1440	**1.12**	**1.31**	**1.43**	**1.65**	**1.88**	**1.95**	**2.33**	**2.92**	**3.40**	**4.09**	**4.66**	**5.28**

Bolded numbers indicate values taken directly from rainfall atlas references. Rainfall estimates for 2-month through 9-month frequencies were taken from the Illinois State Water Survey's *Rainfall Frequency Atlas of the Midwest (Bulletin 71)* by Huff and Angel dated 1992. Rainfall estimates for the 1-year through 100-year frequencies are based on average estimates obtained from the NOAA Atlas 14 website (http://hdsc.nws.noaa.gov/hdsc/pfds/orb/oh_pfds.html). Two observation sites (Cleveland WSO AP 33-1657 and Cleveland Easterly 33-1651) were used to develop the average estimates shown in the table above. Non-bolded numbers were derived by means of linear interpretation between the two rainfall atlas references for estimates.

Table A-2. Rainfall Intensity-Duration.

Tc (min)	Rainfall Intensity (in/hr)											
	2-Month	3-Month	4-Month	6-Month	9-Month	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
5	1.56	1.80	2.04	2.28	2.64	3.84	4.62	5.52	6.30	7.20	7.98	8.70
10	1.44	1.68	1.80	2.10	2.40	3.00	3.60	4.29	4.83	5.55	6.03	6.57
15	1.20	1.40	1.52	1.80	2.04	2.44	2.94	3.52	3.98	4.54	4.98	5.44
20	1.01	1.18	1.28	1.51	1.71	2.03	2.45	2.97	3.37	3.88	4.27	4.68
25	0.90	1.05	1.14	1.34	1.51	1.78	2.15	2.63	3.00	3.48	3.84	4.22
30	0.82	0.96	1.04	1.22	1.38	1.61	1.95	2.41	2.76	3.21	3.56	3.92
35	0.74	0.86	0.93	1.09	1.24	1.43	1.74	2.15	2.47	2.89	3.21	3.55
40	0.68	0.79	0.86	1.00	1.13	1.30	1.58	1.96	2.26	2.65	2.95	3.27
45	0.63	0.73	0.79	0.93	1.05	1.19	1.45	1.81	2.09	2.46	2.75	3.05
50	0.59	0.68	0.74	0.87	0.98	1.11	1.35	1.69	1.96	2.31	2.59	2.88
55	0.56	0.64	0.70	0.82	0.93	1.04	1.27	1.59	1.85	2.19	2.46	2.74
60	0.53	0.61	0.67	0.78	0.88	0.99	1.21	1.51	1.76	2.09	2.35	2.62
65	0.50	0.57	0.63	0.73	0.83	0.92	1.13	1.41	1.64	1.95	2.20	2.46
70	0.47	0.54	0.60	0.69	0.78	0.87	1.06	1.33	1.55	1.84	2.08	2.33
75	0.45	0.52	0.57	0.66	0.75	0.82	1.00	1.26	1.46	1.75	1.97	2.21
80	0.43	0.50	0.54	0.63	0.71	0.78	0.95	1.20	1.39	1.66	1.88	2.11
85	0.41	0.47	0.52	0.60	0.68	0.74	0.91	1.14	1.33	1.59	1.80	2.02
90	0.39	0.46	0.50	0.58	0.66	0.71	0.87	1.09	1.27	1.52	1.72	1.94
95	0.38	0.44	0.48	0.56	0.63	0.68	0.83	1.05	1.22	1.46	1.66	1.86
100	0.37	0.43	0.47	0.54	0.61	0.66	0.80	1.01	1.17	1.41	1.60	1.80
105	0.35	0.41	0.45	0.52	0.59	0.63	0.77	0.97	1.13	1.36	1.55	1.74
110	0.34	0.40	0.44	0.51	0.58	0.61	0.74	0.94	1.09	1.31	1.50	1.69
115	0.33	0.39	0.43	0.49	0.56	0.59	0.72	0.91	1.06	1.27	1.45	1.64
120	0.33	0.38	0.42	0.48	0.55	0.57	0.70	0.88	1.03	1.24	1.41	1.60
180	0.24	0.28	0.31	0.35	0.40	0.41	0.50	0.63	0.74	0.89	1.02	1.16
360	0.14	0.16	0.18	0.21	0.24	0.24	0.29	0.37	0.43	0.53	0.62	0.71
720	0.08	0.09	0.10	0.12	0.14	0.14	0.17	0.21	0.25	0.30	0.35	0.40
1440	0.05	0.05	0.06	0.07	0.08	0.08	0.10	0.12	0.14	0.17	0.19	0.22

APPENDIX B

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/16/2011 **Project :** CUY-90-14.90 **Location :** East Bank Outfall, I-90 WB 142+14 RT

Description : East Bank Outfall - Water Quality Basin to Cuyahoga River, I-90 WB 142+14 RT **Designer :** PNS

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 572.50

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D1B	D1	147+96	0.79	0.71	15.00	4.20	5.12	3.0	3.7	18	13.1	0.0137	580.58	5.17	11.47	0.0016	581.54	583.98	2.44	1.90	CB 2-3
begin		147+96	0.79	0.71									580.40				581.52	584.00			0.015
D1	D2	147+96	0.30	0.27	15.04	4.19	4.85	4.1	4.8	18	363.6	0.0046	580.40	3.73	6.62	0.0027	581.39	584.00	2.61	2.10	CB 2-3
		144+33	1.09	0.98									578.74				579.91	582.84			0.015
D2B	D2	144+33	0.82	0.74	15.00	4.20	5.12	3.1	3.8	18	13.3	0.0450	578.84	7.99	20.78	0.0017	579.38	582.84	3.46	2.50	CB 2-3
begin		144+33	1.91	1.72									578.24				579.36	582.84			0.015
D2	D3	144+33	0.30	0.27	16.67	3.97	4.03	7.9	8.0	24	265.3	0.0135	577.69	6.60	24.53	0.0017	578.51	582.84	4.33	3.15	CB 2-3
		141+67	2.21	1.99									574.10				576.23	582.40			0.015
D3B	D3	141+67	0.68	0.61	15.00	4.20	5.12	2.6	3.1	18	12.8	0.0320	578.11	6.74	17.53	0.0012	578.80	582.01	3.21	2.40	CB 2-3
begin		141+67	2.89	2.60									577.70				578.79	582.40			0.015
D3	D6	141+67	0.00	0.00	17.34	3.89	4.03	10.1	10.5	24	79.6	0.0009	574.10	3.22	6.25	0.0028	576.23	582.40	6.17	6.30	MH 3
		140+88	2.89	2.60						**Warning**			574.03				576.00	582.48			0.015
D6	D5	140+88	0.00	0.00	21.13	3.47	4.03	9.0	10.5	24	43.0	0.0035	574.03	4.07	12.46	0.0028	576.00	582.48	6.48	6.45	MH 3
		140+64	2.89	2.60									573.88				575.88	581.58			0.015
D5	D4	140+64	0.00	0.00	21.34	3.45	4.03	9.0	10.5	24	296.0	0.0018	573.88	2.86	9.01	0.0028	575.88	581.58	5.70	5.70	MH 3
		137+82	2.89	2.60									573.34				574.92	579.53			0.015

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D4A	D4	137+82		0.29	0.26	18.00	3.81	4.65	1.0	1.2	15	11.7	0.0531	576.15	6.24	13.88	0.0005	576.41	579.35	2.94	1.95	CB 2-3 *
begin		137+82		3.18	2.86									575.53				576.37	579.53			0.015
D4	HW	137+82		0.00	0.00	23.07	3.29	3.98	9.4	11.4	30	134.7	0.0048	572.84	4.67	26.36	0.0010	574.15	579.53	5.38	4.19	MH 3
final		136+47		3.18	2.86									572.20				574.01	574.71			0.015

* CB 2-3 is WQB Unit

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/16/2011 **Project :** CUY-90-14.90 **Location :** East Bank Outfall, I-90 WB 142+14 RT

Description : East Bank Outfall - Water Quality Basin to Cuyahoga River, I-90 WB 142+14 RT **Designer :** PNS

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 50

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 572.50

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D1B	D1	147+96	0.79	0.71	15.00	4.20	5.48	3.0	3.9	18	13.1	0.0137	580.58	5.17	11.47	0.0018	581.55	583.98	2.43	1.90	CB 2-3
begin		147+96	0.79	0.71									580.40				581.53	584.00			0.015
D1	D2	147+96	0.30	0.27	15.04	4.19	5.17	4.1	5.1	18	363.6	0.0046	580.40	3.73	6.62	0.0031	581.44	584.00	2.56	2.10	CB 2-3
		144+33	1.09	0.98									578.74				579.92	582.84			0.015
D2B	D2	144+33	0.82	0.74	15.00	4.20	5.48	3.1	4.0	18	13.3	0.0450	578.84	7.99	20.78	0.0020	579.40	582.84	3.44	2.50	CB 2-3
begin		144+33	1.91	1.72									578.24				579.37	582.84			0.015
D2	D3	144+33	0.30	0.27	16.67	3.97	4.26	7.9	8.5	24	265.3	0.0135	577.69	6.60	24.53	0.0019	578.53	582.84	4.31	3.15	CB 2-3
		141+67	2.21	1.99									574.10				576.28	582.40			0.015
D3B	D3	141+67	0.68	0.61	15.00	4.20	5.48	2.6	3.4	18	12.8	0.0320	578.11	6.74	17.53	0.0014	578.82	582.01	3.19	2.40	CB 2-3
begin		141+67	2.89	2.60									577.70				578.80	582.40			0.015
D3	D6	141+67	0.00	0.00	17.34	3.89	4.26	10.1	11.1	24	79.6	0.0009	574.10	3.22	6.25	0.0032	576.28	582.40	6.12	6.30	MH 3
		140+88	2.89	2.60						**Warning**			574.03				576.02	582.48			0.015
D6	D5	140+88	0.00	0.00	21.13	3.47	4.26	9.0	11.1	24	43.0	0.0035	574.03	4.07	12.46	0.0032	576.02	582.48	6.46	6.45	MH 3
		140+64	2.89	2.60									573.88				575.88	581.58			0.015
D5	D4	140+64	0.00	0.00	21.34	3.45	4.26	9.0	11.1	24	296.0	0.0018	573.88	2.86	9.01	0.0032	575.88	581.58	5.70	5.70	MH 3
		137+82	2.89	2.60									573.34				574.94	579.53			0.015

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D4A	D4	137+82		0.29	0.26	18.00	3.81	4.94	1.0	1.3	15	11.7	0.0531	576.15	6.24	13.88	0.0005	576.42	579.35	2.93	1.95	CB 2-3 *
begin		137+82		3.18	2.86									575.53				576.38	579.53			0.015
D4	HW	137+82		0.00	0.00	23.07	3.29	4.21	9.4	12.1	30	134.7	0.0048	572.84	4.67	26.36	0.0011	574.19	579.53	5.34	4.19	MH 3
final		136+47		3.18	2.86									572.20				574.03	574.71			0.015

* CB 2-3 is WQB Unit

DITCH ANALYSIS

PID : 46933 **Date :** 04/17/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
141+24	143+58	R	284.00	1.00	3.00	3.00	0.0035	0.68	0.68	0.90	0.61	Seed	3.84	5	0.030	13.19	1.45	0.13	2.35	0.59	4.53
												Seed	4.39	10	0.040	13.78	1.20	0.16	2.68	0.71	5.27
143+58	143+58	L	16.00	1.00	3.00	3.00	0.2500 *	0.00	0.68	0.90	0.61	Seed	3.83	5	0.030	13.23	6.88	3.27	2.35	0.21	2.26
												Jute Mat	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Temp. Mat	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 1	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 2	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 3	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 3	4.38	10	0.040	13.83	5.82	4.04	2.68	0.26	2.55

DITCH ANALYSIS

PID : 46933 **Date :** 04/17/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
141+24	143+58	R	284.00	1.00	3.00	3.00	0.0035	0.68	0.68	0.90	0.61	Seed	3.84	5	0.030	13.19	1.45	0.13	2.35	0.59	4.53
												Seed	5.81	50	0.040	13.52	1.29	0.18	3.56	0.81	5.83
143+58	143+58	L	16.00	1.00	3.00	3.00	0.2500 *	0.00	0.68	0.90	0.61	Seed	3.83	5	0.030	13.23	6.88	3.27	2.35	0.21	2.26
												Jute Mat	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Temp. Mat	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 1	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 2	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 3	3.83	5	0.040	13.24	5.58	3.79	2.35	0.24	2.46
												Perm, Type 3	5.80	50	0.040	13.56	6.27	4.66	3.55	0.30	2.79

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-1 RT ditch **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat		**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP		**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
148+24	148+00	R	34.00	1.00	3.00	3.00	0.0050	0.75	0.75	0.90	0.68	Seed	4.25	5	0.030	10.33	1.73	0.19	2.87	0.59	4.57
												Seed	5.01	10	0.040	10.39	1.46	0.23	3.38	0.73	5.37
148+00	Concent							0.05		0.90	0.72					10.00					
148+00	147+96	R	26.00	1.00	3.00	3.00	0.0050	0.00	0.80	0.00	0.72	Seed	4.21	5	0.030	10.57	1.76	0.19	3.03	0.61	4.66
												Seed	4.95	10	0.040	10.68	1.48	0.23	3.56	0.75	5.47

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-1 RT ditch **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat		**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP		**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
148+24	148+00	R	34.00	1.00	3.00	3.00	0.0050	0.75	0.75	0.90	0.68	Seed	4.25	5	0.030	10.33	1.73	0.19	2.87	0.59	4.57
												Seed	6.68	50	0.040	10.36	1.57	0.26	4.51	0.83	5.95
148+00	Concent							0.05		0.90	0.72					10.00					
148+00	147+96	R	26.00	1.00	3.00	3.00	0.0050	0.00	0.80	0.00	0.72	Seed	4.21	5	0.030	10.57	1.76	0.19	3.03	0.61	4.66
												Seed	6.59	50	0.040	10.63	1.59	0.26	4.74	0.84	6.07

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-2 LT pier 7 **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
144+74	144+58	L	74.00	1.00	3.00	3.00	0.0040	0.15	0.15	0.90	0.14	Seed	4.12	5	0.030	11.18	1.02	0.07	0.56	0.29	2.74
												Seed	4.81	10	0.040	11.39	0.87	0.09	0.65	0.36	3.16

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-2 LT pier 7 **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
144+74	144+58	L	74.00	1.00	3.00	3.00	0.0040	0.15	0.15	0.90	0.14	Seed	4.12	5	0.030	11.18	1.02	0.07	0.56	0.29	2.74
												Seed	6.39	50	0.040	11.28	0.95	0.10	0.86	0.41	3.45

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-2 RT Pier 7 **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat		**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP		**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
144+74	144+58	R	30.00	1.00	3.00	3.00	0.0060	0.67	0.67	0.90	0.60	Seed	4.26	5	0.030	10.28	1.80	0.20	2.57	0.54	4.25
												Seed	5.02	10	0.040	10.33	1.52	0.25	3.03	0.67	5.00
144+58	Concent							0.15		0.90	0.74					10.00					
144+58	144+96	R	52.00	1.00	3.00	3.00	0.0060	0.00	0.82	0.00	0.74	Seed	4.18	5	0.030	10.73	1.89	0.22	3.09	0.59	4.54
												Seed	4.91	10	0.040	10.87	1.59	0.27	3.62	0.72	5.33

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-2 RT Pier 7 **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat		**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP		**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
144+74	144+58	R	30.00	1.00	3.00	3.00	0.0060	0.67	0.67	0.90	0.60	Seed	4.26	5	0.030	10.28	1.80	0.20	2.57	0.54	4.25
												Seed	6.69	50	0.040	10.31	1.63	0.28	4.04	0.76	5.54
144+58	Concent							0.15		0.90	0.74					10.00					
144+58	144+96	R	52.00	1.00	3.00	3.00	0.0060	0.00	0.82	0.00	0.74	Seed	4.18	5	0.030	10.73	1.89	0.22	3.09	0.59	4.54
												Seed	6.53	50	0.040	10.81	1.71	0.31	4.82	0.82	5.91

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-1 Left Pier 8 **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
148+24	148+00	L	75.00	1.00	3.00	3.00	0.0100	0.05	0.05	0.90	0.05	Seed	4.12	5	0.030	11.15	1.04	0.08	0.19	0.13	1.77
												Seed	4.81	10	0.040	11.36	0.91	0.10	0.22	0.16	1.97

DITCH ANALYSIS

PID : 46933 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to east bank b pond inlet D-1 Left Pier 8 **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
148+24	148+00	L	75.00	1.00	3.00	3.00	0.0100	0.05	0.05	0.90	0.05	Seed	4.12	5	0.030	11.15	1.04	0.08	0.19	0.13	1.77
												Seed	6.40	50	0.040	11.25	0.98	0.12	0.29	0.19	2.13

DITCH ANALYSIS

PID : 46933 **Date :** 12/07/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to East Bank Basin A **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
137+40	137+33	R	7.00	1.00	3.00	3.00	0.0295	0.29	0.29	0.90	0.26	Seed	4.29	5	0.030	10.04	2.60	0.45	1.12	0.25	2.48
												Jute Mat	4.29	5	0.040	10.06	2.09	0.53	1.12	0.29	2.72
												Temp. Mat	4.29	5	0.040	10.06	2.09	0.53	1.12	0.29	2.72
												Temp. Mat	5.08	10	0.040	10.05	2.20	0.57	1.33	0.31	2.87
137+33	133+22	R	11.00	1.00	3.00	3.00	0.2000 *	0.00	0.29	0.90	0.26	Seed	4.29	5	0.030	10.09	5.14	1.88	1.12	0.15	1.90
												Jute Mat	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Temp. Mat	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Perm, Type 1	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Perm, Type 2	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Perm, Type 2	5.07	10	0.040	10.09	4.39	2.40	1.33	0.19	2.15

DITCH ANALYSIS

PID : 46933 **Date :** 12/07/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to East Bank Basin A **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

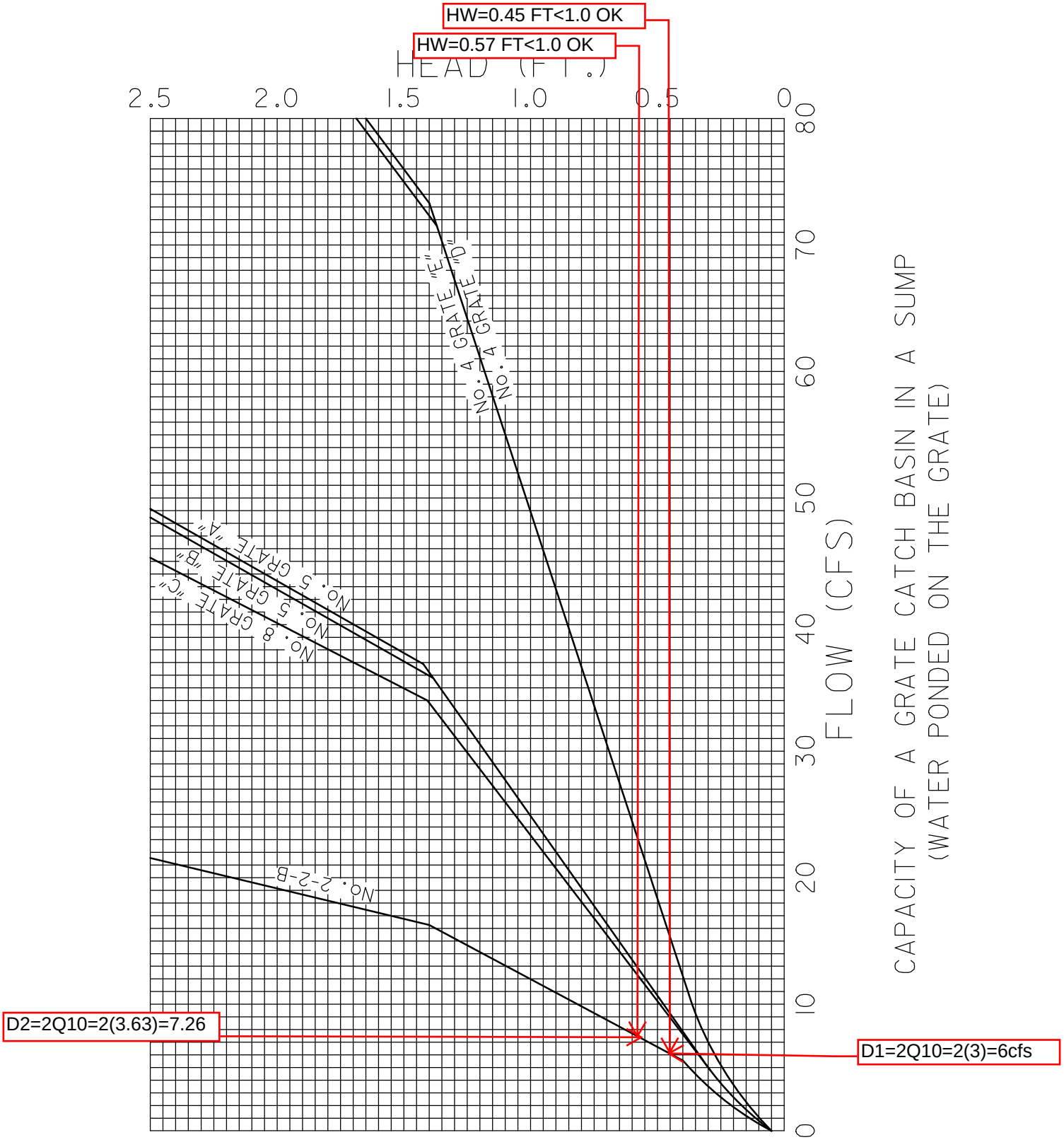
(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
137+40	137+33	R	7.00	1.00	3.00	3.00	0.0295	0.29	0.29	0.90	0.26	Seed	4.29	5	0.030	10.04	2.60	0.45	1.12	0.25	2.48
												Jute Mat	4.29	5	0.040	10.06	2.09	0.53	1.12	0.29	2.72
												Temp. Mat	4.29	5	0.040	10.06	2.09	0.53	1.12	0.29	2.72
												Temp. Mat	6.78	50	0.040	10.05	2.38	0.66	1.77	0.36	3.15
137+33	133+22	R	11.00	1.00	3.00	3.00	0.2000 *	0.00	0.29	0.90	0.26	Seed	4.29	5	0.030	10.09	5.14	1.88	1.12	0.15	1.90
												Jute Mat	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Temp. Mat	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Perm, Type 1	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Perm, Type 2	4.28	5	0.040	10.10	4.22	2.18	1.12	0.17	2.05
												Perm, Type 2	6.76	50	0.040	10.09	4.76	2.78	1.77	0.22	2.34

CAPACITY OF A GRATE CATCH BASIN IN A SUMP

1102-1

REFERENCE SECTION
1102.3.5



Extended Dry Detention 137+00 to 138+00

Project Summary	
Title	East Bank A
Engineer	PNSHEDIVY
Company	HNTB
Date	10/20/2011

Notes

Table of Contents

Extended Dry Detention 137+00 to 138+00

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Proposed Storm Sewer DA	wq	0	0.022	12.000	0.329
Proposed Storm Sewer DA	5 year	5	0.065	12.000	0.932
Proposed Storm Sewer DA	10 year	10	0.077	12.000	1.089
Proposed Storm Sewer DA	25 year	25	0.094	12.000	1.314
Proposed Storm Sewer DA	50 year	50	0.107	12.000	1.500

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Analysis Point Pro	wq	0	0.020	18.250	0.006
Analysis Point Pro	5 year	5	0.061	12.050	0.787
Analysis Point Pro	10 year	10	0.073	12.050	0.991
Analysis Point Pro	25 year	25	0.089	12.050	1.216
Analysis Point Pro	50 year	50	0.103	12.050	1.390

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Extended Detention (IN)	wq	0	0.022	12.000	0.329	(N/A)	(N/A)
Extended Detention (OUT)	wq	0	0.020	18.250	0.006	579.22	0.016
Extended Detention (IN)	5 year	5	0.065	12.000	0.932	(N/A)	(N/A)
Extended Detention (OUT)	5 year	5	0.061	12.050	0.787	579.49	0.028
Extended Detention (IN)	10 year	10	0.077	12.000	1.089	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Extended Detention (OUT)	10 year	10	0.073	12.050	0.991	579.51	0.029
Extended Detention (IN)	25 year	25	0.094	12.000	1.314	(N/A)	(N/A)
Extended Detention (OUT)	25 year	25	0.089	12.050	1.216	579.54	0.030
Extended Detention (IN)	50 year	50	0.107	12.000	1.500	(N/A)	(N/A)
Extended Detention (OUT)	50 year	50	0.103	12.050	1.390	579.56	0.031

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.5	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.5	0.6	0.6	0.6
10.500	0.6	0.6	0.6	0.6	0.7
11.000	0.7	0.7	0.7	0.8	0.8
11.500	0.8	0.9	1.0	1.3	1.7
12.000	1.9	2.0	2.0	2.1	2.1
12.500	2.1	2.2	2.2	2.2	2.2
13.000	2.3	2.3	2.3	2.3	2.3
13.500	2.3	2.3	2.4	2.4	2.4
14.000	2.4	2.4	2.4	2.4	2.4
14.500	2.4	2.5	2.5	2.5	2.5
15.000	2.5	2.5	2.5	2.5	2.5
15.500	2.5	2.5	2.5	2.6	2.6
16.000	2.6	2.6	2.6	2.6	2.6
16.500	2.6	2.6	2.6	2.6	2.6

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.6	2.6	2.6	2.7	2.7
17.500	2.7	2.7	2.7	2.7	2.7
18.000	2.7	2.7	2.7	2.7	2.7
18.500	2.7	2.7	2.7	2.7	2.7
19.000	2.7	2.7	2.7	2.8	2.8
19.500	2.8	2.8	2.8	2.8	2.8
20.000	2.8	2.8	2.8	2.8	2.8
20.500	2.8	2.8	2.8	2.8	2.8
21.000	2.8	2.8	2.8	2.8	2.8
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.9	2.9	2.9	2.9	2.9
22.500	2.9	2.9	2.9	2.9	2.9
23.000	2.9	2.9	2.9	2.9	2.9
23.500	2.9	2.9	2.9	2.9	2.9
24.000	2.9	(N/A)	(N/A)	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.4	0.4	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.5	0.5	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.6	0.6	0.6	0.6	0.6
10.000	0.6	0.6	0.6	0.7	0.7
10.500	0.7	0.7	0.7	0.8	0.8
11.000	0.8	0.8	0.9	0.9	0.9
11.500	1.0	1.0	1.2	1.5	1.9
12.000	2.3	2.3	2.4	2.4	2.5
12.500	2.5	2.5	2.6	2.6	2.6
13.000	2.6	2.6	2.7	2.7	2.7
13.500	2.7	2.7	2.7	2.8	2.8
14.000	2.8	2.8	2.8	2.8	2.8
14.500	2.8	2.9	2.9	2.9	2.9
15.000	2.9	2.9	2.9	2.9	2.9
15.500	2.9	3.0	3.0	3.0	3.0
16.000	3.0	3.0	3.0	3.0	3.0
16.500	3.0	3.0	3.0	3.1	3.1

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.1	3.1	3.1	3.1	3.1
17.500	3.1	3.1	3.1	3.1	3.1
18.000	3.1	3.1	3.1	3.1	3.2
18.500	3.2	3.2	3.2	3.2	3.2
19.000	3.2	3.2	3.2	3.2	3.2
19.500	3.2	3.2	3.2	3.2	3.2
20.000	3.2	3.2	3.2	3.2	3.3
20.500	3.3	3.3	3.3	3.3	3.3
21.000	3.3	3.3	3.3	3.3	3.3
21.500	3.3	3.3	3.3	3.3	3.3
22.000	3.3	3.3	3.3	3.3	3.3
22.500	3.3	3.3	3.3	3.4	3.4
23.000	3.4	3.4	3.4	3.4	3.4
23.500	3.4	3.4	3.4	3.4	3.4
24.000	3.4	(N/A)	(N/A)	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.5	0.5	0.5	0.5
8.000	0.5	0.5	0.5	0.5	0.5
8.500	0.5	0.6	0.6	0.6	0.6
9.000	0.6	0.6	0.6	0.6	0.7
9.500	0.7	0.7	0.7	0.7	0.7
10.000	0.7	0.8	0.8	0.8	0.8
10.500	0.8	0.9	0.9	0.9	0.9
11.000	1.0	1.0	1.0	1.1	1.1
11.500	1.2	1.3	1.4	1.8	2.3
12.000	2.7	2.8	2.9	2.9	3.0
12.500	3.0	3.0	3.1	3.1	3.1
13.000	3.2	3.2	3.2	3.2	3.2
13.500	3.3	3.3	3.3	3.3	3.3
14.000	3.4	3.4	3.4	3.4	3.4
14.500	3.4	3.4	3.5	3.5	3.5
15.000	3.5	3.5	3.5	3.5	3.5
15.500	3.5	3.6	3.6	3.6	3.6
16.000	3.6	3.6	3.6	3.6	3.6
16.500	3.6	3.7	3.7	3.7	3.7

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.7	3.7	3.7	3.7	3.7
17.500	3.7	3.7	3.7	3.8	3.8
18.000	3.8	3.8	3.8	3.8	3.8
18.500	3.8	3.8	3.8	3.8	3.8
19.000	3.8	3.8	3.8	3.9	3.9
19.500	3.9	3.9	3.9	3.9	3.9
20.000	3.9	3.9	3.9	3.9	3.9
20.500	3.9	3.9	3.9	3.9	3.9
21.000	3.9	4.0	4.0	4.0	4.0
21.500	4.0	4.0	4.0	4.0	4.0
22.000	4.0	4.0	4.0	4.0	4.0
22.500	4.0	4.0	4.0	4.0	4.0
23.000	4.0	4.0	4.1	4.1	4.1
23.500	4.1	4.1	4.1	4.1	4.1
24.000	4.1	(N/A)	(N/A)	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.5	0.5
8.000	0.6	0.6	0.6	0.6	0.6
8.500	0.6	0.6	0.6	0.7	0.7
9.000	0.7	0.7	0.7	0.7	0.7
9.500	0.8	0.8	0.8	0.8	0.8
10.000	0.8	0.9	0.9	0.9	0.9
10.500	1.0	1.0	1.0	1.0	1.1
11.000	1.1	1.1	1.2	1.2	1.3
11.500	1.3	1.4	1.7	2.0	2.6
12.000	3.1	3.2	3.3	3.3	3.4
12.500	3.4	3.5	3.5	3.5	3.6
13.000	3.6	3.6	3.7	3.7	3.7
13.500	3.7	3.7	3.8	3.8	3.8
14.000	3.8	3.8	3.9	3.9	3.9
14.500	3.9	3.9	3.9	3.9	4.0
15.000	4.0	4.0	4.0	4.0	4.0
15.500	4.0	4.1	4.1	4.1	4.1
16.000	4.1	4.1	4.1	4.1	4.1
16.500	4.2	4.2	4.2	4.2	4.2

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.2	4.2	4.2	4.2	4.2
17.500	4.2	4.3	4.3	4.3	4.3
18.000	4.3	4.3	4.3	4.3	4.3
18.500	4.3	4.3	4.3	4.4	4.4
19.000	4.4	4.4	4.4	4.4	4.4
19.500	4.4	4.4	4.4	4.4	4.4
20.000	4.4	4.4	4.4	4.5	4.5
20.500	4.5	4.5	4.5	4.5	4.5
21.000	4.5	4.5	4.5	4.5	4.5
21.500	4.5	4.5	4.5	4.5	4.5
22.000	4.6	4.6	4.6	4.6	4.6
22.500	4.6	4.6	4.6	4.6	4.6
23.000	4.6	4.6	4.6	4.6	4.6
23.500	4.6	4.6	4.6	4.6	4.7
24.000	4.7	(N/A)	(N/A)	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 0 years
Storm Event: WQstorm

Time-Depth Curve: WQstorm	
Label	WQstorm
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	0 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.0	0.0	0.0	0.0
2.500	0.0	0.0	0.0	0.0	0.0
3.000	0.0	0.0	0.0	0.0	0.0
3.500	0.0	0.0	0.0	0.0	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.1
5.500	0.1	0.1	0.1	0.1	0.1
6.000	0.1	0.1	0.1	0.1	0.1
6.500	0.1	0.1	0.1	0.1	0.1
7.000	0.1	0.1	0.1	0.1	0.1
7.500	0.1	0.1	0.1	0.1	0.1
8.000	0.1	0.1	0.1	0.1	0.1
8.500	0.1	0.1	0.2	0.2	0.2
9.000	0.2	0.2	0.2	0.2	0.2
9.500	0.2	0.2	0.2	0.2	0.2
10.000	0.2	0.2	0.2	0.2	0.2
10.500	0.2	0.2	0.2	0.2	0.3
11.000	0.3	0.3	0.3	0.3	0.3
11.500	0.3	0.3	0.4	0.5	0.6
12.000	0.7	0.8	0.8	0.8	0.8
12.500	0.8	0.8	0.8	0.8	0.8
13.000	0.8	0.9	0.9	0.9	0.9
13.500	0.9	0.9	0.9	0.9	0.9
14.000	0.9	0.9	0.9	0.9	0.9
14.500	0.9	0.9	0.9	0.9	0.9
15.000	0.9	0.9	0.9	0.9	1.0
15.500	1.0	1.0	1.0	1.0	1.0
16.000	1.0	1.0	1.0	1.0	1.0
16.500	1.0	1.0	1.0	1.0	1.0

Extended Dry Detention 137+00 to 138+00

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 0 years
Storm Event: WQstorm

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	1.0	1.0	1.0	1.0	1.0
17.500	1.0	1.0	1.0	1.0	1.0
18.000	1.0	1.0	1.0	1.0	1.0
18.500	1.0	1.0	1.0	1.0	1.0
19.000	1.0	1.0	1.0	1.0	1.0
19.500	1.0	1.0	1.0	1.0	1.0
20.000	1.0	1.0	1.1	1.1	1.1
20.500	1.1	1.1	1.1	1.1	1.1
21.000	1.1	1.1	1.1	1.1	1.1
21.500	1.1	1.1	1.1	1.1	1.1
22.000	1.1	1.1	1.1	1.1	1.1
22.500	1.1	1.1	1.1	1.1	1.1
23.000	1.1	1.1	1.1	1.1	1.1
23.500	1.1	1.1	1.1	1.1	1.1
24.000	1.1	(N/A)	(N/A)	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method (Computational Notes)
Definition of Terms

At	Total area (acres): At = Ai+Ap
Ai	Impervious area (acres)
Ap	Pervious area (acres)
CNi	Runoff curve number for impervious area
CNp	Runoff curve number for pervious area
fLoss	f loss constant infiltration (depth/time)
gKs	Saturated Hydraulic Conductivity (depth/time)
Md	Volumetric Moisture Deficit
Psi	Capillary Suction (length)
hK	Horton Infiltration Decay Rate (time^-1)
fo	Initial Infiltration Rate (depth/time)
fc	Ultimate(capacity)Infiltration Rate (depth/time)
Ia	Initial Abstraction (length)
dt	Computational increment (duration of unit excess rainfall) Default dt is smallest value of 0.1333Tc, rtm, and th (Smallest dt is then adjusted to match up with Tp)
UDdt	User specified override computational main time increment (only used if UDdt is => .1333Tc)
D(t)	Point on distribution curve (fraction of P) for time step t
K	2 / (1 + (Tr/Tp)): default K = 0.75: (for Tr/Tp = 1.67)
Ks	Hydrograph shape factor = Unit Conversions * K: = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K Default Ks = 645.333 * 0.75 = 484
Lag	Lag time from center of excess runoff (dt) to Tp: Lag = 0.6Tc
P	Total precipitation depth, inches
Pa(t)	Accumulated rainfall at time step t
Pi(t)	Incremental rainfall at time step t
qp	Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi. = (Ks * A * Q) / Tp (where Q = 1in. runoff, A=sq.mi.)
Qu(t)	Unit hydrograph ordinate (cfs) at time step t
Q(t)	Final hydrograph ordinate (cfs) at time step t
Rai(t)	Accumulated runoff (inches) at time step t for impervious area
Rap(t)	Accumulated runoff (inches) at time step t for pervious area
Rii(t)	Incremental runoff (inches) at time step t for impervious area
Rip(t)	Incremental runoff (inches) at time step t for pervious area
R(t)	Incremental weighted total runoff (inches)
Rtm	Time increment for rainfall table
Si	S for impervious area: Si = (1000/CNi) - 10
Sp	S for pervious area: Sp = (1000/CNp) - 10
t	Time step (row) number
Tc	Time of concentration
Tb	Time (hrs) of entire unit hydrograph: Tb = Tp + Tr
Tp	Time (hrs) to peak of a unit hydrograph: Tp = (dt/2) + Lag
Tr	Time (hrs) of receding limb of unit hydrograph: Tr = ratio of Tp

Extended Dry Detention 137+00 to 138+00

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method
Computational Notes
Precipitation

Column (1)	Time for time step t
Column (2)	D(t) = Point on distribution curve for time step t
Column (3)	Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4)	Pa(t) = D(t) x P: Col.(2) x P

Pervious Area Runoff (using SCS Runoff CN Method)

Column (5)	Rap(t) = Accumulated pervious runoff for time step t
	If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
	If (Pa(t) is > 0.2Sp) then use:
	
	Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)

Column (6)	Rip(t) = Incremental pervious runoff for time step t Rip(t) = Rap(t) - Rap(t-1) Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

Impervious Area Runoff

Column (7 & 8)...	Did not specify to use impervious areas.

Incremental Weighted Runoff

Column (9)	R(t) = (Ap/At) x Rip(t) + (Ai/At) x Rii(t) R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS Unit Hydrograph Method

Column (10)	Q(t) is computed with the SCS unit hydrograph method using R(t) and Qu(t).

Extended Dry Detention 137+00 to 138+00

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 0 years
Storm Event: WQstorm

Storm Event	WQstorm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.170 hours
Area (User Defined)	0.291 acres

Computational Time Increment	0.023 hours
Time to Peak (Computed)	11.968 hours
Flow (Peak, Computed)	0.333 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.329 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.291 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.9 in
Runoff Volume (Pervious)	0.022 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.022 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.170 hours
Computational Time Increment	0.023 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Extended Dry Detention 137+00 to 138+00

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 0 years
Storm Event: WQstorm

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.941 ft^3/s
Unit peak time, Tp	0.113 hours
Unit receding limb, Tr	0.453 hours
Total unit time, Tb	0.567 hours

Extended Dry Detention 137+00 to 138+00

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 0 years
Label: Proposed Storm Sewer DA Storm Event: WQstorm

Storm Event	WQstorm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.170 hours
Area (User Defined)	0.291 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
4.900	0.001	0.001	0.001	0.001	0.001
5.150	0.001	0.001	0.001	0.001	0.001
5.400	0.001	0.001	0.001	0.002	0.002
5.650	0.002	0.002	0.002	0.002	0.002
5.900	0.002	0.002	0.002	0.002	0.002
6.150	0.002	0.002	0.002	0.002	0.002
6.400	0.002	0.002	0.002	0.002	0.002
6.650	0.002	0.002	0.002	0.003	0.003
6.900	0.003	0.003	0.003	0.003	0.003
7.150	0.003	0.003	0.003	0.003	0.003
7.400	0.003	0.003	0.003	0.003	0.003
7.650	0.003	0.003	0.003	0.003	0.003
7.900	0.004	0.004	0.004	0.004	0.004
8.150	0.004	0.004	0.004	0.004	0.004
8.400	0.004	0.004	0.005	0.005	0.005
8.650	0.005	0.005	0.005	0.005	0.005
8.900	0.006	0.006	0.006	0.006	0.006
9.150	0.006	0.006	0.006	0.006	0.006
9.400	0.006	0.007	0.007	0.007	0.007
9.650	0.007	0.007	0.007	0.007	0.008
9.900	0.008	0.008	0.008	0.008	0.009
10.150	0.009	0.009	0.010	0.010	0.010
10.400	0.011	0.011	0.011	0.012	0.012
10.650	0.012	0.013	0.013	0.014	0.015
10.900	0.015	0.016	0.016	0.017	0.018
11.150	0.019	0.020	0.021	0.022	0.024
11.400	0.025	0.026	0.028	0.032	0.042
11.650	0.057	0.082	0.112	0.150	0.198
11.900	0.268	0.324	0.329	0.292	0.217
12.150	0.142	0.096	0.073	0.059	0.051
12.400	0.045	0.041	0.036	0.033	0.030
12.650	0.028	0.027	0.025	0.024	0.024
12.900	0.023	0.022	0.021	0.020	0.020

Extended Dry Detention 137+00 to 138+00

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 0 years
Label: Proposed Storm Sewer DA Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
13.150	0.019	0.018	0.018	0.018	0.017
13.400	0.017	0.016	0.016	0.015	0.015
13.650	0.015	0.014	0.014	0.014	0.013
13.900	0.013	0.013	0.012	0.012	0.012
14.150	0.012	0.011	0.011	0.011	0.011
14.400	0.011	0.011	0.011	0.011	0.011
14.650	0.010	0.010	0.010	0.010	0.010
14.900	0.010	0.010	0.010	0.010	0.009
15.150	0.009	0.009	0.009	0.009	0.009
15.400	0.009	0.009	0.009	0.008	0.008
15.650	0.008	0.008	0.008	0.008	0.008
15.900	0.008	0.008	0.007	0.007	0.007
16.150	0.007	0.007	0.007	0.007	0.007
16.400	0.007	0.007	0.007	0.007	0.007
16.650	0.007	0.007	0.007	0.007	0.007
16.900	0.007	0.007	0.007	0.006	0.006
17.150	0.006	0.006	0.006	0.006	0.006
17.400	0.006	0.006	0.006	0.006	0.006
17.650	0.006	0.006	0.006	0.006	0.006
17.900	0.006	0.006	0.006	0.006	0.006
18.150	0.006	0.006	0.006	0.006	0.005
18.400	0.005	0.005	0.005	0.005	0.005
18.650	0.005	0.005	0.005	0.005	0.005
18.900	0.005	0.005	0.005	0.005	0.005
19.150	0.005	0.005	0.005	0.005	0.005
19.400	0.005	0.005	0.005	0.005	0.004
19.650	0.004	0.004	0.004	0.004	0.004
19.900	0.004	0.004	0.004	0.004	0.004
20.150	0.004	0.004	0.004	0.004	0.004
20.400	0.004	0.004	0.004	0.004	0.004
20.650	0.004	0.004	0.004	0.004	0.004
20.900	0.004	0.004	0.004	0.004	0.004
21.150	0.004	0.004	0.004	0.004	0.004
21.400	0.004	0.004	0.004	0.004	0.004
21.650	0.004	0.004	0.004	0.004	0.004
21.900	0.004	0.004	0.004	0.004	0.004
22.150	0.004	0.004	0.004	0.004	0.004
22.400	0.004	0.004	0.004	0.004	0.004
22.650	0.004	0.004	0.004	0.004	0.004
22.900	0.004	0.004	0.004	0.004	0.004
23.150	0.004	0.004	0.004	0.004	0.004
23.400	0.004	0.004	0.004	0.004	0.004

Extended Dry Detention 137+00 to 138+00

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 0 years
Label: Proposed Storm Sewer DA Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
23.650	0.004	0.004	0.004	0.004	0.004
23.900	0.003	0.003	0.003	0.003	0.002
24.150	0.001	0.001	(N/A)	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000	0.000
4.250	0.000	0.000	0.000	0.000	0.000
4.500	0.000	0.000	0.000	0.000	0.000
4.750	0.000	0.000	0.000	0.000	0.000
5.000	0.000	0.000	0.000	0.000	0.000
5.250	0.000	0.000	0.000	0.000	0.000
5.500	0.000	0.000	0.000	0.000	0.000
5.750	0.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000	0.000
6.250	0.000	0.000	0.000	0.000	0.000
6.500	0.000	0.000	0.000	0.000	0.000
6.750	0.000	0.000	0.000	0.000	0.000
7.000	0.000	0.000	0.000	0.000	0.000
7.250	0.000	0.000	0.000	0.000	0.000
7.500	0.000	0.000	0.000	0.000	0.000
7.750	0.000	0.001	0.001	0.001	0.001
8.000	0.001	0.001	0.001	0.001	0.001
8.250	0.001	0.001	0.001	0.001	0.001
8.500	0.001	0.001	0.001	0.001	0.001
8.750	0.001	0.001	0.001	0.001	0.001
9.000	0.001	0.001	0.001	0.001	0.001
9.250	0.001	0.001	0.001	0.001	0.001
9.500	0.001	0.001	0.001	0.001	0.001
9.750	0.001	0.001	0.001	0.001	0.001
10.000	0.001	0.001	0.001	0.001	0.001

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	0.001	0.002	0.002	0.002	0.002
10.500	0.002	0.002	0.002	0.002	0.002
10.750	0.002	0.002	0.002	0.002	0.002
11.000	0.002	0.002	0.002	0.002	0.002
11.250	0.003	0.003	0.003	0.003	0.003
11.500	0.003	0.003	0.003	0.003	0.004
11.750	0.004	0.005	0.005	0.006	0.007
12.000	0.008	0.010	0.011	0.012	0.012
12.250	0.013	0.013	0.013	0.013	0.013
12.500	0.014	0.014	0.014	0.014	0.014
12.750	0.014	0.014	0.014	0.014	0.014
13.000	0.014	0.014	0.015	0.015	0.015
13.250	0.015	0.015	0.015	0.015	0.015
13.500	0.015	0.015	0.015	0.015	0.015
13.750	0.015	0.015	0.015	0.015	0.015
14.000	0.015	0.015	0.015	0.015	0.015
14.250	0.015	0.015	0.015	0.015	0.015
14.500	0.015	0.016	0.016	0.016	0.016
14.750	0.016	0.016	0.016	0.016	0.016
15.000	0.016	0.016	0.016	0.016	0.016
15.250	0.016	0.016	0.016	0.016	0.016
15.500	0.016	0.016	0.016	0.016	0.016
15.750	0.016	0.016	0.016	0.016	0.016
16.000	0.016	0.016	0.016	0.016	0.016
16.250	0.016	0.016	0.016	0.016	0.016
16.500	0.016	0.016	0.016	0.016	0.016
16.750	0.016	0.016	0.016	0.016	0.016
17.000	0.016	0.016	0.016	0.016	0.016
17.250	0.016	0.016	0.016	0.016	0.016
17.500	0.016	0.016	0.016	0.016	0.016
17.750	0.016	0.016	0.016	0.016	0.016
18.000	0.016	0.016	0.016	0.016	0.016
18.250	0.016	0.016	0.016	0.016	0.016
18.500	0.016	0.016	0.016	0.016	0.016
18.750	0.016	0.016	0.016	0.016	0.016
19.000	0.016	0.016	0.016	0.016	0.016
19.250	0.016	0.016	0.016	0.016	0.016
19.500	0.016	0.016	0.016	0.016	0.016
19.750	0.016	0.016	0.016	0.016	0.016
20.000	0.016	0.016	0.016	0.016	0.016
20.250	0.016	0.016	0.016	0.016	0.016

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.016	0.016	0.016	0.016	0.016
20.750	0.016	0.016	0.016	0.016	0.016
21.000	0.016	0.016	0.016	0.016	0.016
21.250	0.016	0.016	0.016	0.016	0.016
21.500	0.016	0.016	0.016	0.016	0.016
21.750	0.016	0.016	0.016	0.016	0.016
22.000	0.016	0.016	0.016	0.016	0.016
22.250	0.016	0.016	0.016	0.016	0.016
22.500	0.016	0.016	0.016	0.016	0.016
22.750	0.016	0.016	0.016	0.016	0.016
23.000	0.016	0.016	0.016	0.016	0.016
23.250	0.016	0.016	0.016	0.016	0.016
23.500	0.016	0.016	0.015	0.015	0.015
23.750	0.015	0.015	0.015	0.015	0.015
24.000	0.015	0.015	0.015	0.015	0.015
24.250	0.015	0.015	0.015	0.015	0.015
24.500	0.015	0.015	0.015	0.015	0.015
24.750	0.015	0.015	0.015	0.015	0.015
25.000	0.015	0.015	0.015	0.015	0.015
25.250	0.015	0.015	0.015	0.015	0.015
25.500	0.015	0.015	0.015	0.015	0.015
25.750	0.015	0.015	0.015	0.015	0.015
26.000	0.015	0.015	0.015	0.015	0.015
26.250	0.014	0.014	0.014	0.014	0.014
26.500	0.014	0.014	0.014	0.014	0.014
26.750	0.014	0.014	0.014	0.014	0.014
27.000	0.014	0.014	0.014	0.014	0.014
27.250	0.014	0.014	0.014	0.014	0.014
27.500	0.014	0.014	0.014	0.014	0.014
27.750	0.014	0.014	0.014	0.014	0.014
28.000	0.014	0.014	0.014	0.014	0.014
28.250	0.014	0.014	0.014	0.014	0.014
28.500	0.014	0.013	0.013	0.013	0.013
28.750	0.013	0.013	0.013	0.013	0.013
29.000	0.013	0.013	0.013	0.013	0.013
29.250	0.013	0.013	0.013	0.013	0.013
29.500	0.013	0.013	0.013	0.013	0.013
29.750	0.013	0.013	0.013	0.013	0.013
30.000	0.013	0.013	0.013	0.013	0.013
30.250	0.013	0.013	0.013	0.013	0.013
30.500	0.013	0.013	0.013	0.013	0.013

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
30.750	0.013	0.013	0.013	0.013	0.013
31.000	0.012	0.012	0.012	0.012	0.012
31.250	0.012	0.012	0.012	0.012	0.012
31.500	0.012	0.012	0.012	0.012	0.012
31.750	0.012	0.012	0.012	0.012	0.012
32.000	0.012	0.012	0.012	0.012	0.012
32.250	0.012	0.012	0.012	0.012	0.012
32.500	0.012	0.012	0.012	0.012	0.012
32.750	0.012	0.012	0.012	0.012	0.012
33.000	0.012	0.012	0.012	0.012	0.012
33.250	0.012	0.012	0.012	0.012	0.012
33.500	0.012	0.012	0.011	0.011	0.011
33.750	0.011	0.011	0.011	0.011	0.011
34.000	0.011	0.011	0.011	0.011	0.011
34.250	0.011	0.011	0.011	0.011	0.011
34.500	0.011	0.011	0.011	0.011	0.011
34.750	0.011	0.011	0.011	0.011	0.011
35.000	0.011	0.011	0.011	0.011	0.011
35.250	0.011	0.011	0.011	0.010	0.010
35.500	0.010	0.010	0.010	0.010	0.010
35.750	0.010	0.010	0.010	0.010	0.010
36.000	0.010	0.010	0.010	0.010	0.010
36.250	0.010	0.010	0.010	0.010	0.010
36.500	0.010	0.010	0.010	0.010	0.010
36.750	0.010	0.010	0.010	0.010	0.010
37.000	0.010	0.010	0.010	0.010	0.010
37.250	0.010	0.010	0.010	0.010	0.010
37.500	0.010	0.009	0.009	0.009	0.009
37.750	0.009	0.009	0.009	0.009	0.009
38.000	0.009	0.009	0.009	0.009	0.009
38.250	0.009	0.009	0.009	0.009	0.009
38.500	0.009	0.009	0.009	0.009	0.009
38.750	0.009	0.009	0.009	0.009	0.009
39.000	0.009	0.009	0.009	0.009	0.009
39.250	0.009	0.009	0.009	0.009	0.009
39.500	0.009	0.009	0.009	0.009	0.009
39.750	0.009	0.009	0.009	0.009	0.009
40.000	0.009	0.008	0.008	0.008	0.008
40.250	0.008	0.008	0.008	0.008	0.008
40.500	0.008	0.008	0.008	0.008	0.008
40.750	0.008	0.008	0.008	0.008	0.008

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
41.000	0.008	0.008	0.008	0.008	0.008
41.250	0.008	0.008	0.008	0.008	0.008
41.500	0.008	0.008	0.008	0.008	0.008
41.750	0.008	0.008	0.008	0.008	0.008
42.000	0.008	0.008	0.008	0.008	0.008
42.250	0.008	0.008	0.008	0.008	0.008
42.500	0.008	0.008	0.008	0.008	0.008
42.750	0.008	0.008	0.008	0.008	0.008
43.000	0.008	0.008	0.007	0.007	0.007
43.250	0.007	0.007	0.007	0.007	0.007
43.500	0.007	0.007	0.007	0.007	0.007
43.750	0.007	0.007	0.007	0.007	0.007
44.000	0.007	0.007	0.007	0.007	0.007
44.250	0.007	0.007	0.007	0.007	0.007
44.500	0.007	0.007	0.007	0.007	0.007
44.750	0.007	0.007	0.007	0.007	0.007
45.000	0.007	0.007	0.007	0.007	0.007
45.250	0.007	0.007	0.007	0.007	0.007
45.500	0.007	0.007	0.007	0.007	0.007
45.750	0.007	0.007	0.007	0.007	0.007
46.000	0.007	0.007	0.007	0.007	0.007
46.250	0.007	0.007	0.007	0.006	0.006
46.500	0.006	0.006	0.006	0.006	0.006
46.750	0.006	0.006	0.006	0.006	0.006
47.000	0.006	0.006	0.006	0.006	0.006
47.250	0.006	0.006	0.006	0.006	0.006
47.500	0.006	0.006	0.006	0.006	0.006
47.750	0.006	0.006	0.006	0.006	0.006
48.000	0.006	0.006	0.006	0.006	0.006
48.250	0.006	0.006	0.006	0.006	0.006
48.500	0.006	0.006	0.006	0.006	0.006
48.750	0.006	0.006	0.006	0.006	0.006
49.000	0.006	0.006	0.006	0.006	0.006
49.250	0.006	0.006	0.006	0.006	0.006
49.500	0.006	0.006	0.006	0.006	0.006
49.750	0.006	0.006	0.006	0.006	0.006
50.000	0.006	0.006	0.006	0.005	0.005
50.250	0.005	0.005	0.005	0.005	0.005
50.500	0.005	0.005	0.005	0.005	0.005
50.750	0.005	0.005	0.005	0.005	0.005
51.000	0.005	0.005	0.005	0.005	0.005

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
51.250	0.005	0.005	0.005	0.005	0.005
51.500	0.005	0.005	0.005	0.005	0.005
51.750	0.005	0.005	0.005	0.005	0.005
52.000	0.005	0.005	0.005	0.005	0.005
52.250	0.005	0.005	0.005	0.005	0.005
52.500	0.005	0.005	0.005	0.005	0.005
52.750	0.005	0.005	0.005	0.005	0.005
53.000	0.005	0.005	0.005	0.005	0.005
53.250	0.005	0.005	0.005	0.005	0.005
53.500	0.005	0.005	0.005	0.005	0.005
53.750	0.005	0.005	0.005	0.005	0.004
54.000	0.004	0.004	0.004	0.004	0.004
54.250	0.004	0.004	0.004	0.004	0.004
54.500	0.004	0.004	0.004	0.004	0.004
54.750	0.004	0.004	0.004	0.004	0.004
55.000	0.004	0.004	0.004	0.004	0.004
55.250	0.004	0.004	0.004	0.004	0.004
55.500	0.004	0.004	0.004	0.004	0.004
55.750	0.004	0.004	0.004	0.004	0.004
56.000	0.004	0.004	0.004	0.004	0.004
56.250	0.004	0.004	0.004	0.004	0.004
56.500	0.004	0.004	0.004	0.004	0.004
56.750	0.004	0.004	0.004	0.004	0.004
57.000	0.004	0.004	0.004	0.004	0.004
57.250	0.004	0.004	0.004	0.004	0.004
57.500	0.004	0.004	0.004	0.004	0.004
57.750	0.004	0.004	0.004	0.004	0.003
58.000	0.003	0.003	0.003	0.003	0.003
58.250	0.003	0.003	0.003	0.003	0.003
58.500	0.003	0.003	0.003	0.003	0.003
58.750	0.003	0.003	0.003	0.003	0.003
59.000	0.003	0.003	0.003	0.003	0.003
59.250	0.003	0.003	0.003	0.003	0.003
59.500	0.003	0.003	0.003	0.003	0.003
59.750	0.003	0.003	0.003	0.003	0.003
60.000	0.003	0.003	0.003	0.003	0.003
60.250	0.003	0.003	0.003	0.003	0.003
60.500	0.003	0.003	0.003	0.003	0.003
60.750	0.003	0.003	0.003	0.003	0.003
61.000	0.003	0.003	0.003	0.003	0.003
61.250	0.003	0.003	0.003	0.003	0.003

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
61.500	0.003	0.003	0.003	0.003	0.003
61.750	0.003	0.003	0.003	0.003	0.003
62.000	0.003	0.003	0.003	0.003	0.003
62.250	0.003	0.003	0.003	0.003	0.003
62.500	0.003	0.003	0.003	0.003	0.003
62.750	0.003	0.003	0.003	0.003	0.003
63.000	0.003	0.003	0.003	0.003	0.003
63.250	0.003	0.003	0.003	0.003	0.003
63.500	0.002	0.002	0.002	0.002	0.002
63.750	0.002	0.002	0.002	0.002	0.002
64.000	0.002	0.002	0.002	0.002	0.002
64.250	0.002	0.002	0.002	0.002	0.002
64.500	0.002	0.002	0.002	0.002	0.002
64.750	0.002	0.002	0.002	0.002	0.002
65.000	0.002	0.002	0.002	0.002	0.002
65.250	0.002	0.002	0.002	0.002	0.002
65.500	0.002	0.002	0.002	0.002	0.002
65.750	0.002	0.002	0.002	0.002	0.002
66.000	0.002	0.002	0.002	0.002	0.002
66.250	0.002	0.002	0.002	0.002	0.002
66.500	0.002	0.002	0.002	0.002	0.002
66.750	0.002	0.002	0.002	0.002	0.002
67.000	0.002	0.002	0.002	0.002	0.002
67.250	0.002	0.002	0.002	0.002	0.002
67.500	0.002	0.002	0.002	0.002	0.002
67.750	0.002	0.002	0.002	0.002	0.002
68.000	0.002	0.002	0.002	0.002	0.002
68.250	0.002	0.002	0.002	0.002	0.002
68.500	0.002	0.002	0.002	0.002	0.002
68.750	0.002	0.002	0.002	0.002	0.002
69.000	0.002	0.002	0.002	0.002	0.002
69.250	0.002	0.002	0.002	0.002	0.002
69.500	0.002	0.002	0.002	0.002	0.002
69.750	0.002	0.002	0.002	0.002	0.002
70.000	0.002	0.002	0.002	0.002	0.002
70.250	0.002	0.002	0.002	0.002	0.002
70.500	0.002	0.002	0.002	0.002	0.002
70.750	0.002	0.002	0.002	0.002	0.002
71.000	0.002	0.002	0.002	0.002	0.002
71.250	0.002	0.002	0.002	0.002	0.002
71.500	0.002	0.002	0.002	0.002	0.002

Extended Dry Detention 137+00 to 138+00

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
71.750	0.002	0.001	0.001	0.001	0.001
72.000	0.001	(N/A)	(N/A)	(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Elevation-Area Volume Curve
Label: Extended Detention

Return Event: 0 years
Storm Event: Type II 24 hour

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
578.60	0.0	0.018	0.000	0.000	0.000
578.80	0.0	0.020	0.057	0.004	0.004
579.00	0.0	0.025	0.068	0.005	0.008
579.10	0.0	0.037	0.093	0.003	0.011
579.20	0.0	0.040	0.116	0.004	0.015
579.80	0.0	0.051	0.136	0.027	0.043
580.20	0.0	0.060	0.166	0.022	0.065
580.40	0.0	0.064	0.186	0.012	0.077

Extended Dry Detention 137+00 to 138+00

Subsection: Volume Equations
Label: Extended Detention

Return Event: 0 years
Storm Event: Type II 24 hour

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Extended Dry Detention 137+00 to 138+00

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

Requested Pond Water Surface Elevations	
Minimum (Headwater)	578.60 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	580.40 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	579.40	580.40
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	578.60	580.40
Culvert-Circular	Culvert - 1	Forward	TW	576.14	580.40
Tailwater Settings	Tailwater			(N/A)	(N/A)

Extended Dry Detention 137+00 to 138+00

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	578.60 ft
Orifice Diameter	0.50 in
Orifice Coefficient	0.660

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	579.40 ft
Orifice Area	2.6 ft²
Orifice Coefficient	0.660
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.00 in
Length	11.00 ft
Length (Computed Barrel)	11.01 ft
Slope (Computed)	0.050 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900

Extended Dry Detention 137+00 to 138+00

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

Inlet Control Data	
T1 ratio (HW/D)	1.070
T2 ratio (HW/D)	1.172
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	577.48 ft	T1 Flow	4.802 ft³/s
T2 Elevation	577.61 ft	T2 Flow	5.488 ft³/s

Extended Dry Detention 137+00 to 138+00

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Extended Dry Detention 137+00 to 138+00

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.60	0.000	0.00	0.00	0.00	0.00	0.000	(N/A)	0.00
578.85	0.003	578.85	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.10	0.005	579.10	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.35	0.006	579.35	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.40	0.006	579.40	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.60	0.007	579.60	Free Outfall	576.90	0.00	0.000	(N/A)	0.00
579.85	0.008	579.85	Free Outfall	577.73	0.00	0.000	(N/A)	0.00
580.10	0.005	580.10	579.68	579.68	0.00	0.000	(N/A)	0.00
580.35	0.000	580.35	580.35	580.35	0.00	0.000	(N/A)	0.00
580.40	0.000	580.40	580.40	580.40	0.00	0.000	(N/A)	0.00

Message
WS below an invert; no flow.
H =.23
H =.48
H =.73
H =.78
H =.98
H =1.23
H =.42
H =.00
H =.00

Extended Dry Detention 137+00 to 138+00

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.60	0.000	0.00	0.00	0.00	0.00	0.000	(N/A)	0.00
578.85	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.10	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.35	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.40	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.60	1.744	579.60	Free Outfall	576.90	0.00	0.000	(N/A)	0.00
579.85	5.886	579.85	Free Outfall	577.73	0.00	0.000	(N/A)	0.00
580.10	11.340	580.10	579.68	579.68	0.00	0.000	(N/A)	0.00
580.35	13.210	580.35	580.35	580.35	0.00	0.000	(N/A)	0.00
580.40	13.553	580.40	580.40	580.40	0.00	0.000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.2ft
Weir: H =0.45ft
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=.70
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=.95
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.00

Extended Dry Detention 137+00 to 138+00

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 15.537 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.60	0.000	0.00	0.00	Free Outfall	0.00	0.000	(N/A)	0.00
578.85	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.10	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.35	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.40	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.60	1.752	576.90	Free Outfall	Free Outfall	0.00	0.001	(N/A)	0.00
579.85	5.891	577.73	Free Outfall	Free Outfall	0.00	0.004	(N/A)	0.00
580.10	11.343	579.68	Free Outfall	Free Outfall	0.00	0.002	(N/A)	0.00
580.35	12.669	580.35	Free Outfall	Free Outfall	0.00	0.541	(N/A)	0.00
580.40	12.761	580.40	Free Outfall	Free Outfall	0.00	0.792	(N/A)	0.00

Message
WS below an invert; no flow.
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .199ft Dcr= .526ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .504ft Dcr= .982ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =3.54
INLET CONTROL... Submerged: HW =4.21
INLET CONTROL... Submerged: HW =4.26

Extended Dry Detention 137+00 to 138+00

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
578.60	0.000	(N/A)	0.00
578.85	0.003	(N/A)	0.00
579.10	0.005	(N/A)	0.00
579.35	0.006	(N/A)	0.00
579.40	0.006	(N/A)	0.00
579.60	1.752	(N/A)	0.00
579.85	5.891	(N/A)	0.00
580.10	11.343	(N/A)	0.00
580.35	12.669	(N/A)	0.00
580.40	12.761	(N/A)	0.00

Contributing Structures
(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1

Extended Dry Detention 137+00 to 138+00

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

Peak Discharge	0.006 ft³/s
Time to Peak	18.250 hours
Hydrograph Volume	0.020 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.050	0.001	0.001	0.001	0.001	0.001
10.300	0.001	0.001	0.001	0.001	0.001
10.550	0.001	0.001	0.001	0.001	0.001
10.800	0.001	0.001	0.002	0.002	0.002
11.050	0.002	0.002	0.002	0.002	0.002
11.300	0.002	0.002	0.002	0.002	0.002
11.550	0.002	0.002	0.002	0.003	0.003
11.800	0.003	0.004	0.004	0.004	0.004
12.050	0.005	0.005	0.005	0.005	0.005
12.300	0.005	0.005	0.005	0.005	0.005
12.550	0.005	0.005	0.005	0.005	0.005
12.800	0.005	0.005	0.005	0.005	0.005
13.050	0.005	0.005	0.005	0.005	0.005
13.300	0.005	0.005	0.005	0.005	0.005
13.550	0.005	0.005	0.005	0.005	0.005
13.800	0.005	0.005	0.005	0.005	0.005
14.050	0.005	0.005	0.005	0.005	0.005
14.300	0.005	0.005	0.005	0.005	0.005
14.550	0.005	0.005	0.005	0.005	0.005
14.800	0.005	0.005	0.006	0.006	0.006
15.050	0.006	0.006	0.006	0.006	0.006
15.300	0.006	0.006	0.006	0.006	0.006
15.550	0.006	0.006	0.006	0.006	0.006
15.800	0.006	0.006	0.006	0.006	0.006
16.050	0.006	0.006	0.006	0.006	0.006
16.300	0.006	0.006	0.006	0.006	0.006
16.550	0.006	0.006	0.006	0.006	0.006
16.800	0.006	0.006	0.006	0.006	0.006
17.050	0.006	0.006	0.006	0.006	0.006
17.300	0.006	0.006	0.006	0.006	0.006
17.550	0.006	0.006	0.006	0.006	0.006
17.800	0.006	0.006	0.006	0.006	0.006
18.050	0.006	0.006	0.006	0.006	0.006
18.300	0.006	0.006	0.006	0.006	0.006
18.550	0.006	0.006	0.006	0.006	0.006
18.800	0.006	0.006	0.006	0.006	0.006
19.050	0.006	0.006	0.006	0.006	0.006

Extended Dry Detention 137+00 to 138+00

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
19.300	0.006	0.006	0.006	0.006	0.006
19.550	0.006	0.006	0.006	0.006	0.006
19.800	0.006	0.006	0.006	0.006	0.006
20.050	0.006	0.006	0.006	0.006	0.006
20.300	0.006	0.006	0.006	0.006	0.006
20.550	0.006	0.006	0.006	0.006	0.006
20.800	0.006	0.006	0.006	0.006	0.006
21.050	0.006	0.006	0.006	0.006	0.006
21.300	0.006	0.006	0.006	0.006	0.006
21.550	0.006	0.006	0.006	0.006	0.006
21.800	0.006	0.006	0.006	0.006	0.006
22.050	0.006	0.006	0.006	0.006	0.006
22.300	0.006	0.006	0.006	0.006	0.006
22.550	0.006	0.006	0.006	0.006	0.005
22.800	0.005	0.005	0.005	0.005	0.005
23.050	0.005	0.005	0.005	0.005	0.005
23.300	0.005	0.005	0.005	0.005	0.005
23.550	0.005	0.005	0.005	0.005	0.005
23.800	0.005	0.005	0.005	0.005	0.005
24.050	0.005	0.005	0.005	0.005	0.005
24.300	0.005	0.005	0.005	0.005	0.005
24.550	0.005	0.005	0.005	0.005	0.005
24.800	0.005	0.005	0.005	0.005	0.005
25.050	0.005	0.005	0.005	0.005	0.005
25.300	0.005	0.005	0.005	0.005	0.005
25.550	0.005	0.005	0.005	0.005	0.005
25.800	0.005	0.005	0.005	0.005	0.005
26.050	0.005	0.005	0.005	0.005	0.005
26.300	0.005	0.005	0.005	0.005	0.005
26.550	0.005	0.005	0.005	0.005	0.005
26.800	0.005	0.005	0.005	0.005	0.005
27.050	0.005	0.005	0.005	0.005	0.005
27.300	0.005	0.005	0.005	0.005	0.005
27.550	0.005	0.005	0.005	0.005	0.005
27.800	0.005	0.005	0.005	0.005	0.005
28.050	0.005	0.005	0.005	0.005	0.005
28.300	0.005	0.005	0.005	0.005	0.005
28.550	0.005	0.005	0.005	0.005	0.005
28.800	0.005	0.005	0.005	0.005	0.005
29.050	0.005	0.005	0.005	0.005	0.005
29.300	0.005	0.005	0.005	0.005	0.005
29.550	0.005	0.005	0.005	0.005	0.005

Extended Dry Detention 137+00 to 138+00

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
29.800	0.005	0.005	0.005	0.005	0.005
30.050	0.005	0.005	0.005	0.005	0.005
30.300	0.005	0.005	0.005	0.005	0.005
30.550	0.005	0.005	0.005	0.005	0.005
30.800	0.005	0.005	0.005	0.005	0.005
31.050	0.005	0.005	0.005	0.005	0.005
31.300	0.005	0.005	0.005	0.005	0.005
31.550	0.005	0.005	0.005	0.005	0.005
31.800	0.005	0.005	0.005	0.005	0.005
32.050	0.005	0.005	0.005	0.005	0.005
32.300	0.005	0.005	0.005	0.005	0.005
32.550	0.005	0.005	0.005	0.005	0.005
32.800	0.005	0.005	0.005	0.005	0.005
33.050	0.005	0.005	0.005	0.005	0.005
33.300	0.005	0.005	0.005	0.005	0.005
33.550	0.005	0.005	0.005	0.005	0.005
33.800	0.005	0.005	0.005	0.005	0.005
34.050	0.005	0.005	0.005	0.005	0.005
34.300	0.005	0.005	0.005	0.005	0.005
34.550	0.005	0.005	0.005	0.005	0.005
34.800	0.005	0.005	0.005	0.005	0.005
35.050	0.005	0.005	0.005	0.005	0.005
35.300	0.005	0.005	0.005	0.005	0.005
35.550	0.005	0.005	0.005	0.005	0.005
35.800	0.005	0.005	0.005	0.005	0.005
36.050	0.005	0.005	0.005	0.005	0.005
36.300	0.005	0.005	0.005	0.005	0.005
36.550	0.005	0.005	0.005	0.005	0.005
36.800	0.005	0.005	0.005	0.005	0.005
37.050	0.005	0.005	0.005	0.005	0.005
37.300	0.005	0.005	0.005	0.005	0.005
37.550	0.005	0.005	0.005	0.005	0.005
37.800	0.005	0.005	0.005	0.005	0.005
38.050	0.005	0.005	0.005	0.005	0.005
38.300	0.005	0.005	0.005	0.005	0.005
38.550	0.005	0.005	0.005	0.005	0.005
38.800	0.005	0.005	0.005	0.005	0.005
39.050	0.005	0.004	0.004	0.004	0.004
39.300	0.004	0.004	0.004	0.004	0.004
39.550	0.004	0.004	0.004	0.004	0.004
39.800	0.004	0.004	0.004	0.004	0.004
40.050	0.004	0.004	0.004	0.004	0.004

Extended Dry Detention 137+00 to 138+00

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years

Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
40.300	0.004	0.004	0.004	0.004	0.004
40.550	0.004	0.004	0.004	0.004	0.004
40.800	0.004	0.004	0.004	0.004	0.004
41.050	0.004	0.004	0.004	0.004	0.004
41.300	0.004	0.004	0.004	0.004	0.004
41.550	0.004	0.004	0.004	0.004	0.004
41.800	0.004	0.004	0.004	0.004	0.004
42.050	0.004	0.004	0.004	0.004	0.004
42.300	0.004	0.004	0.004	0.004	0.004
42.550	0.004	0.004	0.004	0.004	0.004
42.800	0.004	0.004	0.004	0.004	0.004
43.050	0.004	0.004	0.004	0.004	0.004
43.300	0.004	0.004	0.004	0.004	0.004
43.550	0.004	0.004	0.004	0.004	0.004
43.800	0.004	0.004	0.004	0.004	0.004
44.050	0.004	0.004	0.004	0.004	0.004
44.300	0.004	0.004	0.004	0.004	0.004
44.550	0.004	0.004	0.004	0.004	0.004
44.800	0.004	0.004	0.004	0.004	0.004
45.050	0.004	0.004	0.004	0.004	0.004
45.300	0.004	0.004	0.004	0.004	0.004
45.550	0.004	0.004	0.004	0.004	0.004
45.800	0.004	0.004	0.004	0.004	0.004
46.050	0.004	0.004	0.004	0.004	0.004
46.300	0.004	0.004	0.004	0.004	0.004
46.550	0.004	0.004	0.004	0.004	0.004
46.800	0.004	0.004	0.004	0.004	0.004
47.050	0.004	0.004	0.004	0.004	0.004
47.300	0.004	0.004	0.004	0.004	0.004
47.550	0.004	0.004	0.004	0.004	0.004
47.800	0.004	0.004	0.004	0.004	0.004
48.050	0.004	0.004	0.004	0.004	0.004
48.300	0.004	0.004	0.004	0.004	0.004
48.550	0.004	0.004	0.004	0.004	0.004
48.800	0.004	0.004	0.004	0.004	0.004
49.050	0.004	0.004	0.004	0.004	0.004
49.300	0.004	0.004	0.004	0.004	0.004
49.550	0.004	0.004	0.004	0.004	0.004
49.800	0.004	0.004	0.004	0.004	0.004
50.050	0.004	0.004	0.004	0.004	0.004
50.300	0.004	0.004	0.004	0.004	0.004
50.550	0.004	0.004	0.004	0.004	0.004

Extended Dry Detention 137+00 to 138+00

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
50.800	0.004	0.004	0.004	0.004	0.004
51.050	0.004	0.004	0.004	0.004	0.004
51.300	0.004	0.004	0.004	0.004	0.004
51.550	0.004	0.004	0.004	0.004	0.004
51.800	0.004	0.004	0.004	0.004	0.004
52.050	0.004	0.003	0.003	0.003	0.003
52.300	0.003	0.003	0.003	0.003	0.003
52.550	0.003	0.003	0.003	0.003	0.003
52.800	0.003	0.003	0.003	0.003	0.003
53.050	0.003	0.003	0.003	0.003	0.003
53.300	0.003	0.003	0.003	0.003	0.003
53.550	0.003	0.003	0.003	0.003	0.003
53.800	0.003	0.003	0.003	0.003	0.003
54.050	0.003	0.003	0.003	0.003	0.003
54.300	0.003	0.003	0.003	0.003	0.003
54.550	0.003	0.003	0.003	0.003	0.003
54.800	0.003	0.003	0.003	0.003	0.003
55.050	0.003	0.003	0.003	0.003	0.003
55.300	0.003	0.003	0.003	0.003	0.003
55.550	0.003	0.003	0.003	0.003	0.003
55.800	0.003	0.003	0.003	0.003	0.003
56.050	0.003	0.003	0.003	0.003	0.003
56.300	0.003	0.003	0.003	0.003	0.003
56.550	0.003	0.003	0.003	0.003	0.003
56.800	0.003	0.003	0.003	0.003	0.003
57.050	0.003	0.003	0.003	0.003	0.003
57.300	0.003	0.003	0.003	0.003	0.003
57.550	0.003	0.003	0.003	0.003	0.003
57.800	0.003	0.003	0.003	0.003	0.003
58.050	0.003	0.003	0.003	0.003	0.002
58.300	0.002	0.002	0.002	0.002	0.002
58.550	0.002	0.002	0.002	0.002	0.002
58.800	0.002	0.002	0.002	0.002	0.002
59.050	0.002	0.002	0.002	0.002	0.002
59.300	0.002	0.002	0.002	0.002	0.002
59.550	0.002	0.002	0.002	0.002	0.002
59.800	0.002	0.002	0.002	0.002	0.002
60.050	0.002	0.002	0.002	0.002	0.002
60.300	0.002	0.002	0.002	0.002	0.002
60.550	0.002	0.002	0.002	0.002	0.002
60.800	0.002	0.002	0.002	0.002	0.002
61.050	0.002	0.002	0.002	0.002	0.002

Extended Dry Detention 137+00 to 138+00

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
61.300	0.002	0.002	0.002	0.002	0.002
61.550	0.002	0.002	0.002	0.002	0.002
61.800	0.002	0.002	0.002	0.002	0.002
62.050	0.002	0.002	0.002	0.002	0.002
62.300	0.002	0.002	0.002	0.002	0.002
62.550	0.002	0.002	0.002	0.002	0.002
62.800	0.002	0.002	0.002	0.002	0.002
63.050	0.002	0.002	0.002	0.002	0.002
63.300	0.002	0.002	0.002	0.002	0.002
63.550	0.002	0.002	0.002	0.002	0.002
63.800	0.002	0.002	0.002	0.002	0.002
64.050	0.002	0.002	0.002	0.002	0.002
64.300	0.002	0.002	0.002	0.002	0.002
64.550	0.002	0.002	0.002	0.002	0.002
64.800	0.002	0.002	0.002	0.002	0.002
65.050	0.002	0.002	0.002	0.002	0.002
65.300	0.002	0.002	0.002	0.002	0.002
65.550	0.002	0.002	0.002	0.002	0.002
65.800	0.002	0.002	0.002	0.002	0.002
66.050	0.002	0.002	0.002	0.002	0.002
66.300	0.002	0.002	0.002	0.002	0.002
66.550	0.002	0.002	0.002	0.002	0.002
66.800	0.002	0.002	0.002	0.002	0.001
67.050	0.001	0.001	0.001	0.001	0.001
67.300	0.001	0.001	0.001	0.001	0.001
67.550	0.001	0.001	0.001	0.001	0.001
67.800	0.001	0.001	0.001	0.001	0.001
68.050	0.001	0.001	0.001	0.001	0.001
68.300	0.001	0.001	0.001	0.001	0.001
68.550	0.001	0.001	0.001	0.001	0.001
68.800	0.001	0.001	0.001	0.001	0.001
69.050	0.001	0.001	0.001	0.001	0.001
69.300	0.001	0.001	0.001	0.001	0.001
69.550	0.001	0.001	0.001	0.001	0.001
69.800	0.001	0.001	0.001	0.001	0.001
70.050	0.001	0.001	0.001	0.001	0.001
70.300	0.001	0.001	0.001	0.001	0.001
70.550	0.001	0.001	0.001	0.001	0.001
70.800	0.001	0.001	0.001	0.001	0.001
71.050	0.001	0.001	0.001	0.001	0.001
71.300	0.001	0.001	0.001	0.001	0.001
71.550	0.001	0.001	0.001	0.001	0.001

Extended Dry Detention 137+00 to 138+00

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years

Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
71.800	0.001	0.001	0.001	0.001	0.001

Extended Dry Detention 137+00 to 138+00

Subsection: Diverted Hydrograph
Label: Outlet-Culvert

Return Event: 0 years
Storm Event: WQstorm

Peak Discharge	0.006 ft³/s
Time to Peak	18.250 hours
Hydrograph Volume	0.020 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.050	0.001	0.001	0.001	0.001	0.001
10.300	0.001	0.001	0.001	0.001	0.001
10.550	0.001	0.001	0.001	0.001	0.001
10.800	0.001	0.001	0.002	0.002	0.002
11.050	0.002	0.002	0.002	0.002	0.002
11.300	0.002	0.002	0.002	0.002	0.002
11.550	0.002	0.002	0.002	0.003	0.003
11.800	0.003	0.004	0.004	0.004	0.004
12.050	0.005	0.005	0.005	0.005	0.005
12.300	0.005	0.005	0.005	0.005	0.005
12.550	0.005	0.005	0.005	0.005	0.005
12.800	0.005	0.005	0.005	0.005	0.005
13.050	0.005	0.005	0.005	0.005	0.005
13.300	0.005	0.005	0.005	0.005	0.005
13.550	0.005	0.005	0.005	0.005	0.005
13.800	0.005	0.005	0.005	0.005	0.005
14.050	0.005	0.005	0.005	0.005	0.005
14.300	0.005	0.005	0.005	0.005	0.005
14.550	0.005	0.005	0.005	0.005	0.005
14.800	0.005	0.005	0.006	0.006	0.006
15.050	0.006	0.006	0.006	0.006	0.006
15.300	0.006	0.006	0.006	0.006	0.006
15.550	0.006	0.006	0.006	0.006	0.006
15.800	0.006	0.006	0.006	0.006	0.006
16.050	0.006	0.006	0.006	0.006	0.006
16.300	0.006	0.006	0.006	0.006	0.006
16.550	0.006	0.006	0.006	0.006	0.006
16.800	0.006	0.006	0.006	0.006	0.006
17.050	0.006	0.006	0.006	0.006	0.006
17.300	0.006	0.006	0.006	0.006	0.006
17.550	0.006	0.006	0.006	0.006	0.006
17.800	0.006	0.006	0.006	0.006	0.006
18.050	0.006	0.006	0.006	0.006	0.006
18.300	0.006	0.006	0.006	0.006	0.006
18.550	0.006	0.006	0.006	0.006	0.006
18.800	0.006	0.006	0.006	0.006	0.006
19.050	0.006	0.006	0.006	0.006	0.006

Extended Dry Detention 137+00 to 138+00

Subsection: Diverted Hydrograph
Label: Outlet-Culvert

Return Event: 0 years
Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
19.300	0.006	0.006	0.006	0.006	0.006
19.550	0.006	0.006	0.006	0.006	0.006
19.800	0.006	0.006	0.006	0.006	0.006
20.050	0.006	0.006	0.006	0.006	0.006
20.300	0.006	0.006	0.006	0.006	0.006
20.550	0.006	0.006	0.006	0.006	0.006
20.800	0.006	0.006	0.006	0.006	0.006
21.050	0.006	0.006	0.006	0.006	0.006
21.300	0.006	0.006	0.006	0.006	0.006
21.550	0.006	0.006	0.006	0.006	0.006
21.800	0.006	0.006	0.006	0.006	0.006
22.050	0.006	0.006	0.006	0.006	0.006
22.300	0.006	0.006	0.006	0.006	0.006
22.550	0.006	0.006	0.006	0.006	0.005
22.800	0.005	0.005	0.005	0.005	0.005
23.050	0.005	0.005	0.005	0.005	0.005
23.300	0.005	0.005	0.005	0.005	0.005
23.550	0.005	0.005	0.005	0.005	0.005
23.800	0.005	0.005	0.005	0.005	0.005
24.050	0.005	0.005	0.005	0.005	0.005
24.300	0.005	0.005	0.005	0.005	0.005
24.550	0.005	0.005	0.005	0.005	0.005
24.800	0.005	0.005	0.005	0.005	0.005
25.050	0.005	0.005	0.005	0.005	0.005
25.300	0.005	0.005	0.005	0.005	0.005
25.550	0.005	0.005	0.005	0.005	0.005
25.800	0.005	0.005	0.005	0.005	0.005
26.050	0.005	0.005	0.005	0.005	0.005
26.300	0.005	0.005	0.005	0.005	0.005
26.550	0.005	0.005	0.005	0.005	0.005
26.800	0.005	0.005	0.005	0.005	0.005
27.050	0.005	0.005	0.005	0.005	0.005
27.300	0.005	0.005	0.005	0.005	0.005
27.550	0.005	0.005	0.005	0.005	0.005
27.800	0.005	0.005	0.005	0.005	0.005
28.050	0.005	0.005	0.005	0.005	0.005
28.300	0.005	0.005	0.005	0.005	0.005
28.550	0.005	0.005	0.005	0.005	0.005
28.800	0.005	0.005	0.005	0.005	0.005
29.050	0.005	0.005	0.005	0.005	0.005
29.300	0.005	0.005	0.005	0.005	0.005
29.550	0.005	0.005	0.005	0.005	0.005

Extended Dry Detention 137+00 to 138+00

Subsection: Diverted Hydrograph
Label: Outlet-Culvert

Return Event: 0 years
Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
29.800	0.005	0.005	0.005	0.005	0.005
30.050	0.005	0.005	0.005	0.005	0.005
30.300	0.005	0.005	0.005	0.005	0.005
30.550	0.005	0.005	0.005	0.005	0.005
30.800	0.005	0.005	0.005	0.005	0.005
31.050	0.005	0.005	0.005	0.005	0.005
31.300	0.005	0.005	0.005	0.005	0.005
31.550	0.005	0.005	0.005	0.005	0.005
31.800	0.005	0.005	0.005	0.005	0.005
32.050	0.005	0.005	0.005	0.005	0.005
32.300	0.005	0.005	0.005	0.005	0.005
32.550	0.005	0.005	0.005	0.005	0.005
32.800	0.005	0.005	0.005	0.005	0.005
33.050	0.005	0.005	0.005	0.005	0.005
33.300	0.005	0.005	0.005	0.005	0.005
33.550	0.005	0.005	0.005	0.005	0.005
33.800	0.005	0.005	0.005	0.005	0.005
34.050	0.005	0.005	0.005	0.005	0.005
34.300	0.005	0.005	0.005	0.005	0.005
34.550	0.005	0.005	0.005	0.005	0.005
34.800	0.005	0.005	0.005	0.005	0.005
35.050	0.005	0.005	0.005	0.005	0.005
35.300	0.005	0.005	0.005	0.005	0.005
35.550	0.005	0.005	0.005	0.005	0.005
35.800	0.005	0.005	0.005	0.005	0.005
36.050	0.005	0.005	0.005	0.005	0.005
36.300	0.005	0.005	0.005	0.005	0.005
36.550	0.005	0.005	0.005	0.005	0.005
36.800	0.005	0.005	0.005	0.005	0.005
37.050	0.005	0.005	0.005	0.005	0.005
37.300	0.005	0.005	0.005	0.005	0.005
37.550	0.005	0.005	0.005	0.005	0.005
37.800	0.005	0.005	0.005	0.005	0.005
38.050	0.005	0.005	0.005	0.005	0.005
38.300	0.005	0.005	0.005	0.005	0.005
38.550	0.005	0.005	0.005	0.005	0.005
38.800	0.005	0.005	0.005	0.005	0.005
39.050	0.005	0.004	0.004	0.004	0.004
39.300	0.004	0.004	0.004	0.004	0.004
39.550	0.004	0.004	0.004	0.004	0.004
39.800	0.004	0.004	0.004	0.004	0.004
40.050	0.004	0.004	0.004	0.004	0.004

Extended Dry Detention 137+00 to 138+00

Subsection: Diverted Hydrograph
Label: Outlet-Culvert

Return Event: 0 years
Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
40.300	0.004	0.004	0.004	0.004	0.004
40.550	0.004	0.004	0.004	0.004	0.004
40.800	0.004	0.004	0.004	0.004	0.004
41.050	0.004	0.004	0.004	0.004	0.004
41.300	0.004	0.004	0.004	0.004	0.004
41.550	0.004	0.004	0.004	0.004	0.004
41.800	0.004	0.004	0.004	0.004	0.004
42.050	0.004	0.004	0.004	0.004	0.004
42.300	0.004	0.004	0.004	0.004	0.004
42.550	0.004	0.004	0.004	0.004	0.004
42.800	0.004	0.004	0.004	0.004	0.004
43.050	0.004	0.004	0.004	0.004	0.004
43.300	0.004	0.004	0.004	0.004	0.004
43.550	0.004	0.004	0.004	0.004	0.004
43.800	0.004	0.004	0.004	0.004	0.004
44.050	0.004	0.004	0.004	0.004	0.004
44.300	0.004	0.004	0.004	0.004	0.004
44.550	0.004	0.004	0.004	0.004	0.004
44.800	0.004	0.004	0.004	0.004	0.004
45.050	0.004	0.004	0.004	0.004	0.004
45.300	0.004	0.004	0.004	0.004	0.004
45.550	0.004	0.004	0.004	0.004	0.004
45.800	0.004	0.004	0.004	0.004	0.004
46.050	0.004	0.004	0.004	0.004	0.004
46.300	0.004	0.004	0.004	0.004	0.004
46.550	0.004	0.004	0.004	0.004	0.004
46.800	0.004	0.004	0.004	0.004	0.004
47.050	0.004	0.004	0.004	0.004	0.004
47.300	0.004	0.004	0.004	0.004	0.004
47.550	0.004	0.004	0.004	0.004	0.004
47.800	0.004	0.004	0.004	0.004	0.004
48.050	0.004	0.004	0.004	0.004	0.004
48.300	0.004	0.004	0.004	0.004	0.004
48.550	0.004	0.004	0.004	0.004	0.004
48.800	0.004	0.004	0.004	0.004	0.004
49.050	0.004	0.004	0.004	0.004	0.004
49.300	0.004	0.004	0.004	0.004	0.004
49.550	0.004	0.004	0.004	0.004	0.004
49.800	0.004	0.004	0.004	0.004	0.004
50.050	0.004	0.004	0.004	0.004	0.004
50.300	0.004	0.004	0.004	0.004	0.004
50.550	0.004	0.004	0.004	0.004	0.004

Extended Dry Detention 137+00 to 138+00

Subsection: Diverted Hydrograph
Label: Outlet-Culvert

Return Event: 0 years
Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
50.800	0.004	0.004	0.004	0.004	0.004
51.050	0.004	0.004	0.004	0.004	0.004
51.300	0.004	0.004	0.004	0.004	0.004
51.550	0.004	0.004	0.004	0.004	0.004
51.800	0.004	0.004	0.004	0.004	0.004
52.050	0.004	0.003	0.003	0.003	0.003
52.300	0.003	0.003	0.003	0.003	0.003
52.550	0.003	0.003	0.003	0.003	0.003
52.800	0.003	0.003	0.003	0.003	0.003
53.050	0.003	0.003	0.003	0.003	0.003
53.300	0.003	0.003	0.003	0.003	0.003
53.550	0.003	0.003	0.003	0.003	0.003
53.800	0.003	0.003	0.003	0.003	0.003
54.050	0.003	0.003	0.003	0.003	0.003
54.300	0.003	0.003	0.003	0.003	0.003
54.550	0.003	0.003	0.003	0.003	0.003
54.800	0.003	0.003	0.003	0.003	0.003
55.050	0.003	0.003	0.003	0.003	0.003
55.300	0.003	0.003	0.003	0.003	0.003
55.550	0.003	0.003	0.003	0.003	0.003
55.800	0.003	0.003	0.003	0.003	0.003
56.050	0.003	0.003	0.003	0.003	0.003
56.300	0.003	0.003	0.003	0.003	0.003
56.550	0.003	0.003	0.003	0.003	0.003
56.800	0.003	0.003	0.003	0.003	0.003
57.050	0.003	0.003	0.003	0.003	0.003
57.300	0.003	0.003	0.003	0.003	0.003
57.550	0.003	0.003	0.003	0.003	0.003
57.800	0.003	0.003	0.003	0.003	0.003
58.050	0.003	0.003	0.003	0.003	0.002
58.300	0.002	0.002	0.002	0.002	0.002
58.550	0.002	0.002	0.002	0.002	0.002
58.800	0.002	0.002	0.002	0.002	0.002
59.050	0.002	0.002	0.002	0.002	0.002
59.300	0.002	0.002	0.002	0.002	0.002
59.550	0.002	0.002	0.002	0.002	0.002
59.800	0.002	0.002	0.002	0.002	0.002
60.050	0.002	0.002	0.002	0.002	0.002
60.300	0.002	0.002	0.002	0.002	0.002
60.550	0.002	0.002	0.002	0.002	0.002
60.800	0.002	0.002	0.002	0.002	0.002
61.050	0.002	0.002	0.002	0.002	0.002

Extended Dry Detention 137+00 to 138+00

Subsection: Diverted Hydrograph
Label: Outlet-Culvert

Return Event: 0 years
Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
61.300	0.002	0.002	0.002	0.002	0.002
61.550	0.002	0.002	0.002	0.002	0.002
61.800	0.002	0.002	0.002	0.002	0.002
62.050	0.002	0.002	0.002	0.002	0.002
62.300	0.002	0.002	0.002	0.002	0.002
62.550	0.002	0.002	0.002	0.002	0.002
62.800	0.002	0.002	0.002	0.002	0.002
63.050	0.002	0.002	0.002	0.002	0.002
63.300	0.002	0.002	0.002	0.002	0.002
63.550	0.002	0.002	0.002	0.002	0.002
63.800	0.002	0.002	0.002	0.002	0.002
64.050	0.002	0.002	0.002	0.002	0.002
64.300	0.002	0.002	0.002	0.002	0.002
64.550	0.002	0.002	0.002	0.002	0.002
64.800	0.002	0.002	0.002	0.002	0.002
65.050	0.002	0.002	0.002	0.002	0.002
65.300	0.002	0.002	0.002	0.002	0.002
65.550	0.002	0.002	0.002	0.002	0.002
65.800	0.002	0.002	0.002	0.002	0.002
66.050	0.002	0.002	0.002	0.002	0.002
66.300	0.002	0.002	0.002	0.002	0.002
66.550	0.002	0.002	0.002	0.002	0.002
66.800	0.002	0.002	0.002	0.002	0.001
67.050	0.001	0.001	0.001	0.001	0.001
67.300	0.001	0.001	0.001	0.001	0.001
67.550	0.001	0.001	0.001	0.001	0.001
67.800	0.001	0.001	0.001	0.001	0.001
68.050	0.001	0.001	0.001	0.001	0.001
68.300	0.001	0.001	0.001	0.001	0.001
68.550	0.001	0.001	0.001	0.001	0.001
68.800	0.001	0.001	0.001	0.001	0.001
69.050	0.001	0.001	0.001	0.001	0.001
69.300	0.001	0.001	0.001	0.001	0.001
69.550	0.001	0.001	0.001	0.001	0.001
69.800	0.001	0.001	0.001	0.001	0.001
70.050	0.001	0.001	0.001	0.001	0.001
70.300	0.001	0.001	0.001	0.001	0.001
70.550	0.001	0.001	0.001	0.001	0.001
70.800	0.001	0.001	0.001	0.001	0.001
71.050	0.001	0.001	0.001	0.001	0.001
71.300	0.001	0.001	0.001	0.001	0.001
71.550	0.001	0.001	0.001	0.001	0.001

Extended Dry Detention 137+00 to 138+00

Subsection: Diverted Hydrograph
Label: Outlet-Culvert

Return Event: 0 years
Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
71.800	0.001	0.001	0.001	0.001	0.001

Extended Dry Detention 137+00 to 138+00

Index

East Bank Basin A Water Quality Calculations

	Made By:	AReede	Date:	12/2/2011
	Checked By:	BHess	Date:	12/2/2011

Water Quality:	WQv= (PAC)/12		From ODOT L&D2 1115.4		
	Precipitation	0.75	in		
	A - Drainage Area	0.29	acres		
	Cq	0.9	when drainage area is impervious		
Water Quality Volume	WQv =	0.0163	ac*ft		
Extended Detention Volume (EDV) =	120%*WQV	0.0196	ac*ft		
Required Forebay Volume (RFV)	10% of WQv	0.0016	ac*ft		
Actual WQv Released	EDV - RFV	0.0179	ac*ft		
Provided Forebay Volume (assuming trapezoidal configuration)	Bottom of Basin Elevation	578.5	Top of Berm Elevation	579	
	Area of bottom of Forebay (ac)	0.001	Area of Top of Forebay (ac)	0.009	
	Provided Forebay Volume	0.0022	ac*ft		
	Forebay % of Basin	11.07	%		
	Check for WQv provided	OK			

Drainage Time			
	16 hour WQ flow (see enclosed spreadsheet)	0.529	ft^3/s
16 hour check	16 hour volume	95	ft^3
	50% of WQv (not to exceed)	426	ft^3
	Check for 16 hour compliance	OK	
48 hour check	48 hour WQ flow (see enclosed spreadsheet)	3.684	
	48 hour volume	663	
	100% of WQv (not to exceed)	853	
	Check for 48 hour compliance	OK	

Emergency Spillway Calculation	Weir Equation	Q=3.367BH^3/2	
	Q10	1.089	cfs
	B (Weir length)	6	ft
	H=	0.14	ft
	Top of Embankment	580.4	
	Invert of Emergency Spillway	579.56	
	Available Depth	0.84	
	Check for emergency spillway depth	OK	

Anti-Seep Collar	From ODOT L&D 2 1117.4.1.2		
	Y- Depth of water at spillway crest,	1.52	ft
	Z-slope of upstream face of embankment	4	
	S-slope of outfall pipe	0.0025	
	Length of Saturation Seepage length	12.3	ft
	increase	1.8	ft
	W-Width of Collar	7	
	D - Diameter of Conduit	2	
	P - Projection of Collar (P=W-D)	5	
	# of collars	0	
	Minimum 2 collars at minimum spacing 10'.		

