Ditch/Inlet Spacing/Storm Sewer Design

I-70/I-71/SR 315 West Interchange

FRA-70-13.10
Phase 6R
PID No. 89464

June 06, 2021

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FINAL TRACINGS
DRAINAGE REPORT
for
FRA-71-14.36
PROJECT 6R
PID 105523

1. This drainage report contains the proposed ditch analysis, bridge's scupper spacing and roadway inlet spacing calculations, and the routing calculations. The drainage basin maps are included in with this electronic submission within a sub-folder.
2. The bmp treatment for Phase 6A & 6R has been incorporated into the BMP structure treating the storm water in Phase's 1 through 5. During the initial meetings with the OEPA in 2010, Phase 6 was a future project west of the Scioto River and Project 4 was the I-70/I-71 "South Trench" corridor east of the river. You will see this in the accompanying letter to ODOT, sent to the OEPA, along with the meeting minutes with the OEPA. Late in 2013 Project 44 and project 6 limits were redefined. Phase 4B is now the I-70/I-71 corridor from Front Street to Grant Avenue. West of Front Street there now is Phase 4A "I-70 EB & I-71 NB" and Phase 6A "I-70WB & I-71 SB". Both Phases have been separated out into smaller buildable phases 4A & 4R, and 6A & 6R. Both Phases $ & 6 cross the river and extend down toward Greenlawn Avenue. The initial BMP calculations from 2010 determine that around 39cfs needs to be treated, but 50cfs was used to get credit for future projects in the area. Current day, the BMP structure design has been revised to treat 75cfs. This was done to get credit for not only Phase 4 and Phase 6 that cross the river, but future phases that come along in the i-70/i-71/SR 315 Interchange.
3. The proposed bridge hydraulics for the Scioto River was performed as a combined Phase 4 and Phase 6 project. Phase 4A "FRA-70-12.68" analyzed the combined bridge hydraulics for both projects. For the Phase 6A & 6R bridge hydraulics analysis and supporting documents, refer to the FRA-70-12.68 project.

ms consultants, inc.
engineers, architects, planners

Office: **03**

Project Number **60-06634-00**

Date **05-27-10**

Page **1** of **1**

Time **1:30m**

Prepared By **TAZ/SWA**

Minutes of: [x] **Meeting** [ ] **Phone Conversation**

Project:

Persons in Attendance	Organization	Individuals and Copies			
	OEPA	Harry Kallipolitis			
	ODOT	Matthew Cozzoli		Brad Jones	
	ODOT	Mike Wawszkiewicz		Ferzan Ahmed	
	ms	Shawn Arden/Ted Zangmeister		Tom Hibbard/Heather Seitz	

Additional Distribution:

Item No.	Topic/Description	Action By
	ODOT/ms gave Harry Kallipolitis an overview of Project 1, 3, 2 and 4. Mike Wawszkiewicz then informed Harry K. that it was ODOT's intention to develop (1) manufactured system to treat the water quality for the 4 separate projects. This Manufactured Structure will have to be a special design due to the volume of water it is expecting to treat. Mike W. also informed Harry K. of the time table when it was anticipated the projects would go to construction. It was anticipated that Project 1 will go to construction in 2011, and be completed in 2013. Project 2 (along with the new storm sewer outlet and BMP manufactured system) would go to construction in 2013 and be completed by 2015. Project 3 then 4 would follow in that order with two year construction schedules.	
1	Mike W. asked Harry K. if the EPA would have a problem with this. Harry K. stated that, installing the BMP system as part of the Project 2 to service all four project would be ok with the EPA. The only requirement from the EPA for ODOT is a letter of intent stating that ODOT is going to install the BMP manufactured system as stated above. He also wanted a statement in the letter from ODOT that if the BMP device was not to be constructed, then ODOT would install other mitigation devices for the projects. Harry K. also wanted to see calculations, along with the letter of intent, that the BMP requirements for all four project are being meet with the single manufactured system. Harry also mentioned that EPA will want to review the design and specifications package of the special manufactured system to be detailed in Project 2.	ms - calcs ODOT-letter

OHIO DEPARTMENT OF TRANSPORTATION

DISTRICT 6 • DEPARTMENT OF PRODUCTION
400 EAST WILLIAM STREET • DELAWARE, OHIO • 43015 • 800.372.7714

October 12, 2010

Mr. Harry Kallipolitis
Ohio EPA, Central District
PO Box 1049
Columbus OH 43216-1049

Re: FRA-71-17.76
FRA-70-14.48
PID Nos. 77369 & 77370
I-70/I-71 South Innerbelt Project
Post Construction Stormwater BMP
Letter of Intent

Dear Mr. Kallipolitis:

As a follow up to the meeting held at your office on May 27, 2010, we are writing this letter of intent to confirm that the Ohio Department of Transportation will construct the post-construction Best Management Practice (BMP) for the entire 70/71 project area, east of the Scioto River, during construction of FRA-70-14.48, the I-70/I-71 East Interchange (Project 2). Construction for this project is anticipated to follow the completion of FRA-71.17.76, the I-71/I-670 Interchange (Project 1).

The intention is for this BMP to be in the form of one large manufactured system, capable of treating water quality volumes as required by the Ohio EPA's NPDES General Permit. This plan is based upon the concept discussed at our meeting held at your office on the above mentioned date. Should this BMP device not be constructed as planned for Project 2, ODOT will install other mitigation devices capable of treating the required water quality volumes for the South Innerbelt Projects.

Enclosed for your review is the Post-Construction Stormwater BMP Investigation report. Contained within is a summary table of systems researched, testing data from four manufacturers and one independent municipality, and the water quality volume calculation for the entire project area. The manufactured systems will be required to treat this volume, and the testing data indicates that there are multiple systems currently on the market to meet this volume, though they are larger than what is currently approved by ODOT. ODOT will make a special approval of a larger system for this project only, and the manufactured water quality treatment system specifications will include only the manufacturers capable of providing this proven technology.

Project 2, which includes the storm sewer outlet at the Scioto River and BMP manufactured system, is currently being designed. ODOT will provide further information, including the final design and system specifications to the Ohio EPA when the design is complete. Please contact me if there are any questions or concerns regarding this proposal.

Sincerely,

Ferzan M. Ahmed, P.E.
Administrator
Office of Production
ODOT - District 6

Enclosure

Copy: L. Montgomery, B. Jones, J. Adams, M. Wawszkiewicz, T. Hibbard, T. Zangmeister, S. Arden, file

ms consultants, inc.
engineers, architects, planners

job no 10-016634 sheet 1
made by HLHS date 8/23/10
checked _____ date _____
office Columbus
project 70/71 WQ BMP

$WQ_F = C i A$ where $i = 0.65$ in/hr, $C = 0.9$

$WQ_{FI} = [(0.9)(0.65)(241.9)](0.2)$ Ex. Impervious Area = 241.9 acres

$= 28.3$ cfs

$WQ_{FO} = [(0.9)(0.65)(13.5)](1.0)$ New Impervious Area = 13.5 acres

$= 7.9$ cfs

$WQ_{FT} = 36.2$ cfs → Use 50 cfs for safety factor for Future development.

DITCH ANALYSIS

Trans. Ramp D7

DITCH ANALYSIS

DITCH ANALYSIS

PID : 89464 **Date :** 06/19/2019 **Project :** Phase 6R **Location :** Coumbus, Ohio, I-70/I71/SR 315 Interchange

Description : Transitional D7 STA 17004+50 to STA 17007+37.69 RT **Designer :** DNO

Rainfall Area : C

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.)
17004+0	17005+0	R	103.00	2.00	4.00	14.00	0.0316	0.09	0.09	0.54	0.05	Seed	4.30	5	0.030	11.37	1.26	0.13	0.21	0.06	3.16
												Seed	4.99	10	0.040	11.59	1.06	0.16	0.24	0.08	3.50
17005+0	17006+0	R	104.00	2.00	4.00	3.20	0.0649	0.12	0.21	0.52	0.11	Seed	4.20	5	0.030	12.12	2.27	0.36	0.47	0.09	2.64
												Seed	4.83	10	0.040	12.46	1.98	0.46	0.54	0.11	2.81
17006+0	17006+2	R	25.00	2.00	12.50	3.00	0.1412 *	0.02	0.23	0.64	0.12	Seed	4.18	5	0.030	12.27	2.79	0.64	0.52	0.07	3.12
												Jute Mat	4.18	5	0.040	12.30	2.30	0.75	0.52	0.08	3.31
												Temp. Mat	4.18	5	0.040	12.30	2.30	0.75	0.52	0.08	3.31
												Temp. Mat	4.80	10	0.040	12.64	2.40	0.80	0.59	0.09	3.42
17006+2	17007+3	R	114.00	2.00	2.50	2.00	0.1104 *	0.10	0.33	0.66	0.19	Seed	4.10	5	0.030	12.86	3.37	0.71	0.78	0.10	2.47
												Jute Mat	4.09	5	0.040	12.97	2.79	0.84	0.78	0.12	2.55
												Temp. Mat	4.09	5	0.040	12.97	2.79	0.84	0.78	0.12	2.55
												Temp. Mat	4.69	10	0.040	13.28	2.92	0.92	0.89	0.13	2.60

Short Street

DITCH ANALYSIS

DITCH ANALYSIS

PID : 89464 **Date :** 01/16/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Short Street, 13+66 Rt Side Ditch Design, along Ramp D6, Drainage Area (D32-D3) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
6003+60	6003+00	L	56.17	0.00	12.50	12.50	0.0312	0.03	0.03	0.50	0.01	Seed	6.19	5	0.030	1.87	1.03	0.16	0.08	0.08	2.01
												Seed	7.78	10	0.040	2.08	0.90	0.19	0.11	0.10	2.42
6003+00	6000+50	L	230.06	0.00	12.50	12.50	0.0561	0.24	0.26	0.50	0.13	Seed	5.75	5	0.030	3.55	2.23	0.58	0.76	0.17	4.13
												Jute Mat	5.65	5	0.040	3.98	1.79	0.64	0.75	0.18	4.57
												Jute Mat	6.94	10	0.040	4.08	1.88	0.69	0.92	0.20	4.93
6000+50	6000+00	L	49.44	0.00	12.50	12.50	0.0384	0.19	0.45	0.50	0.22	Seed	4.43	5	0.030	10.47	2.07	0.47	0.99	0.20	4.90
												Jute Mat	4.42	5	0.040	10.57	1.66	0.52	0.99	0.22	5.47
												Jute Mat	5.19	10	0.040	10.54	1.73	0.56	1.16	0.23	5.81
278+38	278+00	L	38.15	0.00	12.50	12.50	0.0039	0.43	0.88	0.50	0.44	Seed	4.11	5	0.030	12.82	1.02	0.09	1.81	0.38	9.43
												Seed	4.75	10	0.040	12.94	0.85	0.11	2.09	0.44	11.11
278+00	277+75	L	25.00	0.00	12.50	12.50	0.0160	0.01	0.89	0.50	0.45	Seed	4.08	5	0.030	13.06	1.73	0.29	1.82	0.29	7.25
												Seed	4.70	10	0.040	13.23	1.44	0.34	2.10	0.34	8.53
277+75	277+49	L	26.41	0.00	12.50	12.50	0.0280	0.02	0.91	0.50	0.45	Seed	4.05	5	0.030	13.27	2.13	0.46	1.84	0.26	6.56

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.)
												Jute Mat	4.05	5	0.040	13.32	1.72	0.51	1.84	0.29	7.30
												Jute Mat	4.66	10	0.040	13.48	1.78	0.54	2.12	0.31	7.70
13+62	13+66	R	26.89	0.00	12.50	12.50	0.1038 *	0.08	0.99	0.50	0.49	Seed	4.03	5	0.030	13.44	3.55	1.37	1.99	0.21	5.29
												Jute Mat	4.03	5	0.040	13.47	2.87	1.52	1.98	0.23	5.87
												Temp. Mat	4.03	5	0.040	13.47	2.87	1.52	1.98	0.23	5.87
												Perm, Type 1	4.03	5	0.040	13.47	2.87	1.52	1.98	0.23	5.87
												Perm, Type 1	4.64	10	0.040	13.63	2.96	1.61	2.29	0.25	6.21

Ramp D6, Drainage Area (D2)

Time of Overland Flow in Minutes

C =	0.50
L =	292.89
s =	5.44

(percent)

To = 10.509 min.

Total Td= 10.509 min.

Ramp D6, Drainage Area (D24)

Time of Overland Flow in Minutes

C =	0.50
L =	357.28
s =	4.68

(percent)

To = 12.204 min.

Total Td= 12.204 min.

Ramp C3

DITCH ANALYSIS

DITCH ANALYSIS

PID : 89464 **Date :** 05/21/2021 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3, 3008+62.50 Rt Side paved Ditch Drainage Area (D300-D302) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
3011+50	3010+50	R	100.95	2.00	2.00	2.00	0.0714	0.08	0.08	0.84	0.06	Seed	6.24	5	0.030	1.72	2.32	0.36	0.40	0.08	2.32
												Seed	7.93	10	0.040	1.78	2.10	0.49	0.51	0.11	2.44
3010+50	3009+00	R	145.22	2.00	2.00	2.00	0.0446	0.17	0.25	0.81	0.20	Seed	6.01	5	0.030	2.53	2.95	0.49	1.23	0.18	2.71
												Jute Mat	5.97	5	0.040	2.70	2.43	0.58	1.22	0.21	2.83
												Jute Mat	7.50	10	0.040	2.69	2.61	0.66	1.54	0.24	2.95
3009+00	3008+63	R	35.61	4.00	2.00	2.00	0.0050	0.05	0.30	0.80	0.24	Seed	5.85	5	0.030	3.16	1.27	0.08	1.41	0.25	4.99
												Seed	7.28	10	0.040	3.21	1.13	0.10	1.75	0.33	5.33

DITCH ANALYSIS

PID : 89464 **Date :** 05/26/2021 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3, 3008+62.50 Rt Side paved Ditch Drainage Area (D303-D304) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