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Element Details			
ID	73	End	48.000 hours
Label	Minimum Drain Time - 1	Pond Node	Extended Detention
Start	0.000 hours	Outlet Structure	Composite Outlet Structure - 1
Increment	1.000 hours		

Notes

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: User Notifications

Label: Minimum Drain Time - 1

User Notifications

Message Id	15
Scenario	wq
Element Type	Composite Outlet Structure
Element Id	59
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Kr (reverse flow entrance loss coefficient) was not specified. Kr was set to same value as Ke= 0.200 .
Source	Warning
Message Id	67
Scenario	wq
Element Type	Composite Outlet Structure
Element Id	59
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure Composite Outlet Structure - 1. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	40
Scenario	wq
Element Type	Minimum Drain Time
Element Id	73
Label	Minimum Drain Time - 1
Time	(N/A)
Message	Mass balance for routing volumes vary by more than 0.5 %. (0.6 % of Outflow Volume))
Source	Warning

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Elevation

Label: Minimum Drain Time - 1 (OUT)

Time vs. Elevation (ft)

Output Time increment = 3,600.000 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	579.22	579.20	579.19	579.18	579.17
5.000	579.16	579.15	579.14	579.13	579.12
10.000	579.11	579.10	579.08	579.07	579.05
15.000	579.04	579.02	579.01	578.99	578.98
20.000	578.97	578.95	578.94	578.93	578.92
25.000	578.90	578.89	578.88	578.87	578.86
30.000	578.85	578.83	578.82	578.81	578.80
35.000	578.78	578.77	578.76	578.75	578.75
40.000	578.74	578.73	578.72	578.72	578.71
45.000	578.70	578.70	578.69	578.69	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Volume

Label: Minimum Drain Time - 1 (OUT)

Time vs. Elevation (ft)

Output Time increment = 3,600.000 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	579.22	579.20	579.19	579.18	579.17
5.000	579.16	579.15	579.14	579.13	579.12
10.000	579.11	579.10	579.08	579.07	579.05
15.000	579.04	579.02	579.01	578.99	578.98
20.000	578.97	578.95	578.94	578.93	578.92
25.000	578.90	578.89	578.88	578.87	578.86
30.000	578.85	578.83	578.82	578.81	578.80
35.000	578.78	578.77	578.76	578.75	578.75
40.000	578.74	578.73	578.72	578.72	578.71
45.000	578.70	578.70	578.69	578.69	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Area Volume Curve

Label: Extended Detention

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
578.60	0.0	0.018	0.000	0.000	0.000
578.80	0.0	0.020	0.057	0.004	0.004
579.00	0.0	0.025	0.068	0.005	0.008
579.10	0.0	0.037	0.093	0.003	0.011
579.20	0.0	0.040	0.116	0.004	0.015
579.80	0.0	0.051	0.136	0.027	0.043
580.20	0.0	0.060	0.166	0.022	0.065
580.40	0.0	0.064	0.186	0.012	0.077

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	578.60 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	580.40 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	579.40	580.40
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	578.60	580.40
Culvert-Circular	Culvert - 1	Forward	TW	576.14	580.40
Tailwater Settings	Tailwater			(N/A)	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	578.60 ft
Orifice Diameter	0.50 in
Orifice Coefficient	0.660

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	579.40 ft
Orifice Area	2.6 ft²
Orifice Coefficient	0.660
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.00 in
Length	11.00 ft
Length (Computed Barrel)	11.01 ft
Slope (Computed)	0.050 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Inlet Control Data	
T1 ratio (HW/D)	1.070
T2 ratio (HW/D)	1.172
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	577.48 ft	T1 Flow	4.802 ft³/s
T2 Elevation	577.61 ft	T2 Flow	5.488 ft³/s

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves

Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.60	0.000	0.00	0.00	0.00	0.00	0.000	(N/A)	0.00
578.85	0.003	578.85	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.10	0.005	579.10	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.35	0.006	579.35	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.40	0.006	579.40	Free Outfall	576.14	0.00	0.000	(N/A)	0.00
579.60	0.007	579.60	Free Outfall	576.90	0.00	0.000	(N/A)	0.00
579.85	0.008	579.85	Free Outfall	577.73	0.00	0.000	(N/A)	0.00
580.10	0.005	580.10	579.68	579.68	0.00	0.000	(N/A)	0.00
580.35	0.000	580.35	580.35	580.35	0.00	0.000	(N/A)	0.00
580.40	0.000	580.40	580.40	580.40	0.00	0.000	(N/A)	0.00

Message
WS below an invert; no flow.
H =.23
H =.48
H =.73
H =.78
H =.98
H =1.23
H =.42
H =.00
H =.00

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves

Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.60	0.000	0.00	0.00	0.00	0.00	0.000	(N/A)	0.00
578.85	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.10	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.35	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.40	0.000	0.00	0.00	576.14	0.00	0.000	(N/A)	0.00
579.60	1.744	579.60	Free Outfall	576.90	0.00	0.000	(N/A)	0.00
579.85	5.886	579.85	Free Outfall	577.73	0.00	0.000	(N/A)	0.00
580.10	11.340	580.10	579.68	579.68	0.00	0.000	(N/A)	0.00
580.35	13.210	580.35	580.35	580.35	0.00	0.000	(N/A)	0.00
580.40	13.553	580.40	580.40	580.40	0.00	0.000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.2ft
Weir: H =0.45ft
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=.70
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=.95
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.00

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves

Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 15.537 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.60	0.000	0.00	0.00	Free Outfall	0.00	0.000	(N/A)	0.00
578.85	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.10	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.35	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.40	0.000	576.14	Free Outfall	Free Outfall	0.00	0.000	(N/A)	0.00
579.60	1.752	576.90	Free Outfall	Free Outfall	0.00	0.001	(N/A)	0.00
579.85	5.891	577.73	Free Outfall	Free Outfall	0.00	0.004	(N/A)	0.00
580.10	11.343	579.68	Free Outfall	Free Outfall	0.00	0.002	(N/A)	0.00
580.35	12.669	580.35	Free Outfall	Free Outfall	0.00	0.541	(N/A)	0.00
580.40	12.761	580.40	Free Outfall	Free Outfall	0.00	0.792	(N/A)	0.00

Message
WS below an invert; no flow.
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .199ft Dcr= .526ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .504ft Dcr= .982ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =3.54
INLET CONTROL... Submerged: HW =4.21
INLET CONTROL... Submerged: HW =4.26

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Composite Rating Curve

Label: Composite Outlet Structure - 1

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
578.60	0.000	(N/A)	0.00
578.85	0.003	(N/A)	0.00
579.10	0.005	(N/A)	0.00
579.35	0.006	(N/A)	0.00
579.40	0.006	(N/A)	0.00
579.60	1.752	(N/A)	0.00
579.85	5.891	(N/A)	0.00
580.10	11.343	(N/A)	0.00
580.35	12.669	(N/A)	0.00
580.40	12.761	(N/A)	0.00

Contributing Structures
(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Volume-Flow Table (Pond)

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	579.22 ft
Volume (Initial)	0.016 ac-ft
Flow (Initial Outlet)	0.006 ft³/s
Flow (Initial Infiltration)	0.000 ft³/s
Flow (Initial, Total)	0.006 ft³/s
Time Increment	1.000 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
578.60	0.000	0.000	0.018	0.000	0.000	0.000
578.85	0.003	0.005	0.022	0.000	0.003	0.121
579.10	0.005	0.011	0.037	0.000	0.005	0.282
579.35	0.006	0.022	0.043	0.000	0.006	0.527
579.40	0.006	0.024	0.044	0.000	0.006	0.579
579.60	1.752	0.033	0.047	0.000	1.752	2.545
579.85	5.891	0.045	0.052	0.000	5.891	6.983
580.10	11.343	0.059	0.058	0.000	11.343	12.767
580.35	12.669	0.074	0.063	0.000	12.669	14.459
580.40	12.761	0.077	0.064	0.000	12.761	14.628

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Level Pool Pond Routing Summary

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	579.22 ft
Volume (Initial)	0.016 ac-ft
Flow (Initial Outlet)	0.006 ft³/s
Flow (Initial Infiltration)	0.000 ft³/s
Flow (Initial, Total)	0.006 ft³/s
Time Increment	1.000 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.000 ft³/s	Time to Peak (Flow, In)	0.000 hours
Flow (Peak Outlet)	0.006 ft³/s	Time to Peak (Flow, Outlet)	0.000 hours

Elevation (Water Surface, Peak)	579.20 ft
Volume (Peak)	0.016 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.016 ac-ft
Volume (Total Inflow)	0.000 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.014 ac-ft
Volume (Retained)	0.002 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.6 %

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Detention Time

Label: Extended Detention

Infiltration	
Infiltration Method (Computed)	No Infiltration

Approximate Detention Times	
Time to Peak (Outflow + Infiltration, Peak to Peak Detention Time)	0.000 hours
Time to Peak (Inflow, Peak to Peak Detention Time)	0.000 hours
Detention Time (Peak to Peak)	0.000 hours

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Pond Routed Hydrograph (total out)

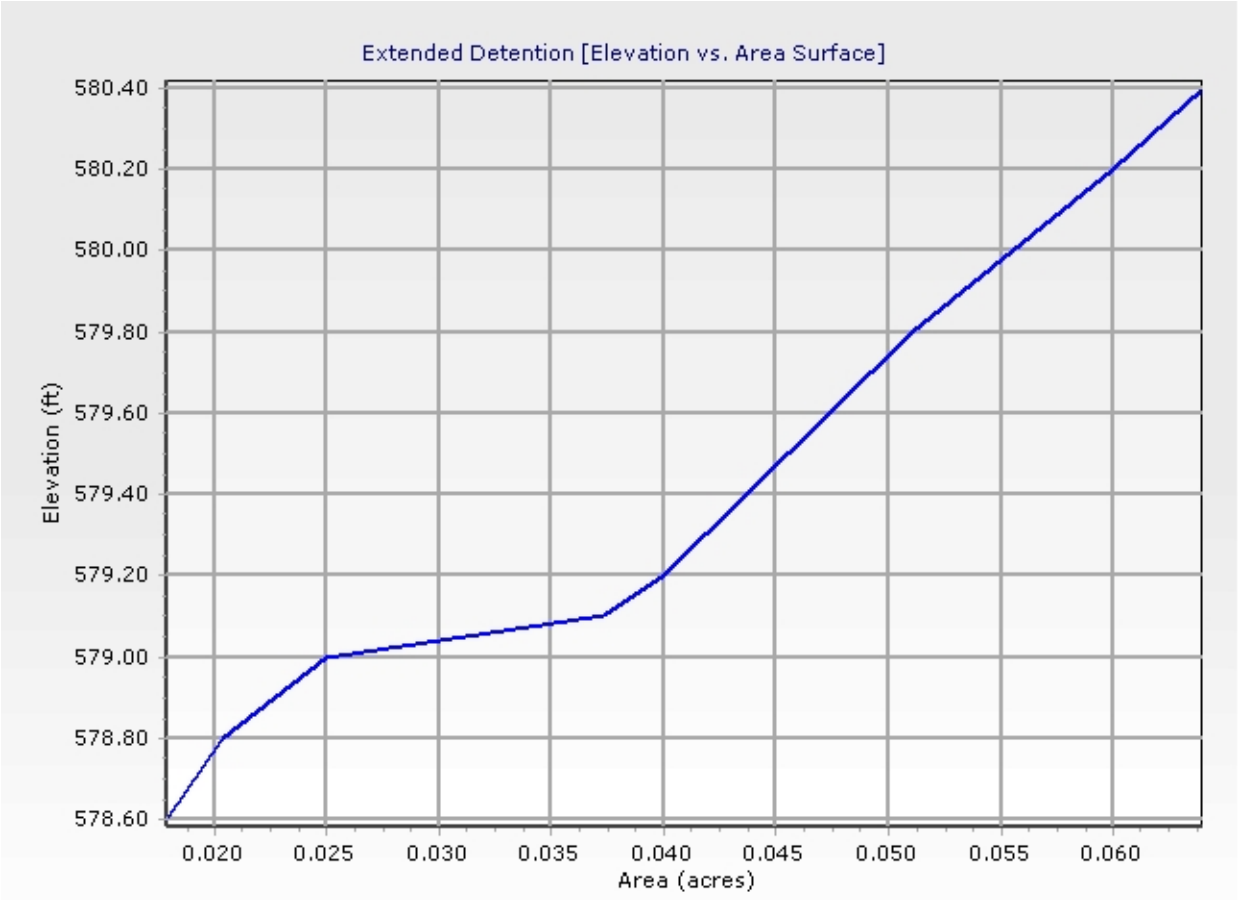
Label: Minimum Drain Time - 1

Peak Discharge	0.006 ft³/s
Time to Peak	0.000 hours
Hydrograph Volume	0.014 ac-ft

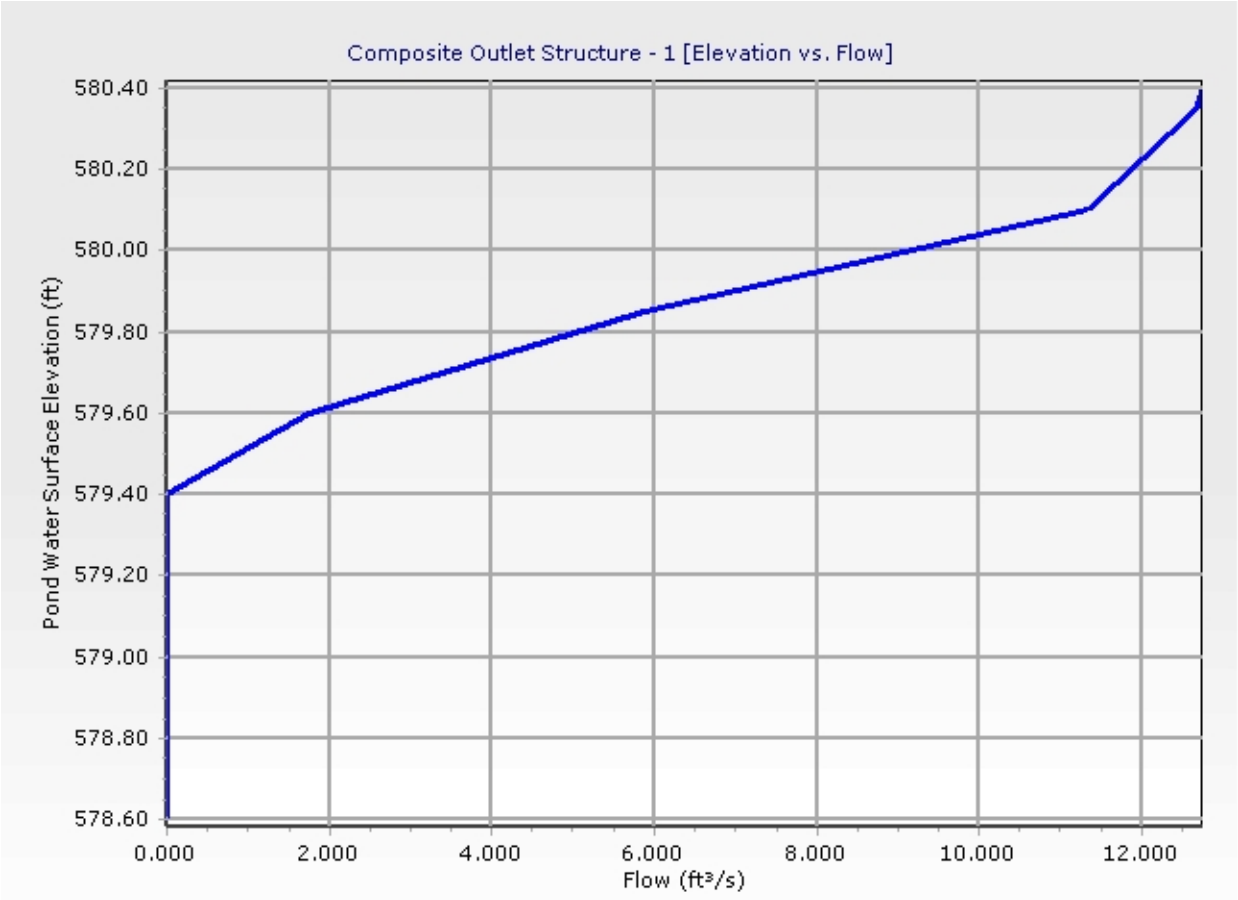
HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 1.000 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.006	0.005	0.005	0.005	0.005
5.000	0.005	0.005	0.005	0.005	0.005
10.000	0.005	0.005	0.005	0.005	0.005
15.000	0.005	0.005	0.004	0.004	0.004
20.000	0.004	0.004	0.004	0.004	0.004
25.000	0.004	0.004	0.004	0.004	0.004
30.000	0.003	0.003	0.003	0.003	0.003
35.000	0.003	0.002	0.002	0.002	0.002
40.000	0.002	0.002	0.002	0.002	0.002
45.000	0.001	0.001	0.001	0.001	(N/A)

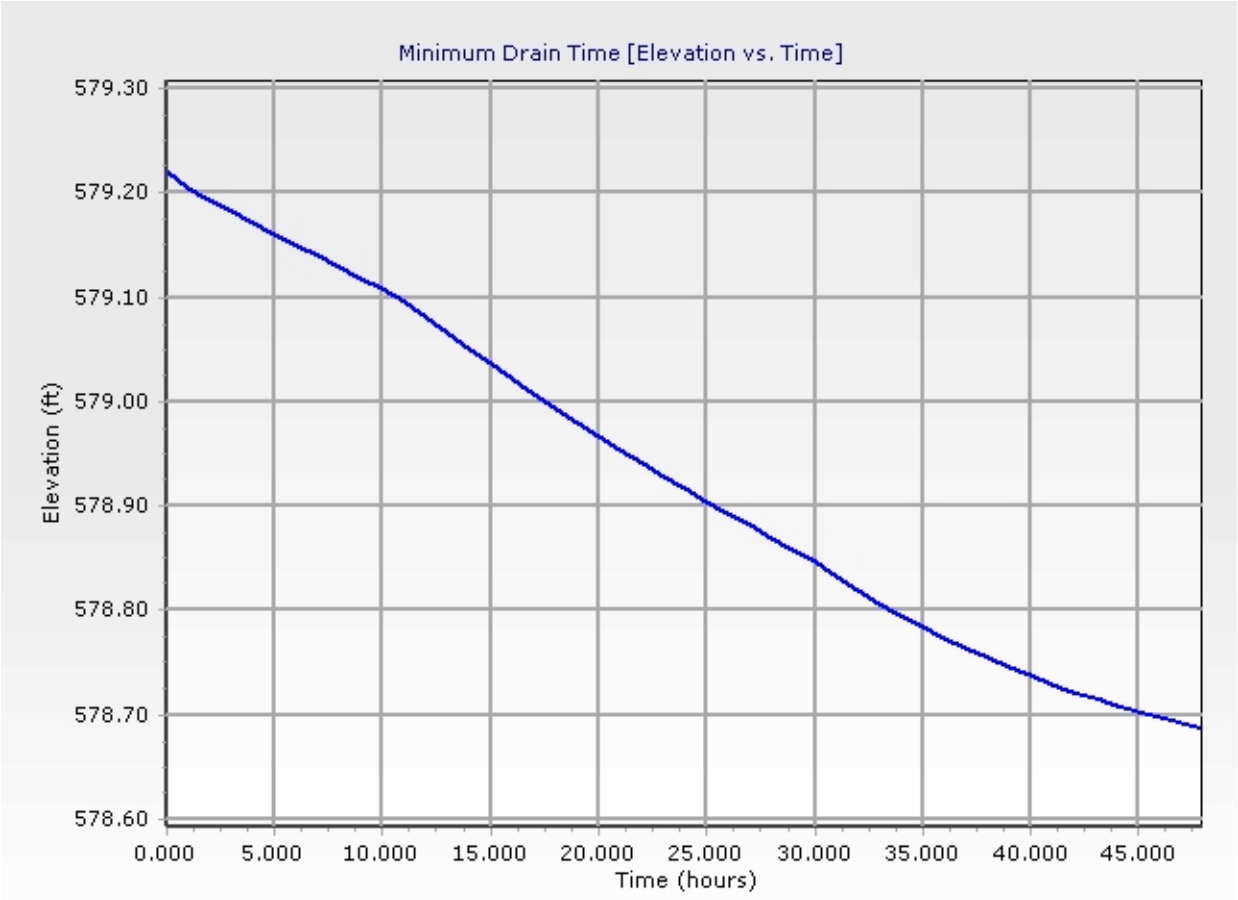
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



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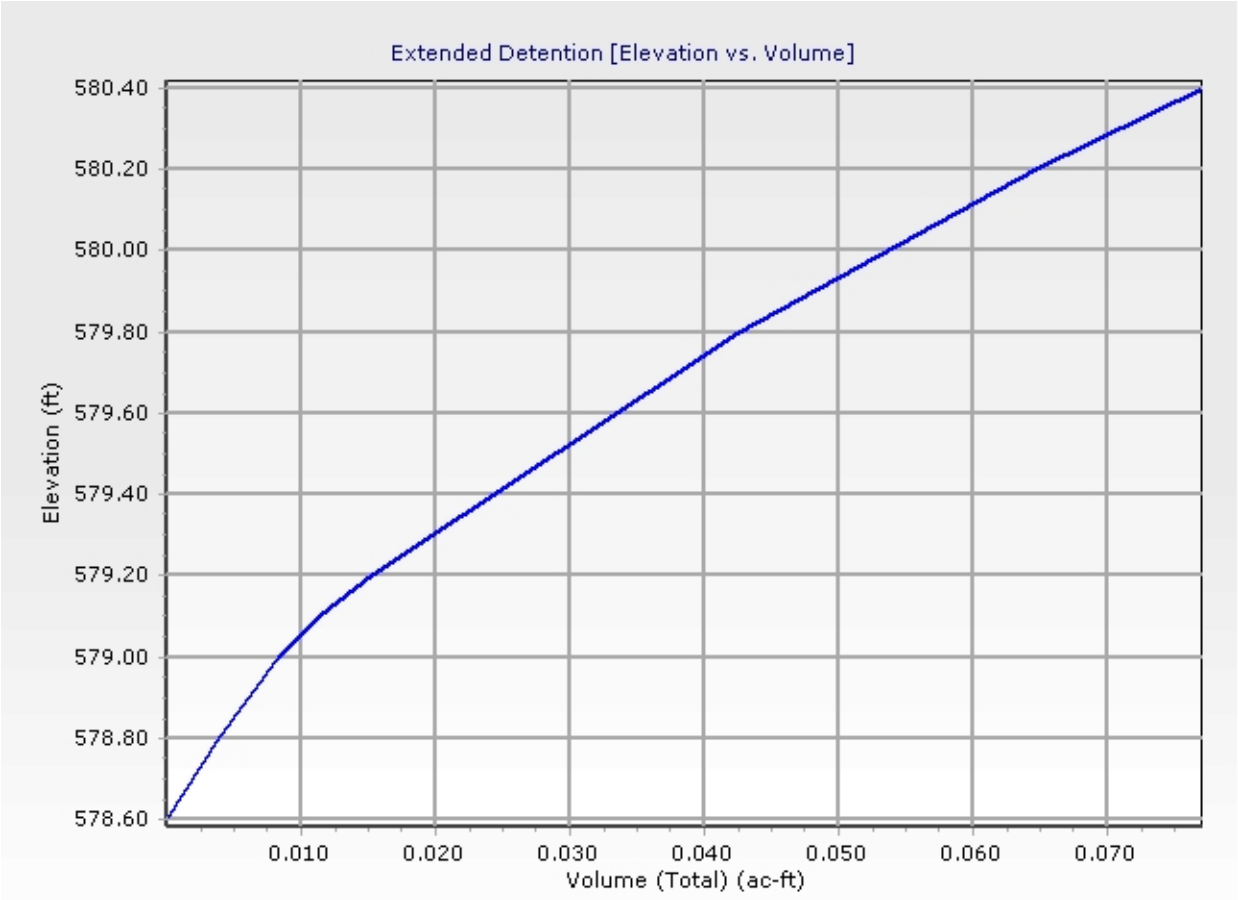

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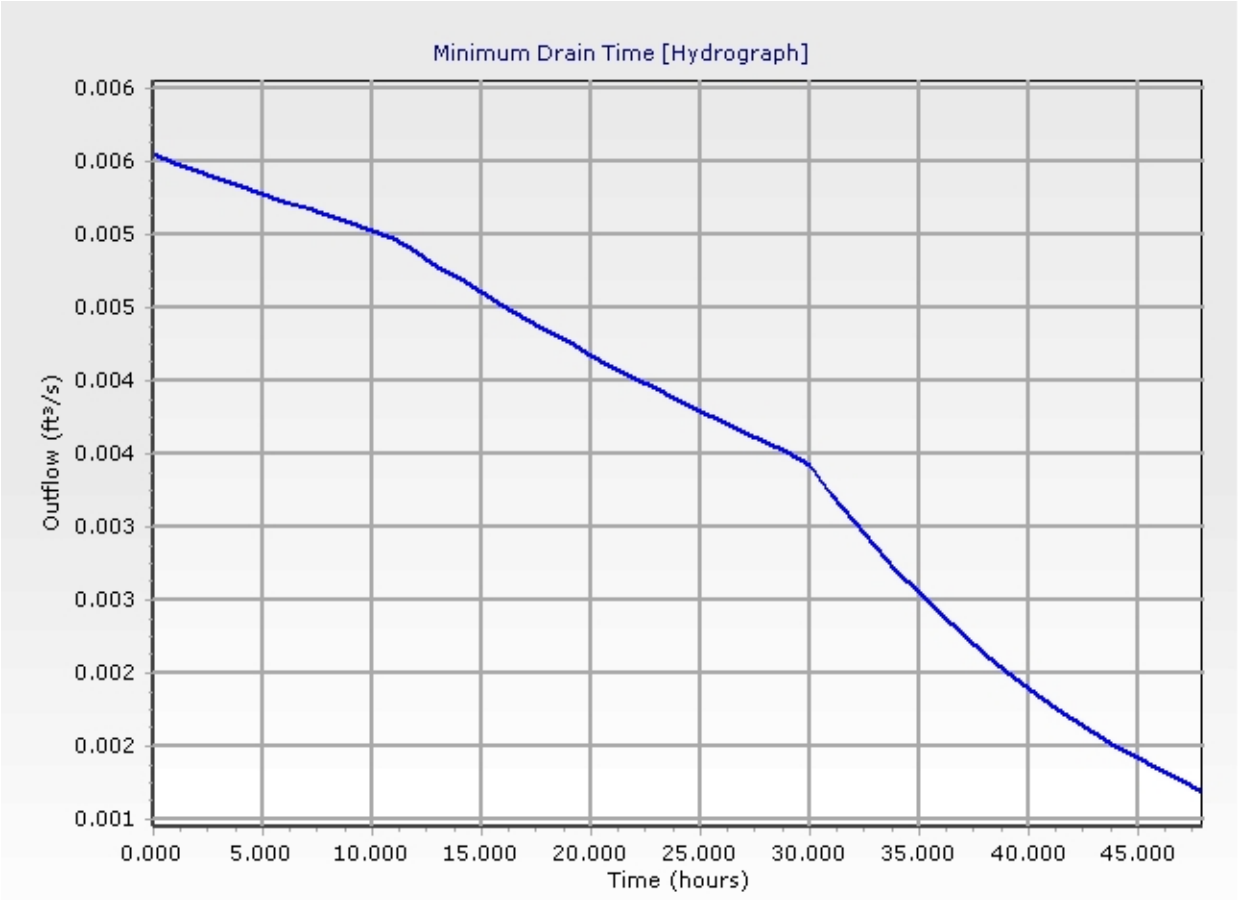

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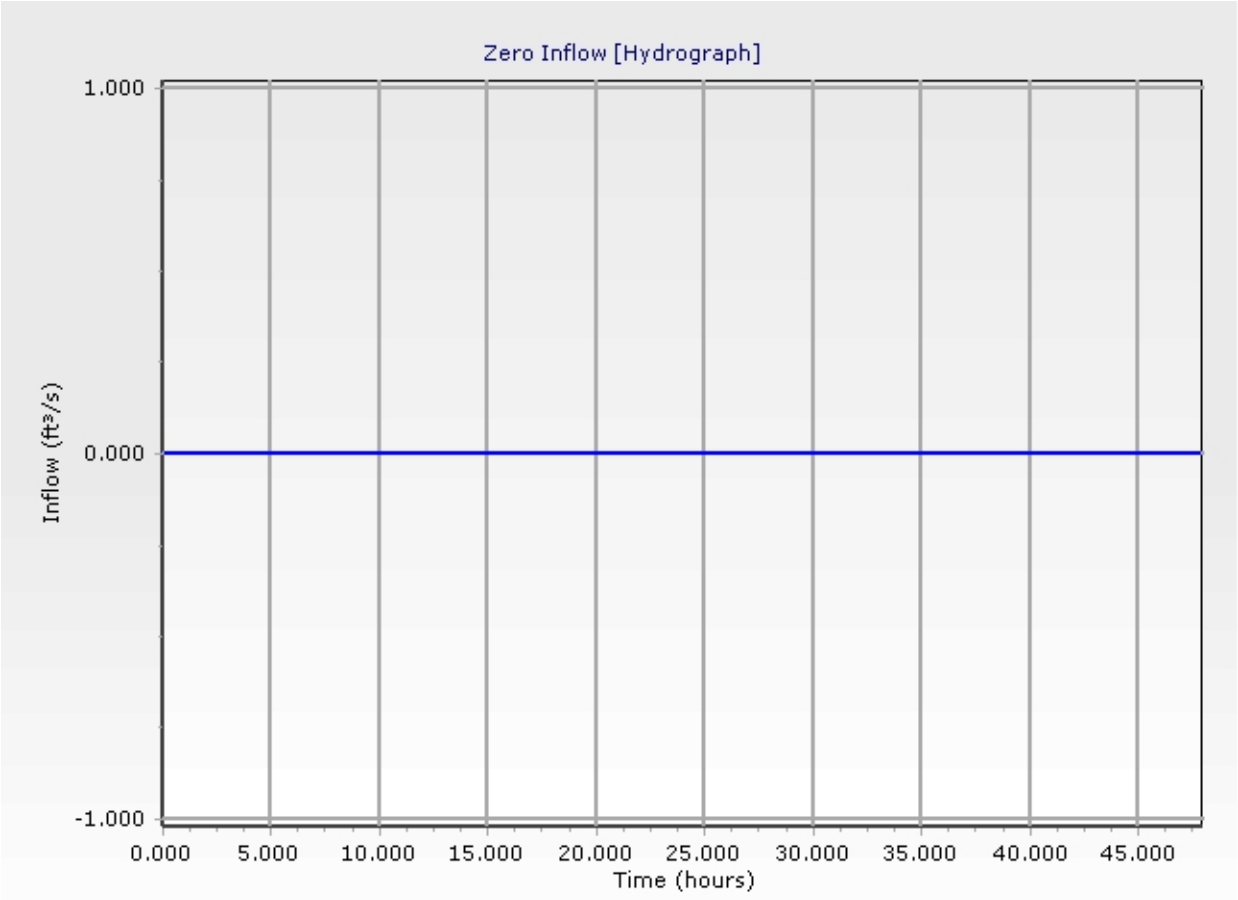

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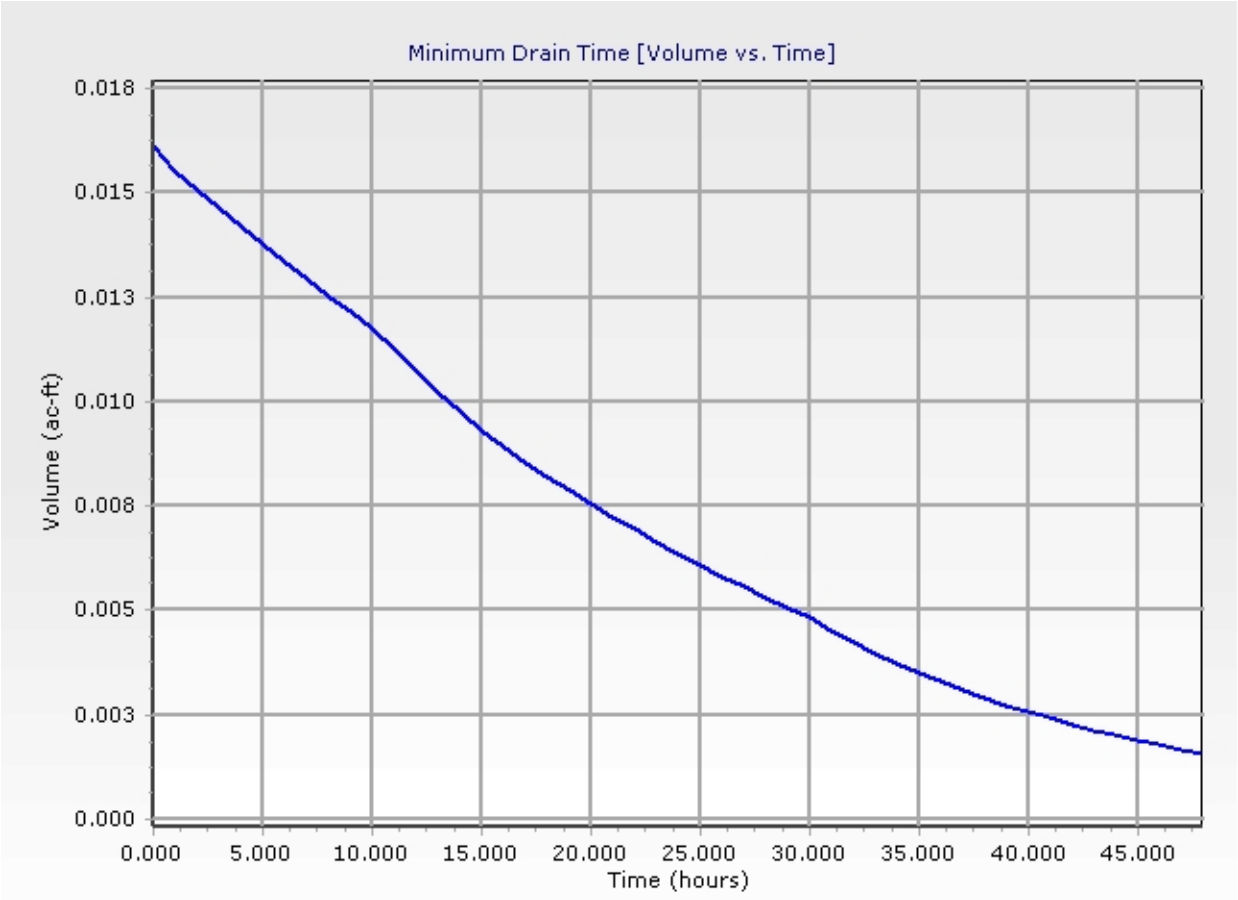
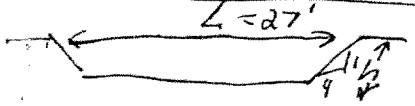


For	Riprap @ East bank BMP 3 & 4	Job no. 49633	Sheet no. 1/2
Made by	P. Sheeley	Checked by	Backchecked by
Date	7-20-11	Date	Date

HNTB

Determine shear stress on d/s of forebay



$Q_{10} = \frac{7}{5.8}$ cfs $\tau = \gamma h S = 62.4(0.25)h$

$\tau = 1.22$ lb/ft² ✓

$h = 0.078$ (Manning's solver) 6" stone (Pond Aggregate 601)

BASIN B updated

$n = 0.041$
$S = 25\%$
$B_W = 27$
FS = 4:1
$Q = \frac{16}{5.8}$

$h = 0.078'$ ✓
$V = 3.27$ ft/s
3.0 ft/s

$D_{50} = 6"$

$\tau_{D50=6"} \cong 5 \times D_{50} = 2.5$ lb/ft²

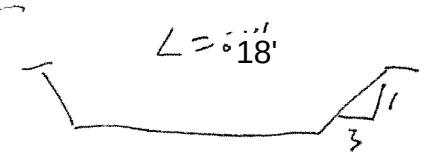
Julien, 1998 Erosion & Sedimentation

$\tau_{D50} > \tau$ ∴ STABLE.

Also check LBD V II p. 178/240 Figure 1107-1
No protection required for Velocity < 4 ft/s.

ARE FLOWS STILL VALID FOR ALL BASINS? ✓ updated

BASIN A ✓



$Q_{10} = 0.29 \times 0.90 \times 5.1 = 1.33$ cfs

$h = \cancel{0.0242}$ 0.0284

$n = 0.041$
$S = 33\%$
FS = BS = 3:1
$Q = 1.33$

Manning's solver $h = 0.0284$

$\rightarrow \tau_{10} = \gamma h S = 62.4 \times 0.0284 \times 0.33 = 0.58$ lb/ft² < 2.5 ✓ O.K.

ME101-2004

Innerbelt

Project Summary	
Title	Innerbelt
Engineer	PNShedivy
Company	
Date	11/10/2011

East Bank Basin B

Notes

Table of Contents

Innerbelt

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
I-90 Bridge 147	WQ storm	0	0.066	12.000	1.02
I-90 Bridge 147	5 yr	5	0.211	12.000	3.03
I-90 Bridge 147	10-yr	10	0.251	12.000	3.57
I-90 Bridge 147	25-yr	25	0.306	12.000	4.32
I-90 Bridge 147	50-yr	50	0.353	12.000	4.96
I-90 Bridge 143	WQ storm	0	0.046	12.000	0.71
I-90 Bridge 143	5 yr	5	0.147	12.000	2.11
I-90 Bridge 143	10-yr	10	0.174	12.000	2.48
I-90 Bridge 143	25-yr	25	0.213	12.000	3.00
I-90 Bridge 143	50-yr	50	0.246	12.000	3.45
I-90 Bridge - 142	WQ storm	0	0.048	12.000	0.73
I-90 Bridge - 142	5 yr	5	0.151	12.000	2.17
I-90 Bridge - 142	10-yr	10	0.179	12.000	2.55
I-90 Bridge - 142	25-yr	25	0.219	12.000	3.09
I-90 Bridge - 142	50-yr	50	0.253	12.000	3.55

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
D-1	WQ storm	0	0.066	12.000	1.02
D-1	5 yr	5	0.211	12.000	3.03
D-1	10-yr	10	0.251	12.000	3.57
D-1	25-yr	25	0.306	12.000	4.32
D-1	50-yr	50	0.353	12.000	4.96
D-2	WQ storm	0	0.113	12.000	1.73
D-2	5 yr	5	0.358	12.000	5.16
D-2	10-yr	10	0.425	12.000	6.05
D-2	25-yr	25	0.519	12.000	7.32
D-2	50-yr	50	0.599	12.000	8.41
D-4	WQ storm	0	0.158	16.050	0.06
D-4	5 yr	5	0.507	12.100	6.07
D-4	10-yr	10	0.602	12.050	7.31
D-4	25-yr	25	0.735	12.050	8.98
D-4	50-yr	50	0.849	12.050	10.42
Out 20	WQ storm	0	0.158	16.100	0.06
Out 20	5 yr	5	0.507	12.100	6.07
Out 20	10-yr	10	0.602	12.100	7.30
Out 20	25-yr	25	0.735	12.100	8.95
Out 20	50-yr	50	0.849	12.100	10.34

Pond Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
EB Detention (IN)	WQ storm	0	0.160	12.000	2.41	(N/A)	(N/A)
EB Detention (OUT)	WQ storm	0	0.158	16.050	0.06	577.98	0.113
EB Detention (IN)	5 yr	5	0.509	12.000	7.23	(N/A)	(N/A)
EB Detention (OUT)	5 yr	5	0.507	12.100	6.07	578.45	0.176
EB Detention (IN)	10-yr	10	0.604	12.000	8.48	(N/A)	(N/A)
EB Detention (OUT)	10-yr	10	0.602	12.050	7.31	578.52	0.185
EB Detention (IN)	25-yr	25	0.738	12.000	10.24	(N/A)	(N/A)
EB Detention (OUT)	25-yr	25	0.735	12.050	8.98	578.59	0.196
EB Detention (IN)	50-yr	50	0.852	12.000	11.76	(N/A)	(N/A)
EB Detention (OUT)	50-yr	50	0.849	12.050	10.42	578.65	0.205

Time-Depth Curve: Type II 24-hr 10-yr	
Label	Type II 24-hr 10-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.4	0.4	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.5	0.5	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.6	0.6	0.6	0.6	0.6
10.000	0.6	0.6	0.6	0.7	0.7
10.500	0.7	0.7	0.7	0.8	0.8
11.000	0.8	0.8	0.9	0.9	0.9
11.500	1.0	1.0	1.2	1.5	1.9
12.000	2.3	2.3	2.4	2.4	2.5
12.500	2.5	2.5	2.6	2.6	2.6
13.000	2.6	2.6	2.7	2.7	2.7
13.500	2.7	2.7	2.7	2.8	2.8
14.000	2.8	2.8	2.8	2.8	2.8
14.500	2.8	2.9	2.9	2.9	2.9
15.000	2.9	2.9	2.9	2.9	2.9
15.500	2.9	3.0	3.0	3.0	3.0
16.000	3.0	3.0	3.0	3.0	3.0

Innerbelt

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10 years
Storm Event: Type II 24-hr 10-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	3.0	3.0	3.0	3.1	3.1
17.000	3.1	3.1	3.1	3.1	3.1
17.500	3.1	3.1	3.1	3.1	3.1
18.000	3.1	3.1	3.1	3.1	3.2
18.500	3.2	3.2	3.2	3.2	3.2
19.000	3.2	3.2	3.2	3.2	3.2
19.500	3.2	3.2	3.2	3.2	3.2
20.000	3.2	3.2	3.2	3.2	3.3
20.500	3.3	3.3	3.3	3.3	3.3
21.000	3.3	3.3	3.3	3.3	3.3
21.500	3.3	3.3	3.3	3.3	3.3
22.000	3.3	3.3	3.3	3.3	3.3
22.500	3.3	3.3	3.3	3.4	3.4
23.000	3.4	3.4	3.4	3.4	3.4
23.500	3.4	3.4	3.4	3.4	3.4
24.000	3.4	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: Type II 24-hr 25-yr	
Label	Type II 24-hr 25-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.5	0.5	0.5	0.5
8.000	0.5	0.5	0.5	0.5	0.5
8.500	0.5	0.6	0.6	0.6	0.6
9.000	0.6	0.6	0.6	0.6	0.7
9.500	0.7	0.7	0.7	0.7	0.7
10.000	0.7	0.8	0.8	0.8	0.8
10.500	0.8	0.9	0.9	0.9	0.9
11.000	1.0	1.0	1.0	1.1	1.1
11.500	1.2	1.3	1.5	1.8	2.3
12.000	2.7	2.8	2.9	2.9	3.0
12.500	3.0	3.0	3.1	3.1	3.1
13.000	3.2	3.2	3.2	3.2	3.3
13.500	3.3	3.3	3.3	3.3	3.3
14.000	3.4	3.4	3.4	3.4	3.4
14.500	3.4	3.4	3.5	3.5	3.5
15.000	3.5	3.5	3.5	3.5	3.5
15.500	3.6	3.6	3.6	3.6	3.6
16.000	3.6	3.6	3.6	3.6	3.6

Innerbelt

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25 years
Storm Event: Type II 24-hr 25-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	3.7	3.7	3.7	3.7	3.7
17.000	3.7	3.7	3.7	3.7	3.7
17.500	3.7	3.7	3.8	3.8	3.8
18.000	3.8	3.8	3.8	3.8	3.8
18.500	3.8	3.8	3.8	3.8	3.8
19.000	3.8	3.9	3.9	3.9	3.9
19.500	3.9	3.9	3.9	3.9	3.9
20.000	3.9	3.9	3.9	3.9	3.9
20.500	3.9	3.9	3.9	3.9	4.0
21.000	4.0	4.0	4.0	4.0	4.0
21.500	4.0	4.0	4.0	4.0	4.0
22.000	4.0	4.0	4.0	4.0	4.0
22.500	4.0	4.0	4.0	4.0	4.0
23.000	4.1	4.1	4.1	4.1	4.1
23.500	4.1	4.1	4.1	4.1	4.1
24.000	4.1	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: Type II 24-hr 50-yr	
Label	Type II 24-hr 50-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.4	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.5	0.6
8.000	0.6	0.6	0.6	0.6	0.6
8.500	0.6	0.6	0.6	0.7	0.7
9.000	0.7	0.7	0.7	0.7	0.8
9.500	0.8	0.8	0.8	0.8	0.8
10.000	0.9	0.9	0.9	0.9	0.9
10.500	1.0	1.0	1.0	1.0	1.1
11.000	1.1	1.1	1.2	1.2	1.3
11.500	1.3	1.4	1.7	2.0	2.7
12.000	3.1	3.2	3.3	3.4	3.4
12.500	3.5	3.5	3.5	3.6	3.6
13.000	3.6	3.7	3.7	3.7	3.7
13.500	3.8	3.8	3.8	3.8	3.8
14.000	3.9	3.9	3.9	3.9	3.9
14.500	3.9	4.0	4.0	4.0	4.0
15.000	4.0	4.0	4.0	4.1	4.1
15.500	4.1	4.1	4.1	4.1	4.1
16.000	4.1	4.1	4.2	4.2	4.2

Innerbelt

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50 years
Storm Event: Type II 24-hr 50-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	4.2	4.2	4.2	4.2	4.2
17.000	4.2	4.2	4.3	4.3	4.3
17.500	4.3	4.3	4.3	4.3	4.3
18.000	4.3	4.3	4.3	4.4	4.4
18.500	4.4	4.4	4.4	4.4	4.4
19.000	4.4	4.4	4.4	4.4	4.4
19.500	4.4	4.4	4.5	4.5	4.5
20.000	4.5	4.5	4.5	4.5	4.5
20.500	4.5	4.5	4.5	4.5	4.5
21.000	4.5	4.5	4.5	4.6	4.6
21.500	4.6	4.6	4.6	4.6	4.6
22.000	4.6	4.6	4.6	4.6	4.6
22.500	4.6	4.6	4.6	4.6	4.6
23.000	4.6	4.7	4.7	4.7	4.7
23.500	4.7	4.7	4.7	4.7	4.7
24.000	4.7	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: Type II 24-hr 5-yr	
Label	Type II 24-hr 5-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.3	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.5	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.5	0.5	0.6	0.6
10.500	0.6	0.6	0.6	0.6	0.7
11.000	0.7	0.7	0.7	0.8	0.8
11.500	0.8	0.9	1.0	1.2	1.6
12.000	1.9	2.0	2.0	2.1	2.1
12.500	2.1	2.2	2.2	2.2	2.2
13.000	2.2	2.3	2.3	2.3	2.3
13.500	2.3	2.3	2.3	2.4	2.4
14.000	2.4	2.4	2.4	2.4	2.4
14.500	2.4	2.4	2.4	2.5	2.5
15.000	2.5	2.5	2.5	2.5	2.5
15.500	2.5	2.5	2.5	2.5	2.5
16.000	2.6	2.6	2.6	2.6	2.6
16.500	2.6	2.6	2.6	2.6	2.6

Innerbelt

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5 years
Storm Event: Type II 24-hr 5-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.6	2.6	2.6	2.6	2.6
17.500	2.6	2.6	2.7	2.7	2.7
18.000	2.7	2.7	2.7	2.7	2.7
18.500	2.7	2.7	2.7	2.7	2.7
19.000	2.7	2.7	2.7	2.7	2.7
19.500	2.7	2.7	2.7	2.8	2.8
20.000	2.8	2.8	2.8	2.8	2.8
20.500	2.8	2.8	2.8	2.8	2.8
21.000	2.8	2.8	2.8	2.8	2.8
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.8	2.8	2.8	2.8	2.8
22.500	2.9	2.9	2.9	2.9	2.9
23.000	2.9	2.9	2.9	2.9	2.9
23.500	2.9	2.9	2.9	2.9	2.9
24.000	2.9	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve

Label: ODOT TR-55

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

Time-Depth Curve: Type II 24-hr Water Quality Storm	
Label	Type II 24-hr Water Quality Storm
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	0 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.0	0.0	0.0	0.0
2.500	0.0	0.0	0.0	0.0	0.0
3.000	0.0	0.0	0.0	0.0	0.0
3.500	0.0	0.0	0.0	0.0	0.0
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.1
5.500	0.1	0.1	0.1	0.1	0.1
6.000	0.1	0.1	0.1	0.1	0.1
6.500	0.1	0.1	0.1	0.1	0.1
7.000	0.1	0.1	0.1	0.1	0.1
7.500	0.1	0.1	0.1	0.1	0.1
8.000	0.1	0.1	0.1	0.1	0.1
8.500	0.1	0.1	0.1	0.1	0.2
9.000	0.2	0.2	0.2	0.2	0.2
9.500	0.2	0.2	0.2	0.2	0.2
10.000	0.2	0.2	0.2	0.2	0.2
10.500	0.2	0.2	0.2	0.2	0.2
11.000	0.2	0.3	0.3	0.3	0.3
11.500	0.3	0.3	0.4	0.5	0.6
12.000	0.7	0.7	0.7	0.7	0.8
12.500	0.8	0.8	0.8	0.8	0.8
13.000	0.8	0.8	0.8	0.8	0.8
13.500	0.8	0.8	0.8	0.9	0.9
14.000	0.9	0.9	0.9	0.9	0.9
14.500	0.9	0.9	0.9	0.9	0.9
15.000	0.9	0.9	0.9	0.9	0.9

Subsection: Time-Depth Curve

Label: ODOT TR-55

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
15.500	0.9	0.9	0.9	0.9	0.9
16.000	0.9	0.9	0.9	0.9	0.9
16.500	0.9	0.9	0.9	0.9	0.9
17.000	0.9	0.9	1.0	1.0	1.0
17.500	1.0	1.0	1.0	1.0	1.0
18.000	1.0	1.0	1.0	1.0	1.0
18.500	1.0	1.0	1.0	1.0	1.0
19.000	1.0	1.0	1.0	1.0	1.0
19.500	1.0	1.0	1.0	1.0	1.0
20.000	1.0	1.0	1.0	1.0	1.0
20.500	1.0	1.0	1.0	1.0	1.0
21.000	1.0	1.0	1.0	1.0	1.0
21.500	1.0	1.0	1.0	1.0	1.0
22.000	1.0	1.0	1.0	1.0	1.0
22.500	1.0	1.0	1.0	1.0	1.0
23.000	1.0	1.0	1.0	1.0	1.0
23.500	1.0	1.0	1.0	1.0	1.0
24.000	1.1	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Runoff CN-Area

Label: I-90 Bridge - 142

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	0.680	100.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.680	(N/A)	(N/A)	98.000

Subsection: Runoff CN-Area

Label: I-90 Bridge 143

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads	98.000	0.660	100.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.660	(N/A)	(N/A)	98.000

Subsection: Runoff CN-Area

Label: I-90 Bridge 147

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads	98.000	0.950	100.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.950	(N/A)	(N/A)	98.000

Storm Event	Type II 24-hr Water Quality Storm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.680 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	11.979 hours
Flow (Peak, Computed)	0.74 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.73 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.680 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	0.048 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.048 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432

Subsection: Unit Hydrograph Summary

Label: I-90 Bridge - 142

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

SCS Unit Hydrograph Parameters	
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.61 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Subsection: Unit Hydrograph Summary
Label: I-90 Bridge 143

Return Event: 0 years
Storm Event: Type II 24-hr Water Quality Storm

Storm Event	Type II 24-hr Water Quality Storm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.660 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	11.978 hours
Flow (Peak, Computed)	0.72 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.71 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.660 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	0.046 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.046 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432

Subsection: Unit Hydrograph Summary

Label: I-90 Bridge 143

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

SCS Unit Hydrograph Parameters	
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.49 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.444 hours
Total unit time, Tb	0.556 hours

Storm Event	Type II 24-hr Water Quality Storm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.950 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	11.979 hours
Flow (Peak, Computed)	1.04 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	1.02 ft^3/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.950 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	0.066 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.066 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432

Subsection: Unit Hydrograph Summary

Label: I-90 Bridge 147

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

SCS Unit Hydrograph Parameters	
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.45 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	577.00	577.00	577.00	577.00	577.00
0.250	577.00	577.00	577.00	577.00	577.00
0.500	577.00	577.00	577.00	577.00	577.00
0.750	577.00	577.00	577.00	577.00	577.00
1.000	577.00	577.00	577.00	577.00	577.00
1.250	577.00	577.00	577.00	577.00	577.00
1.500	577.00	577.00	577.00	577.00	577.00
1.750	577.00	577.00	577.00	577.00	577.00
2.000	577.00	577.00	577.00	577.00	577.00
2.250	577.00	577.00	577.00	577.00	577.00
2.500	577.00	577.00	577.00	577.00	577.00
2.750	577.00	577.00	577.00	577.00	577.00
3.000	577.00	577.00	577.00	577.00	577.00
3.250	577.00	577.00	577.00	577.00	577.00
3.500	577.00	577.00	577.00	577.00	577.00
3.750	577.00	577.00	577.00	577.00	577.00
4.000	577.00	577.00	577.00	577.00	577.00
4.250	577.00	577.00	577.00	577.00	577.00
4.500	577.00	577.00	577.00	577.00	577.00
4.750	577.00	577.00	577.00	577.00	577.00
5.000	577.00	577.00	577.00	577.00	577.00
5.250	577.00	577.01	577.01	577.01	577.01
5.500	577.01	577.01	577.01	577.01	577.01
5.750	577.01	577.01	577.01	577.01	577.01
6.000	577.01	577.01	577.01	577.01	577.01
6.250	577.01	577.01	577.01	577.01	577.01
6.500	577.02	577.02	577.02	577.02	577.02
6.750	577.02	577.02	577.02	577.02	577.02
7.000	577.02	577.02	577.02	577.02	577.02
7.250	577.02	577.03	577.03	577.03	577.03
7.500	577.03	577.03	577.03	577.03	577.03
7.750	577.03	577.03	577.03	577.03	577.04
8.000	577.04	577.04	577.04	577.04	577.04
8.250	577.04	577.04	577.04	577.04	577.04
8.500	577.04	577.05	577.05	577.05	577.05
8.750	577.05	577.05	577.05	577.05	577.06
9.000	577.06	577.06	577.06	577.06	577.06
9.250	577.06	577.07	577.07	577.07	577.07
9.500	577.07	577.07	577.07	577.08	577.08
9.750	577.08	577.08	577.08	577.08	577.09

Innerbelt

Subsection: Time vs. Elevation

Label: EB Detention (OUT)

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.000	577.09	577.09	577.09	577.09	577.10
10.250	577.10	577.10	577.10	577.10	577.11
10.500	577.11	577.11	577.11	577.12	577.12
10.750	577.12	577.13	577.13	577.13	577.14
11.000	577.14	577.14	577.15	577.15	577.16
11.250	577.16	577.17	577.17	577.18	577.19
11.500	577.19	577.20	577.21	577.22	577.23
11.750	577.26	577.29	577.33	577.38	577.45
12.000	577.53	577.62	577.69	577.74	577.78
12.250	577.80	577.82	577.84	577.85	577.86
12.500	577.87	577.87	577.88	577.89	577.89
12.750	577.90	577.90	577.90	577.91	577.91
13.000	577.92	577.92	577.92	577.93	577.93
13.250	577.93	577.93	577.94	577.94	577.94
13.500	577.94	577.95	577.95	577.95	577.95
13.750	577.95	577.95	577.96	577.96	577.96
14.000	577.96	577.96	577.96	577.96	577.96
14.250	577.97	577.97	577.97	577.97	577.97
14.500	577.97	577.97	577.97	577.97	577.97
14.750	577.97	577.97	577.98	577.98	577.98
15.000	577.98	577.98	577.98	577.98	577.98
15.250	577.98	577.98	577.98	577.98	577.98
15.500	577.98	577.98	577.98	577.98	577.98
15.750	577.98	577.98	577.98	577.98	577.98
16.000	577.98	577.98	577.98	577.98	577.98
16.250	577.98	577.98	577.98	577.98	577.98
16.500	577.98	577.98	577.98	577.98	577.98
16.750	577.98	577.98	577.98	577.98	577.98
17.000	577.98	577.98	577.98	577.98	577.98
17.250	577.98	577.98	577.98	577.98	577.98
17.500	577.98	577.98	577.98	577.98	577.98
17.750	577.98	577.98	577.98	577.97	577.97
18.000	577.97	577.97	577.97	577.97	577.97
18.250	577.97	577.97	577.97	577.97	577.97
18.500	577.97	577.97	577.97	577.97	577.97
18.750	577.97	577.97	577.97	577.97	577.96
19.000	577.96	577.96	577.96	577.96	577.96
19.250	577.96	577.96	577.96	577.96	577.96
19.500	577.96	577.96	577.96	577.96	577.96
19.750	577.95	577.95	577.95	577.95	577.95

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.000	577.95	577.95	577.95	577.95	577.95
20.250	577.95	577.95	577.95	577.94	577.94
20.500	577.94	577.94	577.94	577.94	577.94
20.750	577.94	577.94	577.94	577.94	577.94
21.000	577.93	577.93	577.93	577.93	577.93
21.250	577.93	577.93	577.93	577.93	577.93
21.500	577.93	577.93	577.92	577.92	577.92
21.750	577.92	577.92	577.92	577.92	577.92
22.000	577.92	577.92	577.92	577.92	577.91
22.250	577.91	577.91	577.91	577.91	577.91
22.500	577.91	577.91	577.91	577.91	577.91
22.750	577.91	577.90	577.90	577.90	577.90
23.000	577.90	577.90	577.90	577.90	577.90
23.250	577.90	577.90	577.90	577.89	577.89
23.500	577.89	577.89	577.89	577.89	577.89
23.750	577.89	577.89	577.89	577.89	577.88
24.000	577.88	577.88	577.88	577.88	577.88
24.250	577.88	577.88	577.87	577.87	577.87
24.500	577.87	577.87	577.87	577.86	577.86
24.750	577.86	577.86	577.86	577.86	577.85
25.000	577.85	577.85	577.85	577.85	577.85
25.250	577.84	577.84	577.84	577.84	577.84
25.500	577.84	577.83	577.83	577.83	577.83
25.750	577.83	577.83	577.82	577.82	577.82
26.000	577.82	577.82	577.82	577.81	577.81
26.250	577.81	577.81	577.81	577.80	577.80
26.500	577.80	577.80	577.80	577.80	577.79
26.750	577.79	577.79	577.79	577.79	577.79
27.000	577.78	577.78	577.78	577.78	577.78
27.250	577.78	577.77	577.77	577.77	577.77
27.500	577.77	577.77	577.76	577.76	577.76
27.750	577.76	577.76	577.76	577.75	577.75
28.000	577.75	577.75	577.75	577.75	577.74
28.250	577.74	577.74	577.74	577.74	577.74
28.500	577.73	577.73	577.73	577.73	577.73
28.750	577.73	577.73	577.72	577.72	577.72
29.000	577.72	577.72	577.72	577.71	577.71
29.250	577.71	577.71	577.71	577.71	577.70
29.500	577.70	577.70	577.70	577.70	577.70
29.750	577.70	577.69	577.69	577.69	577.69

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
30.000	577.69	577.69	577.68	577.68	577.68
30.250	577.68	577.68	577.68	577.67	577.67
30.500	577.67	577.67	577.67	577.67	577.67
30.750	577.66	577.66	577.66	577.66	577.66
31.000	577.66	577.65	577.65	577.65	577.65
31.250	577.65	577.65	577.64	577.64	577.64
31.500	577.64	577.64	577.64	577.64	577.63
31.750	577.63	577.63	577.63	577.63	577.63
32.000	577.62	577.62	577.62	577.62	577.62
32.250	577.62	577.62	577.61	577.61	577.61
32.500	577.61	577.61	577.61	577.61	577.60
32.750	577.60	577.60	577.60	577.60	577.60
33.000	577.59	577.59	577.59	577.59	577.59
33.250	577.59	577.59	577.58	577.58	577.58
33.500	577.58	577.58	577.58	577.58	577.57
33.750	577.57	577.57	577.57	577.57	577.57
34.000	577.56	577.56	577.56	577.56	577.56
34.250	577.56	577.56	577.55	577.55	577.55
34.500	577.55	577.55	577.55	577.55	577.54
34.750	577.54	577.54	577.54	577.54	577.54
35.000	577.54	577.53	577.53	577.53	577.53
35.250	577.53	577.53	577.53	577.52	577.52
35.500	577.52	577.52	577.52	577.52	577.52
35.750	577.51	577.51	577.51	577.51	577.51
36.000	577.51	577.51	577.50	577.50	577.50
36.250	577.50	577.50	577.50	577.50	577.49
36.500	577.49	577.49	577.49	577.49	577.49
36.750	577.49	577.48	577.48	577.48	577.48
37.000	577.48	577.48	577.48	577.48	577.47
37.250	577.47	577.47	577.47	577.47	577.47
37.500	577.47	577.46	577.46	577.46	577.46
37.750	577.46	577.46	577.46	577.45	577.45
38.000	577.45	577.45	577.45	577.45	577.45
38.250	577.45	577.44	577.44	577.44	577.44
38.500	577.44	577.44	577.44	577.43	577.43
38.750	577.43	577.43	577.43	577.43	577.43
39.000	577.43	577.42	577.42	577.42	577.42
39.250	577.42	577.42	577.42	577.42	577.41
39.500	577.41	577.41	577.41	577.41	577.41
39.750	577.41	577.40	577.40	577.40	577.40

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
40.000	577.40	577.40	577.40	577.40	577.39
40.250	577.39	577.39	577.39	577.39	577.39
40.500	577.39	577.39	577.38	577.38	577.38
40.750	577.38	577.38	577.38	577.38	577.38
41.000	577.37	577.37	577.37	577.37	577.37
41.250	577.37	577.37	577.37	577.36	577.36
41.500	577.36	577.36	577.36	577.36	577.36
41.750	577.36	577.35	577.35	577.35	577.35
42.000	577.35	577.35	577.35	577.35	577.35
42.250	577.34	577.34	577.34	577.34	577.34
42.500	577.34	577.34	577.34	577.33	577.33
42.750	577.33	577.33	577.33	577.33	577.33
43.000	577.33	577.33	577.32	577.32	577.32
43.250	577.32	577.32	577.32	577.32	577.32
43.500	577.31	577.31	577.31	577.31	577.31
43.750	577.31	577.31	577.31	577.31	577.30
44.000	577.30	577.30	577.30	577.30	577.30
44.250	577.30	577.30	577.30	577.29	577.29
44.500	577.29	577.29	577.29	577.29	577.29
44.750	577.29	577.29	577.28	577.28	577.28
45.000	577.28	577.28	577.28	577.28	577.28
45.250	577.28	577.28	577.27	577.27	577.27
45.500	577.27	577.27	577.27	577.27	577.27
45.750	577.27	577.26	577.26	577.26	577.26
46.000	577.26	577.26	577.26	577.26	577.26
46.250	577.26	577.25	577.25	577.25	577.25
46.500	577.25	577.25	577.25	577.25	577.25
46.750	577.25	577.24	577.24	577.24	577.24
47.000	577.24	577.24	577.24	577.24	577.24
47.250	577.24	577.23	577.23	577.23	577.23
47.500	577.23	577.23	577.23	577.23	577.23
47.750	577.23	577.23	577.22	577.22	577.22
48.000	577.22	577.22	577.22	577.22	577.22
48.250	577.22	577.22	577.22	577.21	577.21
48.500	577.21	577.21	577.21	577.21	577.21
48.750	577.21	577.21	577.21	577.21	577.20
49.000	577.20	577.20	577.20	577.20	577.20
49.250	577.20	577.20	577.20	577.20	577.20
49.500	577.20	577.19	577.19	577.19	577.19
49.750	577.19	577.19	577.19	577.19	577.19

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
50.000	577.19	577.19	577.19	577.18	577.18
50.250	577.18	577.18	577.18	577.18	577.18
50.500	577.18	577.18	577.18	577.18	577.18
50.750	577.17	577.17	577.17	577.17	577.17
51.000	577.17	577.17	577.17	577.17	577.17
51.250	577.17	577.17	577.17	577.16	577.16
51.500	577.16	577.16	577.16	577.16	577.16
51.750	577.16	577.16	577.16	577.16	577.16
52.000	577.16	577.15	577.15	577.15	577.15
52.250	577.15	577.15	577.15	577.15	577.15
52.500	577.15	577.15	577.15	577.15	577.15
52.750	577.14	577.14	577.14	577.14	577.14
53.000	577.14	577.14	577.14	577.14	577.14
53.250	577.14	577.14	577.14	577.14	577.14
53.500	577.13	577.13	577.13	577.13	577.13
53.750	577.13	577.13	577.13	577.13	577.13
54.000	577.13	577.13	577.13	577.13	577.13
54.250	577.12	577.12	577.12	577.12	577.12
54.500	577.12	577.12	577.12	577.12	577.12
54.750	577.12	577.12	577.12	577.12	577.12
55.000	577.12	577.11	577.11	577.11	577.11
55.250	577.11	577.11	577.11	577.11	577.11
55.500	577.11	577.11	577.11	577.11	577.11
55.750	577.11	577.11	577.11	577.10	577.10
56.000	577.10	577.10	577.10	577.10	577.10
56.250	577.10	577.10	577.10	577.10	577.10
56.500	577.10	577.10	577.10	577.10	577.10
56.750	577.10	577.09	577.09	577.09	577.09
57.000	577.09	577.09	577.09	577.09	577.09
57.250	577.09	577.09	577.09	577.09	577.09
57.500	577.09	577.09	577.09	577.09	577.09
57.750	577.09	577.08	577.08	577.08	577.08
58.000	577.08	577.08	577.08	577.08	577.08
58.250	577.08	577.08	577.08	577.08	577.08
58.500	577.08	577.08	577.08	577.08	577.08
58.750	577.08	577.08	577.08	577.07	577.07
59.000	577.07	577.07	577.07	577.07	577.07
59.250	577.07	577.07	577.07	577.07	577.07
59.500	577.07	577.07	577.07	577.07	577.07
59.750	577.07	577.07	577.07	577.07	577.07

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
60.000	577.07	577.07	577.07	577.07	577.06
60.250	577.06	577.06	577.06	577.06	577.06
60.500	577.06	577.06	577.06	577.06	577.06
60.750	577.06	577.06	577.06	577.06	577.06
61.000	577.06	577.06	577.06	577.06	577.06
61.250	577.06	577.06	577.06	577.06	577.06
61.500	577.06	577.06	577.06	577.05	577.05
61.750	577.05	577.05	577.05	577.05	577.05
62.000	577.05	577.05	577.05	577.05	577.05
62.250	577.05	577.05	577.05	577.05	577.05
62.500	577.05	577.05	577.05	577.05	577.05
62.750	577.05	577.05	577.05	577.05	577.05
63.000	577.05	577.05	577.05	577.05	577.05
63.250	577.05	577.05	577.05	577.04	577.04
63.500	577.04	577.04	577.04	577.04	577.04
63.750	577.04	577.04	577.04	577.04	577.04
64.000	577.04	577.04	577.04	577.04	577.04
64.250	577.04	577.04	577.04	577.04	577.04
64.500	577.04	577.04	577.04	577.04	577.04
64.750	577.04	577.04	577.04	577.04	577.04
65.000	577.04	577.04	577.04	577.04	577.04
65.250	577.04	577.04	577.04	577.04	577.04
65.500	577.04	577.04	577.04	577.03	577.03
65.750	577.03	577.03	577.03	577.03	577.03
66.000	577.03	577.03	577.03	577.03	577.03
66.250	577.03	577.03	577.03	577.03	577.03
66.500	577.03	577.03	577.03	577.03	577.03
66.750	577.03	577.03	577.03	577.03	577.03
67.000	577.03	577.03	577.03	577.03	577.03
67.250	577.03	577.03	577.03	577.03	577.03
67.500	577.03	577.03	577.03	577.03	577.03
67.750	577.03	577.03	577.03	577.03	577.03
68.000	577.03	577.03	577.03	577.03	577.03
68.250	577.03	577.03	577.03	577.03	577.03
68.500	577.03	577.03	577.02	577.02	577.02
68.750	577.02	577.02	577.02	577.02	577.02
69.000	577.02	577.02	577.02	577.02	577.02
69.250	577.02	577.02	577.02	577.02	577.02
69.500	577.02	577.02	577.02	577.02	577.02
69.750	577.02	577.02	577.02	577.02	577.02

Subsection: Time vs. Elevation

Label: EB Detention (OUT)

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
70.000	577.02	577.02	577.02	577.02	577.02
70.250	577.02	577.02	577.02	577.02	577.02
70.500	577.02	577.02	577.02	577.02	577.02
70.750	577.02	577.02	577.02	577.02	577.02
71.000	577.02	577.02	577.02	577.02	577.02
71.250	577.02	577.02	577.02	577.02	577.02
71.500	577.02	577.02	577.02	577.02	577.02
71.750	577.02	577.02	577.02	577.02	577.02
72.000	577.02	(N/A)	(N/A)	(N/A)	(N/A)

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000	0.000
4.250	0.000	0.000	0.000	0.000	0.000
4.500	0.000	0.000	0.000	0.000	0.000
4.750	0.000	0.000	0.000	0.000	0.000
5.000	0.000	0.000	0.000	0.000	0.000
5.250	0.001	0.001	0.001	0.001	0.001
5.500	0.001	0.001	0.001	0.001	0.001
5.750	0.001	0.001	0.001	0.001	0.001
6.000	0.001	0.001	0.001	0.001	0.001
6.250	0.001	0.001	0.001	0.001	0.002
6.500	0.002	0.002	0.002	0.002	0.002
6.750	0.002	0.002	0.002	0.002	0.002
7.000	0.002	0.002	0.002	0.002	0.002
7.250	0.003	0.003	0.003	0.003	0.003
7.500	0.003	0.003	0.003	0.003	0.003
7.750	0.003	0.003	0.003	0.004	0.004
8.000	0.004	0.004	0.004	0.004	0.004
8.250	0.004	0.004	0.004	0.004	0.004
8.500	0.005	0.005	0.005	0.005	0.005
8.750	0.005	0.005	0.005	0.006	0.006
9.000	0.006	0.006	0.006	0.006	0.006
9.250	0.007	0.007	0.007	0.007	0.007
9.500	0.007	0.007	0.008	0.008	0.008
9.750	0.008	0.008	0.008	0.009	0.009

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.000	0.009	0.009	0.009	0.010	0.010
10.250	0.010	0.010	0.011	0.011	0.011
10.500	0.011	0.012	0.012	0.012	0.012
10.750	0.013	0.013	0.013	0.014	0.014
11.000	0.015	0.015	0.015	0.016	0.016
11.250	0.017	0.017	0.018	0.019	0.019
11.500	0.020	0.021	0.022	0.023	0.025
11.750	0.027	0.030	0.035	0.041	0.049
12.000	0.058	0.068	0.076	0.083	0.087
12.250	0.090	0.093	0.094	0.096	0.097
12.500	0.098	0.099	0.100	0.101	0.101
12.750	0.102	0.102	0.103	0.103	0.104
13.000	0.104	0.105	0.105	0.106	0.106
13.250	0.106	0.107	0.107	0.107	0.108
13.500	0.108	0.108	0.108	0.109	0.109
13.750	0.109	0.109	0.109	0.110	0.110
14.000	0.110	0.110	0.110	0.110	0.110
14.250	0.111	0.111	0.111	0.111	0.111
14.500	0.111	0.111	0.111	0.111	0.112
14.750	0.112	0.112	0.112	0.112	0.112
15.000	0.112	0.112	0.112	0.112	0.112
15.250	0.112	0.112	0.112	0.113	0.113
15.500	0.113	0.113	0.113	0.113	0.113
15.750	0.113	0.113	0.113	0.113	0.113
16.000	0.113	0.113	0.113	0.113	0.113
16.250	0.113	0.113	0.113	0.113	0.113
16.500	0.113	0.113	0.113	0.113	0.113
16.750	0.113	0.113	0.113	0.113	0.113
17.000	0.112	0.112	0.112	0.112	0.112
17.250	0.112	0.112	0.112	0.112	0.112
17.500	0.112	0.112	0.112	0.112	0.112
17.750	0.112	0.112	0.112	0.112	0.112
18.000	0.112	0.112	0.112	0.112	0.111
18.250	0.111	0.111	0.111	0.111	0.111
18.500	0.111	0.111	0.111	0.111	0.111
18.750	0.111	0.111	0.111	0.111	0.110
19.000	0.110	0.110	0.110	0.110	0.110
19.250	0.110	0.110	0.110	0.110	0.110
19.500	0.110	0.110	0.109	0.109	0.109
19.750	0.109	0.109	0.109	0.109	0.109

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.000	0.109	0.109	0.109	0.108	0.108
20.250	0.108	0.108	0.108	0.108	0.108
20.500	0.108	0.108	0.108	0.107	0.107
20.750	0.107	0.107	0.107	0.107	0.107
21.000	0.107	0.107	0.106	0.106	0.106
21.250	0.106	0.106	0.106	0.106	0.106
21.500	0.106	0.106	0.105	0.105	0.105
21.750	0.105	0.105	0.105	0.105	0.105
22.000	0.105	0.104	0.104	0.104	0.104
22.250	0.104	0.104	0.104	0.104	0.104
22.500	0.104	0.103	0.103	0.103	0.103
22.750	0.103	0.103	0.103	0.103	0.103
23.000	0.103	0.102	0.102	0.102	0.102
23.250	0.102	0.102	0.102	0.102	0.102
23.500	0.101	0.101	0.101	0.101	0.101
23.750	0.101	0.101	0.101	0.101	0.100
24.000	0.100	0.100	0.100	0.100	0.100
24.250	0.100	0.099	0.099	0.099	0.099
24.500	0.099	0.098	0.098	0.098	0.098
24.750	0.097	0.097	0.097	0.097	0.097
25.000	0.096	0.096	0.096	0.096	0.096
25.250	0.095	0.095	0.095	0.095	0.094
25.500	0.094	0.094	0.094	0.094	0.093
25.750	0.093	0.093	0.093	0.093	0.092
26.000	0.092	0.092	0.092	0.092	0.091
26.250	0.091	0.091	0.091	0.091	0.090
26.500	0.090	0.090	0.090	0.089	0.089
26.750	0.089	0.089	0.089	0.088	0.088
27.000	0.088	0.088	0.088	0.087	0.087
27.250	0.087	0.087	0.087	0.086	0.086
27.500	0.086	0.086	0.086	0.085	0.085
27.750	0.085	0.085	0.085	0.084	0.084
28.000	0.084	0.084	0.084	0.083	0.083
28.250	0.083	0.083	0.083	0.082	0.082
28.500	0.082	0.082	0.082	0.081	0.081
28.750	0.081	0.081	0.081	0.080	0.080
29.000	0.080	0.080	0.080	0.079	0.079
29.250	0.079	0.079	0.079	0.079	0.078
29.500	0.078	0.078	0.078	0.078	0.077
29.750	0.077	0.077	0.077	0.077	0.076

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
30.000	0.076	0.076	0.076	0.076	0.075
30.250	0.075	0.075	0.075	0.075	0.075
30.500	0.074	0.074	0.074	0.074	0.074
30.750	0.073	0.073	0.073	0.073	0.073
31.000	0.072	0.072	0.072	0.072	0.072
31.250	0.072	0.071	0.071	0.071	0.071
31.500	0.071	0.070	0.070	0.070	0.070
31.750	0.070	0.070	0.069	0.069	0.069
32.000	0.069	0.069	0.068	0.068	0.068
32.250	0.068	0.068	0.068	0.067	0.067
32.500	0.067	0.067	0.067	0.067	0.066
32.750	0.066	0.066	0.066	0.066	0.065
33.000	0.065	0.065	0.065	0.065	0.065
33.250	0.064	0.064	0.064	0.064	0.064
33.500	0.063	0.063	0.063	0.063	0.063
33.750	0.063	0.062	0.062	0.062	0.062
34.000	0.062	0.062	0.061	0.061	0.061
34.250	0.061	0.061	0.061	0.060	0.060
34.500	0.060	0.060	0.060	0.060	0.059
34.750	0.059	0.059	0.059	0.059	0.059
35.000	0.058	0.058	0.058	0.058	0.058
35.250	0.058	0.057	0.057	0.057	0.057
35.500	0.057	0.057	0.056	0.056	0.056
35.750	0.056	0.056	0.056	0.055	0.055
36.000	0.055	0.055	0.055	0.055	0.054
36.250	0.054	0.054	0.054	0.054	0.054
36.500	0.053	0.053	0.053	0.053	0.053
36.750	0.053	0.053	0.052	0.052	0.052
37.000	0.052	0.052	0.052	0.051	0.051
37.250	0.051	0.051	0.051	0.051	0.050
37.500	0.050	0.050	0.050	0.050	0.050
37.750	0.050	0.049	0.049	0.049	0.049
38.000	0.049	0.049	0.048	0.048	0.048
38.250	0.048	0.048	0.048	0.048	0.047
38.500	0.047	0.047	0.047	0.047	0.047
38.750	0.047	0.046	0.046	0.046	0.046
39.000	0.046	0.046	0.045	0.045	0.045
39.250	0.045	0.045	0.045	0.045	0.044
39.500	0.044	0.044	0.044	0.044	0.044
39.750	0.044	0.043	0.043	0.043	0.043

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
40.000	0.043	0.043	0.043	0.042	0.042
40.250	0.042	0.042	0.042	0.042	0.042
40.500	0.041	0.041	0.041	0.041	0.041
40.750	0.041	0.041	0.040	0.040	0.040
41.000	0.040	0.040	0.040	0.040	0.039
41.250	0.039	0.039	0.039	0.039	0.039
41.500	0.039	0.039	0.038	0.038	0.038
41.750	0.038	0.038	0.038	0.038	0.037
42.000	0.037	0.037	0.037	0.037	0.037
42.250	0.037	0.037	0.036	0.036	0.036
42.500	0.036	0.036	0.036	0.036	0.035
42.750	0.035	0.035	0.035	0.035	0.035
43.000	0.035	0.035	0.034	0.034	0.034
43.250	0.034	0.034	0.034	0.034	0.034
43.500	0.033	0.033	0.033	0.033	0.033
43.750	0.033	0.033	0.033	0.032	0.032
44.000	0.032	0.032	0.032	0.032	0.032
44.250	0.032	0.031	0.031	0.031	0.031
44.500	0.031	0.031	0.031	0.031	0.030
44.750	0.030	0.030	0.030	0.030	0.030
45.000	0.030	0.030	0.030	0.029	0.029
45.250	0.029	0.029	0.029	0.029	0.029
45.500	0.029	0.028	0.028	0.028	0.028
45.750	0.028	0.028	0.028	0.028	0.028
46.000	0.027	0.027	0.027	0.027	0.027
46.250	0.027	0.027	0.027	0.027	0.026
46.500	0.026	0.026	0.026	0.026	0.026
46.750	0.026	0.026	0.026	0.026	0.025
47.000	0.025	0.025	0.025	0.025	0.025
47.250	0.025	0.025	0.025	0.024	0.024
47.500	0.024	0.024	0.024	0.024	0.024
47.750	0.024	0.024	0.024	0.023	0.023
48.000	0.023	0.023	0.023	0.023	0.023
48.250	0.023	0.023	0.023	0.022	0.022
48.500	0.022	0.022	0.022	0.022	0.022
48.750	0.022	0.022	0.022	0.022	0.021
49.000	0.021	0.021	0.021	0.021	0.021
49.250	0.021	0.021	0.021	0.021	0.021
49.500	0.020	0.020	0.020	0.020	0.020
49.750	0.020	0.020	0.020	0.020	0.020

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
50.000	0.020	0.019	0.019	0.019	0.019
50.250	0.019	0.019	0.019	0.019	0.019
50.500	0.019	0.019	0.018	0.018	0.018
50.750	0.018	0.018	0.018	0.018	0.018
51.000	0.018	0.018	0.018	0.018	0.017
51.250	0.017	0.017	0.017	0.017	0.017
51.500	0.017	0.017	0.017	0.017	0.017
51.750	0.017	0.017	0.016	0.016	0.016
52.000	0.016	0.016	0.016	0.016	0.016
52.250	0.016	0.016	0.016	0.016	0.016
52.500	0.015	0.015	0.015	0.015	0.015
52.750	0.015	0.015	0.015	0.015	0.015
53.000	0.015	0.015	0.015	0.014	0.014
53.250	0.014	0.014	0.014	0.014	0.014
53.500	0.014	0.014	0.014	0.014	0.014
53.750	0.014	0.014	0.013	0.013	0.013
54.000	0.013	0.013	0.013	0.013	0.013
54.250	0.013	0.013	0.013	0.013	0.013
54.500	0.013	0.013	0.012	0.012	0.012
54.750	0.012	0.012	0.012	0.012	0.012
55.000	0.012	0.012	0.012	0.012	0.012
55.250	0.012	0.012	0.012	0.011	0.011
55.500	0.011	0.011	0.011	0.011	0.011
55.750	0.011	0.011	0.011	0.011	0.011
56.000	0.011	0.011	0.011	0.011	0.011
56.250	0.010	0.010	0.010	0.010	0.010
56.500	0.010	0.010	0.010	0.010	0.010
56.750	0.010	0.010	0.010	0.010	0.010
57.000	0.010	0.010	0.010	0.009	0.009
57.250	0.009	0.009	0.009	0.009	0.009
57.500	0.009	0.009	0.009	0.009	0.009
57.750	0.009	0.009	0.009	0.009	0.009
58.000	0.009	0.009	0.008	0.008	0.008
58.250	0.008	0.008	0.008	0.008	0.008
58.500	0.008	0.008	0.008	0.008	0.008
58.750	0.008	0.008	0.008	0.008	0.008
59.000	0.008	0.008	0.008	0.008	0.007
59.250	0.007	0.007	0.007	0.007	0.007
59.500	0.007	0.007	0.007	0.007	0.007
59.750	0.007	0.007	0.007	0.007	0.007

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
60.000	0.007	0.007	0.007	0.007	0.007
60.250	0.007	0.007	0.007	0.007	0.006
60.500	0.006	0.006	0.006	0.006	0.006
60.750	0.006	0.006	0.006	0.006	0.006
61.000	0.006	0.006	0.006	0.006	0.006
61.250	0.006	0.006	0.006	0.006	0.006
61.500	0.006	0.006	0.006	0.006	0.006
61.750	0.006	0.006	0.006	0.005	0.005
62.000	0.005	0.005	0.005	0.005	0.005
62.250	0.005	0.005	0.005	0.005	0.005
62.500	0.005	0.005	0.005	0.005	0.005
62.750	0.005	0.005	0.005	0.005	0.005
63.000	0.005	0.005	0.005	0.005	0.005
63.250	0.005	0.005	0.005	0.005	0.005
63.500	0.005	0.005	0.005	0.004	0.004
63.750	0.004	0.004	0.004	0.004	0.004
64.000	0.004	0.004	0.004	0.004	0.004
64.250	0.004	0.004	0.004	0.004	0.004
64.500	0.004	0.004	0.004	0.004	0.004
64.750	0.004	0.004	0.004	0.004	0.004
65.000	0.004	0.004	0.004	0.004	0.004
65.250	0.004	0.004	0.004	0.004	0.004
65.500	0.004	0.004	0.004	0.004	0.004
65.750	0.004	0.004	0.004	0.003	0.003
66.000	0.003	0.003	0.003	0.003	0.003
66.250	0.003	0.003	0.003	0.003	0.003
66.500	0.003	0.003	0.003	0.003	0.003
66.750	0.003	0.003	0.003	0.003	0.003
67.000	0.003	0.003	0.003	0.003	0.003
67.250	0.003	0.003	0.003	0.003	0.003
67.500	0.003	0.003	0.003	0.003	0.003
67.750	0.003	0.003	0.003	0.003	0.003
68.000	0.003	0.003	0.003	0.003	0.003
68.250	0.003	0.003	0.003	0.003	0.003
68.500	0.003	0.003	0.003	0.003	0.003
68.750	0.003	0.003	0.002	0.002	0.002
69.000	0.002	0.002	0.002	0.002	0.002
69.250	0.002	0.002	0.002	0.002	0.002
69.500	0.002	0.002	0.002	0.002	0.002
69.750	0.002	0.002	0.002	0.002	0.002

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
70.000	0.002	0.002	0.002	0.002	0.002
70.250	0.002	0.002	0.002	0.002	0.002
70.500	0.002	0.002	0.002	0.002	0.002
70.750	0.002	0.002	0.002	0.002	0.002
71.000	0.002	0.002	0.002	0.002	0.002
71.250	0.002	0.002	0.002	0.002	0.002
71.500	0.002	0.002	0.002	0.002	0.002
71.750	0.002	0.002	0.002	0.002	0.002
72.000	0.002	(N/A)	(N/A)	(N/A)	(N/A)

Innerbelt

Subsection: Elevation-Area Volume Curve

Return Event: 0 years

Label: EB Detention

Storm Event: Type II 24-hr Water Quality Storm

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
577.00	0.0	0.102	0.000	0.000	0.000
578.00	0.0	0.128	0.345	0.115	0.115
579.00	0.0	0.156	0.426	0.142	0.257
579.01	0.0	0.187	0.514	0.002	0.259
580.00	0.0	0.241	0.640	0.211	0.470
581.00	0.0	0.283	0.785	0.262	0.732

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	577.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	581.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	R0	Forward	C0	578.00	581.00
Orifice-Circular	Orifice - 1	Forward	C0	577.00	581.00
Culvert-Circular	C0	Forward	TW	574.50	581.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data

Return Event: 0 years

Label: EB Detention WQB

Storm Event: Type II 24-hr Water Quality Storm

Structure ID: R0 Structure Type: Inlet Box	
Number of Openings	1
Elevation	578.00 ft
Orifice Area	2.6 ft²
Orifice Coefficient	0.660
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: C0 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	129.20 ft
Length (Computed Barrel)	129.20 ft
Slope (Computed)	0.002 ft/ft

Outlet Control Data	
Manning's n	0.015
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.159
T2 ratio (HW/D)	1.306
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	576.82 ft	T1 Flow	15.55 ft³/s
T2 Elevation	577.11 ft	T2 Flow	17.77 ft³/s

Innerbelt

Subsection: Outlet Input Data

Return Event: 0 years

Label: EB Detention WQB

Storm Event: Type II 24-hr Water Quality Storm

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	2
Elevation	577.00 ft
Orifice Diameter	1.0 in
Orifice Coefficient	0.660

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
577.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
577.10	0.00	0.00	0.00	574.56	0.00	0.00	(N/A)	0.00
577.20	0.00	0.00	0.00	574.58	0.00	0.00	(N/A)	0.00
577.30	0.00	0.00	0.00	574.59	0.00	0.00	(N/A)	0.00
577.40	0.00	0.00	0.00	574.60	0.00	0.00	(N/A)	0.00
577.50	0.00	0.00	0.00	574.61	0.00	0.00	(N/A)	0.00
577.60	0.00	0.00	0.00	574.61	0.00	0.00	(N/A)	0.00
577.70	0.00	0.00	0.00	574.61	0.00	0.00	(N/A)	0.00
577.80	0.00	0.00	0.00	574.62	0.00	0.00	(N/A)	0.00
577.90	0.00	0.00	0.00	574.62	0.00	0.00	(N/A)	0.00
578.00	0.00	0.00	0.00	574.63	0.00	0.00	(N/A)	0.00
578.10	0.62	578.10	Free Outfall	574.93	0.00	0.00	(N/A)	0.00
578.20	1.74	578.20	Free Outfall	575.21	0.00	0.00	(N/A)	0.00
578.30	3.20	578.30	Free Outfall	575.48	0.00	0.00	(N/A)	0.00
578.40	4.93	578.40	Free Outfall	575.74	0.00	0.00	(N/A)	0.00
578.50	6.89	578.50	Free Outfall	576.00	0.00	0.00	(N/A)	0.00
578.60	9.06	578.60	Free Outfall	576.27	0.00	0.00	(N/A)	0.00
578.70	11.42	578.70	Free Outfall	576.56	0.00	0.00	(N/A)	0.00
578.80	12.31	578.80	Free Outfall	576.67	0.00	0.00	(N/A)	0.00
578.90	13.06	578.90	Free Outfall	576.78	0.00	0.00	(N/A)	0.00
579.00	13.77	579.00	Free Outfall	576.89	0.00	0.00	(N/A)	0.00
579.10	14.44	579.10	Free Outfall	577.00	0.00	0.00	(N/A)	0.00
579.20	15.08	579.20	Free Outfall	577.14	0.00	0.00	(N/A)	0.00
579.30	15.69	579.30	Free Outfall	577.27	0.00	0.00	(N/A)	0.00
579.40	16.29	579.40	Free Outfall	577.40	0.00	0.00	(N/A)	0.00
579.50	16.86	579.50	Free Outfall	577.53	0.00	0.00	(N/A)	0.00
579.60	17.41	579.60	Free Outfall	577.66	0.00	0.00	(N/A)	0.00
579.70	17.95	579.70	Free Outfall	577.79	0.00	0.00	(N/A)	0.00
579.80	18.47	579.80	Free Outfall	577.91	0.00	0.00	(N/A)	0.00
579.90	18.97	579.90	578.03	578.03	0.00	0.00	(N/A)	0.00
580.00	19.47	580.00	578.15	578.15	0.00	0.00	(N/A)	0.00
580.10	19.95	580.10	578.28	578.28	0.00	0.00	(N/A)	0.00
580.20	20.42	580.20	578.40	578.40	0.00	0.00	(N/A)	0.00
580.30	20.88	580.30	578.52	578.52	0.00	0.00	(N/A)	0.00
580.40	21.33	580.40	578.63	578.63	0.00	0.00	(N/A)	0.00

Innerbelt

Subsection: Individual Outlet Curves

Label: EB Detention WQB

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
580.50	21.76	580.50	578.75	578.75	0.00	0.00	(N/A)	0.00
580.60	22.20	580.60	578.87	578.87	0.00	0.00	(N/A)	0.00
580.70	22.62	580.70	578.99	578.99	0.00	0.00	(N/A)	0.00
580.80	23.03	580.80	579.10	579.10	0.00	0.00	(N/A)	0.00
580.90	23.44	580.90	579.21	579.21	0.00	0.00	(N/A)	0.00
581.00	23.84	581.00	579.33	579.33	0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.1ft
Weir: H =0.2ft
Weir: H =0.3ft
Weir: H =0.4ft
Weir: H =0.5ft
Weir: H =0.6ft
Weir: H =0.7ft
Orifice: H =.80; Riser orifice equation controlling.
Orifice: H =.90; Riser orifice equation controlling.
Orifice: H =1.00; Riser orifice equation controlling.
Orifice: H =1.10; Riser orifice equation controlling.
Orifice: H =1.20; Riser orifice equation controlling.

Subsection: Individual Outlet Curves

Label: EB Detention WQB

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Message
Orifice: H =1.30; Riser orifice equation controlling.
Orifice: H =1.40; Riser orifice equation controlling.
Orifice: H =1.50; Riser orifice equation controlling.
Orifice: H =1.60; Riser orifice equation controlling.
Orifice: H =1.70; Riser orifice equation controlling.
Orifice: H =1.80; Riser orifice equation controlling.
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.90
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.00
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.10
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.20
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.30
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.40
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.50
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.60
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.70
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.80
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.90
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=3.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
577.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
577.10	0.01	574.56	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.20	0.02	574.58	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.30	0.03	574.59	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.40	0.03	574.60	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.50	0.04	574.61	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.60	0.04	574.61	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.70	0.05	574.61	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.80	0.05	574.62	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.90	0.05	574.62	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.00	0.06	574.63	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.10	0.68	574.93	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.20	1.81	575.21	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.30	3.27	575.48	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.40	5.00	575.74	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.50	6.96	576.00	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.60	9.14	576.27	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.70	11.49	576.56	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.80	12.38	576.67	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
578.90	13.13	576.78	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.00	13.83	576.89	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.10	14.51	577.00	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.20	15.15	577.14	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.30	15.76	577.27	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.40	16.36	577.40	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.50	16.93	577.53	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.60	17.48	577.66	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.70	18.02	577.79	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.80	18.54	577.91	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.90	19.03	578.03	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.00	19.53	578.15	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.10	20.02	578.28	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
580.20	20.49	578.40	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
580.30	20.94	578.52	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
580.40	21.38	578.63	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.50	21.82	578.75	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.60	22.26	578.87	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
580.70	22.67	578.99	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.80	23.09	579.10	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.90	23.49	579.21	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
581.00	23.90	579.33	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00

Message
WS below an invert; no flow.
BACKWATER CONTROL.. Vh= .005ft hwDi= .057ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .006ft hwDi= .071ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .007ft hwDi= .081ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .008ft hwDi= .087ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .009ft hwDi= .092ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .010ft hwDi= .096ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .010ft hwDi= .099ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .010ft hwDi= .104ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .011ft hwDi= .107ft Lbw= 129.2ft Hev= .00ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
BACKWATER CONTROL.. Vh= .011ft hwDi= .110ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .049ft hwDi= .357ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .088ft hwDi= .582ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .124ft hwDi= .792ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .158ft hwDi= 1.000ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .191ft hwDi= 1.209ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .225ft hwDi= 1.429ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .262ft hwDi= 1.665ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .278ft hwDi= 1.758ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .293ft hwDi= 1.840ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .309ft hwDi= 1.920ft Lbw= 129.2ft Hev= .00ft
FULL FLOW...Lfull=2.08ft Vh=.332ft HL=.509ft Hev= .00ft
FULL FLOW...Lfull=27.76ft Vh=.361ft HL=.708ft Hev= .00ft
FULL FLOW...Lfull=46.35ft Vh=.391ft HL=.887ft Hev= .00ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
FULL FLOW...Lfull=60.39ft Vh=.421ft HL=1.052ft Hev= .00ft
FULL FLOW...Lfull=71.35ft Vh=.451ft HL=1.209ft Hev= .00ft
FULL FLOW...Lfull=80.00ft Vh=.481ft HL=1.358ft Hev= .00ft
FULL FLOW...Lfull=87.04ft Vh=.511ft HL=1.502ft Hev= .00ft
FULL FLOW...Lfull=92.72ft Vh=.541ft HL=1.641ft Hev= .00ft
FULL FLOW...Lfull=97.41ft Vh=.571ft HL=1.774ft Hev= .00ft
FULL FLOW...Lfull=101.26ft Vh=.600ft HL=1.905ft Hev= .00ft
FULL FLOW...Lfull=104.71ft Vh=.631ft HL=2.038ft Hev= .00ft
FULL FLOW...Lfull=107.65ft Vh=.661ft HL=2.167ft Hev= .00ft
FULL FLOW...Lfull=109.85ft Vh=.690ft HL=2.288ft Hev= .00ft
FULL FLOW...Lfull=111.95ft Vh=.720ft HL=2.412ft Hev= .00ft
FULL FLOW...Lfull=113.79ft Vh=.750ft HL=2.534ft Hev= .00ft
FULL FLOW...Lfull=115.47ft Vh=.780ft HL=2.660ft Hev= .00ft
FULL FLOW...Lfull=116.83ft Vh=.810ft HL=2.777ft Hev= .00ft
FULL FLOW...Lfull=118.10ft Vh=.839ft HL=2.897ft Hev= .00ft
FULL FLOW...Lfull=118.47ft Vh=.869ft HL=3.005ft Hev= .00ft
FULL FLOW...Lfull=119.47ft Vh=.899ft HL=3.124ft Hev= .00ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
577.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
577.10	0.01	577.10	Free Outfall	574.56	0.00	0.00	(N/A)	0.00
577.20	0.02	577.20	Free Outfall	574.58	0.00	0.00	(N/A)	0.00
577.30	0.03	577.30	Free Outfall	574.59	0.00	0.00	(N/A)	0.00
577.40	0.03	577.40	Free Outfall	574.60	0.00	0.00	(N/A)	0.00
577.50	0.04	577.50	Free Outfall	574.61	0.00	0.00	(N/A)	0.00
577.60	0.04	577.60	Free Outfall	574.61	0.00	0.00	(N/A)	0.00
577.70	0.05	577.70	Free Outfall	574.61	0.00	0.00	(N/A)	0.00
577.80	0.05	577.80	Free Outfall	574.62	0.00	0.00	(N/A)	0.00
577.90	0.05	577.90	Free Outfall	574.62	0.00	0.00	(N/A)	0.00
578.00	0.06	578.00	Free Outfall	574.63	0.00	0.00	(N/A)	0.00
578.10	0.06	578.10	Free Outfall	574.93	0.00	0.00	(N/A)	0.00
578.20	0.06	578.20	Free Outfall	575.21	0.00	0.00	(N/A)	0.00
578.30	0.06	578.30	Free Outfall	575.48	0.00	0.00	(N/A)	0.00
578.40	0.07	578.40	Free Outfall	575.74	0.00	0.00	(N/A)	0.00
578.50	0.07	578.50	Free Outfall	576.00	0.00	0.00	(N/A)	0.00
578.60	0.07	578.60	Free Outfall	576.27	0.00	0.00	(N/A)	0.00
578.70	0.07	578.70	Free Outfall	576.56	0.00	0.00	(N/A)	0.00
578.80	0.08	578.80	Free Outfall	576.67	0.00	0.00	(N/A)	0.00
578.90	0.08	578.90	Free Outfall	576.78	0.00	0.00	(N/A)	0.00
579.00	0.08	579.00	Free Outfall	576.89	0.00	0.00	(N/A)	0.00
579.10	0.08	579.10	577.00	577.00	0.00	0.00	(N/A)	0.00
579.20	0.08	579.20	577.14	577.14	0.00	0.00	(N/A)	0.00
579.30	0.08	579.30	577.27	577.27	0.00	0.00	(N/A)	0.00
579.40	0.08	579.40	577.40	577.40	0.00	0.00	(N/A)	0.00
579.50	0.08	579.50	577.53	577.53	0.00	0.00	(N/A)	0.00
579.60	0.08	579.60	577.66	577.66	0.00	0.00	(N/A)	0.00
579.70	0.08	579.70	577.79	577.79	0.00	0.00	(N/A)	0.00
579.80	0.08	579.80	577.91	577.91	0.00	0.00	(N/A)	0.00
579.90	0.08	579.90	578.03	578.03	0.00	0.00	(N/A)	0.00
580.00	0.08	580.00	578.15	578.15	0.00	0.00	(N/A)	0.00
580.10	0.08	580.10	578.28	578.28	0.00	0.00	(N/A)	0.00
580.20	0.08	580.20	578.40	578.40	0.00	0.00	(N/A)	0.00
580.30	0.08	580.30	578.52	578.52	0.00	0.00	(N/A)	0.00
580.40	0.08	580.40	578.63	578.63	0.00	0.00	(N/A)	0.00

Subsection: Individual Outlet Curves

Label: EB Detention WQB

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
580.50	0.08	580.50	578.75	578.75	0.00	0.00	(N/A)	0.00
580.60	0.08	580.60	578.87	578.87	0.00	0.00	(N/A)	0.00
580.70	0.08	580.70	578.99	578.99	0.00	0.00	(N/A)	0.00
580.80	0.08	580.80	579.10	579.10	0.00	0.00	(N/A)	0.00
580.90	0.08	580.90	579.21	579.21	0.00	0.00	(N/A)	0.00
581.00	0.07	581.00	579.33	579.33	0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
H =.06
H =.16
H =.26
H =.36
H =.46
H =.56
H =.66
H =.76
H =.86
H =.96
H =1.06
H =1.16
H =1.26
H =1.36
H =1.46
H =1.56
H =1.66
H =1.76
H =1.86
H =1.96
H =2.06
H =2.06
H =2.03
H =2.00
H =1.97
H =1.94

Subsection: Individual Outlet Curves

Label: EB Detention WQB

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Message
H =1.91
H =1.89
H =1.87
H =1.85
H =1.82
H =1.80
H =1.79
H =1.77
H =1.75
H =1.73
H =1.71
H =1.70
H =1.69
H =1.67

Innerbelt

Subsection: Composite Rating Curve

Label: EB Detention WQB

Return Event: 0 years

Storm Event: Type II 24-hr Water Quality Storm

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
577.00	0.00	(N/A)	0.00
577.10	0.01	(N/A)	0.00
577.20	0.02	(N/A)	0.00
577.30	0.03	(N/A)	0.00
577.40	0.03	(N/A)	0.00
577.50	0.04	(N/A)	0.00
577.60	0.04	(N/A)	0.00
577.70	0.05	(N/A)	0.00
577.80	0.05	(N/A)	0.00
577.90	0.05	(N/A)	0.00
578.00	0.06	(N/A)	0.00
578.10	0.68	(N/A)	0.00
578.20	1.81	(N/A)	0.00
578.30	3.27	(N/A)	0.00
578.40	5.00	(N/A)	0.00
578.50	6.96	(N/A)	0.00
578.60	9.14	(N/A)	0.00
578.70	11.49	(N/A)	0.00
578.80	12.38	(N/A)	0.00
578.90	13.13	(N/A)	0.00
579.00	13.83	(N/A)	0.00
579.10	14.51	(N/A)	0.00
579.20	15.15	(N/A)	0.00
579.30	15.76	(N/A)	0.00
579.40	16.36	(N/A)	0.00
579.50	16.93	(N/A)	0.00
579.60	17.48	(N/A)	0.00
579.70	18.02	(N/A)	0.00
579.80	18.54	(N/A)	0.00
579.90	19.03	(N/A)	0.00
580.00	19.53	(N/A)	0.00
580.10	20.02	(N/A)	0.00
580.20	20.49	(N/A)	0.00
580.30	20.94	(N/A)	0.00
580.40	21.38	(N/A)	0.00
580.50	21.82	(N/A)	0.00
580.60	22.26	(N/A)	0.00
580.70	22.67	(N/A)	0.00
580.80	23.09	(N/A)	0.00
580.90	23.49	(N/A)	0.00
581.00	23.90	(N/A)	0.00

Innerbelt

Subsection: Composite Rating Curve | Return Event: 0 years

Label: EB Detention WQB | Storm Event: Type II 24-hr Water Quality Storm

Composite Outflow Summary

Contributing Structures
(no Q: R0,Orifice - 1,C0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0

Index

East Bank Basin B Water Quality Calculations

	Made By:	AReede	Date:	12/2/2011
	Checked By:	BHess	Date:	12/2/2011

Water Quality:	WQv= (PAC)/12		From ODOT L&D2 1115.4		
	Precipitation	0.75	in		
	A - Drainage Area	2.29	acres		
	Cq	0.9	when drainage area is impervious		
Water Quality Volume	WQv =	0.1288	ac*ft		
Extended Detention Volume (EDV) =	120%*WQV	0.1546	ac*ft		
Required Forebay Volume (RFV)	10% of WQv	0.0129	ac*ft		
Actual WQv Released	EDV - RFV	0.1417	ac*ft		
Provided Forebay Volume (assuming trapezoidal configuration)	Bottom of Basin Elevation	578	Top of Berm Elevation	578.8	
	Area of bottom of Forebay (ac)	0.0185	Area of Top of Forebay (ac)	0.0282	
	Provided Forebay Volume	0.0185	ac*ft		
	Forebay % of Basin	12.00	%		
	Check for WQv provided	OK			

Drainage Time			
	16 hour WQ flow (see enclosed spreadsheet)	5.65	ft^3/s
16 hour check	16 hour volume	1017	ft^3
	50% of WQv (not to exceed)	3367	ft^3
	Check for 16 hour compliance	OK	
48 hour check	48 hour WQ flow (see enclosed spreadsheet)	33	
	48 hour volume	5978	
	100% of WQv (not to exceed)	6733	
	Check for 48 hour compliance	OK	

Emergency Spillway Calculation	Weir Equation	Q=3.367BH^3/2	
	Q10	8.48	cfs
	B (Weir length)	9	ft
	H=	0.43	ft
	Top of Embankment	583	
	Invert of Emergency Spillway	582.4	
	Available Depth	0.6	
	Check for emergency spillway depth	OK	

Anti-Seep Collar	From ODOT L&D 2 1117.4.1.2		
	Y- Depth of water at spillway crest,	1.52	ft
	Z-slope of upstream face of embankment	4	
	S-slope of outfall pipe	0.0025	
	Length of Saturation Seepage length	12.3	ft
	increase	1.8	ft
	W-Width of Collar	7	
	D - Diameter of Conduit	2	
	P - Projection of Collar (P=W-D)	5	
	# of collars	0	
	Minimum 2 collars at minimum spacing 10'.		

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Element Details			
ID	69	End	48.000 hours
Label	Minimum Drain Time - 1	Pond Node	EB Detention
Start	0.000 hours	Outlet Structure	EB Detention WQB
Increment	1.000 hours		

Notes

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: User Notifications

Label: Minimum Drain Time - 1

User Notifications

Message Id	15
Scenario	WQ storm
Element Type	Composite Outlet Structure
Element Id	39
Label	EB Detention WQB
Time	(N/A)
Message	Kr (reverse flow entrance loss coefficient) was not specified. Kr was set to same value as Ke= 0.500 .
Source	Warning
Message Id	67
Scenario	WQ storm
Element Type	Composite Outlet Structure
Element Id	39
Label	EB Detention WQB
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure EB Detention WQB. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	17
Scenario	WQ storm
Element Type	Composite Outlet Structure
Element Id	39
Label	EB Detention WQB
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Elevation

Label: Minimum Drain Time - 1 (OUT)

Time vs. Elevation (ft)

Output Time increment = 3,600.000 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	578.00	577.96	577.93	577.89	577.86
5.000	577.82	577.79	577.76	577.72	577.69
10.000	577.66	577.63	577.60	577.57	577.54
15.000	577.51	577.48	577.46	577.43	577.40
20.000	577.38	577.35	577.33	577.31	577.28
25.000	577.26	577.24	577.22	577.21	577.19
30.000	577.17	577.16	577.14	577.13	577.12
35.000	577.11	577.09	577.08	577.08	577.07
40.000	577.06	577.05	577.05	577.04	577.04
45.000	577.03	577.03	577.03	577.02	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Volume

Label: Minimum Drain Time - 1 (OUT)

Time vs. Elevation (ft)

Output Time increment = 3,600.000 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	578.00	577.96	577.93	577.89	577.86
5.000	577.82	577.79	577.76	577.72	577.69
10.000	577.66	577.63	577.60	577.57	577.54
15.000	577.51	577.48	577.46	577.43	577.40
20.000	577.38	577.35	577.33	577.31	577.28
25.000	577.26	577.24	577.22	577.21	577.19
30.000	577.17	577.16	577.14	577.13	577.12
35.000	577.11	577.09	577.08	577.08	577.07
40.000	577.06	577.05	577.05	577.04	577.04
45.000	577.03	577.03	577.03	577.02	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Area Volume Curve

Label: EB Detention

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
577.00	0.0	0.102	0.000	0.000	0.000
578.00	0.0	0.128	0.345	0.115	0.115
579.00	0.0	0.156	0.426	0.142	0.257
579.01	0.0	0.187	0.514	0.002	0.259
580.00	0.0	0.241	0.640	0.211	0.470
581.00	0.0	0.283	0.785	0.262	0.732

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: EB Detention WQB

Requested Pond Water Surface Elevations	
Minimum (Headwater)	577.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	581.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	R0	Forward	C0	578.00	581.00
Orifice-Circular	Orifice - 1	Forward	C0	577.00	581.00
Culvert-Circular	C0	Forward	TW	574.50	581.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: EB Detention WQB

Structure ID: R0 Structure Type: Inlet Box	
Number of Openings	1
Elevation	578.00 ft
Orifice Area	2.6 ft²
Orifice Coefficient	0.660
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: EB Detention WQB

Structure ID: C0 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	129.20 ft
Length (Computed Barrel)	129.20 ft
Slope (Computed)	0.002 ft/ft

Outlet Control Data	
Manning's n	0.015
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.159
T2 ratio (HW/D)	1.306
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	576.82 ft	T1 Flow	15.55 ft³/s
T2 Elevation	577.11 ft	T2 Flow	17.77 ft³/s

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: EB Detention WQB

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	2
Elevation	577.00 ft
Orifice Diameter	1.0 in
Orifice Coefficient	0.660

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
577.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
577.10	0.00	0.00	0.00	574.56	0.00	0.00	(N/A)	0.00
577.20	0.00	0.00	0.00	574.58	0.00	0.00	(N/A)	0.00
577.30	0.00	0.00	0.00	574.59	0.00	0.00	(N/A)	0.00
577.40	0.00	0.00	0.00	574.60	0.00	0.00	(N/A)	0.00
577.50	0.00	0.00	0.00	574.61	0.00	0.00	(N/A)	0.00
577.60	0.00	0.00	0.00	574.61	0.00	0.00	(N/A)	0.00
577.70	0.00	0.00	0.00	574.61	0.00	0.00	(N/A)	0.00
577.80	0.00	0.00	0.00	574.62	0.00	0.00	(N/A)	0.00
577.90	0.00	0.00	0.00	574.62	0.00	0.00	(N/A)	0.00
578.00	0.00	0.00	0.00	574.63	0.00	0.00	(N/A)	0.00
578.10	0.62	578.10	Free Outfall	574.93	0.00	0.00	(N/A)	0.00
578.20	1.74	578.20	Free Outfall	575.21	0.00	0.00	(N/A)	0.00
578.30	3.20	578.30	Free Outfall	575.48	0.00	0.00	(N/A)	0.00
578.40	4.93	578.40	Free Outfall	575.74	0.00	0.00	(N/A)	0.00
578.50	6.89	578.50	Free Outfall	576.00	0.00	0.00	(N/A)	0.00
578.60	9.06	578.60	Free Outfall	576.27	0.00	0.00	(N/A)	0.00
578.70	11.42	578.70	Free Outfall	576.56	0.00	0.00	(N/A)	0.00
578.80	12.31	578.80	Free Outfall	576.67	0.00	0.00	(N/A)	0.00
578.90	13.06	578.90	Free Outfall	576.78	0.00	0.00	(N/A)	0.00
579.00	13.77	579.00	Free Outfall	576.89	0.00	0.00	(N/A)	0.00
579.10	14.44	579.10	Free Outfall	577.00	0.00	0.00	(N/A)	0.00
579.20	15.08	579.20	Free Outfall	577.14	0.00	0.00	(N/A)	0.00
579.30	15.69	579.30	Free Outfall	577.27	0.00	0.00	(N/A)	0.00
579.40	16.29	579.40	Free Outfall	577.40	0.00	0.00	(N/A)	0.00
579.50	16.86	579.50	Free Outfall	577.53	0.00	0.00	(N/A)	0.00
579.60	17.41	579.60	Free Outfall	577.66	0.00	0.00	(N/A)	0.00
579.70	17.95	579.70	Free Outfall	577.79	0.00	0.00	(N/A)	0.00
579.80	18.47	579.80	Free Outfall	577.91	0.00	0.00	(N/A)	0.00
579.90	18.97	579.90	578.03	578.03	0.00	0.00	(N/A)	0.00
580.00	19.47	580.00	578.15	578.15	0.00	0.00	(N/A)	0.00
580.10	19.95	580.10	578.28	578.28	0.00	0.00	(N/A)	0.00
580.20	20.42	580.20	578.40	578.40	0.00	0.00	(N/A)	0.00
580.30	20.88	580.30	578.52	578.52	0.00	0.00	(N/A)	0.00
580.40	21.33	580.40	578.63	578.63	0.00	0.00	(N/A)	0.00
580.50	21.76	580.50	578.75	578.75	0.00	0.00	(N/A)	0.00

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
580.60	22.20	580.60	578.87	578.87	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
580.70	22.62	580.70	578.99	578.99	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
580.80	23.03	580.80	579.10	579.10	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
580.90	23.44	580.90	579.21	579.21	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
581.00	23.84	581.00	579.33	579.33	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
									WS below an invert; no flow.
									WS below an invert; no flow.
									WS below an invert; no flow.
									WS below an invert; no flow.
									WS below an invert; no flow.
									WS below an invert; no flow.
									WS below an invert; no flow.
									WS below an invert; no flow.
									Weir: H =0.1ft
									Weir: H =0.2ft
									Weir: H =0.3ft
									Weir: H =0.4ft
									Weir: H =0.5ft
									Weir: H =0.6ft
									Weir: H =0.7ft
									Orifice: H =.80; Riser orifice equation controlling.
									Orifice: H =.90; Riser orifice equation controlling.
									Orifice: H =1.00; Riser orifice equation controlling.
									Orifice: H =1.10; Riser orifice equation controlling.
									Orifice: H =1.20; Riser orifice equation controlling.
									Orifice: H =1.30; Riser orifice equation controlling.

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = R0 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Message
Orifice: H =1.40; Riser orifice equation controlling.
Orifice: H =1.50; Riser orifice equation controlling.
Orifice: H =1.60; Riser orifice equation controlling.
Orifice: H =1.70; Riser orifice equation controlling.
Orifice: H =1.80; Riser orifice equation controlling.
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.90
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.00
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.10
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.20
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.30
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.40
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.50
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.60
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.70
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.80
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.90
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=3.00

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
577.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
577.10	0.01	574.56	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.20	0.02	574.58	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.30	0.03	574.59	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.40	0.03	574.60	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.50	0.04	574.61	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.60	0.04	574.61	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.70	0.05	574.61	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.80	0.05	574.62	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
577.90	0.05	574.62	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.00	0.06	574.63	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.10	0.68	574.93	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.20	1.81	575.21	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.30	3.27	575.48	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.40	5.00	575.74	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.50	6.96	576.00	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.60	9.14	576.27	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.70	11.49	576.56	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
578.80	12.38	576.67	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
578.90	13.13	576.78	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.00	13.83	576.89	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.10	14.51	577.00	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.20	15.15	577.14	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.30	15.76	577.27	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.40	16.36	577.40	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.50	16.93	577.53	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.60	17.48	577.66	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.70	18.02	577.79	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.80	18.54	577.91	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
579.90	19.03	578.03	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.00	19.53	578.15	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.10	20.02	578.28	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
580.20	20.49	578.40	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
580.30	20.94	578.52	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.40	21.38	578.63	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
580.50	21.82	578.75	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.60	22.26	578.87	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
580.70	22.67	578.99	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.80	23.09	579.10	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
580.90	23.49	579.21	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
581.00	23.90	579.33	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00

Message
WS below an invert; no flow.
BACKWATER CONTROL.. Vh= .005ft hwDi= .057ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .006ft hwDi= .071ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .007ft hwDi= .081ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .008ft hwDi= .087ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .009ft hwDi= .092ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .010ft hwDi= .096ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .010ft hwDi= .099ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .010ft hwDi= .104ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .011ft hwDi= .107ft Lbw= 129.2ft Hev= .00ft

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves

Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
BACKWATER CONTROL.. Vh= .011ft hwDi= .110ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .049ft hwDi= .357ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .088ft hwDi= .582ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .124ft hwDi= .792ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .158ft hwDi= 1.000ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .191ft hwDi= 1.209ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .225ft hwDi= 1.429ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .262ft hwDi= 1.665ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .278ft hwDi= 1.758ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .293ft hwDi= 1.840ft Lbw= 129.2ft Hev= .00ft
BACKWATER CONTROL.. Vh= .309ft hwDi= 1.920ft Lbw= 129.2ft Hev= .00ft
FULL FLOW...Lfull=2.08ft Vh=.332ft HL=.509ft Hev= .00ft
FULL FLOW...Lfull=27.76ft Vh=.361ft HL=.708ft Hev= .00ft
FULL FLOW...Lfull=46.35ft Vh=.391ft HL=.887ft Hev= .00ft
FULL FLOW...Lfull=60.39ft Vh=.421ft HL=1.052ft Hev= .00ft

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 10.50 ft³/s
Upstream ID = R0, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
FULL FLOW...Lfull=71.35ft Vh=.451ft HL=1.209ft Hev= .00ft
FULL FLOW...Lfull=80.00ft Vh=.481ft HL=1.358ft Hev= .00ft
FULL FLOW...Lfull=87.04ft Vh=.511ft HL=1.502ft Hev= .00ft
FULL FLOW...Lfull=92.72ft Vh=.541ft HL=1.641ft Hev= .00ft
FULL FLOW...Lfull=97.41ft Vh=.571ft HL=1.774ft Hev= .00ft
FULL FLOW...Lfull=101.26ft Vh=.600ft HL=1.905ft Hev= .00ft
FULL FLOW...Lfull=104.71ft Vh=.631ft HL=2.038ft Hev= .00ft
FULL FLOW...Lfull=107.65ft Vh=.661ft HL=2.167ft Hev= .00ft
FULL FLOW...Lfull=109.85ft Vh=.690ft HL=2.288ft Hev= .00ft
FULL FLOW...Lfull=111.95ft Vh=.720ft HL=2.412ft Hev= .00ft
FULL FLOW...Lfull=113.79ft Vh=.750ft HL=2.534ft Hev= .00ft
FULL FLOW...Lfull=115.47ft Vh=.780ft HL=2.660ft Hev= .00ft
FULL FLOW...Lfull=116.83ft Vh=.810ft HL=2.777ft Hev= .00ft
FULL FLOW...Lfull=118.10ft Vh=.839ft HL=2.897ft Hev= .00ft
FULL FLOW...Lfull=118.47ft Vh=.869ft HL=3.005ft Hev= .00ft
FULL FLOW...Lfull=119.47ft Vh=.899ft HL=3.124ft Hev= .00ft

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
577.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
577.10	0.01	577.10	Free Outfall	574.56	0.00	0.00	(N/A)	0.00
577.20	0.02	577.20	Free Outfall	574.58	0.00	0.00	(N/A)	0.00
577.30	0.03	577.30	Free Outfall	574.59	0.00	0.00	(N/A)	0.00
577.40	0.03	577.40	Free Outfall	574.60	0.00	0.00	(N/A)	0.00
577.50	0.04	577.50	Free Outfall	574.61	0.00	0.00	(N/A)	0.00
577.60	0.04	577.60	Free Outfall	574.61	0.00	0.00	(N/A)	0.00
577.70	0.05	577.70	Free Outfall	574.61	0.00	0.00	(N/A)	0.00
577.80	0.05	577.80	Free Outfall	574.62	0.00	0.00	(N/A)	0.00
577.90	0.05	577.90	Free Outfall	574.62	0.00	0.00	(N/A)	0.00
578.00	0.06	578.00	Free Outfall	574.63	0.00	0.00	(N/A)	0.00
578.10	0.06	578.10	Free Outfall	574.93	0.00	0.00	(N/A)	0.00
578.20	0.06	578.20	Free Outfall	575.21	0.00	0.00	(N/A)	0.00
578.30	0.06	578.30	Free Outfall	575.48	0.00	0.00	(N/A)	0.00
578.40	0.07	578.40	Free Outfall	575.74	0.00	0.00	(N/A)	0.00
578.50	0.07	578.50	Free Outfall	576.00	0.00	0.00	(N/A)	0.00
578.60	0.07	578.60	Free Outfall	576.27	0.00	0.00	(N/A)	0.00
578.70	0.07	578.70	Free Outfall	576.56	0.00	0.00	(N/A)	0.00
578.80	0.08	578.80	Free Outfall	576.67	0.00	0.00	(N/A)	0.00
578.90	0.08	578.90	Free Outfall	576.78	0.00	0.00	(N/A)	0.00
579.00	0.08	579.00	Free Outfall	576.89	0.00	0.00	(N/A)	0.00
579.10	0.08	579.10	577.00	577.00	0.00	0.00	(N/A)	0.00
579.20	0.08	579.20	577.14	577.14	0.00	0.00	(N/A)	0.00
579.30	0.08	579.30	577.27	577.27	0.00	0.00	(N/A)	0.00
579.40	0.08	579.40	577.40	577.40	0.00	0.00	(N/A)	0.00
579.50	0.08	579.50	577.53	577.53	0.00	0.00	(N/A)	0.00
579.60	0.08	579.60	577.66	577.66	0.00	0.00	(N/A)	0.00
579.70	0.08	579.70	577.79	577.79	0.00	0.00	(N/A)	0.00
579.80	0.08	579.80	577.91	577.91	0.00	0.00	(N/A)	0.00
579.90	0.08	579.90	578.03	578.03	0.00	0.00	(N/A)	0.00
580.00	0.08	580.00	578.15	578.15	0.00	0.00	(N/A)	0.00
580.10	0.08	580.10	578.28	578.28	0.00	0.00	(N/A)	0.00
580.20	0.08	580.20	578.40	578.40	0.00	0.00	(N/A)	0.00
580.30	0.08	580.30	578.52	578.52	0.00	0.00	(N/A)	0.00
580.40	0.08	580.40	578.63	578.63	0.00	0.00	(N/A)	0.00
580.50	0.08	580.50	578.75	578.75	0.00	0.00	(N/A)	0.00

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
580.60	0.08	580.60	578.87	578.87	0.00	0.00	(N/A)	0.00
580.70	0.08	580.70	578.99	578.99	0.00	0.00	(N/A)	0.00
580.80	0.08	580.80	579.10	579.10	0.00	0.00	(N/A)	0.00
580.90	0.08	580.90	579.21	579.21	0.00	0.00	(N/A)	0.00
581.00	0.07	581.00	579.33	579.33	0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
H =.06
H =.16
H =.26
H =.36
H =.46
H =.56
H =.66
H =.76
H =.86
H =.96
H =1.06
H =1.16
H =1.26
H =1.36
H =1.46
H =1.56
H =1.66
H =1.76
H =1.86
H =1.96
H =2.06
H =2.06
H =2.03
H =2.00
H =1.97
H =1.94
H =1.91
H =1.89

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: EB Detention WQB

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = C0 (Culvert-Circular)

Message
H =1.87
H =1.85
H =1.82
H =1.80
H =1.79
H =1.77
H =1.75
H =1.73
H =1.71
H =1.70
H =1.69
H =1.67

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Composite Rating Curve

Label: EB Detention WQB

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
577.00	0.00	(N/A)	0.00
577.10	0.01	(N/A)	0.00
577.20	0.02	(N/A)	0.00
577.30	0.03	(N/A)	0.00
577.40	0.03	(N/A)	0.00
577.50	0.04	(N/A)	0.00
577.60	0.04	(N/A)	0.00
577.70	0.05	(N/A)	0.00
577.80	0.05	(N/A)	0.00
577.90	0.05	(N/A)	0.00
578.00	0.06	(N/A)	0.00
578.10	0.68	(N/A)	0.00
578.20	1.81	(N/A)	0.00
578.30	3.27	(N/A)	0.00
578.40	5.00	(N/A)	0.00
578.50	6.96	(N/A)	0.00
578.60	9.14	(N/A)	0.00
578.70	11.49	(N/A)	0.00
578.80	12.38	(N/A)	0.00
578.90	13.13	(N/A)	0.00
579.00	13.83	(N/A)	0.00
579.10	14.51	(N/A)	0.00
579.20	15.15	(N/A)	0.00
579.30	15.76	(N/A)	0.00
579.40	16.36	(N/A)	0.00
579.50	16.93	(N/A)	0.00
579.60	17.48	(N/A)	0.00
579.70	18.02	(N/A)	0.00
579.80	18.54	(N/A)	0.00
579.90	19.03	(N/A)	0.00
580.00	19.53	(N/A)	0.00
580.10	20.02	(N/A)	0.00
580.20	20.49	(N/A)	0.00
580.30	20.94	(N/A)	0.00
580.40	21.38	(N/A)	0.00
580.50	21.82	(N/A)	0.00
580.60	22.26	(N/A)	0.00
580.70	22.67	(N/A)	0.00
580.80	23.09	(N/A)	0.00
580.90	23.49	(N/A)	0.00
581.00	23.90	(N/A)	0.00

Contributing Structures

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Composite Rating Curve
Label: EB Detention WQB

Composite Outflow Summary

Contributing Structures
(no Q: R0,Orifice - 1,C0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
Orifice - 1,C0 (no Q: R0)
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0
R0,Orifice - 1,C0

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Volume-Flow Table (Pond)

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	<None Selected>

Initial Conditions	
Elevation (Water Surface, Initial)	(N/A) ft
Volume (Initial)	(N/A) ac-ft
Flow (Initial Outlet)	(N/A) ft³/s
Flow (Initial Infiltration)	(N/A) ft³/s
Flow (Initial, Total)	(N/A) ft³/s
Time Increment	(N/A) hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
577.00	0.00	0.000	0.102	0.00	0.00	0.00
577.10	0.01	0.010	0.105	0.00	0.01	0.26
577.20	0.02	0.021	0.107	0.00	0.02	0.53
577.30	0.03	0.032	0.110	0.00	0.03	0.80
577.40	0.03	0.043	0.112	0.00	0.03	1.07
577.50	0.04	0.054	0.115	0.00	0.04	1.35
577.60	0.04	0.066	0.117	0.00	0.04	1.64
577.70	0.05	0.078	0.120	0.00	0.05	1.93
577.80	0.05	0.090	0.123	0.00	0.05	2.23
577.90	0.05	0.102	0.125	0.00	0.05	2.53
578.00	0.06	0.115	0.128	0.00	0.06	2.84
578.10	0.68	0.128	0.131	0.00	0.68	3.77
578.20	1.81	0.141	0.134	0.00	1.81	5.22
578.30	3.27	0.155	0.136	0.00	3.27	7.01
578.40	5.00	0.168	0.139	0.00	5.00	9.08
578.50	6.96	0.182	0.142	0.00	6.96	11.38
578.60	9.14	0.197	0.145	0.00	9.14	13.90
578.70	11.49	0.211	0.147	0.00	11.49	16.61
578.80	12.38	0.226	0.150	0.00	12.38	17.85
578.90	13.13	0.241	0.153	0.00	13.13	18.97
579.00	13.83	0.257	0.156	0.00	13.83	20.05
579.10	14.51	0.276	0.192	0.00	14.51	21.18
579.20	15.15	0.295	0.197	0.00	15.15	22.29
579.30	15.76	0.315	0.202	0.00	15.76	23.39
579.40	16.36	0.336	0.208	0.00	16.36	24.48
579.50	16.93	0.357	0.213	0.00	16.93	25.56
579.60	17.48	0.378	0.218	0.00	17.48	26.63
579.70	18.02	0.400	0.224	0.00	18.02	27.70
579.80	18.54	0.423	0.230	0.00	18.54	28.77

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Volume-Flow Table (Pond)

Label: Minimum Drain Time - 1

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
579.90	19.03	0.446	0.235	0.00	19.03	29.83
580.00	19.53	0.470	0.241	0.00	19.53	30.90
580.10	20.02	0.494	0.245	0.00	20.02	31.98
580.20	20.49	0.519	0.249	0.00	20.49	33.05
580.30	20.94	0.544	0.253	0.00	20.94	34.10
580.40	21.38	0.570	0.257	0.00	21.38	35.17
580.50	21.82	0.596	0.262	0.00	21.82	36.23
580.60	22.26	0.622	0.266	0.00	22.26	37.31
580.70	22.67	0.649	0.270	0.00	22.67	38.37
580.80	23.09	0.676	0.274	0.00	23.09	39.45
580.90	23.49	0.704	0.279	0.00	23.49	40.52
581.00	23.90	0.732	0.283	0.00	23.90	41.60

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Level Pool Pond Routing Summary

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	<None Selected>

Initial Conditions	
Elevation (Water Surface, Initial)	(N/A) ft
Volume (Initial)	(N/A) ac-ft
Flow (Initial Outlet)	(N/A) ft³/s
Flow (Initial Infiltration)	(N/A) ft³/s
Flow (Initial, Total)	(N/A) ft³/s
Time Increment	(N/A) hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	(N/A) ft³/s	Time to Peak (Flow, In)	(N/A) hours
Flow (Peak Outlet)	(N/A) ft³/s	Time to Peak (Flow, Outlet)	(N/A) hours

Elevation (Water Surface, Peak)	(N/A) ft
Volume (Peak)	(N/A) ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	(N/A) ac-ft
Volume (Total Inflow)	(N/A) ac-ft
Volume (Total Infiltration)	(N/A) ac-ft
Volume (Total Outlet Outflow)	(N/A) ac-ft
Volume (Retained)	(N/A) ac-ft
Volume (Unrouted)	(N/A) ac-ft
Error (Mass Balance)	(N/A) %

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Pond Routed Hydrograph (total out)

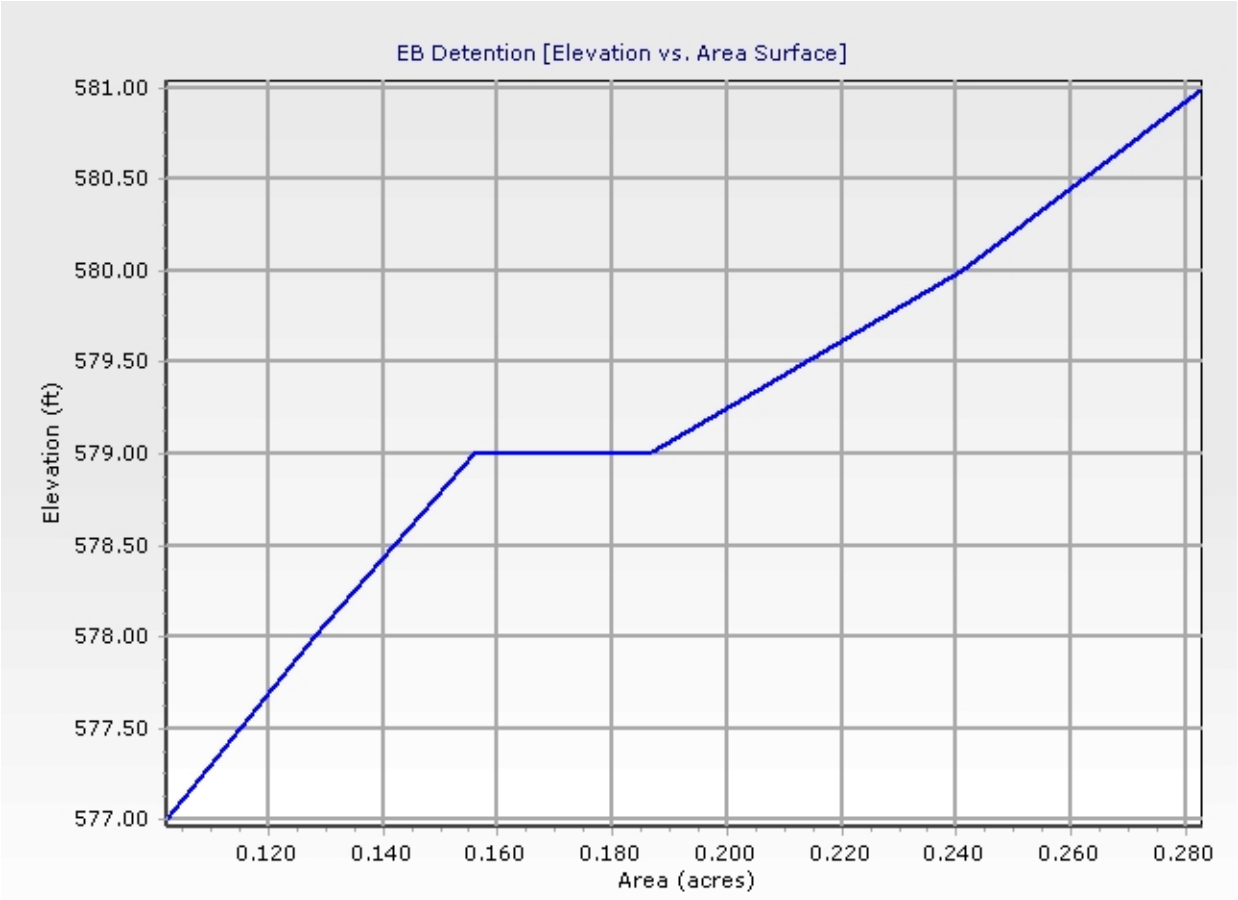
Label: Minimum Drain Time - 1

Peak Discharge	0.06 ft³/s
Time to Peak	0.000 hours
Hydrograph Volume	0.112 ac-ft

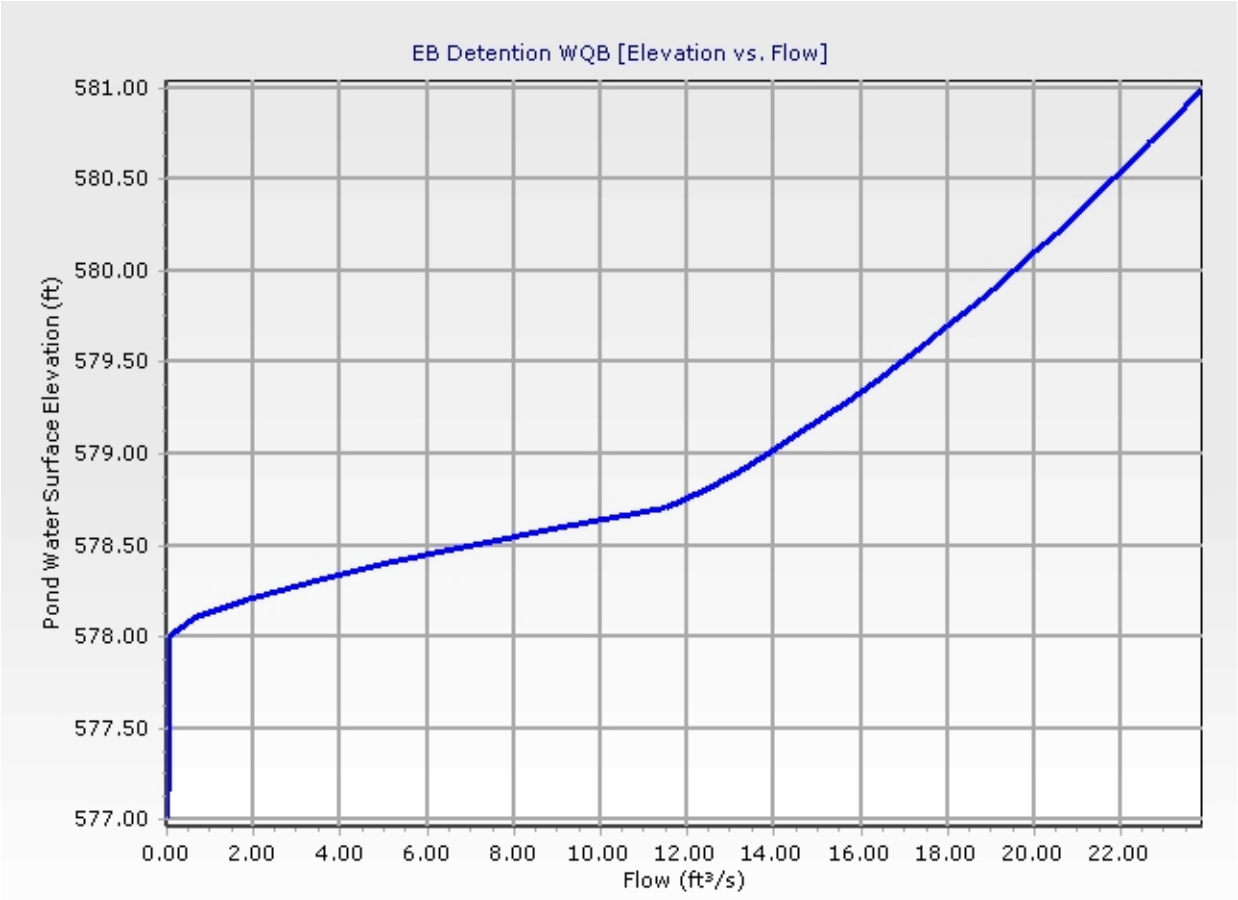
HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 1.000 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.06	0.06	0.05	0.05	0.05
5.000	0.05	0.05	0.05	0.05	0.05
10.000	0.04	0.04	0.04	0.04	0.04
15.000	0.04	0.04	0.04	0.04	0.03
20.000	0.03	0.03	0.03	0.03	0.03
25.000	0.03	0.03	0.02	0.02	0.02
30.000	0.02	0.02	0.02	0.02	0.02
35.000	0.01	0.01	0.01	0.01	0.01
40.000	0.01	0.01	0.01	0.01	0.01
45.000	0.00	0.00	0.00	0.00	(N/A)

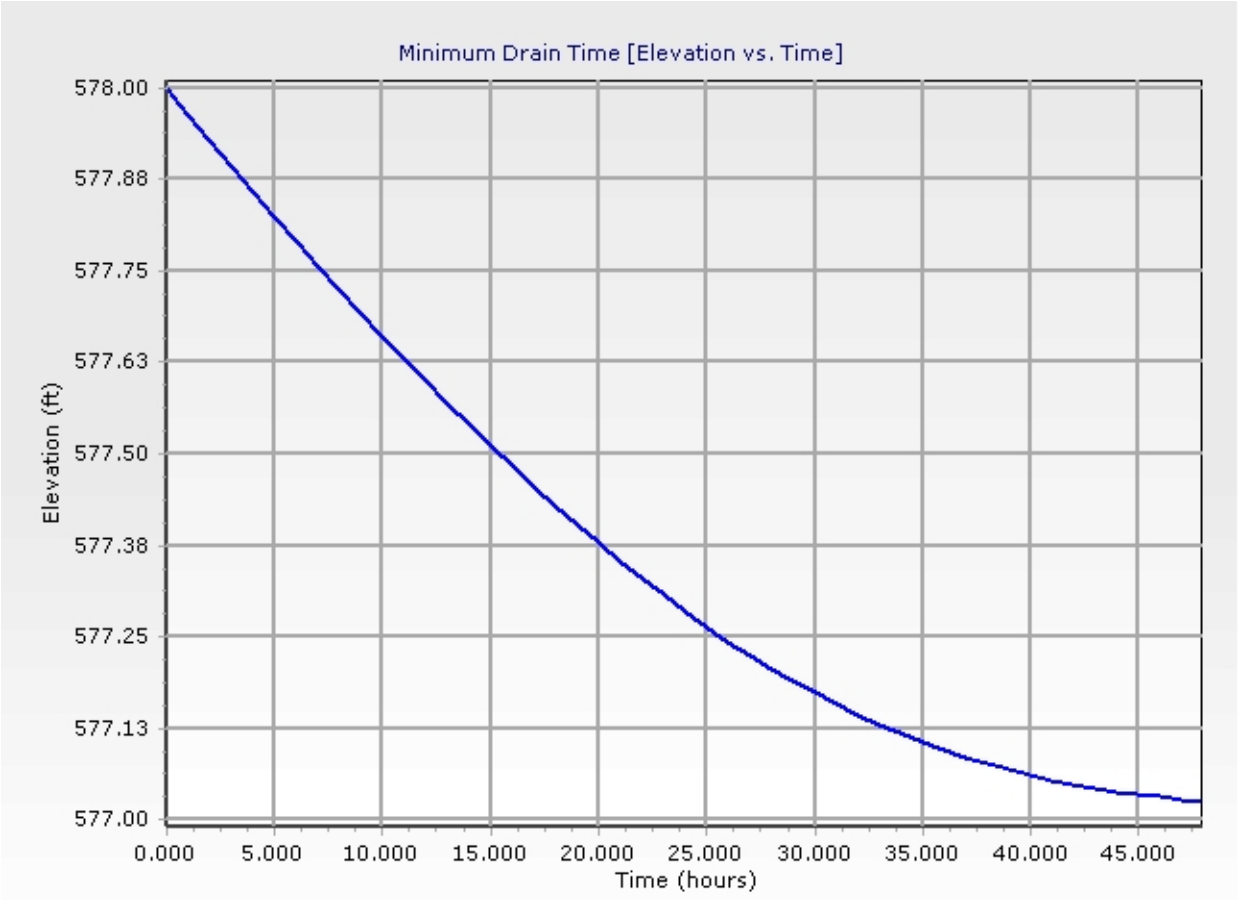
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



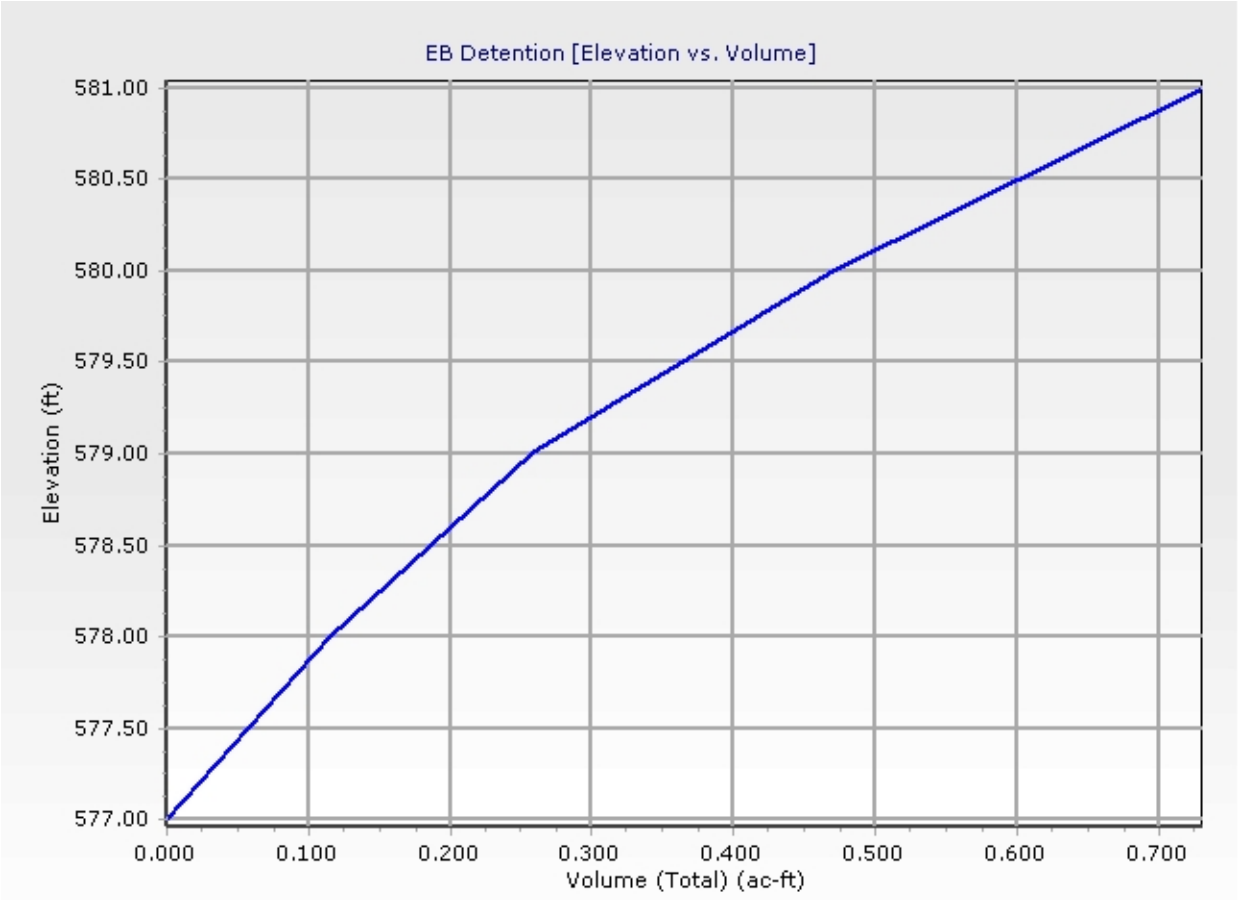
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



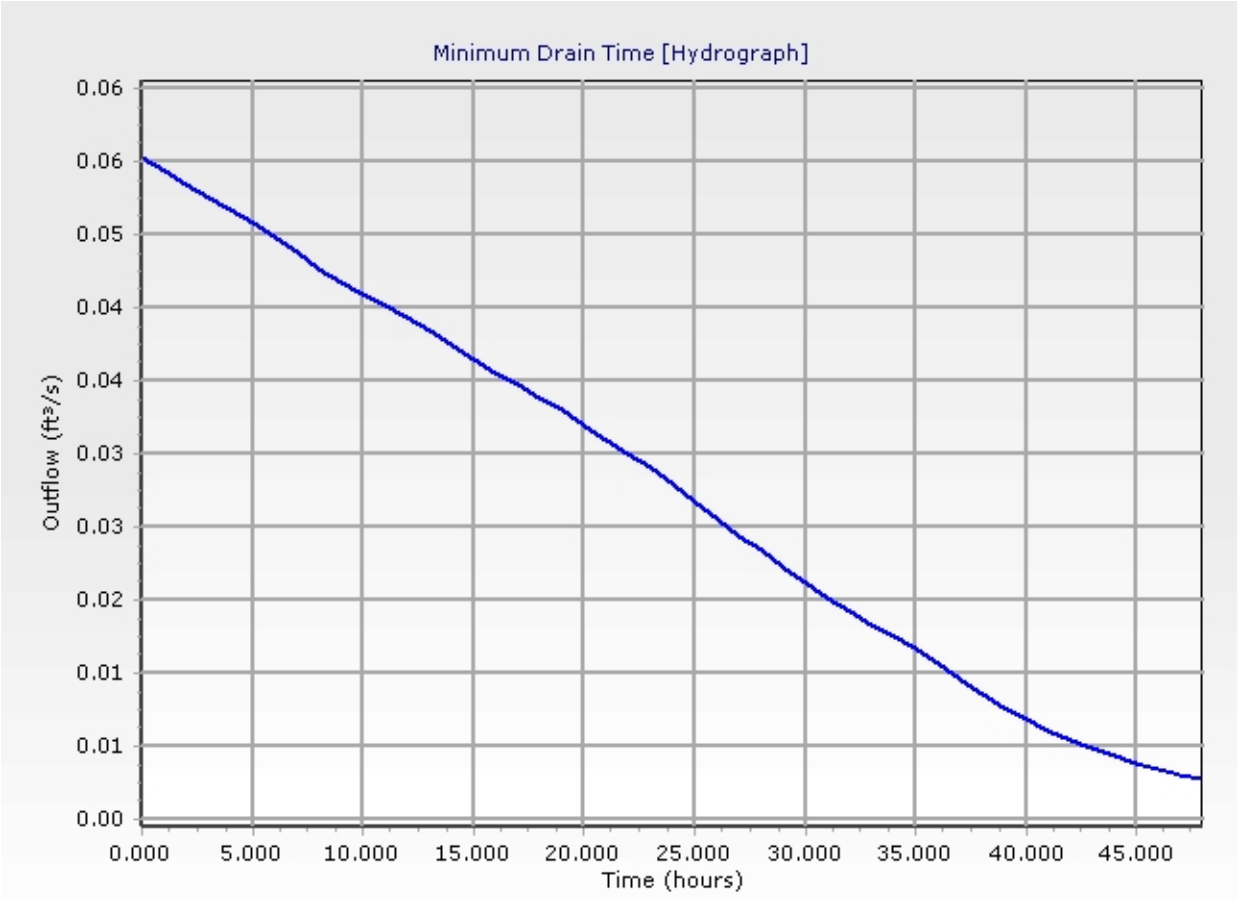
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



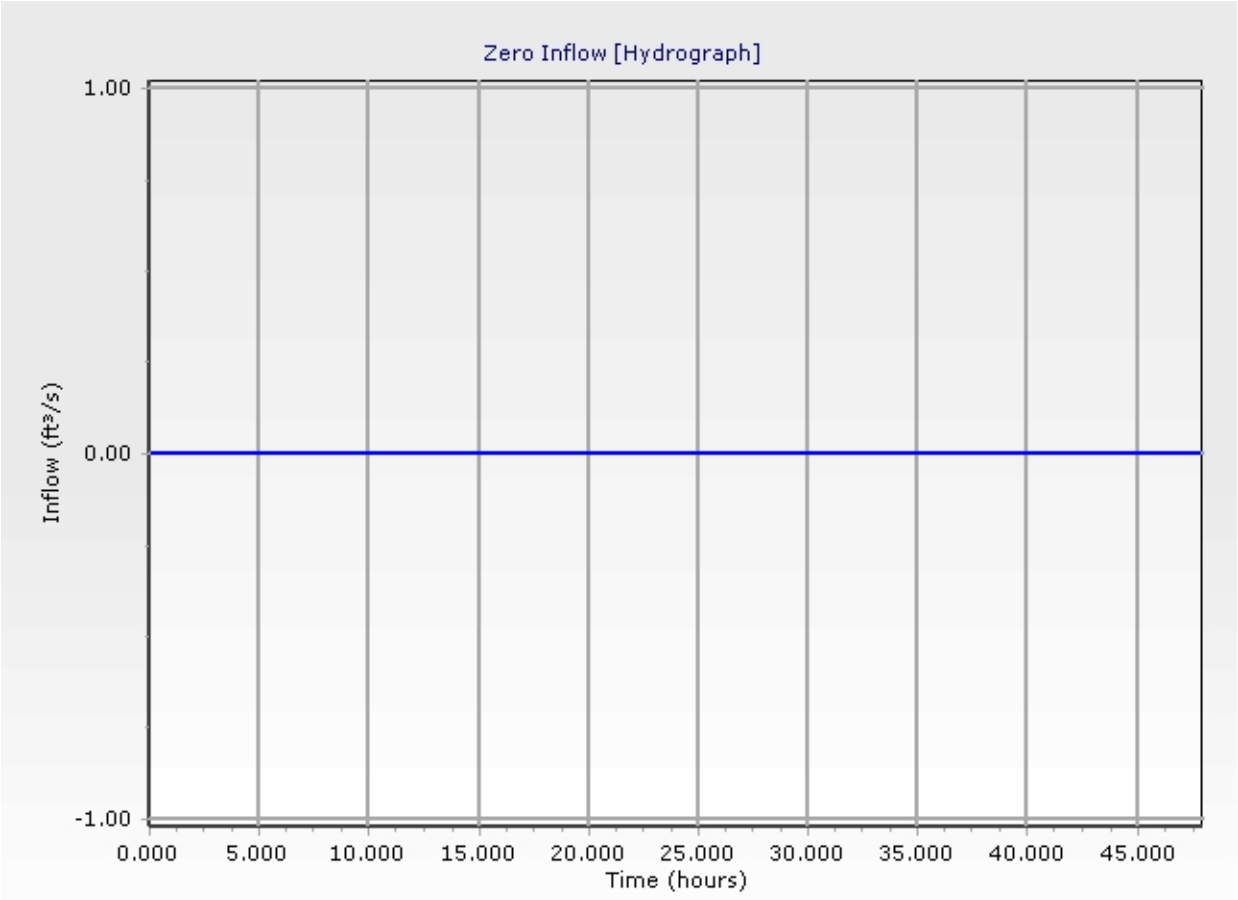
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



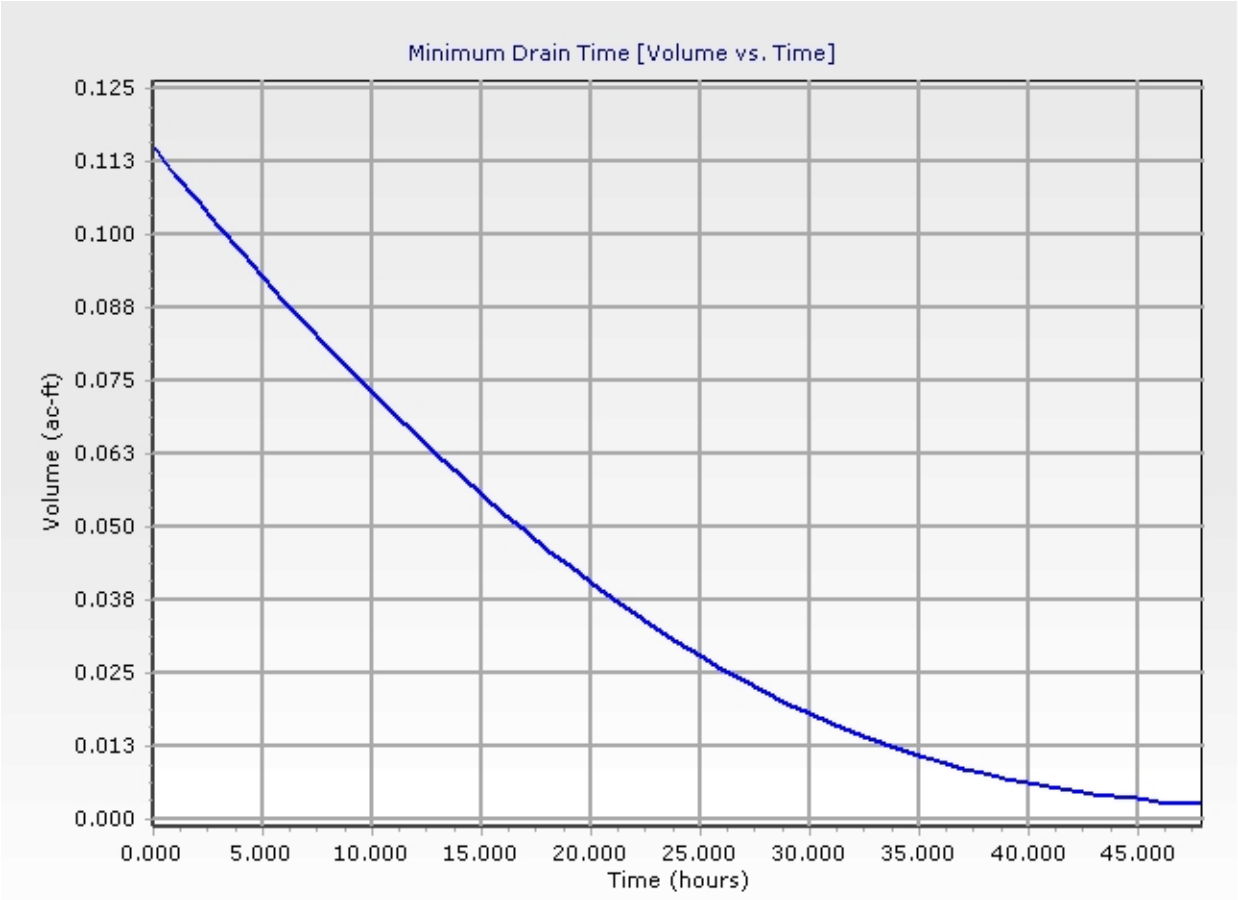
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



APPENDIX C

STORM SEWER SYSTEM

PID : 49633 **Date :** 05/18/2011 **Project :** CUY-90-14.90 **Location :** 3rd Street I90 Scuppers

Description :3rd Street - I-90 Scuppers to CS **Designer :** PNS

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 577.70

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D38A	WQB	155+21	0.30	0.18	10.00	5.10	6.13	0.9	1.1	15	74.0	0.0200	583.00	4.30	8.52	0.0004	583.32	586.58	3.26	2.33	CB 4
begin		154+47	0.30	0.18									581.52				582.35	582.77			0.015

Note: D-38A outlets into a detention pond. The detention pond overflows into structure D-38. D-38A added to drain Northfolk Southern Rail Road property during construction of the EB Innerbelt bridge.

STORM SEWER SYSTEM

PID : 49633 **Date :** 09/27/2011 **Project :** CUY-90-14.90 **Location :** 3rd Street I90 Scuppers

Description :3rd Street - I-90 Scuppers to CS **Designer :** PNS

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 577.70

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D38	9487	34+27		1.75	1.58	10.00	5.10	6.15	8.0	9.7	18	82.8	0.0097	577.00	5.73	9.63	0.0113	578.64	582.50	3.86	4.00	CB 2-3
begin		34+75		1.75	1.58									576.20				577.70	579.70			0.015

CDSS 1.0.0.3.

Close

DITCH ANALYSIS

PID : 46933 **Date :** 04/17/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description : scupper discharge to 3rd st BMP **Designer :** PNS

Rainfall Area : A

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
154+80	154+70	R	17.00	1.00	3.00	3.00	0.0735	1.75	1.75	0.90	1.58	Seed	4.29	5	0.030	10.05	5.86	2.18	6.76	0.48	3.85
												Jute Mat	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Temp. Mat	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 1	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 2	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 2	5.08	10	0.040	10.06	4.94	2.69	8.00	0.59	4.52
154+70	154+40	R	5.40	1.00	3.00	3.00	0.0100	0.00	1.75	0.90	1.58	Seed	4.29	5	0.030	10.09	2.79	0.47	6.75	0.75	5.48
												Jute Mat	4.28	5	0.040	10.10	2.25	0.53	6.75	0.85	6.08
												Temp. Mat	4.28	5	0.040	10.10	2.25	0.53	6.75	0.85	6.08
												Temp. Mat	5.07	10	0.040	10.10	2.35	0.57	8.00	0.91	6.47
154+70	154+68	R	16.00	1.00	3.00	3.00	0.2422*	0.00	1.75	0.01	1.58	Seed	4.28	5	0.030	10.13	9.09	5.41	6.74	0.36	3.15
													4.28	5	0.040	10.14	7.35		6.74	0.41	3.47

*See shear stress calc since CDSS exceeded limits with 24.22% slope

57% Page 1 of 1

CDSS 1.0.0.3.

Close

DITCH ANALYSIS

PID : 46933 **Date :** 04/17/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description : scupper discharge to 3rd st BMP **Designer :** PNS

Rainfall Area : A

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
154+80	154+70	R	17.00	1.00	3.00	3.00	0.0735	1.75	1.75	0.90	1.58	Seed	4.29	5	0.030	10.05	5.86	2.18	6.76	0.48	3.85
												Jute Mat	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Temp. Mat	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 1	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 2	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 2	6.78	50	0.040	10.05	5.32	3.06	10.67	0.67	5.01
154+70	154+40	R	5.40	1.00	3.00	3.00	0.0100	0.00	1.75	0.90	1.58	Seed	4.29	5	0.030	10.09	2.79	0.47	6.75	0.75	5.48
												Jute Mat	4.28	5	0.040	10.10	2.25	0.53	6.75	0.85	6.08
												Temp. Mat	4.28	5	0.040	10.10	2.25	0.53	6.75	0.85	6.08
												Temp. Mat	6.76	50	0.040	10.09	2.53	0.64	10.66	1.03	7.18
154+70	154+68	R	16.00	1.00	3.00	3.00	0.2422*	0.00	1.75	0.01	1.58	Seed	4.28	5	0.030	10.13	9.09	5.41	6.74	0.36	3.15
													4.28	5	0.040	10.14	7.35		6.74	0.41	3.47

*See shear stress calc since CDSS exceeded limits with 24.22% slope

57% Page 1 of 1

CDSS 1.0.0.3.

Close

DITCH ANALYSIS

PID : 46933 **Date :** 04/17/2011 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description : scupper discharge to 3rd st BMP **Designer :** PNS

Rainfall Area : A

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
154+80	154+70	R	17.00	1.00	3.00	3.00	0.0735	1.75	1.75	0.90	1.58	Seed	4.29	5	0.030	10.05	5.86	2.18	6.76	0.48	3.85
												Jute Mat	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Temp. Mat	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 1	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 2	4.29	5	0.040	10.06	4.73	2.49	6.76	0.54	4.26
												Perm, Type 2	6.78	50	0.040	10.05	5.32	3.06	10.67	0.67	5.01
154+70	154+40	R	5.40	1.00	3.00	3.00	0.0100	0.00	1.75	0.90	1.58	Seed	4.29	5	0.030	10.09	2.79	0.47	6.75	0.75	5.48
												Jute Mat	4.28	5	0.040	10.10	2.25	0.53	6.75	0.85	6.08
												Temp. Mat	4.28	5	0.040	10.10	2.25	0.53	6.75	0.85	6.08
												Temp. Mat	6.76	50	0.040	10.09	2.53	0.64	10.66	1.03	7.18
154+70	154+68	R	16.00	1.00	3.00	3.00	0.2500*	0.00	1.75	0.01	1.58	Seed	4.28	5	0.030	10.13	9.19	5.54	6.74	0.36	3.13
													4.28	5	0.040	10.14	7.44		6.74	0.41	3.45

*See shear stress calc since CDSS exceeded limits with 24.22% slope

57% Page 1 of 1

DITCH ANALYSIS

PID : 46933 **Date :** 01/04/2012 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to 3rd st BMP LT ditch **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
154+80	154+80	R	88.00	1.00	3.00	3.00	0.0050	0.58	0.58	0.90	0.52	Seed	4.16	5	0.030	10.90	1.61	0.16	2.17	0.52	4.14
												Seed	4.87	10	0.040	11.07	1.35	0.20	2.54	0.64	4.85

DITCH ANALYSIS

PID : 46933 **Date :** 01/04/2012 **Project :** CUY-90-14.90 **Location :** Beneath Mainline

Description :scupper discharge to 3rd st BMP LT ditch **Designer :** PNS

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

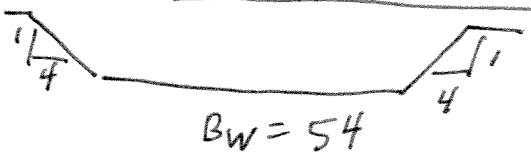
(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
154+80	154+80	R	88.00	1.00	3.00	3.00	0.0050	0.58	0.58	0.90	0.52	Seed	4.16	5	0.030	10.90	1.61	0.16	2.17	0.52	4.14
												Seed	6.48	50	0.040	10.99	1.46	0.23	3.38	0.73	5.37

For	Rip Rap Forebay @ 3rd +	Job no.	49633	Sheet no.
Made by	PNSheldiry	Checked by	BHESS	Backchecked by
Date	9-22-11	Date	9/22/11	Date

HNTB

FOREBAY OVERFLOW



$Q_{10} = 6.35$ cfs
$n = 0.041$
$S = 24.22\%$
$Bw = 54$
$FS = BS = 4:1$

} Manning's Solver

$h = 0.05$ ft

$\tau = \gamma h S$

$= 62.4 \times 0.05 \times 0.25$

$= 0.78$ lb/ft^2 < 2.5 ✓ O.K.

(Julien, 1998)

DITCH AT SCUPPER DISCHARGE WHERE CDSS DID NOT PRODUCE RESULTS

$\tau = \gamma h S = 62.4 \times 0.41 \times 0.25 = 6.4$ lb/ft^2 < 7 lb/ft^2

∴ use tied concrete block MAT TYPE 3 O.K.

16' LONG x 4' WIDE

p. 108 of LDV II

3rd Street Basin Analysis

Project Summary	
Title	3rd Street Outfall
Engineer	PNShedivy
Company	HNTB
Date	10/22/2011

Notes

Table of Contents

3rd Street Basin Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Proposed Storm Sewer DA	wq	0	0.130	12.000	1.91
Proposed Storm Sewer DA	5 year	5	0.392	12.000	5.43
Proposed Storm Sewer DA	10 year	10	0.462	12.000	6.35
Proposed Storm Sewer DA	25 year	25	0.562	12.000	7.67
Proposed Storm Sewer DA	50 year	50	0.645	12.000	8.75
Existing DA	wq	0	0.049	11.900	0.86
Existing DA	5 year	5	0.149	11.900	2.45
Existing DA	10 year	10	0.175	11.900	2.87
Existing DA	25 year	25	0.213	11.900	3.46
Existing DA	50 year	50	0.245	11.900	3.96

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Analysis Point Pro	wq	0	0.127	19.000	0.03
Analysis Point Pro	5 year	5	0.209	24.100	0.04
Analysis Point Pro	10 year	10	0.244	17.500	0.12
Analysis Point Pro	25 year	25	0.344	12.950	0.51
Analysis Point Pro	50 year	50	0.427	12.400	1.44
Analysis Point Pre(same as Pro)	wq	0	0.049	11.900	0.86
Analysis Point Pre(same as Pro)	5 year	5	0.149	11.900	2.45
Analysis Point Pre(same as Pro)	10 year	10	0.175	11.900	2.87
Analysis Point Pre(same as Pro)	25 year	25	0.213	11.900	3.46
Analysis Point Pre(same as Pro)	50 year	50	0.245	11.900	3.96

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)

3rd Street Basin Analysis

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Extended Detention (IN)	wq	0	0.130	12.000	1.91	(N/A)	(N/A)
Extended Detention (OUT)	wq	0	0.127	19.000	0.03	580.45	0.095
Extended Detention (IN)	5 year	5	0.392	12.000	5.43	(N/A)	(N/A)
Extended Detention (OUT)	5 year	5	0.209	24.100	0.04	582.25	0.336
Extended Detention (IN)	10 year	10	0.462	12.000	6.35	(N/A)	(N/A)
Extended Detention (OUT)	10 year	10	0.244	17.500	0.12	582.51	0.378
Extended Detention (IN)	25 year	25	0.562	12.000	7.67	(N/A)	(N/A)
Extended Detention (OUT)	25 year	25	0.344	12.950	0.51	582.55	0.385
Extended Detention (IN)	50 year	50	0.645	12.000	8.75	(N/A)	(N/A)
Extended Detention (OUT)	50 year	50	0.427	12.400	1.44	582.64	0.401

3rd Street Basin Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.5	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.5	0.6	0.6	0.6
10.500	0.6	0.6	0.6	0.6	0.7
11.000	0.7	0.7	0.7	0.8	0.8
11.500	0.8	0.9	1.0	1.3	1.7
12.000	1.9	2.0	2.0	2.1	2.1
12.500	2.1	2.2	2.2	2.2	2.2
13.000	2.3	2.3	2.3	2.3	2.3
13.500	2.3	2.3	2.4	2.4	2.4
14.000	2.4	2.4	2.4	2.4	2.4
14.500	2.4	2.5	2.5	2.5	2.5
15.000	2.5	2.5	2.5	2.5	2.5
15.500	2.5	2.5	2.5	2.6	2.6
16.000	2.6	2.6	2.6	2.6	2.6
16.500	2.6	2.6	2.6	2.6	2.6

3rd Street Basin Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.6	2.6	2.6	2.7	2.7
17.500	2.7	2.7	2.7	2.7	2.7
18.000	2.7	2.7	2.7	2.7	2.7
18.500	2.7	2.7	2.7	2.7	2.7
19.000	2.7	2.7	2.7	2.8	2.8
19.500	2.8	2.8	2.8	2.8	2.8
20.000	2.8	2.8	2.8	2.8	2.8
20.500	2.8	2.8	2.8	2.8	2.8
21.000	2.8	2.8	2.8	2.8	2.8
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.9	2.9	2.9	2.9	2.9
22.500	2.9	2.9	2.9	2.9	2.9
23.000	2.9	2.9	2.9	2.9	2.9
23.500	2.9	2.9	2.9	2.9	2.9
24.000	2.9	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.4	0.4	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.5	0.5	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.6	0.6	0.6	0.6	0.6
10.000	0.6	0.6	0.6	0.7	0.7
10.500	0.7	0.7	0.7	0.8	0.8
11.000	0.8	0.8	0.9	0.9	0.9
11.500	1.0	1.0	1.2	1.5	1.9
12.000	2.3	2.3	2.4	2.4	2.5
12.500	2.5	2.5	2.6	2.6	2.6
13.000	2.6	2.6	2.7	2.7	2.7
13.500	2.7	2.7	2.7	2.8	2.8
14.000	2.8	2.8	2.8	2.8	2.8
14.500	2.8	2.9	2.9	2.9	2.9
15.000	2.9	2.9	2.9	2.9	2.9
15.500	2.9	3.0	3.0	3.0	3.0
16.000	3.0	3.0	3.0	3.0	3.0
16.500	3.0	3.0	3.0	3.1	3.1

3rd Street Basin Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.1	3.1	3.1	3.1	3.1
17.500	3.1	3.1	3.1	3.1	3.1
18.000	3.1	3.1	3.1	3.1	3.2
18.500	3.2	3.2	3.2	3.2	3.2
19.000	3.2	3.2	3.2	3.2	3.2
19.500	3.2	3.2	3.2	3.2	3.2
20.000	3.2	3.2	3.2	3.2	3.3
20.500	3.3	3.3	3.3	3.3	3.3
21.000	3.3	3.3	3.3	3.3	3.3
21.500	3.3	3.3	3.3	3.3	3.3
22.000	3.3	3.3	3.3	3.3	3.3
22.500	3.3	3.3	3.3	3.4	3.4
23.000	3.4	3.4	3.4	3.4	3.4
23.500	3.4	3.4	3.4	3.4	3.4
24.000	3.4	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.5	0.5	0.5	0.5
8.000	0.5	0.5	0.5	0.5	0.5
8.500	0.5	0.6	0.6	0.6	0.6
9.000	0.6	0.6	0.6	0.6	0.7
9.500	0.7	0.7	0.7	0.7	0.7
10.000	0.7	0.8	0.8	0.8	0.8
10.500	0.8	0.9	0.9	0.9	0.9
11.000	1.0	1.0	1.0	1.1	1.1
11.500	1.2	1.3	1.4	1.8	2.3
12.000	2.7	2.8	2.9	2.9	3.0
12.500	3.0	3.0	3.1	3.1	3.1
13.000	3.2	3.2	3.2	3.2	3.2
13.500	3.3	3.3	3.3	3.3	3.3
14.000	3.4	3.4	3.4	3.4	3.4
14.500	3.4	3.4	3.5	3.5	3.5
15.000	3.5	3.5	3.5	3.5	3.5
15.500	3.5	3.6	3.6	3.6	3.6
16.000	3.6	3.6	3.6	3.6	3.6
16.500	3.6	3.7	3.7	3.7	3.7

3rd Street Basin Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.7	3.7	3.7	3.7	3.7
17.500	3.7	3.7	3.7	3.8	3.8
18.000	3.8	3.8	3.8	3.8	3.8
18.500	3.8	3.8	3.8	3.8	3.8
19.000	3.8	3.8	3.8	3.9	3.9
19.500	3.9	3.9	3.9	3.9	3.9
20.000	3.9	3.9	3.9	3.9	3.9
20.500	3.9	3.9	3.9	3.9	3.9
21.000	3.9	4.0	4.0	4.0	4.0
21.500	4.0	4.0	4.0	4.0	4.0
22.000	4.0	4.0	4.0	4.0	4.0
22.500	4.0	4.0	4.0	4.0	4.0
23.000	4.0	4.0	4.1	4.1	4.1
23.500	4.1	4.1	4.1	4.1	4.1
24.000	4.1	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.5	0.5
8.000	0.6	0.6	0.6	0.6	0.6
8.500	0.6	0.6	0.6	0.7	0.7
9.000	0.7	0.7	0.7	0.7	0.7
9.500	0.8	0.8	0.8	0.8	0.8
10.000	0.8	0.9	0.9	0.9	0.9
10.500	1.0	1.0	1.0	1.0	1.1
11.000	1.1	1.1	1.2	1.2	1.3
11.500	1.3	1.4	1.7	2.0	2.6
12.000	3.1	3.2	3.3	3.3	3.4
12.500	3.4	3.5	3.5	3.5	3.6
13.000	3.6	3.6	3.7	3.7	3.7
13.500	3.7	3.7	3.8	3.8	3.8
14.000	3.8	3.8	3.9	3.9	3.9
14.500	3.9	3.9	3.9	3.9	4.0
15.000	4.0	4.0	4.0	4.0	4.0
15.500	4.0	4.1	4.1	4.1	4.1
16.000	4.1	4.1	4.1	4.1	4.1
16.500	4.2	4.2	4.2	4.2	4.2

3rd Street Basin Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.2	4.2	4.2	4.2	4.2
17.500	4.2	4.3	4.3	4.3	4.3
18.000	4.3	4.3	4.3	4.3	4.3
18.500	4.3	4.3	4.3	4.4	4.4
19.000	4.4	4.4	4.4	4.4	4.4
19.500	4.4	4.4	4.4	4.4	4.4
20.000	4.4	4.4	4.4	4.5	4.5
20.500	4.5	4.5	4.5	4.5	4.5
21.000	4.5	4.5	4.5	4.5	4.5
21.500	4.5	4.5	4.5	4.5	4.5
22.000	4.6	4.6	4.6	4.6	4.6
22.500	4.6	4.6	4.6	4.6	4.6
23.000	4.6	4.6	4.6	4.6	4.6
23.500	4.6	4.6	4.6	4.6	4.7
24.000	4.7	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: WQstorm	
Label	WQstorm
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	0 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.0	0.0	0.0	0.0
2.500	0.0	0.0	0.0	0.0	0.0
3.000	0.0	0.0	0.0	0.0	0.0
3.500	0.0	0.0	0.0	0.0	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.1
5.500	0.1	0.1	0.1	0.1	0.1
6.000	0.1	0.1	0.1	0.1	0.1
6.500	0.1	0.1	0.1	0.1	0.1
7.000	0.1	0.1	0.1	0.1	0.1
7.500	0.1	0.1	0.1	0.1	0.1
8.000	0.1	0.1	0.1	0.1	0.1
8.500	0.1	0.1	0.2	0.2	0.2
9.000	0.2	0.2	0.2	0.2	0.2
9.500	0.2	0.2	0.2	0.2	0.2
10.000	0.2	0.2	0.2	0.2	0.2
10.500	0.2	0.2	0.2	0.2	0.3
11.000	0.3	0.3	0.3	0.3	0.3
11.500	0.3	0.3	0.4	0.5	0.6
12.000	0.7	0.8	0.8	0.8	0.8
12.500	0.8	0.8	0.8	0.8	0.8
13.000	0.8	0.9	0.9	0.9	0.9
13.500	0.9	0.9	0.9	0.9	0.9
14.000	0.9	0.9	0.9	0.9	0.9
14.500	0.9	0.9	0.9	0.9	0.9
15.000	0.9	0.9	0.9	0.9	1.0
15.500	1.0	1.0	1.0	1.0	1.0
16.000	1.0	1.0	1.0	1.0	1.0
16.500	1.0	1.0	1.0	1.0	1.0

3rd Street Basin Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 0 years
Storm Event: WQstorm

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	1.0	1.0	1.0	1.0	1.0
17.500	1.0	1.0	1.0	1.0	1.0
18.000	1.0	1.0	1.0	1.0	1.0
18.500	1.0	1.0	1.0	1.0	1.0
19.000	1.0	1.0	1.0	1.0	1.0
19.500	1.0	1.0	1.0	1.0	1.0
20.000	1.0	1.0	1.1	1.1	1.1
20.500	1.1	1.1	1.1	1.1	1.1
21.000	1.1	1.1	1.1	1.1	1.1
21.500	1.1	1.1	1.1	1.1	1.1
22.000	1.1	1.1	1.1	1.1	1.1
22.500	1.1	1.1	1.1	1.1	1.1
23.000	1.1	1.1	1.1	1.1	1.1
23.500	1.1	1.1	1.1	1.1	1.1
24.000	1.1	(N/A)	(N/A)	(N/A)	(N/A)

3rd Street Basin Analysis

Subsection: Runoff CN-Area
Label: Existing DA

Return Event: 0 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	0.664	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.664	(N/A)	(N/A)	98.000

3rd Street Basin Analysis

Subsection: Runoff CN-Area
Label: Proposed Storm Sewer DA

Return Event: 0 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	1.750	100.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.750	(N/A)	(N/A)	98.000

3rd Street Basin Analysis

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method (Computational Notes)

Definition of Terms

At	Total area (acres): At = Ai+Ap
Ai	Impervious area (acres)
Ap	Pervious area (acres)
CNi	Runoff curve number for impervious area
CNp	Runoff curve number for pervious area
fLoss	f loss constant infiltration (depth/time)
gKs	Saturated Hydraulic Conductivity (depth/time)
Md	Volumetric Moisture Deficit
Psi	Capillary Suction (length)
hK	Horton Infiltration Decay Rate (time^-1)
fo	Initial Infiltration Rate (depth/time)
fc	Ultimate(capacity)Infiltration Rate (depth/time)
Ia	Initial Abstraction (length)
dt	Computational increment (duration of unit excess rainfall) Default dt is smallest value of 0.1333Tc, rtm, and th (Smallest dt is then adjusted to match up with Tp)
UDdt	User specified override computational main time increment (only used if UDdt is => .1333Tc)
D(t)	Point on distribution curve (fraction of P) for time step t
K	2 / (1 + (Tr/Tp)): default K = 0.75: (for Tr/Tp = 1.67)
Ks	Hydrograph shape factor = Unit Conversions * K: = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K Default Ks = 645.333 * 0.75 = 484
Lag	Lag time from center of excess runoff (dt) to Tp: Lag = 0.6Tc
P	Total precipitation depth, inches
Pa(t)	Accumulated rainfall at time step t
Pi(t)	Incremental rainfall at time step t
qp	Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi. = (Ks * A * Q) / Tp (where Q = 1in. runoff, A=sq.mi.)
Qu(t)	Unit hydrograph ordinate (cfs) at time step t
Q(t)	Final hydrograph ordinate (cfs) at time step t
Rai(t)	Accumulated runoff (inches) at time step t for impervious area
Rap(t)	Accumulated runoff (inches) at time step t for pervious area
Rii(t)	Incremental runoff (inches) at time step t for impervious area
Rip(t)	Incremental runoff (inches) at time step t for pervious area
R(t)	Incremental weighted total runoff (inches)
Rtm	Time increment for rainfall table
Si	S for impervious area: Si = (1000/CNi) - 10
Sp	S for pervious area: Sp = (1000/CNp) - 10
t	Time step (row) number
Tc	Time of concentration
Tb	Time (hrs) of entire unit hydrograph: Tb = Tp + Tr
Tp	Time (hrs) to peak of a unit hydrograph: Tp = (dt/2) + Lag
Tr	Time (hrs) of receding limb of unit hydrograph: Tr = ratio of Tp

3rd Street Basin Analysis

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method
Computational Notes
Precipitation

Column (1)	Time for time step t
Column (2)	D(t) = Point on distribution curve for time step t
Column (3)	Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4)	Pa(t) = D(t) x P: Col.(2) x P

Pervious Area Runoff (using SCS Runoff CN Method)

Column (5)	Rap(t) = Accumulated pervious runoff for time step t
	If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
	If (Pa(t) is > 0.2Sp) then use:
	
	Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)

Column (6)	Rip(t) = Incremental pervious runoff for time step t Rip(t) = Rap(t) - Rap(t-1) Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

Impervious Area Runoff

Column (7 & 8)...	Did not specify to use impervious areas.

Incremental Weighted Runoff

Column (9)	R(t) = (Ap/At) x Rip(t) + (Ai/At) x Rii(t) R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS Unit Hydrograph Method

Column (10)	Q(t) is computed with the SCS unit hydrograph method using R(t) and Qu(t).

3rd Street Basin Analysis

Subsection: Unit Hydrograph Summary
Label: Existing DA

Return Event: 0 years
Storm Event: WQstorm

Storm Event	WQstorm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.664 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	0.88 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	0.86 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.664 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.9 in
Runoff Volume (Pervious)	0.049 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.049 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

3rd Street Basin Analysis

Subsection: Unit Hydrograph Summary
Label: Existing DA

Return Event: 0 years
Storm Event: WQstorm

SCS Unit Hydrograph Parameters	
Unit peak, qp	9.03 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	WQstorm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.206 hours
Area (User Defined)	1.750 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	12.001 hours
Flow (Peak, Computed)	1.91 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	1.91 ft^3/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.750 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.9 in
Runoff Volume (Pervious)	0.130 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.130 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.206 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

3rd Street Basin Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 0 years
Storm Event: WQstorm

SCS Unit Hydrograph Parameters	
Unit peak, qp	9.65 ft³/s
Unit peak time, Tp	0.137 hours
Unit receding limb, Tr	0.548 hours
Total unit time, Tb	0.685 hours

3rd Street Basin Analysis

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 0 years
Label: Proposed Storm Sewer DA Storm Event: WQstorm

Storm Event	WQstorm
Return Event	0 years
Duration	72.000 hours
Depth	1.1 in
Time of Concentration (Composite)	0.206 hours
Area (User Defined)	1.750 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
3.600	0.00	0.00	0.00	0.00	0.00
3.850	0.00	0.00	0.00	0.00	0.00
4.100	0.00	0.00	0.00	0.00	0.00
4.350	0.00	0.00	0.00	0.00	0.00
4.600	0.00	0.00	0.01	0.01	0.01
4.850	0.01	0.01	0.01	0.01	0.01
5.100	0.01	0.01	0.01	0.01	0.01
5.350	0.01	0.01	0.01	0.01	0.01
5.600	0.01	0.01	0.01	0.01	0.01
5.850	0.01	0.01	0.01	0.01	0.01
6.100	0.01	0.01	0.01	0.01	0.01
6.350	0.01	0.01	0.01	0.01	0.01
6.600	0.01	0.01	0.01	0.01	0.02
6.850	0.02	0.02	0.02	0.02	0.02
7.100	0.02	0.02	0.02	0.02	0.02
7.350	0.02	0.02	0.02	0.02	0.02
7.600	0.02	0.02	0.02	0.02	0.02
7.850	0.02	0.02	0.02	0.02	0.02
8.100	0.02	0.02	0.02	0.02	0.02
8.350	0.02	0.03	0.03	0.03	0.03
8.600	0.03	0.03	0.03	0.03	0.03
8.850	0.03	0.03	0.03	0.03	0.04
9.100	0.04	0.04	0.04	0.04	0.04
9.350	0.04	0.04	0.04	0.04	0.04
9.600	0.04	0.04	0.04	0.04	0.04
9.850	0.04	0.05	0.05	0.05	0.05
10.100	0.05	0.05	0.05	0.06	0.06
10.350	0.06	0.06	0.06	0.07	0.07
10.600	0.07	0.07	0.08	0.08	0.08
10.850	0.09	0.09	0.09	0.10	0.10
11.100	0.10	0.11	0.12	0.12	0.13
11.350	0.14	0.15	0.15	0.16	0.18
11.600	0.23	0.30	0.43	0.59	0.79

3rd Street Basin Analysis

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 0 years
Label: Proposed Storm Sewer DA Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.850	1.05	1.41	1.75	1.91	1.81
12.100	1.47	1.07	0.74	0.54	0.43
12.350	0.36	0.31	0.27	0.24	0.21
12.600	0.19	0.18	0.17	0.16	0.15
12.850	0.14	0.14	0.13	0.13	0.12
13.100	0.12	0.12	0.11	0.11	0.11
13.350	0.10	0.10	0.10	0.10	0.09
13.600	0.09	0.09	0.09	0.08	0.08
13.850	0.08	0.08	0.08	0.08	0.07
14.100	0.07	0.07	0.07	0.07	0.07
14.350	0.07	0.07	0.07	0.06	0.06
14.600	0.06	0.06	0.06	0.06	0.06
14.850	0.06	0.06	0.06	0.06	0.06
15.100	0.06	0.06	0.06	0.06	0.05
15.350	0.05	0.05	0.05	0.05	0.05
15.600	0.05	0.05	0.05	0.05	0.05
15.850	0.05	0.05	0.05	0.05	0.04
16.100	0.04	0.04	0.04	0.04	0.04
16.350	0.04	0.04	0.04	0.04	0.04
16.600	0.04	0.04	0.04	0.04	0.04
16.850	0.04	0.04	0.04	0.04	0.04
17.100	0.04	0.04	0.04	0.04	0.04
17.350	0.04	0.04	0.04	0.04	0.04
17.600	0.04	0.04	0.04	0.04	0.04
17.850	0.04	0.04	0.03	0.03	0.03
18.100	0.03	0.03	0.03	0.03	0.03
18.350	0.03	0.03	0.03	0.03	0.03
18.600	0.03	0.03	0.03	0.03	0.03
18.850	0.03	0.03	0.03	0.03	0.03
19.100	0.03	0.03	0.03	0.03	0.03
19.350	0.03	0.03	0.03	0.03	0.03
19.600	0.03	0.03	0.03	0.03	0.03
19.850	0.03	0.03	0.03	0.03	0.03
20.100	0.02	0.02	0.02	0.02	0.02
20.350	0.02	0.02	0.02	0.02	0.02
20.600	0.02	0.02	0.02	0.02	0.02
20.850	0.02	0.02	0.02	0.02	0.02
21.100	0.02	0.02	0.02	0.02	0.02
21.350	0.02	0.02	0.02	0.02	0.02
21.600	0.02	0.02	0.02	0.02	0.02
21.850	0.02	0.02	0.02	0.02	0.02
22.100	0.02	0.02	0.02	0.02	0.02

3rd Street Basin Analysis

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 0 years
Label: Proposed Storm Sewer DA Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
22.350	0.02	0.02	0.02	0.02	0.02
22.600	0.02	0.02	0.02	0.02	0.02
22.850	0.02	0.02	0.02	0.02	0.02
23.100	0.02	0.02	0.02	0.02	0.02
23.350	0.02	0.02	0.02	0.02	0.02
23.600	0.02	0.02	0.02	0.02	0.02
23.850	0.02	0.02	0.02	0.02	0.02
24.100	0.02	0.01	0.01	0.00	0.00
24.350	0.00	(N/A)	(N/A)	(N/A)	(N/A)

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000	0.000
4.250	0.000	0.000	0.000	0.000	0.000
4.500	0.000	0.000	0.000	0.000	0.000
4.750	0.000	0.000	0.000	0.000	0.000
5.000	0.000	0.000	0.000	0.000	0.000
5.250	0.000	0.000	0.000	0.000	0.000
5.500	0.000	0.000	0.000	0.000	0.000
5.750	0.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000	0.000
6.250	0.000	0.000	0.000	0.001	0.001
6.500	0.001	0.001	0.001	0.001	0.001
6.750	0.001	0.001	0.001	0.001	0.001
7.000	0.001	0.001	0.001	0.001	0.001
7.250	0.001	0.001	0.001	0.001	0.001
7.500	0.001	0.001	0.001	0.001	0.001
7.750	0.001	0.001	0.001	0.001	0.001
8.000	0.001	0.001	0.001	0.001	0.001
8.250	0.001	0.001	0.001	0.001	0.001
8.500	0.002	0.002	0.002	0.002	0.002
8.750	0.002	0.002	0.002	0.002	0.002
9.000	0.002	0.002	0.002	0.002	0.002
9.250	0.003	0.003	0.003	0.003	0.003
9.500	0.003	0.003	0.003	0.003	0.003
9.750	0.004	0.004	0.004	0.004	0.004
10.000	0.004	0.005	0.005	0.005	0.005

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	0.006	0.006	0.006	0.006	0.007
10.500	0.007	0.007	0.007	0.008	0.008
10.750	0.008	0.008	0.009	0.009	0.009
11.000	0.010	0.010	0.010	0.011	0.011
11.250	0.011	0.012	0.012	0.013	0.013
11.500	0.014	0.015	0.015	0.016	0.018
11.750	0.020	0.023	0.026	0.031	0.038
12.000	0.045	0.053	0.058	0.064	0.067
12.250	0.070	0.072	0.074	0.075	0.076
12.500	0.077	0.078	0.079	0.079	0.080
12.750	0.081	0.081	0.081	0.082	0.082
13.000	0.083	0.083	0.084	0.084	0.084
13.250	0.085	0.085	0.085	0.086	0.086
13.500	0.086	0.086	0.087	0.087	0.087
13.750	0.087	0.088	0.088	0.088	0.088
14.000	0.088	0.089	0.089	0.089	0.089
14.250	0.089	0.089	0.090	0.090	0.090
14.500	0.090	0.090	0.090	0.090	0.091
14.750	0.091	0.091	0.091	0.091	0.091
15.000	0.091	0.092	0.092	0.092	0.092
15.250	0.092	0.092	0.092	0.092	0.092
15.500	0.092	0.093	0.093	0.093	0.093
15.750	0.093	0.093	0.093	0.093	0.093
16.000	0.093	0.093	0.093	0.093	0.093
16.250	0.094	0.094	0.094	0.094	0.094
16.500	0.094	0.094	0.094	0.094	0.094
16.750	0.094	0.094	0.094	0.094	0.094
17.000	0.094	0.094	0.094	0.094	0.094
17.250	0.094	0.094	0.095	0.095	0.095
17.500	0.095	0.095	0.095	0.095	0.095
17.750	0.095	0.095	0.095	0.095	0.095
18.000	0.095	0.095	0.095	0.095	0.095
18.250	0.095	0.095	0.095	0.095	0.095
18.500	0.095	0.095	0.095	0.095	0.095
18.750	0.095	0.095	0.095	0.095	0.095
19.000	0.095	0.095	0.095	0.095	0.095
19.250	0.095	0.095	0.095	0.095	0.095
19.500	0.095	0.095	0.095	0.095	0.095
19.750	0.095	0.095	0.095	0.095	0.095
20.000	0.095	0.095	0.095	0.095	0.095
20.250	0.095	0.095	0.095	0.095	0.095

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.095	0.095	0.095	0.095	0.095
20.750	0.094	0.094	0.094	0.094	0.094
21.000	0.094	0.094	0.094	0.094	0.094
21.250	0.094	0.094	0.094	0.094	0.094
21.500	0.094	0.094	0.094	0.094	0.094
21.750	0.094	0.094	0.094	0.094	0.094
22.000	0.094	0.094	0.094	0.094	0.094
22.250	0.094	0.094	0.094	0.094	0.093
22.500	0.093	0.093	0.093	0.093	0.093
22.750	0.093	0.093	0.093	0.093	0.093
23.000	0.093	0.093	0.093	0.093	0.093
23.250	0.093	0.093	0.093	0.093	0.093
23.500	0.093	0.093	0.093	0.093	0.093
23.750	0.093	0.093	0.093	0.092	0.092
24.000	0.092	0.092	0.092	0.092	0.092
24.250	0.092	0.092	0.092	0.092	0.092
24.500	0.091	0.091	0.091	0.091	0.091
24.750	0.091	0.091	0.091	0.090	0.090
25.000	0.090	0.090	0.090	0.090	0.090
25.250	0.090	0.089	0.089	0.089	0.089
25.500	0.089	0.089	0.089	0.089	0.088
25.750	0.088	0.088	0.088	0.088	0.088
26.000	0.088	0.088	0.087	0.087	0.087
26.250	0.087	0.087	0.087	0.087	0.087
26.500	0.087	0.086	0.086	0.086	0.086
26.750	0.086	0.086	0.086	0.086	0.085
27.000	0.085	0.085	0.085	0.085	0.085
27.250	0.085	0.085	0.084	0.084	0.084
27.500	0.084	0.084	0.084	0.084	0.084
27.750	0.084	0.083	0.083	0.083	0.083
28.000	0.083	0.083	0.083	0.083	0.082
28.250	0.082	0.082	0.082	0.082	0.082
28.500	0.082	0.082	0.082	0.081	0.081
28.750	0.081	0.081	0.081	0.081	0.081
29.000	0.081	0.080	0.080	0.080	0.080
29.250	0.080	0.080	0.080	0.080	0.080
29.500	0.079	0.079	0.079	0.079	0.079
29.750	0.079	0.079	0.079	0.079	0.078
30.000	0.078	0.078	0.078	0.078	0.078
30.250	0.078	0.078	0.078	0.077	0.077
30.500	0.077	0.077	0.077	0.077	0.077

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
30.750	0.077	0.077	0.076	0.076	0.076
31.000	0.076	0.076	0.076	0.076	0.076
31.250	0.076	0.075	0.075	0.075	0.075
31.500	0.075	0.075	0.075	0.075	0.074
31.750	0.074	0.074	0.074	0.074	0.074
32.000	0.074	0.073	0.073	0.073	0.073
32.250	0.073	0.073	0.073	0.073	0.072
32.500	0.072	0.072	0.072	0.072	0.072
32.750	0.072	0.072	0.071	0.071	0.071
33.000	0.071	0.071	0.071	0.071	0.070
33.250	0.070	0.070	0.070	0.070	0.070
33.500	0.070	0.070	0.069	0.069	0.069
33.750	0.069	0.069	0.069	0.069	0.069
34.000	0.068	0.068	0.068	0.068	0.068
34.250	0.068	0.068	0.068	0.067	0.067
34.500	0.067	0.067	0.067	0.067	0.067
34.750	0.067	0.066	0.066	0.066	0.066
35.000	0.066	0.066	0.066	0.066	0.065
35.250	0.065	0.065	0.065	0.065	0.065
35.500	0.065	0.065	0.064	0.064	0.064
35.750	0.064	0.064	0.064	0.064	0.064
36.000	0.063	0.063	0.063	0.063	0.063
36.250	0.063	0.063	0.063	0.063	0.062
36.500	0.062	0.062	0.062	0.062	0.062
36.750	0.062	0.062	0.061	0.061	0.061
37.000	0.061	0.061	0.061	0.061	0.061
37.250	0.061	0.060	0.060	0.060	0.060
37.500	0.060	0.060	0.060	0.060	0.060
37.750	0.059	0.059	0.059	0.059	0.059
38.000	0.059	0.059	0.059	0.059	0.059
38.250	0.058	0.058	0.058	0.058	0.058
38.500	0.058	0.058	0.058	0.058	0.058
38.750	0.057	0.057	0.057	0.057	0.057
39.000	0.057	0.057	0.057	0.057	0.057
39.250	0.057	0.056	0.056	0.056	0.056
39.500	0.056	0.056	0.056	0.056	0.056
39.750	0.056	0.056	0.056	0.055	0.055
40.000	0.055	0.055	0.055	0.055	0.055
40.250	0.055	0.055	0.055	0.055	0.055
40.500	0.055	0.054	0.054	0.054	0.054
40.750	0.054	0.054	0.054	0.054	0.054

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
41.000	0.053	0.053	0.053	0.053	0.053
41.250	0.053	0.053	0.053	0.053	0.052
41.500	0.052	0.052	0.052	0.052	0.052
41.750	0.052	0.052	0.052	0.051	0.051
42.000	0.051	0.051	0.051	0.051	0.051
42.250	0.051	0.051	0.051	0.050	0.050
42.500	0.050	0.050	0.050	0.050	0.050
42.750	0.050	0.050	0.049	0.049	0.049
43.000	0.049	0.049	0.049	0.049	0.049
43.250	0.049	0.049	0.048	0.048	0.048
43.500	0.048	0.048	0.048	0.048	0.048
43.750	0.048	0.047	0.047	0.047	0.047
44.000	0.047	0.047	0.047	0.047	0.047
44.250	0.047	0.046	0.046	0.046	0.046
44.500	0.046	0.046	0.046	0.046	0.046
44.750	0.046	0.045	0.045	0.045	0.045
45.000	0.045	0.045	0.045	0.045	0.045
45.250	0.044	0.044	0.044	0.044	0.044
45.500	0.044	0.044	0.044	0.044	0.044
45.750	0.044	0.043	0.043	0.043	0.043
46.000	0.043	0.043	0.043	0.043	0.043
46.250	0.043	0.042	0.042	0.042	0.042
46.500	0.042	0.042	0.042	0.042	0.042
46.750	0.042	0.041	0.041	0.041	0.041
47.000	0.041	0.041	0.041	0.041	0.041
47.250	0.041	0.040	0.040	0.040	0.040
47.500	0.040	0.040	0.040	0.040	0.040
47.750	0.040	0.039	0.039	0.039	0.039
48.000	0.039	0.039	0.039	0.039	0.039
48.250	0.039	0.038	0.038	0.038	0.038
48.500	0.038	0.038	0.038	0.038	0.038
48.750	0.038	0.037	0.037	0.037	0.037
49.000	0.037	0.037	0.037	0.037	0.037
49.250	0.037	0.036	0.036	0.036	0.036
49.500	0.036	0.036	0.036	0.036	0.036
49.750	0.036	0.036	0.035	0.035	0.035
50.000	0.035	0.035	0.035	0.035	0.035
50.250	0.035	0.035	0.034	0.034	0.034
50.500	0.034	0.034	0.034	0.034	0.034
50.750	0.034	0.034	0.034	0.033	0.033
51.000	0.033	0.033	0.033	0.033	0.033

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
51.250	0.033	0.033	0.033	0.033	0.032
51.500	0.032	0.032	0.032	0.032	0.032
51.750	0.032	0.032	0.032	0.032	0.032
52.000	0.031	0.031	0.031	0.031	0.031
52.250	0.031	0.031	0.031	0.031	0.031
52.500	0.031	0.031	0.030	0.030	0.030
52.750	0.030	0.030	0.030	0.030	0.030
53.000	0.030	0.030	0.030	0.029	0.029
53.250	0.029	0.029	0.029	0.029	0.029
53.500	0.029	0.029	0.029	0.029	0.029
53.750	0.028	0.028	0.028	0.028	0.028
54.000	0.028	0.028	0.028	0.028	0.028
54.250	0.028	0.027	0.027	0.027	0.027
54.500	0.027	0.027	0.027	0.027	0.027
54.750	0.027	0.027	0.026	0.026	0.026
55.000	0.026	0.026	0.026	0.026	0.026
55.250	0.026	0.026	0.026	0.025	0.025
55.500	0.025	0.025	0.025	0.025	0.025
55.750	0.025	0.025	0.025	0.025	0.025
56.000	0.024	0.024	0.024	0.024	0.024
56.250	0.024	0.024	0.024	0.024	0.024
56.500	0.024	0.024	0.023	0.023	0.023
56.750	0.023	0.023	0.023	0.023	0.023
57.000	0.023	0.023	0.023	0.022	0.022
57.250	0.022	0.022	0.022	0.022	0.022
57.500	0.022	0.022	0.022	0.022	0.022
57.750	0.022	0.021	0.021	0.021	0.021
58.000	0.021	0.021	0.021	0.021	0.021
58.250	0.021	0.021	0.021	0.021	0.020
58.500	0.020	0.020	0.020	0.020	0.020
58.750	0.020	0.020	0.020	0.020	0.020
59.000	0.020	0.019	0.019	0.019	0.019
59.250	0.019	0.019	0.019	0.019	0.019
59.500	0.019	0.019	0.019	0.019	0.018
59.750	0.018	0.018	0.018	0.018	0.018
60.000	0.018	0.018	0.018	0.018	0.018
60.250	0.018	0.018	0.018	0.017	0.017
60.500	0.017	0.017	0.017	0.017	0.017
60.750	0.017	0.017	0.017	0.017	0.017
61.000	0.017	0.016	0.016	0.016	0.016
61.250	0.016	0.016	0.016	0.016	0.016

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
61.500	0.016	0.016	0.016	0.016	0.015
61.750	0.015	0.015	0.015	0.015	0.015
62.000	0.015	0.015	0.015	0.015	0.015
62.250	0.015	0.015	0.014	0.014	0.014
62.500	0.014	0.014	0.014	0.014	0.014
62.750	0.014	0.014	0.014	0.014	0.014
63.000	0.013	0.013	0.013	0.013	0.013
63.250	0.013	0.013	0.013	0.013	0.013
63.500	0.013	0.013	0.013	0.013	0.012
63.750	0.012	0.012	0.012	0.012	0.012
64.000	0.012	0.012	0.012	0.012	0.012
64.250	0.012	0.012	0.012	0.012	0.011
64.500	0.011	0.011	0.011	0.011	0.011
64.750	0.011	0.011	0.011	0.011	0.011
65.000	0.011	0.011	0.011	0.011	0.010
65.250	0.010	0.010	0.010	0.010	0.010
65.500	0.010	0.010	0.010	0.010	0.010
65.750	0.010	0.010	0.010	0.010	0.009
66.000	0.009	0.009	0.009	0.009	0.009
66.250	0.009	0.009	0.009	0.009	0.009
66.500	0.009	0.009	0.009	0.009	0.008
66.750	0.008	0.008	0.008	0.008	0.008
67.000	0.008	0.008	0.008	0.008	0.008
67.250	0.008	0.008	0.008	0.008	0.008
67.500	0.008	0.007	0.007	0.007	0.007
67.750	0.007	0.007	0.007	0.007	0.007
68.000	0.007	0.007	0.007	0.007	0.007
68.250	0.007	0.006	0.006	0.006	0.006
68.500	0.006	0.006	0.006	0.006	0.006
68.750	0.006	0.006	0.005	0.005	0.005
69.000	0.005	0.005	0.005	0.005	0.005
69.250	0.005	0.005	0.005	0.004	0.004
69.500	0.004	0.004	0.004	0.004	0.004
69.750	0.004	0.004	0.004	0.004	0.004
70.000	0.004	0.004	0.004	0.003	0.003
70.250	0.003	0.003	0.003	0.003	0.003
70.500	0.003	0.003	0.003	0.003	0.003
70.750	0.003	0.003	0.003	0.003	0.003
71.000	0.003	0.003	0.002	0.002	0.002
71.250	0.002	0.002	0.002	0.002	0.002
71.500	0.002	0.002	0.002	0.002	0.002

3rd Street Basin Analysis

Subsection: Time vs. Volume
Label: Extended Detention

Return Event: 0 years
Storm Event: WQstorm

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
71.750	0.002	0.002	0.002	0.002	0.002
72.000	0.002	(N/A)	(N/A)	(N/A)	(N/A)

3rd Street Basin Analysis

Subsection: Elevation-Area Volume Curve
Label: Extended Detention

Return Event: 0 years
Storm Event: Type II 24 hour

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
578.50	0.0	0.000	0.000	0.000	0.000
579.00	0.0	0.040	0.040	0.007	0.007
580.00	0.0	0.056	0.143	0.048	0.054
580.10	0.0	0.087	0.213	0.007	0.062
580.50	0.0	0.109	0.293	0.039	0.101
581.00	0.0	0.123	0.348	0.058	0.159
582.00	0.0	0.153	0.413	0.138	0.296
583.00	0.0	0.186	0.508	0.169	0.466
584.00	0.0	0.203	0.583	0.194	0.660

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	578.50 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	584.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward + Reverse	Culvert - 1	582.50	584.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	578.50	584.00
Culvert-Circular	Culvert - 1	Forward + Reverse	TW	577.00	584.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	3
Elevation	578.50 ft
Orifice Diameter	0.50 in
Orifice Coefficient	0.660

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	582.50 ft
Orifice Area	2.6 ft²
Orifice Coefficient	0.600
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	18.00 in
Length	83.00 ft
Length (Computed Barrel)	83.00 ft
Slope (Computed)	0.010 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.018
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900

3rd Street Basin Analysis

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

Inlet Control Data	
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	578.64 ft	T1 Flow	7.58 ft³/s
T2 Elevation	578.79 ft	T2 Flow	8.66 ft³/s

3rd Street Basin Analysis

Subsection: Individual Outlet Curves | Return Event: 0 years
Label: Composite Outlet Structure - 1 | Storm Event: Type II 24 hour

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.50	0.00	0.00	0.00	0.00	0.00	0.00	577.70	0.00
578.75	0.01	578.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.00	0.01	579.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.25	0.02	579.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.50	0.02	579.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.75	0.02	579.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.00	0.03	580.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.25	0.03	580.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.50	0.03	580.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.75	0.03	580.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.00	0.03	581.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.25	0.04	581.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.50	0.04	581.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.75	0.04	581.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.00	0.04	582.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.25	0.04	582.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.50	0.04	582.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.75	0.04	582.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
583.00	0.05	583.00	578.57	578.57	0.00	0.00	577.70	0.00
583.25	0.04	583.25	579.25	579.25	0.00	0.00	577.70	0.00
583.50	0.04	583.50	579.76	579.76	0.00	0.00	577.70	0.00
583.75	0.04	583.75	580.27	580.27	0.00	0.00	577.70	0.00
584.00	0.04	584.00	580.79	580.79	0.00	0.00	577.70	0.00

Message
WS below an invert; no flow.
H =.23
H =.48
H =.73
H =.98
H =1.23
H =1.48
H =1.73
H =1.98
H =2.23
H =2.48

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
H =2.73
H =2.98
H =3.23
H =3.48
H =3.73
H =3.98
H =4.23
H =4.43
H =4.00
H =3.74
H =3.48
H =3.21

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.50	0.00	0.00	0.00	0.00	0.00	0.00	577.70	0.00
578.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.75	2.44	582.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
583.00	6.89	583.00	Free Outfall	578.57	0.00	0.00	577.70	0.00
583.25	10.67	583.25	Free Outfall	579.25	0.00	0.00	577.70	0.00
583.50	12.32	583.50	Free Outfall	579.76	0.00	0.00	577.70	0.00
583.75	13.78	583.75	Free Outfall	580.27	0.00	0.00	577.70	0.00
584.00	15.09	584.00	Free Outfall	580.79	0.00	0.00	577.70	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.25ft
Weir: H =0.5ft
Orifice: H =.75; Riser orifice equation controlling.
Orifice: H =1.00; Riser orifice equation controlling.
Orifice: H =1.25; Riser orifice equation controlling.
Orifice: H =1.50; Riser orifice equation controlling.

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 11.09 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
578.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.75	2.48	577.70	577.70	577.70	0.00	0.00	577.70	0.00
583.00	6.93	578.57	577.70	577.70	0.00	0.01	577.70	0.00
583.25	10.71	579.25	577.70	577.70	0.00	0.00	577.70	0.00
583.50	12.36	579.76	577.70	577.70	0.00	0.01	577.70	0.00
583.75	13.81	580.27	577.70	577.70	0.00	0.00	577.70	0.00
584.00	15.13	580.79	577.70	577.70	0.00	0.00	577.70	0.00

Message
WS below an invert; no flow.
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 11.09 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
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FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
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FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 11.09 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .457ft Dcr= 1.019ft H.JUMP IN PIPE Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=.571ft HL=1.548ft Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=.760ft HL=2.061ft Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=.950ft HL=2.575ft Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=1.139ft HL=3.088ft Hev= .00ft

3rd Street Basin Analysis

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 0 years
Storm Event: Type II 24 hour

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
578.50	0.00	577.70	0.00	(no Q: Riser - 1,Orifice - 1,Culvert - 1)
578.75	0.01	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
579.00	0.01	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
579.25	0.02	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
579.50	0.02	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
579.75	0.02	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
580.00	0.03	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
580.25	0.03	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
580.50	0.03	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
580.75	0.03	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
581.00	0.03	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
581.25	0.04	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
581.50	0.04	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
581.75	0.04	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
582.00	0.04	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
582.25	0.04	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
582.50	0.04	577.70	0.00	Orifice - 1,Culvert - 1 (no Q: Riser - 1)
582.75	2.48	577.70	0.00	Riser - 1,Orifice - 1,Culvert - 1
583.00	6.93	577.70	0.00	
583.25	10.71	577.70	0.00	
583.50	12.36	577.70	0.00	
583.75	13.81	577.70	0.00	
584.00	15.13	577.70	0.00	

Composite Outflow Summary

Contributing Structures
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1

3rd Street Basin Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

Peak Discharge	0.03 ft³/s
Time to Peak	19.000 hours
Hydrograph Volume	0.127 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
4.200	0.00	0.00	0.00	0.00	0.00
4.450	0.00	0.00	0.00	0.00	0.00
4.700	0.00	0.00	0.00	0.00	0.00
4.950	0.00	0.00	0.00	0.00	0.00
5.200	0.00	0.00	0.00	0.00	0.00
5.450	0.00	0.00	0.01	0.01	0.01
5.700	0.01	0.01	0.01	0.01	0.01
5.950	0.01	0.01	0.01	0.01	0.01
6.200	0.01	0.01	0.01	0.01	0.01
6.450	0.01	0.01	0.01	0.01	0.01
6.700	0.01	0.01	0.01	0.01	0.01
6.950	0.01	0.01	0.01	0.01	0.01
7.200	0.01	0.01	0.01	0.01	0.01
7.450	0.01	0.01	0.01	0.01	0.01
7.700	0.01	0.01	0.01	0.01	0.01
7.950	0.01	0.01	0.01	0.01	0.01
8.200	0.01	0.01	0.01	0.01	0.01
8.450	0.01	0.01	0.01	0.01	0.01
8.700	0.01	0.01	0.01	0.01	0.01
8.950	0.01	0.01	0.01	0.01	0.01
9.200	0.01	0.01	0.01	0.01	0.01
9.450	0.01	0.01	0.01	0.01	0.01
9.700	0.01	0.01	0.01	0.01	0.01
9.950	0.01	0.01	0.01	0.01	0.01
10.200	0.01	0.01	0.01	0.01	0.01
10.450	0.02	0.02	0.02	0.02	0.02
10.700	0.02	0.02	0.02	0.02	0.02
10.950	0.02	0.02	0.02	0.02	0.02
11.200	0.02	0.02	0.02	0.02	0.02
11.450	0.02	0.02	0.02	0.02	0.02
11.700	0.02	0.02	0.02	0.02	0.02
11.950	0.02	0.02	0.03	0.03	0.03
12.200	0.03	0.03	0.03	0.03	0.03
12.450	0.03	0.03	0.03	0.03	0.03
12.700	0.03	0.03	0.03	0.03	0.03
12.950	0.03	0.03	0.03	0.03	0.03
13.200	0.03	0.03	0.03	0.03	0.03

3rd Street Basin Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
13.450	0.03	0.03	0.03	0.03	0.03
13.700	0.03	0.03	0.03	0.03	0.03
13.950	0.03	0.03	0.03	0.03	0.03
14.200	0.03	0.03	0.03	0.03	0.03
14.450	0.03	0.03	0.03	0.03	0.03
14.700	0.03	0.03	0.03	0.03	0.03
14.950	0.03	0.03	0.03	0.03	0.03
15.200	0.03	0.03	0.03	0.03	0.03
15.450	0.03	0.03	0.03	0.03	0.03
15.700	0.03	0.03	0.03	0.03	0.03
15.950	0.03	0.03	0.03	0.03	0.03
16.200	0.03	0.03	0.03	0.03	0.03
16.450	0.03	0.03	0.03	0.03	0.03
16.700	0.03	0.03	0.03	0.03	0.03
16.950	0.03	0.03	0.03	0.03	0.03
17.200	0.03	0.03	0.03	0.03	0.03
17.450	0.03	0.03	0.03	0.03	0.03
17.700	0.03	0.03	0.03	0.03	0.03
17.950	0.03	0.03	0.03	0.03	0.03
18.200	0.03	0.03	0.03	0.03	0.03
18.450	0.03	0.03	0.03	0.03	0.03
18.700	0.03	0.03	0.03	0.03	0.03
18.950	0.03	0.03	0.03	0.03	0.03
19.200	0.03	0.03	0.03	0.03	0.03
19.450	0.03	0.03	0.03	0.03	0.03
19.700	0.03	0.03	0.03	0.03	0.03
19.950	0.03	0.03	0.03	0.03	0.03
20.200	0.03	0.03	0.03	0.03	0.03
20.450	0.03	0.03	0.03	0.03	0.03
20.700	0.03	0.03	0.03	0.03	0.03
20.950	0.03	0.03	0.03	0.03	0.03
21.200	0.03	0.03	0.03	0.03	0.03
21.450	0.03	0.03	0.03	0.03	0.03
21.700	0.03	0.03	0.03	0.03	0.03
21.950	0.03	0.03	0.03	0.03	0.03
22.200	0.03	0.03	0.03	0.03	0.03
22.450	0.03	0.03	0.03	0.03	0.03
22.700	0.03	0.03	0.03	0.03	0.03
22.950	0.03	0.03	0.03	0.03	0.03
23.200	0.03	0.03	0.03	0.03	0.03
23.450	0.03	0.03	0.03	0.03	0.03
23.700	0.03	0.03	0.03	0.03	0.03

3rd Street Basin Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
23.950	0.03	0.03	0.03	0.03	0.03
24.200	0.03	0.03	0.03	0.03	0.03
24.450	0.03	0.03	0.03	0.03	0.03
24.700	0.03	0.03	0.03	0.03	0.03
24.950	0.03	0.03	0.03	0.03	0.03
25.200	0.03	0.03	0.03	0.03	0.03
25.450	0.03	0.03	0.03	0.03	0.03
25.700	0.03	0.03	0.03	0.03	0.03
25.950	0.03	0.03	0.03	0.03	0.03
26.200	0.03	0.03	0.03	0.03	0.03
26.450	0.03	0.03	0.03	0.03	0.03
26.700	0.03	0.03	0.03	0.03	0.03
26.950	0.03	0.03	0.03	0.03	0.03
27.200	0.03	0.03	0.03	0.03	0.03
27.450	0.03	0.03	0.03	0.03	0.03
27.700	0.03	0.03	0.03	0.03	0.03
27.950	0.03	0.03	0.03	0.03	0.03
28.200	0.03	0.03	0.03	0.03	0.03
28.450	0.03	0.03	0.03	0.03	0.03
28.700	0.03	0.03	0.03	0.03	0.03
28.950	0.03	0.03	0.03	0.03	0.03
29.200	0.03	0.03	0.03	0.03	0.03
29.450	0.03	0.03	0.03	0.03	0.03
29.700	0.03	0.03	0.03	0.03	0.03
29.950	0.03	0.03	0.03	0.03	0.03
30.200	0.03	0.03	0.03	0.03	0.03
30.450	0.03	0.03	0.03	0.03	0.03
30.700	0.03	0.03	0.03	0.03	0.03
30.950	0.03	0.03	0.03	0.03	0.03
31.200	0.03	0.03	0.03	0.03	0.03
31.450	0.03	0.03	0.03	0.03	0.03
31.700	0.03	0.03	0.03	0.03	0.03
31.950	0.03	0.03	0.03	0.03	0.03
32.200	0.03	0.03	0.03	0.03	0.03
32.450	0.03	0.03	0.03	0.03	0.03
32.700	0.03	0.03	0.03	0.03	0.03
32.950	0.03	0.03	0.03	0.03	0.03
33.200	0.03	0.03	0.03	0.03	0.03
33.450	0.03	0.03	0.03	0.03	0.03
33.700	0.03	0.03	0.03	0.03	0.03
33.950	0.03	0.03	0.03	0.03	0.03
34.200	0.03	0.03	0.03	0.03	0.03

3rd Street Basin Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
34.450	0.03	0.03	0.03	0.03	0.03
34.700	0.03	0.03	0.03	0.03	0.03
34.950	0.03	0.03	0.03	0.03	0.03
35.200	0.03	0.03	0.03	0.03	0.03
35.450	0.03	0.03	0.03	0.03	0.03
35.700	0.03	0.03	0.03	0.03	0.03
35.950	0.03	0.03	0.03	0.03	0.03
36.200	0.03	0.03	0.03	0.03	0.03
36.450	0.03	0.03	0.03	0.03	0.03
36.700	0.03	0.03	0.03	0.03	0.03
36.950	0.03	0.03	0.03	0.03	0.03
37.200	0.03	0.03	0.03	0.03	0.03
37.450	0.03	0.03	0.03	0.03	0.03
37.700	0.03	0.03	0.03	0.03	0.03
37.950	0.03	0.03	0.03	0.03	0.03
38.200	0.03	0.03	0.03	0.03	0.03
38.450	0.03	0.03	0.03	0.03	0.03
38.700	0.03	0.03	0.03	0.03	0.03
38.950	0.03	0.03	0.03	0.03	0.03
39.200	0.03	0.03	0.03	0.03	0.03
39.450	0.03	0.03	0.03	0.03	0.03
39.700	0.03	0.03	0.03	0.03	0.03
39.950	0.03	0.03	0.03	0.03	0.03
40.200	0.03	0.03	0.03	0.03	0.03
40.450	0.03	0.03	0.03	0.03	0.03
40.700	0.03	0.03	0.03	0.03	0.03
40.950	0.03	0.03	0.03	0.03	0.03
41.200	0.03	0.03	0.03	0.03	0.03
41.450	0.03	0.03	0.03	0.03	0.03
41.700	0.03	0.03	0.03	0.03	0.03
41.950	0.03	0.03	0.03	0.03	0.03
42.200	0.03	0.03	0.03	0.03	0.03
42.450	0.03	0.03	0.03	0.03	0.03
42.700	0.03	0.03	0.03	0.03	0.03
42.950	0.03	0.03	0.03	0.03	0.03
43.200	0.03	0.03	0.03	0.03	0.03
43.450	0.03	0.03	0.03	0.03	0.03
43.700	0.03	0.03	0.03	0.03	0.03
43.950	0.03	0.03	0.03	0.03	0.03
44.200	0.03	0.02	0.02	0.02	0.02
44.450	0.02	0.02	0.02	0.02	0.02
44.700	0.02	0.02	0.02	0.02	0.02

3rd Street Basin Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
44.950	0.02	0.02	0.02	0.02	0.02
45.200	0.02	0.02	0.02	0.02	0.02
45.450	0.02	0.02	0.02	0.02	0.02
45.700	0.02	0.02	0.02	0.02	0.02
45.950	0.02	0.02	0.02	0.02	0.02
46.200	0.02	0.02	0.02	0.02	0.02
46.450	0.02	0.02	0.02	0.02	0.02
46.700	0.02	0.02	0.02	0.02	0.02
46.950	0.02	0.02	0.02	0.02	0.02
47.200	0.02	0.02	0.02	0.02	0.02
47.450	0.02	0.02	0.02	0.02	0.02
47.700	0.02	0.02	0.02	0.02	0.02
47.950	0.02	0.02	0.02	0.02	0.02
48.200	0.02	0.02	0.02	0.02	0.02
48.450	0.02	0.02	0.02	0.02	0.02
48.700	0.02	0.02	0.02	0.02	0.02
48.950	0.02	0.02	0.02	0.02	0.02
49.200	0.02	0.02	0.02	0.02	0.02
49.450	0.02	0.02	0.02	0.02	0.02
49.700	0.02	0.02	0.02	0.02	0.02
49.950	0.02	0.02	0.02	0.02	0.02
50.200	0.02	0.02	0.02	0.02	0.02
50.450	0.02	0.02	0.02	0.02	0.02
50.700	0.02	0.02	0.02	0.02	0.02
50.950	0.02	0.02	0.02	0.02	0.02
51.200	0.02	0.02	0.02	0.02	0.02
51.450	0.02	0.02	0.02	0.02	0.02
51.700	0.02	0.02	0.02	0.02	0.02
51.950	0.02	0.02	0.02	0.02	0.02
52.200	0.02	0.02	0.02	0.02	0.02
52.450	0.02	0.02	0.02	0.02	0.02
52.700	0.02	0.02	0.02	0.02	0.02
52.950	0.02	0.02	0.02	0.02	0.02
53.200	0.02	0.02	0.02	0.02	0.02
53.450	0.02	0.02	0.02	0.02	0.02
53.700	0.02	0.02	0.02	0.02	0.02
53.950	0.02	0.02	0.02	0.02	0.02
54.200	0.02	0.02	0.02	0.02	0.02
54.450	0.02	0.02	0.02	0.02	0.02
54.700	0.02	0.02	0.02	0.02	0.02
54.950	0.02	0.02	0.02	0.02	0.02
55.200	0.02	0.02	0.02	0.02	0.02

3rd Street Basin Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
55.450	0.02	0.02	0.02	0.02	0.02
55.700	0.02	0.02	0.02	0.02	0.02
55.950	0.02	0.02	0.02	0.02	0.02
56.200	0.02	0.02	0.02	0.02	0.02
56.450	0.02	0.02	0.02	0.02	0.02
56.700	0.02	0.02	0.02	0.02	0.02
56.950	0.02	0.02	0.02	0.02	0.02
57.200	0.02	0.02	0.02	0.02	0.02
57.450	0.02	0.02	0.02	0.02	0.02
57.700	0.02	0.02	0.02	0.02	0.02
57.950	0.02	0.02	0.02	0.02	0.02
58.200	0.02	0.02	0.02	0.02	0.02
58.450	0.02	0.02	0.02	0.02	0.02
58.700	0.02	0.02	0.02	0.02	0.02
58.950	0.02	0.02	0.02	0.02	0.02
59.200	0.02	0.02	0.02	0.02	0.02
59.450	0.02	0.02	0.02	0.02	0.02
59.700	0.02	0.02	0.02	0.02	0.02
59.950	0.02	0.02	0.02	0.02	0.02
60.200	0.02	0.02	0.02	0.02	0.02
60.450	0.02	0.02	0.02	0.02	0.02
60.700	0.02	0.02	0.02	0.02	0.02
60.950	0.02	0.02	0.02	0.02	0.02
61.200	0.02	0.02	0.02	0.02	0.02
61.450	0.02	0.02	0.02	0.02	0.02
61.700	0.02	0.02	0.02	0.02	0.02
61.950	0.02	0.02	0.02	0.02	0.02
62.200	0.02	0.02	0.02	0.02	0.02
62.450	0.02	0.02	0.02	0.02	0.02
62.700	0.02	0.02	0.02	0.02	0.02
62.950	0.02	0.02	0.02	0.02	0.02
63.200	0.02	0.02	0.02	0.02	0.02
63.450	0.02	0.02	0.02	0.02	0.02
63.700	0.02	0.02	0.02	0.02	0.02
63.950	0.02	0.02	0.02	0.02	0.02
64.200	0.02	0.02	0.02	0.02	0.02
64.450	0.02	0.02	0.02	0.02	0.02
64.700	0.02	0.02	0.02	0.02	0.02
64.950	0.02	0.02	0.02	0.02	0.02
65.200	0.02	0.02	0.02	0.02	0.02
65.450	0.02	0.02	0.02	0.02	0.02
65.700	0.02	0.02	0.02	0.02	0.02

3rd Street Basin Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 0 years
Label: Extended Detention (OUT) Storm Event: WQstorm

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
65.950	0.02	0.02	0.02	0.02	0.02
66.200	0.02	0.02	0.02	0.02	0.02
66.450	0.02	0.02	0.02	0.02	0.02
66.700	0.02	0.02	0.02	0.02	0.02
66.950	0.02	0.02	0.02	0.02	0.02
67.200	0.02	0.02	0.02	0.02	0.02
67.450	0.02	0.02	0.02	0.02	0.02
67.700	0.02	0.02	0.02	0.02	0.02
67.950	0.02	0.02	0.02	0.02	0.02
68.200	0.01	0.01	0.01	0.01	0.01
68.450	0.01	0.01	0.01	0.01	0.01
68.700	0.01	0.01	0.01	0.01	0.01
68.950	0.01	0.01	0.01	0.01	0.01
69.200	0.01	0.01	0.01	0.01	0.01
69.450	0.01	0.01	0.01	0.01	0.01
69.700	0.01	0.01	0.01	0.01	0.01
69.950	0.01	0.01	0.01	0.01	0.01
70.200	0.01	0.01	0.01	0.01	0.01
70.450	0.01	0.01	0.01	0.01	0.01
70.700	0.01	0.01	0.01	0.01	0.01
70.950	0.01	0.01	0.01	0.01	0.01
71.200	0.01	0.01	0.01	0.01	0.01
71.450	0.01	0.01	0.01	0.01	0.01
71.700	0.01	0.01	0.01	0.01	0.01
71.950	0.01	0.01	(N/A)	(N/A)	(N/A)

3rd Street Basin Analysis

Index

3rd Street Basin Water Quality Calculations

	Made By:	AReede	Date:	12/2/2011
	Checked By:	BHess	Date:	12/2/2011

Water Quality:	WQv= (PAC)/12		From ODOT L&D2 1115.4		
	Precipitation	0.75	in		
	A - Drainage Area	1.75	acres		
	Cq	0.9	when drainage area is impervious		
Water Quality Volume	WQv =	0.0984	ac*ft		
Extended Detention Volume (EDV) =	120%*WQV	0.1181	ac*ft		
Required Forebay Volume (RFV)	10% of WQv	0.0098	ac*ft		
Actual WQv Released	EDV - RFV	0.1083	ac*ft		
Provided Forebay Volume (assuming trapezoidal configuration)	Bottom of Basin Elevation	579.5	Top of Berm Elevation	580	
	Area of bottom of Forebay (ac)	0.0201	Area of Top of Forebay (ac)	0.0342	
	Provided Forebay Volume	0.0134	ac*ft		
	Forebay % of Basin	11.36	%		
	Check for WQv provided	OK			

Drainage Time			
	16 hour WQ flow (see enclosed spreadsheet)	4.05	ft^3/s
16 hour check	16 hour volume	729	ft^3
	50% of WQv (not to exceed)	2573	ft^3
	Check for 16 hour compliance	OK	
48 hour check	48 hour WQ flow (see enclosed spreadsheet)	22.46	
	48 hour volume	4043	
	100% of WQv (not to exceed)	5146	
	Check for 48 hour compliance	OK	

Emergency Spillway Calculation	Weir Equation	Q=3.367BH^3/2	
	Q10	6.35	cfs
	B (Weir length)	6	ft
	H=	0.46	ft
	Top of Embankment	584	
	Invert of Emergency Spillway	583.5	
	Available Depth	0.5	
	Check for emergency spillway depth	OK	

Anti-Seep Collar	From ODOT L&D 2 1117.4.1.2		
	Y- Depth of water at spillway crest,	4.01	ft
	Z-slope of upstream face of embankment	4	
	S-slope of outfall pipe	0.0097	
	Length of Saturation Seepage length	33.4	ft
	increase	5.0	ft
	W-Width of Collar	6	
	D - Diameter of Conduit	2	
	P - Projection of Collar (P=W-D)	4	
	# of collars	1	
	Minimum 2 collars at minimum spacing 10'.		

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Element Details			
ID	74	End	48.000 hours
Label	Minimum Drain Time - 1	Pond Node	Extended Detention
Start	0.000 hours	Outlet Structure	Composite Outlet Structure - 1
Increment	1.000 hours		

Notes

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: User Notifications

Label: Minimum Drain Time - 1

User Notifications

Message Id	15
Scenario	wq
Element Type	Composite Outlet Structure
Element Id	59
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Kr (reverse flow entrance loss coefficient) was not specified. Kr was set to same value as Ke= 0.200 .
Source	Warning
Message Id	17
Scenario	wq
Element Type	Composite Outlet Structure
Element Id	59
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Elevation

Label: Minimum Drain Time - 1 (OUT)

Time vs. Elevation (ft)

Output Time increment = 3,600.000 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	580.45	580.42	580.40	580.37	580.35
5.000	580.33	580.30	580.28	580.26	580.23
10.000	580.20	580.17	580.15	580.12	580.09
15.000	580.07	580.04	580.01	579.98	579.94
20.000	579.90	579.86	579.82	579.78	579.75
25.000	579.71	579.67	579.63	579.59	579.56
30.000	579.52	579.48	579.45	579.41	579.37
35.000	579.34	579.30	579.27	579.23	579.20
40.000	579.16	579.13	579.10	579.06	579.03
45.000	579.00	578.95	578.90	578.86	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Volume

Label: Minimum Drain Time - 1 (OUT)

Time vs. Elevation (ft)

Output Time increment = 3,600.000 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	580.45	580.42	580.40	580.37	580.35
5.000	580.33	580.30	580.28	580.26	580.23
10.000	580.20	580.17	580.15	580.12	580.09
15.000	580.07	580.04	580.01	579.98	579.94
20.000	579.90	579.86	579.82	579.78	579.75
25.000	579.71	579.67	579.63	579.59	579.56
30.000	579.52	579.48	579.45	579.41	579.37
35.000	579.34	579.30	579.27	579.23	579.20
40.000	579.16	579.13	579.10	579.06	579.03
45.000	579.00	578.95	578.90	578.86	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Area Volume Curve

Label: Extended Detention

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
578.50	0.0	0.000	0.000	0.000	0.000
579.00	0.0	0.040	0.040	0.007	0.007
580.00	0.0	0.056	0.143	0.048	0.054
580.10	0.0	0.087	0.213	0.007	0.062
580.50	0.0	0.109	0.293	0.039	0.101
581.00	0.0	0.123	0.348	0.058	0.159
582.00	0.0	0.153	0.413	0.138	0.296
583.00	0.0	0.186	0.508	0.169	0.466
584.00	0.0	0.203	0.583	0.194	0.660

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	578.50 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	584.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward + Reverse	Culvert - 1	582.50	584.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	578.50	584.00
Culvert-Circular	Culvert - 1	Forward + Reverse	TW	577.00	584.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	3
Elevation	578.50 ft
Orifice Diameter	0.50 in
Orifice Coefficient	0.660

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	582.50 ft
Orifice Area	2.6 ft²
Orifice Coefficient	0.600
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	18.00 in
Length	83.00 ft
Length (Computed Barrel)	83.00 ft
Slope (Computed)	0.010 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.018
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Inlet Control Data	
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	578.64 ft	T1 Flow	7.58 ft³/s
T2 Elevation	578.79 ft	T2 Flow	8.66 ft³/s

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.50	0.00	0.00	0.00	0.00	0.00	0.00	577.70	0.00
578.75	0.01	578.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.00	0.01	579.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.25	0.02	579.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.50	0.02	579.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
579.75	0.02	579.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.00	0.03	580.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.25	0.03	580.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.50	0.03	580.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
580.75	0.03	580.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.00	0.03	581.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.25	0.04	581.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.50	0.04	581.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
581.75	0.04	581.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.00	0.04	582.00	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.25	0.04	582.25	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.50	0.04	582.50	Free Outfall	577.70	0.00	0.00	577.70	0.00
582.75	0.04	582.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
583.00	0.05	583.00	578.57	578.57	0.00	0.00	577.70	0.00
583.25	0.04	583.25	579.25	579.25	0.00	0.00	577.70	0.00
583.50	0.04	583.50	579.76	579.76	0.00	0.00	577.70	0.00
583.75	0.04	583.75	580.27	580.27	0.00	0.00	577.70	0.00
584.00	0.04	584.00	580.79	580.79	0.00	0.00	577.70	0.00

Message
WS below an invert; no flow.
H =.23
H =.48
H =.73
H =.98
H =1.23
H =1.48
H =1.73
H =1.98
H =2.23
H =2.48

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves

Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
H =2.73
H =2.98
H =3.23
H =3.48
H =3.73
H =3.98
H =4.23
H =4.43
H =4.00
H =3.74
H =3.48
H =3.21

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.50	0.00	0.00	0.00	0.00	0.00	0.00	577.70	0.00
578.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
579.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
580.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
581.75	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.00	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.25	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
582.75	2.44	582.75	Free Outfall	577.70	0.00	0.00	577.70	0.00
583.00	6.89	583.00	Free Outfall	578.57	0.00	0.00	577.70	0.00
583.25	10.67	583.25	Free Outfall	579.25	0.00	0.00	577.70	0.00
583.50	12.32	583.50	Free Outfall	579.76	0.00	0.00	577.70	0.00
583.75	13.78	583.75	Free Outfall	580.27	0.00	0.00	577.70	0.00
584.00	15.09	584.00	Free Outfall	580.79	0.00	0.00	577.70	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.25ft
Weir: H =0.5ft
Orifice: H =.75; Riser orifice equation controlling.
Orifice: H =1.00; Riser orifice equation controlling.
Orifice: H =1.25; Riser orifice equation controlling.
Orifice: H =1.50; Riser orifice equation controlling.