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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+50	3008+25	R	73.70	2.00	2.00	2.00	0.0395	0.07	0.07	0.83	0.06	Seed	6.26	5	0.030	1.64	1.85	0.23	0.37	0.09	2.37
												Seed	7.96	10	0.040	1.71	1.69	0.30	0.47	0.12	2.49
3000+25	3008+63	R	36.00	4.00	2.00	2.00	0.0059	0.04	0.11	0.81	0.09	Seed	6.08	5	0.030	2.26	0.97	0.05	0.57	0.14	4.55
												Seed	7.64	10	0.040	2.39	0.88	0.07	0.71	0.19	4.74

Worksheet for Ramp C3 3008+63 Rt

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00560	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	4.00	ft
Discharge	2.46	ft³/s

Results

Normal Depth	0.20	ft
Flow Area	0.89	ft²
Wetted Perimeter	4.91	ft
Hydraulic Radius	0.18	ft
Top Width	4.81	ft
Critical Depth	0.22	ft
Critical Slope	0.00434	ft/ft
Velocity	2.75	ft/s
Velocity Head	0.12	ft
Specific Energy	0.32	ft
Froude Number	1.13	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.20	ft
Critical Depth	0.22	ft
Channel Slope	0.00560	ft/ft

Worksheet for Ramp C3 3008+63 Rt

GVF Output Data

Critical Slope	0.00434	ft/ft

Messages

Notes

Normal Depth is < 1.0', which keep it within the MSE Wal W3's l.0' Paved Channel

DITCH ANALYSIS

PID : 89464 **Date :** 03/17/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3, 3014+46 Rt Side Paved Swale Drainage Area (D119-D123) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

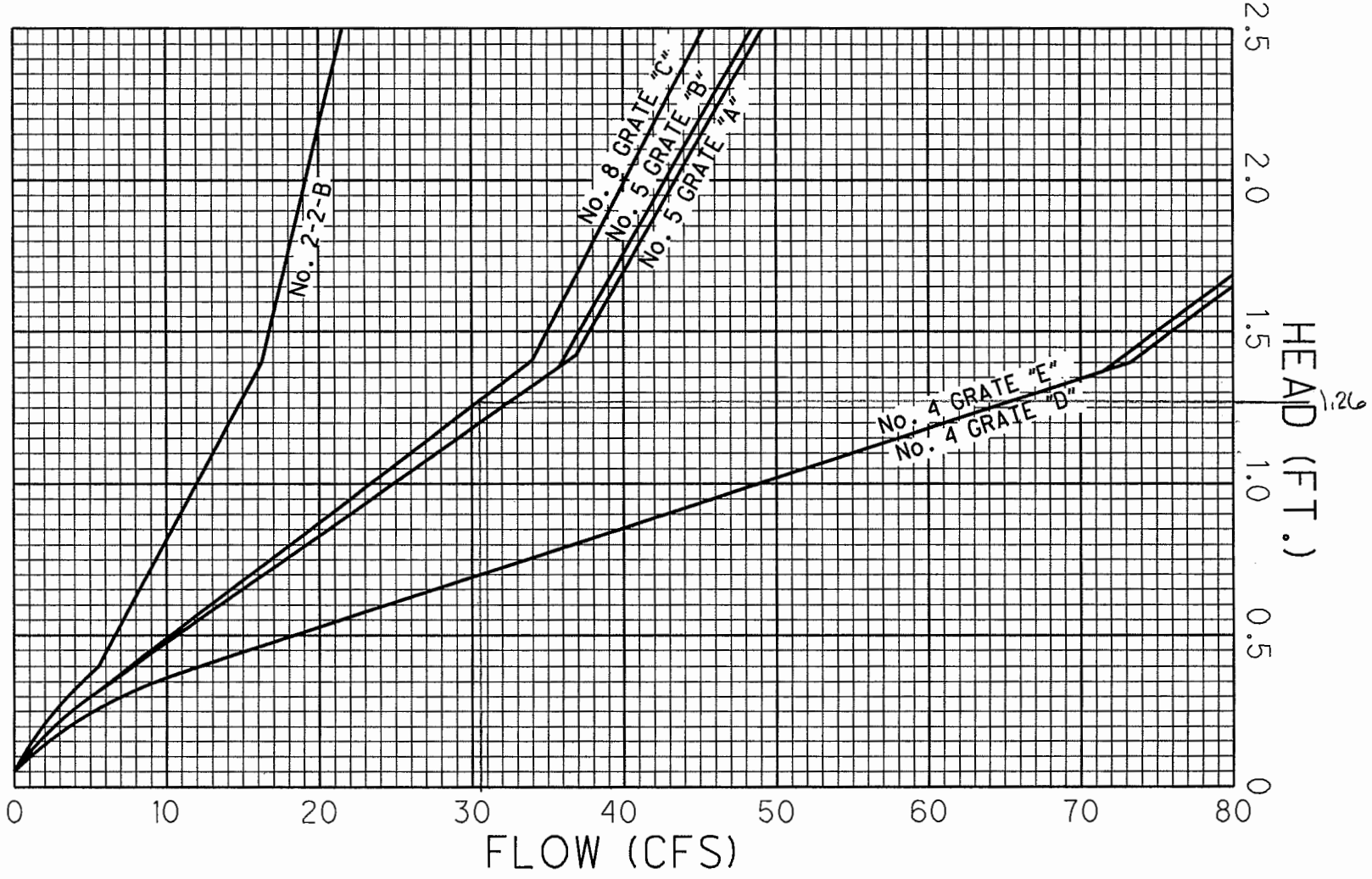
		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
228+00	228+50	R	51.08	2.00	3.00	2.00	0.0131	0.13	0.13	0.60	0.08	Seed	5.40	5	0.030	5.05	1.33	0.11	0.41	0.13	2.66
												Seed	6.58	10	0.040	5.12	1.17	0.14	0.50	0.17	2.87
228+50	3017+21	R	50.83	2.00	3.00	2.00	0.0079	0.06	0.18	0.60	0.11	Seed	5.26	5	0.030	5.72	1.25	0.09	0.57	0.19	2.93
												Seed	6.33	10	0.040	5.89	1.09	0.12	0.69	0.24	3.21
3017+21	3017+00	R	20.68	2.00	3.00	2.00	0.0227	0.01	0.19	0.70	0.11	Seed	5.22	5	0.030	5.90	1.82	0.20	0.60	0.14	2.70
												Seed	6.27	10	0.040	6.11	1.60	0.26	0.72	0.18	2.91
3017+00	3015+00	R	199.62	2.00	3.00	2.00	0.0050	0.12	0.31	0.60	0.19	Seed	4.74	5	0.030	8.53	1.24	0.08	0.89	0.27	3.34
												Seed	5.48	10	0.040	9.15	1.06	0.11	1.03	0.34	3.71
3015+00	3014+46	R	54.12	2.00	2.00	2.00	0.0214	0.04	0.35	0.60	0.21	Seed	4.67	5	0.030	8.95	2.14	0.26	0.98	0.19	2.77
												Seed	5.37	10	0.040	9.63	1.85	0.33	1.13	0.24	2.98
3014+46	Concent							3.35		0.68	2.50					11.62					
3014+46	3014+46	R	0.25	2.00	2.00	2.00	0.0051	0.00	3.70	0.63	2.50	Seed	4.27	5	0.030	11.62	2.59	0.32	10.67	1.02	6.08
												Seed	4.98	10	0.040	11.62	2.18	0.40	12.45	1.26	7.04

CB-2-2B AT STA. RAMP C3 3014+46 RT.