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 11.09 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
578.50	0.00	0.00	0.00	577.70	0.00	0.00	577.70	0.00
578.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
579.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
580.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
581.75	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.00	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.25	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.50	0.12	577.70	577.70	577.70	0.00	0.00	577.70	0.00
582.75	2.48	577.70	577.70	577.70	0.00	0.00	577.70	0.00
583.00	6.93	578.57	577.70	577.70	0.00	0.01	577.70	0.00
583.25	10.71	579.25	577.70	577.70	0.00	0.00	577.70	0.00
583.50	12.36	579.76	577.70	577.70	0.00	0.01	577.70	0.00
583.75	13.81	580.27	577.70	577.70	0.00	0.00	577.70	0.00
584.00	15.13	580.79	577.70	577.70	0.00	0.00	577.70	0.00

Message
WS below an invert; no flow.
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 11.09 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
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FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves

Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 11.09 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .457ft Dcr= 1.019ft H.JUMP IN PIPE Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=.571ft HL=1.548ft Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=.760ft HL=2.061ft Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=.950ft HL=2.575ft Hev= .00ft
FULL FLOW...Lfull=83.00ft Vh=1.139ft HL=3.088ft Hev= .00ft

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Composite Rating Curve

Label: Composite Outlet Structure - 1

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
578.50	0.00	577.70	0.00
578.75	0.01	577.70	0.00
579.00	0.01	577.70	0.00
579.25	0.02	577.70	0.00
579.50	0.02	577.70	0.00
579.75	0.02	577.70	0.00
580.00	0.03	577.70	0.00
580.25	0.03	577.70	0.00
580.50	0.03	577.70	0.00
580.75	0.03	577.70	0.00
581.00	0.03	577.70	0.00
581.25	0.04	577.70	0.00
581.50	0.04	577.70	0.00
581.75	0.04	577.70	0.00
582.00	0.04	577.70	0.00
582.25	0.04	577.70	0.00
582.50	0.04	577.70	0.00
582.75	2.48	577.70	0.00
583.00	6.93	577.70	0.00
583.25	10.71	577.70	0.00
583.50	12.36	577.70	0.00
583.75	13.81	577.70	0.00
584.00	15.13	577.70	0.00

Contributing Structures
(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Composite Rating Curve

Label: Composite Outlet Structure - 1

Composite Outflow Summary

Contributing Structures
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Volume-Flow Table (Pond)

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	<None Selected>

Initial Conditions	
Elevation (Water Surface, Initial)	(N/A) ft
Volume (Initial)	(N/A) ac-ft
Flow (Initial Outlet)	(N/A) ft³/s
Flow (Initial Infiltration)	(N/A) ft³/s
Flow (Initial, Total)	(N/A) ft³/s
Time Increment	(N/A) hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
578.50	0.00	0.000	0.000	0.00	0.00	0.00
578.75	0.01	0.001	0.010	0.00	0.01	0.03
579.00	0.01	0.007	0.040	0.00	0.01	0.18
579.25	0.02	0.017	0.044	0.00	0.02	0.43
579.50	0.02	0.029	0.048	0.00	0.02	0.71
579.75	0.02	0.041	0.052	0.00	0.02	1.02
580.00	0.03	0.054	0.056	0.00	0.03	1.34
580.25	0.03	0.075	0.095	0.00	0.03	1.85
580.50	0.03	0.101	0.109	0.00	0.03	2.47
580.75	0.03	0.129	0.116	0.00	0.03	3.15
581.00	0.03	0.159	0.123	0.00	0.03	3.87
581.25	0.04	0.190	0.130	0.00	0.04	4.64
581.50	0.04	0.224	0.138	0.00	0.04	5.45
581.75	0.04	0.259	0.145	0.00	0.04	6.31
582.00	0.04	0.296	0.153	0.00	0.04	7.21
582.25	0.04	0.336	0.161	0.00	0.04	8.16
582.50	0.04	0.377	0.169	0.00	0.04	9.16
582.75	2.48	0.420	0.177	0.00	2.48	12.65
583.00	6.93	0.466	0.186	0.00	6.93	18.20
583.25	10.71	0.513	0.190	0.00	10.71	23.11
583.50	12.36	0.561	0.194	0.00	12.36	25.93
583.75	13.81	0.610	0.199	0.00	13.81	28.57
584.00	15.13	0.660	0.203	0.00	15.13	31.10

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Level Pool Pond Routing Summary

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	<None Selected>

Initial Conditions	
Elevation (Water Surface, Initial)	(N/A) ft
Volume (Initial)	(N/A) ac-ft
Flow (Initial Outlet)	(N/A) ft³/s
Flow (Initial Infiltration)	(N/A) ft³/s
Flow (Initial, Total)	(N/A) ft³/s
Time Increment	(N/A) hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	(N/A) ft³/s	Time to Peak (Flow, In)	(N/A) hours
Flow (Peak Outlet)	(N/A) ft³/s	Time to Peak (Flow, Outlet)	(N/A) hours

Elevation (Water Surface, Peak)	(N/A) ft
Volume (Peak)	(N/A) ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	(N/A) ac-ft
Volume (Total Inflow)	(N/A) ac-ft
Volume (Total Infiltration)	(N/A) ac-ft
Volume (Total Outlet Outflow)	(N/A) ac-ft
Volume (Retained)	(N/A) ac-ft
Volume (Unrouted)	(N/A) ac-ft
Error (Mass Balance)	(N/A) %

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Detention Time

Label: Extended Detention

Infiltration	
Infiltration Method (Computed)	<None Selected>

Approximate Detention Times	
Time to Peak (Outflow + Infiltration, Peak to Peak Detention Time)	(N/A) hours
Time to Peak (Inflow, Peak to Peak Detention Time)	(N/A) hours
Detention Time (Peak to Peak)	(N/A) hours

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Pond Routed Hydrograph (total out)

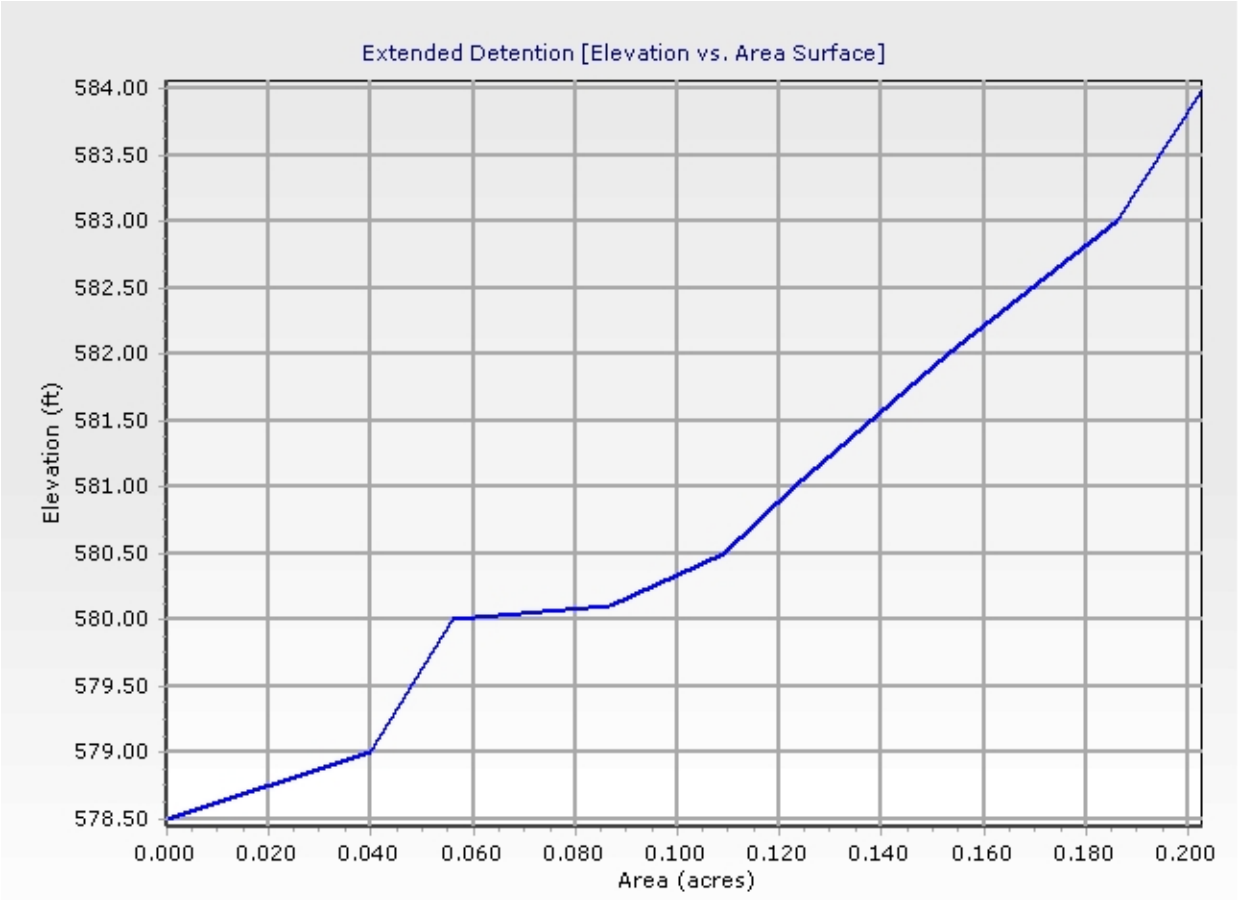
Label: Minimum Drain Time - 1

Peak Discharge	0.03 ft³/s
Time to Peak	0.000 hours
Hydrograph Volume	0.092 ac-ft

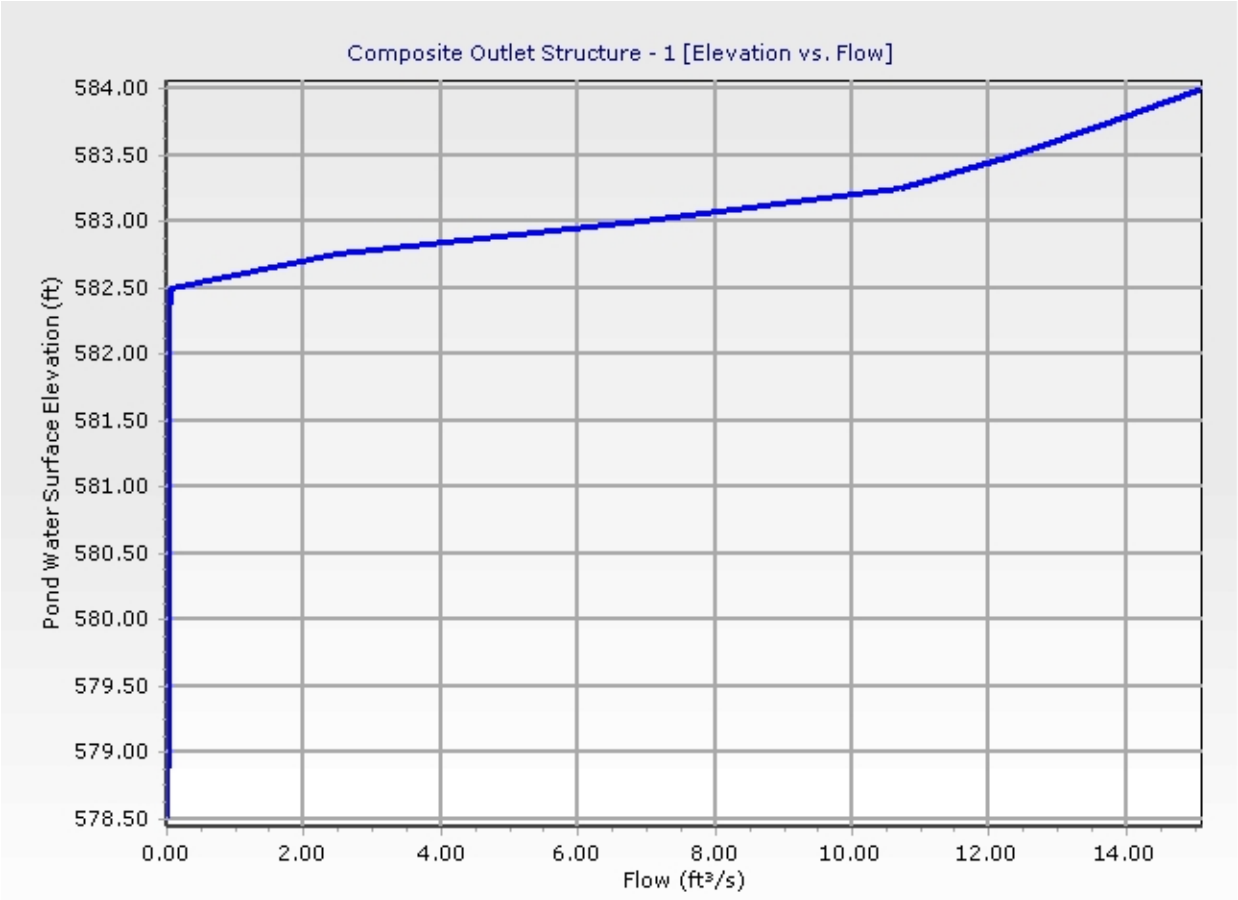
HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 1.000 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.03	0.03	0.03	0.03	0.03
5.000	0.03	0.03	0.03	0.03	0.03
10.000	0.03	0.03	0.03	0.03	0.03
15.000	0.03	0.03	0.03	0.03	0.03
20.000	0.03	0.03	0.02	0.02	0.02
25.000	0.02	0.02	0.02	0.02	0.02
30.000	0.02	0.02	0.02	0.02	0.02
35.000	0.02	0.02	0.02	0.02	0.02
40.000	0.02	0.02	0.02	0.02	0.02
45.000	0.02	0.01	0.01	0.01	(N/A)

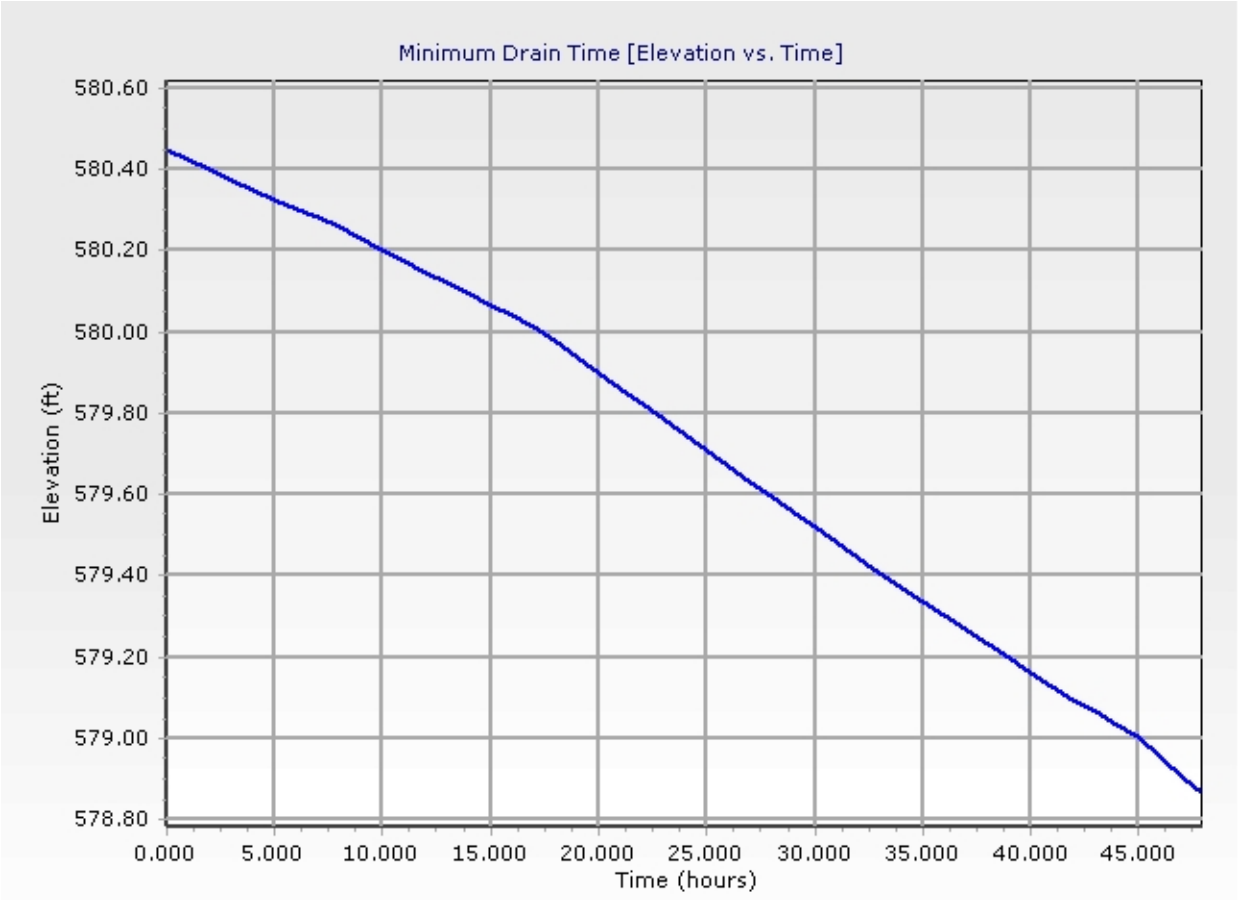
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



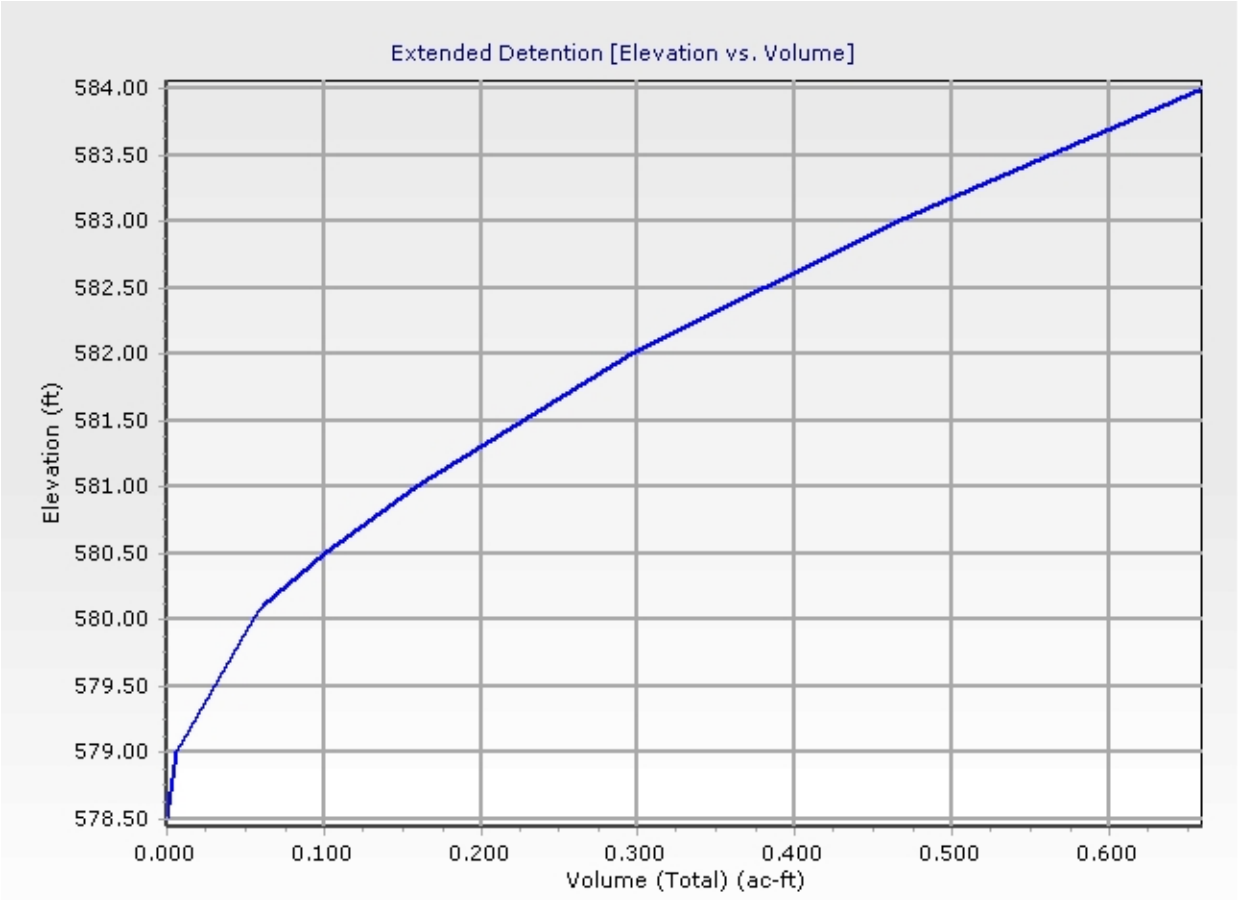
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



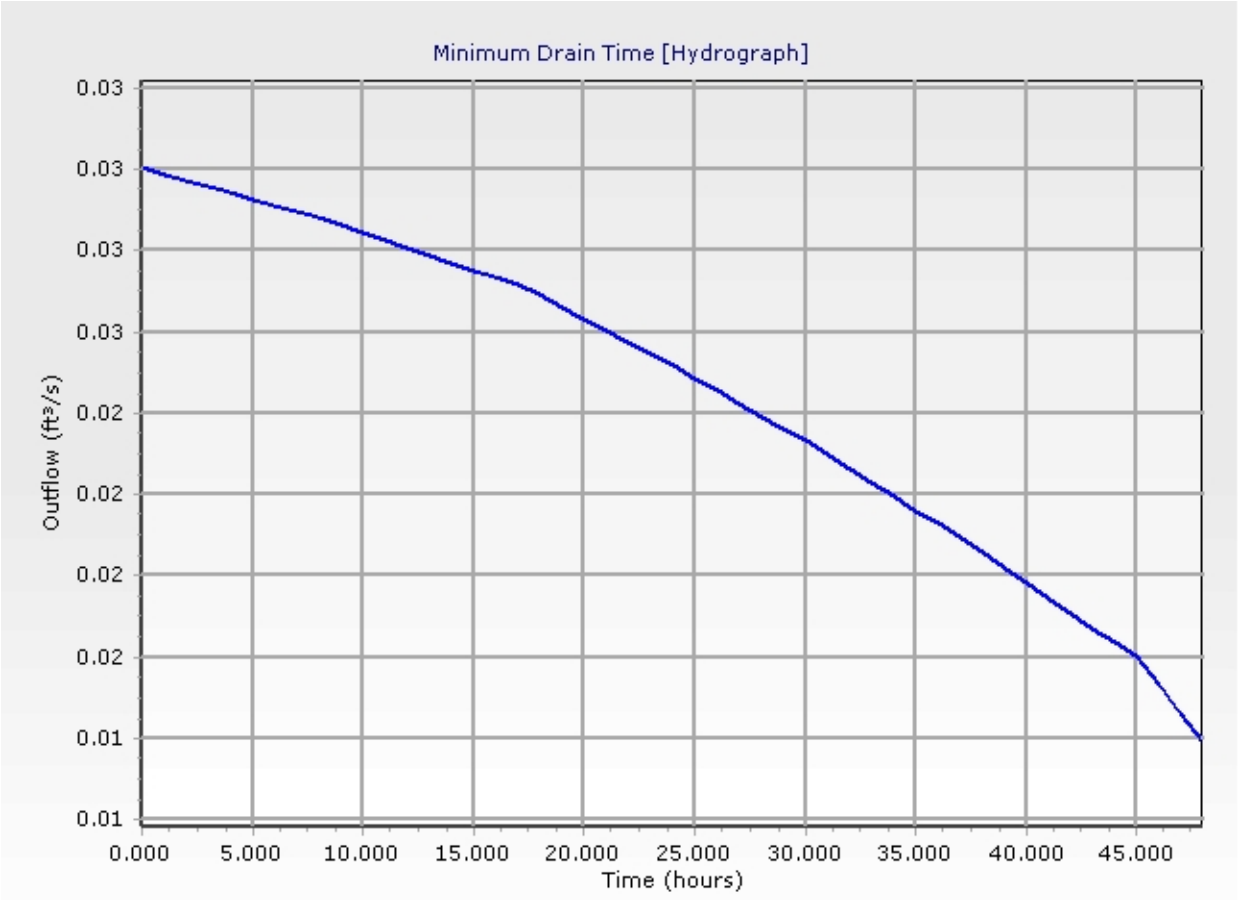
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



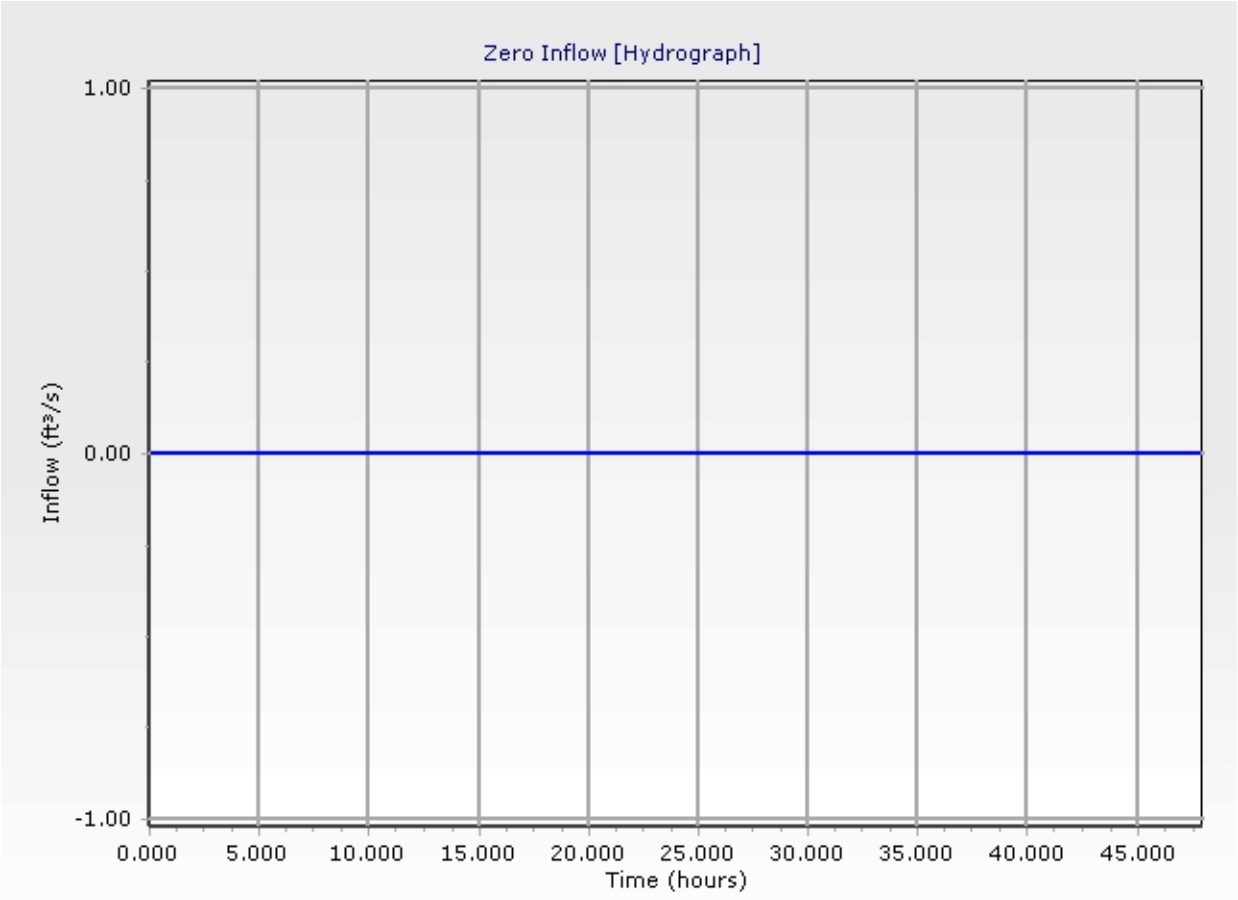
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



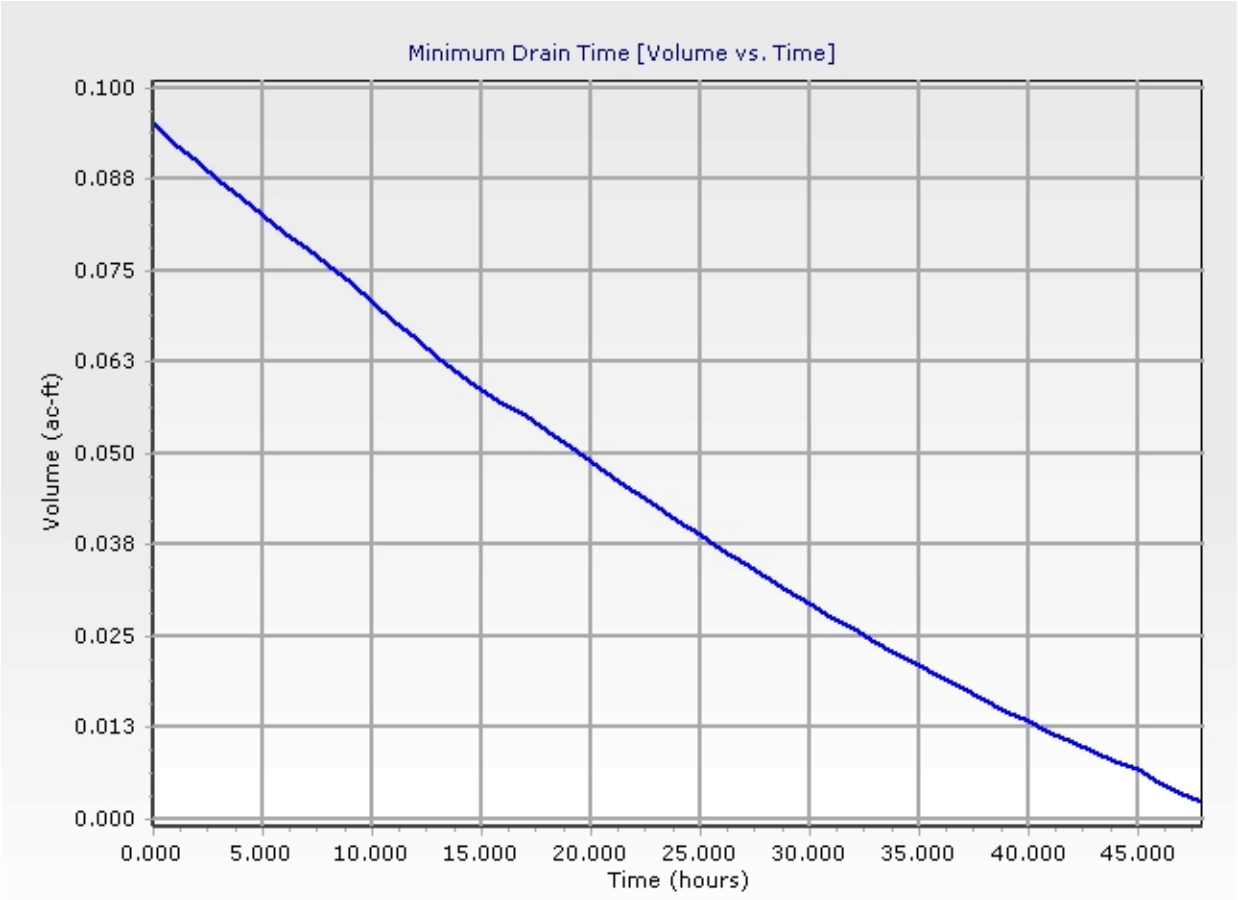
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



APPENDIX D

STORM SEWER SYSTEM

PID : 49633 **Date :** 01/18/2012 **Project :** CUY-90-14.90 **Location :** Canal Road I90Scuppers to EX CB

Description :CANAL ROAD - I-90 Scuppers to CS **Designer :** PNS

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 602.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
* D101	D39	25+41	0.21	0.19	10.00	5.10	6.07	1.0	1.1	12	86.8	0.0050	605.93	2.69	2.34	0.0014	606.45	609.25	2.80	2.32	CB 6
begin		26+27	0.21	0.19									605.50				606.23	607.71			0.015
D39	D99	26+27	0.42	0.37	10.54	4.98	6.06	2.8	3.4	12	26.0	0.0912	605.50	10.39	10.03	0.0122	605.92	607.71	1.79	1.21	CB 6
		26+47	0.63	0.56									603.13				604.03	606.38			0.015
** D100	D99	26+42	0.25	0.23	10.00	5.10	6.20	1.1	1.4	12	7.6	0.1145	603.00	8.74	11.24	0.0020	603.25	605.24	1.99	1.24	CB 3A
begin		26+47	0.88	0.79									602.13				602.88	606.38			0.015
D99	END	26+47	0.00	0.00	10.58	4.97	6.05	3.9	4.8	12	16.3	0.0693	602.13	10.26	8.75	0.0239	602.68	606.38	3.70	3.25	MH 3
final		26+59	0.88	0.79									601.00				602.00	605.16			0.015

* Full flow velocity exceeds 3ft/s, pipe adjacent to pier 11 and minimizing depth of structures.

** D-100 CB City 1 is replacing an existing CB that will be damaged by the construction of D-99 MH. Inlet spread calculations for Canal Road not performed. Spread will be reduced (improved) from existing conditions due to the new bridge.

APPENDIX E

INLET SPACING DESIGN

PID : 49633 **Date :** 12/19/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way to Ex. CS, 104+44 RT

Description : Inlet Spacing - Central Viaduct Way (Carnegie to Commercial) 104+44 RT **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 7.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
105+27	Begin																	
104+58	CB-3	94.00	0.90	0.16	1.00	1.37	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.44	0.08	0.52	0.110	6.89
104+44	CB-3A	20.00	0.90	0.12	1.00	0.30	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.33	0.14	0.47	0.106	6.62
103+92	CB-3A	50.89	0.40	0.17	1.00	0.82	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.29	0.10	0.38	0.098	6.14
103+02	CB-3A	54.00	0.57	0.18	1.00	0.36	10.00	0.0550	0.0160	0.0160	0.00	0.0417	3.60	0.35	0.11	0.46	0.071	4.41
102+50	CB-3A	151.92	0.63	0.09	1.50	2.88	10.00	0.0051	0.0160	0.0160	0.00	0.0417	3.60	0.25	0.07 *	0.31	0.095	5.95

* Bypass goes to CB @ 16+06 on Commercial Drive, see Appendix F Calcs.

INLET SPACING DESIGN

PID : 49633 **Date :** 12/19/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way to Ex. CS, 104+44 RT

Description : Inlet Spacing - Central Viaduct Way (Carnegie to Commercial) 104+44 RT **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 25 **Total Allow. Spread (ft.) :** 7.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
105+27	Begin																	
104+58	CB-3	94.00	0.90	0.16	1.00	1.21	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.66	0.24	0.89	0.135	8.46
104+44	CB-3A	20.00	0.90	0.12	1.00	0.26	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.52	0.39	0.91	0.136	8.51
103+92	CB-3A	50.89	0.40	0.17	1.00	0.70	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.48	0.32	0.81	0.130	8.14
103+02	CB-3A	54.00	0.57	0.18	1.00	0.31	10.00	0.0550	0.0160	0.0160	0.00	0.0417	6.21	0.60	0.36	0.96	0.093	5.79
102+50	CB-3A	151.92	0.63	0.09	1.00	2.36	10.00	0.0051	0.0160	0.0160	0.00	0.0417	6.21	0.44	0.27 *	0.71	0.129	8.09

*Bypass goes to CB @ 16+06 on Commercial Drive, see Appendix F Calcs.

INLET SPACING DESIGN

PID : 49633 **Date :** 09/15/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way to Ex. CS, 104+44 LT

Description : Inlet Spacing - Central Viaduct Way (Carnegie to end) LT curb **Designer :** JCA

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 7.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
105+27	Begin																		
104+44	CB-3A	90.23	0.90	0.14	1.50	1.37	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.32	0.13	0.45	0.105	6.56	
103+90	CB-3A	50.50	0.90	0.07	1.00	0.83	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.27	0.08	0.36	0.096	5.99	
103+84	CB-3A	3.00	0.90	0.02	0.70	0.06	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.15	0.01	0.16	0.070	4.39	
102+60	CB-3	129.08	0.90	0.16	1.80	1.94	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.44	0.08	0.52	0.110	6.88	
101+70	CB-3A	86.00	0.90	0.13	1.00	1.28	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	0.35	0.15	0.50	0.109	6.79	
101+27	I-2-6	37.00	0.90	0.12	1.00	0.54	10.00	0.0063	0.0160	0.0160	0.00	0.0417	3.60	******	******	0.54	0.112	7.00	End

INLET SPACING DESIGN

PID : 49633 **Date :** 09/15/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way to Ex. CS, 104+44 LT

Description : Inlet Spacing - Central Viaduct Way (Carnegie to end) LT curb **Designer :** JCA

Rainfall Area: A **Storm Frequency (yr.) :** 25 **Total Allow. Spread (ft.) :** 7.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
105+27	Begin																		
104+44	CB-3A	90.23	0.90	0.14	1.50	1.21	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.47	0.31	0.78	0.129	8.05	
103+90	CB-3A	50.50	0.90	0.07	1.00	0.71	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.44	0.26	0.70	0.124	7.72	
103+84	CB-3A	3.00	0.90	0.02	0.70	0.05	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.29	0.10	0.39	0.099	6.17	
102+60	CB-3	129.08	0.90	0.16	1.80	1.67	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.69	0.27	0.97	0.139	8.72	
101+70	CB-3A	86.00	0.90	0.13	1.00	1.10	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	0.56	0.44	1.00	0.141	8.82	
101+27	I-2-6	37.00	0.90	0.12	1.00	0.46	10.00	0.0063	0.0160	0.0160	0.00	0.0417	6.21	******	******	1.11	0.147	9.18	End

INLET SPACING DESIGN

PID : 49633 **Date :** 01/04/2012 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way to Ex. CS, 104+44 RT

Description : Inlet Spacing - Central Viaduct Way - 100+30 RT **Designer :** JCA

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 7.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
101+53	Begin																	
101+32	I-2-6	25.00	0.90	0.00	1.50	1.42	10.00	0.0050	0.0160	0.0160	0.00	0.0417	3.60	0.00	0.00	0.00	0.017	1.07

INLET SPACING DESIGN

PID : 49633 **Date :** 01/04/2012 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way to Ex. CS, 104+44 RT

Description : Inlet Spacing - Central Viaduct Way - 100+30 RT **Designer :** JCA

Rainfall Area: A **Storm Frequency (yr.) :** 25 **Total Allow. Spread (ft.) :** 7.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
101+53	Begin																	
101+32	I-2-6	25.00	0.90	0.00	1.50	1.25	10.00	0.0050	0.0160	0.0160	0.00	0.0417	6.21	0.01	0.00	0.01	0.021	1.32

STORM SEWER SYSTEM

PID : 49633 **Date :** 02/09/2015 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way 100+73 (1) LT

Description : Central Viaduct Way Proposed Storm Sewer to Ex. CS_100+73 (1) LT **Designer :**

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 6.00 **Tailwater Elevation (ft.):** 660.79

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D57A WALL		100+15		0.10	0.09	10.00	5.10	6.18	0.5	0.6	6	22.0	0.0218	663.88	3.88	0.77	0.0131	664.21	666.23	2.02	1.85	CB 3A
begin		100+13		0.10	0.09									663.40				663.84	666.10			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 10/31/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way 102+76 LT

Description : Central Viaduct Way Proposed Storm Sewer to Ex. CS_102+76 LT **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 658.38

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D60	D59	101+21		0.16	0.15	10.00	5.10	6.16	0.8	0.9	12	58.8	0.0430	665.65	5.46	6.89	0.0009	665.90	667.40	1.50	0.75	CB 6
begin		100+62		0.16	0.15									663.12				663.82	667.00			0.015
D61	D59	100+85		0.51	0.46	10.00	5.10	5.79	2.3	2.7	12	104.1	0.0087	660.71	4.09	3.11	0.0074	662.68	663.71	1.03	2.00	CB 6
begin		100+62		0.67	0.61									659.80				661.91	667.00			0.015
D59	18222	100+62		0.00	0.00	10.42	5.00	5.79	3.0	3.5	12	35.6	0.0084	658.40	3.86	3.05	0.0129	661.91	667.00	5.09	7.60	MH 3
		100+73		0.67	0.61									658.10				661.45	666.80			0.015
18222	18244	100+73		0.97	0.85	10.58	4.97	5.79	7.3	8.5	18	203.3	0.0015	657.68	4.11	3.76	0.0086	661.45	666.80	5.35	7.62	MH 3
		102+76		1.64	1.46						**Warning**			657.38				659.70	667.55			0.015
D63B	18244	103+03		0.18	0.10	10.00	5.10	6.17	0.5	0.6	12	38.6	0.0453	663.05	4.99	7.07	0.0004	663.26	667.56	4.30	3.51	CB 3A
begin		102+76		1.82	1.56									661.30				661.96	667.55			0.015
D62	D63	102+50		0.09	0.06	10.00	5.10	5.94	0.3	0.3	12	28.3	0.0180	662.63	3.04	4.46	0.0001	662.86	667.22	4.36	3.59	CB 3A
begin		102+60		1.91	1.62									662.12				662.86	667.23			0.015
D63A	D63	101+72		0.13	0.12	10.00	5.10	5.97	0.6	0.7	12	89.2	0.0017	662.73	1.60	1.38	0.0005	663.30	666.63	3.33	2.90	CB 3A
begin		102+60		2.04	1.73									662.58				663.25	667.23			0.015
D63	18244	102+60		0.16	0.14	10.93	4.90	5.94	1.5	1.9	12	14.9	0.0007	661.86	1.96	0.86	0.0036	662.86	667.23	4.37	4.37	CB 3
		102+76		2.20	1.87						**Warning**			661.85				662.64	667.55			0.015

***** Based on the approved as-built survey information, the invert elevation of the pipe leaving structure 18222 was 656.68, which would be lower than the downstream invert elevation and the elevation of the pipes leaving structure D18244, and the invert elevation would also be higher than the pipes entering structure 18222. Based on this elevation the slope of the existing pipe run, 18222 to 18244, would be -0.34%. Therefore the elevation was raised by 1 foot in CDSS to allow for analysis of the system.

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
18244	D65	102+76		0.00	0.00	11.40	4.80	5.79	9.0	10.8	18	93.0	0.0054	657.38	5.09	7.18	0.0142	659.70	667.55	7.85	8.67	MH 3
final		103+69		2.20	1.87									656.88				658.38	667.87			0.015
											Warning											

STORM SEWER SYSTEM

PID : 49633 **Date :** 02/09/2015 **Project :** Cleveland Innerbelt **Location :** Central Viaduct Way & Commerical Rd

Description : Catch Basins D-60A and D-60B **Designer :**

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 658.38

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D60B	D60A	101+27	0.15	0.14	10.00	5.10	6.11	0.7	0.8	12	19.0	0.0000	663.30	0.88	0.01	0.0007	664.30	666.30	2.00	2.00	CB 6
begin		101+27	0.15	0.14						**Warning**			663.30				663.99	666.40			0.015
D60A	CS	101+27	0.10	0.00	10.36	5.02	6.11	0.7	0.8	12	4.0	0.8875	663.25	15.53	31.29	0.0007	663.37	666.40	3.03	2.15	CB 6
final		101+25	0.25	0.14									659.70				660.39	666.40			0.015

NOTE: D-60A to the existing combined sewer is a vertical connection. There is 1' of sloped pipe exiting D-60A then a 90 degree drop connection to the existing CS. The 659.70 elevation is the outlet elevation for D-60A which is also the crown of the combined sewer.

STORM SEWER SYSTEM

PID : 49633 **Date :** 10/31/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way 103+69 LT

Description : Central Viaduct Way Proposed Storm Sewer to Ex. CS_103+69 LT **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 663.24

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D68	D67	103+93	0.17	0.08	10.00	5.10	6.16	0.4	0.5	12	30.0	0.0373	663.53	4.32	6.41	0.0002	663.72	667.90	4.18	3.37	CB 3A
begin		103+84	0.17	0.08									662.41				663.25	667.96			0.015
D67A	D67	103+91	0.07	0.06	10.00	5.10	6.16	0.3	0.4	12	6.7	0.0090	662.47	2.45	3.14	0.0002	663.25	667.97	4.72	4.50	CB 3A
begin		103+84	0.24	0.14									662.41				663.25	667.96			0.015
D67	D65	103+84	0.02	0.02	10.12	5.07	6.16	0.8	1.0	12	13.0	0.0131	662.41	3.65	3.80	0.0010	663.25	667.96	4.71	4.55	CB 3A
final		103+69	0.26	0.16									662.24				663.24	667.87			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/10/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way 104+52 LT

Description : Central Viaduct Way Proposed Storm Sewer to Ex. CS_104+52 LT **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 664.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D69A	D897	104+44	0.14	0.13	10.00	5.10	6.20	0.6	0.8	12	7.2	0.0200	663.14	3.98	4.70	0.0006	664.00	668.14	4.14	4.00	CB 3A
begin		104+52	0.14	0.13									663.00				664.00	668.94			0.015

***** This is the original design elevation. Invert elevation was not verified from the approved as-built survey information, structure D69A was filled with water to an elevation of 662.94.

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/11/2011 **Project :** CUY-90-14.90 **Location :** Central Viaduct Way 104+52 LT

Description : Central Viaduct Way Proposed Storm Sewer to Ex. CS_104+58 RT **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 664.00

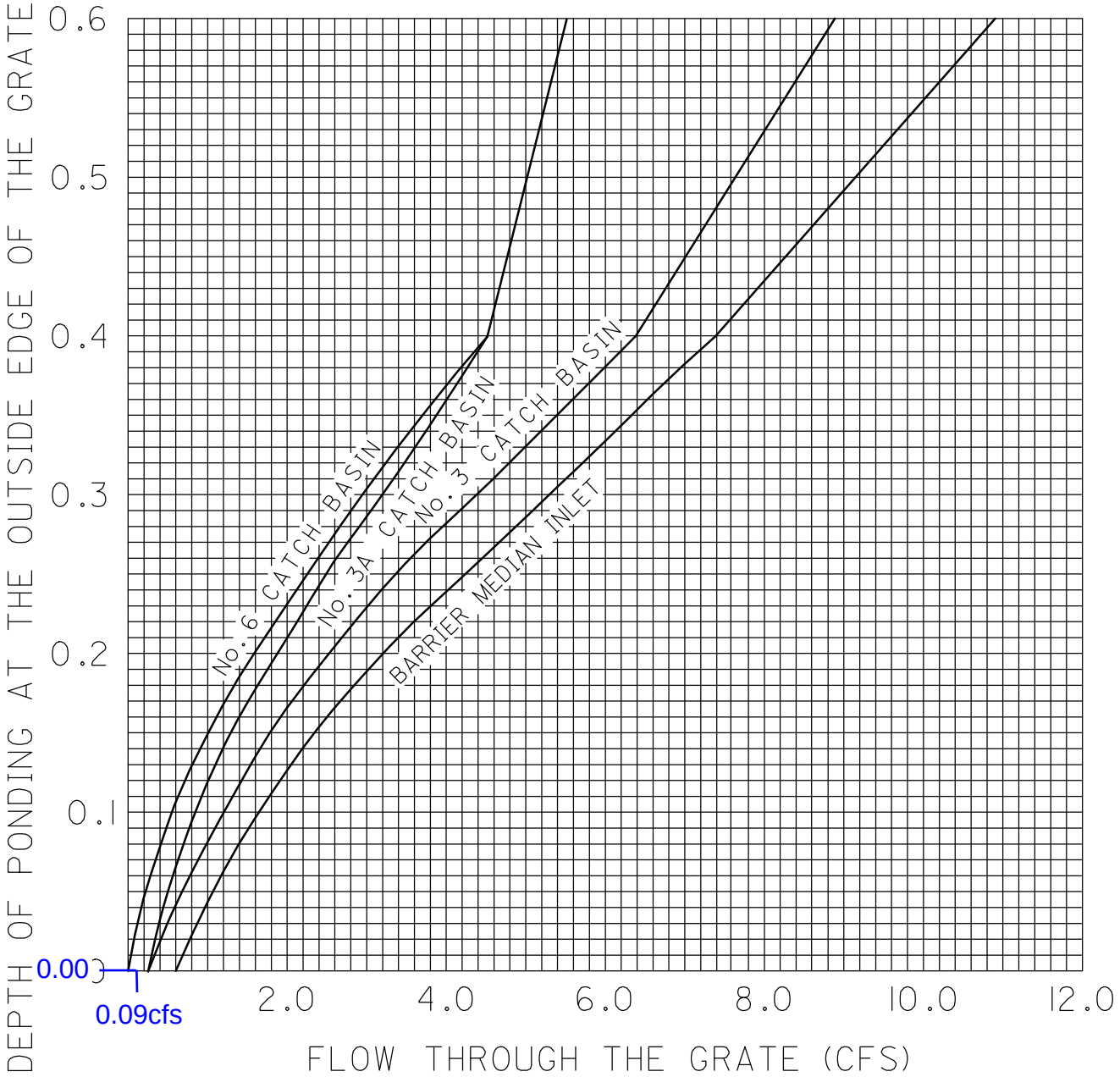
JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D69	D69B	104+42	0.12	0.11	10.00	5.10	6.17	0.6	0.7	12	20.6	0.0137	663.66	3.31	3.89	0.0005	664.09	668.20	4.11	3.54	CB 3A
begin		104+57	0.12	0.11									663.38				664.08	668.33			0.015
D69B	D897	104+57	0.16	0.14	10.10	5.07	6.17	1.3	1.6	12	32.4	0.1164	662.83	9.07	11.33	0.0025	664.08	668.33	4.25	4.50	CB 3
final		104+52	0.28	0.25									659.06				664.00	668.91			0.015

APPENDIX F

D-748 Sump Calculation

CAPACITY OF STANDARD CATCH BASIN GRATES IN PAVEMENT SAGS	1103-3 REFERENCE SECTION 1103.6, 1103.7

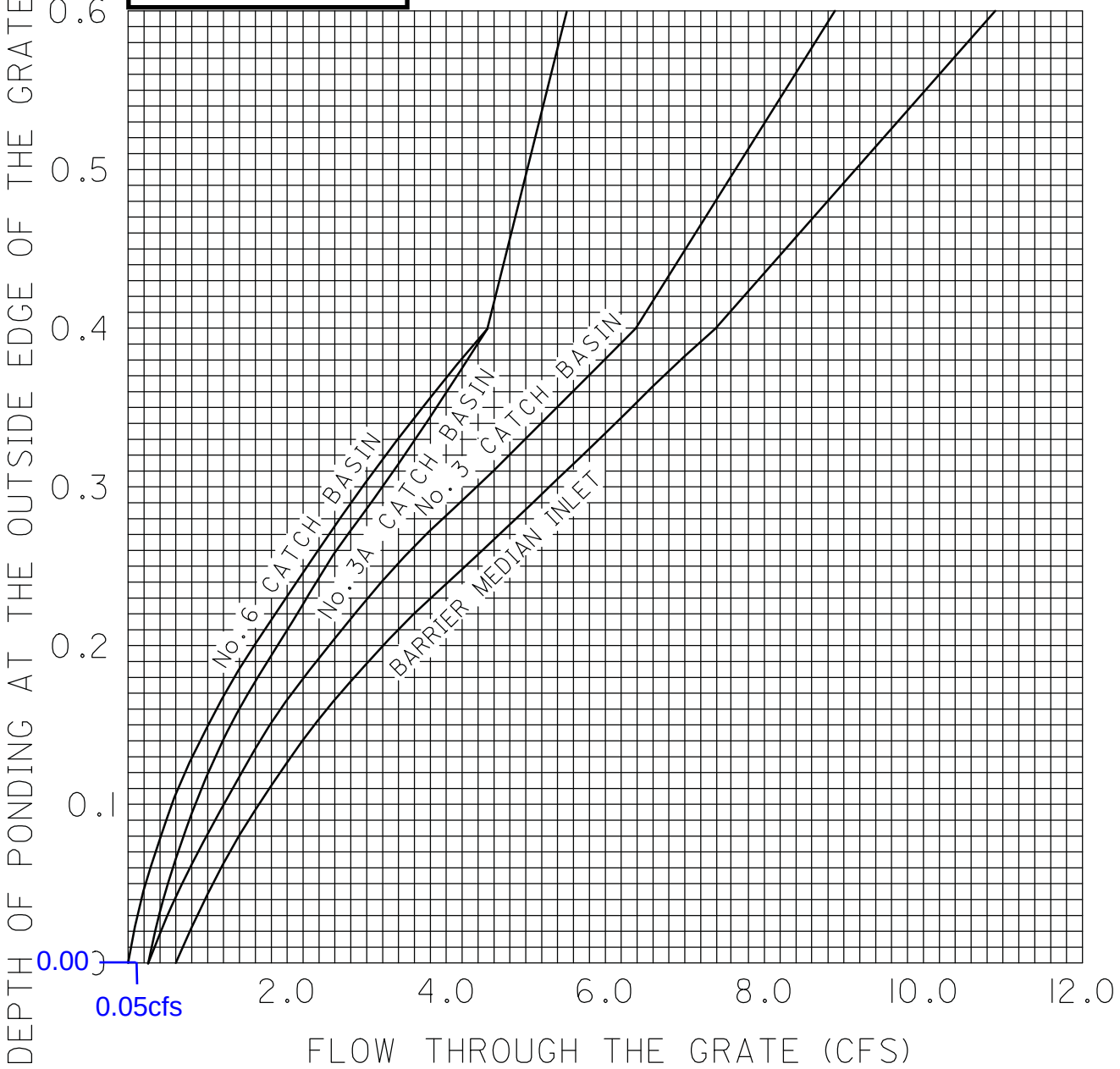
D-748 CB-3A
Q_{10} = 0.09 cfs
HW_{10} = 0.00 ft
$HW_{allowable}$ = 0.50 ft



D-751 Sump Calculation

CAPACITY OF STANDARD CATCH BASIN GRATES IN PAVEMENT SAGS	1103-3
	REFERENCE SECTION 1103.6, 1103.7

D-751 CB-3A
Q_{10} = 0.05cfs
HW_{10} = 0.00ft
$HW_{allowable}$ = 0.50ft



INLET SPACING DESIGN

PID : 49633 **Date :** 11/01/2011 **Project :** CUY-90-14.90 **Location :** Commercial Road

Description : Commercial Road - Left Side **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
101+36	Begin																	
16+06	CB-3A	393.00	0.80	0.14	1.00	2.52	10.00	0.0721	0.0160	0.0160	0.00	0.0417	3.60	0.32	0.08	0.39	0.063	3.93
12+51	CB-3A	355.00	0.77	0.25	1.00	1.99	10.00	0.0652	0.0160	0.0160	0.00	0.0417	3.60	0.52	0.26	0.78	0.083	5.18
10+96	CB-3A	155.00	0.77	0.13	1.00	1.15	10.00	0.0367	0.0160	0.0160	0.00	0.0417	3.60	0.43	0.20	0.63	0.085	5.33
10+81	CB-3A	15.00	0.66	0.01	1.00	0.15	10.00	0.0316	0.0206	0.0206	0.00	0.0417	3.60	0.21	0.01	0.23	0.066	3.20

INLET SPACING DESIGN

PID : 49633 **Date :** 11/01/2011 **Project :** CUY-90-14.90 **Location :** Commercial Road

Description : Commercial Road - Left Side **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
101+36	Begin																	
16+06	CB-3A	393.00	0.80	0.14	1.00	2.10	10.00	0.0721	0.0160	0.0160	0.00	0.0417	6.79	0.51	0.23	0.74	0.080	4.99
12+51	CB-3A	355.00	0.77	0.25	1.00	1.64	10.00	0.0652	0.0160	0.0160	0.00	0.0417	6.79	0.85	0.71	1.56	0.108	6.73
10+96	CB-3A	155.00	0.77	0.13	1.00	0.94	10.00	0.0367	0.0160	0.0160	0.00	0.0417	6.79	0.76	0.65	1.41	0.115	7.21
10+81	CB-3A	15.00	0.66	0.01	1.00	0.11	10.00	0.0316	0.0206	0.0206	0.00	0.0417	6.79	0.52	0.19	0.71	0.101	4.90

INLET SPACING DESIGN

PID : 49633 **Date :** 12/19/2011 **Project :** CUY-90-14.90 **Location :** Commercial Road

Description : Commercial Road - Right Side **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
2+50	Begin																	
0+43	CB-3A	207.00	0.83	0.24	1.00	1.28	10.00	0.0500	0.0160	0.0160	0.00	0.0417	3.60	0.48	0.23	0.72	0.084	5.28
16+06	CB-3A	225.00	0.00	0.00	0.00	0.00	0.00	0.0721	0.0160	0.0160	0.00	0.0417	0.00	0.48	0.21	0.68	0.077	4.84
12+52	CB-3A	354.00	0.65	1.48	1.00	1.33	10.00	0.0652	0.0160	0.0160	0.00	0.0417	3.60	1.53	2.12	3.66	0.148	9.25
12+37	CB-3A	15.00	0.66	0.08	1.00	0.07	10.00	0.0652	0.0160	0.0160	0.00	0.0417	3.60	1.11	1.19	2.30	0.124	7.78
11+11	CB-3A	126.00	0.65	0.73	1.00	0.64	10.00	0.0364	0.0160	0.0160	0.00	0.0417	3.60	1.23	1.67 *	2.90	0.151	9.47
10+96	CB-3A	15.00	0.63	0.12	1.00	0.09	10.00	0.0364	0.0160	0.0160	0.00	0.0417	3.60	0.94	1.00	1.95	0.130	8.15
10+80	CB-3	16.00	0.64	0.10	1.00	0.11	10.00	0.0316	0.0160	0.0160	0.00	0.0417	3.60	0.81	0.43	1.24	0.113	7.07

*Bypass flow from CVW RT (D-62) added to Inlet spacing flow.

INLET SPACING DESIGN

PID : 49633 **Date :** 12/19/2011 **Project :** CUY-90-14.90 **Location :** Commercial Road

Description : Commercial Road - Right Side **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 25 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
2+50	Begin																	
0+43	CB-3A	207.00	0.83	0.24	1.00	1.12	10.00	0.0500	0.0160	0.0160	0.00	0.0417	6.21	0.71	0.53	1.24	0.104	6.48
16+06	CB-3A	225.00	0.00	0.00	0.00	0.00	0.00	0.0721	0.0160	0.0160	0.00	0.0417	0.00	0.82	0.64	1.46*	0.103	6.43
12+52	CB-3A	354.00	0.65	1.48	1.00	1.16	10.00	0.0652	0.0160	0.0160	0.00	0.0417	6.21	2.39	4.20	6.59	0.185	11.54
12+37	CB-3A	15.00	0.66	0.08	1.00	0.06	10.00	0.0652	0.0160	0.0160	0.00	0.0417	6.21	1.79	2.71	4.51	0.160	10.01
11+11	CB-3A	126.00	0.65	0.73	1.00	0.55	10.00	0.0364	0.0160	0.0160	0.00	0.0417	6.21	1.99	3.68	5.67	0.195	12.17
10+96	CB-3A	15.00	0.63	0.12	1.00	0.07	10.00	0.0364	0.0160	0.0160	0.00	0.0417	6.21	1.57	2.59	4.16	0.173	10.84
10+80	CB-3	16.00	0.64	0.10	1.00	0.09	10.00	0.0316	0.0160	0.0160	0.00	0.0417	6.21	1.47	1.53	3.00	0.157	9.84

*Bypass flow from CVW RT (D-62) added to Inlet spacing flow.

STORM SEWER SYSTEM

PID : 49633 **Date :** 10/31/2011 **Project :** CUY-90-14.90 **Location :** Commercial Parking Lot Combined Sewer

Description : Scupper drainage to proposed system to Commercial CS **Designer :** BHess

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 639.75

JUNCTION From	JUNCTION To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D748	D749 begin																				
D750	D749 begin																				
D749	D751																				
D751	D753																				
D753	D754																				
D754	D755																				
D755	18020 final																				

SEE BU 1015 - ROADWAY E9TH DRAINAGE REPORT FOR THESE CALCULATIONS

APPENDIX G

INLET SPACING DESIGN

PID : 49633 **Date :** 09/29/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - I-90 WB TO A4 - LT **Designer :** BH

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.25

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)		TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
159+04	Begin																		
167+26	I-3D	822.00	0.90	0.10	1.00	16.05	17.05	0.0034	0.0300	0.0400	6.00	0.1667	3.92	0.34	0.00		0.34	0.134	4.45
602+08	CB-3A	777.93	0.90	0.25	1.00	3.65	10.00	0.0438	0.0440	0.0440	8.00	0.0417	5.10	0.99	0.16	*	1.15	0.151	3.43

Note: Calculation is also in Appendix H E9th for storm sewer calculation references.

* Proposed sodded flume after CB-3A that flows into 9th Street detention pond.

INLET SPACING DESIGN

PID : 49633 **Date :** 09/29/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - I-90 WB TO A4 - LT **Designer :** BH

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.25

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)		TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
159+04	Begin																		
167+26	I-3D	822.00	0.90	0.10	1.00	17.79	18.79	0.0034	0.0300	0.0400	6.00	0.1667	2.60	0.22	0.00		0.22	0.114	3.82
602+08	CB-3A	777.93	0.90	0.25	1.00	3.99	10.00	0.0438	0.0440	0.0440	8.00	0.0417	3.60	0.74	0.07	*	0.81	0.132	3.01

Note: Calculation is also in Appendix H E9th for storm sewer calculation references.

* Proposed sodded flume after CB-3A that flows into 9th Street detention pond.

INLET SPACING DESIGN

PID : 49633 **Date :** 09/29/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - I-90 WB TO A4 - LT **Designer :** BH

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.25

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)		TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
159+04	Begin																		
167+26	I-3D	822.00	0.90	0.10	1.00	14.88	15.88	0.0034	0.0300	0.0400	6.00	0.1667	5.31	0.46	0.00		0.46	0.150	4.99
602+08	CB-3A	777.93	0.90	0.25	1.00	3.33	10.00	0.0438	0.0440	0.0440	8.00	0.0417	6.79	1.24	0.29	*	1.53	0.168	3.82

Note: Calculation is also in Appendix H E9th for storm sewer calculation references.

* Proposed sodded flume after CB-3A that flows into 9th Street detention pond.

INLET SPACING DESIGN

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - I-90 WB Sag near Station 166+84 RT - bidirectional **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
160+30	Begin																		
166+63	I-3D	633.00	0.90	1.31	1.00	5.75	10.00	0.0036	0.0400	0.0400	9.25	0.1667	3.60	3.42	0.82	4.24	0.380	9.50	
166+84	I-3D	21.00	0.90	0.05	1.00	0.35	10.00	0.0019	0.0400	0.0400	8.50	0.1667	3.60	******	******	0.98	0.248	6.19	Sag
173+67	Begin																		
167+62	I-3D	605.00	0.90	0.47	1.00	6.13	10.00	0.0054	0.0400	0.0400	5.70	0.1667	3.60	1.52	0.00	1.52	0.240	5.99	
166+84	I-3D	78.00	0.90	0.15	1.00	0.93	10.00	0.0060	0.0400	0.0400	8.50	0.1667	3.60	******	******	0.49	0.153	3.83	End

SUMP DATA

Total Flow (cfs) : 1.47 **Ponded Depth (ft.) :** 0.131 **Spread on Pavement (ft.) :** 2.20

INLET SPACING DESIGN

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - I-90 WB Sag near Station 166+84 RT **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 18.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
160+30	Begin																		
166+63	I-3D	633.00	0.90	1.31	1.00	5.24	10.00	0.0036	0.0400	0.0400	12.00	0.1667	5.10	4.33	1.68	6.01	0.433	10.82	
166+84	I-3D	21.00	0.90	0.05	1.00	0.30	10.00	0.0019	0.0400	0.0400	12.00	0.1667	5.10	******	******	1.91	0.318	7.94	Sag
173+67	Begin																		
167+62	I-3D	605.00	0.90	0.47	1.00	5.59	10.00	0.0054	0.0400	0.0400	12.00	0.1667	5.10	2.02	0.14	2.16	0.273	6.83	
166+84	I-3D	78.00	0.90	0.15	1.00	0.83	10.00	0.0060	0.0400	0.0400	12.00	0.1667	5.10	******	******	0.82	0.187	4.67	End

SUMP DATA

Total Flow (cfs) : 2.73 **Ponded Depth (ft.) :** 0.199 **Spread on Pavement (ft.) :** 3.69

12.00

INLET SPACING DESIGN

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - I-90 WB Sag near Station 166+84 RT **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
160+30	Begin																		
166+63	I-3D	633.00	0.90	1.31	1.00	4.80	10.00	0.0036	0.0400	0.0400	12.00	0.1667	6.79	5.22	2.79	8.01	0.482	12.06	
166+84	I-3D	21.00	0.90	0.05	1.00	0.27	10.00	0.0019	0.0400	0.0400	12.00	0.1667	6.79	******	******	3.09	0.381	9.51	Sag
173+67	Begin																		
167+62	I-3D	605.00	0.90	0.47	1.00	5.12	10.00	0.0054	0.0400	0.0400	12.00	0.1667	6.79	2.47	0.40	2.87	0.304	7.61	
166+84	I-3D	78.00	0.90	0.15	1.00	0.73	10.00	0.0060	0.0400	0.0400	12.00	0.1667	6.79	******	******	1.32	0.223	5.57	End

SUMP DATA

Total Flow (cfs) : 4.41 **Ponded Depth (ft.) :** 0.273 **Spread on Pavement (ft.) :** 5.07

INLET SPACING DESIGN

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - A5, RT to 699+06 (15 ft) **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 15.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
709+87	Begin																		
699+06	CB-3	1064.00	0.90	0.44	1.00	7.07	10.00	0.0216	0.0302	0.0302	13.00	0.0417	3.60	******	******	1.42	0.162	5.38	Sag
698+93	Begin																		
699+06	CB-3	13.00	0.90	0.01	1.00	0.23	10.00	0.0216	0.0182	0.0182	15.00	0.0417	3.60	******	******	0.03	0.032	1.78	End

SUMP DATA

Total Flow (cfs) : 1.46 **Ponded Depth (ft.) :** 0.123 **Spread on Pavement (ft.) :** 5.89

INLET SPACING DESIGN

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - A5, RT to 699+06 (15 ft) **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 15.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
709+87	Begin																		
699+06	CB-3	1064.00	0.90	0.44	1.00	6.44	10.00	0.0216	0.0302	0.0302	13.00	0.0417	5.10	******	******	2.02	0.185	6.12	Sag
698+93	Begin																		
699+06	CB-3	13.00	0.90	0.01	1.00	0.21	10.00	0.0216	0.0182	0.0182	15.00	0.0417	5.10	******	******	0.05	0.037	2.03	End

SUMP DATA

Total Flow (cfs) : 2.06 **Ponded Depth (ft.) :** 0.165 **Spread on Pavement (ft.) :** 8.19

INLET SPACING DESIGN

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - A5, RT to 699+06 (15 ft) **Designer :** AHR

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 15.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
709+87	Begin																		
699+06	CB-3	1064.00	0.90	0.44	1.00	5.92	10.00	0.0216	0.0302	0.0302	13.00	0.0417	6.79	******	******	2.69	0.206	6.82	Sag
698+93	Begin																		
699+06	CB-3	13.00	0.90	0.01	1.00	0.19	10.00	0.0216	0.0182	0.0182	15.00	0.0417	6.79	******	******	0.06	0.041	2.27	End

SUMP DATA

Total Flow (cfs) : 2.75 **Ponded Depth (ft.) :** 0.208 **Spread on Pavement (ft.) :** 10.52

DITCH ANALYSIS

PID : 49633 **Date :** 11/17/2011 **Project :** CIB **Location :** Ramp A5 / Wall F

Description : Ramp A5 (Station 699+86 tp 698+90 LT) **Designer :** ELJ

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
699+86	698+90	L	96.00	0.00	6.00	3.00	0.0575	0.07	0.07	0.70	0.05	Seed	3.53	5	0.030	15.79	1.97	0.50	0.17	0.14	1.26
												Jute Mat	3.51	5	0.040	15.98	1.58	0.56	0.17	0.16	1.40
												Temp. Mat	3.51	5	0.040	15.98	1.58	0.56	0.17	0.16	1.40
												Temp. Mat	4.06	10	0.040	15.97	1.70	0.58	0.20	0.16	1.45

DITCH ANALYSIS

PID : 49633 **Date :** 10/20/2011 **Project :** CUY-90-14.90 **Location :** Cleveland, Ohio

Description : Wall F Top of Wall ditch 0+87 to outlet near Ontario **Designer :** AHR

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
168+30	167+60	R	85.00	0.00	2.00	2.00	0.0760	0.05	0.05	0.70	0.03	Seed	4.20	5	0.030	10.60	2.44	0.79	0.14	0.17	0.67
												Jute Mat	4.19	5	0.040	10.68	2.02	0.87	0.14	0.18	0.73
												Temp. Mat	4.19	5	0.040	10.68	2.02	0.87	0.14	0.18	0.73
												Temp. Mat	4.94	10	0.040	10.72	2.13	0.92	0.16	0.19	0.77
167+60	167+36	R	14.00	0.00	2.00	2.00	0.2800 *	0.00	0.05	0.70	0.03	Seed	4.18	5	0.030	10.74	4.14	2.25	0.14	0.13	0.52
												Jute Mat	4.18	5	0.040	10.76	3.04	2.63	0.14	0.15	0.60
												Temp. Mat	4.18	5	0.040	10.76	3.04	2.63	0.14	0.15	0.60
												Perm, Type 1	4.18	5	0.040	10.76	3.04	2.63	0.14	0.15	0.60
												Perm, Type 2	4.18	5	0.040	10.76	3.04	2.63	0.14	0.15	0.60
												Perm, Type 2	4.93	10	0.040	10.79	3.34	2.72	0.16	0.16	0.62
167+36	167+36		13.00	0.00	2.00	2.00	0.3800 *	0.05	0.10	0.70	0.07	Seed	4.18	5	0.030	10.80	5.46	3.82	0.28	0.16	0.64
												Jute Mat	4.17	5	0.040	10.81	4.25	4.33	0.28	0.18	0.73
												Temp. Mat	4.17	5	0.040	10.81	4.25	4.33	0.28	0.18	0.73

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Perm, Type 1	4.17	5	0.040	10.81	4.25	4.33	0.28	0.18	0.73
												Perm, Type 2	4.17	5	0.040	10.81	4.25	4.33	0.28	0.18	0.73
												Perm, Type 3	4.17	5	0.040	10.81	4.25	4.33	0.28	0.18	0.73
												Perm, Type 3	4.92	10	0.040	10.84	4.47	4.58	0.33	0.19	0.77
167+36	168+62	R	170.00	0.00	2.00	2.00	0.0024	0.03	0.13	0.50	0.08	Seed	3.72	5	0.030	14.14	0.80	0.06	0.31	0.44	1.76
												Seed	4.22	10	0.040	14.85	0.69	0.07	0.35	0.50	2.02

DITCH ANALYSIS

PID : 49633 **Date :** 10/20/2011 **Project :** CIB **Location :** Ramp A5 / Wall F

Description : Ramp A5 (Station 699+20 tp 698+70 LT)and Wall F (Station 2+80 to 4+25) **Designer :** AHR

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
2+53	3+35	L	73.00	2.00	2.00	2.50	0.1750 *	0.20	0.20	0.70	0.14	Seed	3.58	5	0.030	15.37	3.26	0.76	0.49	0.07	2.31
												Jute Mat	3.57	5	0.040	15.45	2.74	0.89	0.49	0.08	2.37
												Temp. Mat	3.57	5	0.040	15.45	2.74	0.89	0.49	0.08	2.37
												Temp. Mat	4.14	10	0.040	15.42	2.91	0.97	0.57	0.09	2.40
3+35	4+07	L	72.00	2.00	2.00	2.50	0.0050	0.00	0.20	0.00	0.14	Seed	3.44	5	0.030	16.60	1.02	0.06	0.47	0.19	2.86
												Seed	3.96	10	0.040	16.75	0.88	0.08	0.54	0.24	3.09
4+07	4+25	L	18.00	2.00	2.00	2.50	0.4640 *	0.00	0.20	0.00	0.14	Seed	3.44	5	0.030	16.67	4.37	1.48	0.47	0.05	2.23
												Jute Mat	3.44	5	0.040	16.68	3.65	1.75	0.47	0.06	2.27
												Temp. Mat	3.44	5	0.040	16.68	3.65	1.75	0.47	0.06	2.27
												Perm, Type 1	3.44	5	0.040	16.68	3.65	1.75	0.47	0.06	2.27
												Perm, Type 1	3.95	10	0.040	16.83	3.92	1.87	0.54	0.06	2.29
699+20	698+70	L	50.00	2.00	2.00	2.00	0.0324	0.07	0.27	0.70	0.19	Seed	3.40	5	0.030	17.07	2.12	0.27	0.64	0.13	2.53
												Seed	3.89	10	0.040	17.28	1.85	0.34	0.73	0.17	2.68

DITCH ANALYSIS

PID : 49633 **Date :** 09/21/2011 **Project :** CUY-90-14.90 **Location :** Cleveland, Ohio

Description : Wall DE Top of Wall ditch 2+89 to 3+70 **Designer :** AHR

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
2+89	2+96	R	7.00	0.00	2.00	2.00	0.0187	0.05	0.05	0.70	0.03	Seed	4.29	5	0.030	10.08	1.42	0.26	0.14	0.23	0.90
												Seed	5.07	10	0.040	10.10	1.18	0.31	0.17	0.27	1.07
2+96	3+22	L	26.00	0.00	2.00	2.00	0.2623 *	0.00	0.05	0.70	0.04	Seed	4.27	5	0.030	10.19	3.83	2.29	0.15	0.14	0.56
												Jute Mat	4.27	5	0.040	10.21	3.30	2.46	0.15	0.15	0.60
												Temp. Mat	4.27	5	0.040	10.21	3.30	2.46	0.15	0.15	0.60
												Perm, Type 1	4.27	5	0.040	10.21	3.30	2.46	0.15	0.15	0.60
												Perm, Type 2	4.27	5	0.040	10.21	3.30	2.46	0.15	0.15	0.60
												Perm, Type 2	5.05	10	0.040	10.23	3.40	2.64	0.18	0.16	0.64
3+22	3+70	L	48.00	0.00	2.00	2.00	0.0370	0.00	0.05	0.70	0.04	Seed	4.20	5	0.030	10.63	1.91	0.47	0.16	0.20	0.82
												Jute Mat	4.19	5	0.040	10.72	1.56	0.52	0.16	0.23	0.90
												Temp. Mat	4.19	5	0.040	10.72	1.56	0.52	0.16	0.23	0.90
												Temp. Mat	4.94	10	0.040	10.72	1.67	0.55	0.19	0.24	0.95

DITCH ANALYSIS

PID : 49633 **Date :** 09/30/2011 **Project :** CUY-90-14.90 **Location :** Wall DE POB

Description : Ditch from Wall DE POB to sheet flow **Designer :** AHR

Rainfall Area : A

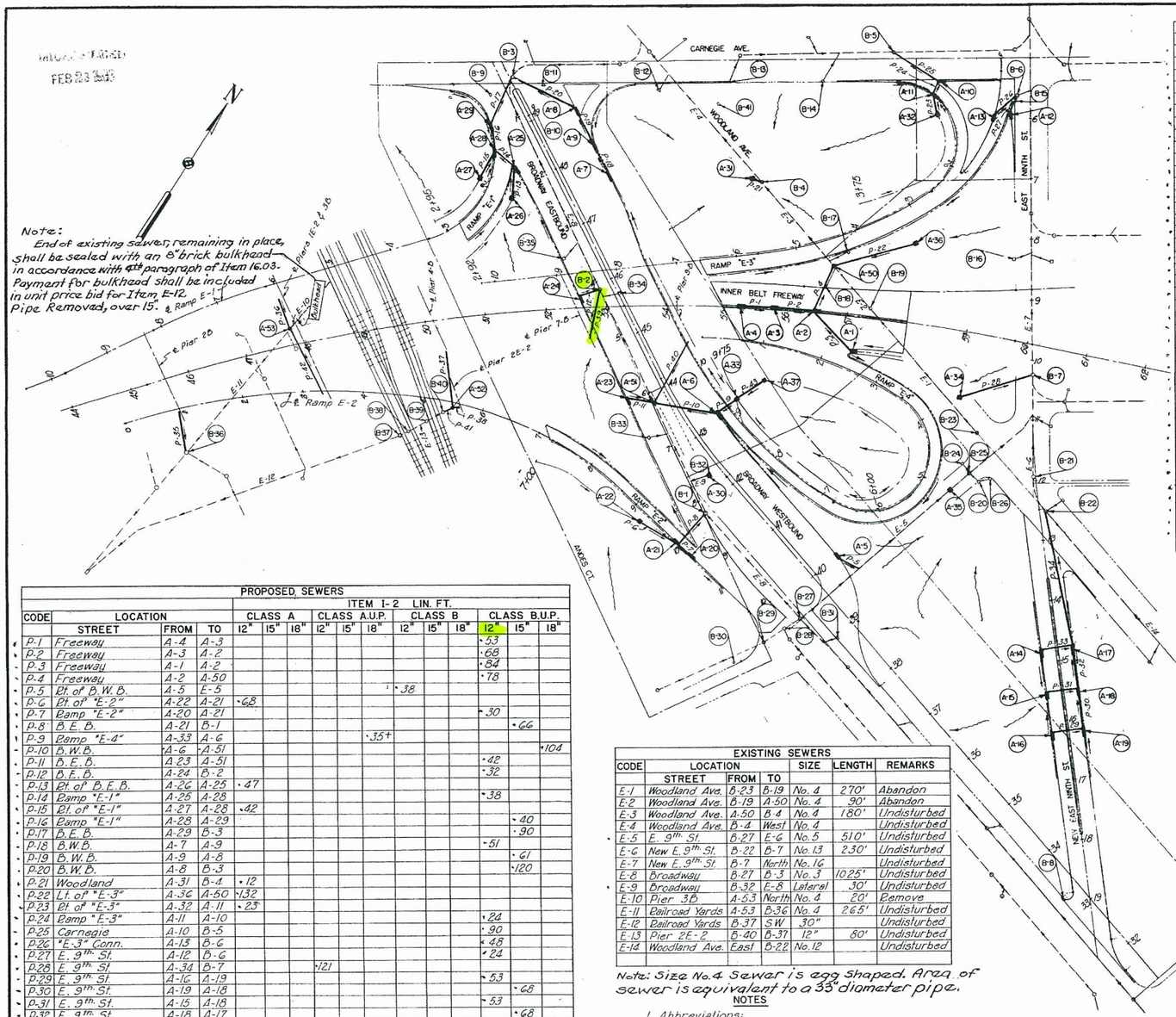
Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
669+26	669+61	R	35.00	0.00	2.00	2.00	0.4514 *	0.02	0.02	0.70	0.01	Seed	3.60	5	0.030	15.17	3.41	2.42	0.05	0.09	0.34
												Jute Mat	3.60	5	0.040	15.17	3.41	2.42	0.05	0.09	0.34
												Temp. Mat	3.60	5	0.040	15.17	3.41	2.42	0.05	0.09	0.34
												Perm, Type 1	3.60	5	0.040	15.17	3.41	2.42	0.05	0.09	0.34
												Perm, Type 2	3.60	5	0.040	15.17	3.41	2.42	0.05	0.09	0.34
												Perm, Type 2	4.17	10	0.040	15.19	3.12	2.72	0.06	0.10	0.39
669+61	669+77	R	16.00	0.00	2.00	2.00	0.0533	0.02	0.04	0.70	0.03	Seed	3.58	5	0.030	15.31	1.93	0.54	0.10	0.16	0.64
												Jute Mat	3.58	5	0.040	15.33	1.70	0.57	0.10	0.17	0.69
												Temp. Mat	3.58	5	0.040	15.33	1.70	0.57	0.10	0.17	0.69
												Temp. Mat	4.15	10	0.040	15.36	1.55	0.64	0.12	0.19	0.77

Ex. Pipe prop D-98 connects into. Ex. CB installed after these plans. pictures taken in field.



PROPOSED SEWERS				ITEM I-2 LIN. FT.										
CODE	LOCATION			CLASS A			CLASS A.U.P.			CLASS B			CLASS B.U.P.		
	STREET	FROM	TO	12"	15"	18"	12"	15"	18"	12"	15"	18"	12"	15"	18"
P-1	Freeway	A-4	A-3										53		
P-2	Freeway	A-3	A-2										68		
P-3	Freeway	A-1	A-2										84		
P-4	Freeway	A-2	A-50										78		
P-5	Rt of B.W.B.	A-5	E-5							‡	38				
P-6	Rt of "E-2"	A-22	A-21	68											
P-7	Ramp "E-2"	A-20	A-21										30		
P-8	B.E.B.	A-21	B-1											66	
P-9	Ramp "E-4"	A-33	A-6						35+						
P-10	B.W.B.	A-6	A-51												104
P-11	B.E.B.	A-23	A-51										42		
P-12	B.E.B.	A-24	B-2										32		
P-13	Rt of B.E.B.	A-26	A-25	47											
P-14	Ramp "E-1"	A-25	A-28										38		
P-15	Rt of "E-1"	A-27	A-28	42											
P-16	Ramp "E-1"	A-28	A-29											40	
P-17	B.E.B.	A-29	B-3											90	
P-18	B.W.B.	A-7	A-9										51		
P-19	B.W.B.	A-9	A-8											61	
P-20	B.W.B.	A-8	B-3											120	
P-21	Woodland	A-31	B-4	12											
P-22	Lt of "E-3"	A-36	A-50	132											
P-23	Rt of "E-3"	A-32	A-11	23											
P-24	Ramp "E-3"	A-11	A-10										24		
P-25	Carnegie	A-10	B-5										90		
P-26	"E-3" Conn.	A-13	B-6										48		
P-27	E. 9th St.	A-12	B-6										24		
P-28	E. 9th St.	A-34	B-7				121								
P-29	E. 9th St.	A-16	A-19										53		
P-30	E. 9th St.	A-19	A-18											68	
P-31	E. 9th St.	A-15	A-18										53		
P-32	E. 9th St.	A-18	A-17											68	
P-33	E. 9th St.	A-14	A-17										53		
P-34	E. 9th St.	A-17	B-22												227
P-35	Pier 2B	Pier 2B	B-36							‡	65				
P-36	Pier 2E-1	2E-1	A-53							✓	50				
P-37	Pier 4B	4B	A-52								95*				
P-38	Pier 2E-2	2E-2	A-52							↘	5				
P-39	B.E.B.	Pier 7B	B-2										75		
P-40	B.W.B.	Pier 9B	A-51										115		
P-41	Pier 2E-2	A-52	B-40							↓	12				
P-42	Piers 3B & 1E-2	1E-2	A-53							↓	120				
P-43	Ramp "E-4"	A-37	A-33	52											
TOTAL				376			121		35	290			1011	513	331
										* 95					

* Sec. M-6.6(b)
† Sec. M-6.5(b) or M 6.8(b)

PROPOSED DRAINAGE STRUCTURES				
CODE	LOCATION	DESCRIPTION	ELEV.	REMARKS
A-1	57+08.5 ℄ Freeway 62.7'Rt.	2-G Inlet	688.89	See Note No. 5
A-2	56+50 ℄ Freeway 2'Lt.	2-G Inlet	690.00	for all Standard
A-3	55+80 ℄ Freeway 2'Lt.	2-G Inlet	689.69	No. 2 Inlets
A-4	55+25 ℄ Freeway 2'Lt.	2-G Inlet	689.88	
A-5	40+00 B.W.B. 52'Rt.	2-G Inlet	674.53	
A-6	43+12.7 B.W.B. 52'Rt.	2-8 Inlet	672.14	
A-7	47+50 B.W.B. 74'Rt.	2-10 Inlet	667.65	
A-8	48+66 B.W.B. 74'Rt.	2-8 Inlet	668.20	
A-9	48+03 B.W.B. 74'Rt.	2-8 Inlet	667.39	
A-10	12+37.5 Carnegie 37.5'Rt.	2-G Inlet	670.7±	
A-11	0+71 ℄ "E-3" 21'Rt.	2-G Inlet	670.37	
A-12	5+92 ℄ E. 9th. 33.3'Rt.	2-G Inlet	671.2±	
A-13	1+00 "E-3" Conn. ℄	2-G Inlet	670.58	
A-14	14+85 ℄ E. 9th. 26'Rt.	2-8 Inlet	672.67	
A-15	15+55 ℄ E. 9th. 26'Rt.	2-G Inlet	672.45	
A-16	16+25 ℄ E. 9th. 26'Rt.	2-8 Inlet	672.66	
A-17	14+85 ℄ E. 9th. 26'Lt.	2-10 Inlet	672.67	
A-18	15+55 ℄ E. 9th. 26'Lt.	2-8 Inlet	672.45	
A-19	16+25 ℄ E. 9th. 26'Lt.	2-10 Inlet	672.66	
A-20	10+25, "E-2" ℄	2-8 Inlet	673.05	
A-21	9+93 "E-2" ℄	2-G Inlet	672.87	
A-22	9+25 "E-2" 16'Rt.	2-2A Catch Basin	671.3	Top of Grate 671.3
A-23	6+00 B.E.B. 35'Rt.	2-8 Inlet	671.37	
A-24	4+15 B.E.B. 35'Rt.	2-8 Inlet	669.96	
A-25	1+73 B.E.B. 40.5'Rt.	2-8 Inlet	668.65	
A-26	2+00 "E-1" 45'Lt.	2-2A Catch Basin	667.6	Top of Grate 667.8
A-27	1+90 "E-1" 18'Rt.	2-2A Catch Basin	666.3	Top of Grate 666.3
A-28	1+42 "E-1" ℄	2-G Inlet	668.11	
A-29	1+00 "E-1" ℄	2-G Inlet	668.37	
A-30	7+15± B.E.B. 35'Lt.	2-2A Catch Basin	671.0	Top of Grate 671.0
A-31	5+56 "E-3" 12'Rt.	2-2A Catch Basin	668.0	Top of Grate 668.0
A-32	1+00 "E-3" 20'Rt.	2-2A Catch Basin	668.1	Top of Grate 668.1
A-33	3+15 "E-4" 13'Rt.	2-2A Catch Basin	669.2	Top of Grate 669.2
A-34	53+07 ℄ Freeway 110'Rt.	2-2A Catch Basin	672.5	Top of Grate 672.5
A-35	5+01 "E-4" 47'Rt.	2-4 Catch Basin	674.00	Top of Grate 674.35
A-36	3+20 "E-3" 60'Rt.	2-2A Catch Basin	672.5	Top of Grate 672.5
A-37	1+14 "E-4" 64'Rt.	2-2A Catch Basin	670.7	Top of Grate 670.7
A-50	56+70 Freeway 78'Rt.	Std. No. 2 Manhole	682.3	Provide Drop Pipe
A-51	6+23 B.E.B. 2'Lt.	Std. No. 1 Manhole	672.72	
A-52	51+53± "E-2" 9'Rt.	Std. No. 1 Manhole	693±	
A-53	47+80 Freeway 27'Lt.	Std. No. 2 Manhole	668.5±	

EXISTING SEWERS					
CODE	LOCATION			SIZE	LENGTH	REMARKS
	STREET	FROM	TO			
E-1	Woodland Ave.	B-23	B-19	No. 4	270'	Abandon
E-2	Woodland Ave.	B-19	A-50	No. 4	90'	Abandon
E-3	Woodland Ave.	A-50	B-4	No. 4	180'	Undisturbed
E-4	Woodland Ave.	B-4	West	No. 4		Undisturbed
E-5	E. 9th St.	B-27	E-6	No. 5	510'	Undisturbed
E-6	New E. 9th St.	B-22	B-7	No. 13	230'	Undisturbed
E-7	New E. 9th St.	B-7	North	No. 16		Undisturbed
E-8	Broadway	B-27	B-3	No. 3	1025'	Undisturbed
E-9	Broadway	B-32	E-8	Laterel	30'	Undisturbed
E-10	Pier 3B	A-53	North	No. 4	20'	Remove
E-11	Railroad Yards	A-53	B-36	No. 4	265'	Undisturbed
E-12	Railroad Yards	B-37	SW	30"		Undisturbed
E-13	Pier 2E-2	B-40	B-37	12"	80'	Undisturbed
E-14	Woodland Ave.	East	B-22	No. 12		Undisturbed

Note: Size No. 4 Sewer is egg Shaped. Area of sewer is equivalent to a 33" diameter pipe.

LEGEND
- Existing Sewer
- Existing Catch Basin or Manhole
- Proposed Sewer
- Proposed Inlet, Catch Basin, or Manhole
- Underdrain
- Ditch Centerline
- Overland Flow

NOTES

1. Abbreviations:
   Rt. - Right
   Lt. - Left
   U.P. - Under Pavement
   Directions are noted as: E, W, S, & N.

2. Cell Letters:
   Drainage structures and pipes are prefixed with the following cell letters:
   A - Proposed Structures
   P - Proposed Pipe Sewers
   B - Existing Structures
   E - Existing Pipe Sewers
   The direction of sewer flow is indicated by arrows.

4. Elevations:
   Elevations shown in the tables are normal ditch and center of structure for 2-2A catch basins; top of cover at the center for manholes; normal grade at the intersection of the center line of cover and at curb face for all 2-G, 2-8, and 2-10 inlets.

5. Standard No. 2 Inlets:
   The Standard No. 2 Inlets shall be provided with a 2" depression in the pavement at the face of the curb for the length of the inlet. The pavement transition required to obtain the depression should not be longer than 2 feet along the curb nor more than 3 feet toward the center of the pavement.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	TYPE FUNDS
2	OHIO		

20
117

CUYAHOGA COUNTY
CITY OF CLEVELAND
INNER BELT FREEWAY - PART 5
EAST APPROACH TO CENTRAL VIADUCT
CUY-42-(17.43-18.02)
DRAINAGE PLAN

EXISTING DRAINAGE STRUCTURES				
CODE	LOCATION	DESCRIPTION	ELEV.	REMARKS
B-1	8+27 B.E.B. 3' Lt.	Manhole	673.77	Adjust to Grade
B-2	4+14 B.E.B. ℄	Manhole	670.63	Adjust to Grade
B-3	0+37 B.E.B. 19' Lt.	Manhole		Undisturbed
B-4	5+43 ℄ "E-3" 115' Rt.	Manhole	668.5±	Adjust to Grade
B-5	11+60 Carnegie 10' Lt.	Manhole		Undisturbed
B-6	5+62 E. 9th St. 22' Rt.	Manhole		Undisturbed
B-7	10+23 E. 9th St. ℄	Manhole		Undisturbed
B-8	18+90 E. 9th St. 45' Rt.	Catch Basin		Abandon
B-9	0+47 B.E.B. 27' Rt.	Catch Basin		Abandon
B-10	49+12 B.W.B. 13' Rt.	Catch Basin		Abandon
B-11	5+82 Carnegie 37' Rt.	Catch Basin		Abandon
B-12	7+75 Carnegie 47' Rt.	Catch Basin		Abandon
B-13	8+90 Carnegie 36' Rt.	Catch Basin		Undisturbed
B-14	10+40 Carnegie 37' Rt.	Catch Basin		Undisturbed
B-15	5+72 E. 9th St. 24' Rt.	Catch Basin		Abandon
B-16	8+34 E. 9th St. 29' Rt.	Catch Basin		Undisturbed
B-17	4+18 "E-3" 30' Lt.	Catch Basin		Abandon
B-18	56+58 Freeway 43' Lt.	Catch Basin		Abandon
B-19	57+35 Freeway 16' Lt.	Manhole		Abandon
B-20	4+83 "E-4" 90' Lt.	Catch Basin		Abandon
B-21	11+95 E. 9th St. 4' Rt.	Manhole		Undisturbed
B-22	12+50 E. 9th St. 10' Lt.	Manhole		Undisturbed
B-23	4+36 "E-4" 80' Lt.	Manhole		Abandon
B-24	4+70 "E-4" 55' Lt.	Catch Basin		Abandon
B-25	4+80 "E-4" 69' Lt.	Manhole		Undisturbed
B-26	4+80 "E-4" 105' Lt.	Catch Basin		Abandon
B-27	10+61 B.E.B. 14' Lt.	Manhole		Undisturbed
B-28	10+54 B.E.B. 15' Rt.	Manhole		Undisturbed
B-29	10+40 B.E.B. 56' Rt.	Manhole		Undisturbed
B-30	10+34 B.E.B. 110' Rt.	Catch Basin		Undisturbed
B-31	38+35 B.W.B. 35' Lt.	Catch Basin		Abandon
B-32	7+75 B.E.B. 35' Lt.	Catch Basin		Remove
B-33	6+90 B.E.B. 30' Rt.	Catch Basin		Abandon
B-34	4+34 B.E.B. 25' Lt.	Catch Basin		Abandon
B-35	3+43 B.E.B. 25' Rt.	Catch Basin		Abandon
B-36	0+82 "E-2" 13' Rt.	Manhole		Undisturbed
B-37	4+70 "E-2" 67' Rt.	Manhole		Undisturbed
B-38	4+80 "E-2" 59' Rt.	Catch Basin		Undisturbed
B-39	5+10 "E-2" 38' Rt.	Catch Basin		Undisturbed
B-40	5+34 "E-2" 19' Rt.	Catch Basin		Undisturbed
B-41	6+73 Carnegie 12' Rt.	Catch Basin		Abandon

GENERAL NOTES

Sewers are designed by the Rational Formula based on a 10 year storm frequency flowing full.

Minimum Velocity of flow is 3.0 F.P.S. for main lines and 2.5 F.P.S. for laterals.

The abandoning of existing manholes shall be in accordance with Section I-16.03 of the Construction and Material Specifications with the following exceptions. (1) The existing inlet and outlet pipes shall be sealed with brick. (2) After the sealing of the existing pipes is completed and the walls removed to the required depth, the manhole shall be filled with sand and compacted in accordance with Section I.-16.03.

Where proposed sewer pipes are to be connected into existing sewers, the hole in the existing sewer shall be cut by the City of Cleveland.

Not all sewer pipes connected to existing catch basins are shown on the plans. Where sewer pipes not shown are encountered during construction the pipes shall be cut at the limits of construction and sealed to the satisfaction of the Engineer. Payment for cutting and sealing in accordance with 4th paragraph of Item 16.03 shall be included in the unit price bid for Item E-101 Roadway Excavation.

Where it is necessary under Item 1-8, "Manholes Adjusted to Grade," to replace unsatisfactory manhole frame and cover castings, payment for the new castings shall be made at the Contract unit price bid per each for Item 1-8, "Manhole Frame and Covers, Furnished and Placed (City Standard Casting)." Payment shall constitute full compensation for furnishing, hauling, and placing all castings and any incidentals necessary to complete the item to the satisfaction of the Engineer.

Standard City Manhole Frames and Covers as shown on Sheet No. 23 shall be used on all new manholes.

Where precast reinforced concrete rings are used for Standard No. 1 or No. 2 Manholes, attention is directed to Standard Construction Drawing 1-8 M.H. No. 1-A for strength and design requirements.

10 ft. of Type I Paved Gutter shall be placed on the upstream side of all Standard No. 2-2 A Catch Basins located in a defined 2 foot bottom ditch.

SCALE 1"= 100'
MADE CEG DATE 1-18-57
TRCD B.M.O DATE 1-21-57
CKD H.K.M. DATE 5-7-57

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 SHEET. 20

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

108
117

CUYAHOGA COUNTY
CITY OF CLEVELAND
INNER BELT FREEWAY
EAST APPROACH VIADUCT
CUY – 42 – (17.43-18.02)

PLAN

SECTION A-A

SECTION THRU GRATING SUPPORT
3"=1'-0"

SECTION THRU GRATING FASTENING
3"=1'-0"

SECTION B-B

Note: W.I. stands for "wrought iron"

TYPE C & D TROUGH SUPPORTS
1"=1'-0"

VIEW E-E

TYPICAL SECTION TYPE L-1 TROUGH DETAILS
1"=1'-0"

TROUGH FIELD SPLICE
1"=1'-0"

DRAINAGE PROVISIONS AT PIER 7B-LOOKING EAST
Drainage Provisions at Pier 9B similar except trough and downspout are on east side of pier and as noted.
1/4"=1'-0"

SECTION M-M PIER 7B
1/4"=1'-0"

SECTION M-M PIER 9B
1/4"=1'-0"

SECTION D-D

SCUPPER DETAILS

SECTION F-F

PLAN

SECTION K-K
1/4"=1'-0"

ELEVATION GIRDER "L" LOOKING SOUTH
1/4"=1'-0"

ELEVATION GIRDER "D" - LOOKING NORTH
1/4"=1'-0"

SECTION J-J
1/4"=1'-0"

SECTION H-H
1/4"=1'-0"

TYPE "A" HANGER

TYPE "B" HANGER

SECTION C-C

PIPE HANGER DETAILS
1"=1'-0"

SCUPPER CONNECTION TO DOWNSPOUT
1"=1'-0"

SECTION G-G AT PIER 2E1
1/4"=1'-0"

DRAINAGE PROVISIONS AT PIERS 2E1 & 2E2 — LOOKING SOUTH
Details at Pier 2E2 shown
Reducer & 8"ø Pipe on Shaft of Pier 2E1 Similar-Exept to be on West Side of Pier.
1/4"=1'-0"

SECTION G-G AT PIER 2E2
1/4"=1'-0"

DRAINAGE PROVISIONS AT PIER 4B - LOOKING WEST
Note that trough and downspout are on West Side of pier
1/4"=1'-0"

SECTION L-L
1/8"=1'-0"

TYPICAL SECTION TYPE L-2 TROUGH DETAILS
1"=1'-0"

NOTES:
For drainage material and additional notes see Sh 109
For detail of Crossframe J4 see Sh. 84

U. S. ROUTE 42 RELOCATION
INNER BELT FREEWAY
EAST APPROACH VIADUCT
BR. NO. CUY-42-17.50
DRAINAGE DETAILS
CLEVELAND CUYAHOGA COUNTY OHIO

SCALE As Noted
MADE PVS. DATE 1-18-57
TRCD H.G. DATE 2-1-57
CKD ARB/JR DATE 2-22-57

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 (2E) B SHEET-108

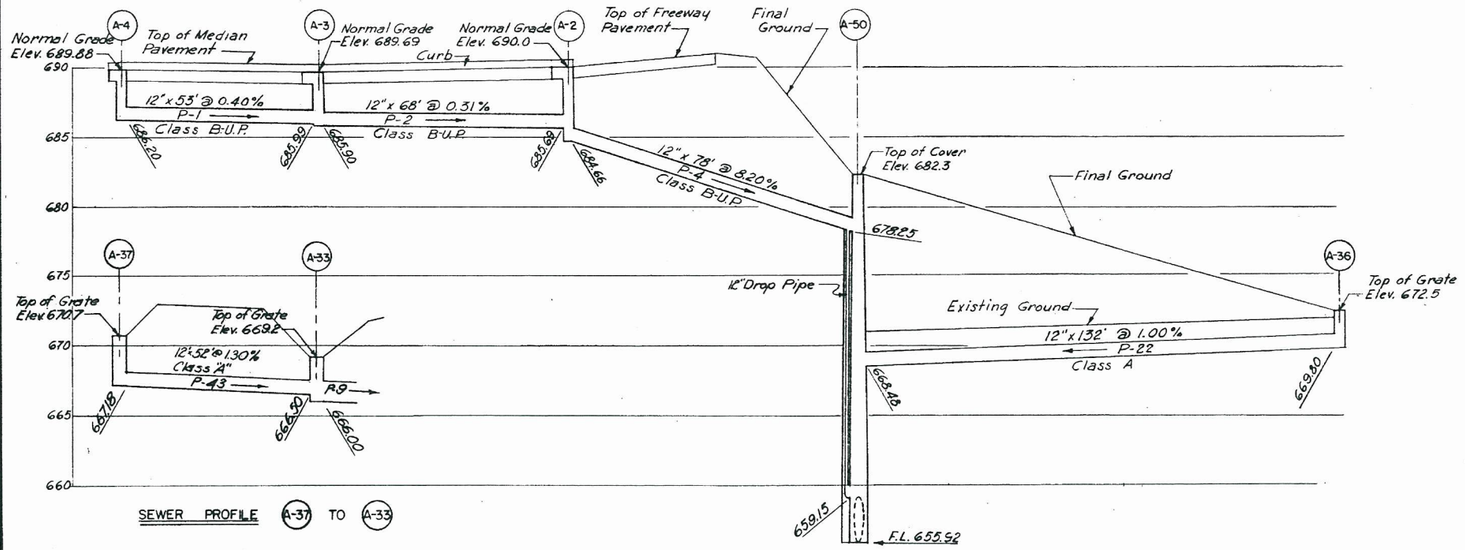
FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

21
117

CUYAHOGA COUNTY
CITY OF CLEVELAND
INNER BELT FREEWAY - PART 5
EAST APPROACH TO CENTRAL VIADUCT
CUY-42-(17.43-18.02)

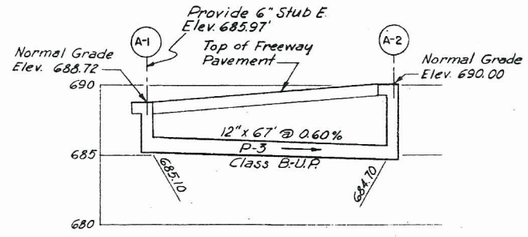
SEWER PROFILES

FEB 23 1959

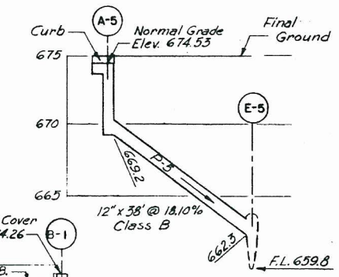


SEWER PROFILE A-37 TO A-33

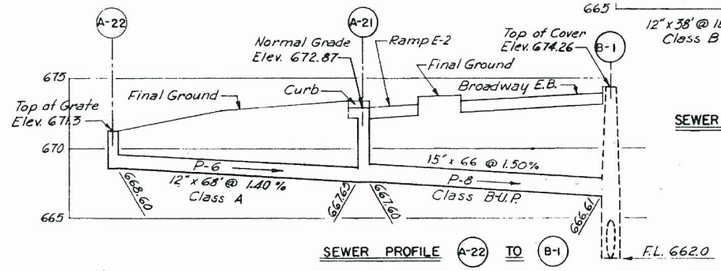
SEWER PROFILE A-4 TO A-36



SEWER PROFILE A-1 TO A-2



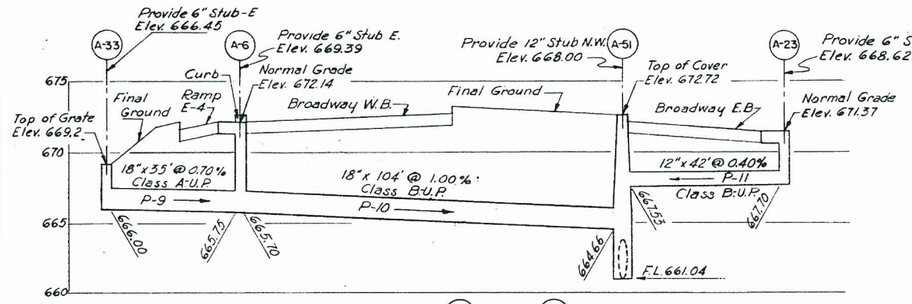
SEWER PROFILE A-5 TO E-5



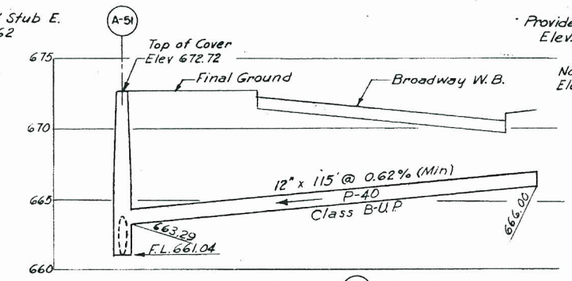
SEWER PROFILE A-22 TO B-1

LIST OF SEWER PROFILES on this sheet

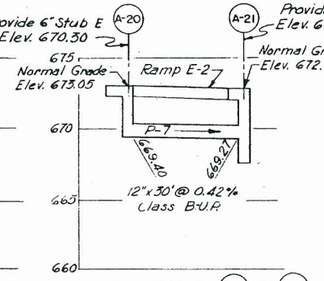
P-1
thru
P-20
P-22
P-39
P-40
P-43



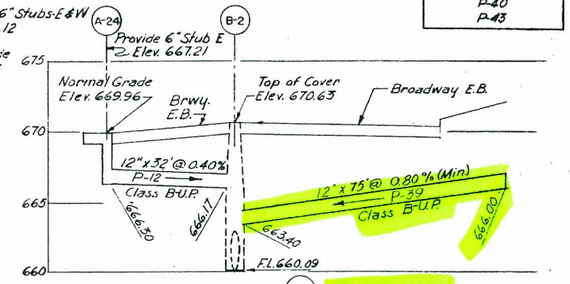
SEWER PROFILES A-33 TO A-23



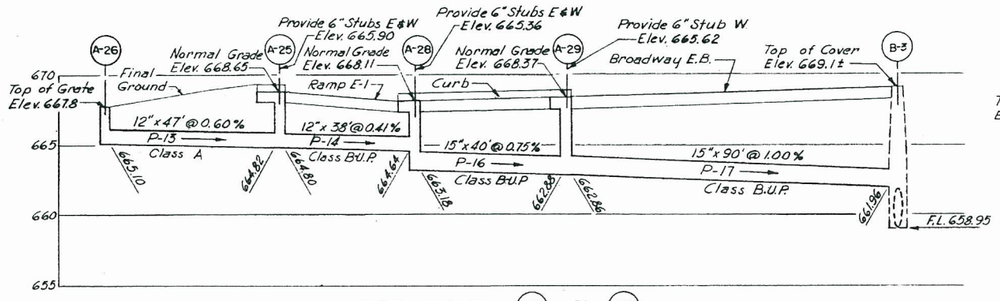
SEWER PROFILE A-51 TO PIER 9-B



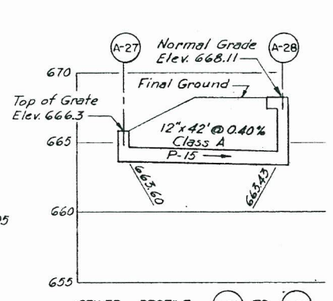
SEWER PROFILE A-20 TO A-21



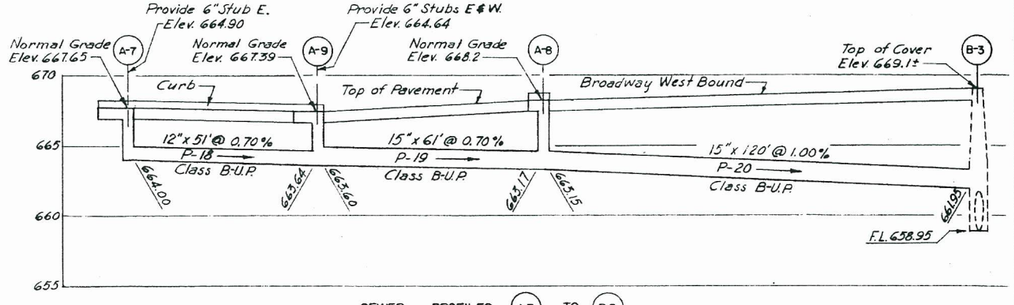
SEWER PROFILES A-24 TO PIER 7-B



SEWER PROFILES A-26 TO B-3



SEWER PROFILE A-27 TO A-28



SEWER PROFILES A-7 TO B-3

SCALE Vert: 1"=5' Hor.: 1"=20'
MADE CEG DATE 1-15-57
TRCD. DATE
CKD. RLL DATE 2-14-57
914 SHEET 21

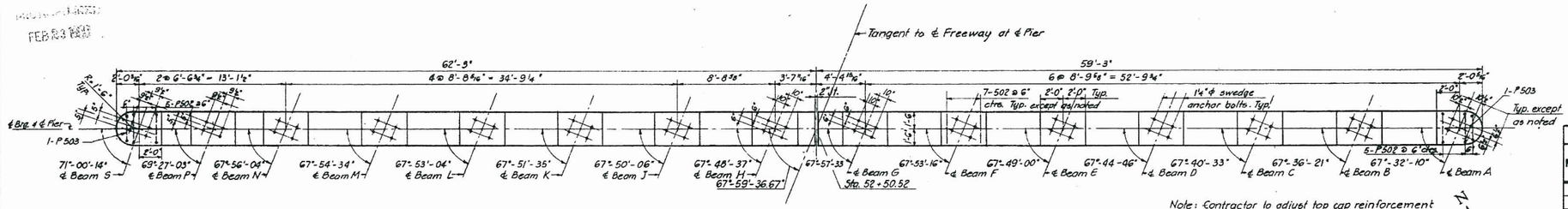
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK

FEB 23 1960

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

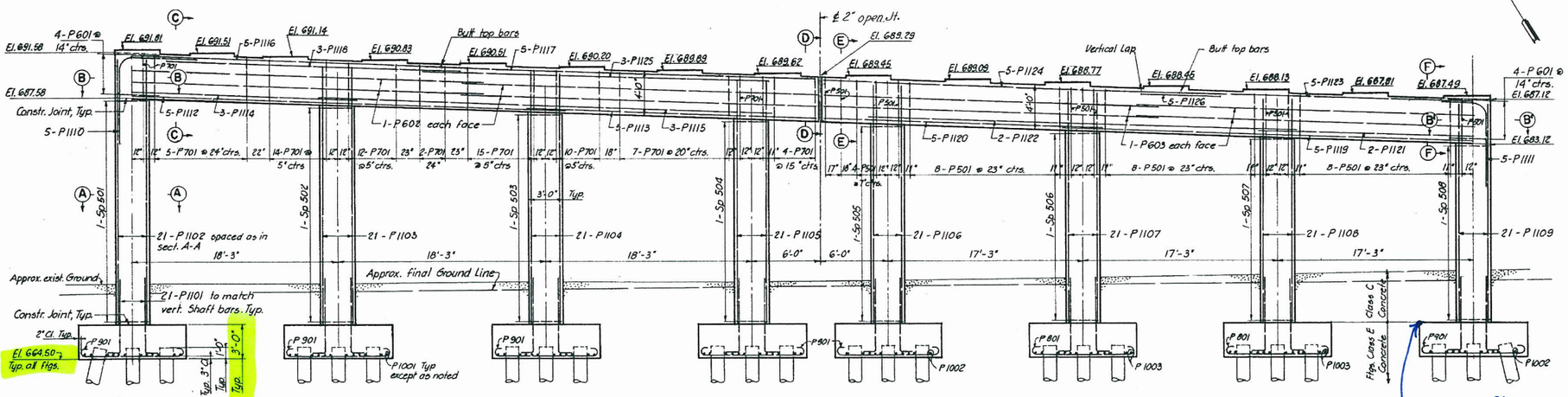
54
117

CUYAHOGA COUNTY
CITY OF CLEVELAND
INNER BELT FREEWAY
EAST APPROACH VIADUCT
CUY-42-(17.43-18.02)



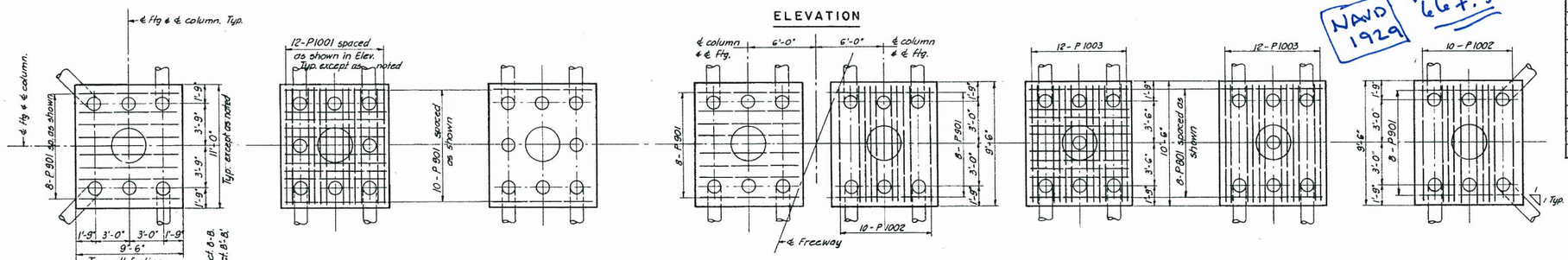
PLAN

Note: Contractor to adjust top cap reinforcement to clear drilled holes for anchor bolts.

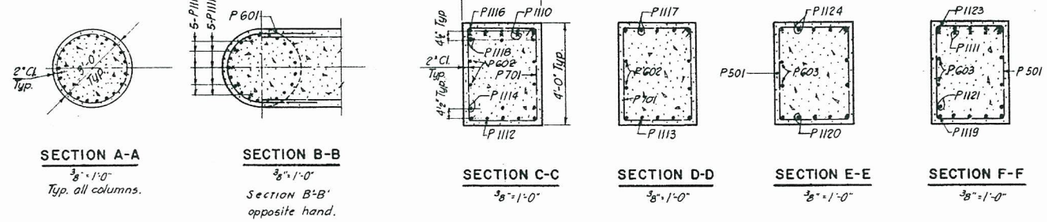


Note: Contractor to adjust top cap reinforcement to clear drilled holes for anchor bolts.

ELEVATION



FOOTING PLAN
Not to scale



REINFORCEMENT SCHEDULE

MARK	NO.	LENGTH	TYPE	DIMENSIONS A	B	C	D	SERIES INCREMENT	WEIGHT (Lbs.)
P 501	36	13'-2"	109	2'-8"	3'-8"				494
P 502	101	4'-8"	105	2'-8"	1'-0"				492
P 503	2	4'-3"	105	2'-3"	1'-0"				9
P 601	8	8'-2"	123	1'-4"	2'-0"				98
P 602	8	31'-3"	Str.						376
P 603	8	29'-9"	Str.						357
P 701	72	13'-4"	109	2'-8"	3'-8"				1962
P 801	16	11'-4"	100	9'-2"					484
P 901	52	11'-8"	100	9'-2"					2 063
P 1001	48	13'-6"	100	10'-8"					2 788
P 1002	20	12'-0"	100	9'-2"					1 033
P 1003	24	13'-0"	100	10'-2"					1 343
P 1101	168	8'-4"	104	6'-9"	1'-7"				7 438
P 1102	21	23'-6"	Str.						2 622
P 1103	21	23'-0"	Str.						2 566
P 1104	21	22'-3"	Str.						2 483
P 1105	21	21'-6"	Str.						2 399
P 1106	21	21'-0"	Str.						2 343
P 1107	21	20'-3"	Str.						2 260
P 1108	21	19'-9"	Str.						2 204
P 1109	21	19'-0"	Str.						2 120
P 1110	5	14'-10"	124	7"/16	7'-9"	7'-9"	1'-6"		394
P 1111	5	14'-10"	125	7"/16	7'-9"	7'-9"	1'-6"		394
P 1112	5	36'-3"	Str.						1016
P 1113	5	25'-9"	Str.						684
P 1114	3	20'-0"	Str.						319
P 1115	3	40'-0"	Str.						638
P 1116	6	27'-6"	Str.						731
P 1117	5	33'-3"	Str.						883
P 1118	3	26'-3"	Str.						418
P 1119	5	36'-3"	Str.						963
P 1120	5	24'-9"	Str.						657
P 1121	2	19'-0"	Str.						202
P 1122	2	38'-0"	Str.						404
P 1123	5	26'-0"	Str.						691
P 1124	5	31'-9"	Str.						843
P 1125	3	30'-6"	Str.						486
P 1126	5	7'-0"	Str.						186
								Total	47 843

SPIRAL REINFORCEMENT SCHEDULE

MARK	NO	CORE DIA. % SPIRAL	LENGTH	PITCH	NO. OF TURNS	WEIGHT (Lbs.)
SP 501	1	2'-8"	20'-1" ±	2"	124	1 117
SP 502	1	2'-8"	19'-5" ±	2"	120	1 081
SP 503	1	2'-8"	18'-8" ±	2"	115	1 036
SP 504	1	2'-8"	18'-0" ±	2"	111	1 000
SP 505	1	2'-8"	17'-7" ±	2½"	87	793
SP 506	1	2'-8"	16'-11" ±	2½"	84	766
SP 507	1	2'-8"	16'-4" ±	2½"	81	738
SP 508	1	2'-8"	15'-7" ±	2½"	78	710
					Total	7 241

NOTES:

54 reinf. C.I.P. Piles 14" Diam. required with an estimated average vertical length of 60 feet.
All battered piles shall be 'battered 3 on 12.
All piles shall be driven to a capacity of 50 tons per pile.
For replacement steel schedule see Sheet 43.
For drainage details see Sheet 108 & 109.
For rustication locations and details see Sheet 65.
For details of shoes and anchor bolts see Sheet 89.
For bar bending diagrams see Sheet 43.
For spiral renforcing notes see sheet 56

NAVD 1929 667.50

* NAVD 1929 = 667.50
− 0.741 NGVD88 Conversion
666.76' Top of footing

U. S. ROUTE 42 RELOCATION
INNER BELT FREEWAY
EAST APPROACH VIADUCT
BR. NO. CUY-42-17.50

PIER 7 B

CLEVELAND CUYAHOGA COUNTY OHIO

SCALE 3/16"=1'-0" exc. as noted
MADE H.G. DATE 11-16-56
TRCD NRK DATE 2-20-57
CKD EW DATE 2-1-57

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 (2E) B SHEET- 54

STORM SEWER SYSTEM

PID : **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO- LOCATED BEHIND SIDEWALK

Description : Side Ditch Inlet to Ex. CB draining Ex. Pier 7B scupper - 26+90 LT (DITCH INLET) **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 668.61

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D98	EX39	26+91	0.13	0.08	15.00	4.20	5.09	0.3	0.4	12	33.0	0.0100	667.96	2.56	3.32	0.0002	668.62	671.38	2.76	2.42	CB 2-2B
begin		26+75	0.13	0.08									667.63				668.61	671.37			0.015

STORM SEWER SYSTEM

PID : **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO- LOCATED BEHIND SIDEWALK

Description : Side Ditch Inlet to Ex. CB draining Ex. Pier 7B scupper - 26+90 LT (DITCH INLET) **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 50

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 668.61

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D98	EX39	26+91	0.13	0.08	15.00	4.20	5.44	0.3	0.4	12	33.0	0.0100	667.96	2.56	3.32	0.0002	668.62	671.38	2.76	2.42	CB 2-2B
begin		26+75	0.13	0.08									667.63				668.61	671.37			0.015

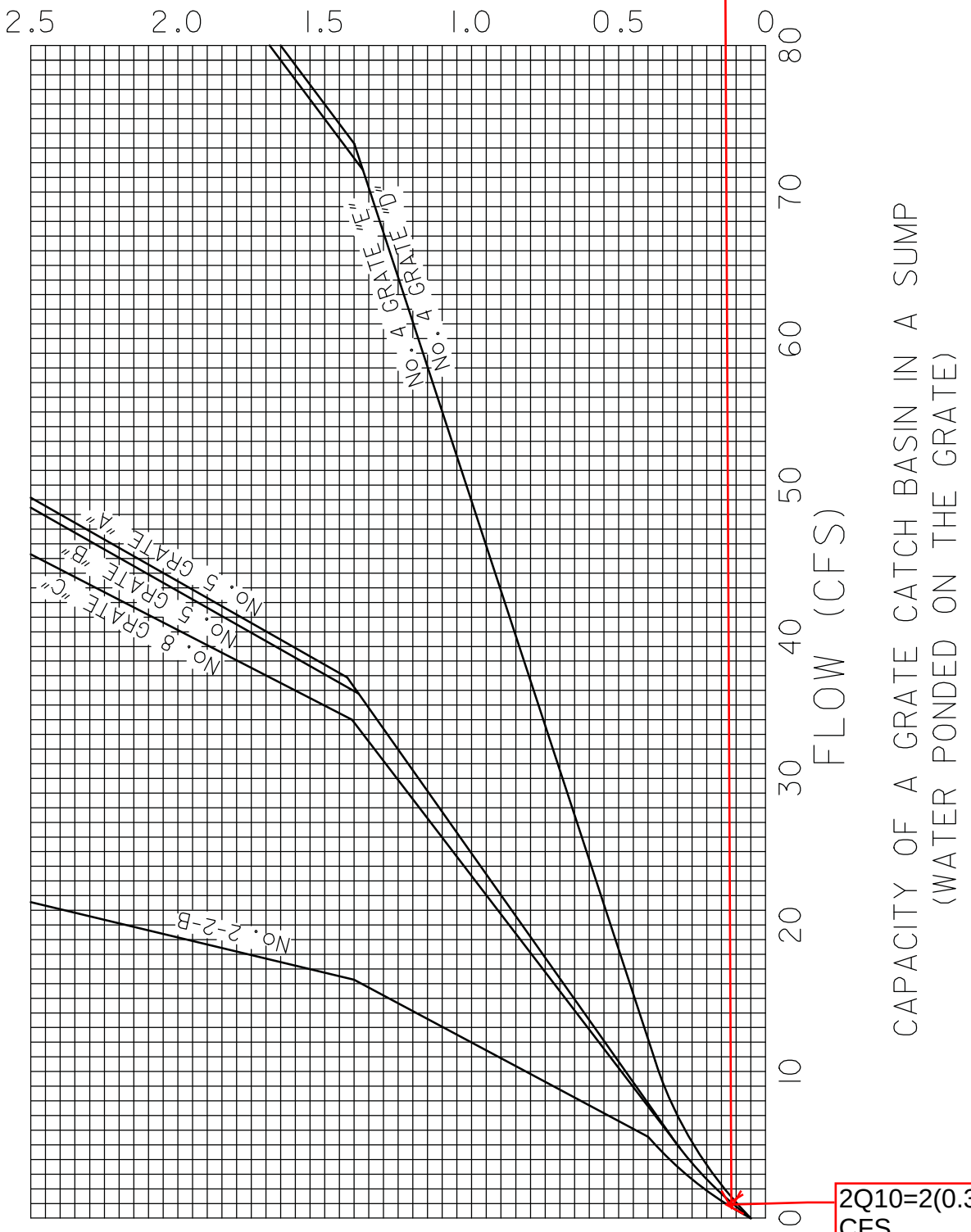
D-98 Sump Calculation

CAPACITY OF A GRATE CATCH BASIN IN A SUMP

1102-1

REFERENCE SECTION
1102.3.5

HW=0.15 FT <1.0 FT; 1.0 FT FREEBOARD AVAILABLE



2Q10=2(0.35)=0.70 CFS

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/17/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Storm Sewer Design - Ontario Outfall **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 662.93

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D125	D126	166+63		1.31	1.18	10.00	5.10	6.05	6.0	7.1	15	20.0	0.0100	686.12	4.90	6.02	0.0162	688.35	690.87	2.52	3.50	I 3D
begin		166+84		1.31	1.18									685.92				688.03	690.85			0.015
D126	D122	166+84		0.20	0.18	10.07	5.08	6.05	6.9	8.2	15	77.2	0.0136	685.92	6.01	7.02	0.0216	688.03	690.85	2.82	3.68	I 3D
		167+62		1.51	1.36									684.87				686.36	691.07			0.015
D122	D190	167+62		0.47	0.42	10.28	5.03	6.05	9.0	10.8	18	72.7	0.0095	684.62	5.72	9.54	0.0140	686.36	691.07	4.71	4.95	I 3D
		167+45		1.98	1.78									683.93				685.34	693.44			0.015
D190	D171	167+45		0.10	0.09	10.49	4.99	6.05	9.3	11.3	18	44.6	0.0150	683.93	7.06	11.99	0.0155	685.34	693.44	8.10	8.01	MH 3
		167+26		2.08	1.87									683.26				684.65	694.91			0.015
D171	D132	167+26		0.10	0.09	10.60	4.97	6.02	9.7	11.8	18	142.3	0.1105	682.66	15.26	32.56	0.0168	683.31	694.91	11.60	10.75	I 3D
		699+38		2.18	1.96									666.93				668.33	671.93			0.015
D132	D179	699+38		0.00	0.00	10.75	4.93	5.08	9.7	10.0	18	39.4	0.0642	665.48	12.49	24.82	0.0120	666.30	671.93	5.63	4.95	MH 3
		698+99		2.18	1.96									662.95				665.83	668.55			0.015
D178	D179	699+05		0.45	0.41	10.00	5.10	5.08	2.1	2.1	15	75.4	0.0119	663.74	4.50	6.58	0.0013	665.93	668.14	2.21	3.15	CB 3
begin		698+99		2.63	2.37									662.84				665.83	668.55			0.015
D179	D50	698+99		0.36	0.25	15.00	4.20	5.08	11.0	13.3	18	12.2	~~0.0000~~	662.45	6.22	0.03	0.0213	665.83	668.55	2.72	4.60	CB 8A
		699+00		2.99	2.62									~~662.45~~ *				665.57	671.54			0.015
											Warning											

* D179 to D50. Based on the approved as-built survey information, the invert elevation at structure D179 is 662.45 and structure D50 is 662.66, which results in a negative slope of -1.72% for the pipe run of D179 to D50.

STORM SEWER SYSTEM

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D50	D51	699+03	0.00	0.00	15.03	4.19	5.08	11.0	13.3	72	54.0	0.0018	662.19	3.53	194.45	0.0000	665.57	671.59	6.02	3.40	MH 3
		698+95	2.99	2.62									662.09				665.57	675.44			0.013
D51	D53	698+95	0.00	0.00	15.29	4.16	5.05	10.9	13.2	72	36.0	0.0018	662.09	3.54	195.93	0.0000	665.50	675.44	9.94	7.35	MH 3
		698+98	2.99	2.62									662.02				665.50	674.14			0.013
D53	8025	698+98	0.00	0.00	15.46	4.13	5.03	10.8	13.2	15	46.0	0.0013	662.02	8.82	2.51	0.0416	665.28	674.14	8.86	10.87	MH 3
		698+53	2.99	2.62						**Warning**			661.96				663.37	668.83			0.013
8025	END	698+53	0.00	0.00	15.54	4.12	5.03	10.8	13.2	15	8.0	0.0038	661.71	8.80	3.69	0.0553	663.37	668.83	5.46	5.87	MH 3
final		698+45	2.99	2.62						**Warning**			661.68				662.93	667.92			0.015

*See 2011-11-02 STORM SEWER - ONTARIO OUTFALL Outfall D52.xml for model run using actual 10-yr Pond Pack flow of 3.6cfs which removes the warning message.

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/17/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Storm Sewer Design - Ontario Outfall **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 50

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 662.93

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D125	D126	166+63		1.31	1.18	10.00	5.10	6.60	6.0	7.8	15	20.0	0.0100	686.12	4.90	6.02	0.0193	689.07	690.87	1.80	3.50	I 3D
begin		166+84		1.31	1.18									685.92				688.68	690.85			0.015
D126	D122	166+84		0.20	0.18	10.07	5.08	6.60	6.9	9.0	15	77.2	0.0136	685.92	6.01	7.02	0.0256	688.68	690.85	2.17	3.68	I 3D
		167+62		1.51	1.36									684.87				686.71	691.07			0.015
D122	D190	167+62		0.47	0.42	10.28	5.03	6.60	9.0	11.8	18	72.7	0.0095	684.62	5.72	9.54	0.0167	686.71	691.07	4.36	4.95	I 3D
		167+45		1.98	1.78									683.93				685.50	693.44			0.015
D190	D171	167+45		0.10	0.09	10.49	4.99	6.60	9.3	12.4	18	44.6	0.0150	683.93	7.06	11.99	0.0184	685.50	693.44	7.94	8.01	MH 3
		167+26		2.08	1.87									683.26				684.68	694.91			0.015
D171	D132	167+26		0.10	0.09	10.60	4.97	6.55	9.7	12.9	18	142.3	0.1105	682.66	15.26	32.56	0.0199	683.34	694.91	11.57	10.75	I 3D
		699+38		2.18	1.96									666.93				668.35	671.93			0.015
D132	D179	699+38		0.00	0.00	10.75	4.93	5.38	9.7	10.5	18	39.4	0.0642	665.48	12.49	24.82	0.0134	666.44	671.93	5.49	4.95	MH 3
		698+99		2.18	1.96									662.95				665.91	668.55			0.015
D178	D179	699+05		0.45	0.41	10.00	5.10	5.38	2.1	2.2	15	75.4	0.0119	663.74	4.50	6.58	0.0015	666.02	668.14	2.12	3.15	CB 3
begin		698+99		2.63	2.37									662.84				665.91	668.55			0.015
D179	D50	698+99		0.36	0.25	15.00	4.20	5.38	11.0	14.1	18	12.2	~~0.0000~~	662.45	6.22	0.03	0.0239	665.91	668.55	2.64	4.60	CB 8A
		699+00		2.99	2.62									~~662.45~~ *				665.62	671.54			0.015
											Warning											

* D179 to D50. Based on the approved as-built survey information, the invert elevation at structure D179 is 662.45 and structure D50 is 662.66, which results in a negative slope of -1.72% for the pipe run of D179 to D50.

STORM SEWER SYSTEM

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D50	D51	699+03	0.00	0.00	15.03	4.19	5.38	11.0	14.1	72	54.0	0.0018	662.19	3.53	194.45	0.0000	665.62	671.59	5.97	3.40	MH 3
		698+95	2.99	2.62									662.09				665.62	675.44			0.013
D51	D53	698+95	0.00	0.00	15.29	4.16	5.38	10.9	14.1	72	36.0	0.0018	662.09	3.54	195.93	0.0000	665.62	675.44	9.82	7.35	MH 3
		698+98	2.99	2.62									662.02				665.62	674.14			0.013
D53	8025	698+98	0.00	0.00	15.46	4.13	5.38	10.8	14.1	15	46.0	0.0013	662.02	8.82	2.51	0.0474	665.62	674.14	8.52	10.87	MH 3
		698+53	2.99	2.62						**Warning**			661.96				663.44	668.83			0.013
8025	END	698+53	0.00	0.00	15.54	4.12	5.38	10.8	14.1	15	8.0	0.0038	661.71	8.80	3.69	0.0632	663.44	668.83	5.39	5.87	MH 3
final		698+45	2.99	2.62						**Warning**			661.68				662.93	667.92			0.015

*See 2011-11-02 STORM SEWER - ONTARIO OUTFALL Outfall D52.xml for model run using actual 10-yr Pond Pack flow of 3.6cfs which removes the warning message.

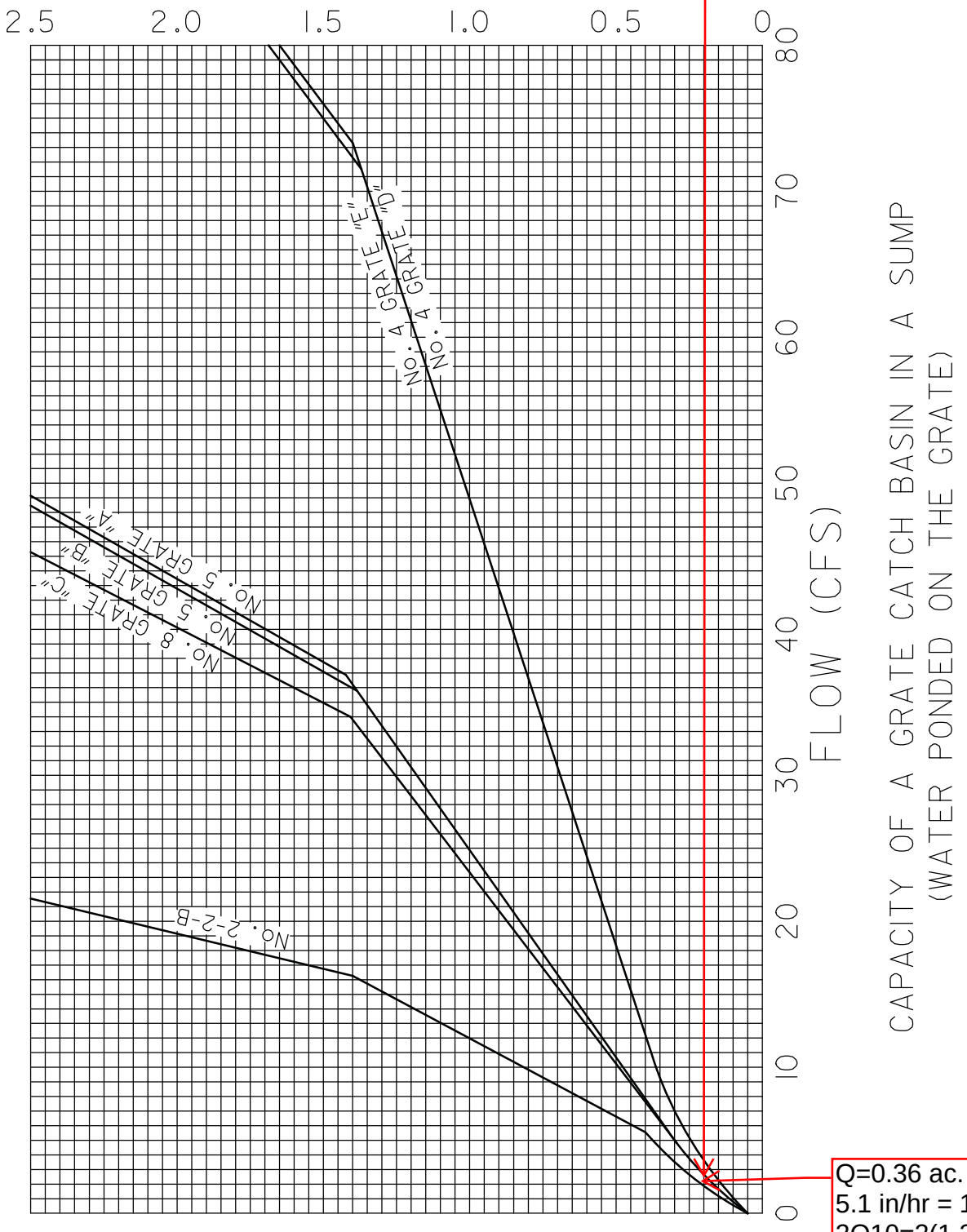
D-179 Sump Calculation

CAPACITY OF A GRATE CATCH BASIN IN A SUMP

1102-1

REFERENCE SECTION
1102.3.5

HW=0.20 FT <1.50 FT;
1.30 FT FREEBOARD



Q=0.36 ac. * 0.78 *
5.1 in/hr = 1.3 cfs
2Q10=2(1.3)=2.6CFS

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/17/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Storm Sewer Design - Ontario Outfall **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 666.96 *

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D125	D126	166+63		1.31	1.18	10.00	5.10	6.14	6.0	7.2	15	20.0	0.0100	686.72	4.90	6.02	0.0167	688.51	690.87	2.36	2.90	I 3D
begin		166+84		1.31	1.18									686.52				688.17	690.85			0.015
D126	D122	166+84		0.20	0.18	10.07	5.08	6.14	6.9	8.3	15	77.2	0.0162	686.52	6.61	7.66	0.0222	688.17	690.85	2.68	3.08	I 3D
		167+62		1.51	1.36									685.27				686.46	691.07			0.015
D122	D190	167+62		0.47	0.42	10.26	5.04	6.07	9.0	10.8	18	72.7	0.0150	685.02	7.01	11.99	0.0141	686.37	691.07	4.70	4.55	I 3D
		167+45		1.98	1.78									683.93				685.35	693.44			0.015
D190	D171	167+45		0.10	0.09	10.44	5.00	6.07	9.4	11.4	18	44.6	0.0150	683.93	7.07	11.99	0.0156	685.35	693.44	8.09	8.01	MH 3
		167+26		2.08	1.87									683.26				684.65	694.91			0.015
D171	D132	167+26		0.10	0.09	10.54	4.98	6.03	9.8	11.8	18	142.3	0.1105	682.66	15.25	32.56	0.0169	683.31	694.91	11.60	10.75	I 3D
		699+38		2.18	1.96									666.93				668.33	671.93			0.015
D132	D179	699+38		0.00	0.00	10.70	4.95	5.12	9.7	10.1	18	39.4	0.0642	665.48	12.49	24.82	0.0122	667.70	671.93	4.23	4.95	MH 3
		698+99		2.18	1.96									662.95				667.22	668.55			0.015
D178	D179	699+05		0.45	0.41	10.00	5.10	5.12	2.1	2.1	15	75.4	0.0119	663.74	4.50	6.58	0.0014	667.33	668.14	0.81	3.15	CB 3
begin		698+99		2.63	2.37									662.84				667.22	668.55			0.015
D179	END	698+99		0.36	0.25	15.00	4.20	5.12	11.0	13.4	18	12.2	0.0238	662.95	8.81	15.12	0.0217	667.22	668.55	1.33	4.10	CB 8A
final		699+00		2.99	2.62									662.66				666.96	671.54 **			0.015

* Tailwater Elevation is from Pondpack 25 Year WSE

** 25 year surcharging stays with in gutter and flows to catch basins along Carnegie.

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/17/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Storm Sewer Design - Ontario Outfall **Designer :** PNS

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 50

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 667.78 *

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D125	D126	166+63		1.31	1.18	10.00	5.10	6.62	6.0	7.8	15	20.0	0.0100	686.72	4.90	6.02	0.0194	689.10	690.87	1.77	2.90	I 3D
begin		166+84		1.31	1.18									686.52				688.71	690.85			0.015
D126	D122	166+84		0.20	0.18	10.07	5.08	6.62	6.9	9.0	15	77.2	0.0162	686.52	6.61	7.66	0.0258	688.71	690.85	2.14	3.08	I 3D
		167+62		1.51	1.36									685.27				686.72	691.07			0.015
D122	D190	167+62		0.47	0.42	10.26	5.04	6.62	9.0	11.8	18	72.7	0.0150	685.02	7.01	11.99	0.0168	686.72	691.07	4.35	4.55	I 3D
		167+45		1.98	1.78									683.93				685.50	693.44			0.015
D190	D171	167+45		0.10	0.09	10.44	5.00	6.62	9.4	12.4	18	44.6	0.0150	683.93	7.07	11.99	0.0185	685.50	693.44	7.94	8.01	MH 3
		167+26		2.08	1.87									683.26				684.68	694.91			0.015
D171	D132	167+26		0.10	0.09	10.54	4.98	5.48	9.8	10.8	18	142.3	0.1105	682.66	15.25	32.56	0.0139	683.28	694.91	11.63	10.75	I 3D
		699+38		2.18	1.96									666.93				668.63	671.93			0.015
D132	D179	699+38		0.00	0.00	10.70	4.95	5.48	9.7	10.8	18	39.4	0.0642	665.48	12.49	24.82	0.0139	668.63	671.93	3.30	4.95	MH 3
		698+99		2.18	1.96									662.95				668.08	668.55			0.015
D178	D179	699+05		0.45	0.41	10.00	5.10	5.48	2.1	2.2	15	75.4	0.0119	663.74	4.50	6.58	0.0016	668.20	668.14	-0.06	3.15	CB 3
begin		698+99		2.63	2.37									662.84				668.08	668.55			0.015
D179	END	698+99		0.36	0.25	15.00	4.20	5.48	11.0	14.4	18	12.2	0.0238	662.95	8.81	15.12	0.0248	668.08	668.55	0.47	4.10	CB 8A
final		699+00		2.99	2.62									662.66				667.78	671.54 **			0.015

* Tailwater Elevation is from Pondpack 50 Year WSE

** 50 year surcharging stays with in gutter and flows to catch basins along Carnegie.

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Storm Sewer Design - Ontario Outfall **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 662.93

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D53	8025	698+98	2.99	2.62	80.00	1.38	1.66	3.6	4.4	15	46.0	0.0013	662.02	2.94	2.18	0.0060	663.29	674.14	10.85	10.87	MH 3
begin		698+53	2.99	2.62						Warning			661.96				663.01	668.83			0.015
8025	END	698+53	0.00	0.00	80.26	1.37	1.66	3.6	4.4	15	8.0	0.0038	661.71	3.17	3.69	0.0060	662.98	668.83	5.85	5.87	MH 3
final		698+45	2.99	2.62									661.68				662.93	667.92			0.015

*Calculation provided to show outlet pipe from storm sewer system network flowing with 3.6 cfs as a result of the 10-year Pond Pack discharge flow eliminating the warning message in the previous calculation.

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Storm Sewer Design - Ontario Outfall **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 50

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 662.93

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D53	8025	698+98	2.99	2.62	80.00	1.38	1.86	3.6	4.9	15	46.0	0.0013	662.02	2.94	2.18	0.0076	663.38	674.14	10.76	10.87	MH 3
begin		698+53	2.99	2.62						**Warning**			661.96				663.03	668.83			0.015
8025	END	698+53	0.00	0.00	80.26	1.37	1.86	3.6	4.9	15	8.0	0.0038	661.71	3.17	3.69	0.0076	662.99	668.83	5.84	5.87	MH 3
final		698+45	2.99	2.62									661.68				662.93	667.92			0.015

*Calculation provided to show outlet pipe from storm sewer system network flowing with 3.6 cfs as a result of the 10-year Pond Pack discharge flow eliminating the warning message in the previous calculation.

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/02/2011 **Project :** CUY-90-14.90 **Location :** Tri-C Parking Lot

Description : D-55 to D-1018 **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 657.41

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D55	1018	23+18	0.82	0.74	10.00	5.10	5.74	3.8	4.2	12	96.0	0.0150	656.96	5.48	4.07	0.0188	659.24	661.00	1.76	3.04	CB 6
begin		22+22	0.82	0.74									655.52				657.44	665.17			0.015
D56	1018	20+23	0.39	0.29	10.00	5.10	5.99	1.5	1.7	12	199.0	0.0100	663.06	3.88	3.32	0.0032	663.60	667.10	3.50	3.04	CB 6
begin		22+22	1.21	1.03									661.07				661.85	665.17			0.015
1018	8060	22+22	0.00	0.00	10.85	4.91	5.74	5.1	5.9	36	280.2	0.0066	654.66	4.34	50.66	0.0001	657.44	665.18	7.74	7.52	MH 3
final		20+42	1.21	1.03									652.80				657.41	669.52			0.015

***** D1018 TO D8060 is a 39" x 31" brick sewer for most of pipe run. A junction exists 30' before D8060 and pipe size changes to a 48". 36" diameter shown is a smaller area than what a 39" x 31" provides, but the smaller area provides a more conservative design. A 38" (which is the equivalent diameter) is not a normal pipe diameter.

D-55 and D-56 Sump Calculation

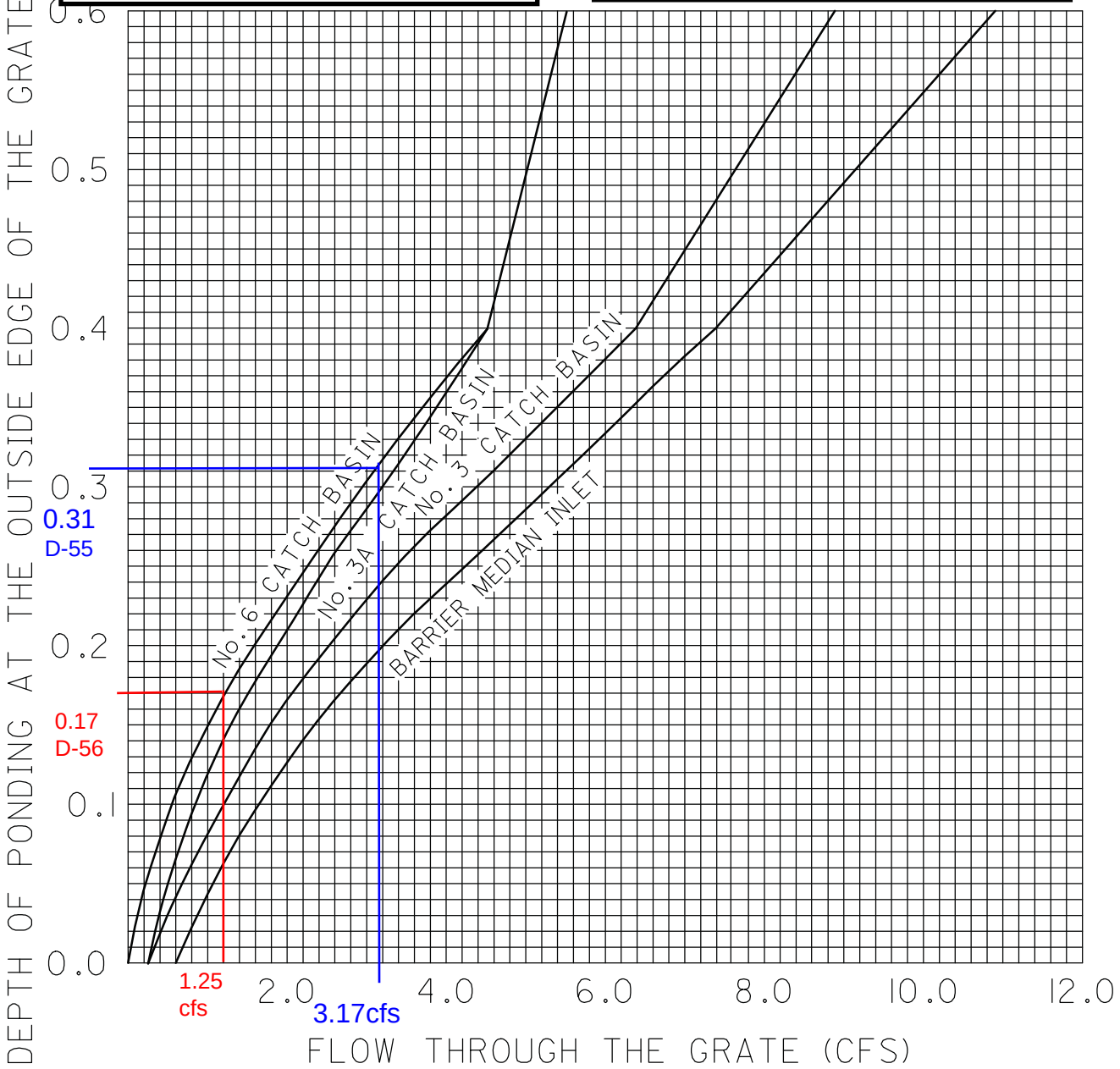
CAPACITY OF STANDARD CATCH BASIN GRATES IN PAVEMENT SAGS

1103-3

REFERENCE SECTION
1103.6, 1103.7

D-55 CB-6
Q5 = ciA = 0.90*4.3*0.82 =3.17 Check
HW = 0.31ft
HWallowable = 0.50ft

D-56 CB-6
Q5 = ciA = 0.74*4.3*0.39 =1.25 Check
HW = 0.17ft
HWallowable = 0.50ft



CALC BY: ERJOHNSON 12/7/11
CHECKED BY: AKL 12/7/11

Ontario Outfall Analysis

Project Summary	
Title	Ontario Outfall Cleveland Innerbelt
Engineer	PNShedivy
Company	HNTB
Date	5/15/2012

Notes

Table of Contents

Table of Contents

Ontario Outfall Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Proposed Storm Sewer DA	5 year	5	0.615	11.950	9.70
Proposed Storm Sewer DA	10 year	10	0.733	11.950	11.45
Proposed Storm Sewer DA	25 year	25	0.903	11.950	13.94
Proposed Storm Sewer DA	50 year	50	1.044	11.950	15.99
Existing DA	5 year	5	0.207	12.000	3.33
Existing DA	10 year	10	0.258	12.000	4.14
Existing DA	25 year	25	0.335	12.000	5.31
Existing DA	50 year	50	0.399	12.000	6.28

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Analysis Point Pro	5 year	5	0.581	12.150	3.23
Analysis Point Pro	10 year	10	0.699	12.150	3.57
Analysis Point Pro	25 year	25	0.868	12.150	4.06
Analysis Point Pro	50 year	50	1.009	12.150	6.86
Analysis Point Pre(same as Pro)	5 year	5	0.207	12.000	3.33
Analysis Point Pre(same as Pro)	10 year	10	0.258	12.000	4.14
Analysis Point Pre(same as Pro)	25 year	25	0.335	12.000	5.31
Analysis Point Pre(same as Pro)	50 year	50	0.399	12.000	6.28

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Underground Detention (IN)	5 year	5	0.615	11.950	9.70	(N/A)	(N/A)
Underground Detention (OUT)	5 year	5	0.581	12.150	3.23	665.52	0.206

Ontario Outfall Analysis

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Underground Detention (IN)	10 year	10	0.733	11.950	11.45	(N/A)	(N/A)
Underground Detention (OUT)	10 year	10	0.699	12.150	3.57	666.07	0.245
Underground Detention (IN)	25 year	25	0.903	11.950	13.94	(N/A)	(N/A)
Underground Detention (OUT)	25 year	25	0.868	12.150	4.06	666.96	0.303
Underground Detention (IN)	50 year	50	1.044	11.950	15.99	(N/A)	(N/A)
Underground Detention (OUT)	50 year	50	1.009	12.150	6.86	667.66	0.336

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.5	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.5	0.6	0.6	0.6
10.500	0.6	0.6	0.6	0.6	0.7
11.000	0.7	0.7	0.7	0.8	0.8
11.500	0.8	0.9	1.0	1.3	1.7
12.000	1.9	2.0	2.0	2.1	2.1
12.500	2.1	2.2	2.2	2.2	2.2
13.000	2.3	2.3	2.3	2.3	2.3
13.500	2.3	2.3	2.4	2.4	2.4
14.000	2.4	2.4	2.4	2.4	2.4
14.500	2.4	2.5	2.5	2.5	2.5
15.000	2.5	2.5	2.5	2.5	2.5
15.500	2.5	2.5	2.5	2.6	2.6
16.000	2.6	2.6	2.6	2.6	2.6
16.500	2.6	2.6	2.6	2.6	2.6

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.6	2.6	2.6	2.7	2.7
17.500	2.7	2.7	2.7	2.7	2.7
18.000	2.7	2.7	2.7	2.7	2.7
18.500	2.7	2.7	2.7	2.7	2.7
19.000	2.7	2.7	2.7	2.8	2.8
19.500	2.8	2.8	2.8	2.8	2.8
20.000	2.8	2.8	2.8	2.8	2.8
20.500	2.8	2.8	2.8	2.8	2.8
21.000	2.8	2.8	2.8	2.8	2.8
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.9	2.9	2.9	2.9	2.9
22.500	2.9	2.9	2.9	2.9	2.9
23.000	2.9	2.9	2.9	2.9	2.9
23.500	2.9	2.9	2.9	2.9	2.9
24.000	2.9	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.4	0.4	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.5	0.5	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.6	0.6	0.6	0.6	0.6
10.000	0.6	0.6	0.6	0.7	0.7
10.500	0.7	0.7	0.7	0.8	0.8
11.000	0.8	0.8	0.9	0.9	0.9
11.500	1.0	1.0	1.2	1.5	1.9
12.000	2.3	2.3	2.4	2.4	2.5
12.500	2.5	2.5	2.6	2.6	2.6
13.000	2.6	2.6	2.7	2.7	2.7
13.500	2.7	2.7	2.7	2.8	2.8
14.000	2.8	2.8	2.8	2.8	2.8
14.500	2.8	2.9	2.9	2.9	2.9
15.000	2.9	2.9	2.9	2.9	2.9
15.500	2.9	3.0	3.0	3.0	3.0
16.000	3.0	3.0	3.0	3.0	3.0
16.500	3.0	3.0	3.0	3.1	3.1

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.1	3.1	3.1	3.1	3.1
17.500	3.1	3.1	3.1	3.1	3.1
18.000	3.1	3.1	3.1	3.1	3.2
18.500	3.2	3.2	3.2	3.2	3.2
19.000	3.2	3.2	3.2	3.2	3.2
19.500	3.2	3.2	3.2	3.2	3.2
20.000	3.2	3.2	3.2	3.2	3.3
20.500	3.3	3.3	3.3	3.3	3.3
21.000	3.3	3.3	3.3	3.3	3.3
21.500	3.3	3.3	3.3	3.3	3.3
22.000	3.3	3.3	3.3	3.3	3.3
22.500	3.3	3.3	3.3	3.4	3.4
23.000	3.4	3.4	3.4	3.4	3.4
23.500	3.4	3.4	3.4	3.4	3.4
24.000	3.4	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.5	0.5	0.5	0.5
8.000	0.5	0.5	0.5	0.5	0.5
8.500	0.5	0.6	0.6	0.6	0.6
9.000	0.6	0.6	0.6	0.6	0.7
9.500	0.7	0.7	0.7	0.7	0.7
10.000	0.7	0.8	0.8	0.8	0.8
10.500	0.8	0.9	0.9	0.9	0.9
11.000	1.0	1.0	1.0	1.1	1.1
11.500	1.2	1.3	1.4	1.8	2.3
12.000	2.7	2.8	2.9	2.9	3.0
12.500	3.0	3.0	3.1	3.1	3.1
13.000	3.2	3.2	3.2	3.2	3.2
13.500	3.3	3.3	3.3	3.3	3.3
14.000	3.4	3.4	3.4	3.4	3.4
14.500	3.4	3.4	3.5	3.5	3.5
15.000	3.5	3.5	3.5	3.5	3.5
15.500	3.5	3.6	3.6	3.6	3.6
16.000	3.6	3.6	3.6	3.6	3.6
16.500	3.6	3.7	3.7	3.7	3.7

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.7	3.7	3.7	3.7	3.7
17.500	3.7	3.7	3.7	3.8	3.8
18.000	3.8	3.8	3.8	3.8	3.8
18.500	3.8	3.8	3.8	3.8	3.8
19.000	3.8	3.8	3.8	3.9	3.9
19.500	3.9	3.9	3.9	3.9	3.9
20.000	3.9	3.9	3.9	3.9	3.9
20.500	3.9	3.9	3.9	3.9	3.9
21.000	3.9	4.0	4.0	4.0	4.0
21.500	4.0	4.0	4.0	4.0	4.0
22.000	4.0	4.0	4.0	4.0	4.0
22.500	4.0	4.0	4.0	4.0	4.0
23.000	4.0	4.0	4.1	4.1	4.1
23.500	4.1	4.1	4.1	4.1	4.1
24.000	4.1	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.5	0.5
8.000	0.6	0.6	0.6	0.6	0.6
8.500	0.6	0.6	0.6	0.7	0.7
9.000	0.7	0.7	0.7	0.7	0.7
9.500	0.8	0.8	0.8	0.8	0.8
10.000	0.8	0.9	0.9	0.9	0.9
10.500	1.0	1.0	1.0	1.0	1.1
11.000	1.1	1.1	1.2	1.2	1.3
11.500	1.3	1.4	1.7	2.0	2.6
12.000	3.1	3.2	3.3	3.3	3.4
12.500	3.4	3.5	3.5	3.5	3.6
13.000	3.6	3.6	3.7	3.7	3.7
13.500	3.7	3.7	3.8	3.8	3.8
14.000	3.8	3.8	3.9	3.9	3.9
14.500	3.9	3.9	3.9	3.9	4.0
15.000	4.0	4.0	4.0	4.0	4.0
15.500	4.0	4.1	4.1	4.1	4.1
16.000	4.1	4.1	4.1	4.1	4.1
16.500	4.2	4.2	4.2	4.2	4.2

Ontario Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.2	4.2	4.2	4.2	4.2
17.500	4.2	4.3	4.3	4.3	4.3
18.000	4.3	4.3	4.3	4.3	4.3
18.500	4.3	4.3	4.3	4.4	4.4
19.000	4.4	4.4	4.4	4.4	4.4
19.500	4.4	4.4	4.4	4.4	4.4
20.000	4.4	4.4	4.4	4.5	4.5
20.500	4.5	4.5	4.5	4.5	4.5
21.000	4.5	4.5	4.5	4.5	4.5
21.500	4.5	4.5	4.5	4.5	4.5
22.000	4.6	4.6	4.6	4.6	4.6
22.500	4.6	4.6	4.6	4.6	4.6
23.000	4.6	4.6	4.6	4.6	4.6
23.500	4.6	4.6	4.6	4.6	4.7
24.000	4.7	(N/A)	(N/A)	(N/A)	(N/A)

Storm Event	Type II 24 hour
Return Event	5 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.180 hours
Area (User Defined)	1.450 acres

Computational Time Increment	0.024 hours
Time to Peak (Computed)	12.000 hours
Flow (Peak, Computed)	3.33 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	3.33 ft³/s

Drainage Area	
SCS CN (Composite)	87.572
Area (User Defined)	1.450 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.7 in
Runoff Volume (Pervious)	0.207 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.207 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.180 hours
Computational Time Increment	0.024 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Existing DA

Return Event: 5 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	9.13 ft^3/s
Unit peak time, Tp	0.120 hours
Unit receding limb, Tr	0.480 hours
Total unit time, Tb	0.600 hours

Storm Event	Type II 24 hour
Return Event	10 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.180 hours
Area (User Defined)	1.450 acres

Computational Time Increment	0.024 hours
Time to Peak (Computed)	12.000 hours
Flow (Peak, Computed)	4.14 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	4.14 ft³/s

Drainage Area	
SCS CN (Composite)	87.572
Area (User Defined)	1.450 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.1 in
Runoff Volume (Pervious)	0.259 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.258 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.180 hours
Computational Time Increment	0.024 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Existing DA

Return Event: 10 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	9.13 ft³/s
Unit peak time, Tp	0.120 hours
Unit receding limb, Tr	0.480 hours
Total unit time, Tb	0.600 hours

Storm Event	Type II 24 hour
Return Event	25 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.180 hours
Area (User Defined)	1.450 acres

Computational Time Increment	0.024 hours
Time to Peak (Computed)	12.000 hours
Flow (Peak, Computed)	5.31 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	5.31 ft³/s

Drainage Area	
SCS CN (Composite)	87.572
Area (User Defined)	1.450 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.8 in
Runoff Volume (Pervious)	0.335 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.335 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.180 hours
Computational Time Increment	0.024 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Existing DA

Return Event: 25 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	9.13 ft^3/s
Unit peak time, Tp	0.120 hours
Unit receding limb, Tr	0.480 hours
Total unit time, Tb	0.600 hours

Storm Event	Type II 24 hour
Return Event	50 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.180 hours
Area (User Defined)	1.450 acres

Computational Time Increment	0.024 hours
Time to Peak (Computed)	12.000 hours
Flow (Peak, Computed)	6.28 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	6.28 ft³/s

Drainage Area	
SCS CN (Composite)	87.572
Area (User Defined)	1.450 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.3 in
Runoff Volume (Pervious)	0.399 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.399 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.180 hours
Computational Time Increment	0.024 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Existing DA

Return Event: 50 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	9.13 ft³/s
Unit peak time, Tp	0.120 hours
Unit receding limb, Tr	0.480 hours
Total unit time, Tb	0.600 hours

Storm Event	Type II 24 hour
Return Event	5 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.144 hours
Area (User Defined)	2.990 acres

Computational Time Increment	0.019 hours
Time to Peak (Computed)	11.953 hours
Flow (Peak, Computed)	9.73 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	9.70 ft³/s

Drainage Area	
SCS CN (Composite)	96.000
Area (User Defined)	2.990 acres
Maximum Retention (Pervious)	0.4 in
Maximum Retention (Pervious, 20 percent)	0.1 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.5 in
Runoff Volume (Pervious)	0.616 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.615 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.144 hours
Computational Time Increment	0.019 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 5 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	23.47 ft³/s
Unit peak time, Tp	0.096 hours
Unit receding limb, Tr	0.385 hours
Total unit time, Tb	0.481 hours

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 10 years
Storm Event: Type II 24 hour

Storm Event	Type II 24 hour
Return Event	10 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.144 hours
Area (User Defined)	2.990 acres

Computational Time Increment	0.019 hours
Time to Peak (Computed)	11.953 hours
Flow (Peak, Computed)	11.48 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	11.45 ft³/s

Drainage Area	
SCS CN (Composite)	96.000
Area (User Defined)	2.990 acres
Maximum Retention (Pervious)	0.4 in
Maximum Retention (Pervious, 20 percent)	0.1 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.9 in
Runoff Volume (Pervious)	0.734 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.733 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.144 hours
Computational Time Increment	0.019 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 10 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	23.47 ft³/s
Unit peak time, Tp	0.096 hours
Unit receding limb, Tr	0.385 hours
Total unit time, Tb	0.481 hours

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 25 years
Storm Event: Type II 24 hour

Storm Event	Type II 24 hour
Return Event	25 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.144 hours
Area (User Defined)	2.990 acres

Computational Time Increment	0.019 hours
Time to Peak (Computed)	11.953 hours
Flow (Peak, Computed)	13.98 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	13.94 ft^3/s

Drainage Area	
SCS CN (Composite)	96.000
Area (User Defined)	2.990 acres
Maximum Retention (Pervious)	0.4 in
Maximum Retention (Pervious, 20 percent)	0.1 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.6 in
Runoff Volume (Pervious)	0.904 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.903 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.144 hours
Computational Time Increment	0.019 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 25 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	23.47 ft³/s
Unit peak time, Tp	0.096 hours
Unit receding limb, Tr	0.385 hours
Total unit time, Tb	0.481 hours

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 50 years
Storm Event: Type II 24 hour

Storm Event	Type II 24 hour
Return Event	50 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.144 hours
Area (User Defined)	2.990 acres

Computational Time Increment	0.019 hours
Time to Peak (Computed)	11.953 hours
Flow (Peak, Computed)	16.03 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	15.99 ft³/s

Drainage Area	
SCS CN (Composite)	96.000
Area (User Defined)	2.990 acres
Maximum Retention (Pervious)	0.4 in
Maximum Retention (Pervious, 20 percent)	0.1 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.2 in
Runoff Volume (Pervious)	1.045 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.044 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.144 hours
Computational Time Increment	0.019 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Ontario Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed Storm Sewer DA

Return Event: 50 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	23.47 ft^3/s
Unit peak time, Tp	0.096 hours
Unit receding limb, Tr	0.385 hours
Total unit time, Tb	0.481 hours

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 5 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	662.00	662.00	662.00	662.00	662.00
0.250	662.00	662.00	662.00	662.00	662.00
0.500	662.00	662.00	662.00	662.00	662.00
0.750	662.00	662.00	662.00	662.00	662.00
1.000	662.00	662.00	662.00	662.00	662.00
1.250	662.00	662.00	662.00	662.00	662.00
1.500	662.00	662.00	662.00	662.00	662.00
1.750	662.00	662.00	662.00	662.00	662.00
2.000	662.00	662.00	662.00	662.00	662.00
2.250	662.00	662.00	662.00	662.00	662.00
2.500	662.00	662.00	662.00	662.00	662.00
2.750	662.00	662.00	662.00	662.00	662.00
3.000	662.01	662.01	662.01	662.01	662.01
3.250	662.01	662.02	662.02	662.02	662.03
3.500	662.03	662.03	662.04	662.04	662.04
3.750	662.05	662.05	662.06	662.06	662.07
4.000	662.07	662.08	662.08	662.09	662.09
4.250	662.10	662.11	662.11	662.12	662.13
4.500	662.13	662.14	662.15	662.16	662.16
4.750	662.17	662.18	662.19	662.20	662.21
5.000	662.22	662.23	662.24	662.25	662.26
5.250	662.27	662.28	662.29	662.30	662.31
5.500	662.32	662.33	662.35	662.36	662.37
5.750	662.38	662.40	662.41	662.42	662.44
6.000	662.45	662.47	662.48	662.49	662.50
6.250	662.51	662.52	662.53	662.53	662.54
6.500	662.55	662.55	662.56	662.57	662.58
6.750	662.59	662.59	662.60	662.61	662.62
7.000	662.63	662.64	662.64	662.65	662.66
7.250	662.67	662.68	662.69	662.70	662.71
7.500	662.72	662.73	662.74	662.75	662.76
7.750	662.77	662.78	662.79	662.80	662.81
8.000	662.82	662.83	662.84	662.85	662.86
8.250	662.88	662.89	662.90	662.91	662.92
8.500	662.94	662.95	662.97	662.98	662.99
8.750	663.01	663.02	663.02	663.03	663.03
9.000	663.03	663.04	663.04	663.04	663.04
9.250	663.04	663.04	663.04	663.05	663.05
9.500	663.05	663.05	663.05	663.05	663.05
9.750	663.05	663.05	663.05	663.05	663.05
10.000	663.05	663.06	663.06	663.06	663.06

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 5 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	663.06	663.06	663.07	663.07	663.07
10.500	663.07	663.07	663.08	663.08	663.08
10.750	663.08	663.09	663.09	663.09	663.10
11.000	663.10	663.11	663.11	663.11	663.12
11.250	663.13	663.14	663.14	663.15	663.16
11.500	663.17	663.19	663.21	663.26	663.35
11.750	663.48	663.65	663.88	664.20	664.58
12.000	664.96	665.28	665.47	665.52	665.49
12.250	665.42	665.34	665.24	665.14	665.04
12.500	664.94	664.84	664.73	664.63	664.53
12.750	664.43	664.33	664.23	664.14	664.06
13.000	663.97	663.89	663.80	663.73	663.66
13.250	663.59	663.53	663.47	663.41	663.36
13.500	663.31	663.27	663.24	663.21	663.18
13.750	663.16	663.14	663.13	663.12	663.11
14.000	663.10	663.09	663.09	663.09	663.08
14.250	663.08	663.08	663.08	663.07	663.07
14.500	663.07	663.07	663.07	663.07	663.07
14.750	663.07	663.07	663.07	663.07	663.06
15.000	663.06	663.06	663.06	663.06	663.06
15.250	663.06	663.06	663.06	663.06	663.06
15.500	663.06	663.06	663.06	663.05	663.05
15.750	663.05	663.05	663.05	663.05	663.05
16.000	663.05	663.05	663.05	663.05	663.05
16.250	663.05	663.05	663.05	663.05	663.05
16.500	663.04	663.04	663.04	663.04	663.04
16.750	663.04	663.04	663.04	663.04	663.04
17.000	663.04	663.04	663.04	663.04	663.04
17.250	663.04	663.04	663.04	663.04	663.04
17.500	663.04	663.04	663.04	663.04	663.04
17.750	663.04	663.04	663.04	663.04	663.04
18.000	663.04	663.04	663.04	663.04	663.04
18.250	663.04	663.04	663.04	663.04	663.04
18.500	663.03	663.03	663.03	663.03	663.03
18.750	663.03	663.03	663.03	663.03	663.03
19.000	663.03	663.03	663.03	663.03	663.03
19.250	663.03	663.03	663.03	663.03	663.03
19.500	663.03	663.03	663.03	663.03	663.03
19.750	663.03	663.03	663.03	663.03	663.03
20.000	663.03	663.03	663.03	663.03	663.03
20.250	663.03	663.03	663.03	663.03	663.03

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 5 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	663.03	663.03	663.03	663.03	663.03
20.750	663.03	663.03	663.03	663.03	663.03
21.000	663.03	663.03	663.03	663.03	663.03
21.250	663.03	663.02	663.02	663.02	663.02
21.500	663.02	663.02	663.02	663.02	663.02
21.750	663.02	663.02	663.02	663.02	663.02
22.000	663.02	663.02	663.02	663.02	663.02
22.250	663.02	663.02	663.02	663.02	663.02
22.500	663.02	663.02	663.02	663.02	663.02
22.750	663.02	663.02	663.02	663.02	663.02
23.000	663.02	663.02	663.02	663.02	663.02
23.250	663.02	663.02	663.02	663.02	663.02
23.500	663.02	663.02	663.02	663.02	663.02
23.750	663.02	663.02	663.02	663.02	663.02
24.000	663.02	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 10 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	662.00	662.00	662.00	662.00	662.00
0.250	662.00	662.00	662.00	662.00	662.00
0.500	662.00	662.00	662.00	662.00	662.00
0.750	662.00	662.00	662.00	662.00	662.00
1.000	662.00	662.00	662.00	662.00	662.00
1.250	662.00	662.00	662.00	662.00	662.00
1.500	662.00	662.00	662.00	662.00	662.00
1.750	662.00	662.00	662.00	662.00	662.00
2.000	662.00	662.00	662.00	662.00	662.00
2.250	662.00	662.00	662.00	662.00	662.00
2.500	662.00	662.00	662.00	662.01	662.01
2.750	662.01	662.01	662.01	662.02	662.02
3.000	662.02	662.03	662.03	662.03	662.04
3.250	662.04	662.05	662.05	662.06	662.06
3.500	662.07	662.07	662.08	662.09	662.09
3.750	662.10	662.11	662.11	662.12	662.13
4.000	662.14	662.15	662.15	662.16	662.17
4.250	662.18	662.19	662.20	662.21	662.22
4.500	662.23	662.24	662.25	662.26	662.27
4.750	662.29	662.30	662.31	662.32	662.34
5.000	662.35	662.36	662.38	662.39	662.40
5.250	662.42	662.43	662.45	662.46	662.48
5.500	662.50	662.51	662.51	662.52	662.53
5.750	662.54	662.54	662.55	662.56	662.57
6.000	662.58	662.59	662.59	662.60	662.61
6.250	662.62	662.63	662.64	662.65	662.66
6.500	662.67	662.68	662.69	662.70	662.71
6.750	662.72	662.73	662.74	662.75	662.76
7.000	662.77	662.78	662.79	662.81	662.82
7.250	662.83	662.84	662.85	662.86	662.88
7.500	662.89	662.90	662.91	662.93	662.94
7.750	662.95	662.96	662.98	662.99	663.00
8.000	663.01	663.02	663.02	663.03	663.03
8.250	663.03	663.03	663.04	663.04	663.04
8.500	663.04	663.04	663.04	663.04	663.04
8.750	663.05	663.05	663.05	663.05	663.05
9.000	663.05	663.05	663.05	663.05	663.05
9.250	663.06	663.06	663.06	663.06	663.06
9.500	663.06	663.06	663.06	663.06	663.06
9.750	663.06	663.06	663.06	663.06	663.07
10.000	663.07	663.07	663.07	663.07	663.07

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 10 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	663.08	663.08	663.08	663.08	663.09
10.500	663.09	663.09	663.09	663.10	663.10
10.750	663.10	663.11	663.11	663.12	663.12
11.000	663.13	663.13	663.14	663.14	663.15
11.250	663.16	663.17	663.18	663.19	663.20
11.500	663.21	663.23	663.26	663.33	663.44
11.750	663.59	663.79	664.07	664.44	664.90
12.000	665.36	665.74	665.99	666.07	666.05
12.250	665.97	665.88	665.78	665.67	665.56
12.500	665.44	665.33	665.21	665.09	664.98
12.750	664.87	664.76	664.66	664.55	664.45
13.000	664.35	664.26	664.17	664.08	663.99
13.250	663.91	663.83	663.75	663.68	663.62
13.500	663.55	663.50	663.44	663.38	663.34
13.750	663.29	663.26	663.22	663.20	663.17
14.000	663.16	663.14	663.13	663.12	663.11
14.250	663.10	663.10	663.09	663.09	663.09
14.500	663.09	663.08	663.08	663.08	663.08
14.750	663.08	663.08	663.08	663.08	663.08
15.000	663.07	663.07	663.07	663.07	663.07
15.250	663.07	663.07	663.07	663.07	663.07
15.500	663.07	663.07	663.06	663.06	663.06
15.750	663.06	663.06	663.06	663.06	663.06
16.000	663.06	663.06	663.06	663.06	663.06
16.250	663.05	663.05	663.05	663.05	663.05
16.500	663.05	663.05	663.05	663.05	663.05
16.750	663.05	663.05	663.05	663.05	663.05
17.000	663.05	663.05	663.05	663.05	663.05
17.250	663.05	663.05	663.05	663.05	663.05
17.500	663.05	663.05	663.05	663.05	663.05
17.750	663.05	663.04	663.04	663.04	663.04
18.000	663.04	663.04	663.04	663.04	663.04
18.250	663.04	663.04	663.04	663.04	663.04
18.500	663.04	663.04	663.04	663.04	663.04
18.750	663.04	663.04	663.04	663.04	663.04
19.000	663.04	663.04	663.04	663.04	663.04
19.250	663.04	663.04	663.04	663.04	663.04
19.500	663.03	663.03	663.03	663.03	663.03
19.750	663.03	663.03	663.03	663.03	663.03
20.000	663.03	663.03	663.03	663.03	663.03
20.250	663.03	663.03	663.03	663.03	663.03

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 10 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	663.03	663.03	663.03	663.03	663.03
20.750	663.03	663.03	663.03	663.03	663.03
21.000	663.03	663.03	663.03	663.03	663.03
21.250	663.03	663.03	663.03	663.03	663.03
21.500	663.03	663.03	663.03	663.03	663.03
21.750	663.03	663.03	663.03	663.03	663.03
22.000	663.03	663.03	663.03	663.03	663.03
22.250	663.03	663.03	663.03	663.03	663.03
22.500	663.03	663.03	663.03	663.03	663.03
22.750	663.03	663.03	663.03	663.03	663.03
23.000	663.03	663.03	663.03	663.03	663.03
23.250	663.03	663.03	663.03	663.03	663.03
23.500	663.03	663.03	663.03	663.03	663.03
23.750	663.03	663.03	663.03	663.03	663.03
24.000	663.03	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 25 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	662.00	662.00	662.00	662.00	662.00
0.250	662.00	662.00	662.00	662.00	662.00
0.500	662.00	662.00	662.00	662.00	662.00
0.750	662.00	662.00	662.00	662.00	662.00
1.000	662.00	662.00	662.00	662.00	662.00
1.250	662.00	662.00	662.00	662.00	662.00
1.500	662.00	662.00	662.00	662.00	662.00
1.750	662.00	662.00	662.00	662.00	662.00
2.000	662.00	662.00	662.00	662.00	662.00
2.250	662.01	662.01	662.01	662.01	662.02
2.500	662.02	662.02	662.03	662.03	662.04
2.750	662.04	662.05	662.05	662.06	662.06
3.000	662.07	662.08	662.08	662.09	662.10
3.250	662.11	662.12	662.12	662.13	662.14
3.500	662.15	662.16	662.17	662.18	662.19
3.750	662.20	662.22	662.23	662.24	662.25
4.000	662.26	662.28	662.29	662.30	662.32
4.250	662.33	662.34	662.36	662.37	662.39
4.500	662.41	662.42	662.44	662.45	662.47
4.750	662.49	662.50	662.51	662.52	662.53
5.000	662.54	662.54	662.55	662.56	662.57
5.250	662.58	662.59	662.60	662.61	662.62
5.500	662.63	662.64	662.65	662.66	662.67
5.750	662.68	662.69	662.70	662.72	662.73
6.000	662.74	662.75	662.76	662.77	662.79
6.250	662.80	662.81	662.82	662.84	662.85
6.500	662.86	662.88	662.89	662.90	662.92
6.750	662.93	662.95	662.96	662.97	662.99
7.000	663.00	663.01	663.02	663.02	663.03
7.250	663.03	663.03	663.04	663.04	663.04
7.500	663.04	663.04	663.04	663.04	663.04
7.750	663.04	663.04	663.04	663.04	663.04
8.000	663.04	663.04	663.05	663.05	663.05
8.250	663.05	663.05	663.05	663.05	663.05
8.500	663.05	663.05	663.06	663.06	663.06
8.750	663.06	663.06	663.06	663.06	663.06
9.000	663.07	663.07	663.07	663.07	663.07
9.250	663.07	663.07	663.07	663.07	663.07
9.500	663.07	663.07	663.07	663.08	663.08
9.750	663.08	663.08	663.08	663.08	663.08
10.000	663.09	663.09	663.09	663.09	663.09

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 25 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	663.10	663.10	663.10	663.11	663.11
10.500	663.11	663.12	663.12	663.12	663.13
10.750	663.13	663.14	663.14	663.15	663.16
11.000	663.16	663.17	663.18	663.18	663.19
11.250	663.20	663.22	663.23	663.24	663.26
11.500	663.28	663.30	663.35	663.43	663.56
11.750	663.75	664.01	664.34	664.80	665.36
12.000	665.95	666.46	666.82	666.96	666.94
12.250	666.86	666.74	666.61	666.48	666.34
12.500	666.21	666.07	665.93	665.80	665.67
12.750	665.53	665.41	665.29	665.17	665.05
13.000	664.94	664.83	664.72	664.61	664.51
13.250	664.41	664.31	664.22	664.13	664.05
13.500	663.96	663.88	663.80	663.73	663.66
13.750	663.60	663.54	663.48	663.43	663.38
14.000	663.33	663.29	663.26	663.23	663.20
14.250	663.18	663.16	663.15	663.14	663.13
14.500	663.12	663.12	663.11	663.11	663.10
14.750	663.10	663.10	663.10	663.09	663.09
15.000	663.09	663.09	663.09	663.09	663.09
15.250	663.09	663.08	663.08	663.08	663.08
15.500	663.08	663.08	663.08	663.08	663.08
15.750	663.08	663.07	663.07	663.07	663.07
16.000	663.07	663.07	663.07	663.07	663.07
16.250	663.07	663.07	663.06	663.06	663.06
16.500	663.06	663.06	663.06	663.06	663.06
16.750	663.06	663.06	663.06	663.06	663.06
17.000	663.06	663.06	663.06	663.06	663.06
17.250	663.06	663.06	663.06	663.06	663.06
17.500	663.06	663.06	663.06	663.06	663.05
17.750	663.05	663.05	663.05	663.05	663.05
18.000	663.05	663.05	663.05	663.05	663.05
18.250	663.05	663.05	663.05	663.05	663.05
18.500	663.05	663.05	663.05	663.05	663.05
18.750	663.05	663.05	663.05	663.05	663.05
19.000	663.05	663.05	663.04	663.04	663.04
19.250	663.04	663.04	663.04	663.04	663.04
19.500	663.04	663.04	663.04	663.04	663.04
19.750	663.04	663.04	663.04	663.04	663.04
20.000	663.04	663.04	663.04	663.04	663.04
20.250	663.04	663.04	663.04	663.04	663.04

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 25 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	663.04	663.04	663.04	663.04	663.04
20.750	663.04	663.04	663.04	663.04	663.04
21.000	663.04	663.04	663.04	663.04	663.04
21.250	663.04	663.04	663.04	663.04	663.04
21.500	663.03	663.03	663.03	663.03	663.03
21.750	663.03	663.03	663.03	663.03	663.03
22.000	663.03	663.03	663.03	663.03	663.03
22.250	663.03	663.03	663.03	663.03	663.03
22.500	663.03	663.03	663.03	663.03	663.03
22.750	663.03	663.03	663.03	663.03	663.03
23.000	663.03	663.03	663.03	663.03	663.03
23.250	663.03	663.03	663.03	663.03	663.03
23.500	663.03	663.03	663.03	663.03	663.03
23.750	663.03	663.03	663.03	663.03	663.03
24.000	663.03	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 50 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	662.00	662.00	662.00	662.00	662.00
0.250	662.00	662.00	662.00	662.00	662.00
0.500	662.00	662.00	662.00	662.00	662.00
0.750	662.00	662.00	662.00	662.00	662.00
1.000	662.00	662.00	662.00	662.00	662.00
1.250	662.00	662.00	662.00	662.00	662.00
1.500	662.00	662.00	662.00	662.00	662.00
1.750	662.00	662.00	662.00	662.00	662.00
2.000	662.01	662.01	662.01	662.01	662.02
2.250	662.02	662.02	662.03	662.03	662.04
2.500	662.05	662.05	662.06	662.07	662.07
2.750	662.08	662.09	662.10	662.11	662.11
3.000	662.12	662.13	662.14	662.16	662.17
3.250	662.18	662.19	662.20	662.21	662.23
3.500	662.24	662.25	662.27	662.28	662.30
3.750	662.31	662.33	662.34	662.36	662.37
4.000	662.39	662.41	662.43	662.44	662.46
4.250	662.48	662.50	662.51	662.52	662.53
4.500	662.53	662.54	662.55	662.56	662.57
4.750	662.58	662.59	662.60	662.61	662.62
5.000	662.63	662.65	662.66	662.67	662.68
5.250	662.69	662.70	662.72	662.73	662.74
5.500	662.75	662.77	662.78	662.79	662.80
5.750	662.82	662.83	662.85	662.86	662.87
6.000	662.89	662.90	662.92	662.93	662.95
6.250	662.96	662.98	662.99	663.01	663.02
6.500	663.02	663.03	663.03	663.03	663.04
6.750	663.04	663.04	663.04	663.04	663.04
7.000	663.04	663.04	663.05	663.05	663.05
7.250	663.05	663.05	663.05	663.05	663.05
7.500	663.05	663.05	663.05	663.05	663.05
7.750	663.05	663.05	663.05	663.05	663.05
8.000	663.05	663.05	663.05	663.06	663.06
8.250	663.06	663.06	663.06	663.06	663.06
8.500	663.06	663.06	663.07	663.07	663.07
8.750	663.07	663.07	663.07	663.07	663.08
9.000	663.08	663.08	663.08	663.08	663.08
9.250	663.08	663.09	663.09	663.09	663.09
9.500	663.09	663.09	663.09	663.09	663.09
9.750	663.09	663.09	663.09	663.10	663.10
10.000	663.10	663.10	663.11	663.11	663.11

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 50 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	663.11	663.12	663.12	663.13	663.13
10.500	663.13	663.14	663.14	663.15	663.15
10.750	663.16	663.17	663.17	663.18	663.19
11.000	663.19	663.20	663.21	663.22	663.23
11.250	663.25	663.26	663.28	663.30	663.32
11.500	663.34	663.37	663.42	663.52	663.67
11.750	663.89	664.18	664.57	665.10	665.76
12.000	666.47	667.17	667.64	667.66	667.49
12.250	667.38	667.25	667.10	666.94	666.79
12.500	666.64	666.48	666.34	666.19	666.05
12.750	665.91	665.77	665.64	665.52	665.39
13.000	665.27	665.15	665.04	664.93	664.82
13.250	664.71	664.61	664.51	664.41	664.32
13.500	664.23	664.14	664.06	663.98	663.89
13.750	663.82	663.75	663.68	663.62	663.56
14.000	663.50	663.45	663.40	663.35	663.31
14.250	663.27	663.24	663.22	663.20	663.18
14.500	663.16	663.15	663.14	663.14	663.13
14.750	663.12	663.12	663.12	663.11	663.11
15.000	663.11	663.11	663.10	663.10	663.10
15.250	663.10	663.10	663.10	663.09	663.09
15.500	663.09	663.09	663.09	663.09	663.09
15.750	663.09	663.08	663.08	663.08	663.08
16.000	663.08	663.08	663.08	663.08	663.08
16.250	663.08	663.07	663.07	663.07	663.07
16.500	663.07	663.07	663.07	663.07	663.07
16.750	663.07	663.07	663.07	663.07	663.07
17.000	663.07	663.07	663.07	663.07	663.07
17.250	663.07	663.07	663.07	663.07	663.06
17.500	663.06	663.06	663.06	663.06	663.06
17.750	663.06	663.06	663.06	663.06	663.06
18.000	663.06	663.06	663.06	663.06	663.06
18.250	663.06	663.06	663.06	663.06	663.06
18.500	663.06	663.06	663.06	663.05	663.05
18.750	663.05	663.05	663.05	663.05	663.05
19.000	663.05	663.05	663.05	663.05	663.05
19.250	663.05	663.05	663.05	663.05	663.05
19.500	663.05	663.05	663.05	663.05	663.05
19.750	663.05	663.05	663.05	663.04	663.04
20.000	663.04	663.04	663.04	663.04	663.04
20.250	663.04	663.04	663.04	663.04	663.04

Ontario Outfall Analysis

Subsection: Time vs. Elevation
Label: Underground Detention (OUT)

Return Event: 50 years
Storm Event: Type II 24 hour

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	663.04	663.04	663.04	663.04	663.04
20.750	663.04	663.04	663.04	663.04	663.04
21.000	663.04	663.04	663.04	663.04	663.04
21.250	663.04	663.04	663.04	663.04	663.04
21.500	663.04	663.04	663.04	663.04	663.04
21.750	663.04	663.04	663.04	663.04	663.04
22.000	663.04	663.04	663.04	663.04	663.04
22.250	663.04	663.04	663.04	663.04	663.04
22.500	663.04	663.04	663.04	663.04	663.04
22.750	663.04	663.04	663.04	663.04	663.04
23.000	663.04	663.04	663.04	663.04	663.04
23.250	663.04	663.04	663.04	663.04	663.04
23.500	663.04	663.04	663.04	663.04	663.04
23.750	663.04	663.04	663.04	663.04	663.04
24.000	663.04	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 5 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.001
3.500	0.001	0.001	0.001	0.001	0.001
3.750	0.001	0.001	0.001	0.001	0.001
4.000	0.001	0.002	0.002	0.002	0.002
4.250	0.002	0.002	0.002	0.002	0.003
4.500	0.003	0.003	0.003	0.003	0.003
4.750	0.004	0.004	0.004	0.004	0.004
5.000	0.004	0.005	0.005	0.005	0.005
5.250	0.005	0.006	0.006	0.006	0.006
5.500	0.007	0.007	0.007	0.007	0.008
5.750	0.008	0.008	0.008	0.009	0.009
6.000	0.009	0.010	0.010	0.010	0.010
6.250	0.011	0.011	0.011	0.012	0.012
6.500	0.012	0.013	0.013	0.013	0.014
6.750	0.014	0.015	0.015	0.015	0.016
7.000	0.016	0.016	0.017	0.017	0.018
7.250	0.018	0.018	0.019	0.019	0.020
7.500	0.020	0.021	0.021	0.022	0.022
7.750	0.022	0.023	0.023	0.024	0.024
8.000	0.025	0.025	0.026	0.026	0.027
8.250	0.027	0.028	0.029	0.029	0.030
8.500	0.030	0.031	0.032	0.032	0.033
8.750	0.034	0.034	0.034	0.035	0.035
9.000	0.035	0.035	0.035	0.036	0.036
9.250	0.036	0.036	0.036	0.036	0.036
9.500	0.036	0.036	0.036	0.036	0.036
9.750	0.036	0.036	0.036	0.036	0.036
10.000	0.036	0.036	0.037	0.037	0.037

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 5 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	0.037	0.037	0.037	0.037	0.037
10.500	0.037	0.037	0.038	0.038	0.038
10.750	0.038	0.038	0.038	0.039	0.039
11.000	0.039	0.039	0.040	0.040	0.040
11.250	0.041	0.041	0.042	0.042	0.043
11.500	0.043	0.044	0.046	0.049	0.054
11.750	0.061	0.072	0.088	0.109	0.137
12.000	0.165	0.188	0.202	0.206	0.204
12.250	0.199	0.193	0.186	0.178	0.171
12.500	0.163	0.155	0.148	0.140	0.133
12.750	0.126	0.119	0.112	0.105	0.099
13.000	0.093	0.088	0.082	0.077	0.073
13.250	0.068	0.064	0.061	0.057	0.054
13.500	0.051	0.049	0.047	0.045	0.044
13.750	0.042	0.041	0.041	0.040	0.040
14.000	0.039	0.039	0.038	0.038	0.038
14.250	0.038	0.038	0.038	0.037	0.037
14.500	0.037	0.037	0.037	0.037	0.037
14.750	0.037	0.037	0.037	0.037	0.037
15.000	0.037	0.037	0.037	0.037	0.037
15.250	0.037	0.037	0.037	0.037	0.036
15.500	0.036	0.036	0.036	0.036	0.036
15.750	0.036	0.036	0.036	0.036	0.036
16.000	0.036	0.036	0.036	0.036	0.036
16.250	0.036	0.036	0.036	0.036	0.036
16.500	0.036	0.036	0.036	0.036	0.036
16.750	0.036	0.036	0.036	0.036	0.036
17.000	0.036	0.036	0.036	0.036	0.036
17.250	0.036	0.036	0.036	0.035	0.035
17.500	0.035	0.035	0.035	0.035	0.035
17.750	0.035	0.035	0.035	0.035	0.035
18.000	0.035	0.035	0.035	0.035	0.035
18.250	0.035	0.035	0.035	0.035	0.035
18.500	0.035	0.035	0.035	0.035	0.035
18.750	0.035	0.035	0.035	0.035	0.035
19.000	0.035	0.035	0.035	0.035	0.035
19.250	0.035	0.035	0.035	0.035	0.035
19.500	0.035	0.035	0.035	0.035	0.035
19.750	0.035	0.035	0.035	0.035	0.035
20.000	0.035	0.035	0.035	0.035	0.035
20.250	0.035	0.035	0.035	0.035	0.035

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 5 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.035	0.035	0.035	0.035	0.035
20.750	0.035	0.035	0.035	0.035	0.035
21.000	0.035	0.035	0.035	0.035	0.035
21.250	0.035	0.035	0.035	0.035	0.035
21.500	0.035	0.035	0.035	0.035	0.035
21.750	0.035	0.035	0.035	0.035	0.035
22.000	0.035	0.035	0.035	0.035	0.035
22.250	0.035	0.035	0.035	0.035	0.035
22.500	0.035	0.035	0.035	0.035	0.035
22.750	0.035	0.035	0.035	0.035	0.035
23.000	0.035	0.035	0.035	0.035	0.035
23.250	0.034	0.034	0.034	0.034	0.034
23.500	0.034	0.034	0.034	0.034	0.034
23.750	0.034	0.034	0.034	0.034	0.034
24.000	0.034	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 10 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.001	0.001	0.001	0.001
3.250	0.001	0.001	0.001	0.001	0.001
3.500	0.001	0.002	0.002	0.002	0.002
3.750	0.002	0.002	0.002	0.003	0.003
4.000	0.003	0.003	0.003	0.003	0.004
4.250	0.004	0.004	0.004	0.004	0.004
4.500	0.005	0.005	0.005	0.005	0.006
4.750	0.006	0.006	0.006	0.007	0.007
5.000	0.007	0.007	0.008	0.008	0.008
5.250	0.009	0.009	0.009	0.010	0.010
5.500	0.010	0.010	0.011	0.011	0.012
5.750	0.012	0.012	0.013	0.013	0.013
6.000	0.014	0.014	0.015	0.015	0.015
6.250	0.016	0.016	0.017	0.017	0.017
6.500	0.018	0.018	0.019	0.019	0.020
6.750	0.020	0.021	0.021	0.022	0.022
7.000	0.023	0.023	0.024	0.024	0.025
7.250	0.025	0.026	0.026	0.027	0.027
7.500	0.028	0.029	0.029	0.030	0.030
7.750	0.031	0.032	0.032	0.033	0.033
8.000	0.034	0.034	0.034	0.035	0.035
8.250	0.035	0.035	0.035	0.035	0.035
8.500	0.035	0.036	0.036	0.036	0.036
8.750	0.036	0.036	0.036	0.036	0.036
9.000	0.036	0.036	0.036	0.036	0.036
9.250	0.036	0.036	0.036	0.036	0.036
9.500	0.037	0.037	0.037	0.037	0.037
9.750	0.037	0.037	0.037	0.037	0.037
10.000	0.037	0.037	0.037	0.037	0.037

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 10 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	0.038	0.038	0.038	0.038	0.038
10.500	0.038	0.038	0.039	0.039	0.039
10.750	0.039	0.039	0.040	0.040	0.040
11.000	0.040	0.041	0.041	0.041	0.042
11.250	0.042	0.043	0.044	0.044	0.045
11.500	0.046	0.047	0.049	0.052	0.059
11.750	0.068	0.082	0.100	0.127	0.160
12.000	0.194	0.222	0.240	0.245	0.244
12.250	0.239	0.232	0.225	0.217	0.209
12.500	0.200	0.192	0.183	0.175	0.166
12.750	0.158	0.150	0.142	0.135	0.127
13.000	0.120	0.114	0.107	0.101	0.095
13.250	0.089	0.084	0.079	0.074	0.070
13.500	0.066	0.062	0.059	0.055	0.053
13.750	0.050	0.048	0.046	0.045	0.043
14.000	0.042	0.041	0.041	0.040	0.040
14.250	0.039	0.039	0.039	0.038	0.038
14.500	0.038	0.038	0.038	0.038	0.038
14.750	0.038	0.038	0.038	0.038	0.038
15.000	0.037	0.037	0.037	0.037	0.037
15.250	0.037	0.037	0.037	0.037	0.037
15.500	0.037	0.037	0.037	0.037	0.037
15.750	0.037	0.037	0.037	0.037	0.037
16.000	0.037	0.036	0.036	0.036	0.036
16.250	0.036	0.036	0.036	0.036	0.036
16.500	0.036	0.036	0.036	0.036	0.036
16.750	0.036	0.036	0.036	0.036	0.036
17.000	0.036	0.036	0.036	0.036	0.036
17.250	0.036	0.036	0.036	0.036	0.036
17.500	0.036	0.036	0.036	0.036	0.036
17.750	0.036	0.036	0.036	0.036	0.036
18.000	0.036	0.036	0.036	0.036	0.036
18.250	0.036	0.036	0.036	0.036	0.036
18.500	0.036	0.036	0.035	0.035	0.035
18.750	0.035	0.035	0.035	0.035	0.035
19.000	0.035	0.035	0.035	0.035	0.035
19.250	0.035	0.035	0.035	0.035	0.035
19.500	0.035	0.035	0.035	0.035	0.035
19.750	0.035	0.035	0.035	0.035	0.035
20.000	0.035	0.035	0.035	0.035	0.035
20.250	0.035	0.035	0.035	0.035	0.035

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 10 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.035	0.035	0.035	0.035	0.035
20.750	0.035	0.035	0.035	0.035	0.035
21.000	0.035	0.035	0.035	0.035	0.035
21.250	0.035	0.035	0.035	0.035	0.035
21.500	0.035	0.035	0.035	0.035	0.035
21.750	0.035	0.035	0.035	0.035	0.035
22.000	0.035	0.035	0.035	0.035	0.035
22.250	0.035	0.035	0.035	0.035	0.035
22.500	0.035	0.035	0.035	0.035	0.035
22.750	0.035	0.035	0.035	0.035	0.035
23.000	0.035	0.035	0.035	0.035	0.035
23.250	0.035	0.035	0.035	0.035	0.035
23.500	0.035	0.035	0.035	0.035	0.035
23.750	0.035	0.035	0.035	0.035	0.035
24.000	0.035	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 25 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.001	0.001	0.001
2.750	0.001	0.001	0.001	0.001	0.001
3.000	0.001	0.002	0.002	0.002	0.002
3.250	0.002	0.002	0.003	0.003	0.003
3.500	0.003	0.003	0.004	0.004	0.004
3.750	0.004	0.004	0.005	0.005	0.005
4.000	0.005	0.006	0.006	0.006	0.006
4.250	0.007	0.007	0.007	0.008	0.008
4.500	0.008	0.009	0.009	0.009	0.010
4.750	0.010	0.010	0.011	0.011	0.012
5.000	0.012	0.012	0.013	0.013	0.014
5.250	0.014	0.014	0.015	0.015	0.016
5.500	0.016	0.017	0.017	0.018	0.018
5.750	0.019	0.019	0.020	0.020	0.021
6.000	0.021	0.022	0.022	0.023	0.023
6.250	0.024	0.025	0.025	0.026	0.026
6.500	0.027	0.028	0.028	0.029	0.029
6.750	0.030	0.031	0.031	0.032	0.033
7.000	0.033	0.034	0.034	0.035	0.035
7.250	0.035	0.035	0.035	0.035	0.035
7.500	0.035	0.035	0.036	0.036	0.036
7.750	0.036	0.036	0.036	0.036	0.036
8.000	0.036	0.036	0.036	0.036	0.036
8.250	0.036	0.036	0.036	0.036	0.036
8.500	0.036	0.036	0.036	0.036	0.037
8.750	0.037	0.037	0.037	0.037	0.037
9.000	0.037	0.037	0.037	0.037	0.037
9.250	0.037	0.037	0.037	0.037	0.037
9.500	0.037	0.037	0.037	0.038	0.038
9.750	0.038	0.038	0.038	0.038	0.038
10.000	0.038	0.038	0.038	0.038	0.039

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 25 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	0.039	0.039	0.039	0.039	0.040
10.500	0.040	0.040	0.040	0.040	0.041
10.750	0.041	0.041	0.042	0.042	0.042
11.000	0.043	0.043	0.043	0.044	0.044
11.250	0.045	0.046	0.047	0.047	0.048
11.500	0.049	0.051	0.053	0.058	0.066
11.750	0.079	0.096	0.120	0.153	0.194
12.000	0.237	0.272	0.295	0.303	0.302
12.250	0.297	0.290	0.282	0.273	0.264
12.500	0.255	0.245	0.236	0.226	0.216
12.750	0.207	0.198	0.189	0.180	0.171
13.000	0.163	0.155	0.147	0.139	0.132
13.250	0.124	0.118	0.111	0.105	0.099
13.500	0.093	0.088	0.082	0.078	0.073
13.750	0.069	0.065	0.061	0.058	0.055
14.000	0.052	0.050	0.048	0.046	0.045
14.250	0.044	0.043	0.042	0.041	0.041
14.500	0.040	0.040	0.040	0.039	0.039
14.750	0.039	0.039	0.039	0.039	0.039
15.000	0.038	0.038	0.038	0.038	0.038
15.250	0.038	0.038	0.038	0.038	0.038
15.500	0.038	0.038	0.038	0.038	0.038
15.750	0.038	0.037	0.037	0.037	0.037
16.000	0.037	0.037	0.037	0.037	0.037
16.250	0.037	0.037	0.037	0.037	0.037
16.500	0.037	0.037	0.037	0.037	0.037
16.750	0.037	0.037	0.037	0.037	0.037
17.000	0.037	0.037	0.037	0.037	0.037
17.250	0.037	0.037	0.036	0.036	0.036
17.500	0.036	0.036	0.036	0.036	0.036
17.750	0.036	0.036	0.036	0.036	0.036
18.000	0.036	0.036	0.036	0.036	0.036
18.250	0.036	0.036	0.036	0.036	0.036
18.500	0.036	0.036	0.036	0.036	0.036
18.750	0.036	0.036	0.036	0.036	0.036
19.000	0.036	0.036	0.036	0.036	0.036
19.250	0.036	0.036	0.036	0.036	0.036
19.500	0.036	0.036	0.036	0.036	0.036
19.750	0.035	0.035	0.035	0.035	0.035
20.000	0.035	0.035	0.035	0.035	0.035
20.250	0.035	0.035	0.035	0.035	0.035

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 25 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.035	0.035	0.035	0.035	0.035
20.750	0.035	0.035	0.035	0.035	0.035
21.000	0.035	0.035	0.035	0.035	0.035
21.250	0.035	0.035	0.035	0.035	0.035
21.500	0.035	0.035	0.035	0.035	0.035
21.750	0.035	0.035	0.035	0.035	0.035
22.000	0.035	0.035	0.035	0.035	0.035
22.250	0.035	0.035	0.035	0.035	0.035
22.500	0.035	0.035	0.035	0.035	0.035
22.750	0.035	0.035	0.035	0.035	0.035
23.000	0.035	0.035	0.035	0.035	0.035
23.250	0.035	0.035	0.035	0.035	0.035
23.500	0.035	0.035	0.035	0.035	0.035
23.750	0.035	0.035	0.035	0.035	0.035
24.000	0.035	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 50 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.001	0.001	0.001	0.001
2.500	0.001	0.001	0.001	0.001	0.001
2.750	0.002	0.002	0.002	0.002	0.002
3.000	0.003	0.003	0.003	0.003	0.003
3.250	0.004	0.004	0.004	0.004	0.005
3.500	0.005	0.005	0.005	0.006	0.006
3.750	0.006	0.007	0.007	0.007	0.008
4.000	0.008	0.008	0.009	0.009	0.009
4.250	0.010	0.010	0.011	0.011	0.011
4.500	0.012	0.012	0.013	0.013	0.014
4.750	0.014	0.014	0.015	0.015	0.016
5.000	0.016	0.017	0.017	0.018	0.018
5.250	0.019	0.020	0.020	0.021	0.021
5.500	0.022	0.022	0.023	0.024	0.024
5.750	0.025	0.025	0.026	0.027	0.027
6.000	0.028	0.029	0.029	0.030	0.031
6.250	0.031	0.032	0.033	0.034	0.034
6.500	0.034	0.035	0.035	0.035	0.035
6.750	0.035	0.035	0.036	0.036	0.036
7.000	0.036	0.036	0.036	0.036	0.036
7.250	0.036	0.036	0.036	0.036	0.036
7.500	0.036	0.036	0.036	0.036	0.036
7.750	0.036	0.036	0.036	0.036	0.036
8.000	0.036	0.036	0.036	0.036	0.036
8.250	0.036	0.037	0.037	0.037	0.037
8.500	0.037	0.037	0.037	0.037	0.037
8.750	0.037	0.037	0.037	0.037	0.038
9.000	0.038	0.038	0.038	0.038	0.038
9.250	0.038	0.038	0.038	0.038	0.038
9.500	0.038	0.038	0.038	0.038	0.038
9.750	0.038	0.039	0.039	0.039	0.039
10.000	0.039	0.039	0.039	0.039	0.040

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 50 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	0.040	0.040	0.040	0.041	0.041
10.500	0.041	0.041	0.042	0.042	0.042
10.750	0.042	0.043	0.043	0.044	0.044
11.000	0.044	0.045	0.045	0.046	0.047
11.250	0.047	0.048	0.049	0.050	0.052
11.500	0.053	0.055	0.058	0.064	0.073
11.750	0.088	0.108	0.136	0.175	0.223
12.000	0.273	0.314	0.336	0.336	0.331
12.250	0.325	0.318	0.311	0.302	0.293
12.500	0.283	0.274	0.264	0.254	0.244
12.750	0.234	0.224	0.215	0.206	0.197
13.000	0.188	0.179	0.170	0.162	0.154
13.250	0.146	0.139	0.132	0.125	0.118
13.500	0.111	0.105	0.099	0.094	0.088
13.750	0.083	0.079	0.074	0.070	0.066
14.000	0.063	0.059	0.056	0.054	0.051
14.250	0.049	0.047	0.046	0.045	0.044
14.500	0.043	0.042	0.041	0.041	0.041
14.750	0.040	0.040	0.040	0.040	0.040
15.000	0.039	0.039	0.039	0.039	0.039
15.250	0.039	0.039	0.039	0.039	0.039
15.500	0.038	0.038	0.038	0.038	0.038
15.750	0.038	0.038	0.038	0.038	0.038
16.000	0.038	0.038	0.038	0.038	0.038
16.250	0.038	0.037	0.037	0.037	0.037
16.500	0.037	0.037	0.037	0.037	0.037
16.750	0.037	0.037	0.037	0.037	0.037
17.000	0.037	0.037	0.037	0.037	0.037
17.250	0.037	0.037	0.037	0.037	0.037
17.500	0.037	0.037	0.037	0.037	0.037
17.750	0.037	0.037	0.037	0.037	0.037
18.000	0.037	0.037	0.037	0.037	0.037
18.250	0.037	0.037	0.037	0.036	0.036
18.500	0.036	0.036	0.036	0.036	0.036
18.750	0.036	0.036	0.036	0.036	0.036
19.000	0.036	0.036	0.036	0.036	0.036
19.250	0.036	0.036	0.036	0.036	0.036
19.500	0.036	0.036	0.036	0.036	0.036
19.750	0.036	0.036	0.036	0.036	0.036
20.000	0.036	0.036	0.036	0.036	0.036
20.250	0.036	0.036	0.036	0.036	0.036

Ontario Outfall Analysis

Subsection: Time vs. Volume
Label: Underground Detention

Return Event: 50 years
Storm Event: Type II 24 hour

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.036	0.036	0.036	0.036	0.036
20.750	0.036	0.036	0.036	0.036	0.036
21.000	0.036	0.036	0.036	0.036	0.035
21.250	0.035	0.035	0.035	0.035	0.035
21.500	0.035	0.035	0.035	0.035	0.035
21.750	0.035	0.035	0.035	0.035	0.035
22.000	0.035	0.035	0.035	0.035	0.035
22.250	0.035	0.035	0.035	0.035	0.035
22.500	0.035	0.035	0.035	0.035	0.035
22.750	0.035	0.035	0.035	0.035	0.035
23.000	0.035	0.035	0.035	0.035	0.035
23.250	0.035	0.035	0.035	0.035	0.035
23.500	0.035	0.035	0.035	0.035	0.035
23.750	0.035	0.035	0.035	0.035	0.035
24.000	0.035	(N/A)	(N/A)	(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Outlet Input Data — Return Event: 5 years

Label: Composite Outlet Structure - 1 — Storm Event: Type II 24 hour 6 month

Requested Pond Water Surface Elevations	
Minimum (Headwater)	662.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	668.19 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 1	Forward	Culvert - 1	662.00	668.19
Rectangular Weir	Weir - 1	Forward	Culvert - 1	667.42	668.19
Culvert-Circular	Culvert - 1	Forward + Reverse	TW	662.00	668.19
Tailwater Settings	Tailwater			(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Outlet Input Data — Return Event: 5 years

Label: Composite Outlet Structure - 1 — Storm Event: Type II 24 hour 6 month

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	1
Elevation	662.00 ft
Orifice Area	0.4 ft²
Top Elevation	662.65 ft
Datum Elevation	662.00 ft
Orifice Coefficient	0.660

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	667.42 ft
Weir Length	8.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.0 in
Length	42.60 ft
Length (Computed Barrel)	42.60 ft
Slope (Computed)	0.005 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.000
T2 ratio (HW/D)	1.195
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	662.00 ft	T1 Flow	4.80 ft³/s
T2 Elevation	663.49 ft	T2 Flow	5.49 ft³/s

Ontario Outfall Analysis

Subsection: Outlet Input Data | Return Event: 10 years

Label: Composite Outlet Structure - 1 | Storm Event: Type II 24 hour 6 month

Requested Pond Water Surface Elevations	
Minimum (Headwater)	662.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	668.19 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 1	Forward	Culvert - 1	662.00	668.19
Rectangular Weir	Weir - 1	Forward	Culvert - 1	667.42	668.19
Culvert-Circular	Culvert - 1	Forward + Reverse	TW	662.00	668.19
Tailwater Settings	Tailwater			(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Outlet Input Data — Return Event: 10 years

Label: Composite Outlet Structure - 1 — Storm Event: Type II 24 hour 6 month

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	1
Elevation	662.00 ft
Orifice Area	0.4 ft²
Top Elevation	662.65 ft
Datum Elevation	662.00 ft
Orifice Coefficient	0.660

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	667.42 ft
Weir Length	8.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.0 in
Length	42.60 ft
Length (Computed Barrel)	42.60 ft
Slope (Computed)	0.005 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.000
T2 ratio (HW/D)	1.195
Slope Correction Factor	-0.500

Ontario Outfall Analysis

Subsection: Outlet Input Data | Return Event: 10 years

Label: Composite Outlet Structure - 1 | Storm Event: Type II 24 hour 6 month

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	662.00 ft	T1 Flow	4.80 ft³/s
T2 Elevation	663.49 ft	T2 Flow	5.49 ft³/s

Ontario Outfall Analysis

Subsection: Outlet Input Data | Return Event: 25 years

Label: Composite Outlet Structure - 1 | Storm Event: Type II 24 hour 6 month

Requested Pond Water Surface Elevations	
Minimum (Headwater)	662.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	668.19 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 1	Forward	Culvert - 1	662.00	668.19
Rectangular Weir	Weir - 1	Forward	Culvert - 1	667.42	668.19
Culvert-Circular	Culvert - 1	Forward + Reverse	TW	662.00	668.19
Tailwater Settings	Tailwater			(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Outlet Input Data — Return Event: 25 years

Label: Composite Outlet Structure - 1 — Storm Event: Type II 24 hour 6 month

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	1
Elevation	662.00 ft
Orifice Area	0.4 ft²
Top Elevation	662.65 ft
Datum Elevation	662.00 ft
Orifice Coefficient	0.660

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	667.42 ft
Weir Length	8.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.0 in
Length	42.60 ft
Length (Computed Barrel)	42.60 ft
Slope (Computed)	0.005 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.000
T2 ratio (HW/D)	1.195
Slope Correction Factor	-0.500

Ontario Outfall Analysis

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Type II 24 hour 6 month

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	662.00 ft	T1 Flow	4.80 ft³/s
T2 Elevation	663.49 ft	T2 Flow	5.49 ft³/s

Ontario Outfall Analysis

Subsection: Outlet Input Data — Return Event: 50 years

Label: Composite Outlet Structure - 1 — Storm Event: Type II 24 hour 6 month

Requested Pond Water Surface Elevations	
Minimum (Headwater)	662.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	668.19 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 1	Forward	Culvert - 1	662.00	668.19
Rectangular Weir	Weir - 1	Forward	Culvert - 1	667.42	668.19
Culvert-Circular	Culvert - 1	Forward + Reverse	TW	662.00	668.19
Tailwater Settings	Tailwater			(N/A)	(N/A)

Ontario Outfall Analysis

Subsection: Outlet Input Data — Return Event: 50 years

Label: Composite Outlet Structure - 1 — Storm Event: Type II 24 hour 6 month

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	1
Elevation	662.00 ft
Orifice Area	0.4 ft²
Top Elevation	662.65 ft
Datum Elevation	662.00 ft
Orifice Coefficient	0.660

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	667.42 ft
Weir Length	8.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.0 in
Length	42.60 ft
Length (Computed Barrel)	42.60 ft
Slope (Computed)	0.005 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.000
T2 ratio (HW/D)	1.195
Slope Correction Factor	-0.500

Ontario Outfall Analysis

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 50 years
Storm Event: Type II 24 hour 6 month

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	662.00 ft	T1 Flow	4.80 ft³/s
T2 Elevation	663.49 ft	T2 Flow	5.49 ft³/s

Ontario Outfall Analysis

Subsection: Detention Time
Label: Underground Detention (IN)

Return Event: 5 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Approximate Detention Times	
Time to Peak (Outflow + Infiltration, Peak to Peak Detention Time)	12.150 hours
Time to Peak (Inflow, Peak to Peak Detention Time)	11.950 hours
Detention Time (Peak to Peak)	0.200 hours

Ontario Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: Underground Detention (IN)

Return Event: 5 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	662.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	9.70 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	3.23 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	665.52 ft
Volume (Peak)	0.206 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.615 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.581 ac-ft
Volume (Retained)	0.034 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.1 %

Ontario Outfall Analysis

Subsection: Detention Time
Label: Underground Detention (IN)

Return Event: 10 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Approximate Detention Times	
Time to Peak (Outflow + Infiltration, Peak to Peak Detention Time)	12.150 hours
Time to Peak (Inflow, Peak to Peak Detention Time)	11.950 hours
Detention Time (Peak to Peak)	0.200 hours

Ontario Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: Underground Detention (IN)

Return Event: 10 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	662.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	11.45 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	3.57 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	666.07 ft
Volume (Peak)	0.245 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.733 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.699 ac-ft
Volume (Retained)	0.034 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.1 %

Ontario Outfall Analysis

Subsection: Detention Time
Label: Underground Detention (IN)

Return Event: 25 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Approximate Detention Times	
Time to Peak (Outflow + Infiltration, Peak to Peak Detention Time)	12.150 hours
Time to Peak (Inflow, Peak to Peak Detention Time)	11.950 hours
Detention Time (Peak to Peak)	0.200 hours

Ontario Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: Underground Detention (IN)

Return Event: 25 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	662.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	13.94 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	4.06 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	666.96 ft
Volume (Peak)	0.303 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.903 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.868 ac-ft
Volume (Retained)	0.035 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.1 %

Ontario Outfall Analysis

Subsection: Detention Time
Label: Underground Detention (IN)

Return Event: 50 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Approximate Detention Times	
Time to Peak (Outflow + Infiltration, Peak to Peak Detention Time)	12.150 hours
Time to Peak (Inflow, Peak to Peak Detention Time)	11.950 hours
Detention Time (Peak to Peak)	0.200 hours

Ontario Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: Underground Detention (IN)

Return Event: 50 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	662.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	15.99 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	6.86 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	667.66 ft
Volume (Peak)	0.336 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	1.044 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	1.009 ac-ft
Volume (Retained)	0.035 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.1 %

Summary for Hydrograph Addition at 'Underground Detention'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed Storm Sewer DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed Storm Sewer DA	0.615	11.950	9.70
Flow (In)	Underground Detention	0.615	11.950	9.70

Ontario Outfall Analysis

Subsection: Pond Inflow Summary
Label: Underground Detention (IN)

Return Event: 10 years
Storm Event: Type II 24 hour

Summary for Hydrograph Addition at 'Underground Detention'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed Storm Sewer DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed Storm Sewer DA	0.733	11.950	11.45
Flow (In)	Underground Detention	0.733	11.950	11.45

Summary for Hydrograph Addition at 'Underground Detention'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed Storm Sewer DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed Storm Sewer DA	0.903	11.950	13.94
Flow (In)	Underground Detention	0.903	11.950	13.94

Summary for Hydrograph Addition at 'Underground Detention'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed Storm Sewer DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed Storm Sewer DA	1.044	11.950	15.99
Flow (In)	Underground Detention	1.044	11.950	15.99

Ontario Outfall Analysis

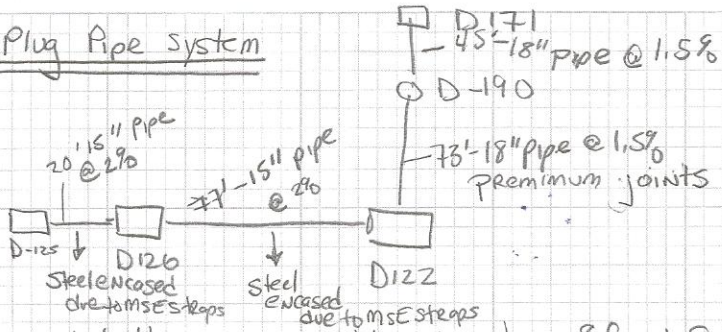
Index

Ontario Outfall Analysis

Calculations for Joint Deflection Check Soil Plug	Job No. 49633	Sheet No. 1/	
Made by AReede	Date 10/1/11		
Checked by ERJOHNSON	Date 10/3/11		
Backchecked by	Date		

HNTB

Soil Plug Pipe System



Anticipated that pipes will be placed in 8 foot Sections

5½ inch deep equipment joint with rubber O-Ring

Normal deflection @ Joint = 0.2984° (½" @ Joint)

Allowable (max) deflection @ Joint = 0.4476° (¾" @ Joint)

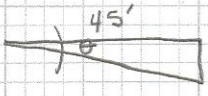
Settlement @ Soil Plug Area per GC-042 - Soil Plug Area Settlement Rev-1 (May 25, 2011). Per page 11 of 90 Consolidation Settlement at the Center of the Plug is approximately 4". This is why storm sewer system was aligned around the edges of the Soil Plug Area where the Consolidation Settlement is less.

The Storm Sewer System From D125-122 will Be Steel Encased due to proximity to MSE straps. In addition the differential settlement is consistent across these pipe runs.

The Consolidation Settlement @ D-122 and D 171 is approx 2.25"

The Consolidation Settlement @ D-190 is approx 3.6"

= 3.6" - 2.25" = 1.35" over 45' (Worst case D190 to D171)



$\frac{1.35}{12} = 0.1125$ $\tan\theta = \frac{0.1125}{45'}$ $\theta = 0.1432°$

For Reverse Curvature = 2 * 0.1432 = 0.2865°

0.2865° < 0.2984° Normal Deflection

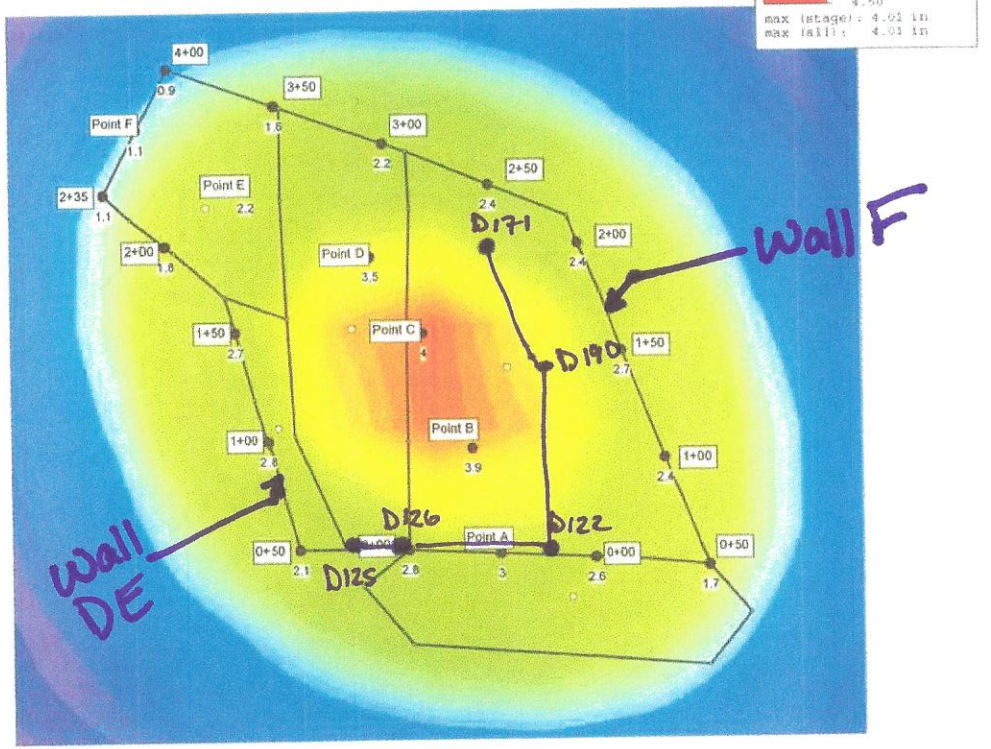
0.2865° < 0.4476° Max Allowable Deflection

Total Consolidation Settlement (Depth: 60 - 202 feet)

Data Type: Consolidation Settlement

Material Name	Color	Unit Weight (kips/ft3)	Sat. Unit Weight (kips/ft3)	Es (ksf)	Eur (ksf)	Material Type	Cc	Cr	OCR	e0
HF / CSG		0.12	0.12	180	180					
CSF		0.12	0.12	300	300					
PCS 1		0.125	0.125			Non-Linear	0.2	0.04	1.7	0.8
NPS 2		0.13	0.13	1000	1000					
NPS 1		0.12	0.12	300	300					
VSC		0.11	0.11			Non-Linear	0.25	0.08	1	0.9
PCS 2		0.125	0.125			Non-Linear	0.2	0.04	1.5	0.7
CSG2		0.13	0.13	1000	1000					

Soil Layers
Layer 1 (20 ft): HF / CSG
Layer 2 (15 ft): CSF
Layer 3 (25 ft): NPS 1
Layer 4 (45 ft): PCS 1
Layer 5 (17 ft): VSC
Layer 6 (80 ft): PCS 2
Layer 7 (25 ft): NPS 2
Layer 8 (10 ft): CSG2



SHEET 10 of 89

Project	Wall F Location
Analysis Description	Settlement Analysis
Drawn By	YHC
Company	S & W
Date	1/26/2011, 9:06:51 AM
File Name	Wall F location_ultimate.s3z

APPENDIX H

INLET SPACING DESIGN

PID : 49633 **Date :** 09/29/2011 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - I-90 WB TO A4 - LT **Designer :** BH

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.25

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
159+04	Begin																	
167+26	I-3D	822.00	0.90	0.10	1.00	16.05	17.05	0.0034	0.0300	0.0400	6.00	0.1667	3.92	0.34	0.00	0.34	0.134	4.45
602+08	CB-3A	777.93	0.90	0.25	1.00	3.65	10.00	0.0438	0.0440	0.0440	8.00	0.0417	5.10	0.99	0.16	1.15	0.151	3.43

DITCH ANALYSIS

PID : 49633 **Date :** 11/17/2011 **Project :** CIB **Location :** I-90 WB Temp

Description :I-90 WB Temp **Designer :** JCA

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
506+50	507+35	L	85.00	0.00	8.00	8.00	0.0030	0.06	0.06	0.90	0.05	Seed	3.36	5	0.030	17.42	0.57	0.04	0.18	0.20	3.18
												Seed	3.83	10	0.040	17.79	0.48	0.04	0.21	0.23	3.70
507+35	507+95	L	60.00	0.00	6.00	7.00	0.0080	0.00	0.06	0.80	0.05	Seed	3.25	5	0.030	18.59	0.87	0.09	0.18	0.18	2.30
												Seed	3.68	10	0.040	19.15	0.74	0.10	0.20	0.20	2.65
507+95	508+20	L	25.00	0.00	5.00	6.00	0.0185	0.22	0.28	0.80	0.23	Seed	3.23	5	0.030	18.83	1.77	0.32	0.74	0.28	3.04
												Seed	3.65	10	0.040	19.43	1.47	0.37	0.84	0.32	3.54
508+20	509+16	L	96.00	0.00	5.00	6.00	0.0219	0.13	0.41	0.80	0.33	Seed	3.16	5	0.030	19.60	2.07	0.42	1.06	0.30	3.35
												Jute Mat	3.14	5	0.040	19.78	1.67	0.46	1.05	0.34	3.72
												Temp. Mat	3.14	5	0.040	19.78	1.67	0.46	1.05	0.34	3.72
												Temp. Mat	3.55	10	0.040	20.36	1.72	0.48	1.19	0.35	3.90
509+16	509+53	L	37.00	0.00	5.00	6.00	0.0173	0.14	0.55	0.80	0.45	Seed	3.11	5	0.030	20.09	2.03	0.38	1.39	0.35	3.88
												Seed	3.51	10	0.040	20.72	1.69	0.44	1.57	0.41	4.52
509+53	510+16	L	63.00	0.00	5.00	6.00	0.0126	0.00	0.55	0.80	0.45	Seed	3.06	5	0.030	20.67	1.79	0.29	1.37	0.37	4.11

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Seed	3.44	10	0.040	21.43	1.49	0.34	1.54	0.43	4.77
510+16	Concent							0.11		0.90	0.55					10.00					
510+16	510+45	L	29.00	0.00	5.00	6.00	0.0098	0.00	0.66	0.90	0.55	Seed	3.04	5	0.030	20.95	1.71	0.26	1.66	0.42	4.62
												Seed	3.41	10	0.040	21.77	1.42	0.30	1.87	0.49	5.38

DITCH ANALYSIS

PID : 49633 **Date :** 11/17/2011 **Project :** CIB **Location :** I-90 WB Temp

Description :I-90 WB Temp - 2 **Designer :** AKL

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
510+86	510+65	L	21.00	0.00	5.00	6.00	0.1434 *	0.07	0.07	0.90	0.06	Seed	3.61	5	0.030	15.12	2.83	1.08	0.23	0.12	1.33
												Jute Mat	3.60	5	0.040	15.15	2.29	1.20	0.23	0.13	1.48
												Temp. Mat	3.60	5	0.040	15.15	2.29	1.20	0.23	0.13	1.48
												Perm, Type 1	3.60	5	0.040	15.15	2.29	1.20	0.23	0.13	1.48
												Perm, Type 1	4.18	10	0.040	15.15	2.36	1.27	0.26	0.14	1.57
510+65	510+55	L	10.00	0.00	5.00	6.00	0.0108	0.00	0.07	0.90	0.06	Seed	3.58	5	0.030	15.30	1.10	0.13	0.23	0.19	2.13
												Seed	4.15	10	0.040	15.33	0.89	0.16	0.26	0.23	2.54
510+55	510+45	L	10.00	0.00	5.00	6.00	0.1250 *	0.00	0.07	0.90	0.06	Seed	3.58	5	0.030	15.37	2.69	0.96	0.23	0.12	1.36
												Jute Mat	3.58	5	0.040	15.38	2.19	1.07	0.23	0.14	1.51
												Temp. Mat	3.58	5	0.040	15.38	2.19	1.07	0.23	0.14	1.51
												Perm, Type 1	3.58	5	0.040	15.38	2.19	1.07	0.23	0.14	1.51
												Perm, Type 1	4.14	10	0.040	15.41	2.26	1.13	0.26	0.15	1.60

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/16/2011 **Project :** CUY-90-14.90 **Location :** E. 9TH ST to detention basin

Description :E. 9TH STREET to detention basin - Temp Connection **Designer :** BH

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 50

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 669.50

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D162	D157	174+92	0.73	0.60	15.00	4.20	5.35	2.5	3.2	15	182.0	0.0098	688.76	4.42	5.97	0.0033	689.44	692.03	2.59	2.02	CB 5
begin		173+09	0.73	0.60									686.97				687.96	695.40			0.015
EXA5	D157	173+20	1.13	1.02	10.00	5.10	6.78	5.2	6.9	15	15.3	0.0098	678.99	5.14	5.96	0.0151	680.24	695.00	14.76	14.76	MH 3
begin		173+09	1.86	1.62									678.84				679.99	695.40			0.015
D157	D158	173+09	0.00	0.00	15.69	4.10	5.20	6.6	8.4	18	75.0	0.0095	670.32	5.50	9.53	0.0085	671.82	695.40	23.58	23.58	MH 3
		173+07	1.86	1.62									669.61				671.18	680.99			0.015
D158	D44	173+07	0.00	0.00	15.91	4.07	5.20	6.6	8.4	18	149.0	0.0099	669.61	5.58	9.73	0.0085	671.18	680.99	9.81	9.88	MH 3
		174+46	1.86	1.62									668.14				669.91	673.99			0.015
* D44	DET9	174+46	0.24	0.22	16.36	4.01	5.20	7.4	9.5	18	37.0	0.0038	668.14	4.17	6.02	0.0110	669.91	673.99	4.08	4.35	CB 3A
final		174+63	2.10	1.84						Warning			668.00				669.50	669.28			0.015

***** D44 to pond is slightly surcharged for this temporary condition and has a 0.27 ft pressure head.

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/16/2011 **Project :** CUY-90-14.90 **Location :** E. 9TH ST to detention basin

Description : E. 9TH STREET to detention basin - CCG1 **Designer :** BH

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 50

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 669.50

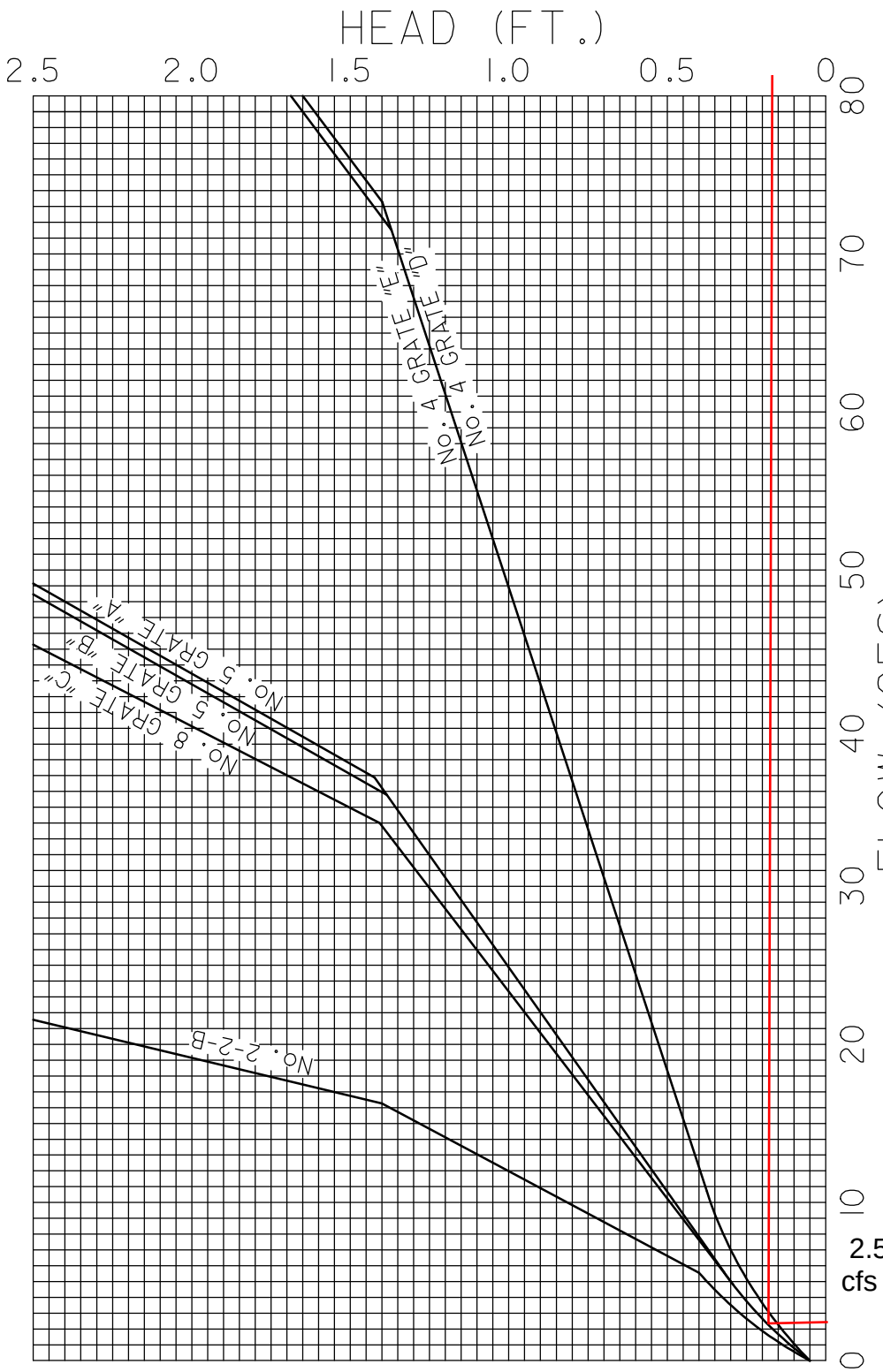
JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(50 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(50 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D162	D157	174+92	0.73	0.60	15.00	4.20	5.35	2.5	3.2	15	182.0	0.0098	688.76	4.42	5.97	0.0033	689.44	692.03	2.59	2.02	CB 5
begin		173+09	0.73	0.60									686.97				687.96	695.40			0.015
D157	D158	173+09	0.00	0.00	15.69	4.10	5.30	2.5	3.2	18	75.0	0.0095	670.32	4.29	9.53	0.0012	670.94	695.40	24.46	23.58	MH 3
		173+07	0.73	0.60									669.61				670.70	680.99			0.015
D158	D44	173+07	0.00	0.00	15.98	4.06	5.16	2.4	3.1	18	149.0	0.0099	669.61	4.34	9.73	0.0012	670.22	680.99	10.77	9.88	MH 3
		174+46	0.73	0.60									668.14				669.58	673.99			0.015
D44	DET9	174+46	0.24	0.22	16.55	3.99	5.16	3.3	4.2	18	37.0	0.0038	668.14	3.29	6.02	0.0022	669.58	673.99	4.41	4.35	CB 3A
final		174+63	0.97	0.82									668.00				669.50	669.28			0.015

CAPACITY OF A GRATE CATCH BASIN IN A SUMP

1102-1

REFERENCE SECTION
1102.3.5

D-162 Sump Calculation Q10= 2.5cfs
2*Q10= 5 cfs Head = 0.2 ft Available freeboard=
=694-692.03
1.97>0.20 ft



INLET SPACING DESIGN

PID : 49633 **Date :** 08/02/2011 **Project :** CUY-90-14.90 **Location :** Cleveland, Ohio

Description :2011-08-02 BL8 - D32 Inlet Spread.xml **Designer :** BAHess

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 9.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
178+94	Begin																	
175+02	CB-3	290.00	0.90	0.48	1.00	1.77	10.00	0.0169	0.0300	0.0300	9.50	0.0417	5.10	1.54	0.64	2.18	0.199	6.63

DITCH ANALYSIS

PID : 49633 **Date :** 09/29/2011 **Project :** CIB **Location :** Ramp A4_2

Description : Ramp A4_2 **Designer :** AHR

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
602+12	601+49	L	76.00	0.00	10.00	2.60	0.0670	0.50	0.50	0.90	0.45	Seed	3.58	5	0.030	15.37	3.37	1.15	1.61	0.28	3.47
												Jute Mat	3.57	5	0.040	15.46	2.72	1.28	1.61	0.31	3.86
												Temp. Mat	3.57	5	0.040	15.46	2.72	1.28	1.61	0.31	3.86
												Perm, Type 1	3.57	5	0.040	15.46	2.72	1.28	1.61	0.31	3.86
												Perm, Type 1	4.14	10	0.040	15.45	2.82	1.35	1.86	0.32	4.08

DITCH ANALYSIS

PID : 49633 **Date :** 09/29/2011 **Project :** CIB **Location :** Ramp A4_1

Description : Ramp A4_1 **Designer :** AHR

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

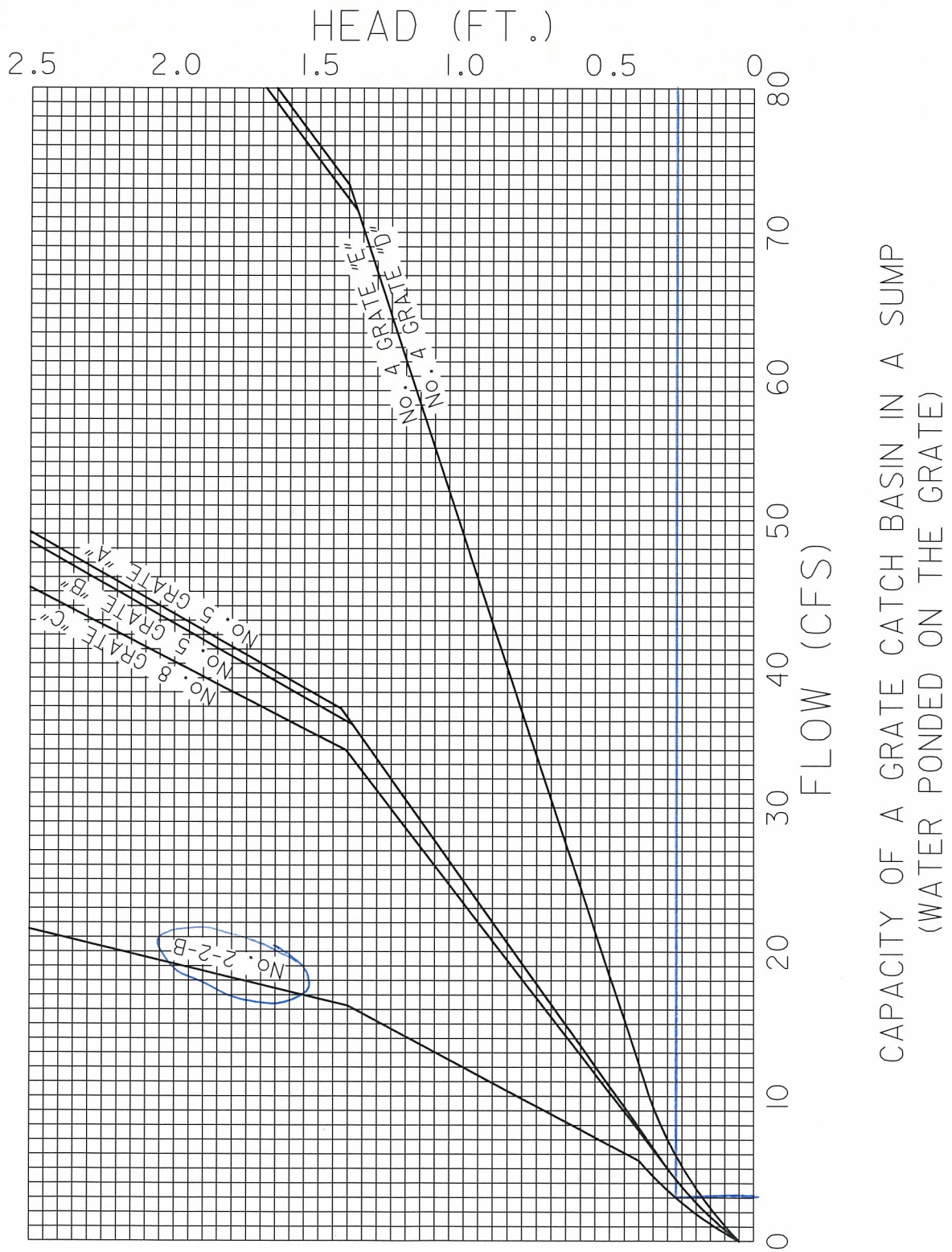
(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
600+93	601+49	L	73.00	0.00	10.00	5.00	0.0130	0.24	0.24	0.78	0.19	Seed	3.52	5	0.030	15.86	1.41	0.20	0.66	0.25	3.75
												Seed	4.05	10	0.040	16.03	1.18	0.24	0.76	0.29	4.39

CAPACITY OF A GRATE CATCH BASIN IN A SUMP

1102-1

REFERENCE SECTION
1102.3.5



CAPACITY OF A GRATE CATCH BASIN IN A SUMP
(WATER PONDED ON THE GRATE)

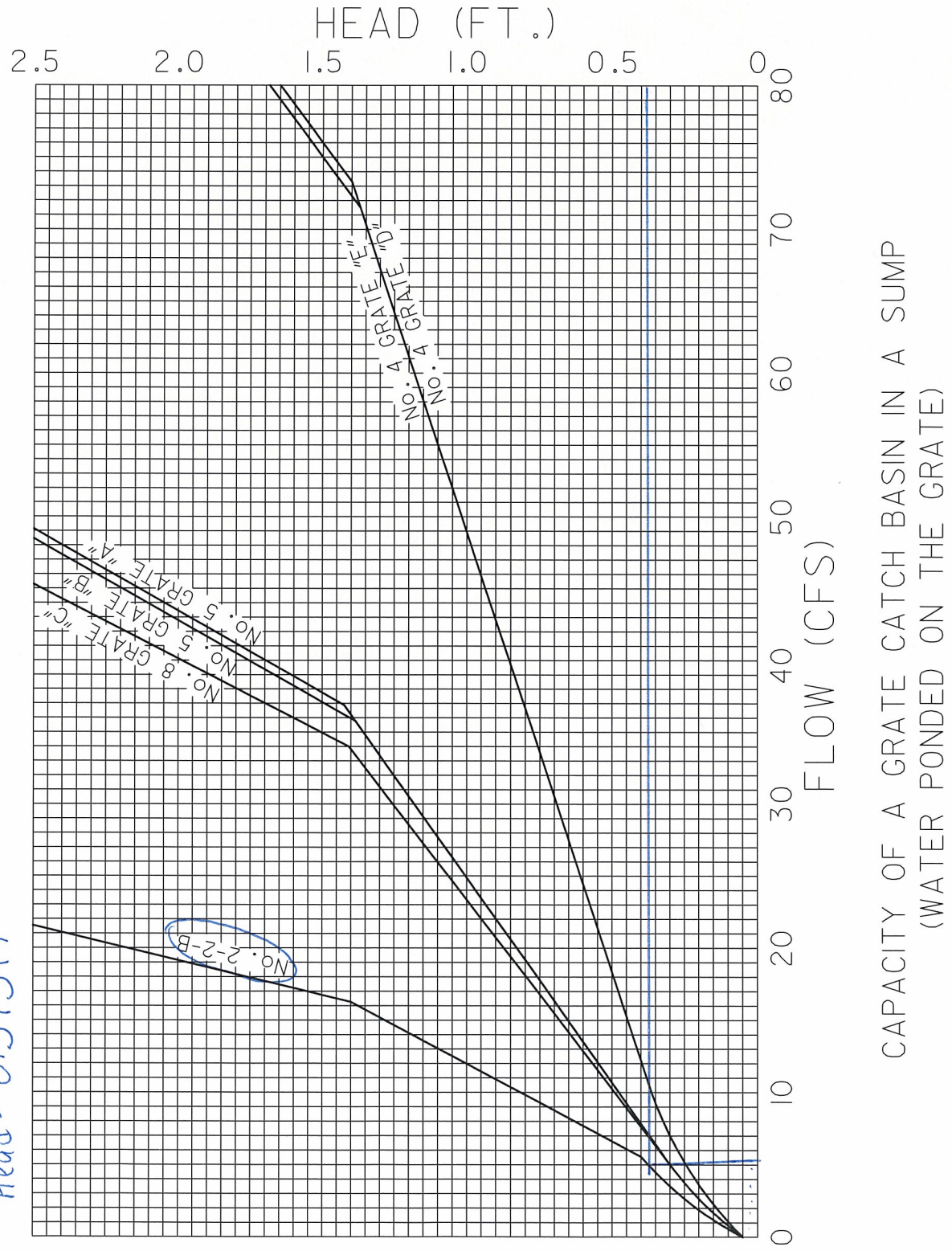
D-166 Sump Calculation
Q_{10} = 1.5 cfs
2 x Q_{10} = 3.0 cfs
Head = 0.25 ft

Grate Elev @ 668.50
Berm Elev @ 670.00 ∴ ok

CAPACITY OF A GRATE CATCH BASIN IN A SUMP

1102-1

REFERENCE SECTION
1102.3.5



CAPACITY OF A GRATE CATCH BASIN IN A SUMP
(WATER PONDED ON THE GRATE)

D-164 Sump Calculation
$Q_{10} = 2.6$ cfs
$2 \times Q_{10} = 2 \times 2.6 = 5.2$ cfs
Head = 0.375 ft

Grate Elev 670.50
Berm Elev @ 672 ∴ OK

STORM SEWER SYSTEM

PID : 49633 **Date :** 10/13/2011 **Project :** Cleveland Innerbelt **Location :** Bridge 8 inlet

Description : 2011-08-02 BL8 - D32 Pipe **Designer :** PNS

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 677.25

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D32	HW	175+02	0.48	0.43	10.00	5.10	6.20	2.2	2.7	15	10.0	0.0100	676.10	4.28	6.02	0.0023	677.27	690.65	13.38	13.30	CB 3
begin		175+27	0.48	0.43									676.00				677.25	677.25			0.015

NOTE:
This is a broken back pipe consisting of three sections:
- first section is 5' @ 1.00%;
- middle section is 26' @ 35.97% and
- the final section is 10' @ 1.00%.