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)

CB -8

NORMAL DEPTH = 1.26

TOTAL DESIGN FLOW = 12.45 cfs

X2 FOR PARTIAL CLOGGING = 24.9 cfs

GRATE CAPACITY = 30.5 cfs > 24.9 cfs, CAPACITY OF GRATE O.K.

DITCH ANALYSIS

PID : 89464 **Date :** 05/21/2021 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3, 3014+46 Rt Side Ditch Drainage Area (D108-D118) **Designer :** DLT

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
3009+48	3010+50	R	90.00	2.00	3.00	2.00	0.0144	1.12	1.12	0.60	0.67	Seed	5.42	5	0.030	4.96	2.71	0.39	3.63	0.43	4.17
												Seed	6.60	10	0.040	5.05	2.33	0.50	4.42	0.56	4.79
3010+50	3013+91	R	351.00	2.00	3.00	2.00	0.0105	1.19	2.31	0.62	1.41	Seed	5.02	5	0.030	6.92	2.92	0.44	7.07	0.66	5.31
												Jute Mat	4.94	5	0.040	7.38	2.35	0.50	6.95	0.76	5.79
												Jute Mat	5.92	10	0.040	7.35	2.47	0.54	8.33	0.83	6.14
3013+91	Concent							0.64		0.78	1.91					10.00					
3013+91	3014+60	R	71.00	2.00	2.00	2.00	0.0051	0.02	2.97	0.60	1.92	Seed	4.43	5	0.030	10.48	2.44	0.29	8.50	0.91	5.65
												Seed	5.18	10	0.040	10.57	2.06	0.36	9.94	1.13	6.53

DITCH ANALYSIS

PID : 89464 **Date :** 05/28/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3, 3010+13.12 Rt Side Paved Swale Drainage Area (D100-D115) **Designer :** TAZ/SSR

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
227+55	228+50	R	95.90	2.00	2.00	2.00	0.0091	0.04	0.04	0.81	0.03	Seed	6.08	5	0.030	2.26	0.89	0.05	0.18	0.09	2.37
												Seed	7.62	10	0.040	2.44	0.80	0.07	0.22	0.12	2.49
228+50	3017+21	R	50.75	2.00	2.00	2.00	0.0242	0.06	0.10	0.83	0.08	Seed	5.95	5	0.030	2.74	1.75	0.18	0.48	0.12	2.48
												Seed	7.38	10	0.040	2.98	1.54	0.25	0.59	0.16	2.66
3017+21	3016+50	R	71.10	2.00	2.00	2.00	0.0356	0.09	0.18	0.79	0.15	Seed	5.83	5	0.030	3.23	2.43	0.34	0.87	0.15	2.62
												Seed	7.16	10	0.040	3.53	2.15	0.46	1.06	0.21	2.82
3016+50	3016+00	R	49.91	2.00	2.00	2.00	0.0232	0.07	0.26	0.78	0.21	Seed	5.74	5	0.030	3.58	2.34	0.30	1.18	0.21	2.84
												Seed	7.00	10	0.040	3.93	2.04	0.40	1.44	0.28	3.11
3016+00	3015+50	R	49.79	2.00	2.00	2.00	0.0054	0.09	0.35	0.80	0.28	Seed	5.61	5	0.030	4.12	1.54	0.12	1.55	0.37	3.47
												Seed	6.77	10	0.040	4.55	1.34	0.16	1.87	0.48	3.90
3015+50	Concent							0.08		0.90	0.35					10.00					
3015+50	3014+50	R	100.63	2.00	2.00	2.00	0.1446 *	0.12	0.55	0.73	0.44	Seed	4.45	5	0.030	10.33	5.10	1.49	1.96	0.17	2.66
												Jute Mat	4.44	5	0.040	10.40	4.21	1.76	1.96	0.19	2.78

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.)
												Temp. Mat	4.44	5	0.040	10.40	4.21	1.76	1.96	0.19	2.78
												Perm, Type 1	4.44	5	0.040	10.40	4.21	1.76	1.96	0.19	2.78
												Perm, Type 1	5.22	10	0.040	10.38	4.44	1.93	2.30	0.21	2.85
3014+50	3013+91	R	64.61	2.00	2.00	2.00	0.2710 *	0.08	0.64	0.71	0.50	Seed	4.42	5	0.030	10.56	6.52	2.50	2.21	0.15	2.59
												Jute Mat	4.41	5	0.040	10.59	5.39	2.95	2.21	0.17	2.70
												Temp. Mat	4.41	5	0.040	10.59	5.39	2.95	2.21	0.17	2.70
												Perm, Type 1	4.41	5	0.040	10.59	5.39	2.95	2.21	0.17	2.70
												Perm, Type 2	4.41	5	0.040	10.59	5.39	2.95	2.21	0.17	2.70
												Perm, Type 2	5.18	10	0.040	10.57	5.69	3.24	2.59	0.19	2.77

DITCH ANALYSIS

PID : 89464 **Date :** 05/28/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3, 3008+00 Lt Side Paved Swale Drainage Area (D40-D50) **Designer :** TAZ/SSR

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
3015+40	3014+00	L	138.75	2.00	2.00	2.00	0.0309	0.12	0.12	0.79	0.10	Seed	6.12	5	0.030	2.12	2.04	0.25	0.59	0.13	2.52
												Seed	7.71	10	0.040	2.23	1.83	0.34	0.75	0.17	2.70
3014+00	3013+50	L	49.64	2.00	2.00	2.00	0.0216	0.06	0.18	0.78	0.14	Seed	6.01	5	0.030	2.52	2.05	0.24	0.87	0.18	2.72
												Seed	7.51	10	0.040	2.68	1.83	0.32	1.09	0.24	2.96
3013+50	3013+00	L	49.40	2.00	2.00	2.00	0.0091	0.07	0.25	0.77	0.20	Seed	5.89	5	0.030	3.00	1.69	0.15	1.15	0.27	3.07
												Seed	7.27	10	0.040	3.24	1.48	0.20	1.42	0.35	3.42
3013+00	3012+00	L	98.59	2.00	2.00	2.00	0.0120	0.14	0.39	0.76	0.30	Seed	5.69	5	0.030	3.78	2.10	0.23	1.72	0.31	3.25
												Seed	6.93	10	0.040	4.13	1.82	0.30	2.09	0.41	3.63
3012+00	3011+50	L	49.36	2.00	2.00	2.00	0.0912	0.07	0.46	0.76	0.36	Seed	5.65	5	0.030	3.96	4.40	1.09	2.02	0.19	2.77
												Jute Mat	5.64	5	0.040	4.00	3.64	1.28	2.01	0.23	2.90
												Temp. Mat	5.64	5	0.040	4.00	3.64	1.28	2.01	0.23	2.90
												Perm, Type 1	5.64	5	0.040	4.00	3.64	1.28	2.01	0.23	2.90
												Perm, Type 1	6.85	10	0.040	4.34	3.86	1.44	2.44	0.25	3.01

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.)
3011+50	3011+00	L	50.01	2.00	2.00	2.00	0.0134	0.07	0.53	0.75	0.41	Seed	5.56	5	0.030	4.35	2.38	0.29	2.27	0.35	3.41
												Seed	6.71	10	0.040	4.74	2.06	0.38	2.73	0.46	3.83
3011+00	3010+50	L	50.01	2.00	2.00	2.00	0.0013	0.06	0.59	0.72	0.45	Seed	5.39	5	0.030	5.14	1.05	0.06	2.42	0.68	4.73
												Seed	6.41	10	0.040	5.66	0.90	0.07	2.88	0.86	5.45
3010+50	3010+00	L	50.49	2.00	2.00	2.00	0.0357	0.06	0.65	0.72	0.49	Seed	5.33	5	0.030	5.38	3.49	0.65	2.63	0.29	3.17
												Jute Mat	5.32	5	0.040	5.43	2.87	0.76	2.62	0.34	3.36
												Jute Mat	6.32	10	0.040	5.94	3.01	0.84	3.11	0.38	3.50
3010+00	3009+00	L	111.81	2.00	2.00	2.00	0.0711	0.14	0.79	0.71	0.59	Seed	5.24	5	0.030	5.83	4.67	1.17	3.10	0.26	3.05
												Jute Mat	5.22	5	0.040	5.91	3.82	1.37	3.09	0.31	3.24
												Temp. Mat	5.22	5	0.040	5.91	3.82	1.37	3.09	0.31	3.24
												Perm, Type 1	5.22	5	0.040	5.91	3.82	1.37	3.09	0.31	3.24
												Perm, Type 1	6.18	10	0.040	6.40	4.02	1.51	3.66	0.34	3.36
3009+00	3008+13	L	103.32	2.00	2.00	2.00	0.1902 *	0.17	0.96	0.71	0.71	Seed	5.17	5	0.030	6.16	6.88	2.61	3.70	0.22	2.88
												Jute Mat	5.16	5	0.040	6.22	5.65	3.08	3.69	0.26	3.04
												Temp. Mat	5.16	5	0.040	6.22	5.65	3.08	3.69	0.26	3.04
												Perm, Type 1	5.16	5	0.040	6.22	5.65	3.08	3.69	0.26	3.04
												Perm, Type 2	5.16	5	0.040	6.22	5.65	3.08	3.69	0.26	3.04
												Perm, Type 3	5.16	5	0.040	6.22	5.65	3.08	3.69	0.26	3.04
												Perm, Type 3	6.10	10	0.040	6.68	5.96	3.38	4.36	0.28	3.14
3008+13	3008+00	L	37.79	2.00	2.00	2.00	0.4747 *	0.06	1.02	0.71	0.76	Seed	5.15	5	0.030	6.28	9.52	5.15	3.89	0.17	2.70

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.)
													5.15	5	0.040	6.30	7.85		3.89	0.21	2.82

DITCH ANALYSIS

PID : 89464 **Date :** 12/22/2014 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3, 3007+50 Lt Side Paved Swale Drainage Area (D51-D54) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
3004+39	3005+50	L	52.85	4.92			0.0072	0.12	0.12	0.82	0.10	Seed	6.24	5	0.030	1.70	1.24	0.11	0.60	0.24	3.04
												Seed	7.92	10	0.040	1.79	1.09	0.14	0.77	0.31	3.44
3005+50	3006+00	L	54.67	4.00	2.00	2.00	0.1280 *	0.07	0.19	0.74	0.15	Seed	6.15	5	0.030	2.00	3.00	0.58	0.90	0.07	4.29
												Jute Mat	6.14	5	0.040	2.06	2.51	0.69	0.90	0.09	4.34
												Jute Mat	7.77	10	0.040	2.12	2.72	0.79	1.14	0.10	4.40
3006+00	3006+50	L	55.59	4.00	2.00	2.00	0.0842	0.20	0.39	0.81	0.31	Seed	6.06	5	0.030	2.33	3.48	0.67	1.89	0.13	4.51
												Jute Mat	6.05	5	0.040	2.38	2.89	0.80	1.89	0.15	4.61
												Jute Mat	7.63	10	0.040	2.41	3.16	0.91	2.38	0.17	4.69
3006+50	3007+50	L	130.91	4.00	2.00	2.00	0.2245 *	0.29	0.68	0.71	0.52	Seed	5.95	5	0.030	2.76	5.66	1.79	3.07	0.13	4.51
												Jute Mat	5.93	5	0.040	2.84	4.71	2.12	3.06	0.15	4.60
												Temp. Mat	5.93	5	0.040	2.84	4.71	2.12	3.06	0.15	4.60
												Perm, Type 1	5.93	5	0.040	2.84	4.71	2.12	3.06	0.15	4.60
												Perm, Type 2	5.93	5	0.040	2.84	4.71	2.12	3.06	0.15	4.60

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	7.44	10	0.040	2.83	5.12	2.42	3.84	0.17	4.69

RAMP D6

DITCH ANALYSIS

DITCH ANALYSIS

PID : 89464 **Date :** 01/16/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D6, 6003+75 Lt Side Ditch Design Drainage Area (D1) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	7.00				

(*) 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.)
6004+50	6003+75	L	63.77	4.00	3.00	6.00	0.0103	0.29	0.29	0.73	0.21	Seed	5.36	5	0.030	5.23	1.39	0.11	1.13	0.17	5.53
												Seed	6.51	10	0.040	5.34	1.22	0.14	1.37	0.22	6.02

Ramp D6, Drainage Area (D1)

Time of Overland Flow in Minutes

C =	0.90
L =	53.76
s =	4.00 (percent)

To = 1.663 min.

Time of Overland Flow in Minutes

C =	0.75
L =	41.67
s =	4.30 (percent)

To = 2.501 min.