STORM SEWER SYSTEM

PID : 49633 **Date :** 10/13/2011 **Project :** CUY-90-14.90 **Location :** OUTLET TO 9TH COMBINED SEWER NEAR STA. 39+00 LT

Description : E 9TH STREET detention basin to BL-7 SCUPPERS, A4 LT SHDR DRAINING **Designer :** AHR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 663.92

	JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
*	D120	D119	601+07	1.76	1.23	75.00	1.45	1.75	1.8	2.2	12	16.0	0.0063	664.64	3.40	2.63	0.0049	665.43	669.25	3.82	3.61	CB 2-2A
**	begin		601+09	1.76	1.23									664.54				665.35	670.15			0.015
	D119	D165	601+09	0.00	0.00	75.08	1.45	1.74	1.8	2.1	12	96.0	0.0059	664.54	3.33	2.56	0.0048	665.28	670.15	4.87	4.61	MH 3
			38+90	1.76	1.23									663.97				664.78	672.40			0.015
	D166	D163	37+75	0.24	0.21	10.00	5.10	6.19	1.0	1.3	12	16.1	0.0150	665.47	4.12	4.06	0.0017	666.00	668.50	2.50	2.03	CB 2-2B
	begin		35+73	2.00	1.44									665.23				665.97	671.28			0.015
	D163	D165	37+73	0.00	0.00	10.07	5.08	6.02	1.0	1.2	12	132.3	0.0088	665.18	3.38	3.11	0.0016	665.64	671.28	5.64	5.10	MH 3
			38+95	2.00	1.44									664.02				664.75	672.07			0.015
	D164	D165	601+52	0.74	0.61	16.00	4.06	4.91	2.5	3.0	12	55.0	0.0031	665.29	3.15	1.85	0.0094	666.51	670.50	3.99	4.21	CB 2-2B
	begin		38+95	2.74	2.05						Warning			665.12				665.99	672.07			0.015
	D165	B68	38+95	0.00	0.00	75.56	1.44	1.74	2.9	3.6	12	5.0	0.0740	663.37	9.75	9.04	0.0134	663.99	672.07	8.08	7.70	MH 3
	final		38+91	2.74	2.05									663.00				663.92	676.80			0.015

* - WQB Structure used
** - TC manipulated to get PondPack flow results

STORM SEWER SYSTEM

PID : 49633 **Date :** 05/18/2011 **Project :** CUY-90-14.90 **Location :** E. 9TH ST at Carnegie/Ramp A4_40+81 LT

Description : E. 9TH STREET at Carnegie/Ramp A4_40+81 LT **Designer :** BSB

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 668.19

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D12	EXCS	40+81		0.13	0.12	10.00	5.10	6.19	0.6	0.7	15	2.6	0.0000	666.94	0.49	0.04	0.0002	668.19	670.32	2.13	2.13	CB 3A
begin		40+83		0.13	0.12						Warning			666.94				668.19	670.34			0.015

9th Street Outfall Analysis

Project Summary

Title	9th Street Outfall Cleveland Innerbelt
Engineer	Brett Hess
Company	HNTB
Date	10/25/2011

Temporary Condition during MOT phase

Notes

Table of Contents

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Existing Orange - 14th	5 year	5.00	1.509	11.900	27.39
Existing Orange - 14th	10 year	10.00	1.870	11.900	33.83
Existing Orange - 14th	25 year	25.00	2.401	11.900	43.15
Existing Orange - 14th	50 year	50.00	2.847	11.900	50.86
Existing 9th	5 year	5.00	0.086	11.950	1.56
Existing 9th	10 year	10.00	0.111	11.900	2.00
Existing 9th	25 year	25.00	0.148	11.900	2.68
Existing 9th	50 year	50.00	0.179	11.900	3.25
Proposed 9th	5 year	5.00	0.502	11.950	8.74
Proposed 9th	10 year	10.00	0.611	11.950	10.53
Proposed 9th	25 year	25.00	0.771	11.950	13.09
Proposed 9th	50 year	50.00	0.904	11.950	15.19
Proposed Orange - 14th	5 year	5.00	1.208	11.900	21.96
Proposed Orange - 14th	10 year	10.00	1.510	11.900	27.40
Proposed Orange - 14th	25 year	25.00	1.954	11.900	35.31
Proposed Orange - 14th	50 year	50.00	2.329	11.900	41.87

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-01	5 year	5.00	1.509	11.900	27.39
J-01	10 year	10.00	1.870	11.900	33.83
J-01	25 year	25.00	2.401	11.900	43.15
J-01	50 year	50.00	2.847	11.900	50.86
Composite Outfall	5 year	5.00	3.481	12.050	31.92
Composite Outfall	10 year	10.00	4.312	12.050	32.49
Composite Outfall	25 year	25.00	5.487	12.000	33.37
Composite Outfall	50 year	50.00	6.473	12.100	34.54
EX_OUT	5 year	5.00	1.697	12.000	16.20
EX_OUT	10 year	10.00	2.091	12.000	16.67
EX_OUT	25 year	25.00	2.649	11.950	17.44
EX_OUT	50 year	50.00	3.146	11.950	17.97
J-02	5 year	5.00	1.615	11.900	14.76
J-02	10 year	10.00	1.985	11.850	14.76
J-02	25 year	25.00	2.507	11.800	14.76
J-02	50 year	50.00	2.973	11.800	14.76
J-03	5 year	5.00	1.613	11.950	14.80
J-03	10 year	10.00	1.983	11.900	14.87

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-03	25 year	25.00	2.504	11.850	14.89
J-03	50 year	50.00	2.971	11.800	14.87
J-04	5 year	5.00	1.612	12.000	14.78
J-04	10 year	10.00	1.982	11.950	14.81
J-04	25 year	25.00	2.504	11.900	14.82
J-04	50 year	50.00	2.970	11.850	14.81
J-06	5 year	5.00	0.086	11.950	1.56
J-06	10 year	10.00	0.111	11.900	2.00
J-06	25 year	25.00	0.148	11.900	2.68
J-06	50 year	50.00	0.179	11.900	3.25
J-11	5 year	5.00	1.208	11.900	21.96
J-11	10 year	10.00	1.510	11.900	27.40
J-11	25 year	25.00	1.954	11.900	35.31
J-11	50 year	50.00	2.329	11.900	41.87
J-12	5 year	5.00	1.287	11.950	14.76
J-12	10 year	10.00	1.616	11.900	14.76
J-12	25 year	25.00	2.075	11.850	14.76
J-12	50 year	50.00	2.432	11.800	14.76
J-13	5 year	5.00	1.286	11.950	14.98
J-13	10 year	10.00	1.614	11.950	14.80
J-13	25 year	25.00	2.073	11.900	14.83
J-13	50 year	50.00	2.429	11.850	14.92
J-14	5 year	5.00	1.285	12.000	14.85
J-14	10 year	10.00	1.613	12.000	14.78
J-14	25 year	25.00	2.072	11.950	14.79
J-14	50 year	50.00	2.429	11.900	14.83
PR_OUT	5 year	5.00	1.785	12.200	16.05
PR_OUT	10 year	10.00	2.223	12.350	16.14
PR_OUT	25 year	25.00	2.840	12.200	17.05
PR_OUT	50 year	50.00	3.329	12.150	18.85
J-16	5 year	5.00	0.501	12.250	1.29
J-16	10 year	10.00	0.611	12.300	1.38
J-16	25 year	25.00	0.770	12.200	2.29
J-16	50 year	50.00	0.904	12.100	4.11

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-2 (IN)	5 year	5.00	0.502	11.950	8.74	(N/A)	(N/A)
PO-2 (OUT)	5 year	5.00	0.501	12.250	1.29	668.81	0.177

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-2 (IN)	10 year	10.00	0.611	11.950	10.53	(N/A)	(N/A)
PO-2 (OUT)	10 year	10.00	0.611	12.300	1.38	669.04	0.227
PO-2 (IN)	25 year	25.00	0.771	11.950	13.09	(N/A)	(N/A)
PO-2 (OUT)	25 year	25.00	0.770	12.200	2.29	669.33	0.289
PO-2 (IN)	50 year	50.00	0.904	11.950	15.19	(N/A)	(N/A)
PO-2 (OUT)	50 year	50.00	0.904	12.100	4.11	669.51	0.328

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.01	0.02	0.02	0.02	0.03
1.000	0.03	0.03	0.04	0.04	0.04
1.500	0.05	0.05	0.05	0.06	0.06
2.000	0.06	0.07	0.07	0.07	0.08
2.500	0.08	0.09	0.09	0.09	0.10
3.000	0.10	0.10	0.11	0.11	0.12
3.500	0.12	0.12	0.13	0.13	0.14
4.000	0.14	0.14	0.15	0.15	0.16
4.500	0.16	0.17	0.17	0.17	0.18
5.000	0.18	0.19	0.19	0.20	0.20
5.500	0.21	0.21	0.22	0.22	0.23
6.000	0.23	0.24	0.24	0.25	0.26
6.500	0.26	0.27	0.27	0.28	0.28
7.000	0.29	0.29	0.30	0.31	0.31
7.500	0.32	0.33	0.33	0.34	0.34
8.000	0.35	0.36	0.36	0.37	0.38
8.500	0.39	0.39	0.40	0.41	0.42
9.000	0.43	0.44	0.45	0.46	0.47
9.500	0.48	0.49	0.50	0.51	0.52
10.000	0.53	0.54	0.55	0.57	0.58
10.500	0.60	0.61	0.63	0.65	0.67
11.000	0.69	0.71	0.73	0.76	0.79
11.500	0.83	0.90	1.03	1.26	1.66
12.000	1.94	1.99	2.04	2.08	2.12
12.500	2.15	2.17	2.19	2.22	2.24
13.000	2.25	2.27	2.29	2.30	2.32
13.500	2.33	2.35	2.36	2.37	2.38
14.000	2.39	2.41	2.42	2.43	2.44
14.500	2.45	2.46	2.47	2.47	2.48
15.000	2.49	2.50	2.51	2.52	2.53
15.500	2.53	2.54	2.55	2.56	2.56
16.000	2.57	2.58	2.58	2.59	2.60
16.500	2.60	2.61	2.61	2.62	2.63

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.63	2.64	2.64	2.65	2.66
17.500	2.66	2.67	2.67	2.68	2.68
18.000	2.69	2.69	2.70	2.70	2.71
18.500	2.71	2.72	2.72	2.73	2.73
19.000	2.74	2.74	2.75	2.75	2.76
19.500	2.76	2.76	2.77	2.77	2.78
20.000	2.78	2.78	2.79	2.79	2.79
20.500	2.80	2.80	2.81	2.81	2.81
21.000	2.82	2.82	2.82	2.83	2.83
21.500	2.84	2.84	2.84	2.85	2.85
22.000	2.85	2.86	2.86	2.86	2.87
22.500	2.87	2.87	2.88	2.88	2.88
23.000	2.89	2.89	2.89	2.90	2.90
23.500	2.90	2.91	2.91	2.91	2.92
24.000	2.92	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.02	0.02	0.02	0.03	0.03
1.000	0.04	0.04	0.04	0.05	0.05
1.500	0.05	0.06	0.06	0.07	0.07
2.000	0.07	0.08	0.08	0.09	0.09
2.500	0.10	0.10	0.10	0.11	0.11
3.000	0.12	0.12	0.13	0.13	0.14
3.500	0.14	0.14	0.15	0.15	0.16
4.000	0.16	0.17	0.17	0.18	0.18
4.500	0.19	0.19	0.20	0.20	0.21
5.000	0.21	0.22	0.23	0.23	0.24
5.500	0.24	0.25	0.25	0.26	0.27
6.000	0.27	0.28	0.28	0.29	0.30
6.500	0.30	0.31	0.32	0.32	0.33
7.000	0.34	0.34	0.35	0.36	0.36
7.500	0.37	0.38	0.39	0.39	0.40
8.000	0.41	0.42	0.42	0.43	0.44
8.500	0.45	0.46	0.47	0.48	0.49
9.000	0.50	0.51	0.52	0.53	0.54
9.500	0.55	0.57	0.58	0.59	0.60
10.000	0.62	0.63	0.64	0.66	0.68
10.500	0.69	0.71	0.73	0.75	0.78
11.000	0.80	0.83	0.85	0.89	0.92
11.500	0.96	1.04	1.20	1.46	1.93
12.000	2.25	2.32	2.38	2.42	2.47
12.500	2.50	2.53	2.55	2.58	2.60
13.000	2.62	2.65	2.66	2.68	2.70
13.500	2.72	2.73	2.75	2.76	2.78
14.000	2.79	2.80	2.81	2.82	2.84
14.500	2.85	2.86	2.87	2.88	2.89
15.000	2.90	2.91	2.92	2.93	2.94
15.500	2.95	2.96	2.97	2.98	2.98
16.000	2.99	3.00	3.01	3.02	3.02
16.500	3.03	3.04	3.04	3.05	3.06

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.07	3.07	3.08	3.09	3.09
17.500	3.10	3.11	3.11	3.12	3.13
18.000	3.13	3.14	3.14	3.15	3.16
18.500	3.16	3.17	3.17	3.18	3.18
19.000	3.19	3.19	3.20	3.20	3.21
19.500	3.21	3.22	3.22	3.23	3.23
20.000	3.24	3.24	3.25	3.25	3.25
20.500	3.26	3.26	3.27	3.27	3.28
21.000	3.28	3.28	3.29	3.29	3.30
21.500	3.30	3.31	3.31	3.31	3.32
22.000	3.32	3.33	3.33	3.33	3.34
22.500	3.34	3.35	3.35	3.35	3.36
23.000	3.36	3.37	3.37	3.37	3.38
23.500	3.38	3.38	3.39	3.39	3.40
24.000	3.40	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.02
0.500	0.02	0.03	0.03	0.03	0.04
1.000	0.04	0.05	0.05	0.06	0.06
1.500	0.07	0.07	0.08	0.08	0.09
2.000	0.09	0.09	0.10	0.10	0.11
2.500	0.12	0.12	0.13	0.13	0.14
3.000	0.14	0.15	0.15	0.16	0.16
3.500	0.17	0.17	0.18	0.18	0.19
4.000	0.20	0.20	0.21	0.21	0.22
4.500	0.23	0.23	0.24	0.24	0.25
5.000	0.26	0.26	0.27	0.28	0.28
5.500	0.29	0.30	0.31	0.31	0.32
6.000	0.33	0.33	0.34	0.35	0.36
6.500	0.37	0.37	0.38	0.39	0.40
7.000	0.40	0.41	0.42	0.43	0.44
7.500	0.45	0.46	0.46	0.47	0.48
8.000	0.49	0.50	0.51	0.52	0.53
8.500	0.54	0.55	0.56	0.58	0.59
9.000	0.60	0.61	0.63	0.64	0.65
9.500	0.67	0.68	0.69	0.71	0.72
10.000	0.74	0.76	0.77	0.79	0.81
10.500	0.83	0.86	0.88	0.91	0.93
11.000	0.96	0.99	1.03	1.07	1.11
11.500	1.16	1.25	1.45	1.76	2.32
12.000	2.71	2.79	2.86	2.92	2.97
12.500	3.01	3.04	3.07	3.10	3.13
13.000	3.16	3.18	3.21	3.23	3.25
13.500	3.27	3.29	3.30	3.32	3.34
14.000	3.35	3.37	3.38	3.40	3.41
14.500	3.43	3.44	3.45	3.47	3.48
15.000	3.49	3.50	3.51	3.53	3.54
15.500	3.55	3.56	3.57	3.58	3.59
16.000	3.60	3.61	3.62	3.63	3.64
16.500	3.64	3.65	3.66	3.67	3.68

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.69	3.70	3.70	3.71	3.72
17.500	3.73	3.74	3.74	3.75	3.76
18.000	3.77	3.77	3.78	3.79	3.80
18.500	3.80	3.81	3.82	3.82	3.83
19.000	3.84	3.84	3.85	3.85	3.86
19.500	3.87	3.87	3.88	3.88	3.89
20.000	3.89	3.90	3.90	3.91	3.91
20.500	3.92	3.93	3.93	3.94	3.94
21.000	3.95	3.95	3.96	3.96	3.97
21.500	3.97	3.98	3.98	3.99	3.99
22.000	4.00	4.00	4.01	4.01	4.02
22.500	4.02	4.03	4.03	4.03	4.04
23.000	4.04	4.05	4.05	4.06	4.06
23.500	4.07	4.07	4.08	4.08	4.09
24.000	4.09	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.02
0.500	0.02	0.03	0.03	0.04	0.04
1.000	0.05	0.05	0.06	0.06	0.07
1.500	0.08	0.08	0.09	0.09	0.10
2.000	0.10	0.11	0.11	0.12	0.13
2.500	0.13	0.14	0.14	0.15	0.15
3.000	0.16	0.17	0.17	0.18	0.19
3.500	0.19	0.20	0.20	0.21	0.22
4.000	0.22	0.23	0.24	0.24	0.25
4.500	0.26	0.26	0.27	0.28	0.29
5.000	0.29	0.30	0.31	0.32	0.32
5.500	0.33	0.34	0.35	0.36	0.36
6.000	0.37	0.38	0.39	0.40	0.41
6.500	0.42	0.42	0.43	0.44	0.45
7.000	0.46	0.47	0.48	0.49	0.50
7.500	0.51	0.52	0.53	0.54	0.55
8.000	0.56	0.57	0.58	0.59	0.60
8.500	0.62	0.63	0.64	0.66	0.67
9.000	0.69	0.70	0.71	0.73	0.74
9.500	0.76	0.77	0.79	0.81	0.83
10.000	0.84	0.86	0.88	0.90	0.93
10.500	0.95	0.98	1.00	1.03	1.06
11.000	1.10	1.13	1.17	1.22	1.27
11.500	1.32	1.43	1.65	2.01	2.65
12.000	3.09	3.18	3.26	3.32	3.38
12.500	3.43	3.46	3.50	3.54	3.57
13.000	3.60	3.63	3.65	3.68	3.70
13.500	3.72	3.74	3.77	3.78	3.80
14.000	3.82	3.84	3.86	3.87	3.89
14.500	3.90	3.92	3.93	3.95	3.96
15.000	3.98	3.99	4.00	4.02	4.03
15.500	4.04	4.06	4.07	4.08	4.09
16.000	4.10	4.11	4.12	4.13	4.14
16.500	4.15	4.16	4.17	4.18	4.19

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.20	4.21	4.22	4.23	4.24
17.500	4.25	4.26	4.27	4.27	4.28
18.000	4.29	4.30	4.31	4.32	4.32
18.500	4.33	4.34	4.35	4.36	4.36
19.000	4.37	4.38	4.38	4.39	4.40
19.500	4.40	4.41	4.42	4.42	4.43
20.000	4.44	4.44	4.45	4.45	4.46
20.500	4.47	4.47	4.48	4.48	4.49
21.000	4.50	4.50	4.51	4.51	4.52
21.500	4.52	4.53	4.54	4.54	4.55
22.000	4.55	4.56	4.56	4.57	4.58
22.500	4.58	4.59	4.59	4.60	4.60
23.000	4.61	4.61	4.62	4.62	4.63
23.500	4.63	4.64	4.64	4.65	4.65
24.000	4.66	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Runoff CN-Area
Label: Existing 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	0.2800	100.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil C	74.000	0.3900	0.0	0.0	74.000
Open space (Lawns,parks etc.) - Fair condition; grass cover 50% to 75% - Soil C	79.000	0.0800	0.0	0.0	79.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.7500	(N/A)	(N/A)	83.493

Subsection: Runoff CN-Area
Label: Proposed 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	0.9900	100.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	74.000	0.5000	0.0	0.0	74.000
CN Description	79.000	0.2700	0.0	0.0	79.000
Temp Connection	98.000	1.1300	100.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	2.8900	(N/A)	(N/A)	92.073

Subsection: Unit Hydrograph Summary
Label: Existing 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.7500 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	1.63 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	1.56 ft³/s

Drainage Area	
SCS CN (Composite)	83.000
Area (User Defined)	0.7500 acres
Maximum Retention (Pervious)	2.05 in
Maximum Retention (Pervious, 20 percent)	0.41 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.38 in
Runoff Volume (Pervious)	0.086 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.086 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Subsection: Unit Hydrograph Summary
Label: Existing 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.20 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Subsection: Unit Hydrograph Summary
Label: Existing Orange - 14th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	9.9300 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	28.40 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	27.39 ft³/s

Drainage Area	
SCS CN (Composite)	88.969
Area (User Defined)	9.9300 acres
Maximum Retention (Pervious)	1.24 in
Maximum Retention (Pervious, 20 percent)	0.25 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.83 in
Runoff Volume (Pervious)	1.510 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.509 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Subsection: Unit Hydrograph Summary
Label: Existing Orange - 14th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	135.01 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Subsection: Unit Hydrograph Summary
Label: Proposed 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.098 hours
Area (User Defined)	2.8900 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.930 hours
Flow (Peak, Computed)	9.01 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	8.74 ft³/s

Drainage Area	
SCS CN (Composite)	92.000
Area (User Defined)	2.8900 acres
Maximum Retention (Pervious)	0.87 in
Maximum Retention (Pervious, 20 percent)	0.17 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.09 in
Runoff Volume (Pervious)	0.502 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.502 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.098 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Subsection: Unit Hydrograph Summary
Label: Proposed 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	33.41 ft³/s
Unit peak time, Tp	0.065 hours
Unit receding limb, Tr	0.261 hours
Total unit time, Tb	0.327 hours

Subsection: Unit Hydrograph Summary
Label: Proposed Orange - 14th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	8.4600 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	22.85 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	21.96 ft³/s

Drainage Area	
SCS CN (Composite)	87.602
Area (User Defined)	8.4600 acres
Maximum Retention (Pervious)	1.42 in
Maximum Retention (Pervious, 20 percent)	0.28 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.72 in
Runoff Volume (Pervious)	1.210 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.208 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Subsection: Unit Hydrograph Summary
Label: Proposed Orange - 14th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	115.03 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

9th Street Outfall Analysis

Subsection: Elevation-Area Volume Curve
Label: PO-2

Return Event: 5.00 years
Storm Event: Type II 24 hour

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
667.00	0.000	0.0006	0.0000	0.000	0.000
667.75	0.000	0.0156	0.0193	0.005	0.005
668.00	0.000	0.1756	0.2435	0.020	0.025
669.00	0.000	0.2091	0.5763	0.192	0.217
669.75	0.000	0.2364	0.6678	0.167	0.384

Subsection: Volume Equations
Label: PO-2

Return Event: 5.00 years
Storm Event: Type II 24 hour

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

9th Street Outfall Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 5.00 years

Label: PO-2 Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
667.00	0.00	0.000	0.0006	0.00	0.00	0.00
667.50	0.68	0.002	0.0084	0.00	0.68	1.58
668.00	0.96	0.025	0.1756	0.00	0.96	13.12
668.50	1.18	0.117	0.1920	0.00	1.18	57.80
669.00	1.36	0.217	0.2091	0.00	1.36	106.49
669.25	1.44	0.271	0.2180	0.00	1.44	132.42
669.50	3.96	0.326	0.2271	0.00	3.96	161.86
669.75	8.49	0.384	0.2364	0.00	8.49	194.43

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 5.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	8.74 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.29 ft³/s	Time to Peak (Flow, Outlet)	12.250 hours

Elevation (Water Surface, Peak)	668.81 ft
Volume (Peak)	0.177 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.502 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.501 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 10.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	10.53 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.38 ft³/s	Time to Peak (Flow, Outlet)	12.300 hours

Elevation (Water Surface, Peak)	669.04 ft
Volume (Peak)	0.227 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.611 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.611 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 25.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	13.09 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	2.29 ft³/s	Time to Peak (Flow, Outlet)	12.200 hours

Elevation (Water Surface, Peak)	669.33 ft
Volume (Peak)	0.289 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.771 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.770 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 50.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	15.19 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	4.11 ft³/s	Time to Peak (Flow, Outlet)	12.100 hours

Elevation (Water Surface, Peak)	669.51 ft
Volume (Peak)	0.328 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.904 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.904 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Pond Inflow Summary
Label: PO-2 (IN)

Return Event: 5.00 years
Storm Event: Type II 24 hour

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.502	11.950	8.74
Flow (In)	PO-2	0.502	11.950	8.74

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.611	11.950	10.53
Flow (In)	PO-2	0.611	11.950	10.53

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.771	11.950	13.09
Flow (In)	PO-2	0.771	11.950	13.09

Subsection: Pond Inflow Summary
Label: PO-2 (IN)

Return Event: 50.00 years
Storm Event: Type II 24 hour

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.904	11.950	15.19
Flow (In)	PO-2	0.904	11.950	15.19

9th Street Outfall Analysis

Index

9th Street Outfall Analysis

Project Summary	
Title	9th Street Outfall Cleveland Innerbelt
Engineer	Brett Hess
Company	HNTB
Date	10/25/2011

CCG1 Condition

Notes

Table of Contents

Table of Contents

9th Street Outfall Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Existing Orange - 14th	5 year	5.00	1.509	11.900	27.39
Existing Orange - 14th	10 year	10.00	1.870	11.900	33.83
Existing Orange - 14th	25 year	25.00	2.401	11.900	43.15
Existing Orange - 14th	50 year	50.00	2.847	11.900	50.86
Existing 9th	5 year	5.00	0.086	11.950	1.56
Existing 9th	10 year	10.00	0.111	11.900	2.00
Existing 9th	25 year	25.00	0.148	11.900	2.68
Existing 9th	50 year	50.00	0.179	11.900	3.25
Proposed 9th	5 year	5.00	0.256	11.950	4.58
Proposed 9th	10 year	10.00	0.319	11.950	5.67
Proposed 9th	25 year	25.00	0.412	11.950	7.23
Proposed 9th	50 year	50.00	0.490	11.950	8.53
Proposed Orange - 14th	5 year	5.00	1.208	11.900	21.96
Proposed Orange - 14th	10 year	10.00	1.510	11.900	27.40
Proposed Orange - 14th	25 year	25.00	1.954	11.900	35.31
Proposed Orange - 14th	50 year	50.00	2.329	11.900	41.87

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-01	5 year	5.00	1.509	11.900	27.39
J-01	10 year	10.00	1.870	11.900	33.83
J-01	25 year	25.00	2.401	11.900	43.15
J-01	50 year	50.00	2.847	11.900	50.86
Composite Outfall	5 year	5.00	3.235	12.050	31.75
Composite Outfall	10 year	10.00	4.020	12.050	32.29
Composite Outfall	25 year	25.00	5.129	12.000	33.17
Composite Outfall	50 year	50.00	6.060	12.000	33.78
EX_OUT	5 year	5.00	1.697	12.000	16.20
EX_OUT	10 year	10.00	2.091	12.000	16.67
EX_OUT	25 year	25.00	2.649	11.950	17.44
EX_OUT	50 year	50.00	3.146	11.950	17.97
J-02	5 year	5.00	1.615	11.900	14.76
J-02	10 year	10.00	1.985	11.850	14.76
J-02	25 year	25.00	2.507	11.800	14.76
J-02	50 year	50.00	2.973	11.800	14.76
J-03	5 year	5.00	1.613	11.950	14.80
J-03	10 year	10.00	1.983	11.900	14.87

9th Street Outfall Analysis

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-03	25 year	25.00	2.504	11.850	14.89
J-03	50 year	50.00	2.971	11.800	14.87
J-04	5 year	5.00	1.612	12.000	14.78
J-04	10 year	10.00	1.982	11.950	14.81
J-04	25 year	25.00	2.504	11.900	14.82
J-04	50 year	50.00	2.970	11.850	14.81
J-06	5 year	5.00	0.086	11.950	1.56
J-06	10 year	10.00	0.111	11.900	2.00
J-06	25 year	25.00	0.148	11.900	2.68
J-06	50 year	50.00	0.179	11.900	3.25
J-11	5 year	5.00	1.208	11.900	21.96
J-11	10 year	10.00	1.510	11.900	27.40
J-11	25 year	25.00	1.954	11.900	35.31
J-11	50 year	50.00	2.329	11.900	41.87
J-12	5 year	5.00	1.287	11.950	14.76
J-12	10 year	10.00	1.616	11.900	14.76
J-12	25 year	25.00	2.075	11.850	14.76
J-12	50 year	50.00	2.432	11.800	14.76
J-13	5 year	5.00	1.286	11.950	14.98
J-13	10 year	10.00	1.614	11.950	14.80
J-13	25 year	25.00	2.073	11.900	14.83
J-13	50 year	50.00	2.429	11.850	14.92
J-14	5 year	5.00	1.285	12.000	14.85
J-14	10 year	10.00	1.613	12.000	14.78
J-14	25 year	25.00	2.072	11.950	14.79
J-14	50 year	50.00	2.429	11.900	14.83
PR_OUT	5 year	5.00	1.540	12.050	15.85
PR_OUT	10 year	10.00	1.930	12.200	15.90
PR_OUT	25 year	25.00	2.482	12.250	15.98
PR_OUT	50 year	50.00	2.916	12.250	16.04
J-16	5 year	5.00	0.256	12.150	1.08
J-16	10 year	10.00	0.319	12.150	1.14
J-16	25 year	25.00	0.412	12.200	1.22
J-16	50 year	50.00	0.490	12.250	1.28

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-2 (IN)	5 year	5.00	0.256	11.950	4.58	(N/A)	(N/A)
PO-2 (OUT)	5 year	5.00	0.256	12.150	1.08	668.27	0.073

9th Street Outfall Analysis

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-2 (IN)	10 year	10.00	0.319	11.950	5.67	(N/A)	(N/A)
PO-2 (OUT)	10 year	10.00	0.319	12.150	1.14	668.41	0.100
PO-2 (IN)	25 year	25.00	0.412	11.950	7.23	(N/A)	(N/A)
PO-2 (OUT)	25 year	25.00	0.412	12.200	1.22	668.61	0.139
PO-2 (IN)	50 year	50.00	0.490	11.950	8.53	(N/A)	(N/A)
PO-2 (OUT)	50 year	50.00	0.490	12.250	1.28	668.78	0.172

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.01	0.02	0.02	0.02	0.03
1.000	0.03	0.03	0.04	0.04	0.04
1.500	0.05	0.05	0.05	0.06	0.06
2.000	0.06	0.07	0.07	0.07	0.08
2.500	0.08	0.09	0.09	0.09	0.10
3.000	0.10	0.10	0.11	0.11	0.12
3.500	0.12	0.12	0.13	0.13	0.14
4.000	0.14	0.14	0.15	0.15	0.16
4.500	0.16	0.17	0.17	0.17	0.18
5.000	0.18	0.19	0.19	0.20	0.20
5.500	0.21	0.21	0.22	0.22	0.23
6.000	0.23	0.24	0.24	0.25	0.26
6.500	0.26	0.27	0.27	0.28	0.28
7.000	0.29	0.29	0.30	0.31	0.31
7.500	0.32	0.33	0.33	0.34	0.34
8.000	0.35	0.36	0.36	0.37	0.38
8.500	0.39	0.39	0.40	0.41	0.42
9.000	0.43	0.44	0.45	0.46	0.47
9.500	0.48	0.49	0.50	0.51	0.52
10.000	0.53	0.54	0.55	0.57	0.58
10.500	0.60	0.61	0.63	0.65	0.67
11.000	0.69	0.71	0.73	0.76	0.79
11.500	0.83	0.90	1.03	1.26	1.66
12.000	1.94	1.99	2.04	2.08	2.12
12.500	2.15	2.17	2.19	2.22	2.24
13.000	2.25	2.27	2.29	2.30	2.32
13.500	2.33	2.35	2.36	2.37	2.38
14.000	2.39	2.41	2.42	2.43	2.44
14.500	2.45	2.46	2.47	2.47	2.48
15.000	2.49	2.50	2.51	2.52	2.53
15.500	2.53	2.54	2.55	2.56	2.56
16.000	2.57	2.58	2.58	2.59	2.60
16.500	2.60	2.61	2.61	2.62	2.63

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.63	2.64	2.64	2.65	2.66
17.500	2.66	2.67	2.67	2.68	2.68
18.000	2.69	2.69	2.70	2.70	2.71
18.500	2.71	2.72	2.72	2.73	2.73
19.000	2.74	2.74	2.75	2.75	2.76
19.500	2.76	2.76	2.77	2.77	2.78
20.000	2.78	2.78	2.79	2.79	2.79
20.500	2.80	2.80	2.81	2.81	2.81
21.000	2.82	2.82	2.82	2.83	2.83
21.500	2.84	2.84	2.84	2.85	2.85
22.000	2.85	2.86	2.86	2.86	2.87
22.500	2.87	2.87	2.88	2.88	2.88
23.000	2.89	2.89	2.89	2.90	2.90
23.500	2.90	2.91	2.91	2.91	2.92
24.000	2.92	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.02	0.02	0.02	0.03	0.03
1.000	0.04	0.04	0.04	0.05	0.05
1.500	0.05	0.06	0.06	0.07	0.07
2.000	0.07	0.08	0.08	0.09	0.09
2.500	0.10	0.10	0.10	0.11	0.11
3.000	0.12	0.12	0.13	0.13	0.14
3.500	0.14	0.14	0.15	0.15	0.16
4.000	0.16	0.17	0.17	0.18	0.18
4.500	0.19	0.19	0.20	0.20	0.21
5.000	0.21	0.22	0.23	0.23	0.24
5.500	0.24	0.25	0.25	0.26	0.27
6.000	0.27	0.28	0.28	0.29	0.30
6.500	0.30	0.31	0.32	0.32	0.33
7.000	0.34	0.34	0.35	0.36	0.36
7.500	0.37	0.38	0.39	0.39	0.40
8.000	0.41	0.42	0.42	0.43	0.44
8.500	0.45	0.46	0.47	0.48	0.49
9.000	0.50	0.51	0.52	0.53	0.54
9.500	0.55	0.57	0.58	0.59	0.60
10.000	0.62	0.63	0.64	0.66	0.68
10.500	0.69	0.71	0.73	0.75	0.78
11.000	0.80	0.83	0.85	0.89	0.92
11.500	0.96	1.04	1.20	1.46	1.93
12.000	2.25	2.32	2.38	2.42	2.47
12.500	2.50	2.53	2.55	2.58	2.60
13.000	2.62	2.65	2.66	2.68	2.70
13.500	2.72	2.73	2.75	2.76	2.78
14.000	2.79	2.80	2.81	2.82	2.84
14.500	2.85	2.86	2.87	2.88	2.89
15.000	2.90	2.91	2.92	2.93	2.94
15.500	2.95	2.96	2.97	2.98	2.98
16.000	2.99	3.00	3.01	3.02	3.02
16.500	3.03	3.04	3.04	3.05	3.06

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.07	3.07	3.08	3.09	3.09
17.500	3.10	3.11	3.11	3.12	3.13
18.000	3.13	3.14	3.14	3.15	3.16
18.500	3.16	3.17	3.17	3.18	3.18
19.000	3.19	3.19	3.20	3.20	3.21
19.500	3.21	3.22	3.22	3.23	3.23
20.000	3.24	3.24	3.25	3.25	3.25
20.500	3.26	3.26	3.27	3.27	3.28
21.000	3.28	3.28	3.29	3.29	3.30
21.500	3.30	3.31	3.31	3.31	3.32
22.000	3.32	3.33	3.33	3.33	3.34
22.500	3.34	3.35	3.35	3.35	3.36
23.000	3.36	3.37	3.37	3.37	3.38
23.500	3.38	3.38	3.39	3.39	3.40
24.000	3.40	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.02
0.500	0.02	0.03	0.03	0.03	0.04
1.000	0.04	0.05	0.05	0.06	0.06
1.500	0.07	0.07	0.08	0.08	0.09
2.000	0.09	0.09	0.10	0.10	0.11
2.500	0.12	0.12	0.13	0.13	0.14
3.000	0.14	0.15	0.15	0.16	0.16
3.500	0.17	0.17	0.18	0.18	0.19
4.000	0.20	0.20	0.21	0.21	0.22
4.500	0.23	0.23	0.24	0.24	0.25
5.000	0.26	0.26	0.27	0.28	0.28
5.500	0.29	0.30	0.31	0.31	0.32
6.000	0.33	0.33	0.34	0.35	0.36
6.500	0.37	0.37	0.38	0.39	0.40
7.000	0.40	0.41	0.42	0.43	0.44
7.500	0.45	0.46	0.46	0.47	0.48
8.000	0.49	0.50	0.51	0.52	0.53
8.500	0.54	0.55	0.56	0.58	0.59
9.000	0.60	0.61	0.63	0.64	0.65
9.500	0.67	0.68	0.69	0.71	0.72
10.000	0.74	0.76	0.77	0.79	0.81
10.500	0.83	0.86	0.88	0.91	0.93
11.000	0.96	0.99	1.03	1.07	1.11
11.500	1.16	1.25	1.45	1.76	2.32
12.000	2.71	2.79	2.86	2.92	2.97
12.500	3.01	3.04	3.07	3.10	3.13
13.000	3.16	3.18	3.21	3.23	3.25
13.500	3.27	3.29	3.30	3.32	3.34
14.000	3.35	3.37	3.38	3.40	3.41
14.500	3.43	3.44	3.45	3.47	3.48
15.000	3.49	3.50	3.51	3.53	3.54
15.500	3.55	3.56	3.57	3.58	3.59
16.000	3.60	3.61	3.62	3.63	3.64
16.500	3.64	3.65	3.66	3.67	3.68

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.69	3.70	3.70	3.71	3.72
17.500	3.73	3.74	3.74	3.75	3.76
18.000	3.77	3.77	3.78	3.79	3.80
18.500	3.80	3.81	3.82	3.82	3.83
19.000	3.84	3.84	3.85	3.85	3.86
19.500	3.87	3.87	3.88	3.88	3.89
20.000	3.89	3.90	3.90	3.91	3.91
20.500	3.92	3.93	3.93	3.94	3.94
21.000	3.95	3.95	3.96	3.96	3.97
21.500	3.97	3.98	3.98	3.99	3.99
22.000	4.00	4.00	4.01	4.01	4.02
22.500	4.02	4.03	4.03	4.03	4.04
23.000	4.04	4.05	4.05	4.06	4.06
23.500	4.07	4.07	4.08	4.08	4.09
24.000	4.09	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.02
0.500	0.02	0.03	0.03	0.04	0.04
1.000	0.05	0.05	0.06	0.06	0.07
1.500	0.08	0.08	0.09	0.09	0.10
2.000	0.10	0.11	0.11	0.12	0.13
2.500	0.13	0.14	0.14	0.15	0.15
3.000	0.16	0.17	0.17	0.18	0.19
3.500	0.19	0.20	0.20	0.21	0.22
4.000	0.22	0.23	0.24	0.24	0.25
4.500	0.26	0.26	0.27	0.28	0.29
5.000	0.29	0.30	0.31	0.32	0.32
5.500	0.33	0.34	0.35	0.36	0.36
6.000	0.37	0.38	0.39	0.40	0.41
6.500	0.42	0.42	0.43	0.44	0.45
7.000	0.46	0.47	0.48	0.49	0.50
7.500	0.51	0.52	0.53	0.54	0.55
8.000	0.56	0.57	0.58	0.59	0.60
8.500	0.62	0.63	0.64	0.66	0.67
9.000	0.69	0.70	0.71	0.73	0.74
9.500	0.76	0.77	0.79	0.81	0.83
10.000	0.84	0.86	0.88	0.90	0.93
10.500	0.95	0.98	1.00	1.03	1.06
11.000	1.10	1.13	1.17	1.22	1.27
11.500	1.32	1.43	1.65	2.01	2.65
12.000	3.09	3.18	3.26	3.32	3.38
12.500	3.43	3.46	3.50	3.54	3.57
13.000	3.60	3.63	3.65	3.68	3.70
13.500	3.72	3.74	3.77	3.78	3.80
14.000	3.82	3.84	3.86	3.87	3.89
14.500	3.90	3.92	3.93	3.95	3.96
15.000	3.98	3.99	4.00	4.02	4.03
15.500	4.04	4.06	4.07	4.08	4.09
16.000	4.10	4.11	4.12	4.13	4.14
16.500	4.15	4.16	4.17	4.18	4.19

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.20	4.21	4.22	4.23	4.24
17.500	4.25	4.26	4.27	4.27	4.28
18.000	4.29	4.30	4.31	4.32	4.32
18.500	4.33	4.34	4.35	4.36	4.36
19.000	4.37	4.38	4.38	4.39	4.40
19.500	4.40	4.41	4.42	4.42	4.43
20.000	4.44	4.44	4.45	4.45	4.46
20.500	4.47	4.47	4.48	4.48	4.49
21.000	4.50	4.50	4.51	4.51	4.52
21.500	4.52	4.53	4.54	4.54	4.55
22.000	4.55	4.56	4.56	4.57	4.58
22.500	4.58	4.59	4.59	4.60	4.60
23.000	4.61	4.61	4.62	4.62	4.63
23.500	4.63	4.64	4.64	4.65	4.65
24.000	4.66	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Runoff CN-Area
Label: Existing 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	0.2800	100.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil C	74.000	0.3900	0.0	0.0	74.000
Open space (Lawns,parks etc.) - Fair condition; grass cover 50% to 75% - Soil C	79.000	0.0800	0.0	0.0	79.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.7500	(N/A)	(N/A)	83.493

9th Street Outfall Analysis

Subsection: Runoff CN-Area
Label: Proposed 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	0.9900	100.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	74.000	0.5000	0.0	0.0	74.000
CN Description	79.000	0.2700	0.0	0.0	79.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.7600	(N/A)	(N/A)	88.267

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.7500 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	1.63 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	1.56 ft³/s

Drainage Area	
SCS CN (Composite)	83.000
Area (User Defined)	0.7500 acres
Maximum Retention (Pervious)	2.05 in
Maximum Retention (Pervious, 20 percent)	0.41 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.38 in
Runoff Volume (Pervious)	0.086 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.086 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

9th Street Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Existing 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.20 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	9.9300 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	28.40 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	27.39 ft³/s

Drainage Area	
SCS CN (Composite)	88.969
Area (User Defined)	9.9300 acres
Maximum Retention (Pervious)	1.24 in
Maximum Retention (Pervious, 20 percent)	0.25 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.83 in
Runoff Volume (Pervious)	1.510 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.509 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

9th Street Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Existing Orange - 14th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	135.01 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.098 hours
Area (User Defined)	1.7600 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.930 hours
Flow (Peak, Computed)	4.69 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	4.58 ft^3/s

Drainage Area	
SCS CN (Composite)	88.000
Area (User Defined)	1.7600 acres
Maximum Retention (Pervious)	1.36 in
Maximum Retention (Pervious, 20 percent)	0.27 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.75 in
Runoff Volume (Pervious)	0.256 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.256 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.098 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

9th Street Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	20.35 ft³/s
Unit peak time, Tp	0.065 hours
Unit receding limb, Tr	0.261 hours
Total unit time, Tb	0.327 hours

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	8.4600 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	22.85 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	21.96 ft³/s

Drainage Area	
SCS CN (Composite)	87.602
Area (User Defined)	8.4600 acres
Maximum Retention (Pervious)	1.42 in
Maximum Retention (Pervious, 20 percent)	0.28 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.72 in
Runoff Volume (Pervious)	1.210 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.208 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

SCS Unit Hydrograph Parameters	
Unit peak, qp	115.03 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

9th Street Outfall Analysis

Subsection: Elevation-Area Volume Curve
Label: PO-2

Return Event: 5.00 years
Storm Event: Type II 24 hour

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
667.00	0.000	0.0006	0.0000	0.000	0.000
667.75	0.000	0.0156	0.0193	0.005	0.005
668.00	0.000	0.1756	0.2435	0.020	0.025
669.00	0.000	0.2091	0.5763	0.192	0.217
669.75	0.000	0.2364	0.6678	0.167	0.384

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	667.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	670.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	TW	669.25	669.75
Orifice-Area	Orifice - 1	Forward	TW	667.00	669.75
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	1
Elevation	667.00 ft
Orifice Area	0.200 ft²
Top Elevation	0.00 ft
Datum Elevation	0.00 ft
Orifice Coefficient	0.600

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	669.25 ft
Orifice Area	2.560 ft²
Orifice Coefficient	0.600
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	True

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

9th Street Outfall Analysis

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 5.00 years
Storm Event: Type II 24 hour

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
667.00	0.00	(N/A)	0.00
667.50	0.68	(N/A)	0.00
668.00	0.96	(N/A)	0.00
668.50	1.18	(N/A)	0.00
669.00	1.36	(N/A)	0.00
669.25	1.44	(N/A)	0.00
669.50	1.52	(N/A)	0.00
669.75	1.60	(N/A)	0.00

Computation Messages

H =.00
H =.50
H =1.00
H =1.50
H =2.00
H =2.25
H =2.50
H =2.75

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
667.00	0.00	(N/A)	0.00
667.50	0.00	(N/A)	0.00
668.00	0.00	(N/A)	0.00
668.50	0.00	(N/A)	0.00
669.00	0.00	(N/A)	0.00
669.25	0.00	(N/A)	0.00
669.50	2.44	(N/A)	0.00
669.75	6.89	(N/A)	0.00

Computation Messages
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
Weir: H =0ft
Weir: H =0.25ft
Weir: H =0.5ft

9th Street Outfall Analysis

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 5.00 years
Storm Event: Type II 24 hour

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
667.00	0.00	(N/A)	0.00
667.50	0.68	(N/A)	0.00
668.00	0.96	(N/A)	0.00
668.50	1.18	(N/A)	0.00
669.00	1.36	(N/A)	0.00
669.25	1.44	(N/A)	0.00
669.50	3.96	(N/A)	0.00
669.75	8.49	(N/A)	0.00

Contributing Structures
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Riser - 1 + Orifice - 1
Riser - 1 + Orifice - 1
Riser - 1 + Orifice - 1

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	4.58 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.08 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	668.27 ft
Volume (Peak)	0.073 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.256 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.256 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.1 %

9th Street Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 10.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	5.67 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.14 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	668.41 ft
Volume (Peak)	0.100 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.319 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.319 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.1 %

9th Street Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 25.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	7.23 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.22 ft³/s	Time to Peak (Flow, Outlet)	12.200 hours

Elevation (Water Surface, Peak)	668.61 ft
Volume (Peak)	0.139 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.412 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.412 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

9th Street Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 50.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	8.53 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.28 ft³/s	Time to Peak (Flow, Outlet)	12.250 hours

Elevation (Water Surface, Peak)	668.78 ft
Volume (Peak)	0.172 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.490 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.490 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

9th Street Outfall Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 10.00 years
Label: PO-2 (OUT) Storm Event: Type II 24 hour

Peak Discharge	1.14 ft³/s
Time to Peak	12.150 hours
Hydrograph Volume	0.319 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
6.200	0.00	0.00	0.00	0.00	0.00
6.450	0.00	0.00	0.00	0.00	0.01
6.700	0.01	0.01	0.01	0.01	0.01
6.950	0.01	0.01	0.01	0.01	0.01
7.200	0.01	0.01	0.01	0.01	0.01
7.450	0.01	0.02	0.02	0.02	0.02
7.700	0.02	0.02	0.02	0.02	0.02
7.950	0.02	0.02	0.02	0.02	0.02
8.200	0.02	0.03	0.03	0.03	0.03
8.450	0.03	0.03	0.03	0.03	0.04
8.700	0.04	0.04	0.04	0.04	0.04
8.950	0.05	0.05	0.05	0.05	0.05
9.200	0.05	0.05	0.05	0.06	0.06
9.450	0.06	0.06	0.06	0.06	0.06
9.700	0.06	0.07	0.07	0.07	0.08
9.950	0.08	0.08	0.08	0.09	0.09
10.200	0.09	0.10	0.10	0.11	0.11
10.450	0.12	0.12	0.13	0.13	0.14
10.700	0.14	0.15	0.16	0.17	0.17
10.950	0.18	0.19	0.20	0.21	0.22
11.200	0.24	0.26	0.28	0.30	0.32
11.450	0.34	0.36	0.42	0.58	0.69
11.700	0.72	0.77	0.85	0.97	1.00
11.950	1.05	1.09	1.12	1.14	1.14
12.200	1.14	1.14	1.13	1.13	1.13
12.450	1.12	1.11	1.11	1.10	1.10
12.700	1.09	1.08	1.08	1.07	1.06
12.950	1.06	1.05	1.04	1.04	1.03
13.200	1.02	1.01	1.01	1.00	0.99
13.450	0.99	0.98	0.97	0.97	0.94
13.700	0.91	0.88	0.84	0.81	0.78
13.950	0.76	0.73	0.70	0.64	0.26
14.200	0.20	0.19	0.19	0.19	0.19
14.450	0.18	0.18	0.18	0.18	0.18
14.700	0.17	0.17	0.17	0.17	0.17
14.950	0.17	0.16	0.16	0.16	0.16
15.200	0.16	0.15	0.15	0.15	0.15

9th Street Outfall Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 10.00 years
Label: PO-2 (OUT) Storm Event: Type II 24 hour

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
15.450	0.15	0.15	0.14	0.14	0.14
15.700	0.14	0.14	0.13	0.13	0.13
15.950	0.13	0.13	0.13	0.12	0.12
16.200	0.12	0.12	0.12	0.12	0.12
16.450	0.12	0.12	0.12	0.12	0.12
16.700	0.12	0.12	0.11	0.11	0.11
16.950	0.11	0.11	0.11	0.11	0.11
17.200	0.11	0.11	0.11	0.11	0.11
17.450	0.11	0.11	0.10	0.10	0.10
17.700	0.10	0.10	0.10	0.10	0.10
17.950	0.10	0.10	0.10	0.10	0.10
18.200	0.10	0.10	0.09	0.09	0.09
18.450	0.09	0.09	0.09	0.09	0.09
18.700	0.09	0.09	0.09	0.09	0.09
18.950	0.09	0.09	0.08	0.08	0.08
19.200	0.08	0.08	0.08	0.08	0.08
19.450	0.08	0.08	0.08	0.08	0.08
19.700	0.08	0.08	0.07	0.07	0.07
19.950	0.07	0.07	0.07	0.07	0.07
20.200	0.07	0.07	0.07	0.07	0.07
20.450	0.07	0.07	0.07	0.07	0.07
20.700	0.07	0.07	0.07	0.07	0.07
20.950	0.07	0.07	0.07	0.07	0.07
21.200	0.07	0.07	0.07	0.07	0.07
21.450	0.07	0.07	0.07	0.07	0.07
21.700	0.07	0.07	0.07	0.07	0.07
21.950	0.07	0.07	0.07	0.07	0.07
22.200	0.07	0.07	0.07	0.06	0.06
22.450	0.06	0.06	0.06	0.06	0.06
22.700	0.06	0.06	0.06	0.06	0.06
22.950	0.06	0.06	0.06	0.06	0.06
23.200	0.06	0.06	0.06	0.06	0.06
23.450	0.06	0.06	0.06	0.06	0.06
23.700	0.06	0.06	0.06	0.06	0.06
23.950	0.06	0.06	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 50.00 years
Label: PO-2 (OUT) Storm Event: Type II 24 hour

Peak Discharge	1.28 ft³/s
Time to Peak	12.250 hours
Hydrograph Volume	0.490 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
4.850	0.00	0.00	0.00	0.00	0.00
5.100	0.00	0.00	0.01	0.01	0.01
5.350	0.01	0.01	0.01	0.01	0.01
5.600	0.01	0.01	0.01	0.01	0.01
5.850	0.02	0.02	0.02	0.02	0.02
6.100	0.02	0.02	0.02	0.02	0.02
6.350	0.02	0.02	0.03	0.03	0.03
6.600	0.03	0.03	0.03	0.03	0.03
6.850	0.03	0.03	0.03	0.04	0.04
7.100	0.04	0.04	0.04	0.04	0.04
7.350	0.04	0.04	0.04	0.05	0.05
7.600	0.05	0.05	0.05	0.05	0.05
7.850	0.05	0.05	0.05	0.06	0.06
8.100	0.06	0.06	0.06	0.06	0.07
8.350	0.07	0.07	0.07	0.08	0.08
8.600	0.08	0.08	0.09	0.09	0.09
8.850	0.09	0.10	0.10	0.10	0.10
9.100	0.11	0.11	0.11	0.11	0.11
9.350	0.11	0.12	0.12	0.12	0.12
9.600	0.12	0.13	0.13	0.13	0.14
9.850	0.14	0.15	0.15	0.16	0.16
10.100	0.17	0.17	0.18	0.19	0.19
10.350	0.20	0.21	0.21	0.22	0.23
10.600	0.24	0.25	0.26	0.27	0.28
10.850	0.30	0.31	0.32	0.33	0.35
11.100	0.37	0.39	0.42	0.44	0.47
11.350	0.50	0.54	0.57	0.60	0.68
11.600	0.70	0.74	0.80	0.91	0.98
11.850	1.02	1.08	1.15	1.21	1.25
12.100	1.27	1.28	1.28	1.28	1.28
12.350	1.28	1.28	1.27	1.27	1.27
12.600	1.26	1.26	1.25	1.25	1.24
12.850	1.24	1.23	1.23	1.22	1.22
13.100	1.21	1.21	1.20	1.19	1.19
13.350	1.18	1.18	1.17	1.16	1.15
13.600	1.14	1.14	1.13	1.12	1.11
13.850	1.11	1.10	1.09	1.08	1.08

9th Street Outfall Analysis

Subsection: Pond Routed Hydrograph (total out) Return Event: 50.00 years
Label: PO-2 (OUT) Storm Event: Type II 24 hour

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
14.100	1.07	1.06	1.05	1.05	1.04
14.350	1.03	1.02	1.02	1.01	1.00
14.600	0.99	0.99	0.98	0.97	0.97
14.850	0.94	0.91	0.87	0.84	0.81
15.100	0.78	0.76	0.73	0.71	0.68
15.350	0.32	0.23	0.21	0.21	0.21
15.600	0.20	0.20	0.20	0.20	0.19
15.850	0.19	0.19	0.19	0.18	0.18
16.100	0.18	0.18	0.18	0.17	0.17
16.350	0.17	0.17	0.17	0.17	0.17
16.600	0.17	0.17	0.17	0.17	0.16
16.850	0.16	0.16	0.16	0.16	0.16
17.100	0.16	0.16	0.16	0.16	0.15
17.350	0.15	0.15	0.15	0.15	0.15
17.600	0.15	0.15	0.15	0.15	0.15
17.850	0.14	0.14	0.14	0.14	0.14
18.100	0.14	0.14	0.14	0.14	0.14
18.350	0.13	0.13	0.13	0.13	0.13
18.600	0.13	0.13	0.13	0.13	0.13
18.850	0.13	0.12	0.12	0.12	0.12
19.100	0.12	0.12	0.12	0.12	0.12
19.350	0.12	0.11	0.11	0.11	0.11
19.600	0.11	0.11	0.11	0.11	0.11
19.850	0.11	0.11	0.10	0.10	0.10
20.100	0.10	0.10	0.10	0.10	0.10
20.350	0.10	0.10	0.10	0.10	0.10
20.600	0.10	0.10	0.10	0.10	0.10
20.850	0.10	0.10	0.10	0.10	0.10
21.100	0.10	0.10	0.10	0.10	0.10
21.350	0.10	0.10	0.10	0.10	0.10
21.600	0.10	0.10	0.10	0.09	0.09
21.850	0.09	0.09	0.09	0.09	0.09
22.100	0.09	0.09	0.09	0.09	0.09
22.350	0.09	0.09	0.09	0.09	0.09
22.600	0.09	0.09	0.09	0.09	0.09
22.850	0.09	0.09	0.09	0.09	0.09
23.100	0.09	0.09	0.09	0.09	0.09
23.350	0.09	0.09	0.09	0.09	0.09
23.600	0.09	0.09	0.09	0.09	0.09
23.850	0.09	0.09	0.09	0.09	(N/A)

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.319	11.950	5.67
Flow (In)	PO-2	0.319	11.950	5.67

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.490	11.950	8.53
Flow (In)	PO-2	0.490	11.950	8.53

9th Street Outfall Analysis

Index

9th Street Outfall Analysis

Project Summary	
Title	9th Street Outfall Cleveland Innerbelt
Engineer	Brett Hess
Company	HNTB
Date	10/25/2011

CCG3 Condition

Notes

Table of Contents

Table of Contents

9th Street Outfall Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Existing Orange - 14th	5 year	5.00	1.509	11.900	27.39
Existing Orange - 14th	10 year	10.00	1.870	11.900	33.83
Existing Orange - 14th	25 year	25.00	2.401	11.900	43.15
Existing Orange - 14th	50 year	50.00	2.847	11.900	50.86
Existing 9th	5 year	5.00	0.086	11.950	1.56
Existing 9th	10 year	10.00	0.111	11.900	2.00
Existing 9th	25 year	25.00	0.148	11.900	2.68
Existing 9th	50 year	50.00	0.179	11.900	3.25
Proposed 9th	5 year	5.00	0.292	11.950	5.14
Proposed 9th	10 year	10.00	0.358	11.950	6.23
Proposed 9th	25 year	25.00	0.455	11.950	7.80
Proposed 9th	50 year	50.00	0.535	11.950	9.08
Proposed Orange - 14th	5 year	5.00	1.208	11.900	21.96
Proposed Orange - 14th	10 year	10.00	1.510	11.900	27.40
Proposed Orange - 14th	25 year	25.00	1.954	11.900	35.31
Proposed Orange - 14th	50 year	50.00	2.329	11.900	41.87

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-01	5 year	5.00	1.509	11.900	27.39
J-01	10 year	10.00	1.870	11.900	33.83
J-01	25 year	25.00	2.401	11.900	43.15
J-01	50 year	50.00	2.847	11.900	50.86
Composite Outfall	5 year	5.00	3.272	12.050	31.78
Composite Outfall	10 year	10.00	4.060	12.050	32.32
Composite Outfall	25 year	25.00	5.171	12.000	33.20
Composite Outfall	50 year	50.00	6.105	12.000	33.81
EX_OUT	5 year	5.00	1.697	12.000	16.20
EX_OUT	10 year	10.00	2.091	12.000	16.67
EX_OUT	25 year	25.00	2.649	11.950	17.44
EX_OUT	50 year	50.00	3.146	11.950	17.97
J-02	5 year	5.00	1.615	11.900	14.76
J-02	10 year	10.00	1.985	11.850	14.76
J-02	25 year	25.00	2.507	11.800	14.76
J-02	50 year	50.00	2.973	11.800	14.76
J-03	5 year	5.00	1.613	11.950	14.80
J-03	10 year	10.00	1.983	11.900	14.87

9th Street Outfall Analysis

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-03	25 year	25.00	2.504	11.850	14.89
J-03	50 year	50.00	2.971	11.800	14.87
J-04	5 year	5.00	1.612	12.000	14.78
J-04	10 year	10.00	1.982	11.950	14.81
J-04	25 year	25.00	2.504	11.900	14.82
J-04	50 year	50.00	2.970	11.850	14.81
J-06	5 year	5.00	0.086	11.950	1.56
J-06	10 year	10.00	0.111	11.900	2.00
J-06	25 year	25.00	0.148	11.900	2.68
J-06	50 year	50.00	0.179	11.900	3.25
J-11	5 year	5.00	1.208	11.900	21.96
J-11	10 year	10.00	1.510	11.900	27.40
J-11	25 year	25.00	1.954	11.900	35.31
J-11	50 year	50.00	2.329	11.900	41.87
J-12	5 year	5.00	1.287	11.950	14.76
J-12	10 year	10.00	1.616	11.900	14.76
J-12	25 year	25.00	2.075	11.850	14.76
J-12	50 year	50.00	2.432	11.800	14.76
J-13	5 year	5.00	1.286	11.950	14.98
J-13	10 year	10.00	1.614	11.950	14.80
J-13	25 year	25.00	2.073	11.900	14.83
J-13	50 year	50.00	2.429	11.850	14.92
J-14	5 year	5.00	1.285	12.000	14.85
J-14	10 year	10.00	1.613	12.000	14.78
J-14	25 year	25.00	2.072	11.950	14.79
J-14	50 year	50.00	2.429	11.900	14.83
PR_OUT	5 year	5.00	1.576	12.050	15.88
PR_OUT	10 year	10.00	1.970	12.200	15.94
PR_OUT	25 year	25.00	2.524	12.250	16.01
PR_OUT	50 year	50.00	2.961	12.250	16.07
J-16	5 year	5.00	0.292	12.150	1.11
J-16	10 year	10.00	0.358	12.150	1.18
J-16	25 year	25.00	0.454	12.200	1.25
J-16	50 year	50.00	0.535	12.250	1.31

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-2 (IN)	5 year	5.00	0.292	11.950	5.14	(N/A)	(N/A)
PO-2 (OUT)	5 year	5.00	0.292	12.150	1.11	668.35	0.088

9th Street Outfall Analysis

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-2 (IN)	10 year	10.00	0.358	11.950	6.23	(N/A)	(N/A)
PO-2 (OUT)	10 year	10.00	0.358	12.150	1.18	668.49	0.116
PO-2 (IN)	25 year	25.00	0.455	11.950	7.80	(N/A)	(N/A)
PO-2 (OUT)	25 year	25.00	0.454	12.200	1.25	668.69	0.155
PO-2 (IN)	50 year	50.00	0.535	11.950	9.08	(N/A)	(N/A)
PO-2 (OUT)	50 year	50.00	0.535	12.250	1.31	668.86	0.189

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.01	0.02	0.02	0.02	0.03
1.000	0.03	0.03	0.04	0.04	0.04
1.500	0.05	0.05	0.05	0.06	0.06
2.000	0.06	0.07	0.07	0.07	0.08
2.500	0.08	0.09	0.09	0.09	0.10
3.000	0.10	0.10	0.11	0.11	0.12
3.500	0.12	0.12	0.13	0.13	0.14
4.000	0.14	0.14	0.15	0.15	0.16
4.500	0.16	0.17	0.17	0.17	0.18
5.000	0.18	0.19	0.19	0.20	0.20
5.500	0.21	0.21	0.22	0.22	0.23
6.000	0.23	0.24	0.24	0.25	0.26
6.500	0.26	0.27	0.27	0.28	0.28
7.000	0.29	0.29	0.30	0.31	0.31
7.500	0.32	0.33	0.33	0.34	0.34
8.000	0.35	0.36	0.36	0.37	0.38
8.500	0.39	0.39	0.40	0.41	0.42
9.000	0.43	0.44	0.45	0.46	0.47
9.500	0.48	0.49	0.50	0.51	0.52
10.000	0.53	0.54	0.55	0.57	0.58
10.500	0.60	0.61	0.63	0.65	0.67
11.000	0.69	0.71	0.73	0.76	0.79
11.500	0.83	0.90	1.03	1.26	1.66
12.000	1.94	1.99	2.04	2.08	2.12
12.500	2.15	2.17	2.19	2.22	2.24
13.000	2.25	2.27	2.29	2.30	2.32
13.500	2.33	2.35	2.36	2.37	2.38
14.000	2.39	2.41	2.42	2.43	2.44
14.500	2.45	2.46	2.47	2.47	2.48
15.000	2.49	2.50	2.51	2.52	2.53
15.500	2.53	2.54	2.55	2.56	2.56
16.000	2.57	2.58	2.58	2.59	2.60
16.500	2.60	2.61	2.61	2.62	2.63

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 5.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.63	2.64	2.64	2.65	2.66
17.500	2.66	2.67	2.67	2.68	2.68
18.000	2.69	2.69	2.70	2.70	2.71
18.500	2.71	2.72	2.72	2.73	2.73
19.000	2.74	2.74	2.75	2.75	2.76
19.500	2.76	2.76	2.77	2.77	2.78
20.000	2.78	2.78	2.79	2.79	2.79
20.500	2.80	2.80	2.81	2.81	2.81
21.000	2.82	2.82	2.82	2.83	2.83
21.500	2.84	2.84	2.84	2.85	2.85
22.000	2.85	2.86	2.86	2.86	2.87
22.500	2.87	2.87	2.88	2.88	2.88
23.000	2.89	2.89	2.89	2.90	2.90
23.500	2.90	2.91	2.91	2.91	2.92
24.000	2.92	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.02	0.02	0.02	0.03	0.03
1.000	0.04	0.04	0.04	0.05	0.05
1.500	0.05	0.06	0.06	0.07	0.07
2.000	0.07	0.08	0.08	0.09	0.09
2.500	0.10	0.10	0.10	0.11	0.11
3.000	0.12	0.12	0.13	0.13	0.14
3.500	0.14	0.14	0.15	0.15	0.16
4.000	0.16	0.17	0.17	0.18	0.18
4.500	0.19	0.19	0.20	0.20	0.21
5.000	0.21	0.22	0.23	0.23	0.24
5.500	0.24	0.25	0.25	0.26	0.27
6.000	0.27	0.28	0.28	0.29	0.30
6.500	0.30	0.31	0.32	0.32	0.33
7.000	0.34	0.34	0.35	0.36	0.36
7.500	0.37	0.38	0.39	0.39	0.40
8.000	0.41	0.42	0.42	0.43	0.44
8.500	0.45	0.46	0.47	0.48	0.49
9.000	0.50	0.51	0.52	0.53	0.54
9.500	0.55	0.57	0.58	0.59	0.60
10.000	0.62	0.63	0.64	0.66	0.68
10.500	0.69	0.71	0.73	0.75	0.78
11.000	0.80	0.83	0.85	0.89	0.92
11.500	0.96	1.04	1.20	1.46	1.93
12.000	2.25	2.32	2.38	2.42	2.47
12.500	2.50	2.53	2.55	2.58	2.60
13.000	2.62	2.65	2.66	2.68	2.70
13.500	2.72	2.73	2.75	2.76	2.78
14.000	2.79	2.80	2.81	2.82	2.84
14.500	2.85	2.86	2.87	2.88	2.89
15.000	2.90	2.91	2.92	2.93	2.94
15.500	2.95	2.96	2.97	2.98	2.98
16.000	2.99	3.00	3.01	3.02	3.02
16.500	3.03	3.04	3.04	3.05	3.06

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 10.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.07	3.07	3.08	3.09	3.09
17.500	3.10	3.11	3.11	3.12	3.13
18.000	3.13	3.14	3.14	3.15	3.16
18.500	3.16	3.17	3.17	3.18	3.18
19.000	3.19	3.19	3.20	3.20	3.21
19.500	3.21	3.22	3.22	3.23	3.23
20.000	3.24	3.24	3.25	3.25	3.25
20.500	3.26	3.26	3.27	3.27	3.28
21.000	3.28	3.28	3.29	3.29	3.30
21.500	3.30	3.31	3.31	3.31	3.32
22.000	3.32	3.33	3.33	3.33	3.34
22.500	3.34	3.35	3.35	3.35	3.36
23.000	3.36	3.37	3.37	3.37	3.38
23.500	3.38	3.38	3.39	3.39	3.40
24.000	3.40	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.02
0.500	0.02	0.03	0.03	0.03	0.04
1.000	0.04	0.05	0.05	0.06	0.06
1.500	0.07	0.07	0.08	0.08	0.09
2.000	0.09	0.09	0.10	0.10	0.11
2.500	0.12	0.12	0.13	0.13	0.14
3.000	0.14	0.15	0.15	0.16	0.16
3.500	0.17	0.17	0.18	0.18	0.19
4.000	0.20	0.20	0.21	0.21	0.22
4.500	0.23	0.23	0.24	0.24	0.25
5.000	0.26	0.26	0.27	0.28	0.28
5.500	0.29	0.30	0.31	0.31	0.32
6.000	0.33	0.33	0.34	0.35	0.36
6.500	0.37	0.37	0.38	0.39	0.40
7.000	0.40	0.41	0.42	0.43	0.44
7.500	0.45	0.46	0.46	0.47	0.48
8.000	0.49	0.50	0.51	0.52	0.53
8.500	0.54	0.55	0.56	0.58	0.59
9.000	0.60	0.61	0.63	0.64	0.65
9.500	0.67	0.68	0.69	0.71	0.72
10.000	0.74	0.76	0.77	0.79	0.81
10.500	0.83	0.86	0.88	0.91	0.93
11.000	0.96	0.99	1.03	1.07	1.11
11.500	1.16	1.25	1.45	1.76	2.32
12.000	2.71	2.79	2.86	2.92	2.97
12.500	3.01	3.04	3.07	3.10	3.13
13.000	3.16	3.18	3.21	3.23	3.25
13.500	3.27	3.29	3.30	3.32	3.34
14.000	3.35	3.37	3.38	3.40	3.41
14.500	3.43	3.44	3.45	3.47	3.48
15.000	3.49	3.50	3.51	3.53	3.54
15.500	3.55	3.56	3.57	3.58	3.59
16.000	3.60	3.61	3.62	3.63	3.64
16.500	3.64	3.65	3.66	3.67	3.68

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 25.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.69	3.70	3.70	3.71	3.72
17.500	3.73	3.74	3.74	3.75	3.76
18.000	3.77	3.77	3.78	3.79	3.80
18.500	3.80	3.81	3.82	3.82	3.83
19.000	3.84	3.84	3.85	3.85	3.86
19.500	3.87	3.87	3.88	3.88	3.89
20.000	3.89	3.90	3.90	3.91	3.91
20.500	3.92	3.93	3.93	3.94	3.94
21.000	3.95	3.95	3.96	3.96	3.97
21.500	3.97	3.98	3.98	3.99	3.99
22.000	4.00	4.00	4.01	4.01	4.02
22.500	4.02	4.03	4.03	4.03	4.04
23.000	4.04	4.05	4.05	4.06	4.06
23.500	4.07	4.07	4.08	4.08	4.09
24.000	4.09	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50.00 years
Storm Event: Type II 24 hour

Time-Depth Curve: Type II 24 hour	
Label	Type II 24 hour
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50.00 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.02
0.500	0.02	0.03	0.03	0.04	0.04
1.000	0.05	0.05	0.06	0.06	0.07
1.500	0.08	0.08	0.09	0.09	0.10
2.000	0.10	0.11	0.11	0.12	0.13
2.500	0.13	0.14	0.14	0.15	0.15
3.000	0.16	0.17	0.17	0.18	0.19
3.500	0.19	0.20	0.20	0.21	0.22
4.000	0.22	0.23	0.24	0.24	0.25
4.500	0.26	0.26	0.27	0.28	0.29
5.000	0.29	0.30	0.31	0.32	0.32
5.500	0.33	0.34	0.35	0.36	0.36
6.000	0.37	0.38	0.39	0.40	0.41
6.500	0.42	0.42	0.43	0.44	0.45
7.000	0.46	0.47	0.48	0.49	0.50
7.500	0.51	0.52	0.53	0.54	0.55
8.000	0.56	0.57	0.58	0.59	0.60
8.500	0.62	0.63	0.64	0.66	0.67
9.000	0.69	0.70	0.71	0.73	0.74
9.500	0.76	0.77	0.79	0.81	0.83
10.000	0.84	0.86	0.88	0.90	0.93
10.500	0.95	0.98	1.00	1.03	1.06
11.000	1.10	1.13	1.17	1.22	1.27
11.500	1.32	1.43	1.65	2.01	2.65
12.000	3.09	3.18	3.26	3.32	3.38
12.500	3.43	3.46	3.50	3.54	3.57
13.000	3.60	3.63	3.65	3.68	3.70
13.500	3.72	3.74	3.77	3.78	3.80
14.000	3.82	3.84	3.86	3.87	3.89
14.500	3.90	3.92	3.93	3.95	3.96
15.000	3.98	3.99	4.00	4.02	4.03
15.500	4.04	4.06	4.07	4.08	4.09
16.000	4.10	4.11	4.12	4.13	4.14
16.500	4.15	4.16	4.17	4.18	4.19

9th Street Outfall Analysis

Subsection: Time-Depth Curve
Label: ODOT TR-55

Return Event: 50.00 years
Storm Event: Type II 24 hour

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.20	4.21	4.22	4.23	4.24
17.500	4.25	4.26	4.27	4.27	4.28
18.000	4.29	4.30	4.31	4.32	4.32
18.500	4.33	4.34	4.35	4.36	4.36
19.000	4.37	4.38	4.38	4.39	4.40
19.500	4.40	4.41	4.42	4.42	4.43
20.000	4.44	4.44	4.45	4.45	4.46
20.500	4.47	4.47	4.48	4.48	4.49
21.000	4.50	4.50	4.51	4.51	4.52
21.500	4.52	4.53	4.54	4.54	4.55
22.000	4.55	4.56	4.56	4.57	4.58
22.500	4.58	4.59	4.59	4.60	4.60
23.000	4.61	4.61	4.62	4.62	4.63
23.500	4.63	4.64	4.64	4.65	4.65
24.000	4.66	(N/A)	(N/A)	(N/A)	(N/A)

9th Street Outfall Analysis

Subsection: Runoff CN-Area
Label: Existing 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	0.2800	100.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil C	74.000	0.3900	0.0	0.0	74.000
Open space (Lawns,parks etc.) - Fair condition; grass cover 50% to 75% - Soil C	79.000	0.0800	0.0	0.0	79.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.7500	(N/A)	(N/A)	83.493

9th Street Outfall Analysis

Subsection: Runoff CN-Area
Label: Proposed 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil C	98.000	1.2600	100.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	74.000	0.5000	0.0	0.0	74.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.7600	(N/A)	(N/A)	91.182

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.7500 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	1.63 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	1.56 ft³/s

Drainage Area	
SCS CN (Composite)	83.000
Area (User Defined)	0.7500 acres
Maximum Retention (Pervious)	2.05 in
Maximum Retention (Pervious, 20 percent)	0.41 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.38 in
Runoff Volume (Pervious)	0.086 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.086 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

9th Street Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Existing 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.20 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	9.9300 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	28.40 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	27.39 ft³/s

Drainage Area	
SCS CN (Composite)	88.969
Area (User Defined)	9.9300 acres
Maximum Retention (Pervious)	1.24 in
Maximum Retention (Pervious, 20 percent)	0.25 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.83 in
Runoff Volume (Pervious)	1.510 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.509 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

SCS Unit Hydrograph Parameters	
Unit peak, qp	135.01 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.098 hours
Area (User Defined)	1.7600 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.930 hours
Flow (Peak, Computed)	5.29 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	5.14 ft³/s

Drainage Area	
SCS CN (Composite)	91.000
Area (User Defined)	1.7600 acres
Maximum Retention (Pervious)	0.99 in
Maximum Retention (Pervious, 20 percent)	0.20 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.00 in
Runoff Volume (Pervious)	0.293 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.292 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.098 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

9th Street Outfall Analysis

Subsection: Unit Hydrograph Summary
Label: Proposed 9th

Return Event: 5.00 years
Storm Event: Type II 24 hour

SCS Unit Hydrograph Parameters	
Unit peak, qp	20.35 ft³/s
Unit peak time, Tp	0.065 hours
Unit receding limb, Tr	0.261 hours
Total unit time, Tb	0.327 hours

Storm Event	Type II 24 hour
Return Event	5.00 years
Duration	24.000 hours
Depth	2.92 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	8.4600 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	22.85 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	21.96 ft³/s

Drainage Area	
SCS CN (Composite)	87.602
Area (User Defined)	8.4600 acres
Maximum Retention (Pervious)	1.42 in
Maximum Retention (Pervious, 20 percent)	0.28 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.72 in
Runoff Volume (Pervious)	1.210 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.208 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

SCS Unit Hydrograph Parameters	
Unit peak, qp	115.03 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

9th Street Outfall Analysis

Subsection: Elevation-Area Volume Curve
Label: PO-2

Return Event: 5.00 years
Storm Event: Type II 24 hour

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
667.00	0.000	0.0006	0.0000	0.000	0.000
667.75	0.000	0.0156	0.0193	0.005	0.005
668.00	0.000	0.1756	0.2435	0.020	0.025
669.00	0.000	0.2091	0.5763	0.192	0.217
669.75	0.000	0.2364	0.6678	0.167	0.384

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	667.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	670.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	TW	669.25	669.75
Orifice-Area	Orifice - 1	Forward	TW	667.00	669.75
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	1
Elevation	667.00 ft
Orifice Area	0.200 ft²
Top Elevation	0.00 ft
Datum Elevation	0.00 ft
Orifice Coefficient	0.600

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	669.25 ft
Orifice Area	2.560 ft²
Orifice Coefficient	0.600
Weir Length	6.50 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	True

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

9th Street Outfall Analysis

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 5.00 years
Storm Event: Type II 24 hour

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
667.00	0.00	(N/A)	0.00
667.50	0.68	(N/A)	0.00
668.00	0.96	(N/A)	0.00
668.50	1.18	(N/A)	0.00
669.00	1.36	(N/A)	0.00
669.25	1.44	(N/A)	0.00
669.50	1.52	(N/A)	0.00
669.75	1.60	(N/A)	0.00

Computation Messages

H =.00
H =.50
H =1.00
H =1.50
H =2.00
H =2.25
H =2.50
H =2.75

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
667.00	0.00	(N/A)	0.00
667.50	0.00	(N/A)	0.00
668.00	0.00	(N/A)	0.00
668.50	0.00	(N/A)	0.00
669.00	0.00	(N/A)	0.00
669.25	0.00	(N/A)	0.00
669.50	2.44	(N/A)	0.00
669.75	6.89	(N/A)	0.00

Computation Messages
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
HW & TW < Inv.El.=669.250
Weir: H =0ft
Weir: H =0.25ft
Weir: H =0.5ft

9th Street Outfall Analysis

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 5.00 years
Storm Event: Type II 24 hour

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
667.00	0.00	(N/A)	0.00
667.50	0.68	(N/A)	0.00
668.00	0.96	(N/A)	0.00
668.50	1.18	(N/A)	0.00
669.00	1.36	(N/A)	0.00
669.25	1.44	(N/A)	0.00
669.50	3.96	(N/A)	0.00
669.75	8.49	(N/A)	0.00

Contributing Structures
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Riser - 1 + Orifice - 1
Riser - 1 + Orifice - 1
Riser - 1 + Orifice - 1

9th Street Outfall Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 5.00 years
Label: PO-2 Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
667.00	0.00	0.000	0.0006	0.00	0.00	0.00
667.50	0.68	0.002	0.0084	0.00	0.68	1.58
668.00	0.96	0.025	0.1756	0.00	0.96	13.12
668.50	1.18	0.117	0.1920	0.00	1.18	57.80
669.00	1.36	0.217	0.2091	0.00	1.36	106.49
669.25	1.44	0.271	0.2180	0.00	1.44	132.42
669.50	3.96	0.326	0.2271	0.00	3.96	161.86
669.75	8.49	0.384	0.2364	0.00	8.49	194.43

9th Street Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 5.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	5.14 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.11 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	668.35 ft
Volume (Peak)	0.088 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.292 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.292 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

9th Street Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 10.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	6.23 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.18 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	668.49 ft
Volume (Peak)	0.116 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.358 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.358 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

9th Street Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 25.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	7.80 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.25 ft³/s	Time to Peak (Flow, Outlet)	12.200 hours

Elevation (Water Surface, Peak)	668.69 ft
Volume (Peak)	0.155 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.455 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.454 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

9th Street Outfall Analysis

Subsection: Level Pool Pond Routing Summary
Label: PO-2 (IN)

Return Event: 50.00 years
Storm Event: Type II 24 hour

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	667.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	9.08 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.31 ft³/s	Time to Peak (Flow, Outlet)	12.250 hours

Elevation (Water Surface, Peak)	668.86 ft
Volume (Peak)	0.189 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.535 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.535 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.292	11.950	5.14
Flow (In)	PO-2	0.292	11.950	5.14

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.358	11.950	6.23
Flow (In)	PO-2	0.358	11.950	6.23

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.455	11.950	7.80
Flow (In)	PO-2	0.455	11.950	7.80

Summary for Hydrograph Addition at 'PO-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Proposed 9th

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Proposed 9th	0.535	11.950	9.08
Flow (In)	PO-2	0.535	11.950	9.08

9th Street Outfall Analysis

Index

E. 9TH Water Quantity Basin Anti-Seep Collar Calculations

	Made By:	ELJ	Date:	11/18/2011
	Checked By:	AKL	Date:	11/18/2011

Anti-Seep Collar

From ODOT L&D 2 1117.4.1.2

Y- Depth of water at spillway crest,	668.41	ft
Z-slope of upstream face of embankment	4	
S-slope of outfall pipe	0.0063	
Length of Saturation Graphically	26.0	ft
Seepage length increase	3.9	ft
W-Width of Collar	5	
D - Diameter of Conduit	1	
P - Projection of Collar (P=W-D)	4	
# of collars	2	

Minimum 2 collars at minimum spacing 10'.

spaced 14 feet apart

*Stationing from Carnegie Avenue

STA. 25+12, 69.20 RT
STA. 25+14, 82.70 RT

APPENDIX I

INLET SPACING DESIGN

PID : 49633 **Date :** 07/18/2011 **Project :** CUY-90-14.90 **Location :** Carnegie

Description : Inlet Spacing - Carnegie (9th to Ontario) LT (Allowable spread = 12 ft + 7 ft) **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 19.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
26+69	Begin																		
25+00	CB-3A	169.00	0.76	0.22	1.00	3.29	10.00	0.0027	0.0160	0.0160	12.00	0.0417	4.30	0.45	0.27	0.72	0.146	9.14	
23+05	CB-3A	195.00	0.66	0.48	1.00	2.82	10.00	0.0030	0.0200	0.0160	12.00	0.0417	4.30	0.86	0.77	1.63	0.212	10.60	
21+00	CB-3A	205.00	0.83	0.35	1.00	2.85	10.00	0.0030	0.0200	0.0160	12.00	0.0417	4.30	0.99	1.03	2.02	0.230	11.48	
18+92	CB-3	208.00	0.85	0.39	1.00	2.87	10.00	0.0030	0.0200	0.0160	12.00	0.0417	4.30	******	******	2.46	0.247	12.44	Sag
18+25	Begin																		
18+92	CB-3	67.00	0.90	0.13	1.00	1.26	10.00	0.0030	0.0200	0.0160	12.00	0.0417	4.30	******	******	0.50	0.136	6.82	End

SUMP DATA

Total Flow (cfs) : 2.96 **Ponded Depth (ft.) :** 0.220 **Spread on Pavement (ft.) :** 10.31

INLET SPACING DESIGN

PID : 49633 **Date :** 07/18/2011 **Project :** CUY-90-14.90 **Location :** Carnegie

Description : Inlet Spacing - Carnegie (9th to Ontario) LT (Allowable spread = 12 ft + 7 ft) **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 19.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
26+69	Begin																		
25+00	CB-3A	169.00	0.76	0.22	1.00	2.82	10.00	0.0027	0.0160	0.0160	12.00	0.0417	6.79	0.61	0.53	1.14	0.174	10.85	
23+05	CB-3A	195.00	0.66	0.48	1.00	2.64	10.00	0.0030	0.0200	0.0160	12.00	0.0417	6.79	1.19	1.49	2.68	0.255	12.95	
21+00	CB-3A	205.00	0.83	0.35	1.00	2.61	10.00	0.0030	0.0200	0.0160	12.00	0.0417	6.79	1.40	2.06	3.46	0.281	14.55	
18+92	CB-3	208.00	0.85	0.39	1.00	2.52	10.00	0.0030	0.0200	0.0160	12.00	0.0417	6.79	******	******	4.31	0.305	16.04	Sag
18+25	Begin																		
18+92	CB-3	67.00	0.90	0.13	1.00	1.07	10.00	0.0030	0.0200	0.0160	12.00	0.0417	6.79	******	******	0.79	0.162	8.09	End

SUMP DATA

Total Flow (cfs) : 5.11 **Ponded Depth (ft.) :** 0.331 **Spread on Pavement (ft.) :** 16.82

INLET SPACING DESIGN

PID : 49633 **Date :** 05/17/2012 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description :INLET SPACING - CARNEGIE (WEST OF ONTARIO) LT **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
10+90	Begin																		
15+25	CB-3	435.00	0.89	0.49	1.00	5.41	10.00	0.0050	0.0160	0.0160	0.00	0.0417	4.30	******	******	1.88	0.187	11.66	Sag
16+73	Begin																		
15+25	CB-3	148.00	0.83	0.26	1.00	1.84	10.00	0.0072	0.0160	0.0160	0.00	0.0417	4.30	******	******	0.93	0.134	8.36	End

SUMP DATA

Total Flow (cfs) : 2.80 **Ponded Depth (ft.) :** 0.211 **Spread on Pavement (ft.) :** 11.96

INLET SPACING DESIGN

PID : 49633 **Date :** 05/17/2012 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description :INLET SPACING - CARNEGIE (WEST OF ONTARIO) LT **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
10+90	Begin																		
15+25	CB-3	435.00	0.89	0.49	1.00	4.70	10.00	0.0050	0.0160	0.0160	0.00	0.0417	6.79	******	******	2.96	0.221	13.84	Sag
16+73	Begin																		
15+25	CB-3	148.00	0.83	0.26	1.00	1.56	10.00	0.0072	0.0160	0.0160	0.00	0.0417	6.79	******	******	1.47	0.159	9.93	End

SUMP DATA

Total Flow (cfs) : 4.43 **Ponded Depth (ft.) :** 0.298 **Spread on Pavement (ft.) :** 17.42

INLET SPACING DESIGN

PID : 49633 **Date :** 05/17/2012 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - RT to Sag on Carnegie (Sta. 15+23) RT (Carnegie=8'+1'=9') **Designer :** ELJ

Rainfall Area: A **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 9.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
698+93	Begin																		
15+23	CB-3	80.00	0.90	0.30	1.00	0.93	10.00	0.0072	0.0160	0.0160	14.00	0.0417	4.30	******	******	1.16	0.146	9.10	Sag
14+10	Begin																		
15+23	CB-3	113.00	0.90	0.12	1.00	1.91	10.00	0.0050	0.0160	0.0160	14.00	0.0417	4.30	******	******	0.46	0.111	6.91	End

SUMP DATA

Total Flow (cfs) : 1.63 **Ponded Depth (ft.) :** 0.136 **Spread on Pavement (ft.) :** 7.27

INLET SPACING DESIGN

PID : 49633 **Date :** 05/17/2012 **Project :** CUY-90-14.90 **Location :** Ontario Outfall

Description : Inlet Spacing - RT to Sag on Carnegie (Sta. 15+23) RT (Carnegie=8'+1'=9') **Designer :** ELJ

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 9.00 **Allowable Depth (ft.)** 0.50

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
698+93	Begin																		
15+23	CB-3	80.00	0.90	0.30	1.00	0.78	10.00	0.0072	0.0160	0.0160	14.00	0.0417	6.79	******	******	1.83	0.173	10.80	Sag
14+10	Begin																		
15+23	CB-3	113.00	0.90	0.12	1.00	1.62	10.00	0.0050	0.0160	0.0160	14.00	0.0417	6.79	******	******	0.73	0.131	8.20	End

SUMP DATA

Total Flow (cfs) : 2.57 **Ponded Depth (ft.) :** 0.197 **Spread on Pavement (ft.) :** 11.09

INLET SPACING DESIGN

PID : 49633 **Date :** 09/12/2011 **Project :** CUY-90-14.90 **Location :** Ontario

Description : Inlet Spacing - Carnegie (9th to Ont) RT to Ont RT (Ont Spread 13' + 8') **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
26+69	Begin																		
25+25	CB-3	144.00	0.90	0.12	1.00	2.94	10.00	0.0027	0.0200	0.0160	12.00	0.0417	4.30	0.44	0.02	0.46	0.135	6.75	
23+25	CB-3	200.00	0.90	0.24	1.00	3.44	10.00	0.0027	0.0200	0.0160	12.00	0.0417	4.30	0.77	0.18	0.95	0.177	8.83	
22+20	CB-3	105.00	0.90	0.12	1.00	1.91	10.00	0.0030	0.0200	0.0160	12.00	0.0417	4.30	0.57	0.07	0.64	0.150	7.48	
20+70	CB-3	150.00	0.83	0.19	1.00	2.60	10.00	0.0030	0.0200	0.0160	12.00	0.0417	4.30	0.65	0.11	0.76	0.159	7.97	
19+35	CB-3A	135.00	0.79	0.21	1.00	2.30	10.00	0.0030	0.0200	0.0160	21.00	0.0417	4.30	0.54	0.28	0.82	0.164	8.18	
29+49	CB-3A	98.00	0.82	0.44	1.00	1.22	10.00	0.0046	0.0160	0.0160	21.00	0.0417	4.30	0.83	1.00	1.83	0.188	11.74	
29+30	CB-3	19.00	0.70	0.04	1.00	0.28	10.00	0.0046	0.0160	0.0160	21.00	0.0417	4.30	******	******	1.12	0.156	9.76	Sag
35+00	Begin																		
29+00	CB-3A	600.00	0.87	0.31	1.00	8.62	10.00	0.0051	0.0160	0.0160	21.00	0.0417	4.30	0.62	0.54	1.16	0.155	9.70	
29+30	CB-3	30.00	0.70	0.07	1.00	0.47	10.00	0.0051	0.0160	0.0160	21.00	0.0417	4.30	******	******	0.75	0.132	8.26	End

SUMP DATA

Total Flow (cfs) : 1.88 **Ponded Depth (ft.) :** 0.153 **Spread on Pavement (ft.) :** 8.35

***** Dimension denotes allowable spread for Ontario - 13 ft for RT only lane + 8 ft allowable spread in through lane = 21 ft.

INLET SPACING DESIGN

PID : 49633 **Date :** 09/12/2011 **Project :** CUY-90-14.90 **Location :** Ontario

Description : Inlet Spacing - Carnegie (9th to Ont) RT to Ont RT (Ont Spread 13' + 8') **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
26+69	Begin																		
25+25	CB-3	144.00	0.90	0.12	1.00	2.52	10.00	0.0027	0.0200	0.0160	12.00	0.0417	6.79	0.63	0.10	0.73	0.160	8.01	
23+25	CB-3	200.00	0.90	0.24	1.00	2.93	10.00	0.0027	0.0200	0.0160	12.00	0.0417	6.79	1.11	0.46	1.57	0.213	10.64	
22+20	CB-3	105.00	0.90	0.12	1.00	1.59	10.00	0.0030	0.0200	0.0160	12.00	0.0417	6.79	0.91	0.29	1.19	0.188	9.42	
20+70	CB-3	150.00	0.83	0.19	1.00	2.18	10.00	0.0030	0.0200	0.0160	12.00	0.0417	6.79	1.00	0.38	1.38	0.199	9.95	
19+35	CB-3A	135.00	0.79	0.21	1.00	1.92	10.00	0.0030	0.0200	0.0160	21.00	0.0417	6.79	0.81	0.68	1.49	0.205	10.24	
29+49	CB-3A	98.00	0.82	0.44	1.00	1.02	10.00	0.0046	0.0160	0.0160	21.00	0.0417	6.79	1.18	1.95	3.13	0.230	14.36	
29+30	CB-3	19.00	0.70	0.04	1.00	0.24	10.00	0.0046	0.0160	0.0160	21.00	0.0417	6.79	******	******	2.14	0.199	12.46	Sag
35+00	Begin																		
29+00	CB-3A	600.00	0.87	0.31	1.00	7.58	10.00	0.0051	0.0160	0.0160	21.00	0.0417	6.79	0.83	1.00	1.83	0.184	11.52	
29+30	CB-3	30.00	0.70	0.07	1.00	0.40	10.00	0.0051	0.0160	0.0160	21.00	0.0417	6.79	******	******	1.33	0.164	10.22	End

SUMP DATA

Total Flow (cfs) : 3.48 **Ponded Depth (ft.) :** 0.248 **Spread on Pavement (ft.) :** 14.32

***** Dimension denotes allowable spread for Ontario - 13 ft for RT only lane + 8 ft allowable spread in through lane = 21 ft.

INLET SPACING DESIGN

PID : 49633 **Date :** 09/12/2011 **Project :** CUY-90-14.90 **Location :** Ontario

Description : Inlet Spacing - Ontario (Carnegie to north) LT **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
31+90	Begin										*								
33+20	CB-3	130.00	0.90	0.25	1.00	1.75	10.00	0.0056	0.0160	0.0160	13.30	0.0417	4.30	0.70	0.27	0.97	0.143	8.91	
33+50	CB-3	30.00	0.85	0.11	1.00	0.47	10.00	0.0051	0.0160	0.0160	8.00	0.0417	4.30	0.53	0.13	0.66	0.126	7.85	
34+05	CB-3	55.00	0.67	0.18	1.00	0.85	10.00	0.0051	0.0160	0.0160	8.00	0.0417	4.30	0.53	0.13	0.65	0.125	7.83	
34+70	CB-3	65.00	0.66	0.20	1.00	0.99	10.00	0.0051	0.0160	0.0160	8.00	0.0417	4.30	0.55	0.14	0.69	0.128	7.98	
35+40	CB-3	70.00	0.69	0.19	1.00	1.07	10.00	0.0051	0.0160	0.0160	8.00	0.0417	4.30	0.55	0.14	0.69	0.128	7.98	
36+10	CB-3	70.00	0.72	0.18	1.00	1.07	10.00	0.0051	0.0160	0.0160	8.00	0.0417	4.30	0.55	0.14	0.69	0.128	7.98	
36+70	CB-3	60.00	0.76	0.14	1.00	0.95	10.00	0.0051	0.0160	0.0160	8.00	0.0417	4.30	0.49	0.10	0.60	0.121	7.57	
37+45	CB-3	75.00	0.90	0.11	1.00	1.23	10.00	0.0050	0.0160	0.0160	8.00	0.0417	4.30	******	******	0.55	0.118	7.35	Sag
38+50	Begin																		
37+75	CB-3A	75.00	0.90	0.04	1.00	1.97	10.00	0.0030	0.0160	0.0160	8.00	0.0417	4.30	0.16	0.01	0.17	0.084	5.25	
37+45	CB-3	30.00	0.90	0.02	1.00	0.90	10.00	0.0030	0.0160	0.0160	8.00	0.0417	4.30	******	******	0.10	0.069	4.28	End

SUMP DATA

Total Flow (cfs) : 0.65 **Ponded Depth (ft.) :** 0.055 **Spread on Pavement (ft.) :** 2.24

***** Due to varying outside lane width, this dimension is the allowable spread width at each CB.

INLET SPACING DESIGN

PID : 49633 **Date :** 09/12/2011 **Project :** CUY-90-14.90 **Location :** Ontario

Description : Inlet Spacing - Ontario (Carnegie to north) LT **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 8.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
31+90	Begin										*								
33+20	CB-3	130.00	0.90	0.25	1.00	1.49	10.00	0.0056	0.0160	0.0160	13.30	0.0417	6.79	0.96	0.57	1.53	0.169	10.57	
33+50	CB-3	30.00	0.85	0.11	1.00	0.39	10.00	0.0051	0.0160	0.0160	8.00	0.0417	6.79	0.81	0.38	1.19	0.157	9.79	
34+05	CB-3	55.00	0.67	0.18	1.00	0.70	10.00	0.0051	0.0160	0.0160	8.00	0.0417	6.79	0.82	0.39	1.21	0.158	9.86	
34+70	CB-3	65.00	0.66	0.20	1.00	0.82	10.00	0.0051	0.0160	0.0160	8.00	0.0417	6.79	0.85	0.43	1.28	0.161	10.07	
35+40	CB-3	70.00	0.69	0.19	1.00	0.88	10.00	0.0051	0.0160	0.0160	8.00	0.0417	6.79	0.86	0.44	1.30	0.162	10.12	
36+10	CB-3	70.00	0.72	0.18	1.00	0.88	10.00	0.0051	0.0160	0.0160	8.00	0.0417	6.79	0.86	0.44	1.30	0.162	10.14	
36+70	CB-3	60.00	0.76	0.14	1.00	0.78	10.00	0.0051	0.0160	0.0160	8.00	0.0417	6.79	0.80	0.37	1.17	0.156	9.72	
37+45	CB-3	75.00	0.90	0.11	1.00	1.01	10.00	0.0050	0.0160	0.0160	8.00	0.0417	6.79	******	******	1.07	0.151	9.44	Sag
38+50	Begin																		
37+75	CB-3A	75.00	0.90	0.04	1.00	1.67	10.00	0.0030	0.0160	0.0160	8.00	0.0417	6.79	0.23	0.05	0.27	0.100	6.24	
37+45	CB-3	30.00	0.90	0.02	1.00	0.74	10.00	0.0030	0.0160	0.0160	8.00	0.0417	6.79	******	******	0.18	0.086	5.38	End

SUMP DATA

Total Flow (cfs) : 1.25 **Ponded Depth (ft.) :** 0.108 **Spread on Pavement (ft.) :** 5.55

***** Due to varying outside lane width, this dimension is the allowable spread width at each CB.

INLET SPACING DESIGN

PID : 49633 **Date :** 09/12/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO

Description :INLET SPACING - ONTARIO (SOUTH OF CARNEGIE) LT **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 9.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
31+60	Begin																		
30+70	CB-3A	115.00	0.69	0.39	1.00	1.28	10.00	0.0082	0.0160	0.0160	9.00	0.0417	4.30	0.62	0.54	1.16	0.142	8.87	
30+33	CB-3	37.00	0.73	0.09	1.00	0.47	10.00	0.0082	0.0160	0.0160	9.00	0.0417	4.30	******	******	0.82	0.125	7.80	Sag
25+00	Begin																		
27+10	I-2-8	210.00	0.67	0.45	1.00	2.08	10.00	0.0106	0.0160	0.0160	9.00	0.1667	4.30	0.89	0.41	1.30	0.141	8.82	
29+80	CB-3A	270.00	0.84	0.07	1.00	4.36	10.00	0.0052	0.0160	0.0160	9.00	0.0417	4.30	0.42	0.24	0.66	0.125	7.83	
30+33	CB-3	53.00	0.71	0.11	1.00	0.85	10.00	0.0052	0.0160	0.0160	9.00	0.0417	4.30	******	******	0.58	0.119	7.44	End

SUMP DATA

Total Flow (cfs) : 1.40 **Ponded Depth (ft.) :** 0.119 **Spread on Pavement (ft.) :** 6.23

INLET SPACING DESIGN

PID : 49633 **Date :** 09/12/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO

Description :INLET SPACING - ONTARIO (SOUTH OF CARNEGIE) LT **Designer :** AKL

Rainfall Area: A **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 9.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
31+60	Begin																		
30+70	CB-3A	115.00	0.69	0.39	1.00	1.08	10.00	0.0082	0.0160	0.0160	9.00	0.0417	6.79	0.84	0.99	1.83	0.168	10.53	
30+33	CB-3	37.00	0.73	0.09	1.00	0.40	10.00	0.0082	0.0160	0.0160	9.00	0.0417	6.79	******	******	1.44	0.154	9.62	Sag
25+00	Begin																		
27+10	I-2-8	210.00	0.67	0.45	1.00	1.77	10.00	0.0106	0.0160	0.0160	9.00	0.1667	6.79	1.14	0.91	2.05	0.168	10.47	
29+80	CB-3A	270.00	0.84	0.07	1.00	3.65	10.00	0.0052	0.0160	0.0160	9.00	0.0417	6.79	0.67	0.64	1.31	0.162	10.11	
30+33	CB-3	53.00	0.71	0.11	1.00	0.70	10.00	0.0052	0.0160	0.0160	9.00	0.0417	6.79	******	******	1.17	0.155	9.70	End

SUMP DATA

Total Flow (cfs) : 2.61 **Ponded Depth (ft.) :** 0.199 **Spread on Pavement (ft.) :** 11.23

STORM SEWER SYSTEM

PID : 49633 **Date :** 09/15/2011 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : CARNEGIE - CONNECT TO EXISTING 12" STORM SEWER AT 25+23 RT **Designer :** AKL

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 665.69

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D12A	EX12	25+24		0.12	0.11	10.00	5.10	6.20	0.6	0.7	12	9.3	0.0549	665.20	5.44	7.79	0.0005	665.69	669.26	3.57	3.06	CB 3
begin		25+18		0.12	0.11									664.69				665.69	670.32			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 07/19/2011 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : Storm Sewer Design Carnegie Left 1 **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 664.66

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D70	2304	23+05		0.48	0.32	10.00	5.10	6.20	1.6	2.0	12	6.0	0.0050	663.69 *	3.04	2.35	0.0040	664.68	669.06	4.38	4.37	CB 3A
begin		23+05		0.48	0.32									663.66				664.66	669.55			0.015

* This is the original design elevation. Invert elevation could not be verified from the approved as-built survey information, structure D70 was filled with water to an elevation of 664.81.

STORM SEWER SYSTEM

PID : 49633 **Date :** 10/26/2011 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : Storm Sewer Design Carnegie Left 1A **Designer :** JCA

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 663.96

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D73	7828	21+00		0.35	0.29	10.00	5.10	6.18	1.5	1.8	12	23.0	0.0100	663.40 *	3.90	3.32	0.0034	664.04	668.65	4.61	4.25	CB 3A
begin		21+00		0.35	0.29									663.17				663.96	671.18			0.015

NOTE: CDSS calculation shows full length of existing pipe. 6 feet of pipe to be reconstructed at 1% slope within limits of new sidewalk construction. Invert at end of 6 foot proposed pipe = 663.34'

***** This is the original design elevation. Invert elevation could not be verified from the approved as-built survey information, structure D73 was filled with water to an elevation of 664.53.

STORM SEWER SYSTEM

PID : 49633 **Date :** 07/19/2011 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : Storm Sewer Design Carnegie Left 1B **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 664.75

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D76	7899	18+92		0.52	0.45	10.00	5.10	6.18	2.3	2.8	12	57.0	0.0432	664.03 *	7.49	6.90	0.0080	665.21	668.07	2.86	3.04	CB 3
begin		18+33		0.52	0.45									661.57				664.75	668.32			0.015

* This is the original design elevation. Invert elevation could not be verified from the approved as-built survey information, structure D76 was filled with water to an elevation of 664.77.

STORM SEWER SYSTEM

PID : 49633 **Date :** 05/17/2012 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : Storm Sewer Design Carnegie-Ontario 5 **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 662.89

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D93	8726	15+25		0.75	0.65	10.00	5.10	6.18	3.3	4.0	15	19.1	~~0.0000~~	661.75	2.71	0.01	0.0052	663.00	667.19	4.19	4.19	CB 3
begin		15+14		0.75	0.65						**Warning**			~~661.75~~ *				662.89	667.69			0.015

***** D93 to D8726. Based on the approved as-built survey information, the invert elevation at structure D8726 would be 662.17, which would result in a negative slope of -2.20% for the pipe run of D93 to D8726.

STORM SEWER SYSTEM

PID : 49633 **Date :** 07/19/2011 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : Storm Sewer Design Carnegie-Ontario 2-3 **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 659.35

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D72	D72A	22+20		0.12	0.11	10.00	5.10	6.14	0.6	0.7	12	42.9	0.0093	666.15	2.91	3.21	0.0005	666.47	669.00	2.53	1.85	CB 3
begin		21+75		0.12	0.11									665.75				666.42	668.90			0.015
D72A	CS	21+75		0.10	0.09	10.25	5.04	6.12	1.0	1.2	12	47.7	0.1753	665.20	9.72	13.91	0.0015	665.41	668.90	3.49	2.70	CB 3
final		21+76		0.22	0.20									656.84				659.35	669.53			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 10/21/2011 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : Storm Sewer Design Carnegie-Ontario 2-3B **Designer :** JCA

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 658.61

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D77	D77B	19+35		0.21	0.17	10.00	5.10	6.18	0.8	1.0	12	17.0	0.0076	664.10	3.05	2.90	0.0011	664.70	668.22	3.52	3.12	CB 3A
begin		19+45		0.21	0.17									663.97				664.68	668.36			0.015
D77B	D77A	19+45		0.00	0.00	10.09	5.07	6.13	0.8	1.0	12	55.0	0.0276	663.95	4.81	5.52	0.0011	664.25	668.36	4.11	3.41	MH 3
		20+00		0.21	0.17									662.43				663.14	669.10			0.015
D74	D77A	20+64		0.19	0.16	10.00	5.10	6.15	0.8	1.0	12	64.3	0.0264	664.55	4.68	5.40	0.0010	664.85	668.57	3.72	3.02	CB 3
begin		20+00		0.40	0.32									662.85				663.56	669.10			0.015
D77A	D780	20+00		0.00	0.00	10.28	5.03	6.06	1.6	2.0	12	38.6	~~0.0000~~	657.01	2.07	0.01	0.0040	658.77	669.24	10.47	11.23	MH 3
final		19+91		0.40	0.32						Warning			~~657.01~~ *				658.61	669.10			0.015

***** D77A to D7809 (Shown as D780 in CDSS). The invert elevation of structure D7809, from D77A, could not be verified from the approved as-built survey information. The original design called for the pipe to have an invert elevation of 657.61 at D7809, however this would result in a negative slope of -1.55%.

STORM SEWER SYSTEM

PID : 49633 **Date :** 09/26/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO

Description : Storm Sewer Design Carnegie-Ontario 2-3D **Designer :** AKL

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 664.21

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D79	D80	29+00		0.31	0.27	10.00	5.10	6.15	1.4	1.7	12	30.0	0.0063	663.71	3.22	2.64	0.0029	664.53	667.95	3.42	3.24	CB 3A
begin		29+30		0.31	0.27									663.52				664.44	667.60			0.015
D80	D81	29+30		0.11	0.08	10.16	5.06	6.15	1.8	2.1	12	19.4	0.0175	663.58	5.00	4.40	0.0048	664.44	667.60	3.16	3.02	CB 3
		29+49		0.42	0.35									663.24				664.35	667.62			0.015
D81	7710	29+49		0.44	0.36	10.22	5.05	6.15	3.6	4.3	12	7.0	0.0586	663.24	9.40	8.04	0.0198	664.35	667.62	3.27	3.38	CB 3A
final		29+50		0.86	0.71									662.83				664.21	668.43			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 05/17/2012 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : STORM SEWER - CARNEGIE - SAG @ 15+23 RT **Designer :** AKL

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 663.63

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D136	8734	15+25		0.68	0.61	10.00	5.10	6.19	3.1	3.8	15	29.7	0.0269	662.72	6.76	9.88	0.0046	663.77	666.92	3.15	2.95	CB 3
begin		15+01		0.68	0.61									661.92				663.63	667.60			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 12/07/2011 **Project :** Cleveland Innerbelt **Location :** BL - 14 Carnegie

Description : BL14 Catch Basin D-136A **Designer :** ELJ

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 660.83

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
136A	8734	15+35		0.26	0.23	10.00	5.10	6.20	1.2	1.5	12	16.4	0.0976	661.56	8.36	10.37	0.0022	661.82	667.41	5.59	4.85	CB 2-2B
begin		15+26		0.26	0.23									659.96				660.83	667.69			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 09/15/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO

Description : Storm Sewer Design Carnegie-Ontario 4 **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 662.29

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D95	D96	33+20		0.25	0.23	10.00	5.10	6.17	1.1	1.4	12	30.0	0.0060	662.84	3.02	2.57	0.0020	663.47	666.92	3.45	3.08	CB 3
begin		33+50		0.25	0.23									662.66				663.41	666.82			0.015
D96	D86A	33+50		0.11	0.09	10.17	5.06	6.13	1.6	2.0	12	26.0	0.0060	662.66	3.27	2.57	0.0040	663.41	666.82	3.41	3.16	CB 3
		33+75		0.36	0.32									662.50				663.30	667.50			0.015
D85	D86	34+70		0.20	0.18	10.00	5.10	5.94	0.9	1.1	12	65.0	0.0070	662.40	3.01	2.78	0.0012	663.02	666.40	3.38	3.00	CB 3
begin		34+05		0.56	0.50									661.95				662.94	666.61			0.015
D86	D86A	34+05		0.18	0.15	10.36	5.02	5.94	1.7	2.0	12	31.0	0.0050	661.95	3.07	2.35	0.0041	662.94	666.61	3.67	3.66	CB 3
		33+75		0.74	0.65									661.79				662.81	667.50			0.015
D86A	D86B	33+75		0.00	0.00	10.53	4.98	5.94	3.3	3.9	15	109.0	0.0040	661.54	3.29	3.83	0.0048	662.81	667.50	4.69	4.71	MH 3
final		34+61		0.74	0.65									661.10				662.29	670.50			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 05/19/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO

Description : Storm Sewer Design Carnegie-Ontario 4B **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 662.38

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D88	D87	35+40	0.19	0.13	10.00	5.10	6.08	0.7	0.8	12	70.0	0.0090	662.12	3.02	3.15	0.0007	662.48	666.12	3.64	3.00	CB 3
begin		36+10	0.19	0.13									661.49				662.43	665.90			0.015
D87	8277	36+10	0.18	0.13	10.39	5.01	6.08	1.3	1.6	12	19.0	0.0060	661.49	3.12	2.57	0.0026	662.43	665.90	3.47	3.41	CB 3
final		35+96	0.37	0.26									661.38				662.38	666.22			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 11/17/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO

Description : Storm Sewer Design Carnegie-Ontario 4C **Designer :** AKL

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 661.75

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D89	8470	36+70		0.14	0.11	10.00	5.10	6.18	0.5	0.7	12	23.0	0.0110	661.00	3.07	3.48	0.0005	661.76	665.89	4.13	3.89	CB 3
begin		36+82		0.14	0.11									660.75				661.75	666.88			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 05/19/2011 **Project :** CUY-90-14.90 **Location :** ONTARIO

Description : Storm Sewer Design Carnegie-Ontario 4D **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 661.81

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D91	D90	37+75		0.04	0.04	10.00	5.10	6.15	0.2	0.2	12	30.0	0.0250	661.66	3.00	5.25	0.0001	661.82	665.66	3.84	3.00	CB 3A
begin		37+45		0.04	0.04									660.91				661.82	665.49			0.015
D90	8472	37+45		0.13	0.12	10.17	5.06	6.15	0.8	0.9	12	10.0	0.0100	660.91	3.28	3.32	0.0009	661.82	665.49	3.67	3.58	CB 3
final		37+50		0.17	0.15									660.81				661.81	666.34			0.015

STORM SEWER SYSTEM

PID : 49633 **Date :** 09/15/2011 **Project :** CUY-90-14.90 **Location :** CARNEGIE

Description : Storm Sewer Design Carnegie-Ontario 6A **Designer :** MTR

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 664.22

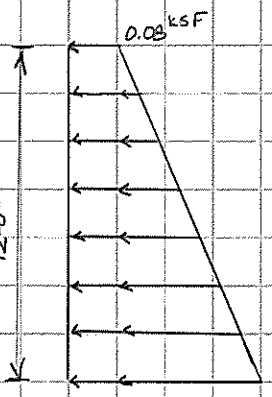
JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D82	D83	29+80		0.07	0.06	10.00	5.10	6.11	0.3	0.4	12	51.2	0.0152	663.69	2.87	4.10	0.0001	664.41	667.89	3.48	3.20	CB 3A
begin		30+33		0.07	0.06									662.91				664.41	667.71			0.015
D84	D83	30+70		0.39	0.27	10.00	5.10	6.11	1.4	1.7	12	35.6	0.0132	663.93	4.25	3.82	0.0029	664.51	667.93	3.42	3.00	CB 3A
begin		30+33		0.46	0.33									663.46				664.41	667.71			0.015
D83	8025	30+33		0.20	0.14	10.30	5.03	6.11	2.4	2.9	12	20.9	0.0134	662.71	4.88	3.84	0.0089	664.41	667.71	3.30	4.00	CB 3
final		30+52		0.66	0.48									662.43				664.22	668.83			0.015

For C.O.C. - TREMONT CATCH BASIN	Job no. 49633	Sheet no.
Made by BTA	Checked by JTW	Backchecked by
Date 10/24/11	Date 10/24/11	Date

HNTB

CHECK IF A CITY OF CLEVELAND CATCH BASIN - CB-1, WILL WORK FOR A DEPTH OF 12'-0".

ASSUME 2'-0" SURCHARGE



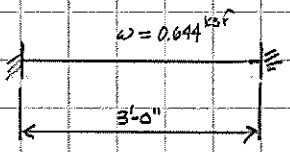
ASSUME 2'-0" SURCHARGE

$2'0"(0.04^{KCF}) = 0.08^{KSF}$

$14'0"(0.04^{KCF}) = 0.56^{KSF}$

$0.56^{KSF}(1.15) = 0.644^{KSF}$ ← L.F

CONSERVATIVELY, CHECK A SIMPLY SUPPORTED BEAM BETWEEN CATCH BASIN WALLS



MAX SHEAR: $0.644^{KSF}\left(\frac{3}{2}\right) = 0.966^{K}$

MAX MOMENT: $\frac{0.644\,(3)^2}{12} = 0.483^{K\cdot Ft}$

$A_s = 0.2\,in^2$

$d = 3\,in$

$\rho = \frac{0.20\,in^2}{(12)(3)} = 0.0055$

$R_u = \frac{M_u}{bd^2} = \frac{0.4833^{K\cdot Ft}(12"/Ft)}{(12")(3")^2} = 0.054^{ksi} = 54^{psi}$ $\quad m = \frac{60{,}000}{0.85(4000)} = 17.6$

$\rho_{REQ'D} = \frac{1}{m}\left(1-\sqrt{1-\frac{2mR_u}{f_y}}\right) = \frac{1}{17.6}\left(1-\sqrt{1-\frac{2(17.6)(54)}{60000}}\right) = 0.0009$

$1.2\,M_{cr} = \frac{1.2\left(7.5\sqrt{4000}\right)\left(\frac{12(6)^3}{12}\right)}{6/2} = 40983^{lb\text{-}in} = 3.42^{K\cdot Ft} \Rightarrow \rho_{REQ'D} = \frac{4}{3}(0.0009) = \underline{0.0012}$

$V_c = 2\sqrt{f'_c}\,bd \Rightarrow 2\sqrt{4000}(12)(3) = 4553.7^{lb} \Rightarrow 4.6^{K}$

OK MOMENT, OK SHEAR

ME101-1204

APPENDIX J

FOR INFORMATION ONLY - UPDATED MAIN SPAN UNITS 1-2-3 / RAMP A SCUPPER CALCULATIONS. OFFICIAL CALCULATIONS WILL BE SUBMITTED WITH THE UNIT 2 SUPERSTRUCTURE PLANS.

Bridge Deck Drainage Calculations Summary

For Bridge CUY-90-1566 - (Main Span Unit 1-2-3 & Ramp A5)

Unit 1

Unit 1 is the new I-90 WB Bridge from approximately Sta. 122 + 93 to Sta. 127 + 02 and spans 409 ft. For the Interim condition, Unit 1 has a 0.81% longitudinal slope, 2% cross slope from crown to right, 4% cross slope left of the crown, 5-12 ft lanes, 12 ft right shoulder, and 8 ft left shoulder. The high point of the bridge or drainage divide is located approximately at Station 136+34 ft.

During the Bidirectional condition the bridge has 4-11 ft west bound lanes, and 2-12 ft east bound lanes with a PCB dividing the two allowing drainage to pass from west to east bound lanes. The east bond right shoulder is 6 ft and the west bound left shoulder is variable.

Four 5 ft wide scuppers are proposed on the right shoulder with locations shown on the attached calculations and drainage map from the high point to the beginning of Unit 1. Two scuppers are located on Unit 1 next to pier 2. The other scuppers will downspout at piers 3 & 4 and are offset from the pier approx. 62ft and will flow down the delta frame to the pier. These scuppers are necessary per the below spread criteria.

Spread was analyzed for the interim/ future condition, along with the bi-directional condition. Per the scope requirements the interim/future condition spread was not to exceed the shoulder during a 10-year event. For the bi-directional condition, it is required that the 2-year event spread not exceed the shoulder plus 1/3 of the adjacent travel lane. For the proposed four scupper configuration described above, 10-yr spread criteria are met, meeting ODOT requirements. During the bi-directional condition the spread exceeded the 2-year criteria by 0.16 ft and 0.15 ft at 129+43 and 122+28, respectively, which has been approved by ODOT for final design.

Unit 2

Unit 2 is the new I-90 WB Bridge from approximately Sta. 127 + 02 to Sta. 157 + 94.5 and spans 3092.5 ft. For the Interim condition, Unit 2 has a 0.81% longitudinal slope, 2% cross slope from crown to right, 4% cross slope left of the crown going up to the high point at Sta. 136+34. From Sta. 136+34, the longitudinal slope transitions to 0.50% longitudinal slope, 2%-4% cross slope from the crown to right, and 4% cross slope left of crown has 5-12 ft lanes, 12 ft right shoulder, and 4-8 ft left shoulder. At approx. Sta. 141+00 the left lane transitions into Ramp A5 and a drainage barrier starting at Sta. 149+85 will be in place so that Ramp A5 doesn't flow across the mainline.

During the Bidirectional condition the bridge has 4-11 ft west bound lanes, and 2-12 ft east bound lanes with a PCB dividing the two allowing drainage to pass from west to east bound lanes. The east bond right shoulder is 6 ft and the west bound left shoulder is variable. Ramp A5 converges with the mainline at Sta. 145+00.

19 total scuppers are located on Unit 2. Four 5 ft wide scuppers are proposed on the right shoulder with locations shown on the attached calculations and drainage map from the high point to the beginning of Unit 1. Two scuppers are located on Unit 1 next to pier 2, and the other two scuppers will downspout at piers 3 & 4, respectively on Unit 2 and are offset from the pier approx. 62ft and will flow down the delta frame to the pier. Seventeen 5 ft wide scuppers are proposed from the high point to the end on Unit 2. Nine are located along the right shoulder, five on the left shoulder, and three along the barrier between Ramp A5 and the mainline. The scupper located at Sta. 157+92 along the Ramp A5 barrier acts as a backup to the scupper at Sta. 158+00 which is used for the calculations. The 5 ft wide scupper at Sta. 148+90 & 155+94 has a 6 ft shoulder but rounding occurs at 4ft. Due to maintenance of this scupper, it will be 5 ft and depressed through the rounding and have a maximum 5% slope transition from the rounding to the top of scupper. The high side shoulder has a low point on Ramp A5 at 718+18.91 and high point at 716+52.78. A scupper is located at the low point and flanking scuppers at 718+30 and 718+05. A sump calculation shows 0.0063ft of depth, and 0.16ft of spread at the low point. The edge of shoulder

side of the scupper will be depressed 1" at the sag, and will need to be hand finished 10ft on either side of the scupper.

Spread was analyzed for the interim/ future condition, along with the bi-directional condition. Per the scope requirements the interim/future condition spread was not to exceed the shoulder during a 10-yr event. For the bi-directional condition, it is required that the 2-yr event spread not exceed the shoulder plus 1/3 of the adjacent travel lane. For the proposed 14 scupper configuration described above, 10-yr & 2-yr spread criteria are met, meeting ODOT requirements on Unit 2.

Unit 3

Unit 3 is the new I-90 WB Bridge from approximately Sta. 157 + 94.5 to Sta. 166 + 37.14 and spans 839.5 ft. For the Interim condition, Unit 3 has a 0.5% longitudinal slope, 4% cross slope from crown to right, 4% cross slope left. 5-12 ft lanes, 12 ft right shoulder, and 6 ft left shoulder. At approx. Sta. 159+00 the left lane transitions into Ramp A4 and a gore section divides traffic. No drainage barrier is needed to separate Ramp A4 and the mainline.

During the Bidirectional condition the bridge has 3-11 ft west bound lanes, and 2-12 ft east bound lanes with a PCB dividing the two allowing drainage to pass from west to east bound lanes. The east bond right shoulder is 6 ft and the west bound left shoulder is variable. Ramp A4 converges with the mainline at Sta. 158+00.

One 5 ft wide scupper is proposed on the right shoulder at pier 12 with location shown on the attached calculations and drainage map. The remaining drainage will flow off the bridge and to the inlets in the approach slab. An inlet is also on the left shoulder after the approach slab to pick up drainage from the left shoulder.

Spread was analyzed for the interim/ future condition, along with the bi-directional condition. Per the scope requirements the interim/future condition spread was not to exceed the shoulder during a 10-yr event. For the bi-directional condition, it is required that the 2-yr event spread not exceed the shoulder plus 1/3 of the adjacent travel lane. For the proposed one scupper configuration described above, 10-yr & 2-yr spread criteria are met, meeting ODOT requirements on Unit 3.

Ramp A5

Ramp A5 is the new I-90 WB Bridge/On Ramp for Ontario Ave. from approximately Sta. 707+32.5 to Sta. 699+75.55 and spans 763.44 ft. For the Interim/Bi-directional condition, Ramp A5 has a 0.42-4.99% longitudinal slope, and variable cross slopes do to the super change of the ramp. The Ramp has 2-12 ft lanes, 6 ft right shoulder, and 4 ft left shoulder that tapers down to 2ft.

Two 4 ft wide scuppers are proposed on the left shoulder at piers 2 & 3 and are shown on the attached calculations and drainage map. The remaining drainage on the right shoulder will flow to inlets off the bridge and are included in Gateway Submittal. Scupper flows will be discharged to the combined sewers along Central Viaduct and a new system draining the parking lot north of Commercial Rd.

Spread was analyzed for the interim/ future condition, along with the bi-directional condition (same as Interim). Per the scope requirements the interim/future condition spread was not to exceed the shoulder during a 10-year event. For the proposed two scupper configuration described above, 10-yr spread criteria were met, meeting ODOT requirements.

HNTB

Made by: AHR Date: 8/8/2011
Checked by: BH Date: 8/8/2011

Job Number: 49633
I-90 WB/Ramp A6

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width

MAIN VIADUCT UNIT 1 & 2 TO HIGH POINT DECK DRAINAGE CALCULATIONS (ODOT 10 YR RAINFALL CHECK FOR INTERIM CONDITION)

LOCATION										GUTTER ANALYSIS							INLET ANALYSIS								
Station	offset (feet)	Side	Area (A) (acres)	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder Width (ft)	Spread (t) (ft)	Inlet Width (w) (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept Flow (E) (cfs)	By-Pass (cfs)	By-Pass %
136+34 - High Point																									
133+08.56 I-90 WB	35.00	RT	0.55	0.9	0.495	0.495	10	5.1	2.523	0.0081	0.0200	0.000	2.523	0.208	12.00	10.38	5.00	1.08	2.34	1.33	3.95	1.0	2.087	0.436	17%
							Spread is less than allowable OK																		
129+43 I-90 WB	35.00	RT	0.67	0.9	0.603	0.603	10	5.1	3.076	0.0081	0.0200	0.436	3.512	0.235	12.00	11.74	5.00	1.38	2.55	1.33	3.95	0.980	2.659	0.853	24%
							Spread is less than allowable OK																		
126+96 I-90 WB	35.00	RT	0.47	0.9	0.423	0.423	10	5.1	2.157	0.0081	0.0200	0.853	3.010	0.222	12.00	11.09	5.00	1.23	2.45	1.33	3.95	1.0	2.403	0.607	20%
							Spread is less than allowable OK																		
126+86 I-90 WB	35.00	RT	0.02	0.9	0.02	0.02	10	5.1	0.101	0.0081	0.0200	0.607	0.708	0.129	12.00	6.45	5.00	0.42	1.70	1.33	3.95	1.0	0.694	0.013	2%
							Spread is less than allowable OK																		
122+28 I-90 WB End of Bridge	35.00	RT	0.95	0.9	0.855	0.855	10	5.1	4.361	0.0085	0.0230	0.013	4.374	0.266	12.00	11.58	0.00	1.54	2.84	0.00	0.00	0	0.000	4.374	100%
							Spread is less than allowable OK										*Drainage inlets and design will be in Tremont Roadway Package*							
Left Should Mainline/Ramp A6																									
808+13 122+56 Ramp A6/ I-90WB	6.00 105.00	RT LT	0.33	0.9	0.297	0.297	10	5.1	1.515	0.0200	0.0400	0.000	1.515	0.188	8.00	4.69	0.00	0.44	3.44	0.00	0.00	0	0.000	1.515	100%
							Spread is less than allowable OK										*Drainage inlets and design will be in Tremont Roadway Package*							

HNTB

Made by: AHR Date: 8/8/2011
Checked by: BH Date: 8/8/2011

Job Number: 49633
I-90 WB/Ramp A6

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width plus 1/3 travel lane

MAIN VIADUCT UNIT 1 & 2 TO HIGH POINT DECK DRAINAGE CALCULATIONS (ODOT 2 YR RAINFALL CHECK FOR BI-DIRECTIONAL CONDITION)

LOCATION							GUTTER ANALYSIS									INLET ANALYSIS								
Station	offset (feet)	Side	Area (A) (acres)	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Allowable Spread (ft)	Spread (t) (ft)	Inlet Width (w) (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept Flow (E) (cfs)	By-Pass (cfs)	By-Pass %
136+34 - High Point																									
133+08.56 I-90 WB	35.00	RT	0.55	0.9	0.495	0.495	10	3.6	1.78103	0.0081	0.0200	0.000	1.781	0.182	10.00	9.11	5.00	0.83	2.15	1.33	3.95	1.0	1.569	0.212	12%
							Spread is less than allowable OK																		
129+43 I-90 WB	35.00	RT	0.67	0.9	0.603	0.603	10	3.6	2.17112	0.0081	0.0200	0.212	2.384	0.203	10.00	10.16	5.00	1.03	2.31	1.33	3.95	0.980	1.953	0.430	18%
							Spread is greater than allowable NO GOOD **ODOT approval for this location to exceed by 0.16 ft**																	
126+96 I-90 WB	35.00	RT	0.47	0.9	0.423	0.423	10	3.6	1.5228	0.0081	0.0200	0.430	1.953	0.189	10.00	9.43	5.00	0.89	2.20	1.33	3.95	1.0	1.693	0.260	13%
							Spread is less than allowable OK																		
126+86 I-90 WB	35.00	RT	0.02	0.9	0.02	0.02	10	3.6	0.07096	0.0081	0.0200	0.260	0.331	0.097	10.00	4.85	5.00	0.23	1.41	1.33	3.95	1.0	0.331	0.000	0%
							Spread is less than allowable OK																		
122+28 I-90 WB End of Bridge	35.00	RT	0.95	0.9	0.855	0.855	10	3.6	3.078	0.0085	0.0230	0.000	3.078	0.233	10.00	10.15	0.00	1.18	2.60	0.00	0.00	0	0.000	3.078	100%
							Spread is greater than allowable NO GOOD **ODOT approval for this location to exceed by 0.15 ft**									*Drainage inlets and design will be in Tremont Roadway Package*							
Left Should Mainline/Ramp A6																									
808+13 122+56 Ramp A6/ I-90WB	6.00 105.00	RT LT	0.33	0.9	0.297	0.297	10	3.6	1.0692	0.0200	0.0400	0.000	1.069	0.165	8.00	4.12	0.00	0.34	3.15	0.00	0.00	0	0.000	1.069	100%
							Spread is less than allowable OK									*Drainage inlets and design will be in Tremont Roadway Package*								

HNTB

Made by: AHR Date: 8/8/2011
Checked by: BH Date: 8/8/2011

Job Number: 49633
I-90 WB Mainline

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width

MAIN VIADUCT UNIT 2, 3, RAMP A5 FROM HIGH POINT DECK DRAINAGE CALCULATIONS (ODOT 10 YR RAINFALL CHECK FOR INTERIM CONDITION)

LOCATION							GUTTER ANALYSIS									INLET ANALYSIS								
Station	offset (feet)	Side	Area (A) (acres)	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder Width (ft)	Spread (t) (ft)	Inlet Width (w) (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept Flow (E) (cfs)	By-Pass (cfs)	By-Pass %
136+34 - High Point																									
138+11.48 I-90 WB East Bank Basin A	35.00	RT	0.29	0.9	0.265	0.265	10	5.1	1.353	0.0050	0.0200	0.000	1.353	0.180	12.00	8.99	5.00	0.81	1.67	1.33	3.95	1.0	1.198	0.155	11%
										Spread is less than allowable OK															
140+68.75 I-90 WB East Bank Basin B	35.00	RT	0.45	0.9	0.407	0.407	10	5.1	2.078	0.0050	0.0200	0.155	2.233	0.217	12.00	10.85	5.00	1.18	1.90	1.33	3.95	0.980	1.768	0.465	21%
										Spread is less than allowable OK															
141+91.26 I-90 WB East Bank Basin B	35.00	RT	0.22	0.9	0.198	0.198	10	5.1	1.009	0.0050	0.0200	0.465	1.474	0.186	12.00	9.29	5.00	0.86	1.71	1.33	3.95	1.0	1.287	0.187	13%
										Spread is less than allowable OK															
144+18.75 I-90 WB East Bank Basin B	35.00	RT	0.43	0.9	0.386	0.386	10	5.1	1.97	0.0050	0.0200	0.187	2.157	0.214	12.00	10.71	5.00	1.15	1.88	1.33	3.95	1.0	1.755	0.402	19%
										Spread is less than allowable OK															
145+41.42 I-90 WB East Bank Basin B	35.00	RT	0.23	0.9	0.211	0.211	10	5.1	1.078	0.0050	0.0200	0.402	1.480	0.186	12.00	9.30	5.00	0.87	1.71	1.33	3.95	1.0	1.291	0.189	13%
										Spread is less than allowable OK															
147+68.56 I-90 WB East Bank Basin B	35.00	RT	0.48	0.9	0.428	0.428	10	5.1	2.183	0.0050	0.0240	0.189	2.371	0.238	12.00	9.90	5.00	1.18	2.02	1.33	3.95	1.0	2.009	0.363	15%
										Spread is less than allowable OK															
148+91.78 I-90 WB East Bank Basin B	35.00	RT	0.26	0.9	0.238	0.238	10	5.1	1.214	0.0050	0.0370	0.363	1.576	0.240	12.00	6.48	5.00	0.78	2.03	1.33	3.95	1.0	1.546	0.031	2%
										Spread is less than allowable OK															
155+48 I-90 WB	35.00	RT	1.16	0.9	1.046	1.046	10	5.1	5.336	0.0050	0.0400	0.031	5.367	0.391	12.00	9.77	5.00	1.91	2.81	1.33	3.95	1.0	4.576	0.791	15%
										Spread is less than allowable OK															
157+73 I-90 WB	35.00	RT	0.42	0.9	0.374	0.374	10	5.1	1.909	0.0050	0.0400	0.791	2.700	0.302	12.00	7.55	5.00	1.14	2.37	1.33	3.95	1.0	2.551	0.149	6%
										Spread is less than allowable OK															
160+30 I-90 WB	35.00	RT	0.52	0.9	0.464	0.464	10	5.1	2.366	0.0050	0.0400	0.149	2.515	0.294	12.00	7.35	5.00	1.08	2.33	1.33	3.95	1.0	2.395	0.120	5%
										Spread is less than allowable OK															
166+60 I-90 WB	35.00	RT	1.30	0.9	1.174	1.174	10	5.1	5.985	0.0050	0.0400	0.120	6.105	0.410	12.00	10.25	0.00	2.10	2.91	0.00	0.00	0	0.000	6.105	100%
										Spread is less than allowable OK							*Drainage inlets and design will be in Gateway Roadway Package*							
Left Mainline Shoulder																									
High Point ML -136+34																									
145+39.77 720+40.93 I-90WB/ Ramp A5	57.03 6.00	LT RT	0.15	0.9	0.133	0.133	10	5.1	0.679	0.0046	0.0400	0.000	0.679	0.183	6.00	4.57	5.00	0.42	1.62	1.33	3.95	1.0	0.679	0.000	0%
										Spread is less than allowable OK															
718+30 Ramp A5	6.00	RT	0.03	0.9	0.031	0.031	10	5.1	0.157	0.0044	0.0384	0.000	0.157	0.105	6.00	2.74	5.00	0.14	1.09	1.33	3.95	1.0	0.157	0.000	0%
										Spread is less than allowable OK															
718+18.91 Ramp A5	6.00	RT	0.002	0.9	0.002	0.002	10	5.1	0.008	0.0044	0.0384	0.000	0.008	0.034	6.00	0.89	5.00	0.02	0.52	1.33	3.95	1.0	0.008	0.000	0%
										Spread is less than allowable OK															
Low Point Ramp A5-718+18.91																									
718+18.91 Ramp A5	6.00	RT	0.002	0.9	0.002	0.002	10	5.1	0.01	0.0054	0.0384	0.000	0.010	0.036	6.00	0.93	5.00	0.02	0.59	1.33	3.95	1.0	0.010	0.000	0%
										Spread is less than allowable OK															
718+05 Ramp A5	6.00	RT	0.02	0.9	0.015	0.015	10	5.1	0.075	0.0054	0.0384	0.000	0.075	0.077	6.00	1.99	5.00	0.08	0.98	1.33	3.95	1.0	0.075	0.000	0%
										Spread is less than allowable OK															
High Point Ramp A5-716+52.78																									
155+94 709+70 I-90WB/ Ramp A5	87.00 5.00	LT RT	0.06	0.9	0.05	0.05	10	5.1	0.257	0.0040	0.0296	0.000	0.257	0.117	4.00	3.94	5.00	0.23	1.12	1.33	3.95	1.0	0.257	0.000	0%
										Spread is less than allowable OK															
699+23 End of Ramp A5	6.00	RT	0.41	0.9	0.367	0.367	10	5.1	1.872	0.0260	0.0450	0.000	1.872	0.202	6.00	4.49	0.00	0.45	4.12	0.00	0.00	0	0.000	1.872	100%
										Spread is less than allowable OK															
Ramp A5/Mainline Diveded Right Shoulder																									
709+87 155+78 Ramp A5/ I-90WB	36.00 46.00	LT RT	0.51	0.9	0.461	0.461	10	5.1	2.352	0.0044	0.0400	0.000	2.352	0.294	12.00	7.35	5.00	1.08	2.18	1.33	3.95	1.0	2.241	0.112	5%
										Spread is less than allowable OK															
707+61 158+00 Ramp A5/ I-90WB	36.00 50.00	LT RT	0.21	0.9	0.189	0.189	10	5.1	0.964	0.0044	0.0400	0.112	1.076	0.219	12.00	5.48	5.00	0.60	1.79	1.33	3.95	1.0	1.074	0.002	0%
										Spread is less than allowable OK															
705+27 Ramp A5	28.00	LT	0.16	0.9	0.148	0.148	10	5.1	0.752	0.0292	0.0400	0.002	0.754	0.135	4.00	3.37	4.00	0.23	3.33	1.33	3.95	1.0	0.754	0.000	0%
										Spread is less than allowable OK															
703+48 Ramp A5	28.00	LT	0.12	0.9	0.11	0.11	10	5.1	0.56	0.0445	0.0400	0.000	0.560	0.111	4.00	2.78	4.00	0.15	3.62	1.33	3.95	0.950	0.532	0.028	5%
										Spread is less than allowable OK															
699+53 End of Ramp A5	30.00	LT	0.05	0.9	0.047	0.047	10	5.1	0.239	0.0366	0.0467	0.028	0.267	0.093	2.00	1.99	0.00	0.09	2.90	0.00	0.00	0.000	0.000	0.267	100%
										Spread is less than allowable OK							*Drainage inlets and design will be in Gateway Roadway Package*							
Left Mainline Shoulder after Ramp A5																									
609+86 166+83 Ramp A4/ I-90WB	13.00 76.00	RT LT	0.08	0.9	0.071	0.071	10	5.1	0.364	0.0034	0.0338	0.000	0.364	0.144	6.00	4.26	0.00	0.31	1.19	0.00	0.00	0.000	0.000	0.364	100%
										Spread is less than allowable OK							*Drainage inlets and design will be in Gateway Roadway Package*							

HNTB

Made by: AHR Date: 8/8/2011
Checked by: BH Date: 8/8/2011

Job Number: 49633
I-90 WB Mainline

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width + 1/3 adjacent travel lane

MAIN VIADUCT UNIT 2, 3, RAMP A5 FROM HIGH POINT DECK DRAINAGE CALCULATIONS (ODOT 2 YR RAINFALL CHECK FOR BI-DIRECTIONAL CONDITION)

LOCATION										GUTTER ANALYSIS							INLET ANALYSIS								
Station	offset (feet)	Side	Area (A) (acres)	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Allowable Spread (ft)	Spread (t) (ft)	Inlet Width (w) (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept Flow (E) (cfs)	By-Pass (cfs)	By-Pass %
136+34 - High Point																									
138+11.48 I-90 WB	35.00	RT	0.29	0.9	0.262	0.262	10	3.6	0.943	0.0050	0.0200	0.000	0.943	0.157	10.00	7.86	5.00	0.62	1.53	1.33	3.95	1.0	0.880	0.063	7%
										Spread is less than allowable OK														
140+68.75 I-90 WB	35.00	RT	0.46	0.9	0.412	0.412	10	3.6	1.485	0.0050	0.0200	0.063	1.548	0.189	10.00	9.46	5.00	0.89	1.73	1.33	3.95	0.980	1.314	0.235	15%
										Spread is less than allowable OK														
141+91.26 I-90 WB	35.00	RT	0.22	0.9	0.196	0.196	10	3.6	0.706	0.0050	0.0200	0.235	0.940	0.157	10.00	7.85	5.00	0.62	1.53	1.33	3.95	1.0	0.878	0.063	7%
										Spread is less than allowable OK														
144+18.75 I-90 WB	35.00	RT	0.43	0.9	0.386	0.386	10	3.6	1.39	0.0050	0.0200	0.063	1.452	0.185	10.00	9.24	5.00	0.85	1.70	1.33	3.95	1.0	1.271	0.181	12%
										Spread is less than allowable OK														
145+41.24 I-90 WB	35.00	RT	0.24	0.9	0.212	0.212	10	3.6	0.761	0.0050	0.0200	0.181	0.943	0.157	10.00	7.85	5.00	0.62	1.53	1.33	3.95	1.0	0.879	0.063	7%
										Spread is less than allowable OK														
147+68.56 I-90 WB	35.00	RT	0.48	0.9	0.428	0.428	10	3.6	1.541	0.0050	0.0240	0.063	1.604	0.205	10.00	8.55	5.00	0.88	1.83	1.33	3.95	1.0	1.450	0.154	10%
										Spread is less than allowable OK														
148+91.78 I-90 WB	35.00	RT	0.26	0.9	0.235	0.235	10	3.6	0.846	0.0050	0.0370	0.154	1.000	0.202	10.00	5.46	5.00	0.55	1.81	1.33	3.95	1.0	0.998	0.001	0%
										Spread is less than allowable OK														
155+48 I-90 WB	35.00	RT	1.16	0.9	1.046	1.046	10	3.6	3.767	0.0050	0.0400	0.001	3.768	0.342	10.00	8.56	5.00	1.46	2.57	1.33	3.95	1.0	3.407	0.361	10%
										Spread is less than allowable OK														
157+73 I-90 WB	35.00	RT	0.42	0.9	0.374	0.374	10	3.6	1.348	0.0050	0.0400	0.361	1.709	0.255	10.00	6.36	5.00	0.81	2.11	1.33	3.95	1.0	1.681	0.028	2%
										Spread is less than allowable OK														
160+30 I-90 WB	35.00	RT	0.52	0.9	0.464	0.464	10	3.6	1.67	0.0050	0.0400	0.028	1.698	0.254	10.00	6.35	5.00	0.81	2.11	1.33	3.95	1.0	1.671	0.027	2%
										Spread is less than allowable OK														
166+60 I-90 WB	35.00	RT	1.30	0.9	1.174	1.174	10	3.6	4.225	0.0050	0.0400	0.027	4.252	0.358	10.00	8.95	0.00	1.60	2.65	0.00	0.00	0	0.000	4.252	100%
										Spread is less than allowable OK							*Drainage inlets and design will be in Gateway Roadway Package*							
Left Mainline Shoulder																									
High Point ML -136+34																									
145+39.77 720+40.93 I-90WB/ Ramp A5	57.03 6.00	LT RT	0.15	0.9	0.133	0.133	10	3.6	0.48	0.0046	0.0400	0.000	0.480	0.161	6.00	4.02	5.00	0.32	1.49	1.33	3.95	1.0	0.480	0.000	0%
										Spread is less than allowable OK														
718+30 Ramp A5	6.00	RT	0.03	0.9	0.031	0.031	10	3.6	0.111	0.0044	0.0384	0.000	0.111	0.092	6.00	2.40	5.00	0.11	1.00	1.33	3.95	1.0	0.111	0.000	0%
										Spread is less than allowable OK														
718+18.91 Ramp A5	6.00	RT	0.002	0.9	0.002	0.002	10	3.6	0.006	0.0044	0.0384	0.000	0.006	0.030	6.00	0.78	5.00	0.01	0.47	1.33	3.95	1.0	0.006	0.000	0%
										Spread is less than allowable OK														
Low Point Ramp A5-718+18.91																									
718+18.91 Ramp A5	6.00	RT	0.002	0.9	0.002	0.002	10	3.6	0.007	0.0054	0.0384	0.000	0.007	0.031	6.00	0.81	5.00	0.01	0.54	1.33	3.95	1.0	0.007	0.000	0%
										Spread is less than allowable OK														
718+05 Ramp A5	6.00	RT	0.02	0.9	0.015	0.015	10	3.6	0.053	0.0054	0.0384	0.000	0.053	0.067	6.00	1.75	5.00	0.06	0.90	1.33	3.95	1.0	0.053	0.000	0%
										Spread is less than allowable OK														
High Point Ramp A5-716+52.78																									
155+94 709+70 I-90WB/ Ramp A5	87.00 5.00	LT RT	0.06	0.9	0.05	0.05	10	3.6	0.181	0.0040	0.0296	0.000	0.181	0.102	4.00	3.46	5.00	0.18	1.03	1.33	3.95	1.0	0.181	0.000	0%
										Spread is less than allowable OK														
699+23 End of Ramp A5	6.00	RT	0.41	0.9	0.367	0.367	10	3.6	1.321	0.0260	0.0450	0.000	1.321	0.177	6.00	3.94	0.00	0.35	3.78	0.00	0.00	0	0.000	1.321	100%
										Spread is less than allowable OK							*Drainage inlets and design will be in Gateway Roadway Package*							
Ramp A5/Mainline Diveded Right Shoulder																									
709+87 155+78 Ramp A5/ I-90WB	36.00 46.00	LT RT	0.51	0.9	0.461	0.461	10	3.6	1.661	0.0044	0.0400	0.000	1.661	0.258	12.00	6.45	5.00	0.83	2.00	1.33	3.95	1.0	1.630	0.031	2%
										Spread is less than allowable OK														
707+61 158+00 Ramp A5/ I-90WB	36.00 50.00	LT RT	0.21	0.9	0.189	0.189	10	3.6	0.681	0.0044	0.0400	0.031	0.711	0.188	12.00	4.69	5.00	0.44	1.61	1.33	3.95	1.0	0.711	0.000	0%
										Spread is less than allowable OK														
705+27 Ramp A5	28.00	LT	0.16	0.9	0.148	0.148	10	3.6	0.531	0.0292	0.0400	0.000	0.531	0.118	4.00	2.95	4.00	0.17	3.05	1.33	3.95	1.0	0.531	0.000	0%
										Spread is less than allowable OK														
703+48 Ramp A5	28.00	LT	0.12	0.9	0.11	0.11	10	3.6	0.395	0.0445	0.0400	0.000	0.395	0.098	4.00	2.44	4.00	0.12	3.31	1.33	3.95	0.950	0.376	0.020	5%
										Spread is less than allowable OK														
699+53 End of Ramp A5	30.00	LT	0.05	0.9	0.047	0.047	10	3.6	0.169	0.0366	0.0467	0.020	0.189	0.081	2.00	1.74	0.00	0.07	2.66	0.00	0.00	0.000	0.000	0.189	100%
										Spread is less than allowable OK							*Drainage inlets and design will be in Gateway Roadway Package*							
Left Mainline Shoulder after Ramp A5																									
609+86 166+83 Ramp A4/ I-90WB	13.00 76.00	RT LT	0.08	0.9	0.071	0.071	10	3.6	0.257	0.0034	0.0338	0.000	0.257	0.126	6.00	3.74	0.00	0.24	1.09	0.00	0.00	0.000	0.000	0.257	100%
										Spread is less than allowable OK							*Drainage inlets and design will be in Gateway Roadway Package*							

Chapter 8 : HEC 12
Interception Capacity of Inlets in Sag Locations

Go to Chapter 9

Inlets in sag locations operate as weirs under low head conditions and as orifices at greater depths. Orifice flow begins at depths dependent on the grate size, the curb opening height, or the slot width of the inlet, as the case may be. At depths between those at which weir flow definitely prevails and those at which orifice flow prevails, flow is in a transition stage. At these depths, control is ill-defined and flow may fluctuate between weir and orifice control. Design procedures adopted for this Circular are based on a conservative approach to estimating the capacity of inlets in sump locations.

The efficiency of inlets in passing debris is critical in sag locations because all runoff which enters the sag must be passed through the inlet. Total or partial clogging of inlets in these locations can result in hazardous ponded conditions. Grate inlets alone are not recommended for use in sag locations because of the tendencies of grates to become clogged. Combination inlets or curb-opening inlets are recommended for use in these locations.

8.1 Grate Inlets

A grate inlet in a sag location operates as a weir to depths dependent on the bar configuration and size of the grate and as an orifice at greater depths. Grates of larger dimension and grates with more open area, i.e., with less space occupied by lateral and longitudinal bars, will operate as weirs to greater depths than smaller grates or grates with less open area.

The capacity of grate inlets operating as weirs is:

$$Q_i = C_w P d^{1.5}$$

Q10 = 0.018cfs
Cw = 3.0
P = (5ftx1ft Grate) = 12
d = 0.0063ft
Spread = 0.16ft with 3.84% cross slope

where: P = perimeter of the grate in ft (m) disregarding bars and the side against the curb
C_w = 3.0 (1.66 for Sl)

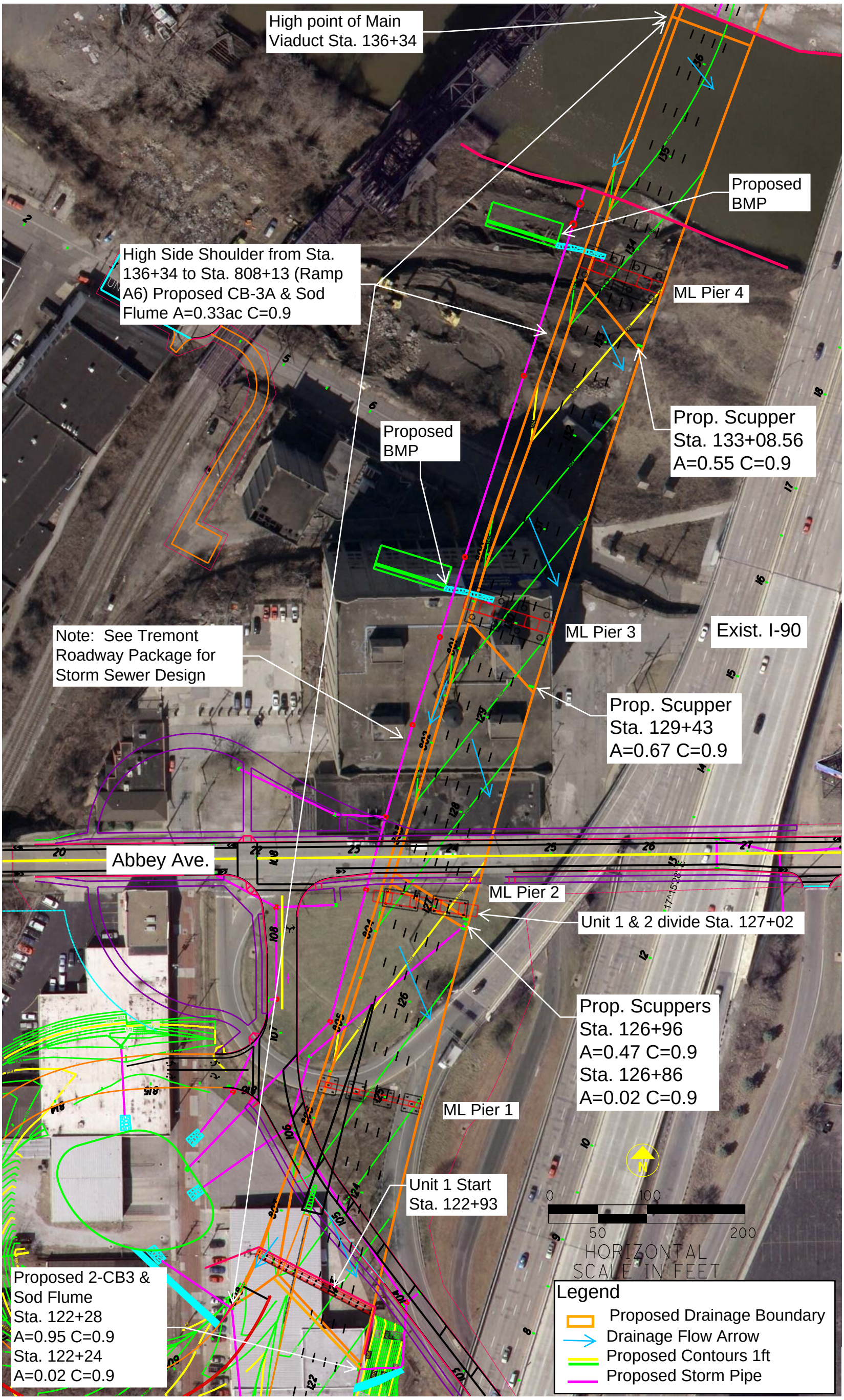
The capacity of a grate inlet operating as an orifice is:

$$Q_i = C_o A(2gd)^{0.5} \qquad (18)$$

where: C_o = orifice coefficient
= 0.67
A = clear opening area of the grate, ft^2 (m^2)
g = 32.16 ft/s^2 (9.80 m/s^2)

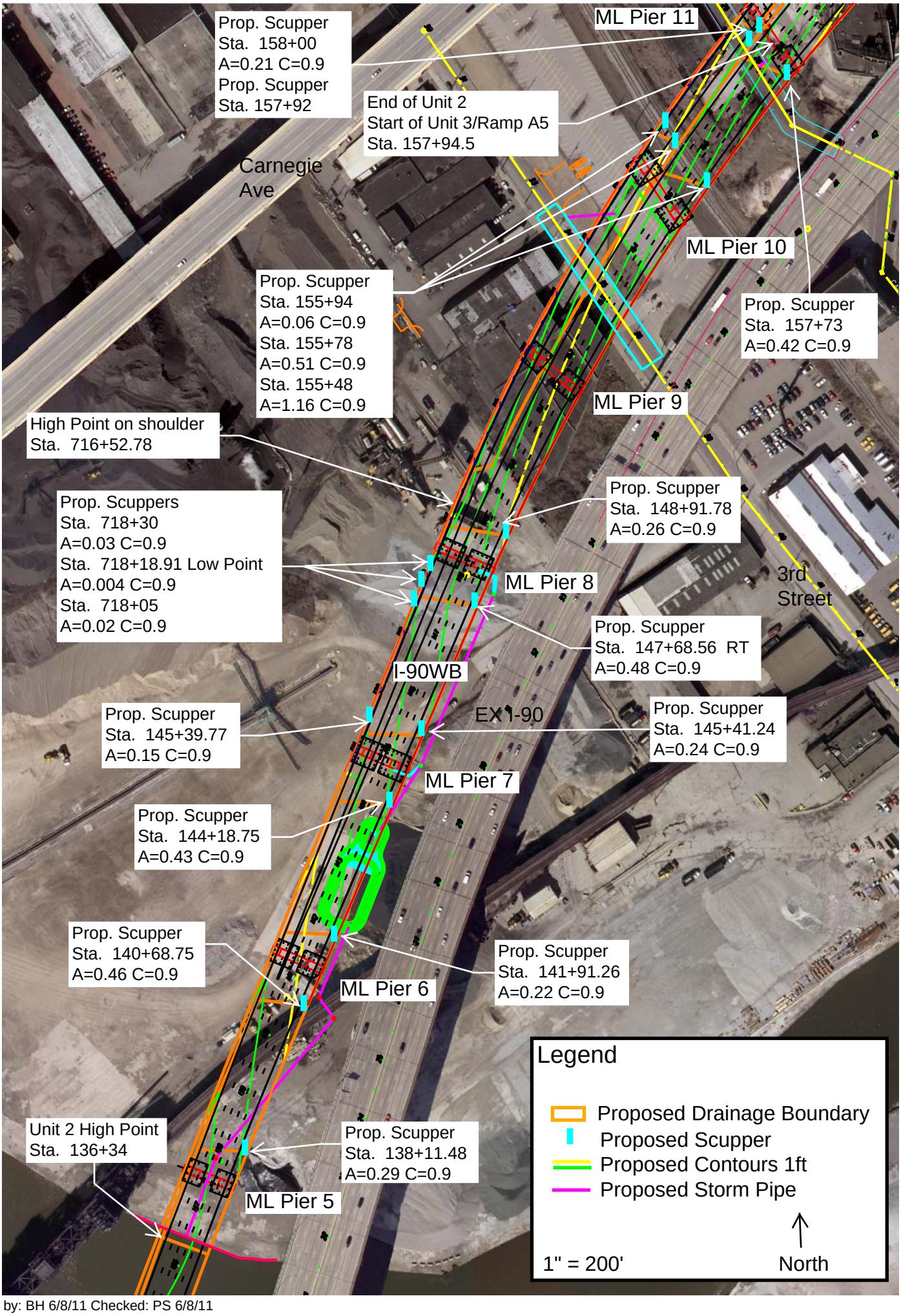
Use of Equation (18) requires the clear area of opening of the grate. Tests of three grates for the Federal

Unit 1 & 2 Proposed Drainage Map
to Sta. 136+34



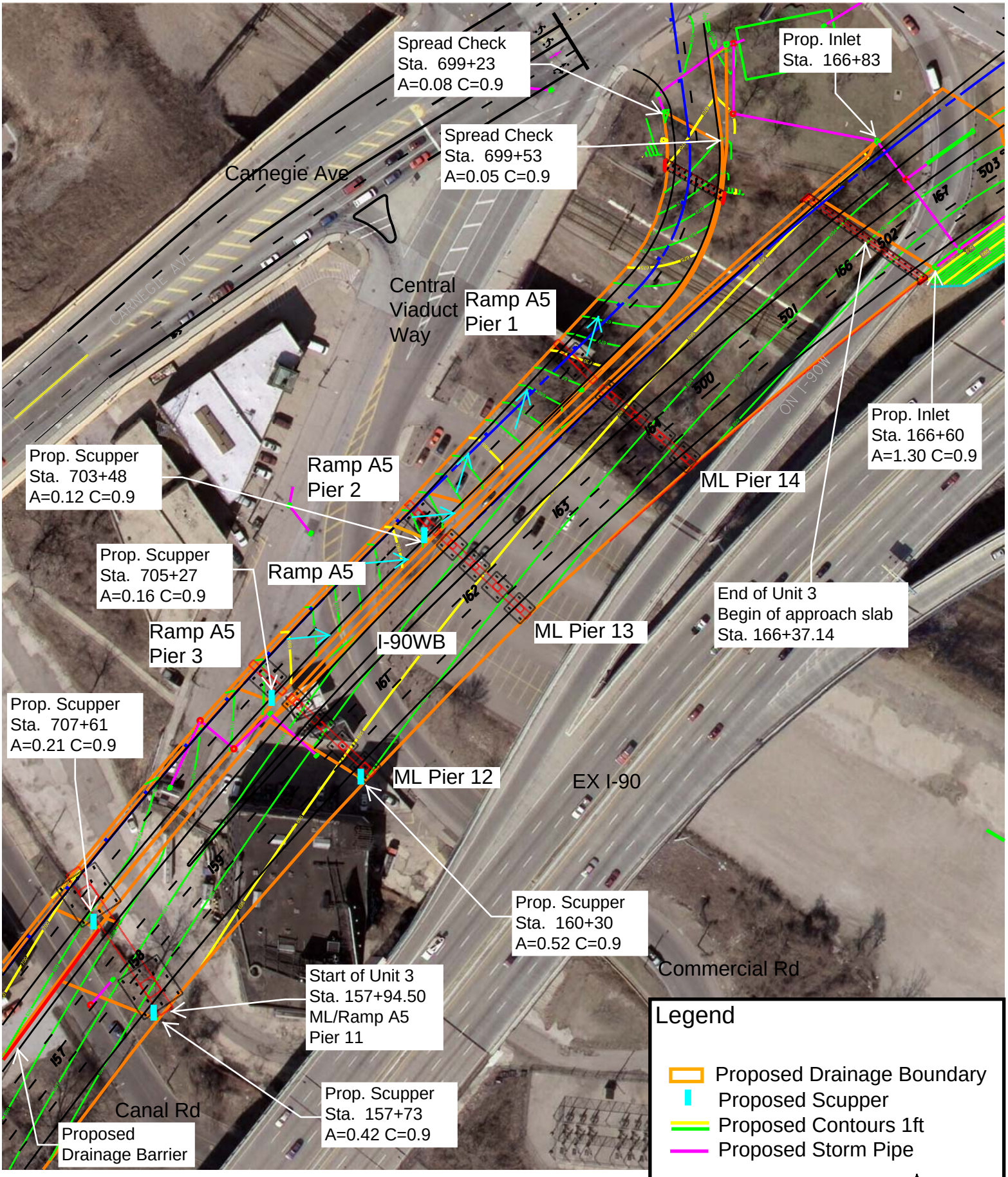
By: BH 6/8/2011
Checked: PS 6/8/2011

Unit 2 Proposed Drainage Map



by: BH 6/8/11 Checked: PS 6/8/11

Unit 3 & Ramp A5 Proposed Drainage Map



by: BH 6/8/11 Checked: PS 6/8/11

APPENDIX K

For information only. Calculations have been RFC'd already.

Roadway Partial Gateway (Resurfacing BL-778-12) – Drainage Calculations

Drainage calculations can be found in the following buildable units:
Bridge drainage (including spread calc for D-21) BU - RFC plans:

- 1240-Bridges 7 & 8
- 1260-Bridge 9
- 1270-Bridge 10/11

Roadway BU – Interim Plans (include SS calc for D-21):

- 1500-Wall I / A3

The drainage calculations for bridges 7, 8, 9, 10, 11, and 12 are located in the aforementioned documents and additional calculations are summarized below. A drainage divide is located on Bridge 9 at Sta. 67+27 and water travels downstream to Bridge 7 and 8 and downstream to Bridges 10, 11, and 12. Bridge 7 and 8 are located at ~Sta. 61+00 and Bridge 10, 11, and 12 are located at ~Sta. 70+50. Drainage calculations for Bridges 7-12 (previously calculated) and a drainage area map are provided. In summary, the bridge drainage for this resurfacing/redecking portion of Gateway, has no adverse impact to existing spread calculations

Westbound Drainage

Bridge 9 downstream to Bridges 7
A closed drainage system exists along the median between bridge 9 and 7 west bound lanes. A crown exists at the edge of pavement/start of median shoulder. Three curb openings (Sta. 64+00, 63+02, and 62+28) are exposed along the median and all flow is intercepted by these openings since the drainage area is small and the curb opening length required to intercept all flow is less than the actual length (see attached hand calc). A reverse vertical curve exists on Bridge 7 and five scuppers are proposed to capture flow after this transition along bridge 7 median (Sta. 60+05, 59+89, 59+30, and 58+98). The traveled lanes all direct flow to the shoulder. A CB-3A is proposed beyond Bridge 9 shoulder (Sta. 64+74) and a sodded flume beyond bridge 7 shoulder (Sta. 58+38). The proposed spread exceeds into the traveled way for the 10-yr storm by as much as 0.58 ft on bridge 7.

Bridge 9 downstream to Bridges 10, 11, and 12
Water travels from the median to the shoulder; no crown exists although curb openings are exposed (Sta. 69+53 and 70+57). On Bridge 11, water travels from the median into 4 proposed scuppers on its shoulder (Sta. 72+66, 72+71, 72+76, and 72+81). Bypass from these scuppers travels onto Bridge 10. Bridge 10 contains a drainage divide and water travels westward and eastward. The eastward flow (and Bridge 11 bypass) is captured in two proposed scuppers (Sta. 73+82 and 73+88). The bypass from these scuppers is conveyed down a flume located some distance beyond it. Bridge 9 shoulder drainage is conveyed down a flume (Sta. 68+98). Allowable spread is not exceeded using the 10-yr design criteria.

Eastbound Drainage

Bridge 9 downstream to Bridges 7

A closed drainage system exists along the median between bridge 9 and 7 west bound lanes. No crown exists and water travels from the shoulder to the median. Three scuppers are proposed on bridge 9 (Sta. 66+22, 65+91, and 65+17). Three inlets (Sta. 64+00, 63+02, and 62+28) are exposed along the median downstream of the scuppers and flow is intercepted by each using its 10 ft curb opening and assuming the grate is a factor of safety only. The attached CDSS calculations begin by taking the flows as calculated from the bridge scupper runoff spreadsheet plus the drainage area to inlet at Sta. 64+00. CDSS then calculates the spread at each inlet. For the 10-yr storm, existing/proposed spread is 3.69/3.81, 4.76/4.76, and 5.37/5.37 ft for inlets at Sta. 64+00, 63+02, and 62+28, respectively. As shown in the calculations and summarized, the existing problem is the spacing of the inlets downstream of the bridge since the resurfacing didn't change the drainage areas and proposed spreads at these inlets are essentially identical; from each inlet essentially no bypass is conveyed to the next downstream inlet.

Additionally, the spread at inlet Sta. 64+00 was provided in the bridge 9 drainage report and the two inlets downstream, at Sta. 63+02 and 62+28, convey no bypass to bridge 7 and hence were not included in the bridge 7 and 8 drainage report.

A crown shift occurs on Bridge 8 and bypass from 62+28 travels across bridge 8 and into the proposed CB3A inlets (Sta. 58+59 and 58+51). These proposed inlets downstream of Bridge 8 also capture bi-directional flow from Bridge 7.

Bridge 9 downstream to Bridges 10, 11, and 12

A closed drainage system exists along the median between bridge 9 and 7 west bound lanes. No crown exists and water travels from the shoulder to the median. Two curb opening inlets (Sta. 69+53 and 70+57) are exposed along the median downstream of bridge 9 and flow is intercepted by each. Downstream of these inlets on Bridge 12, two scuppers are proposed (Sta. 70+95 and 71+40). A crown shift occurs on Bridge 12 and bypass from these scuppers travels across Bridge 12 into the two proposed inlets (Sta. 74+31 and 74+38). Bridge 9 shoulder drainage is conveyed down a flume (Sta. 68+18). Proposed spread exceeds into the traveled way for the 10-yr storm by as much as 0.39 ft for the proposed scupper on bridge 12 at Sta. 70+95.

Relaxed Drainage Spread Criteria

The design frequency of bridge deck drainage in the Scope of Work (14.2.4) and the L&D states the 10-year event for the Interim and Future condition and a 2 year event for the Bi-Directional Condition be used in the design. For the I-90 bridges, designated by BL-7, 8, 9, 10, 11, and 12, the project scope has these structures, being redecked, with no change in deck width. After evaluating the existing shoulder widths, there was a concern that they are deficient to today's standards. With these shoulder widths, the proposed spread criteria for the project will not be able to be met, without introducing numerous scuppers on the structures. Also, when Innerbelt Contract CCG-3 is constructed these structures and adjacent pavement will no longer exist. After discussions with ODOT and HDR, it was determined that drainage criteria on these structures, be evaluated on a case by case basis. We recommended and used the 2-year storm for the design frequency in spread analysis. That requirement is to confine the 2-year

design storm to the Bi-Directional and Interim Condition shoulder width, and use the 10-yr storm as a check to limit the extent to which spread exceeds the shoulder width.

Utilizing this criteria, when the 10-year spread criteria could be met it was reported, however if it could not be met, the extent to which it extended into the traveled way was reported and approved by HDR and ODOT. The Bridge drainage documents stated this relaxed criteria and serve as documentation.

HNTB

Made by: PNS Date: 8/15/2011
Checked by: BH Date: 8/15/2011
Job Number: 49633

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width for ultimate condition or shoulder width plus 1/3 traveled lane for Interim, whichever is greater.

WB DRAINAGE CALCULATIONS (ODOT 10 YR RAINFALL CHECK FOR INTERIM & FUTURE CONDITION)

LOCATION							GUTTER ANALYSIS											INLET ANALYSIS					
Station	offset (feet)	Side	Area (A) Side	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder width (ft)	Spread (ft)	scupper or inlet width (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept low (E) (cf	By-Pass (cfs)	By-Pass %
WB/EB existing inlet Sta. 64+00 median	3.00	RT	0.007	0.9	0.006	0.006	10	5.1	0.031	0.0163	0.0200	0.000	0.031	0.035	3.50	1.75	0.00	0.03	1.01	3.00	0.00	0.000	0.031	0.000	0%
							Spread is less than allowable OK										*See hand calc showing Lt less than curb opening length*							
WB/EB existing inlet Sta. 63+02 median	3.00	RT	0.007	0.9	0.006	0.006	10	5.1	0.033	0.0127	0.0200	0.000	0.033	0.037	3.50	1.87	0.00	0.04	0.93	3.00	0.00	0.000	0.033	0.000	0%
							Spread is less than allowable OK										*See hand calc showing Lt less than curb opening length*							
WB/EB existing inlet Sta. 62+28 median	3.00	RT	0.005	0.9	0.004	0.004	10	5.1	0.021	0.0127	0.0166	0.000	0.021	0.029	3.50	1.77	0.00	0.03	0.79	3.00	0.00	0.000	0.021	0.000	0%
							Spread is less than allowable OK										*See hand calc showing Lt less than curb opening length*							
WB 60+05 poposed scupper median	7.00	LT	0.024	0.9	0.022	0.0216	10	5.1	0.11	0.0132	0.0099	0.000	0.110	0.045	4.00	4.55	1.50	0.10	1.07	0.50	2.00	1.0	0.072	0.038	34%
							Spread is greater than allowable NO GOOD																		
WB 59+89 poposed scupper median	7.00	LT	0.028	0.9	0.025	0.0252	10	5.1	0.129	0.0132	0.0126	0.038	0.166	0.058	4.00	4.57	1.50	0.13	1.27	0.50	2.00	1.0	0.109	0.057	35%
							Spread is greater than allowable NO GOOD																		
WB 59+30 poposed scupper median	7.00	LT	0.0604	0.9	0.054	0.0544	10	5.1	0.277	0.0134	0.0190	0.057	0.335	0.087	4.00	4.58	1.50	0.20	1.68	0.50	2.00	1.0	0.219	0.116	35%
							Spread is greater than allowable NO GOOD																		
WB 58+98 poposed scupper median	7.00	LT	0.076	0.9	0.068	0.0684	10	5.1	0.349	0.0137	0.0230	0.116	0.465	0.105	4.00	4.57	1.50	0.24	1.93	0.50	2.00	1.0	0.304	0.161	35%
							Spread is greater than allowable NO GOOD																		
WB proposed CB3A Inlet Sta. 64+74 shoulder	52.00	LT	0.230	0.9	0.207	0.207	10	5.1	1.056	0.0188	0.0300	0.000	1.056	0.096	11.00	4.96	1.41	0.24	3.20	2.42	5.50	1.000	0.623	0.432	41%
							Spread is less than allowable OK										Area past inlet (acres) =	0.02		I (in/hr) =	5.1			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.018	Q =	0.092	< 0.75?
																					Total Q to flume =		0.524	Y	
WB 58+38 proposed sod flume shoulder	57.00	LT	0.1235	0.9	0.111	0.1112	10	5.1	0.567	0.0137	0.0420	0.000	0.567	0.142	4.00	3.38	0.00	0.24	2.36	0.00	5.00	0.000	0.000	0.567	100%
							Spread is less than allowable OK										Area past scupper (acres) =	0.00		I (in/hr) =	5.10			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.000	Q =	0.567	< 0.75?
																					Total Q to flume =		0.567	Y	
Drainage Divide Sta. 67+27																									
WB/EB existing inlet Sta. 69+53 median	3.00	RT	0	0.9	0	0.000	10	5.1	0	0.0170	0.0428	0.000	0.000	0.090	3.50	0.00	2.50	0.00	2.10	3.00	5.00	0.00	0.000	0.000	#DIV/0!
							Spread is less than allowable OK																		
WB/EB existing inlet Sta. 70+57 median	3.00	RT	0	0.9	0	0.000	10	5.1	0	0.0170	0.0428	0.000	0.000	0.090	3.50	0.00	2.50	0.00	2.10	3.00	5.00	0.00	0.000	0.000	#DIV/0!
							Spread is less than allowable OK																		
72+66 proposed scupper shoulder	22.00	LT	0.23	0.9	0.209	0.2093	10	5.1	1.068	0.0360	0.0160	0.000	1.068	0.105	8.30	6.54	1.50	0.34	3.12	0.50	2.00	0.905	0.484	0.583	55%
							Spread is less than allowable OK																		
72+71 proposed scupper shoulder	22.00	LT	0.01	0.9	0.007	0.0072	10	5.1	0.037	0.0360	0.0160	0.583	0.620	0.085	8.30	5.33	1.50	0.23	2.72	0.50	2.00	0.925	0.336	0.284	46%
							Spread is less than allowable OK																		
72+76 proposed scupper shoulder	22.00	LT	0.01	0.9	0.007	0.0072	10	5.1	0.037	0.0360	0.0160	0.284	0.321	0.067	8.30	4.17	1.50	0.14	2.31	0.50	2.00	0.970	0.217	0.104	32%
							Spread is less than allowable OK																		
72+81 proposed scupper shoulder	22.00	LT	0.01	0.9	0.007	0.0072	10	5.1	0.037	0.0360	0.0160	0.104	0.141	0.049	8.30	3.06	1.50	0.08	1.88	0.50	2.00	1.0	0.117	0.023	17%
							Spread is less than allowable OK																		
73+82 proposed scupper shoulder	52.00	LT	0.22	0.9	0.194	0.1935	10	5.1	0.987	0.0348	0.0160	0.023	1.010	0.103	9.50	6.45	1.50	0.33	3.04	0.50	2.00	0.903	0.463	0.548	54%
							Spread is less than allowable OK																		
73+88 proposed scupper shoulder	52.00	LT	0.02	0.9	0.018	0.018	10	5.1	0.092	0.0348	0.0160	0.548	0.639	0.087	9.50	5.43	1.50	0.24	2.71	0.50	2.00	0.921	0.340	0.299	47%
							Spread is less than allowable OK										Area past scupper (acres) =	0.09		I (in/hr) =	5.10			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.081	Q =	0.413	< 0.75?
																					Total Q to flume =		0.712	Y	
WB End of Bridge Sta. 68+98 shoulder	52.00	LT	0.160	0.9	0.144	0.144	10	5.1	0.734	0.0144	0.0300	0.000	0.734	0.084	11.00	4.55	0.00	0.19	2.80	0.00	5.00	0.000	0.000	0.734	100%
							Spread is less than allowable OK										Area past bridge (acres) =	0.00		I (in/hr) =	5.1			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.000	Q =	0.000	< 0.75?
																					Total Q to flume =		0.734	Y	

HNTB

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Job Number: 49633

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width for ultimate condition or shoulder width plus 1/3 traveled lane for Interim, whichever is greater.

WB DRAINAGE CALCULATIONS (ODOT 2 YR RAINFALL CHECK FOR INTERIM & FUTURE CONDITION)

LOCATION										GUTTER ANALYSIS									INLET ANALYSIS					
Station	offset (feet)	Side	Area (A) Side	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder width + 1/3 traveled way (ft)	Spread (ft)	scupper or inlet width (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept low (E) (cf	By-Pass (cfs)	By-Pass %
WB/EB existing inlet Sta. 64+00 median	3.00	RT	0.007	0.9	0.006	0.006	10	3.6	0.022	0.0163	0.0200	0.000	0.022	0.031	15.70	1.53	0.00	0.02	0.92	3.00	0.00	0.000	0.022	0.000	0%
							Spread is less than allowable OK										*See hand calc showing Lt less than curb opening length*							
WB/EB existing inlet Sta. 63+02 median	3.00	RT	0.007	0.9	0.006	0.006	10	3.6	0.023	0.0127	0.0200	0.000	0.023	0.033	15.70	1.64	0.00	0.03	0.85	3.00	0.00	0.000	0.023	0.000	0%
							Spread is less than allowable OK										*See hand calc showing Lt less than curb opening length*							
WB/EB existing inlet Sta. 62+28 median	3.00	RT	0.005	0.9	0.004	0.004	10	3.6	0.015	0.0127	0.0166	0.000	0.015	0.026	15.70	1.56	0.00	0.02	0.73	3.00	0.00	0.000	0.015	0.000	0%
							Spread is less than allowable OK										*See hand calc showing Lt less than curb opening length*							
WB 60+05 poposed scupper median	7.00	LT	0.024	0.9	0.022	0.0216	10	3.6	0.078	0.0132	0.0099	0.000	0.078	0.040	7.70	3.99	1.50	0.08	0.98	0.50	2.00	1.0	0.056	0.022	28%
							Spread is less than allowable OK																	
WB 59+89 poposed scupper median	7.00	LT	0.028	0.9	0.025	0.0252	10	3.6	0.091	0.0132	0.0126	0.022	0.113	0.050	7.70	3.95	1.50	0.10	1.15	0.50	2.00	1.0	0.081	0.031	28%
							Spread is less than allowable OK																	
WB 59+30 poposed scupper median	7.00	LT	0.0604	0.9	0.054	0.0544	10	3.6	0.196	0.0134	0.0190	0.031	0.227	0.075	7.70	3.96	1.50	0.15	1.53	0.50	2.00	1.0	0.164	0.064	28%
							Spread is less than allowable OK																	
WB 58+98 poposed scupper median	7.00	LT	0.076	0.9	0.068	0.0684	10	3.6	0.246	0.0137	0.0230	0.064	0.310	0.090	7.70	3.93	1.50	0.18	1.75	0.50	2.00	1.0	0.224	0.086	28%
							Spread is less than allowable OK																	
WB proposed CB3A Inlet Sta. 64+74 shoulder	52.00	LT	0.230	0.9	0.207	0.207	10	3.6	0.745	0.0188	0.0300	0.000	0.745	0.096	16.70	4.36	1.41	0.21	3.20	2.42	5.50	1.000	0.483	0.262	35%
							Spread is less than allowable OK										Area past inlet (acres) =	0.02		I (in/hr) =	5.1			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.018	Q =	0.092	< 0.75?
																						Total Q to flume =	0.354	Y
WB 58+38 proposed sod flume shoulder	57.00	LT	0.1235	0.9	0.111	0.1112	10	3.6	0.400	0.0137	0.0420	0.000	0.400	0.125	4.00	2.97	0.00	0.18	2.17	0.00	5.00	0.000	0.000	0.400	100%
							Spread is less than allowable OK										Area past scupper (acres) =	0.00		I (in/hr) =	5.10			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.000	Q =	0.400	< 0.75?
																						Total Q to flume =	0.400	Y
Drainage Divide Sta. 67+27																									
WB/EB existing inlet Sta. 69+53 median	3.00	RT	0	0.9	0	0.000	10	3.6	0	0.0170	0.0428	0.000	0.000	0.090	10.70	0.00	2.50	0.00	2.10	3.00	5.00	0.00	0.000	0.000	#DIV/0!
							Spread is less than allowable OK																	
WB/EB existing inlet Sta. 70+57 median	3.00	RT	0	0.9	0	0.000	10	3.6	0	0.0170	0.0428	0.000	0.000	0.090	9.20	0.00	2.50	0.00	2.10	3.00	5.00	0.00	0.000	0.000	#DIV/0!
							Spread is less than allowable OK																	
72+66 proposed scupper shoulder	22.00	LT	0.23	0.9	0.209	0.2093	10	3.6	0.754	0.0360	0.0160	0.000	0.754	0.092	24.70	5.74	1.50	0.26	2.86	0.50	2.00	0.905	0.378	0.375	50%
							Spread is less than allowable OK																	
72+71 proposed scupper shoulder	22.00	LT	0.01	0.9	0.007	0.0072	10	3.6	0.026	0.0360	0.0160	0.375	0.401	0.073	24.70	4.53	1.50	0.16	2.44	0.50	2.00	0.925	0.244	0.157	39%
							Spread is less than allowable OK																	
72+76 proposed scupper shoulder	22.00	LT	0.01	0.9	0.007	0.0072	10	3.6	0.026	0.0360	0.0160	0.157	0.183	0.054	24.70	3.38	1.50	0.09	2.01	0.50	2.00	0.970	0.140	0.042	23%
							Spread is less than allowable OK																	
72+81 proposed scupper shoulder	22.00	LT	0.01	0.9	0.007	0.0072	10	3.6	0.026	0.0360	0.0160	0.042	0.068	0.037	24.70	2.34	1.50	0.04	1.57	0.50	2.00	1.0	0.064	0.004	6%
							Spread is less than allowable OK																	
73+82 proposed scupper shoulder	52.00	LT	0.22	0.9	0.194	0.1935	10	3.6	0.697	0.0348	0.0160	0.004	0.701	0.090	11.70	5.62	1.50	0.25	2.77	0.50	2.00	0.903	0.357	0.344	49%
							Spread is less than allowable OK																	
73+88 proposed scupper shoulder	52.00	LT	0.02	0.9	0.018	0.018	10	3.6	0.065	0.0348	0.0160	0.344	0.409	0.074	11.70	4.59	1.50	0.17	2.42	0.50	2.00	0.921	0.246	0.163	40%
							Spread is less than allowable OK										Area past scupper (acres) =	0.09		I (in/hr) =	5.10			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.081	Q =	0.413	< 0.75?
																						Total Q to flume =	0.577	Y
WB End of Bridge Sta. 68+98 shoulder	52.00	LT	0.160	0.9	0.144	0.144	10	3.6	0.518	0.0144	0.0300	0.000	0.518	0.084	11.70	4.00	0.00	0.17	2.80	0.00	5.00	0.000	0.000	0.518	100%
							Spread is less than allowable OK										Area past bridge (acres) =	0.00		I (in/hr) =	5.1			Is Q to flume
																	Runoff Coeff. (C) =	0.90		CA =	0.000	Q =	0.000	< 0.75?
																						Total Q to flume =	0.518	Y

HNTB | Made by: PNS | Date: 8/17/2011 | Checked by: BH | Date: 8/17/2011

Job Number: 49633

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width for ultimate condition or shoulder width plus 1/3 traveled lane for Interim, whichever is greater.

EB DRAINAGE CALCULATIONS (ODOT 10 YR RAINFALL CHECK FOR INTERIM & FUTURE CONDITION) using L&D Manual, Vol 2 guidance. 1103.6.2

LOCATION							GUTTER ANALYSIS											INLET ANALYSIS					
Station	offset (feet)	Side	Area (A) Side	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder width (ft)	Spread (ft)	scupper or inlet width (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept low (E) (cfs	By-Pass (cfs)	By-Pass %
EB poposed scupper median Sta. 66+22	3.00	RT	0.090	0.9	0.081	0.081	10	5.1	0.413	0.0108	0.0300	0.000	0.413	0.116	3.50	3.87	1.83	0.23	1.84	0.50	2.00	1.0	0.338	0.075	18%
							Spread is greater than allowable NO GOOD																		
EB Bridge 9 poposed scupper median Sta. 65+91	3.00	RT	0.032	0.9	0.028	0.028	10	5.1	0.145	0.0132	0.0300	0.075	0.219	0.088	3.50	2.94	1.83	0.13	1.69	0.50	2.00	1.0	0.203	0.016	7%
							Spread is less than allowable OK																		
EB Bridge 9 poposed scupper median Sta. 65+17	3.00	RT	0.072	0.9	0.065	0.065	10	5.1	0.33	0.0188	0.0300	0.016	0.347	0.098	3.50	3.27	1.83	0.16	2.16	0.50	2.00	0.960	0.296	0.051	15%
							Spread is less than allowable OK																		
WB/EB existing inlet Sta. 64+00 median	3.00	RT	0.098	0.9	0.088	0.088	10	5.1	0.45	0.0163	0.0300	0.051	0.501	0.116	3.50	3.86	2.50	0.22	2.25	3.00	5.00	1.000	0.470	0.031	6%
							Spread is greater than allowable NO GOOD																		
WB/EB existing inlet Sta. 63+02 median	3.00	RT	0.101	0.9	0.091	0.091	10	5.1	0.464	0.0127	0.0200	0.031	0.494	0.104	3.50	5.18	2.50	0.27	1.84	3.00	5.00	1.000	0.409	0.085	17%
							Spread is greater than allowable NO GOOD																		
WB/EB existing inlet Sta. 62+28 median	3.00	RT	0.086	0.9	0.077	0.077	10	5.1	0.394	0.0127	0.0160	0.085	0.479	0.094	3.50	5.89	2.50	0.28	1.73	3.00	5.00	1.000	0.370	0.110	23%
							Spread is greater than allowable NO GOOD																		
EB Bridge 9 spread checkpoint Shoulder Sta. 65+18	51.00	RT	0.049	0.9	0.044	0.044	10	5.1	0.224	0.0188	0.0400	0.000	0.224	0.093	10.00	2.32	0.00	0.11	2.08	0.00	2.00	0	0.000	0.224	100%
							Spread is less than allowable OK											Area past checkpoint (acres) =		0.01	I (in/hr) =	5.1			Is Q to flume
																		Runoff Coeff. (C) =		0.90	CA =	0.009	Q =	0.046	< 0.75?
																						Total Q to flume =		0.270	Y
EB 58+97 spread checkpoint shoulder	62.00	RT	0.4098	0.9	0.369	0.3688	10	5.1	1.881	0.0154	0.0300	0.110	1.991	0.196	9.50	6.53	0.00	0.64	3.11	0.00	2.00	0.000	0.000	1.991	100%
							Spread is less than allowable OK																		
EB 58+59 proposed CB3A Inlet shoulder	63.00	RT	0.054	0.9	0.049	0.049	10	5.1	0.247	0.0110	0.0280	1.991	2.238	0.213	9.50	7.59	1.41	0.81	2.77	2.42	5.50	1.000	0.945	1.293	58%
							Spread is less than allowable OK																		
EB 58+51 proposed CB3A Inlet shoulder	63.00	RT	0.012	0.9	0.011	0.011	10	5.1	0.056	0.0110	0.0280	1.293	1.349	0.176	9.50	6.28	1.41	0.55	2.44	2.42	5.50	1.000	0.665	0.684	51%
							Spread is less than allowable OK											Area past scupper (acres) =		0.01	I (in/hr) =	5.10			Is Q to flume
																		Runoff Coeff. (C) =		0.90	CA =	0.011	Q =	0.056	< 0.75?
																						Total Q to flume =		0.741	Y
Drainage Divide Sta. 67+27																									
WB/EB existing inlet Sta. 69+53 median	3.00	RT	0.200	0.9	0.18	0.180	10	5.1	0.918	0.0170	0.0428	0.000	0.918	0.137	3.50	3.84	1.50	0.26	3.20	3.00	5.00	1.00	0.673	0.245	27%
							Spread is greater than allowable NO GOOD																		
WB/EB existing inlet Sta. 70+57 median	3.00	RT	0.075	0.9	0.067	0.067	10	5.1	0.342	0.0170	0.0428	0.245	0.588	0.090	3.50	3.25	1.50	0.15	2.10	3.00	5.00	1.00	0.475	0.113	19%
							Spread is less than allowable OK																		
EB 70+95 proposed scupper median	3.00	RT	0.040	0.90	0.036	0.036	10	5.1	0.182	0.0360	0.0170	0.113	0.295	0.066	3.50	3.89	1.50	0.13	2.29	0.50	2.00	0.98	0.210	0.084	29%
							Spread is greater than allowable NO GOOD																		
EB 71+40 proposed scupper median	3.00	RT	0.031	0.90	0.027	0.027	10	5.1	0.14	0.0360	0.0170	0.084	0.224	0.060	3.50	3.51	1.50	0.10	2.14	0.50	2.00	0.98	0.170	0.054	24%
							Spread is greater than allowable NO GOOD																		
							Bypass flow travels across bridge to proposed inlets off right side of bridge.																		
EB 74+30.85 Proposed CB3A Inlet shoulder	73.00	RT	0.447	0.90	0.402	0.402	10	5.1	2.052	0.0360	0.0375	0.054	2.106	0.186	15.00	4.95	1.41	0.46	4.58	2.42	5.50	1.000	1.246	0.860	41%
							Spread is less than allowable OK																		
EB 74+37.85 Proposed CB3A Inlet shoulder	73.00	RT	0.030	0.90	0.027	0.027	10	5.1	0.138	0.0360	0.0375	0.860	0.998	0.140	15.00	3.74	1.41	0.26	3.80	2.42	5.50	1.000	0.716	0.282	28%
							Spread is less than allowable OK											Area past scupper (acres) =		0.00	I (in/hr) =	5.10			Is Q to flume
																		Runoff Coeff. (C) =		0.90	CA =	0.000	Q =	0.282	< 0.75?
																						Total Q to flume =		0.282	Y
EB Bridge 9 End of Bridge Shoulder Sta. 67+90	51.00	RT	0.020	0.9	0.018	0.018	10	5.1	0.092	0.0188	0.0400	0.000	0.092	0.060	10.00	1.66	0.00	0.05	1.50	0.00	5.00	0.000	0.000	0.092	100%
							Spread is less than allowable OK											Area past bridge (acres) =		0.01	I (in/hr) =	5.1			Is Q to flume
																		Runoff Coeff. (C) =		0.90	CA =	0.009	Q =	0.046	< 0.75?
																						Total Q to flume =		0.138	Y
EB Bridge 9 End of Bridge Shoulder Sta. 68+18	3.00	RT	0.074	0.9	0.066	0.066	10	5.1	0.338	0.0065	0.0300	0.000	0.338	0.044	3.50	3.96	0.00	0.09	1.45	0.00	5.00	0.000	0.000	0.338	100%
							Spread is less than allowable OK																		

HNTB | Made by: PNS | Date: 8/15/2011 | Checked by: BH | Date: 8/15/2011

Job Number: 49633

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width for ultimate condition or shoulder width plus 1/3 traveled lane for Interim, whichever is greater.

EB DRAINAGE CALCULATIONS (ODOT 2YR RAINFALL CHECK FOR INTERIM & FUTURE CONDITION)

LOCATION							GUTTER ANALYSIS												INLET ANALYSIS					
Station	offset (feet)	Side	Area (A) Side	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder width + 1/3 traveled way (ft)	Spread (ft)	scupper or inlet width (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept low (E) (cfs	By-Pass (cfs)	By-Pass %
EB poposed scupper median Sta. 66+22	3.00	RT	0.090	0.9	0.081	0.081	10	3.6	0.292	0.0108	0.0300	0.000	0.292	0.102	6.20	3.40	1.50	0.17	1.68	0.50	2.00	1.0	0.230	0.062	21%
							Spread is less than allowable OK																	
EB Bridge 9 poposed scupper median Sta. 65+91	3.00	RT	0.032	0.9	0.028	0.028	10	3.6	0.102	0.0132	0.0300	0.062	0.164	0.079	6.20	2.64	1.50	0.10	1.57	0.50	2.00	1.0	0.146	0.017	11%
							Spread is less than allowable OK																	
EB Bridge 9 poposed scupper median Sta. 65+17	3.00	RT	0.072	0.9	0.065	0.065	10	3.6	0.233	0.0188	0.0300	0.017	0.251	0.087	6.20	2.90	1.50	0.13	1.99	0.50	2.00	0.960	0.206	0.044	18%
							Spread is less than allowable OK																	
WB/EB existing inlet Sta. 64+00 median	3.00	RT	0.098	0.9	0.088	0.088	10	3.6	0.318	0.0163	0.0300	0.044	0.362	0.102	6.20	3.41	2.50	0.17	2.07	3.00	5.00	1.000	0.351	0.011	3%
							Spread is less than allowable OK																	
WB/EB existing inlet Sta. 63+02 median	3.00	RT	0.101	0.9	0.091	0.091	10	3.6	0.327	0.0127	0.0200	0.011	0.338	0.090	6.20	4.49	2.50	0.20	1.67	3.00	5.00	1.000	0.299	0.039	11%
							Spread is less than allowable OK																	
WB/EB existing inlet Sta. 62+28 median	3.00	RT	0.086	0.9	0.077	0.077	10	3.6	0.278	0.0127	0.0160	0.039	0.317	0.081	6.20	5.04	2.50	0.20	1.56	3.00	5.00	1.000	0.266	0.051	16%
							Spread is less than allowable OK																	
EB Bridge 9 spread checkpoint Shoulder Sta. 65+18	51.00	RT	0.049	0.9	0.044	0.044	10	3.6	0.158	0.0188	0.0400	0.000	0.158	0.081	25.67	2.04	0.00	0.08	1.91	0.00	2.00	1.0	0.000	0.158	100%
							Spread is less than allowable OK										Area past checkpoint (acres) =			0.01	I (in/hr) =	5.1			Is Q to flume
																	Runoff Coeff. (C) =			0.90	CA =	0.009	Q =	0.046	< 0.75?
																						Total Q to flume =		0.204	Y
EB 58+97 spread checkpoint shoulder	62.00	RT	0.4098	0.9	0.369	0.3688	10	3.6	1.328	0.0154	0.0300	0.051	1.379	0.171	43.50	5.69	0.00	0.49	2.84	0.00	2.00	0.000	0.000	1.379	100%
							Spread is less than allowable OK																	
EB 58+59 proposed CB3A Inlet shoulder	63.00	RT	0.054	0.9	0.049	0.049	10	3.6	0.175	0.0110	0.0280	1.379	1.553	0.185	43.50	6.62	1.41	0.61	2.53	2.42	5.50	1.000	0.734	0.819	53%
							Spread is less than allowable OK																	
EB 58+51 proposed CB3A Inlet shoulder	63.00	RT	0.012	0.9	0.011	0.011	10	3.6	0.04	0.0110	0.0280	0.819	0.859	0.149	43.50	5.30	1.41	0.39	2.18	2.42	5.50	1.000	0.483	0.377	44%
							Spread is less than allowable OK										Area past scupper (acres) =			0.01	I (in/hr) =	5.10			Is Q to flume
																	Runoff Coeff. (C) =			0.90	CA =	0.011	Q =	0.056	< 0.75?
																						Total Q to flume =		0.433	Y
Drainage Divide Sta. 67+27																									
WB/EB existing inlet Sta. 69+53 median	3.00	RT	0.200	0.9	0.18	0.180	10	3.6	0.648	0.0170	0.0428	0.000	0.648	0.137	7.20	3.37	1.50	0.23	3.20	3.00	5.00	1.00	0.513	0.135	21%
							Spread is less than allowable OK																	
WB/EB existing inlet Sta. 70+57 median	3.00	RT	0.075	0.9	0.067	0.067	10	3.6	0.242	0.0170	0.0428	0.135	0.377	0.090	7.20	2.75	1.50	0.12	2.10	3.00	5.00	1.00	0.330	0.046	12%
							Spread is less than allowable OK																	
EB 70+95 proposed scupper median	3.00	RT	0.040	0.90	0.036	0.036	10	3.6	0.128	0.0360	0.0170	0.046	0.174	0.054	7.20	3.19	1.50	0.09	2.01	0.50	2.00	0.98	0.139	0.035	20%
							Spread is less than allowable OK																	
EB 71+40 proposed scupper median	3.00	RT	0.031	0.90	0.027	0.027	10	3.6	0.099	0.0360	0.0170	0.035	0.134	0.049	7.20	2.89	1.50	0.07	1.88	0.50	2.00	0.98	0.112	0.021	16%
							Spread is less than allowable OK										Bypass flow travels across bridge to proposed inlets off right side of bridge.								
EB 74+30.85 Proposed CB3A Inlet shoulder	73.00	RT	0.447	0.90	0.402	0.402	10	3.6	1.448	0.0360	0.0375	0.021	1.470	0.162	9.70	4.33	1.41	0.35	4.19	2.42	5.50	1.000	0.957	0.513	35%
							Spread is less than allowable OK																	
EB 74+37.85 Proposed CB3A Inlet shoulder	73.00	RT	0.030	0.90	0.027	0.027	10	3.6	0.097	0.0360	0.0375	0.513	0.610	0.117	9.70	3.11	1.41	0.18	3.36	2.42	5.50	1.000	0.488	0.122	20%
							Spread is less than allowable OK										Area past scupper (acres) =			0.00	I (in/hr) =	5.10			Is Q to flume
																	Runoff Coeff. (C) =			0.90	CA =	0.000	Q =	0.122	< 0.75?
																						Total Q to flume =		0.122	Y
EB Bridge 9 End of Bridge Shoulder Sta. 67+90	51.00	RT	0.020	0.9	0.018	0.018	10	3.6	0.065	0.0188	0.0400	0.000	0.065	0.060	25.70	1.46	0.00	0.04	1.50	0.00	5.00	0.000	0.000	0.065	100%
							Spread is less than allowable OK										Area past bridge (acres) =			0.01	I (in/hr) =	5.1			Is Q to flume
																	Runoff Coeff. (C) =			0.90	CA =	0.009	Q =	0.046	< 0.75?
																						Total Q to flume =		0.111	Y
EB Bridge 9 End of Bridge Shoulder Sta. 68+18	3.00	RT	0.074	0.9	0.066	0.066	10	3.6	0.239	0.0065	0.0300	0.000	0.239	0.044	6.20	3.47	0.00	0.08	1.45	0.00	5.00	0.000	0.000	0.239	100%
							Spread is less than allowable OK																	

HNTB

Job Number: 49633

Made by: PNS Date: 8/15/2011
Checked by: BH Date: 8/15/2011

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width for ultimate condition or shoulder width plus 1/3 traveled lane for Interim, whichever is greater.

EXISTING EB DRAINAGE CALCULATIONS (ODOT 10 YR RAINFALL CHECK FOR INTERIM & FUTURE CONDITION) using L&D Manual, Vol 2 guidance. 1103.6.2

LOCATION							GUTTER ANALYSIS											INLET ANALYSIS					
Station	offset (feet)	Side	Area (A) Side	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder width (ft)	Spread (ft)	scupper or inlet width (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept low (E) (cfs	By-Pass (cfs)	By-Pass %
EB existing scupper median Sta. 66+00	3.00	RT	0.106	0.9	0.095	0.095	10	5.1	0.487	0.0108	0.0300	0.000	0.487	0.124	3.50	4.12	2.50	0.25	1.91	0.50	2.00	1.0	0.446	0.040	8%
							Spread is greater than allowable NO GOOD																		
EB Bridge 9 existing scupper median Sta. 65+30	3.00	RT	0.069	0.9	0.062	0.062	10	5.1	0.317	0.0132	0.0300	0.040	0.357	0.106	3.50	3.53	2.50	0.19	1.91	0.50	2.00	1.0	0.344	0.013	4%
							Spread is greater than allowable NO GOOD																		
EB Bridge 9 existing scupper median Sta. 65+17	3.00	RT	0.019 0.194	0.9	0.017	0.017	10	5.1	0.087	0.0188	0.0300	0.013	0.101	0.062	3.50	2.06	2.50	0.06	1.58	0.50	2.00	1.0	0.101	0.000	0%
							Spread is less than allowable OK																		
WB/EB existing inlet Sta. 64+00 median	3.00	RT	0.098	0.9	0.088	0.088	10	5.1	0.45	0.0163	0.0300	0.000	0.450	0.111	3.50	3.70	2.50	0.21	2.19	3.00	5.00	1.000	0.427	0.022	5%
							Spread is greater than allowable NO GOOD																		
WB/EB existing inlet Sta. 63+02 median	3.00	RT	0.101	0.9	0.091	0.091	10	5.1	0.464	0.0127	0.0200	0.022	0.486	0.103	3.50	5.15	2.50	0.26	1.83	3.00	5.00	1.000	0.404	0.082	17%
							Spread is greater than allowable NO GOOD																		
WB/EB existing inlet Sta. 62+28 median	3.00	RT	0.086	0.9	0.077	0.077	10	5.1	0.394	0.0127	0.0160	0.082	0.477	0.094	3.50	5.88	2.50	0.28	1.73	3.00	5.00	1.000	0.368	0.108	23%
							Spread is greater than allowable NO GOOD																		
EB Bridge 9 spread checkpoint Shoulder Sta. 65+18	51.00	RT	0.049	0.9	0.044	0.044	10	5.1	0.224	0.0188	0.0400	0.000	0.224	0.093	10.00	2.32	0.00	0.11	2.08	0.00	2.00	0	0.000	0.224	100%
							Spread is less than allowable OK											Area past checkpoint (acres) =		0.01	I (in/hr) =	5.1			Is Q to flume
																		Runoff Coeff. (C) =		0.90	CA =	0.009	Q =	0.046	< 0.75?
																						Total Q to flume =		0.270	Y
EB 58+97 spread checkpoint shoulder	62.00	RT	0.4098	0.9	0.369	0.3688	10	5.1	1.881	0.0154	0.0300	0.108	1.989	0.196	9.50	6.53	0.00	0.64	3.11	0.00	2.00	0.000	0.000	1.989	100%
							Spread is less than allowable OK																		

HNTB

Made by: PNS Date: 8/15/2011
Checked by: BH Date: 8/15/2011
Job Number: 49633

Use spread equation from 1986 FHWA Bridge Deck Drainage Guidelines.
Use E=1-(1-w/t)^2.67*Q per HEC 12 for determining inlet intercept flow.
where w = scupper width (ft), and t = design spread (ft).
n = 0.015 Allowable Spread is spread that is less than the shoulder width for ultimate condition or shoulder width plus 1/3 traveled lane for Interim, whichever is greater.

EXISTING EB DRAINAGE CALCULATIONS (ODOT 2 YR RAINFALL CHECK FOR INTERIM & FUTURE CONDITION) using L&D Manual, Vol 2 guidance. 1103.6.2

LOCATION							GUTTER ANALYSIS											INLET ANALYSIS					
Station	offset (feet)	Side	Area (A) Side	Runoff Coeff (C)	CA	Total CA	T (min.)	I (in/hr)	Q (cfs)	L-Sl. (ft/ft)	X-Sl. (ft/ft)	By-Pass (cfs)	Total Q (cfs)	Y (ft)	Shoulder width (ft)	Spread (ft)	scupper or inlet width (ft)	Flow Area (sq ft)	Velocity (ft/s)	Length (flow dir.) (ft)	Splash Over Vel for L (ft/s)	Splash Reduction Factor	Inlet Intercept low (E) (cfs	By-Pass (cfs)	By-Pass %
EB existing scupper median Sta. 66+00	3.00	RT	0.106	0.9	0.095	0.095	10	3.6	0.343	0.0108	0.0300	0.000	0.343	0.108	3.50	3.61	2.50	0.20	1.75	0.50	2.00	1.0	0.329	0.015	4%
							Spread is greater than allowable NO GOOD																		
EB Bridge 9 existing scupper median Sta. 65+30	3.00	RT	0.069	0.9	0.062	0.062	10	3.6	0.224	0.0132	0.0300	0.015	0.238	0.091	3.50	3.04	2.50	0.14	1.72	0.50	2.00	1.0	0.236	0.002	1%
							Spread is less than allowable OK																		
EB Bridge 9 existing scupper median Sta. 65+17	3.00	RT	0.019 0.194	0.9	0.017	0.017	10	3.6	0.062	0.0188	0.0300	0.002	0.064	0.052	3.50	1.74	2.50	0.05	1.41	0.50	2.00	1.0	0.064	0.000	0%
							Spread is less than allowable OK																		
WB/EB existing inlet Sta. 64+00 median	3.00	RT	0.098	0.9	0.088	0.088	10	3.6	0.318	0.0163	0.0300	0.000	0.318	0.098	3.50	3.25	2.50	0.16	2.00	3.00	5.00	1.000	0.311	0.006	2%
							Spread is less than allowable OK																		
WB/EB existing inlet Sta. 63+02 median	3.00	RT	0.101	0.9	0.091	0.091	10	3.6	0.327	0.0127	0.0200	0.006	0.334	0.089	3.50	4.47	2.50	0.20	1.67	3.00	5.00	1.000	0.296	0.037	11%
							Spread is greater than allowable NO GOOD																		
WB/EB existing inlet Sta. 62+28 median	3.00	RT	0.086	0.9	0.077	0.077	10	3.6	0.278	0.0127	0.0160	0.037	0.316	0.081	3.50	5.04	2.50	0.20	1.56	3.00	5.00	1.000	0.265	0.051	16%
							Spread is greater than allowable NO GOOD																		
EB Bridge 9 spread checkpoint Shoulder Sta. 65+18	51.00	RT	0.049	0.9	0.044	0.044	10	3.6	0.158	0.0188	0.0400	0.000	0.158	0.081	10.00	2.04	0.00	0.08	1.91	0.00	2.00	1.0	0.000	0.158	100%
							Spread is less than allowable OK											Area past checkpoint (acres) =		0.01	I (in/hr) =	5.1			Is Q to flume
																		Runoff Coeff. (C) =		0.90	CA =	0.009	Q =	0.046	< 0.75?
																						Total Q to flume =		0.204	Y
EB 58+97 spread checkpoint shoulder	62.00	RT	0.4098	0.9	0.369	0.3688	10	3.6	1.328	0.0154	0.0300	0.051	1.378	0.171	9.50	5.69	0.00	0.49	2.84	0.00	2.00	0.000	0.000	1.378	100%
							Spread is less than allowable OK																		

INLET SPACING DESIGN

PID : 49633 **Date :** 08/18/2011 **Project :** Cleveland Innerbelt **Location :** EB I90 Between bridge 9 and 7

Description :PR - EB median **Designer :** PNS

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 3.50 **Allowable Depth (ft.)** 0.00

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
65+17	Begin																	
64+00	I-3B	117.00	0.00	0.00	0.00	0.00	0.00	0.0163	0.0300	0.0300	3.50	0.1670	0.00	0.36	0.00	0.36	0.102	3.40
63+02	I-3B	98.00	0.90	0.09	10.00	1.36	11.36	0.0127	0.0200	0.0200	3.50	0.1670	3.39	0.28	0.00	0.28	0.083	4.16
62+28	I-3B	74.00	0.90	0.09	10.00	1.10	11.10	0.0127	0.0160	0.0160	3.50	0.1670	3.43	0.27	0.00	0.27	0.075	4.70

INLET SPACING DESIGN

PID : 49633 **Date :** 08/18/2011 **Project :** Cleveland Innerbelt **Location :** EB I90 Between bridge 9 and 7

Description :EX - EB median **Designer :** PNS

Rainfall Area: A **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 3.50 **Allowable Depth (ft.)** 0.00

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
65+17	Begin																	
64+00	I-3B	117.00	0.00	0.00	0.00	0.00	0.00	0.0163	0.0300	0.0300	3.50	0.1670	0.00	0.32	0.00	0.32	0.097	3.24
63+02	I-3B	98.00	0.90	0.09	10.00	1.36	11.36	0.0127	0.0200	0.0200	3.50	0.1670	3.39	0.28	0.00	0.28	0.083	4.16
62+28	I-3B	74.00	0.90	0.09	10.00	1.10	11.10	0.0127	0.0160	0.0160	3.50	0.1670	3.43	0.27	0.00	0.27	0.075	4.70

INLET SPACING DESIGN

PID : 49633 **Date :** 08/18/2011 **Project :** Cleveland Innerbelt **Location :** EB I90 Between bridge 9 and 7

Description :PR - 10 yr - EB median **Designer :** PNS

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 3.50 **Allowable Depth (ft.)** 0.00

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
65+17	Begin																	
64+00	I-3B	117.00	0.00	0.00	0.00	0.00	0.00	0.0163	0.0300	0.0300	3.50	0.1670	0.00	0.49	0.00	0.49	0.114	3.81
63+02	I-3B	98.00	0.90	0.09	10.00	1.24	11.24	0.0127	0.0200	0.0200	3.50	0.1670	4.84	0.40	0.00	0.40	0.095	4.76
62+28	I-3B	74.00	0.90	0.09	10.00	1.00	11.00	0.0127	0.0160	0.0160	3.50	0.1670	4.88	0.38	0.00	0.38	0.086	5.37

INLET SPACING DESIGN

PID : 49633 **Date :** 08/18/2011 **Project :** Cleveland Innerbelt **Location :** EB I90 Between bridge 9 and 7

Description :EX - EB median **Designer :** PNS

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 3.50 **Allowable Depth (ft.)** 0.00

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
65+17	Begin																	
64+00	I-3B	117.00	0.00	0.00	0.00	0.00	0.00	0.0163	0.0300	0.0300	3.50	0.1670	0.00	0.45	0.00	0.45	0.111	3.69
63+02	I-3B	98.00	0.90	0.09	10.00	1.24	11.24	0.0127	0.0200	0.0200	3.50	0.1670	4.84	0.40	0.00	0.40	0.095	4.76
62+28	I-3B	74.00	0.90	0.09	10.00	1.00	11.00	0.0127	0.0160	0.0160	3.50	0.1670	4.88	0.38	0.00	0.38	0.086	5.37

For Resurfacing Gateway	Job no. 49633	Sheet no.
Made by PN Shedivy	Checked by BAHess	Backchecked by
Date 8-15-2011	Date 8/15/11	Date

HNTB

HEC-22 Curb Opening Inlets on Grade

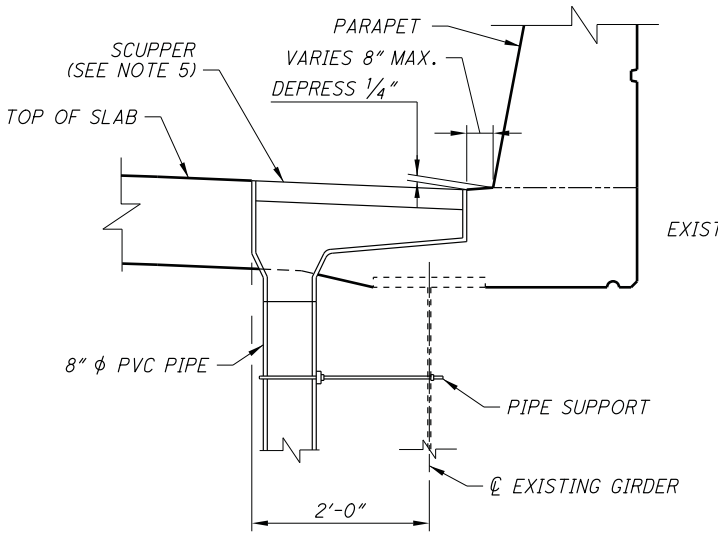
$$L_T = K_C Q^{0.42} S_L^{0.3} \left(\frac{1}{n S_x}\right)^{0.6}$$

$$= (0.6)(.033\,cfs)^{0.42} (0.0127)^{0.3} \left(\frac{1}{(0.015)(0.0166)}\right)^{0.6}$$

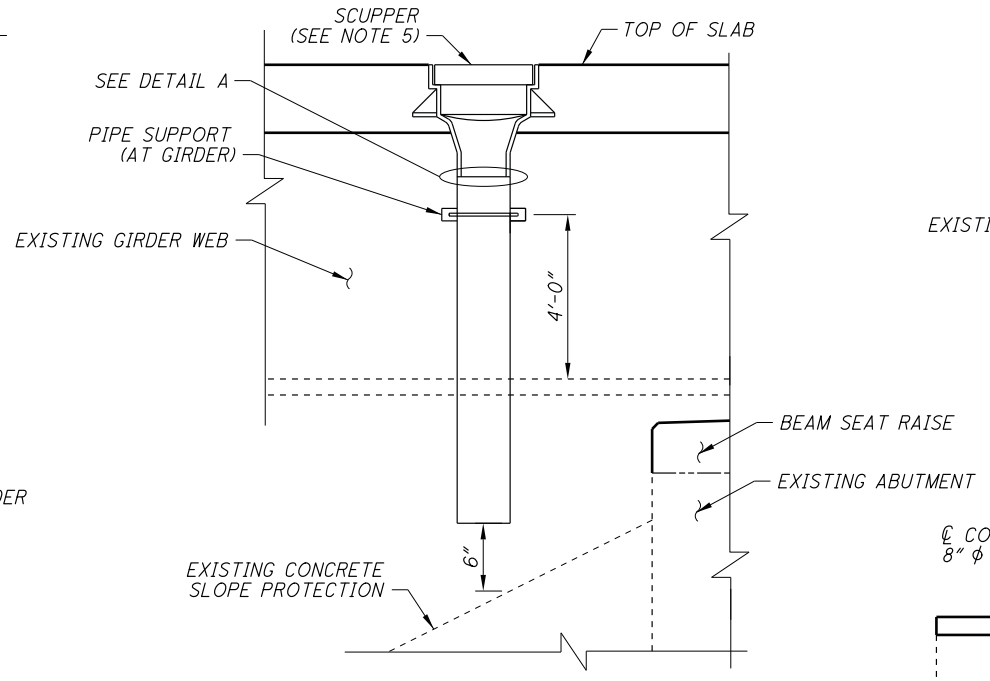
$$= 5.6\ ft$$ < curb opening of existing median ≈ 10 ft

ALL flow intercepted for inlets on WB @ Sta. 64+00, 63+02, & 62+28

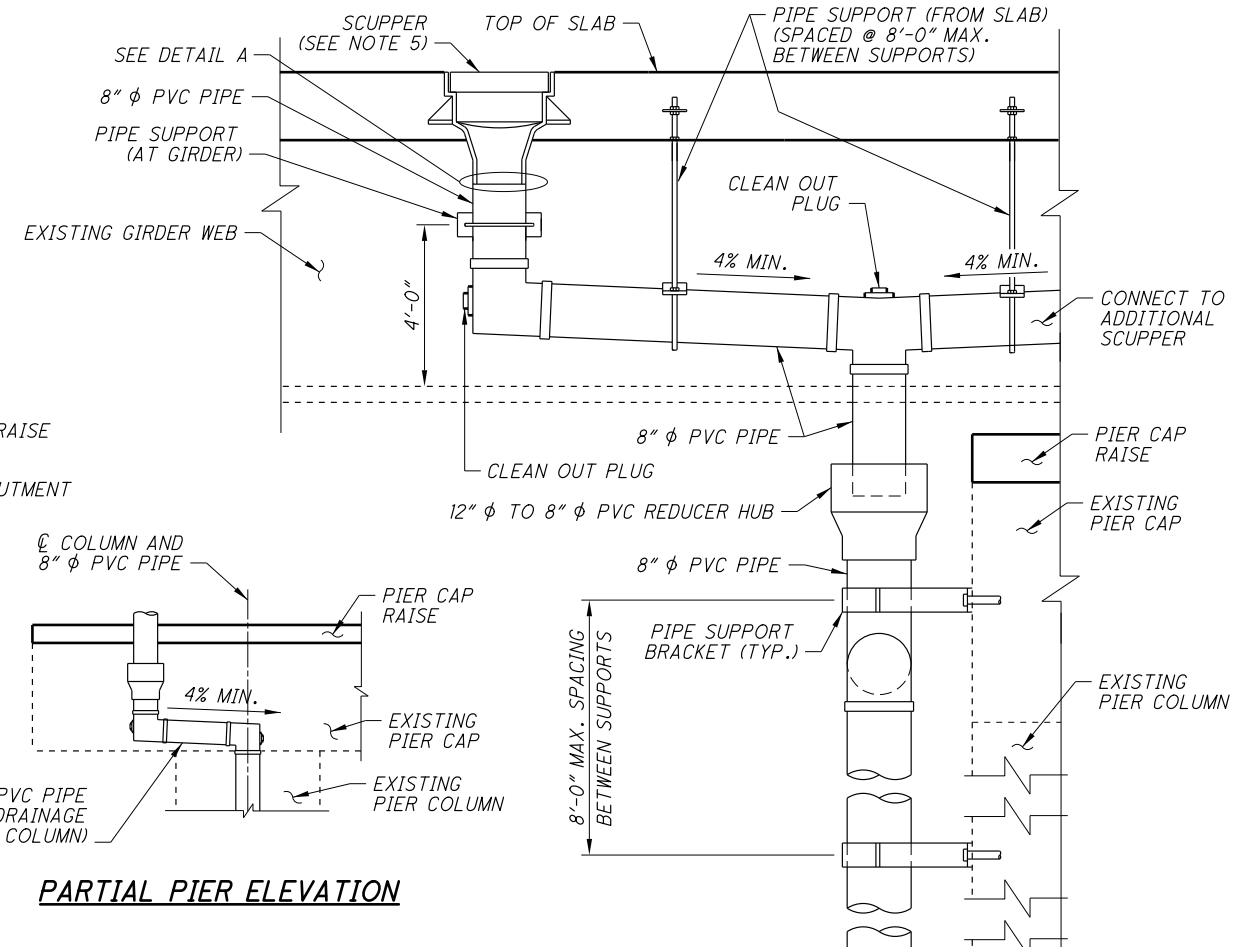
Note: worst case using L_x, L_L, & Q used.