Velocity in fps

V=3.281ks0.5

k =	0.21
s =	4.500 (percent)

V = 1.482

Travel Time for Shallow Swale or Channels

Td=L/60V

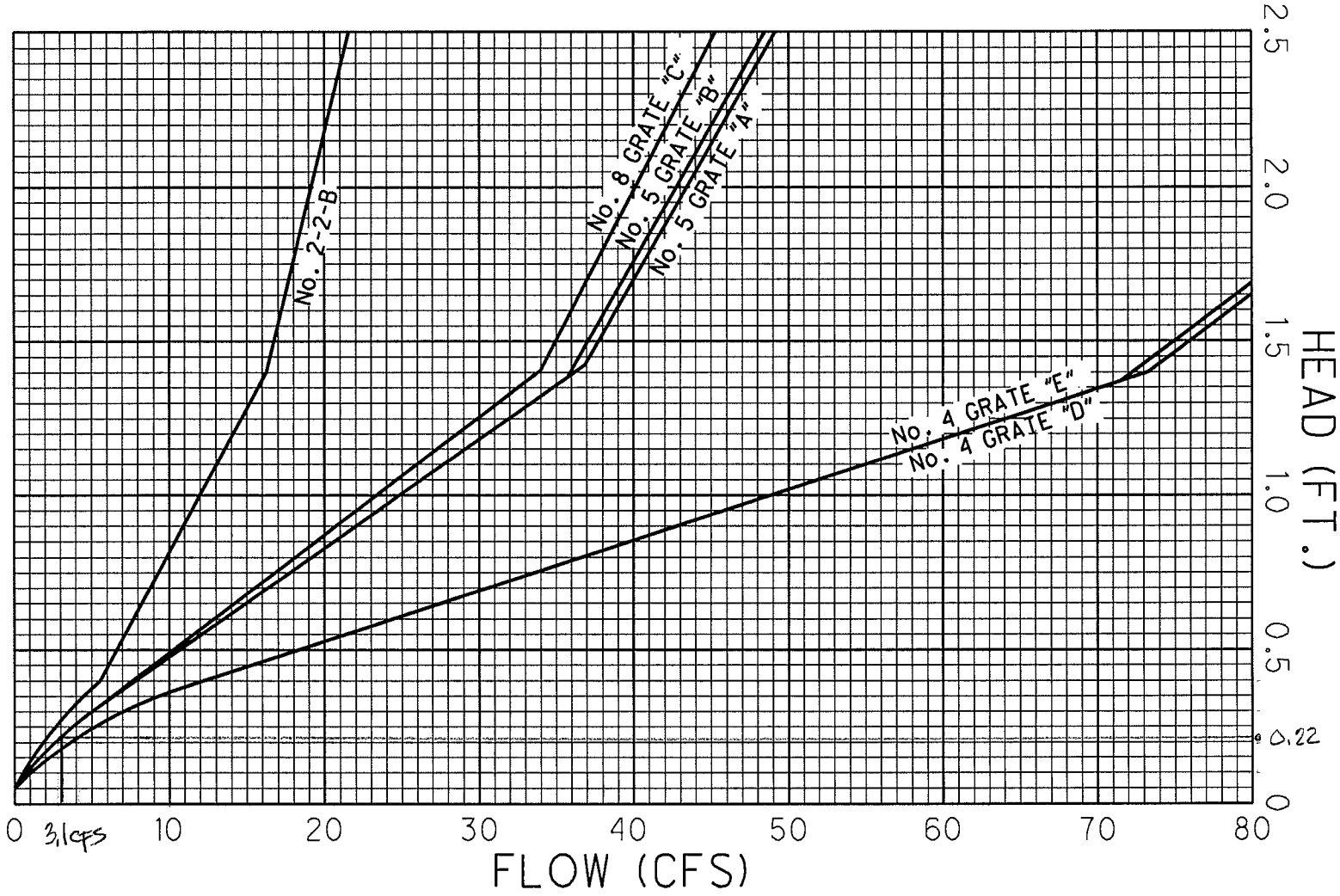
L =	28.47

Td = 0.320 min.

Total Td= 4.484 min.

RAMP D6 @ STA. 6003+75 LT.

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)

CB - 8

NORMAL DEPTH = 0.22

TOTAL DESIGN FLOW = 1.37 cfs

X2 FOR PARTIAL CLOGGING = 2.74 cfs

GRATE CAPACITY = 3.1 cfs > 2.74, (O.K)

DITCH ANALYSIS

PID : 89464 **Date :** 06/19/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D6, 6003+00 Rt Side Ditch Design Drainage Area (D5-D7) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	7.00				

(*) 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.)
6001+50	6002+50	R	105.47	1.00	15.00	6.00	0.0623	0.17	0.17	0.77	0.13	Seed	6.10	5	0.030	2.21	2.40	0.53	0.80	0.14	3.88
												Jute Mat	6.05	5	0.040	2.37	1.94	0.61	0.80	0.16	4.27
												Jute Mat	7.67	10	0.040	2.32	2.07	0.67	1.01	0.17	4.64
6002+50	6002+75	R	25.82	2.00	15.00	6.00	0.0720	0.06	0.23	0.69	0.17	Seed	6.01	5	0.030	2.54	2.61	0.55	1.04	0.12	4.55
												Jute Mat	6.00	5	0.040	2.58	2.12	0.63	1.04	0.14	4.96
												Jute Mat	7.59	10	0.040	2.51	2.26	0.71	1.31	0.16	5.33
6002+75	6003+00	R	39.93	2.00	10.00	5.00	0.1325 *	0.08	0.31	0.63	0.22	Seed	5.95	5	0.030	2.76	3.68	1.01	1.31	0.12	3.83
												Jute Mat	5.94	5	0.040	2.80	3.00	1.18	1.31	0.14	4.14
												Temp. Mat	5.94	5	0.040	2.80	3.00	1.18	1.31	0.14	4.14
												Temp. Mat	7.49	10	0.040	2.71	3.21	1.33	1.65	0.16	4.41

Ramp D6, Drainage Area (D5)

Time of Overland Flow in Minutes

C =	0.90
L =	45.19
s =	4.37 (percent)

To = 1.480 min.

Total Td= 1.480 min.

DITCH ANALYSIS

PID : 89464 **Date :** 06/19/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D6, 6004+75 Rt Side Ditch Design Drainage Area (D8-D12) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
382+25	381+75	L	51.15	4.08			0.0395	0.10	0.10	0.71	0.07	Seed	5.16	5	0.030	6.21	1.96	0.33	0.37	0.13	2.08
												Seed	6.22	10	0.040	6.28	1.72	0.41	0.44	0.17	2.32
381+75	6003+00	R	44.97	2.92			0.0633	0.10	0.20	0.63	0.13	Seed	5.11	5	0.030	6.46	2.94	0.69	0.69	0.17	2.00
												Jute Mat	5.10	5	0.040	6.51	2.42	0.78	0.68	0.20	2.13
												Jute Mat	6.13	10	0.040	6.57	2.59	0.85	0.82	0.21	2.21
6003+00	Concent							0.31		0.71	0.35					2.71					
6003+00	6003+50	R	63.38	2.92			0.0131	0.13	0.64	0.52	0.42	Seed	5.02	5	0.030	6.94	2.45	0.34	2.12	0.42	3.07
												Seed	6.00	10	0.040	7.06	2.13	0.43	2.53	0.52	3.40
6003+50	6004+50	R	115.96	4.00	6.00	2.00	0.0228	0.17	0.81	0.52	0.51	Seed	4.87	5	0.030	7.74	2.39	0.31	2.50	0.21	5.72
												Seed	5.76	10	0.040	7.98	2.07	0.40	2.95	0.28	6.22
6004+50	6004+75	R	28.38	4.00	6.00	2.00	0.0119	0.11	0.92	0.69	0.59	Seed	4.83	5	0.030	7.98	1.99	0.21	2.83	0.28	6.22
												Seed	5.69	10	0.040	8.26	1.73	0.26	3.33	0.36	6.85

Ramp D6, Drainage Area (D8)

Time of Overland Flow in Minutes

C =	0.50
L =	35.12
s =	3.94 (percent)

To = 4.052 min.