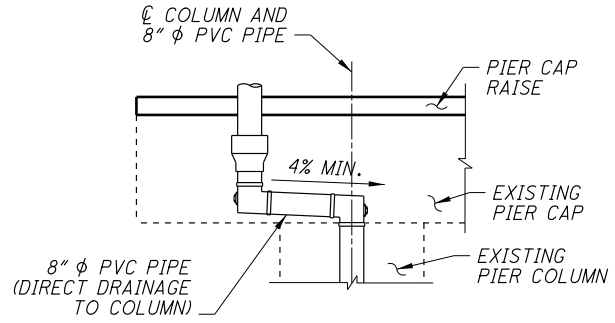


TYPICAL SCUPPER ELEVATION

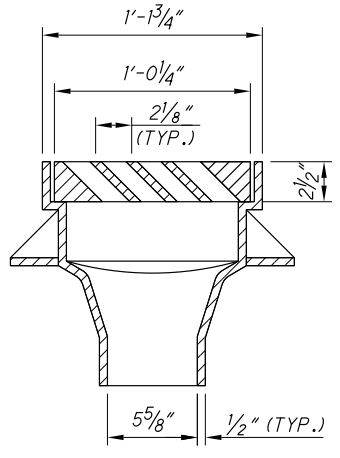


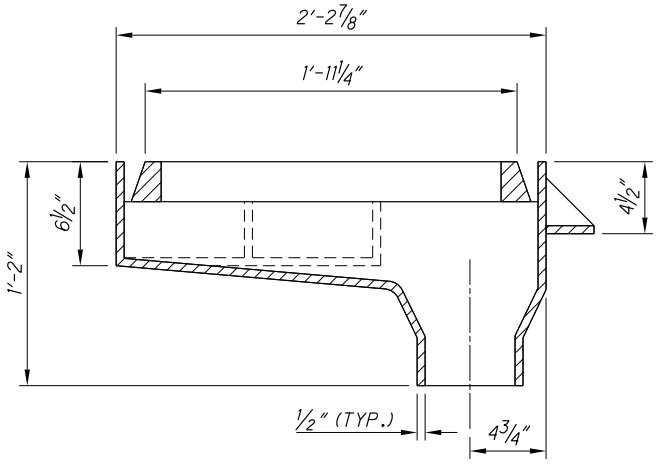
DRAINAGE PIPE AT ABUTMENT DETAIL





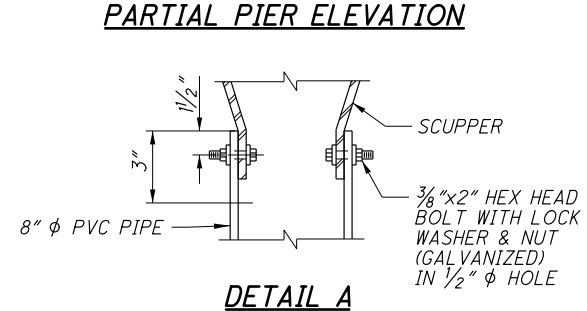
PARTIAL PIER ELEVATION



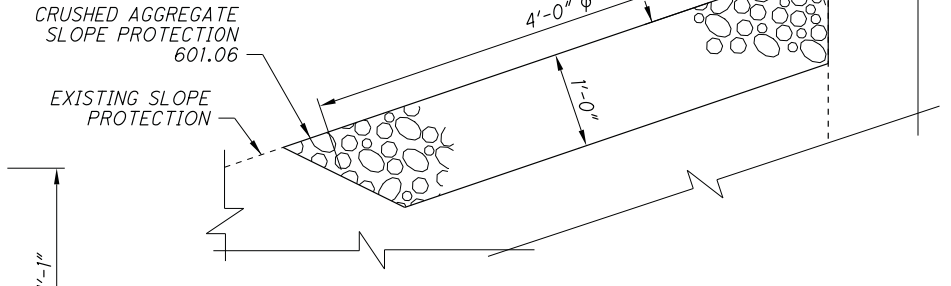


SCUPPER DETAILS

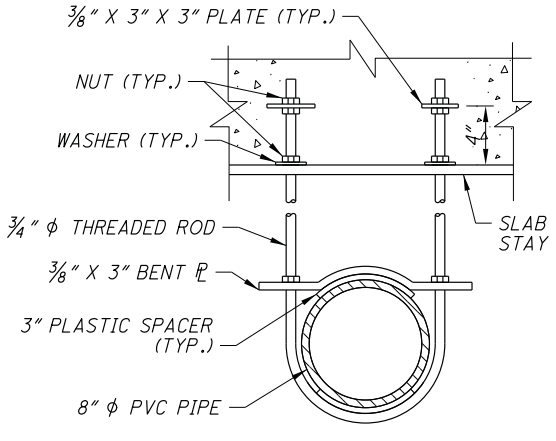
(SEE NOTE 5)



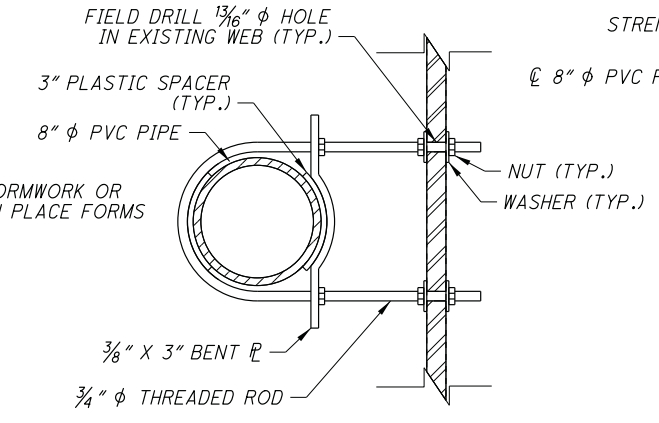
DETAIL A



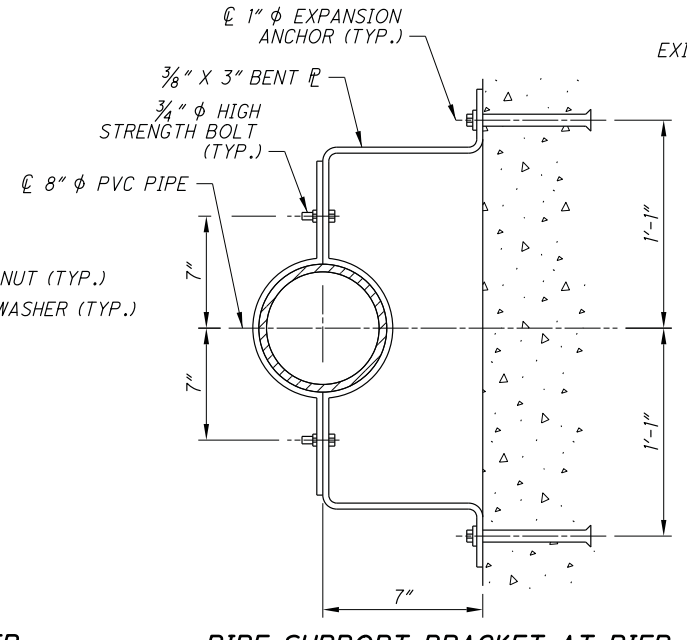
DRAINAGE PIPE AT PIER DETAIL



PIPE SUPPORT FROM SLAB



PIPE SUPPORT AT GIRDER



PIPE SUPPORT BRACKET AT PIER

(FIELD BEND BRACKET RADIAL TO FIT CURVE OF PIER COLUMN)

NOTES:

1. FOR SCUPPER LOCATIONS, SEE SHEET 20/42.
2. ADJUST THE TOP OF SCUPPER INLET TO MATCH THE CROSS SLOPE OF THE SLAB.
3. ALL MATERIALS FOR THE SUPPORT HANGERS AND BRACKETS SHALL BE ASTM A709 GRADE 36 AND GALVANIZED PER CMS 711.02.
4. POLYVINYL-CHLORIDE (PVC) PIPE USED IN BRIDGE DRAINS SHALL CONFORM TO CMS 707.45.
5. SCUPPER SHALL BE A NEENAH FOUNDRY MODEL NUMBER R-3922. BOLTS FOR SCUPPER GRATE SHALL BE STAINLESS STEEL.

STATE OF OHIO
BRIAN T. AVARELLO
E - 66619
REGISTERED
PROFESSIONAL ENGINEER

NO.	REVISIONS	DATE
A	FINAL SUBMITTAL	01-19-11
1	APPROVED FOR CONSTRUCTION	03-15-11

DESIGN AGENCY
WALSH CONSTRUCTION
HNTB

CLEVELAND'S MANNERBELT BRIDGE
OHIO DEPARTMENT OF TRANSPORTATION

BRIDGE 9

DRAINAGE DETAILS

BRIDGE NO. CUY-90-1640
1-90 EASTBOUND AND WESTBOUND OVER I-77 SOUTHBOUND

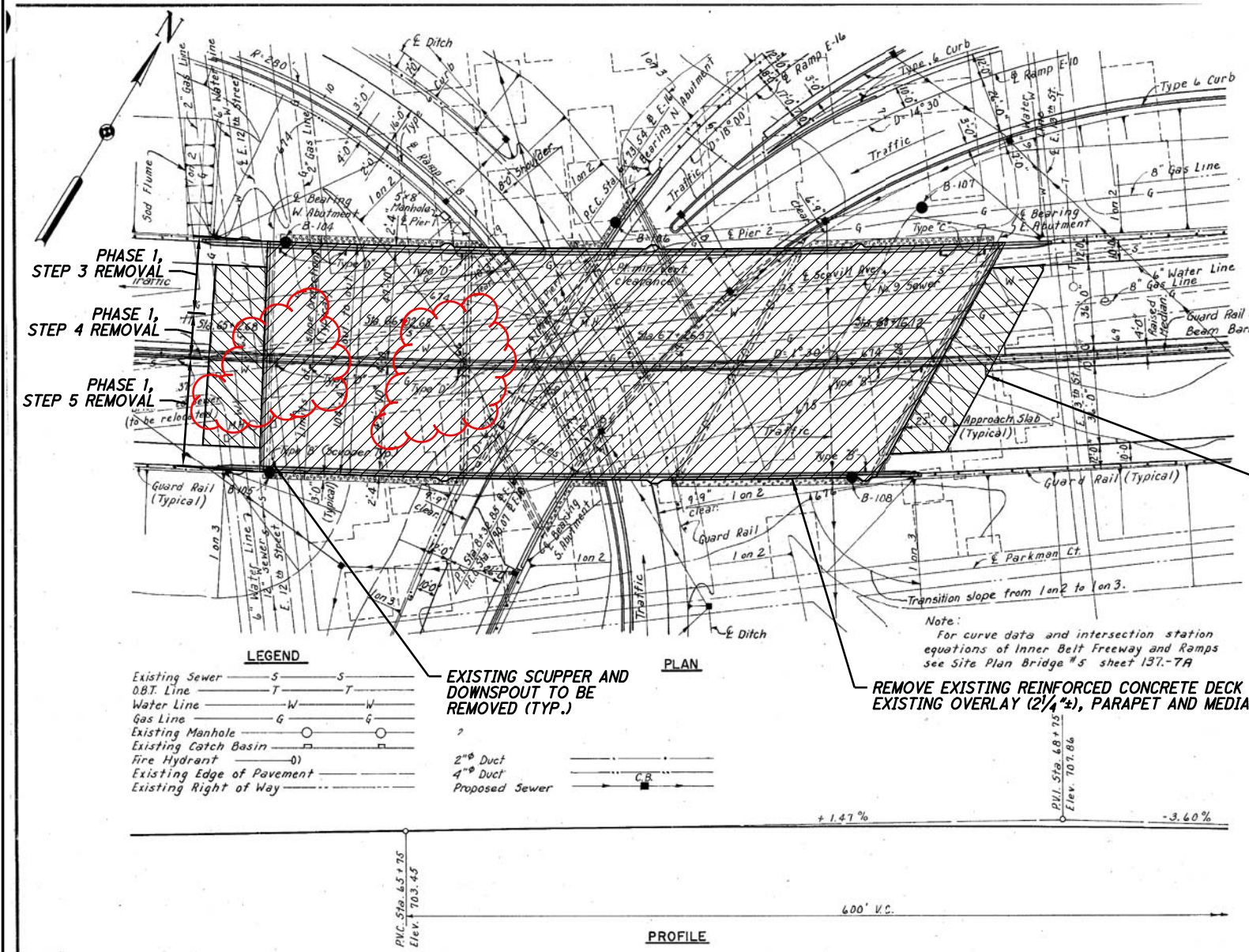
DESIGNED	DRAWN	REVIEWED	DATE
JTW	JTW	JOL	03-14-11
CHECKED	CHECKED	STRUCTURE FILE NUMBER	
BTA	BTA	1807773	

CUY-90-14.90
PID No. 77332/85531

24/42

0/0

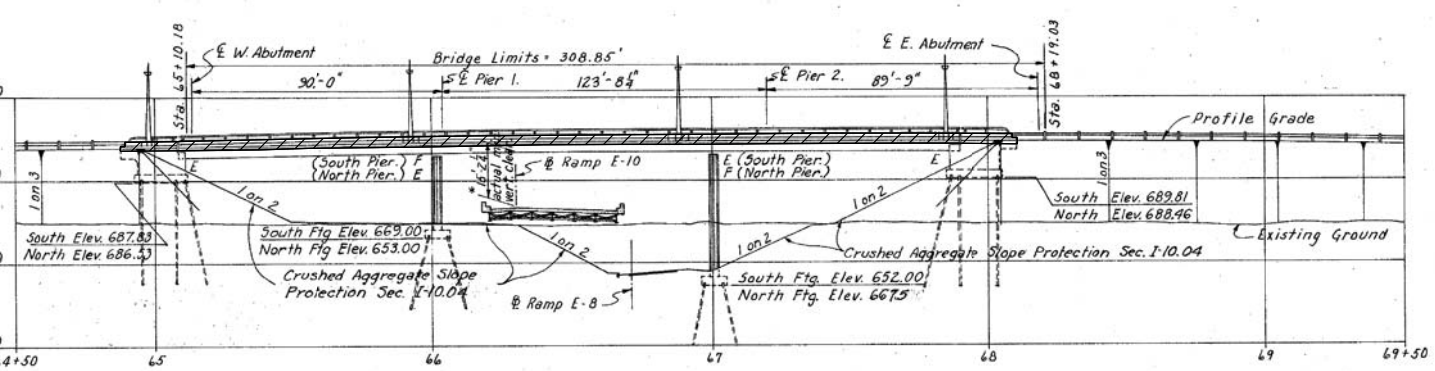
Date:14-MAR-2011
Model:Sheet3
File:P_PWP:dms72457\49633-S-BR-MDT02-1640C.dgn



PLAN

LEGEND

Existing Sewer	S — S
O.B.T. Line	T — T
Water Line	W — W
Gas Line	G — G
Existing Manhole	○ — ○
Existing Catch Basin	□
Fire Hydrant	◇
Existing Edge of Pavement	
Existing Right of Way	
2"ϕ Duct	
4"ϕ Duct	
Proposed Sewer	C.B.

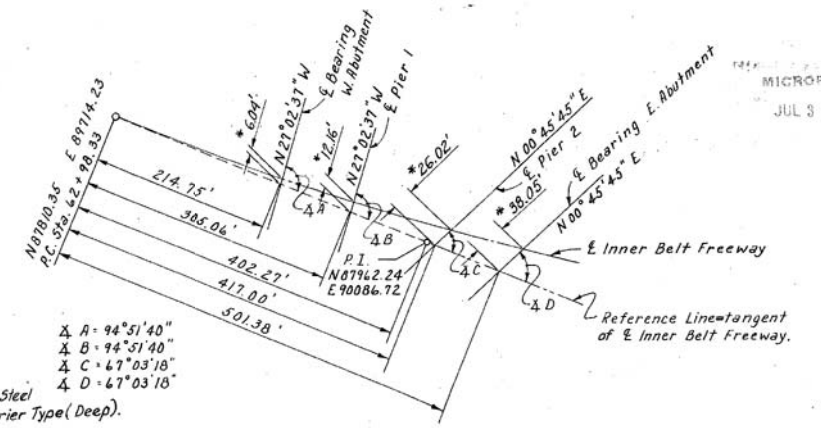


PROFILE

ELEVATION

* 15'-0" Required minimum vertical clearance. Point of actual minimum vertical clearance occurs at North exterior girder and 2'-6" Rt. ℄ Ramp E-16.

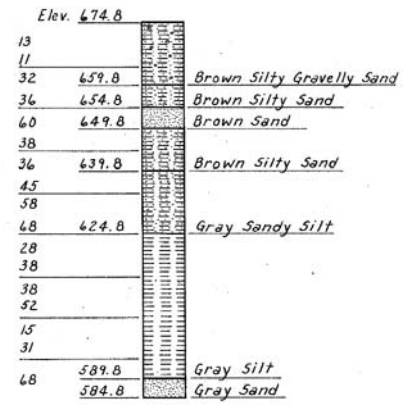
Note: Elevations for pier footings are shown for exterior footing only. For other elevations see sheets 101-7A & 102-7A



BRIDGE LAYOUT DIAGRAM

No Scale

* Offsets measured from reference line to ℄ Inner Belt Freeway along ℄ bearings.



BORING B-106

Vertical Scale 1" = 20'
Sta. 66+10 65' Lt.

Note.
The figures to the left indicates the number of hammer blows required to drive the sample spoon 1 ft. They are given at 5' intervals starting at Elev. 674.8

PROPOSED STRUCTURE
Type: Continuous welded steel girder with reinforced concrete deck and substructure
Spans: 90'-0", 123'-8¼" & 89'-9" (along ℄ Inner Belt Fr Wy.)
Roadway: 102'-0" t/t. parapets
Loading: C.F. 2000 - Adequate for A.A.S.H.O. alternate loading
Skew: Varies
Surface Course: 1" Monolithic Concrete.
Alignment: 1° 30' curve left.
Approach Slabs: AS-1-54 (25' Long)
Superelevation: .03' per ft

NOTES:

Rod soundings only were taken at location B-104, B-105, B-107 and B-108. The core drilling made at B-106 is plotted.

For details of slope protection see sheet 174-7A

The following items are not included in the Bridge Plans. (See Roadway Plans for details.)

Removal of existing pavements, etc.

Relocation or removal of existing utilities.

Approach grading, pavement and slab.

Roadway guard rail.

PILE INFORMATION			
Location	Diameter	Number	Estimated ave. length
W. Abutment	12"	48	38'
E. Abutment	12"	51	40'
Pier 1	14"	56	27'
Pier 2	14"	60	65'

Pile lengths are based on boring data and are approximate only. The Contractor shall assume full responsibility for length of piling selected for driving.

H.N.T.B. BR. NO. 3 PART 7A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK

SITE PLAN
INNER BELT FREEWAY OVER
RAMPS E-8, E-10 AND E-16
BR. NO. CUY-42-1843 STA. 65+10.18
Scale: 1" = 30' STA. 68+19.03

WILLOW-INNER BELT FREEWAY
CLEVELAND CUYAHOGA COUNTY OHIO

DRAWN	TRACED	CHECKED	REVIEWED	REVISED
AJS	REK	PAR	JCT	
DATE 7-2-58	DATE 8-20-58	DATE 8-4-58	DATE 11-13-58	SHEET 100

LEGEND:

- INDICATES AREA TO BE REMOVED PER ITEM 202 PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN

- INDICATES AREA TO BE REMOVED PER ITEM 202 APPROACH SLAB REMOVED

NOTE:

1. ALL EXISTING ELEVATIONS SHOWN ON THE ORIGINAL BRIDGE PLANS HAVE NOT BEEN ADJUSTED TO THE CURRENT PROJECT SURVEY ELEVATIONS. ELEVATIONS NEED TO BE ADJUSTED TO THE CURRENT PROJECT SURVEY ELEVATIONS. FOR REAR ABUTMENT, PIER 1, PIER 2 AND FORWARD ABUTMENT THE ELEVATION ADJUSTMENT IS APPROXIMATELY 0.92, 0.70, 0.75 AND 1.00 FEET LOWER RESPECTIVELY THAN EXISTING ELEVATIONS SHOWN ON THE ORIGINAL BRIDGE PLANS.

FED. ROADS DIV. NO.	STATE	FED. AID PROJ. NO.	
2	OHIO		

100
181

MICROFILMED JUL 3 1985

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY-21-15.32
CUY-42-18.42

STATE OF OHIO
BRIAN T. AVARELLO
E - 66619
REGISTERED
PROFESSIONAL ENGINEER

NO.	REVISIONS	DATE
A	INTERIM REVIEW SUBMITTAL	12-02-10
B	FINAL SUBMITTAL	01-19-11
1	APPROVED FOR CONSTRUCTION	03-15-11

DESIGN AGENCY
WALSH HNTB
WALSH CONSTRUCTION

CLEVELAND'S INNERBELT BRIDGES
OHIO DEPARTMENT OF TRANSPORTATION
90

BRIDGE 9

REMOVAL DETAILS - 1

BRIDGE NO. CUY-90-1640
I-90 EASTBOUND AND WESTBOUND OVER I-77 SOUTHBOUND

DESIGNED	DRAWN	CHECKED	REVIEWED	DATE
JTW	JTW	NJ	JOL	03-14-11

STRUCTURE FILE NUMBER 1807773

CUY-90-14.90
PID No. 77332/85531

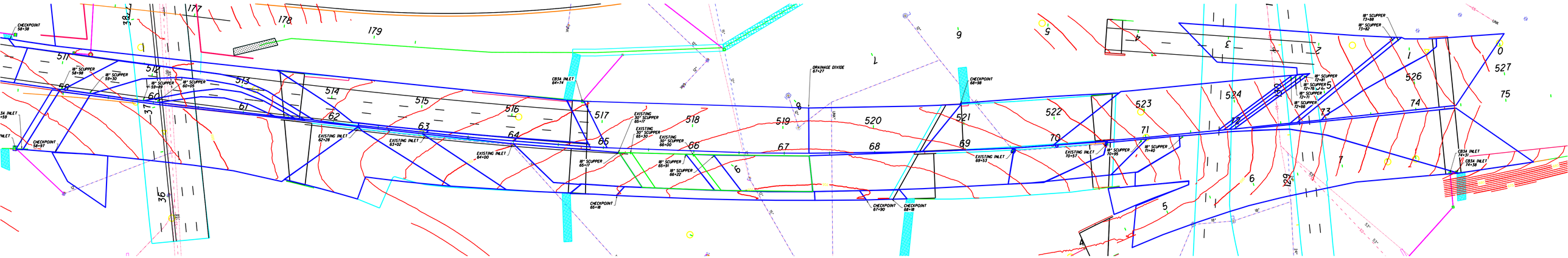
8 / 42

Date: 16-MAR-2011
Model: Sheet1
File: P_PWP: dms72457\49633-S-BR-IXS01-1640C.dgn

Roadway Partial Gateway (Resurfacing BL-7/8-12) - Proposed and Existing Drainage Map - (note existing contains only Eastbound from Bridge 9 to 7 only)

EXISTING DRAINAGE AREA

PROPOSED DRAINAGE AREA



APPENDIX L

For information only. Calculations have been RFC'd already.

Wall I Drainage Calculations Summary

Existing & Proposed Drainage Conditions

Wall I is a new wall that will connect E. 14th Street to a new bridge that spans E. 9th Street. The 449 ft wall starts at E. 9th Street bridge abutment and travels northeast. The alignment of the existing E. 14th Street is shifting north towards the right of way line creating the need for the wall.

The existing E. 14th Street on-ramp was constructed from the 1959 Willow Innerbelt Freeway Part 6. This project had an existing No. 9 brick combined sewer being removed and rerouted through a proposed 66" concrete pipe along Webster Ave (See Willow Innerbelt Freeway Part 6 Plans & Figure 1). Figure 1 shows the existing drainage area for inlets that were constructed per the 1959 plans. The existing drainage enters in two manholes (A101 & A102) located along the 66" approximately 416 ft northwest of E. 9th Street. These two inlets have a combined tributary drainage area of 6.31 acres, runoff coefficient of 0.78, and a 10-year discharge rate of 31.4 cfs.

With the realignment of E. 14th Street on-ramp, drainage areas are being shifted, and additional pavement from Bridges 7 & 8 add additional flow to the 66" sewer. There are no impacts to CSO 094 because the additional 0.16 acre of pavement area drained onto E. 9th Street and was tributary to the 96" interceptor which the 66" drains into. The increase at A101 will be approve by the City of Cleveland to have an increase from 31.4 cfs to 33.3 cfs, since the 66" pipe has capacity. Downstream of A101, a 57"slip lining be installed to the 96" (see Wall I 66 Inch Drainage Report). Due to the height of the fill on the existing pipes connecting to manholes A101 & A102, a new storm sewer pipe will connect the existing/proposed inlets around Bridge 9 to manhole A101. The total drainage area is 6.47 acre, runoff coefficient of 0.82, and discharge rate of 33.3 cfs.

HNTB

Made by: BAHess Date: 6/30/2011
Checked by: PNShedivy Date: 6/30/2011

Job Number: 49633

Cleveland Innerbelt 66 inch Existing 1959, Pre-Project and Proposed Drainage Areas and Runoff Coefficients

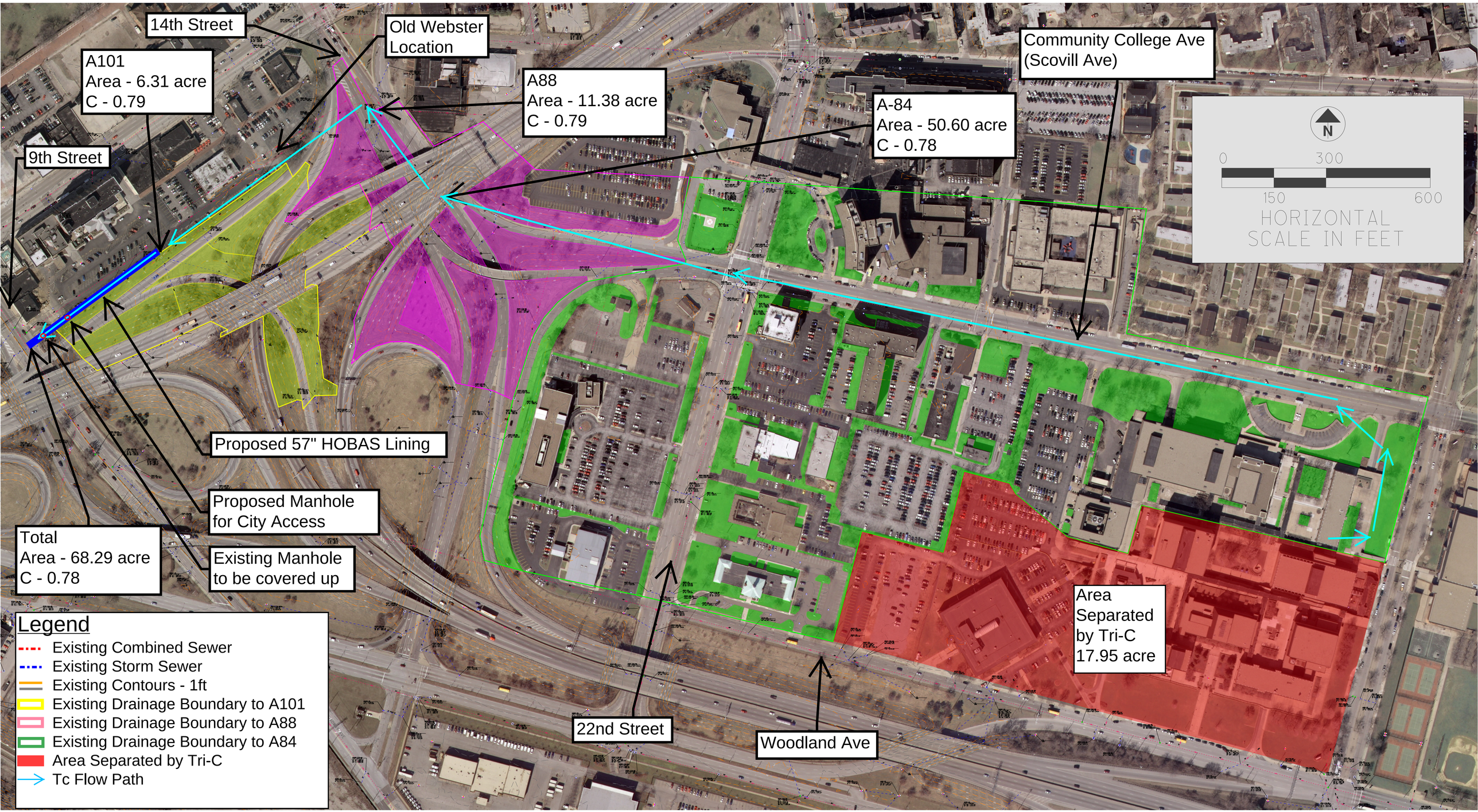
CN, Curve Number	82	69.00	98	98	74	94			
C, Rational Coefficient	0.7	0.30	0.9	0.9	0.5	0.8			
Terrain Description	Fair ROW grass > 4:1 slopes	Fair ROW grass < 10:1 slopes	Pavement	Sidewalk	Dense Residentual	Industrial/ Commercial	Area	CN	C
Pre-Project									
A84 - Existing Manhole - 22nd & Scovill-No. 7 (Broadway 14+50, 1350LT)		10.42	40.18				50.600	92.03	0.78
A88 - Existing Manhole - 14th-66" (14th 132+05, 10LT)	5.33	0.40	5.65				11.383	89.48	0.79
A101 - Existing Manhole - Ramp A3/Webster Street - 66" (A3 3004+15, 60RT)	3.32		2.99				6.310	89.58	0.79
Total A84, A88 & A101 Pre-Project Conditions	**8.65**	**10.82**	**48.82**				**68.293**	**91.38**	**0.78**
Existing 1959 - (A88 is same as Pre-Project)									
A84 - Existing 1959 Conditions - Estimated 25% Impervious			17.140		51.41		68.550	80.00	0.60
Proposed Conditions									
A101 - Wall I/Ramp A3 Proposed Conditions	2.59		3.880				6.470	91.60	0.82

HNTB	Made by: BAHess		Date:	6/30/2011
	Checked by: PNShedivy		Date:	6/30/2011
Job Number: 49633				

Cleveland Innerbelt 66inch Pre and Post Drainage Areas and Runoff Coefficients: TC CALCULATION/FLOW

Analysis Condition	Existing/Proposed		Existing	Proposed
Outfall Name	A84 - Pre Project	A84 - 1959 Conditions	A101	A101
Sheetflow	Grass	Grass	Grass	Grass
Runoff Coeffiecient	0.300	0.300	0.700	0.700
length, ft (<100)	100.000	100.000	65.000	65.000
dz, ft	0.650	0.650	20.000	20.000
slope	0.007	0.007	0.308	0.308
Tt, min	16.624	16.624	1.852	1.852
Shallow Concentrated			Grass	Grass
length, ft			215.000	215.000
dz, ft			9.500	9.500
slope			1.838	1.838
Intercept Coefficient, k			0.430	0.430
avg velocity, ft/s			2.753	2.753
Tt, min			1.417	1.417
Shallow Concentrated				
length, ft				
dz, ft				
slope				
Intercept Coefficient, k				
avg velocity, ft/s				
Tt, min				
Pipe Flow				
length, ft	3200.000	3200.000	385.000	385.000
dz, ft	9.000	9.000	1.630	1.630
slope	0.003	0.003	0.004	0.004
Avg. Pipe Size	24"-No.8	24"-No.8	12"-15"	12"-15"
avg velocity, ft/s	4.000	4.000	3.500	3.500
Tt, min	13.333	13.333	1.833	1.833
Channel flow				
side slope, X:1				
side slope, X:1				
bank full depth, ft				
dz, ft				
length, ft				
manning's, n				
cross-sectional area, ft^2				
wetted perimeter, ft				
hydraulic radius, ft				
slope				
velocity, ft/s				
Tt, min				
Total Tc, min	29.96	29.96	5.10	5.10
Regulated Total Tc, min	3.00	3.00	3.00	3.00
Area, acres	50.600	68.550	6.310	6.470
C weighted	0.78	0.60	0.79	0.82
Intesities, in/hr				
I 5	2.410	2.410	5.500	5.500
I 10	2.760	2.760	6.270	6.270
I 25	3.210	3.210	7.170	7.170
Flows, cfs				
Q5	94.684	99.126	27.583	29.178
Q10	108.435	113.522	31.444	33.262
Q25	126.114	132.031	35.958	38.037

Figure 1 - Wall I 66 Inch Combined Sewer Analysis Drainage Map



A96 = 0.688ac for CCG3 conditions

LEGEND
WALL I AND RAMP A3 DRAINAGE MAP

- EXISTING CONTOURS 1 FT
- PROPOSED CONTOURS 1 FT
- PROPOSED SEPARATE STORM DRAINAGE AREA
- PROPOSED COMBINED SEWER DRAINAGE AREA
- PROPOSED STORM SEWER/STRUCTURES
- EXISTING COMBINED SEWER PIPES
- EXISTING STORM SEWER PIPES

N

0 50
25 100
HORIZONTAL SCALE IN FEET

CLEVELAND INNERBELT

WSP WILSH DESIGN AGENCY HNTB

INLET SPACING DESIGN

PID : 49633 **Date :** 05/25/2011 **Project :** CUY-90-14.90 **Location :** Ramp A3 - Wall I -Barrier Wall

Description : Spread Calculation for end of Wall I - 3003+75 **Designer :** ELJ

Rainfall Area: A **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.25

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
3008+63	Begin																	
3003+75	CB-3A	488.00	0.90	0.40	1.00	2.91	10.00	0.0155	0.0475	0.0475	6.00	0.0417	5.10	1.39	0.45	1.83	0.225	4.74

STORM SEWER SYSTEM

PID : 49633 **Date :** 07/14/2011 **Project :** CUY-90-14.90 **Location :** Ramp A3 - SS 3003+73.5 RT

Description : 2011-07-14 Ramp A3- SS 3003+73.5 RT **Designer :** ELJ

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 667.37

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D22	FREE	3003+73	0.40	0.36	10.00	5.10	6.20	1.8	2.2	15	34.0	0.3244 *	677.15	14.14	34.30	0.0016	677.37	683.76	6.39	5.36	CB 3A
begin		3003+73	0.40	0.36									666.12				667.37	667.60			0.015

NOTE:
This is a broken back pipe consisting of three sections:
- first section: 5' @ 1.00%,
- middle section: 26' @ 35.97% and
- final section: 10' @ 1.00%

STORM SEWER SYSTEM

PID : 49633 **Date :** 09/26/2011 **Project :** Cleveland Innerbelt **Location :** Ramp A3 - 3002+87 LT to Ex. SS/Proposed 57"

Description : Ramp A3 - 3002+87 LT to Ex. SS /Proposed 57" - D23 **Designer :** ELJ

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 66.00 **Tailwater Elevation (ft.):** 650.51

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
A84	A88	72+50	50.60	39.47	30.00	2.79	3.23	110.2	127.3	66	276.0	0.0035	650.36	8.56	213.04	0.0014	654.40	664.56	10.16	8.70	MH 3
begin		71+83	50.60	39.47									649.40				654.01	668.76			0.013
A88	A102	71+83	11.38	8.99	30.54	2.76	3.23	133.7	156.3	66	652.0	0.0038	649.38	9.27	222.79	0.0022	654.01	668.76	14.75	13.88	MH 3
		65+87	61.98	48.46									646.90				652.60	670.25			0.013
A102	A101	65+87	0.00	0.00	31.71	2.69	3.23	130.5	156.3	66	122.0	0.0038	646.88	9.18	221.81	0.0022	652.60	668.75	16.15	16.37	MH 3
		3004+24	61.98	48.46									646.42				652.33	671.29			0.013
EXF1	D23	3002+50	2.46	1.94	30.00	2.79	3.23	5.4	6.3	15	150.0	0.0030	652.46	4.42	3.30	0.0125	655.20	656.82	1.62	3.11	CB 2-6
begin		3002+86	64.44	50.40						Warning			652.01				653.33	661.40			0.015
D23	A101	3002+87	2.35	1.86	30.57	2.76	3.23	10.5	12.3	24	198.0	0.0066	652.01	5.42	17.15	0.0039	653.33	661.40	8.07	7.39	CB 8
		72+50	66.79	52.26									650.70				652.33	671.29			0.015
A101	101A	3004+24	1.50	1.18	31.93	2.68	3.23	143.2	172.4	57	254.0	0.0040	646.53	10.71	182.09	0.0041	652.33	671.29	18.96	20.01	MH 3
		3006+93	68.29	53.44						Warning			645.52				651.29	675.05			0.011
101A	A100	3006+93	0.00	0.00	32.33	2.66	3.23	142.1	172.4	57	162.0	0.0040	645.52	10.74	182.92	0.0041	651.29	675.05	23.76	24.78	MH 3
		3008+48	68.29	53.44									644.87				650.62	673.76			0.011
A100	END	3008+48	0.00	0.00	32.58	2.64	3.23	141.3	172.4	57	27.0	0.0040	644.87	10.68	181.79	0.0041	650.62	673.76	23.14	24.14	MH 3
final		3008+77	68.29	53.44									644.76				650.51	672.00			0.011

STORM SEWER SYSTEM

PID : 49633 **Date :** 06/29/2011 **Project :** CUY-90-14.90 **Location :** I-90 / Ramp A3 SS 3004+39 LT

Description : I-90 / Ramp A3 SS to Ditch LT_3004+39 LT **Designer :** ELJ

Rainfall Area: A **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
D21	FREE	3004+39	0.28	0.25	10.00	5.10	6.19	1.3	1.6	15	54.0	0.2917 *	693.50	12.28	32.52	0.0008	693.69	669.90	-23.79	-24.85	CB 3A
begin		3004+33	0.28	0.25									677.75				678.62	679.00			0.015

NOTE:
This is a broken back pipe consisting of three sections:
- first section: 10' @ 5.00%,
- middle section: 34' @ 43.72% and
- final section: 10' @ 1.00%

DITCH ANALYSIS

PID : 46933 **Date :** 09/22/2011 **Project :** CUY-90-14.90 **Location :** Ramp A3

Description : Ramp A3 - 2999+90 LT to 3002+86 LT **Designer :** PNS

Rainfall Area : A

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
2999+90	3001+30		140.00	0.00	4.00	2.00	0.0040	0.20	0.20	0.70	0.14	Seed	3.38	5	0.030	17.24	1.03	0.10	0.47	0.39	2.35
												Seed	3.85	10	0.040	17.66	0.84	0.12	0.54	0.46	2.77
3001+30	3002+00	L	73.00	2.00	4.00	2.00	0.0186	0.14	0.34	0.70	0.24	Seed	3.31	5	0.030	17.91	1.81	0.20	0.78	0.17	3.03
												Seed	3.76	10	0.040	18.43	1.56	0.25	0.89	0.21	3.29
3002+00	3002+86	L	105.00	2.00	4.00	2.00	0.0593	0.26	0.60	0.70	0.42	Seed	3.26	5	0.030	18.45	3.23	0.63	1.37	0.17	3.02
												Jute Mat	3.25	5	0.040	18.57	2.65	0.74	1.37	0.20	3.19
												Temp. Mat	3.25	5	0.040	18.57	2.65	0.74	1.37	0.20	3.19
												Temp. Mat	3.68	10	0.040	19.07	2.75	0.79	1.55	0.21	3.28

DITCH ANALYSIS

PID : 46933 **Date :** 09/21/2011 **Project :** CUY-90-14.90 **Location :** Ramp A3

Description : Ramp A3 - 3008+14 LT to 3002+86 LT **Designer :** PNS

Rainfall Area : A

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
3008+14	Concent							0.31		0.90	0.28					10.00					
3008+14	3007+00	L	108.00	2.00	13.00	7.00	0.0175	0.28	0.59	0.75	0.48	Seed	3.51	5	0.030	15.99	1.80	0.24	1.70	0.22	6.46
												Seed	4.04	10	0.040	16.17	1.52	0.30	1.96	0.27	7.45
3007+00	3005+35	L	182.00	2.00	20.00	6.00	0.0242	0.43	1.02	0.76	0.81	Seed	3.37	5	0.030	17.36	2.18	0.37	2.74	0.24	8.34
												Seed	3.83	10	0.040	17.82	1.82	0.44	3.12	0.29	9.65
3005+35	3004+47	L	67.00	2.00	10.00	4.00	0.0227	0.28	1.30	0.76	1.03	Seed	3.32	5	0.030	17.79	2.59	0.45	3.41	0.31	6.40
												Jute Mat	3.31	5	0.040	17.89	2.09	0.51	3.40	0.36	7.04
												Temp. Mat	3.31	5	0.040	17.89	2.09	0.51	3.40	0.36	7.04
												Temp. Mat	3.77	10	0.040	18.33	2.17	0.54	3.87	0.38	7.35
3004+47	3003+35	L	116.00	2.00	5.00	3.00	0.1563 *	0.30	1.59	0.70	1.23	Seed	3.28	5	0.030	18.21	6.04	2.24	4.05	0.23	3.84
												Jute Mat	3.28	5	0.040	18.29	4.93	2.61	4.04	0.27	4.14
												Temp. Mat	3.28	5	0.040	18.29	4.93	2.61	4.04	0.27	4.14
												Perm, Type 1	3.28	5	0.040	18.29	4.93	2.61	4.04	0.27	4.14

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Perm, Type 2	3.28	5	0.040	18.29	4.93	2.61	4.04	0.27	4.14
												Perm, Type 2	3.73	10	0.040	18.71	5.13	2.78	4.60	0.29	4.28
3003+35	3002+86	L	49.00	2.00	4.00	2.00	0.1653 *	0.15	1.75	0.70	1.34	Seed	3.26	5	0.030	18.41	6.59	2.51	4.38	0.24	3.46
												Jute Mat	3.26	5	0.040	18.44	5.39	2.94	4.38	0.28	3.71
												Temp. Mat	3.26	5	0.040	18.44	5.39	2.94	4.38	0.28	3.71
												Perm, Type 1	3.26	5	0.040	18.44	5.39	2.94	4.38	0.28	3.71
												Perm, Type 2	3.26	5	0.040	18.44	5.39	2.94	4.38	0.28	3.71
												Perm, Type 2	3.71	10	0.040	18.85	5.60	3.14	4.98	0.30	3.83

DITCH ANALYSIS

PID : 46933 **Date :** 09/23/2011 **Project :** CUY-90-14.90 **Location :** Ramp A3

Description : Ramp A3-Wall I - 3007+44 RT to 3002+68 RT **Designer :** AHR

Rainfall Area : A

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
3007+44	3007+12	R	32.00	0.00	2.00	2.00	0.0404	0.02	0.02	0.50	0.01	Seed	3.57	5	0.030	15.42	1.26	0.27	0.03	0.11	0.43
												Seed	4.13	10	0.040	15.52	1.01	0.32	0.03	0.13	0.52
3007+12	3006+70	R	42.40	2.00	2.00	2.00	0.0404	0.03	0.05	0.50	0.02	Seed	3.50	5	0.030	16.09	1.03	0.09	0.08	0.04	2.15
												Seed	4.02	10	0.040	16.27	0.91	0.12	0.09	0.05	2.19
3006+70	3004+98	R	171.70	2.00	2.00	2.00	0.0080	0.16	0.21	0.70	0.14	Seed	3.26	5	0.030	18.45	1.20	0.08	0.45	0.16	2.64
												Seed	3.69	10	0.040	18.98	1.03	0.10	0.51	0.20	2.82
3004+98	3004+44	R	53.60	2.00	2.00	2.00	0.0572	0.06	0.27	0.70	0.18	Seed	3.23	5	0.030	18.81	2.47	0.38	0.58	0.11	2.42
												Seed	3.65	10	0.040	19.40	2.15	0.48	0.65	0.13	2.54
3004+44	3004+10	R	34.20	2.00	2.00	2.00	0.0031	0.04	0.31	0.70	0.21	Seed	3.17	5	0.030	19.39	0.98	0.05	0.66	0.27	3.06
												Seed	3.58	10	0.040	20.08	0.83	0.06	0.74	0.33	3.33
3004+10	3003+75		35.00	2.00	2.00	2.00	0.0352	0.04	0.35	0.70	0.24	Seed	3.15	5	0.030	19.64	2.28	0.31	0.74	0.14	2.57
												Seed	3.55	10	0.040	20.38	1.96	0.40	0.83	0.18	2.72
3003+75	Concent							0.40		0.90	0.60					5.00					

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
3003+75	3003+43	R	32.30	2.00	2.00	2.00	0.0352	0.07	0.82	0.80	0.65	Seed	3.14	5	0.030	19.81	3.22	0.55	2.03	0.25	3.01
												Jute Mat	3.13	5	0.040	19.85	2.63	0.65	2.03	0.30	3.19
												Temp. Mat	3.13	5	0.040	19.85	2.63	0.65	2.03	0.30	3.19
												Temp. Mat	3.53	10	0.040	20.57	2.72	0.70	2.29	0.32	3.27
3003+43	3002+95	R	47.10	2.00	2.00	2.00	0.0173	0.10	0.92	0.80	0.73	Seed	3.11	5	0.030	20.15	2.60	0.35	2.26	0.33	3.31
												Seed	3.49	10	0.040	20.93	2.19	0.44	2.54	0.41	3.64
3002+95	3002+68	R	28.00	2.00	2.00	2.00	0.0098	0.06	0.98	0.80	0.78	Seed	3.09	5	0.030	20.37	2.17	0.24	2.40	0.40	3.58
												Seed	3.47	10	0.040	21.18	1.83	0.30	2.69	0.49	3.97

DITCH ANALYSIS

PID : 46933 **Date :** 06/16/2011 **Project :** CUY-90-14.90 **Location :** Ramp A3-Wall I - 3002+68 RT TEMP

Description : Ramp A3-Wall I - 3002+30 RT to 3002+68 RT(Ex. Inlet) TEMP **Designer :** ELJ

Rainfall Area : A

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

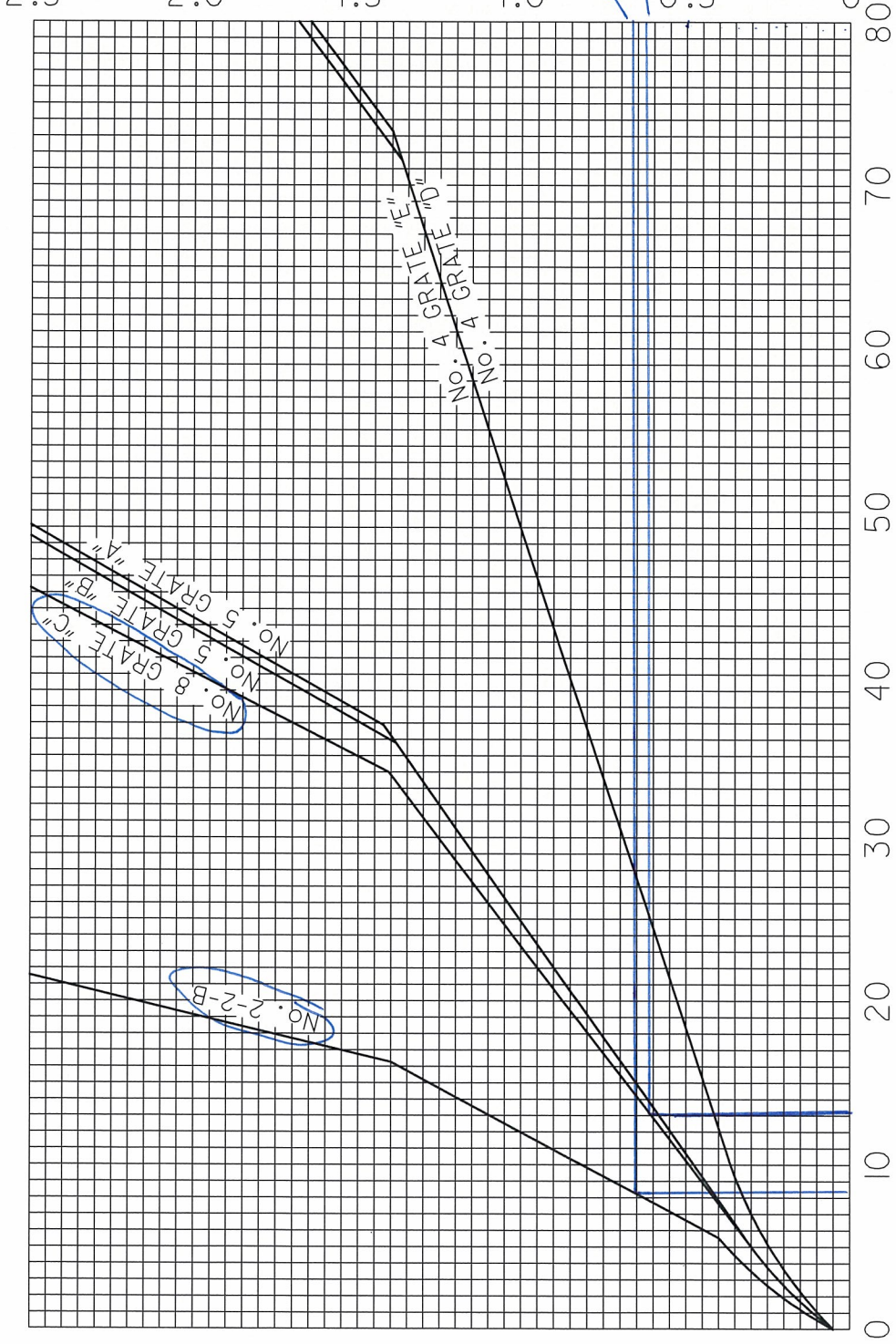
STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
3002+30	3002+68	R	37.32	0.00	2.00	3.00	0.0148	0.41	0.41	0.78	0.32	Seed	3.59	5	0.030	15.29	2.16	0.42	1.14	0.46	2.30
												Jute Mat	3.58	5	0.040	15.36	1.73	0.47	1.14	0.51	2.56
												Temp. Mat	3.58	5	0.040	15.36	1.73	0.47	1.14	0.51	2.56
												Temp. Mat	4.15	10	0.040	15.34	1.79	0.50	1.32	0.54	2.71

Station 3002+68 RT Capacity of Sump Calc
(Ex. Inlet)
and Station 3002+87 LT Capacity of Sump Calc
(D-23)

CAPACITY OF A GRATE CATCH BASIN IN A SUMP

1102-1

REFERENCE SECTION
1102.3.5



CAPACITY OF A GRATE CATCH BASIN IN A SUMP (WATER PONDED ON THE GRATE)

Existing Inlet @ D-23
Q_{10} = 2.10 cfs

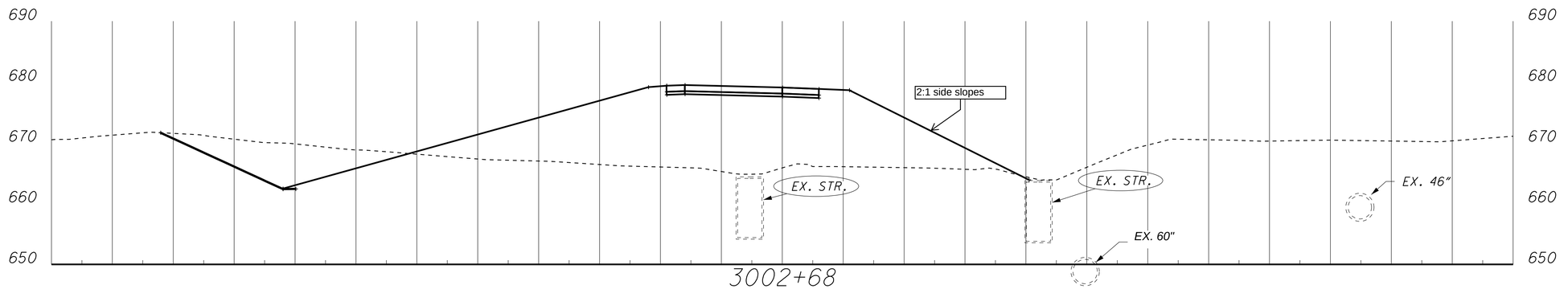
@ D-23
$2Y_{10}$ = 0.63 ft

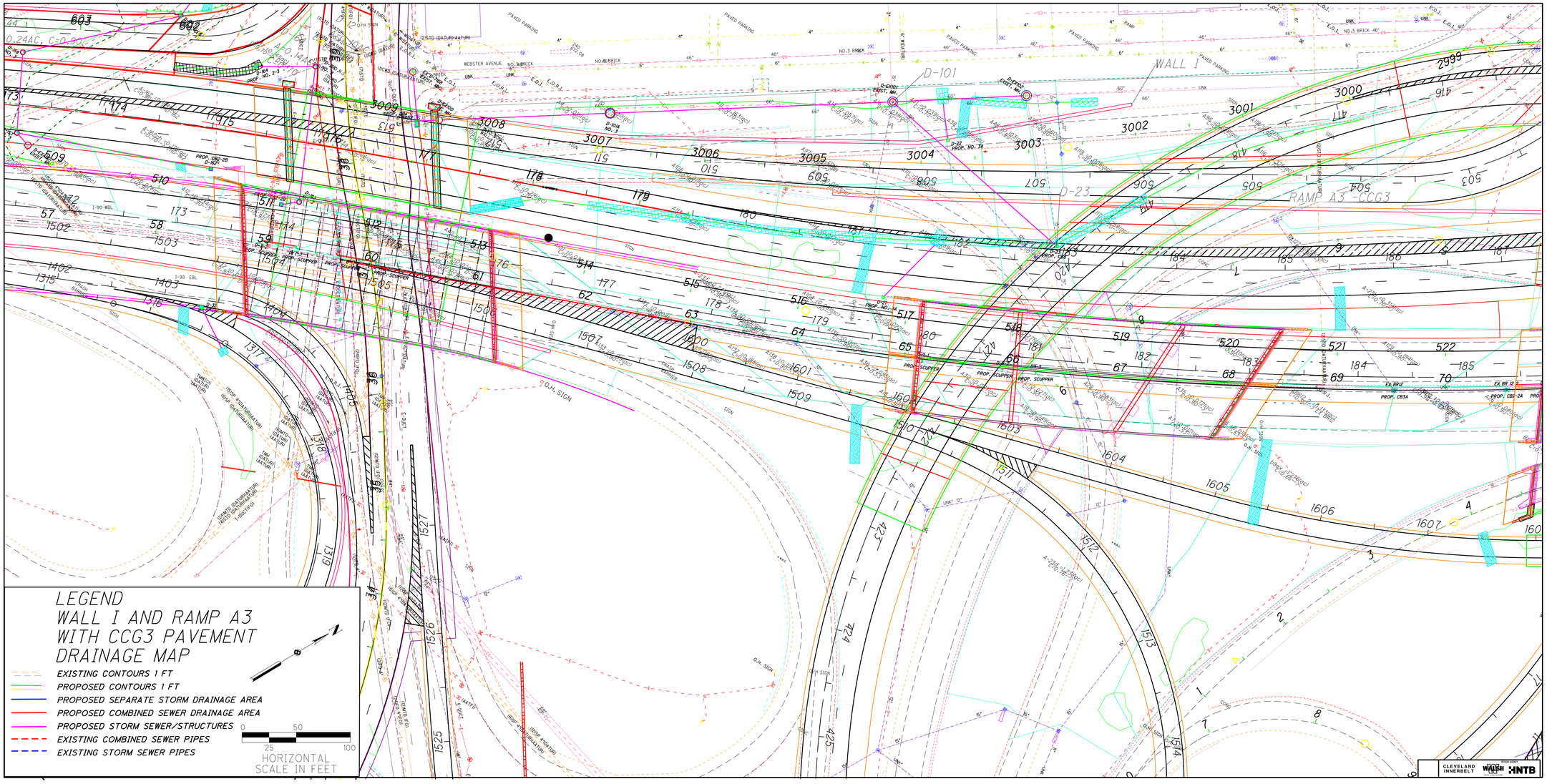
Btm @ 661.4 + 0.63 = 662.03

7+69 = 6948 << 662.03 << 665
∴ OK

CB-8
@ D-23
Q_{10} = 1.65 + 4.98 c
= 6.53 cfs
2 x 6.53 = 13.06

use 2-2A conservative for 2-2B @ Existing Inle
Q_{10} = 1.32 + 2.7
= 4.05 cfs
2 x 4.05 cfs = 8.1


690
680
670
660
650
2:1 side slopes
EX. STR.
EX. STR.
EX. 60"
EX. 46"
3002+68

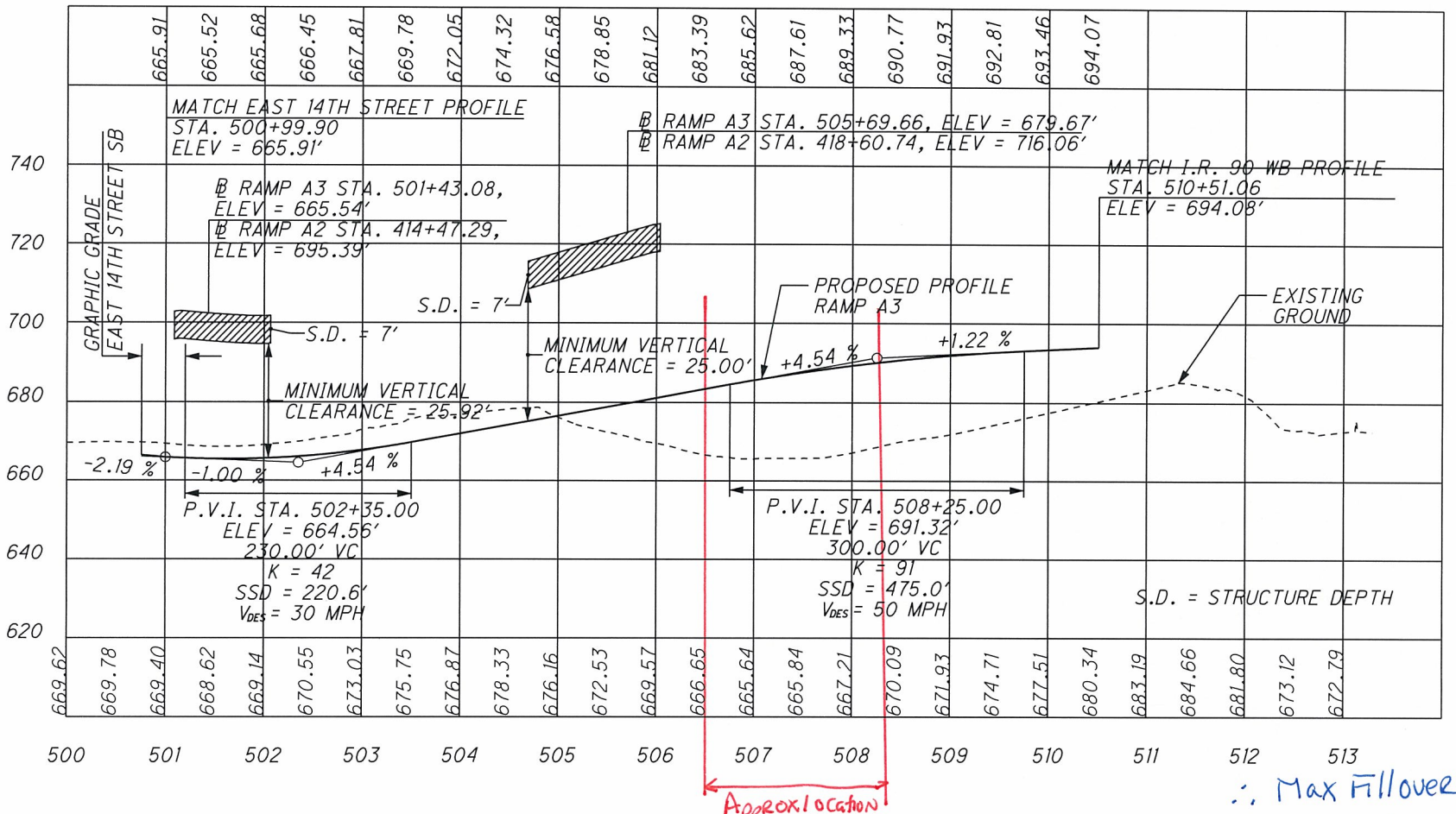

LEGEND
WALL I AND RAMP A3
WITH CCG3 PAVEMENT
DRAINAGE MAP
EXISTING CONTOURS 1 FT
PROPOSED CONTOURS 1 FT
PROPOSED SEPARATE STORM DRAINAGE AREA
PROPOSED COMBINED SEWER DRAINAGE AREA
PROPOSED STORM SEWER/STRUCTURES
EXISTING COMBINED SEWER PIPES
EXISTING STORM SEWER PIPES
0
50
25
100
HORIZONTAL
SCALE IN FEET
WALL I
RAMP A3 -CCG3
D-101
D-23
WEBSTER AVENUE
PAVED PARKING
O.H. SIGN
CLEVELAND
INNERBELT
WALSH
NTB

Ramp A3 - Determine Max Fill for Pipe Between D101 + D-23

D101 @ Stat 3004+23.5, 58.71' RT, Top of Pipe @ 652.7
℄ Ramp A3 Elev @ 3004+23.5 = 686.5'

D-23 @ Station 3002+87.34, 88.84' LT Top of Pipe 654.6
℄ Ramp A3 Elev @ 3002+87 ≈ 688'

RAMP A3



Approx location of D-101 to D-23 pipe → Max Elev ≈ 691

∴ Max Fill over pipe =

691
− 650.71
40.29

∴ PerODOT L+D Volume 2 Table 1008-10

Revised July, 2002

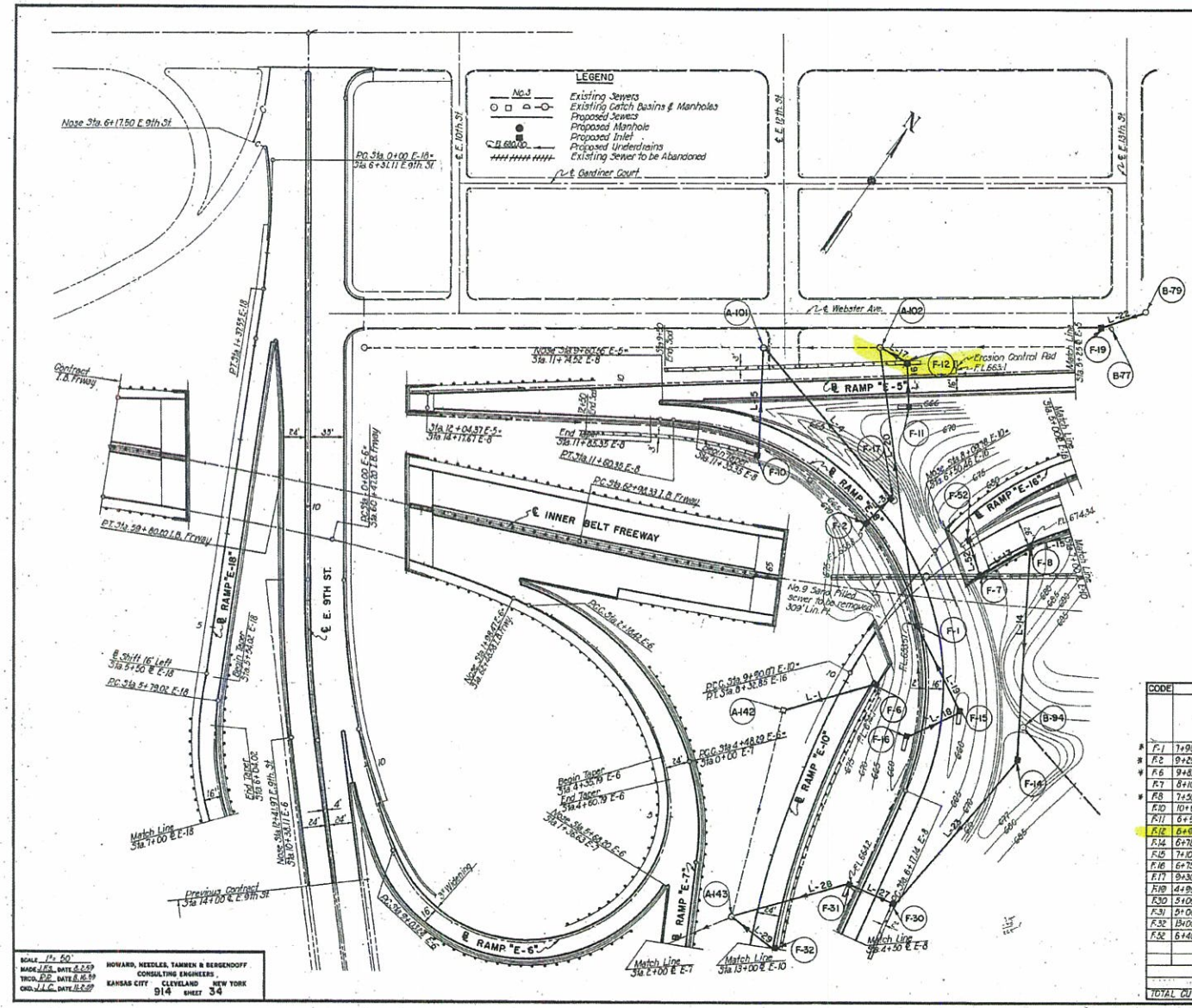
MAXIMUM ALLOWABLE HEIGHT OF COVER FOR REINFORCED CONCRETE PIPE WITH TYPE 2 BEDDING

1008-10

Reference Section
1008.2.1

706.02 Pipe-Minimum Test Load to Produce a 0.01-Inch Crack												
Pipe	Thick-	D-Load										
Dia.	ness	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	
Inches	Inches	Height of Fill (Maximum)										
12	2	*	*	*	*	28	31	35	38	42	46	
15	2.25	*	*	*	*	28	31	35	39	42	46	
18	2.5	*	17	20	24	28	31	35	39	42	46	
21	2.75	*	17	20	24	28	31	35	38	42	46	
24	3	*	16	20	24	27	31	34	38	42	45	
27	3.25	13	16	20	24	27	31	34	38	41	45	
30	3.5	12	16	20	23	27	31	34	38	41	45	
36	4	12	16	19	23	27	30	34	37	41	44	
42	4.5	12	16	19	23	26	30	33	37	41	44	
48	5	12	15	19	23	26	30	33	37	40	44	
54	5.5	12	15	19	22	26	29	33	37	40	44	
60	6	11	15	19	22	26	29	33	36	40	43	
66	6.5	11	15	18	22	25	29	32	36	39	43	
72	7	11	14	18	22	25	29	32	36	39	43	
78	7.5	11	14	18	21	25	28	32	35	39	42	
84	8	11	14	18	21	25	28	32	35	39	42	
90	8	10	14	18	21	25	28	32	35	39	42	
96	8.5	10	14	17	21	25	28	32	35	39	42	
102	8.5	10	14	17	21	24	28	31	35	38	42	
108	9	10	14	17	21	24	28	31	35	38	42	
114	9.5	10	13	17	21	24	28	31	35	38	42	
120	10	10	13	17	20	24	27	31	34	38	42	
126	10.5	9	13	17	20	24	27	31	34	38	41	
132	11	9	13	16	20	24	27	31	34	38	41	
144	12	9	12	16	20	23	27	30	34	37	41	

ASBUILTS 1/2



FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS	34
2	OHIO			181

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY-42-18.42
CUY-21-15.32
DRAINAGE PLAN

ESTIMATED QUANTITIES-UNDERDRAINS		
I-4 6" Underdrain Pipe	L.F.	2025
I-4 6"C.M.P. Outlet for Underdrains	L.F.	20
I-5 Pipe Special	Each	2

CODE	ROADWAY	FROM	TO	ESTIMATED QUANTITIES, PIPES						
				I-2 12" Class "B" L.F.	I-2 12" B-UP L.F.	I-2 15" Class B L.F.	I-2 15" B-UP L.F.	I-2 15"B-UP M 66.6(B) L.F.	I-2 12"C.I.P. M-65.6(B) L.F.	I-2 18"B-UP M-66.6(B) L.F.
L-1	Ramp E-10	F-6	A-142		100					
L-3	Ramp E-6	F-2	F-17		34					
L-4	Ramp E-8	F-17	A-101					204		
L-5	Ramp E-8	F-10	A-101		110					
L-13	Ramp E-10	F-7	F-8		86					
L-14	I-B Freeway	F-8	F-14			222				
L-15	Ramp E-10	F-24	F-8	116						
L-16	Ramp E-5	F-11	F-12		46					
L-17	Ramp E-5	F-12	A-102						30	
L-18	Ramp E-8	F-16	F-15		58					
L-19	Ramp E-8	F-15	F-1				100			
L-20	Ramp E-8	F-1	A-102					256		
L-22	Ramp E-5	F-19	B-79		46					
L-23	Ramp E-8	F-14	F-30			200				
L-27	Ramp E-8	F-30	F-31				47			
L-28	Ramp E-10	F-31	A-143							124
L-29	Ramp E-10	F-32	A-143		54					
L-52	Ramp E-16	F-52	F-7		36					
TOTAL CUY-42-18.42				116	540	422	147	500	30	124

CODE	LOCATION	EST. QUANTITIES, CATCH BASINS, INLETS & MH'S						
		I-8 Std E-6 Inlet Each	I-8 Std E-8 C.B. Each	I-8 Std E-8A C.B. Each		I-8 Std #3 C.B. Each		I-14 Paved Apron L.F.
* F-1	1+98 Ramp E-8 5Lt.	1						
* F-2	9+25 Ramp E-8 5Lt.	1						
* F-6	9+85 Ramp E-10 28Lt.		1					
F-7	8+10 Ramp E-10 19 Lt.	1						
* F-8	7+50 Ramp E-10 19 Lt.	1						
F-10	10+66 Ramp E-8 18 Lt.			1				10
F-11	6+97 Ramp E-5 30 Lt.			1				20
F-12	6+07 Ramp E-5 18 Lt.			1				20
F-14	6+78 Ramp E-8 100Rt.			1				
F-15	7+10 Ramp E-8 32Rt.			1				10
F-16	6+75 Ramp E-8 18 Lt.			1				10
F-17	9+30 Ramp E-8 30Rt.			1				10
F-19	4+95 Ramp E-5 47Rt.					1		
F-30	5+00 Ramp E-8 37Rt.			1				10
F-31	5+00 Ramp E-8 15 Lt.			1				10
F-32	13+00 Ramp E-10 27 Lt.	1						
F-52	6+40 Ramp E-16 18 Lt.	1						
TOTAL CUY-42-18.42		6	1	9		1		100

Note: Asterisked inlets are to be Std. I-E-A Inlets as per Standard drawing I-8 I E-A 4-23-58

Rev. A.E.K. 1-11-60

SCALE 1"= 50'
MADE J.E.S. DATE 8-2-59
TRCD. P.P. DATE 8-16-59
CKD. J.J.C. DATE 11-2-59

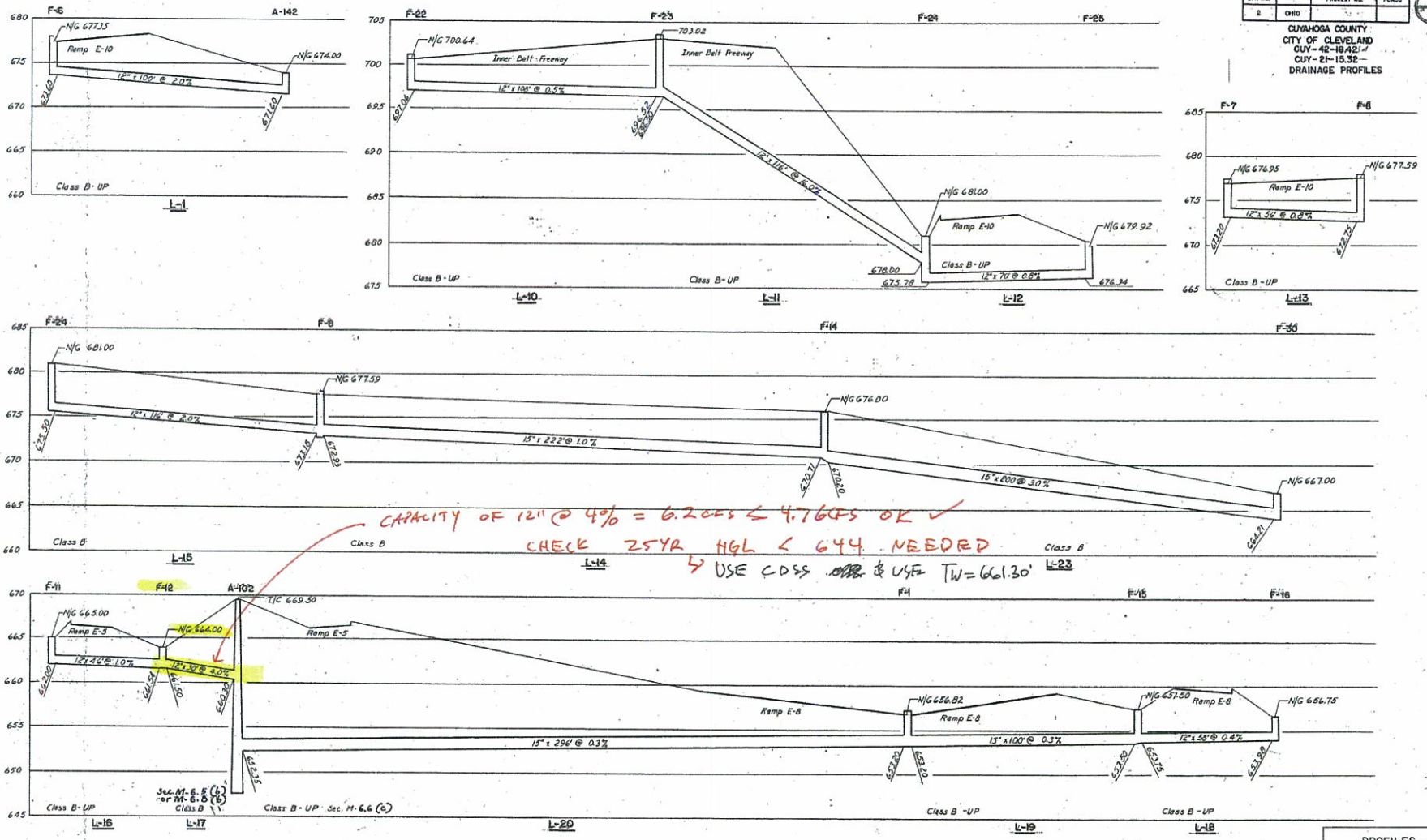
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
SHEET 34
914

RAMPS R/L

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

36 of 181

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY-42-18.42
CUY-21-15.32
DRAINAGE PROFILES



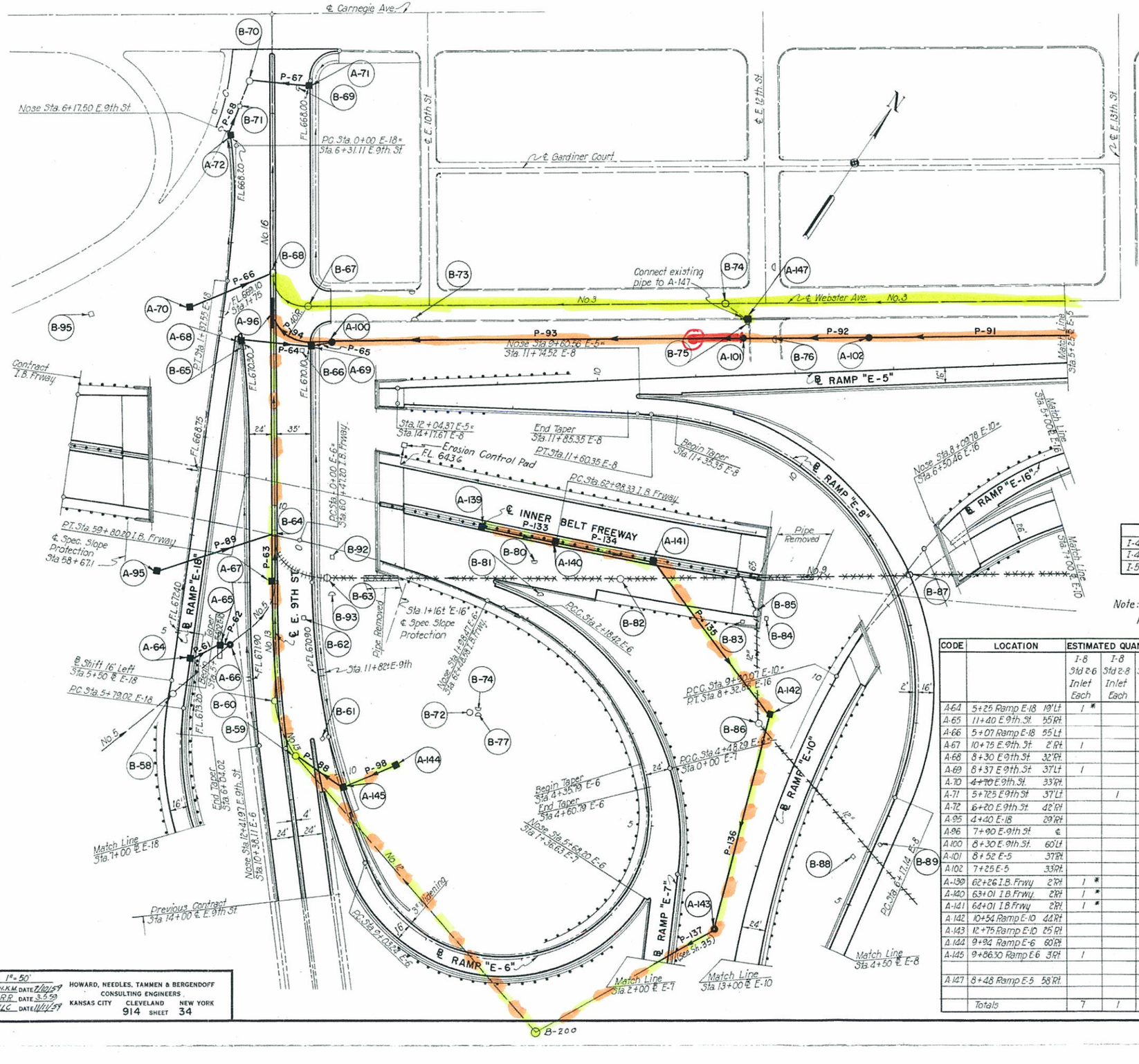
SCALE: HOR. 1"=100' VERT. 1"=10'
MADE: DATE 7-9-59
TRCD. DATE
CRD: DATE 8-20-59
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 SHEET. 36

PROFILES
L-1, L-10 TO L-20, & L-23

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

34
175

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY-42-18.29
DRAINAGE PLAN



CODE	LOCATION	FROM	TO	ESTIMATED QUANTITIES–PIPES							
				I-2 12" Class B L.F.	I-2 12" B-UP L.F.	I-2 66" B-UP M.6.6(c) L.F.	I-2 66" B-UP M-106.6(a) L.F.	I-2 66"and B-UP M-106.6(a) L.F.	Special No.9 Sand Filled L.F.	I-2 15" Class B L.F.	I-2 15" B-UP L.F.
P61	Ramp E-18	A-64	A-65	28							
P62	Ramp E-18	A-65	A-66	6							
P63	East 9th St.	A-67	B-64		42						
P64	East 9th St.	A-68	A-69		68						
P65	East 9th St.	A-69	A-100		20						
P66	East 9th St.	A-70	B-68		88						
P67	East 9th St.	A-71	B-70		66						
P68	East 9th St.	A-72	B-71		24						
P88	East 9th St.	A-145	B-59								54
P89	Ramp E-18	A-95	B-64		122						
P92	Ramp E-5	A-102	A-101			122					
P93	Ramp E-5	A-101	A-100				416				
P94	Ramp E-5	A-100	A-96				14	40			
P98	Ramp E-6	A-144	A-145							56	
	I.B. Freeway	B-87	B-63						585		
P133	I.B. Freeway	A-139	A-140		12						
P134	I.B. Freeway	A-140	A-141		98						
P135	I.B. Freeway	A-141	A-142		192						
P136	Ramp E-10	A-142	A-143	226 *							
	I.B. Freeway	A-84	B-87						615		
	Totals			34	792	122	430	40	1200	56	54

* Sec. M-6.6(c)

ESTIMATED QUANTITIES - UNDERDRAINS		
I-4, 6" Underdrain Pipe	LF	3,313
I-4, 8" C.M.P. Outlet for Underdrains	LF	20'
I-5, 6" Pipe Special	Each	3

Note: Inlets noted thus * are Standard No. 2-6-A Inlets.

CODE	LOCATION	ESTIMATED QUANTITIES, INLETS, CATCH BASINS, MANHOLES								
		I-8 Std 2-6 Inlet Each	I-8 Std 2-8 Inlet Each	I-8 Std 3-A C.B. Each	I-8 Std 2-2-A C.B. Each	I-8 Std #2 M.H. Each	I-8 Junc. Cham. Each		I-8 Std #3 C.B. Each	I-14 Paved Apron Lin. Ft.
A-64	5+25 Ramp E-18 19' Lt	1 *								
A-65	11+40 E. 9th St. 55' Rt.				1					20
A-66	5+07 Ramp E-18 55' Lt					1				
A-67	10+75 E. 9th St. 2' Rt.	1								
A-68	8+30 E. 9th St. 32' Rt.			1						
A-69	8+37 E. 9th St. 37' Lt	1								
A-70	4+70 E. 9th St. 33' Rt.				1					
A-71	5+125 E. 9th St. 37' Lt		1							
A-72	6+20 E. 9th St. 42' Rt			1						
A-95	4+40 E-18 29' Rt				1					
A-96	7+90 E. 9th St. ℄						1			
A-100	8+30 E. 9th St. 60' Lt					1				
A-101	8+52 E-5 37' Rt.					1				
A-102	7+25 E-5 33' Rt.					1				
A-139	62+26 I.B. Frwy 2' Rt	1 *								
A-140	63+01 I.B. Frwy. 2' Rt	1 *								
A-141	64+01 I.B. Frwy 2' Rt.	1 *								
A-142	10+54 Ramp E-10 44' Rt				1					
A-143	12+75 Ramp E-10 25' Rt					1				
A-144	9+94 Ramp E-6 60' Rt				1					
A-145	9+86.30 Ramp E-6 3' Rt	1								
A-147	8+48 Ramp E-5 58' Rt.							1		
	Totals	7	1	2	5	5	1	1		20

ESTIMATED QUANTITIES, INLETS C.B. & M.H.				
CODE	LOCATION	I-8 M.H. adj to Grade Each	I-16 M.H. Aban Each	I-16 Inlet Aban. Each
B-58	5+65 E-18 3' Lt.		1	
B-59	12+57 E 9th St. 10' Lt	1		
B-60	12+00 E 9th St. 4' Rt		1	
B-61	12+41 E 9th St. 39' Lt.			1
B-62	11+17 E. 9th St. 29' Lt.			1
B-63	10+74 E. 9th St. 53' Lt		1	
B-64	10+28 E. 9th St ℄	1		
B-65	2+03 E. 18th 27' Lt.			1
B-66	8+40 E. 9th St. 30' Lt.			1
B-67	7+95 E. 9th St. 35' Lt.	1		
B-68	7+62 E. 9th St ℄	1		
B-69	5+74 E. 9th St. 27' Lt.			1
B-70	5+67 E. 9th St. 22' Rt	1		
B-71	5+94 E. 9th St. 33' Rt			1
B-73	11+82 E-5 68' Rt.			1
B-75	8+49 E-5 54' Rt			1
B-76	8+18 E-5 36' Rt.			1
B-72	2+36 E-6 112' Rt.		1	
B-78	6+56 E-5 25' Rt			1
B-74	2+44 E-6 102' Rt.			1
B-80	62+84 Frwy 25' Rt.			1
B-81	62+95 Frwy 57' Rt.			1
B-82	63+72 Frwy 25' Rt.		1	
B-83	64+99 Frwy 47' Rt.			1
B-84	65+20 Frwy 41' Rt.			1
B-85	65+09 Frwy. 37' Rt.		1	
B-86	65+30 Frwy 149' Rt.		1	
B-87	66+58 Frwy 22' Lt.		1	
B-88	5+46 E-8 16' Lt.			1
B-89	5+72 E-8 3' Rt.			1
B-92	10+54 E-9th St. 39' Lt.			1
B-93	10+92 E-9th St. 58' Lt.			1
B-94	7+00 E-8 100' Rt.		1	
B-95	1+87 E-18 129' Rt.			1
B-77	2+50 E-6 110' Rt.			1
	Totals	5	9	21

Rev. JAG 1-11-60

SCALE 1" = 50'
MADE M.K.M. DATE 7/19/59
TRCD. R.B. DATE 3.5.59
CKD. J.L.C. DATE 11/4/59

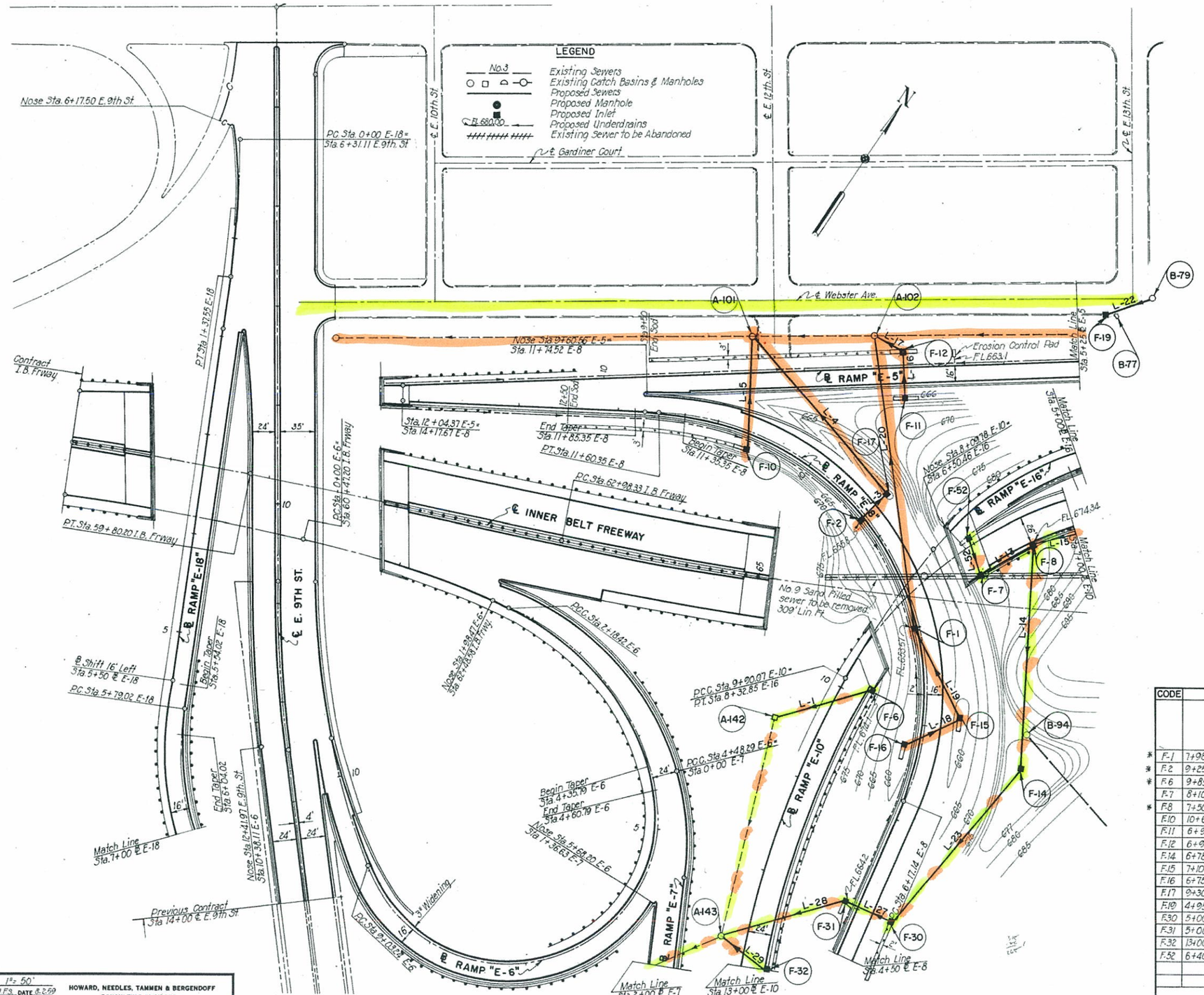
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 SHEET 34

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

34
181

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY-42-18.42
CUY-21-15.32

DRAINAGE PLAN



ESTIMATED QUANTITIES-UNDERDRAINS		
I-4 6" Underdrain Pipe	L.F.	2025
I-4 8" C.M.P. Outlet for Underdrains	L.F.	20
I-5 Pipe Special	Each	2

CODE	ROADWAY	FROM	TO	ESTIMATED QUANTITIES, PIPES						
				I-2 12" Class 'B' L.F.	I-2 12" B-U.P. L.F.	I-2 15" Class B L.F.	I-2 15" B-U.P. L.F.	I-2 15" B.U.P. M 6.6(4) L.F.	I-2 12" Cl. B M-65.(1) M 6.8(6) L.F.	I-2 18" B-U.P. M-6.6(6) L.F.
L-1	Ramp E-10	F-6	A-142		100					
L-3	Ramp E-8	F-2	F-17		34					
L-4	Ramp E-8	F-17	A-101					204		
L-5	Ramp E-8	F-10	A-101		110					
L-13	Ramp E-10	F-7	F-8		56					
L-14	I-B Freeway	F-8	F-14			222				
L-15	Ramp E-10	F-24	F-8	116						
L-16	Ramp E-5	F-11	F-12		46					
L-17	Ramp E-5	F-12	A-102						30	
L-18	Ramp E-8	F-16	F-15		58					
L-19	Ramp E-8	F-15	F-1				100			
L-20	Ramp E-8	F-1	A-102					296		
L-22	Ramp E-5	F-19	B-79		46					
L-23	Ramp E-8	F-14	F-30			200				
L-27	Ramp E-8	F-30	F-31				47			
L-28	Ramp E-10	F-31	A-143							124
L-29	Ramp E-10	F-32	A-143		54					
L-52	Ramp E-16	F-52	F-7		36					
TOTAL CUY-42-18.42				116	540	422	147	500	30	124

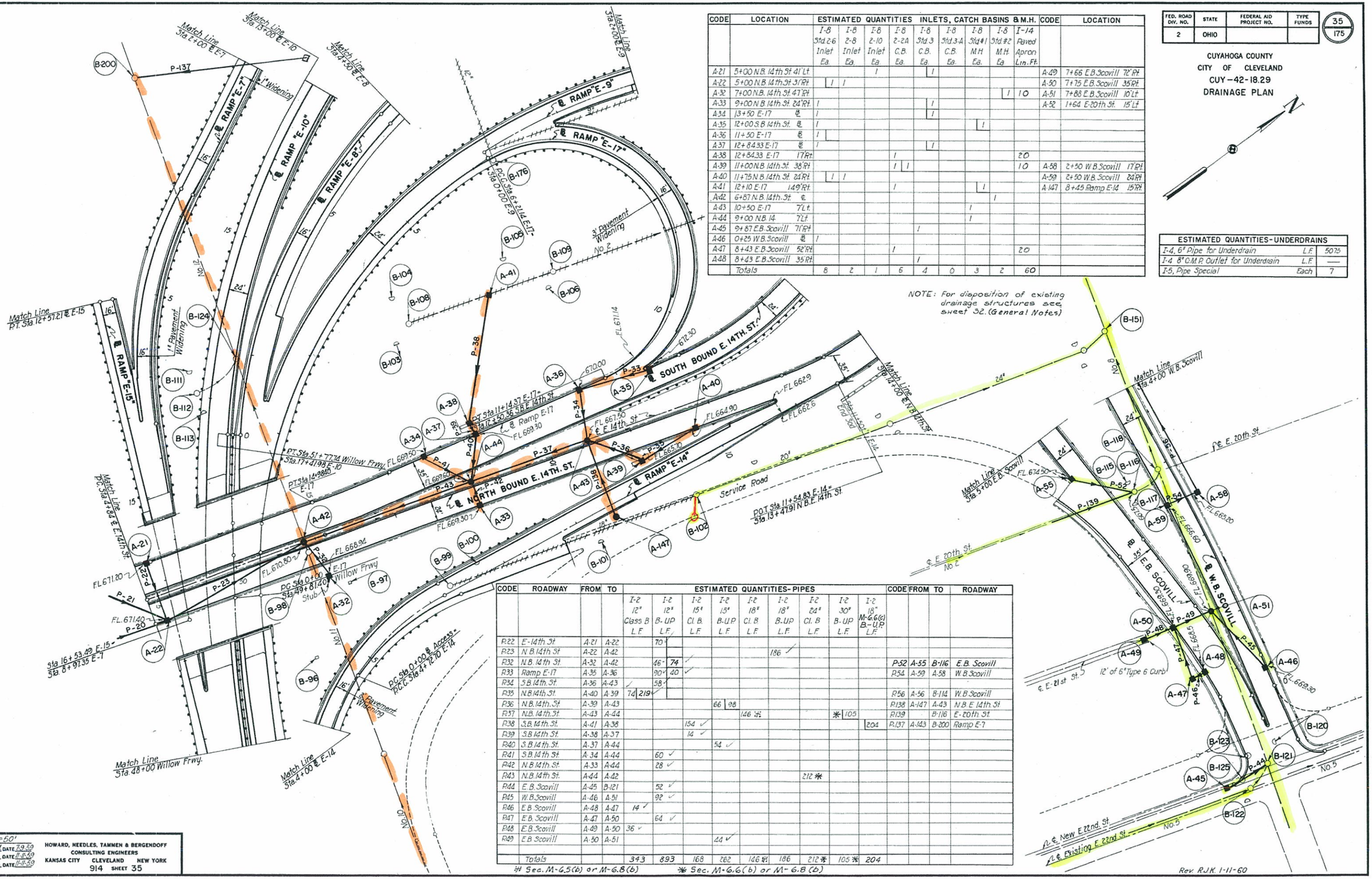
CODE	LOCATION	EST. QUANTITIES, CATCH BASINS, INLETS & MH'S					
		I-8 Std 2-6 Inlet Each	I-8 Std 2-8 C.B. Each	I-8 Std 2-2A C.B. Each	I-8 Std #3 C.B. Each		I-14 Paved Apron L.F.
* F-1	7+98 Ramp E-8 5'Lt.	1					
* F-2	9+25 Ramp E-8 5'Lt.	1					
* F-6	9+85 Ramp E-10 20'Lt.		1				
F-7	8+10 Ramp E-10 20' Lt.	1					
* F-8	7+50 Ramp E-10 20'Lt.	1					
F-10	10+65 Ramp E-8 18'Lt.			1			10
F-11	6+97 Ramp E-5 30'Lt.			1			20
F-12	6+97 Ramp E-5 18'Lt.			1			20
F-14	6+78 Ramp E-8 100'Rt.			1			
F-15	7+10 Ramp E-8 32'Rt.			1			10
F-16	6+75 Ramp E-8 18'Lt.			1			10
F-17	9+30 Ramp E-8 30'Rt.			1			10
F-19	4+95 Ramp E-5 47'Rt.				1		
F-30	5+00 Ramp E-8 37'Rt.			1			10
F-31	5+00 Ramp E-8 15'Lt.			1			10
F-32	13+00 Ramp E-10 27'Lt.	1					
F-52	6+40 Ramp E-16 18'Lt.	1					
TOTAL CUY-42-18.42		6	1	9	1		100

Note:
Asterisked inlets are to be Std.-2-A inlets as per Standard drawing I-8 I 2-A 4-23-59.

Rev. A.E.K. 1-11-60

SCALE 1"= 50'
MADE J.F.S. DATE 8.2.59
TRCD. P.P. DATE 8.16.59
CKD. J.J.C. DATE 11.2.59

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 SHEET 34



NOTE: For disposition of existing drainage structures see sheet 32. (General Notes)

CODE	LOCATION	ESTIMATED QUANTITIES INLETS, CATCH BASINS & M.H. I-8 Std 2-6 Inlet Ea.	I-8 2-8 Inlet Ea.	I-8 2-10 Inlet Ea.	I-8 2-24 C.B. Ea.	I-8 Std 3 C.B. Ea.	I-8 Std 3-A C.B. Ea.	I-8 Std #1 M.H. Ea.	I-8 Std #2 M.H. Ea.	I-14 Paved Apron Lin. Ft.	CODE	LOCATION
A-21	5+00 N.B. 14th St 41' Lt.			1		1					A-49	7+66 E.B. Scovill 72' Rt.
A-22	5+00 N.B. 14th St 31' Rt.	1	1								A-50	7+75 E.B. Scovill 35' Rt.
A-32	7+00 N.B. 14th St 47' Rt.								1	10	A-51	7+88 E.B. Scovill 10' Lt.
A-33	9+00 N.B. 14th St 24' Rt.	1				1					A-52	1+64 E. 20th St. 15' Lt.
A-34	13+50 E-17 ℄	1				1						
A-35	12+00 S.B. 14th St. ℄	1						1				
A-36	11+50 E-17 ℄	1										
A-37	12+84.33 E-17 ℄	1				1						
A-38	12+84.33 E-17 17' Rt.				1					20		
A-39	11+00 N.B. 14th St. 38' Rt.				1	1				10	A-58	2+50 W.B. Scovill 17' Rt.
A-40	11+75 N.B. 14th St. 24' Rt.	1	1								A-59	2+50 W.B. Scovill 24' Rt.
A-41	12+10 E-17 149' Rt.				1			1			A-147	8+45 Ramp E-14 15' Rt.
A-42	6+87 N.B. 14th St. ℄								1			
A-43	10+50 E-17 7' Lt.							1				
A-44	9+00 N.B. 14 7' Lt							1				
A-45	9+87 E.B. Scovill 71' Rt.					1						
A-46	0+25 W.B. Scovill ℄	1										
A-47	8+43 E.B. Scovill 92' Rt.				1					20		
A-48	8+43 E.B. Scovill 35' Rt.					1						
	Totals	8	2	1	6	4	0	3	2	60		

CODE	ROADWAY	FROM	TO	ESTIMATED QUANTITIES-PIPES I-2 12" Class B L.F.	I-2 12" B-UP L.F.	I-2 15" Cl. B L.F.	I-2 15" B-UP L.F.	I-2 18" Cl. B L.F.	I-2 18" B-UP L.F.	I-2 24" Cl. B L.F.	I-2 30" B-UP L.F.	I-2 18" M-6.6(c) B-UP L.F.	CODE	FROM	TO	ROADWAY
P-22	E-14th St	A-21	A-22		70											
P-23	N.B. 14th St	A-22	A-42						186 ✓							
P-32	N.B. 14th St	A-32	A-42		46	74 ✓							P-52	A-55	B-116	E.B. Scovill
P-33	Ramp E-17	A-35	A-36		90 ✓	40 ✓							P-54	A-59	A-58	W.B. Scovill
P-34	S.B. 14th St.	A-36	A-43	✓	58 ✓								P-56	A-56	B-114	W.B. Scovill
P-35	N.B. 14th St.	A-40	A-39	74	219 ✓								P-138	A-147	A-43	N.B. E. 14th St.
P-36	N.B. 14th St.	A-39	A-43				66	98					P-139		B-116	E. 20th St.
P-37	N.B. 14th St.	A-43	A-44					146 #			✱	105	P-137	A-143	B-200	Ramp E-7
P-38	S.B. 14th St.	A-41	A-38			154 ✓						204				
P-39	S.B. 14th St.	A-38	A-37			14 ✓										
P-40	S.B. 14th St.	A-37	A-44				54 ✓									
P-41	S.B. 14th St.	A-34	A-44		60 ✓											
P-42	N.B. 14th St.	A-33	A-44		28 ✓											
P-43	N.B. 14th St.	A-44	A-42							212 ✱						
P-44	E.B. Scovill	A-45	B-121		52 ✓											
P-45	W.B. Scovill	A-46	A-51		92 ✓											
P-46	E.B. Scovill	A-48	A-47	14 ✓												
P-47	E.B. Scovill	A-47	A-50		64 ✓											
P-48	E.B. Scovill	A-49	A-50	36 ✓												
P-49	E.B. Scovill	A-50	A-51				44 ✓									
	Totals			343	893	168	262	146 #	186	212 ✱	105 ✱	204				

Sec. M-6.5(b) or M-6.8(b) ✱ Sec. M-6.6(b) or M-6.8(b)

ESTIMATED QUANTITIES-UNDERDRAINS		
I-4, 6" Pipe for Underdrain	L.F.	5075
I-4 8" C.M.P. Outlet for Underdrain	L.F.	—
I-5, Pipe Special	Each	7

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

35
175

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY-42-18.29
DRAINAGE PLAN

SCALE 1" = 50'
MADE H.E.M. DATE 7-9-59
TRCD. R.R. DATE 11-11-59
CKD. G.M.G. DATE 11-11-59

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 SHEET 35

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

36
175

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY-42-18.29
DRAINAGE PLAN

CODE	ROADWAY	FROM	TO	ESTIMATED QUANTITIES – PIPES										CODE	FROM	TO	ROADWAY
				I-12 12" Class "B" L.F.	I-12 12" B-UP L.F.	I-12 15" Cl. B L.F.	I-12 18" Cl. B. L.F.	I-12 18" B-UP L.F.	I-12 24" Cl. B L.F.	I-12 24" B-UP L.F.	I-12 66" M.6.6(c) L.F.	I-12 66" Rad Pipe M-6.6(c) L.F.					
P.69	N.B. 14th St.	A-73	A-74		68	14					B-U.P.	B-U.P.	P.87	A-94	B-169	East 18th St.
P.70	N.B. 14th St.	A-74	A-75			78					* 260	* 16	P.90	A-84	A-88	N.B.E 14th St.
P.71	N.B. 14th St.	A-75	A-76				124				588	64	P.91	A-88	A-97	Ramp E-5
P.72	W.B. Scovill	A-77	A-78	14												
P.73	W.B. Scovill	A-78	A-79					46								
P.74	N.B. 14th St.	A-79	A-76					88								
P.75	N.B. 14th St.	A-76	A-80						70							
P.76	S.B. 14th St.	A-81	A-82				82									
P.77	S.B. 14th St.	A-82	A-83					40								
P.78	S.B. 14th St.	A-83	A-80				64									
P.79	N.B. 14th St.	A-80	A-84						52 #							
P.80	S.B. 14th St.	A-85	A-88		76											
P.81	S.B. 14th St.	A-86	A-87	44												
P.82	S.B. 14th St.	A-87	A-88		52											
P.84	W.B. Scovill		B-151							#106						
P.85	East 18th St.	A-92	A-93		78											
P.86	East 14th St.	A-93	B-162		50											
	Totals			58	338	78	270	174	70	106#	588	64				

* Sec. M-6.6 (b) # Sec. M-6.6 (b) or M-6.8 (b)

ESTIMATED QUANTITIES UNDERDRAINS		
I-4, 6" Underdrain Pipe	L.F.	4825
I-4, 8" C.M.P. Outlet For Underdrains	L.F.	110
I-5, Pipe Special	Each	8

CODE	LOCATION	ESTIMATED QUANTITIES – C.B.B.M.H'S. I-8 M.H. Adj. to Grade Each	I-16 M.H. Aban. Each	I-16 Inlet Aban. Each
B-90	68+58 Frwy. 23' Lt.			1
B-91	68+39 Frwy. 59' Lt.			1
B-126	10+04 S B.E 14th. 106' Rt.			1
B-127	9+96 S B.E 14th. 161' Rt.			1
B-128	2+15 E-9 1' Rt.		1	
B-129	9+00 S B.E 14th. 70' Rt.		1	
B-130	8+40 S B.E 14th. 3' Lt.			1
B-131	8+26 S B.E 14th. 54' Lt.			1
B-136	69+67 I B Frwy. 54' Lt.		1	
B-137	5+85 S B.E 14th. 7' Lt.			1
B-138	6+26 S B.E 14th 61' Lt.			1
B-139	5+66 S B.E 14th. 6' Lt.		1	
B-140	5+46 S B.E 14th. 38' Lt.			1
B-141	17+32 N B.E 14th ℄		1	
B-142	17+96 N B.E 14th 9' Rt.		1	
B-143	7+67 W.B. Scovill 9' Lt.			1
B-144	7+38 W.B. Scovill 14' Lt.	1		
B-145	17+13 N B.E 14th 5' Rt.			1
B-146	7+34 W.B. Scovill 32' Lt.			1
B-147	5+53 W.B. Scovill 144' Rt.			1
B-148	4+85 W.B. Scovill 18' Lt.			1
B-149	4+73 W.B. Scovill 12' Lt.		1	
B-150	4+48 W.B. Scovill 22' Lt.			1
B-151	4+85 W.B. Scovill 21' Rt.	1 *		
B-157	4+44.5 B.E. 14th. 46' Lt.			1
B-158	20+41 N.B.E. 14th. 29' Rt.			1
B-159	20+49 N.B.E. 14th. 43' Rt.			1
B-160	20+53 N.B.E. 14th. 46' Rt	1		
B-161	20+68 N.B.E. 14th. 44' Rt.			1
B-162	20+85 N.B.E. 14th. 10' Rt.	1		
B-163	21+15 N.B.E. 14th. 29' Rt.			1
B-164	21+54 N.B.E. 14th. 10' Rt.		1	
B-165	21+76 N.B.E. 14th. 28' Lt.			1
B-166	21+56 N.B.E. 14th. 51' Lt.			1
B-167	23+02 N.B.E. 14th. 28' Lt.			1
B-168	23+61 N.B.E. 14th. 38' Lt.			1
B-169	23+61 N.B.E. 14th. 171' Rt.			1
B-170	23+66 N.B.E. 14th. 11' Rt.	1		
B-172	22+79 N.B.E. 14th. 188' Rt.	1		
B-173	22+64 N.B.E. 14th. 207' Rt.			1
B-176	3+80 S.B. 14th. 30' Lt.			1
B-177	4+32 E-5 27' Rt.			1
B-171	2+54 18th. St. T.O. 8' Lt.			1
	Totals	5	8	29

* Item I-8, Manhole Reconstructed to Grade, as per plan.

CODE	LOCATION	ESTIMATED QUANTITIES – INLETS, CATCH BASINS & M.H. I-8 Std 26 Inlet Each	I-8 Std 28 Inlet Each	I-8 Std 3-A C.B. Each	I-8 Std 22A C.B. Each	I-8 Std 7 C.B. Each	I-8 Std 1 M.H. Each	I-8 Std 2 M.H. Each	I-14 Paved Apron Lin Ft	CODE	LOCATION
A-73	14+43 N B 14th 55' Rt		1			1			10	A-87	3+75 S B 14th ℄
A-74	14+40 N B 14th 14' Lt					1			10	A-88	20+57 N B 14th 10' Lt
A-75	5+22 N B 14th St ℄	1									
A-76	16+50 N B 14th 15' Lt				1				20		
A-77	6+50 W.B. Scov. 17' Rt				1				20		
A-78	6+50 W.B. Scov. ℄	1	1							A-92	1+25 E 18th St ℄
A-79	6+35 W.B. Scov. 46' Lt			1	1				10	A-93	21+35 E 14th 26' Rt
A-80	17+22 N B 14th 10' Lt			1			1			A-94	3+10 E 18th 47' Rt
A-81	8+07.5 B 14th 27' Rt					1					
A-82	7+25 E B Scov. ℄	1									
A-83	0+50 E B Scov. ℄	1									
A-84	17+88 N B 14th 3' Lt							1			
A-85	4+28 S B 14th ℄	1									
A-86	4+00.5 B 14th 40' Rt					1					
	Totals	7	1	1	5	2	1	2	70		

SCALE 1" = 50'
MADE HKM DATE 7/13/59
TRCD. R.P. DATE 9/16/59
CKD. GMG DATE 11/12/59

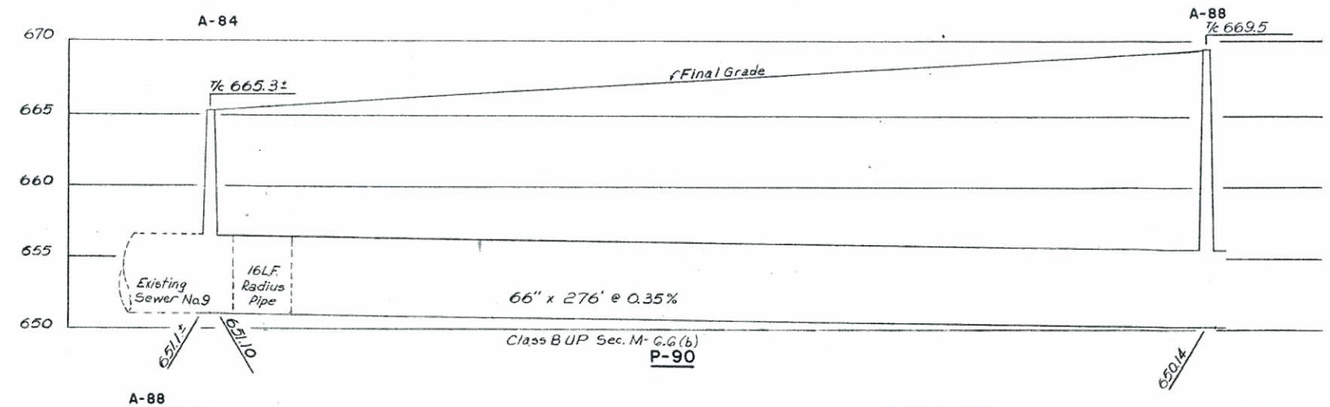
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY CLEVELAND NEW YORK
914 SHEET 36

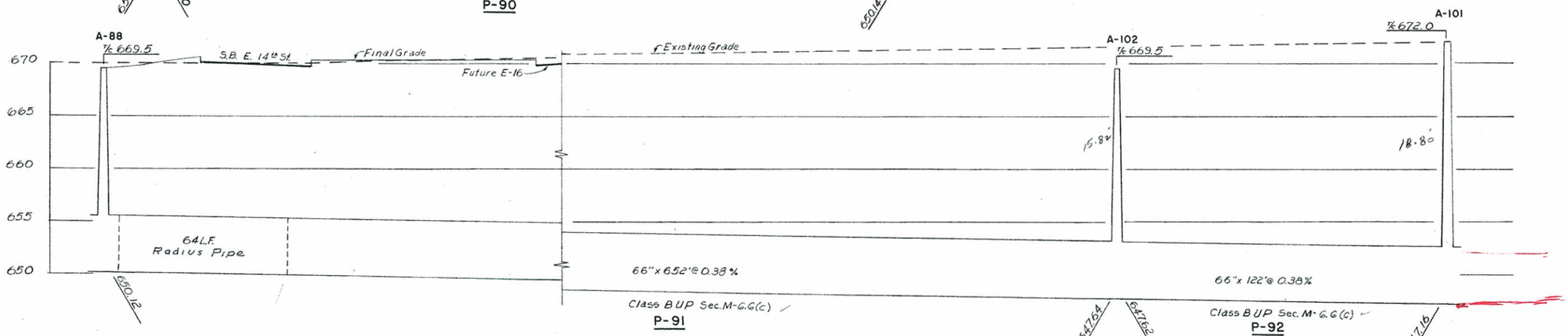
Rev. R.J.K. 1-11-60

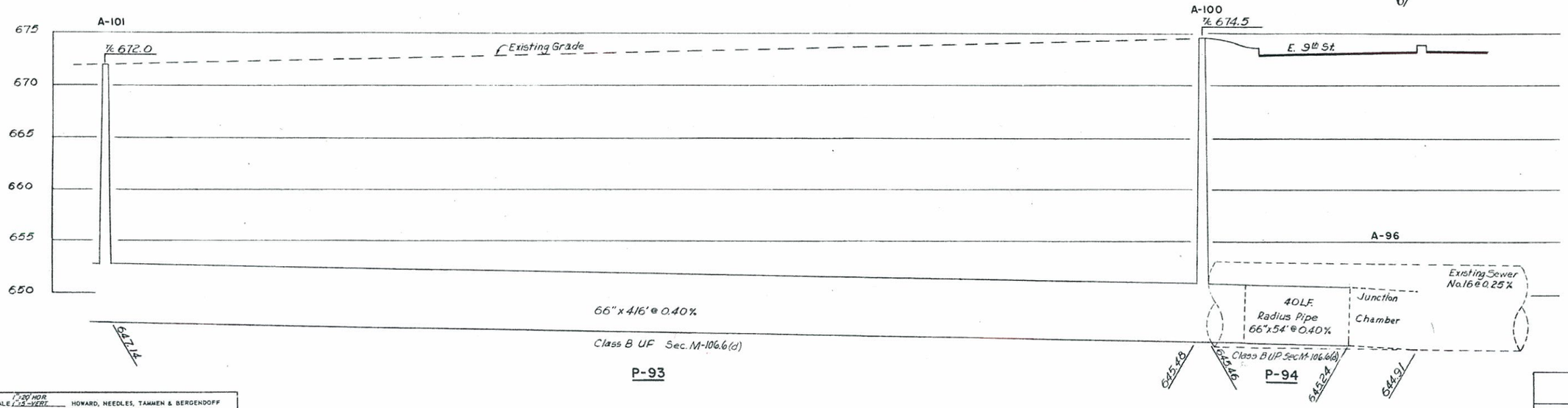
FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	TYPE FUNDS
2	OHIO		

41
175

CUYAHOGA COUNTY
CITY OF CLEVELAND
CUY - 42 - 18.29







SCALE 1"=20 HOR. 1"=5 VERT.
MADE HKM DATE 2-15-59
TRCD. ___ DATE ___
CKD. JLG DATE 3-1-59

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
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