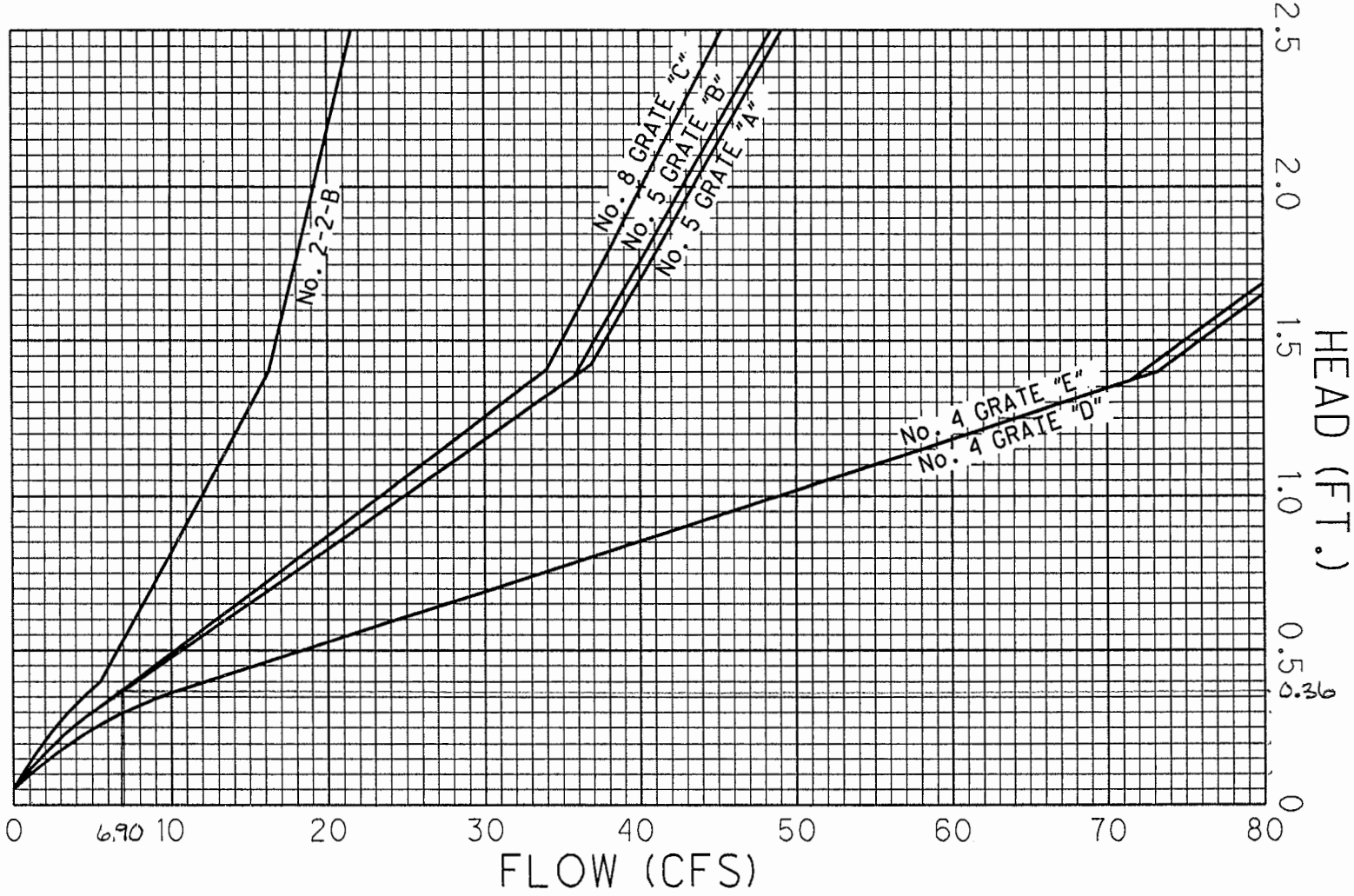
Time of Overland Flow in Minutes

C =	0.50
L =	12.22
s =	10.39 (percent)

To = 1.730 min.

Total Td= 5.782 min.

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)

CB - 8

NORMAL DEPTH = 0.36'

TOTAL DESIGN FLOW = 3.33 CFS

X2 FOR PARTIAL CLOGGING = 6.66 CFS

GRATE CAPACITY = 6.9 CFS > 6.66 CFS, O.K.

I-71 SB

DITCH ANALYSIS

DITCH ANALYSIS

PID : 89464 **Date :** 12/29/2014 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB, 210+08 Lt, Drainage Area (D245) **Designer :** TAZ

Rainfall Area : C

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.)
216+50	210+08	L	644.17	2.00	2.00	4.00	0.0050	1.24	1.24	0.68	0.84	Seed	5.13	5	0.030	6.37	1.88	0.19	4.33	0.60	5.62
												Seed	5.96	10	0.040	7.20	1.59	0.23	5.03	0.75	6.48

DITCH ANALYSIS

PID : 89464 **Date :** 12/23/2014 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB, 219+25 Lt Side Ditch Design Drainage Area (D270) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
220+50	219+36	L	117.27	2.00	4.00	8.00	0.0050	0.57	0.57	0.77	0.44	Seed	5.16	5	0.030	6.21	1.38	0.12	2.25	0.38	6.58
												Seed	6.17	10	0.040	6.45	1.17	0.15	2.69	0.48	7.70
219+36	Concent							0.28		0.54	0.59					4.81					
219+36	219+33	L	3.00	2.00	4.00	8.00	0.0050	0.00	0.85	0.77	0.59	Seed	5.16	5	0.030	6.25	1.48	0.14	3.02	0.44	7.27
												Seed	6.16	10	0.040	6.49	1.26	0.17	3.61	0.54	8.53

I-71 SB to CB @ Sta. 219+25 Lt. Drainage Area (D270)

Time of Overland Flow in Minutes

C =	0.90	
L =	207.06	
s =	1.25	(percent)

To = 4.809 min.

Total Td= 4.809 min.

DITCH ANALYSIS

PID : 89464 **Date :** 12/23/2014 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB, 219+25 Lt Side Ditch Design Drainage Area (D268-D269) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:** 1.00	**Temporary Mat:**	1.25
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	7.00			

(*) 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.)
217+50	219+00	L	100.00	2.00	4.00	8.00	0.0784	0.24	0.24	0.54	0.13	Seed	4.94	5	0.030	7.39	2.51	0.47	0.63	0.10	3.16
												Jute Mat	4.91	5	0.040	7.54	2.06	0.55	0.62	0.11	3.35
												Jute Mat	5.88	10	0.040	7.49	2.20	0.60	0.75	0.12	3.48
219+00	219+33	L	32.84	2.00	4.00	8.00	0.0050	0.04	0.28	0.62	0.15	Seed	4.82	5	0.030	8.08	1.01	0.07	0.74	0.22	4.64
												Seed	5.72	10	0.040	8.12	0.87	0.09	0.88	0.28	5.32

I-71 SB to CB @ Sta. 219+25 Lt. (D269)

Time of Overland Flow in Minutes

C =	0.70	
L =	164.92	
s =	3.40	(percent)

To = 6.149 min.

Time of Overland Flow in Minutes

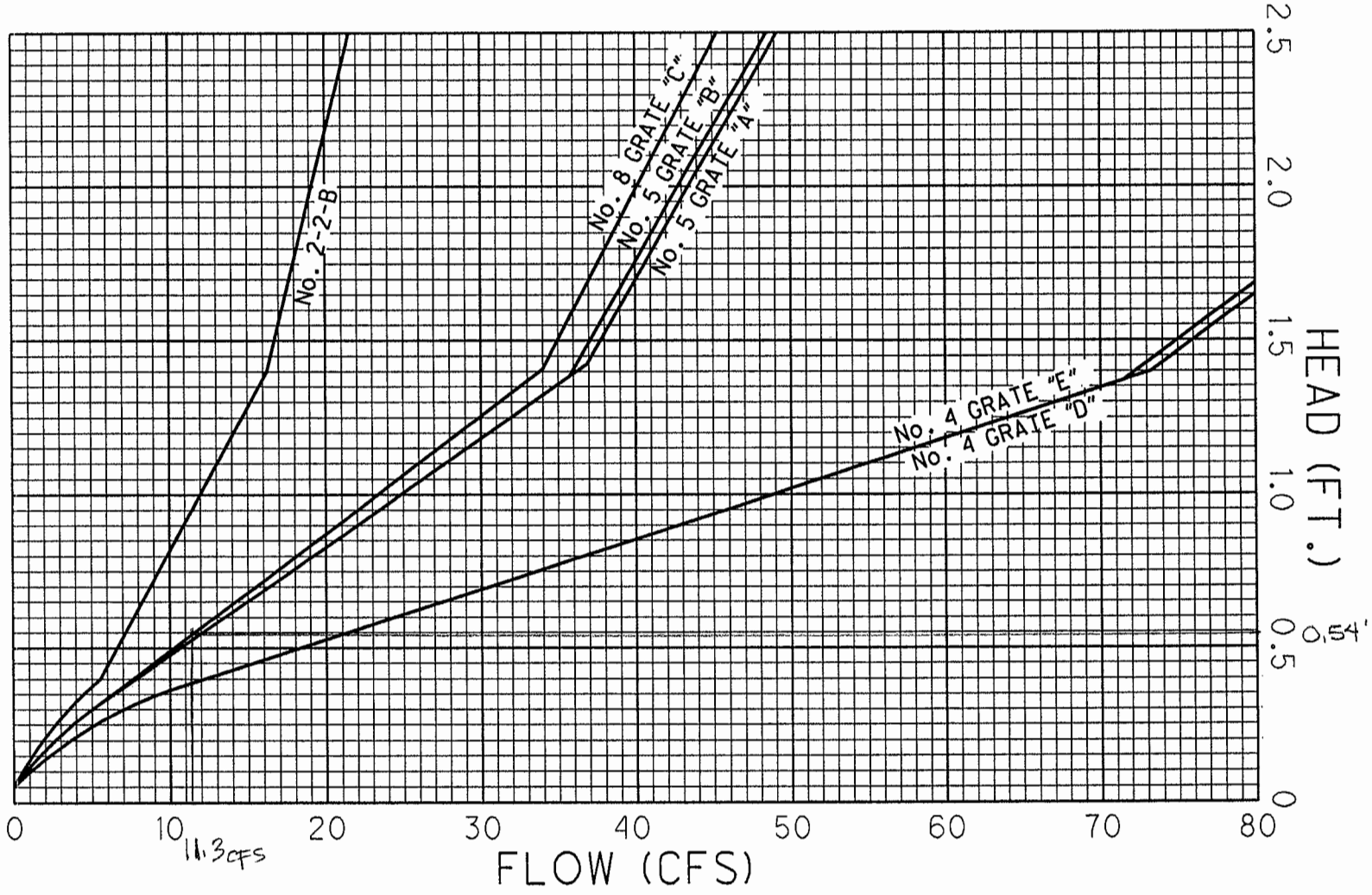
C =	0.70	
L =	5.79	
s =	25.00	(percent)

To = 0.593 min.

Total Td= 6.742 min.

CB @ I-71 SB STA. 219+25 LT.

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)

CB - 8

NORMAL DEPTH = 0.54'

TOTAL DESIGN FLOW = 3.61 CFS

X2 FOR PARTIAL CLOGGING = 7.22 CFS

GRATE CAPACITY = 11.3 CFS > 7.22 CFS, SUMP CAPACITY O.K.

DITCH ANALYSIS

PID : 89464 **Date :** 03/20/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB, 222+71 Lt Side Ditch Design Drainage Area (D272-D274) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
Permanent Mat		**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP		**Type B:**	7.00				

(*) 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.)
225+50	223+76	L	172.67	2.00	4.00	8.00	0.0050	0.13	0.13	0.40	0.05	Seed	5.77	5	0.030	3.48	0.78	0.04	0.29	0.13	3.61
												Seed	6.96	10	0.040	4.03	0.68	0.05	0.35	0.17	4.06
223+76	Concent							1.43		0.90	1.34					10.73					
223+76	222+71	L	104.40	2.00	4.00	8.00	0.0245	0.09	1.65	0.40	1.37	Seed	4.32	5	0.030	11.27	3.19	0.63	5.93	0.41	6.97
												Jute Mat	4.30	5	0.040	11.40	2.58	0.72	5.91	0.47	7.68
												Jute Mat	5.03	10	0.040	11.37	2.69	0.78	6.91	0.51	8.11

DITCH ANALYSIS

PID : 89464 **Date :** 03/20/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB, 222+71 Lt Side Ditch Design Drainage Area (D271) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
Permanent Mat		**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP		**Type B:**	7.00				

(*) 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.)
220+50	222+70	L	221.00	2.00	4.00	8.00	0.0050	1.25	1.25	0.83	1.03	Seed	3.89	5	0.030	14.64	1.60	0.16	4.02	0.50	8.01
												Seed	4.42	10	0.040	15.07	1.34	0.19	4.57	0.61	9.27
222+70	Concent							1.65		0.83	2.40					11.37					
222+70	222+71	L	0.43	2.00	4.00	8.00	0.0050	0.00	2.90	0.83	2.40	Seed	3.89	5	0.030	14.64	1.99	0.23	9.34	0.73	10.80
												Seed	4.42	10	0.040	15.07	1.66	0.27	10.63	0.88	12.55

I-71 SB to CB @ Sta. 222+60 Lt. (D271)

Time of Overland Flow in Minutes

C =	0.90
L =	254.58
s =	0.99 (percent)

To = 5.763 min.

Time of Overland Flow in Minutes

C =	0.70
L =	7.26
s =	12.50 (percent)

To = 0.836 min.

Velocity in fps

V=3.281ks0.5

k =	0.21
s =	0.500 (percent)

V = 0.494

Travel Time for Shallow Swale or Channels

Td=L/60V

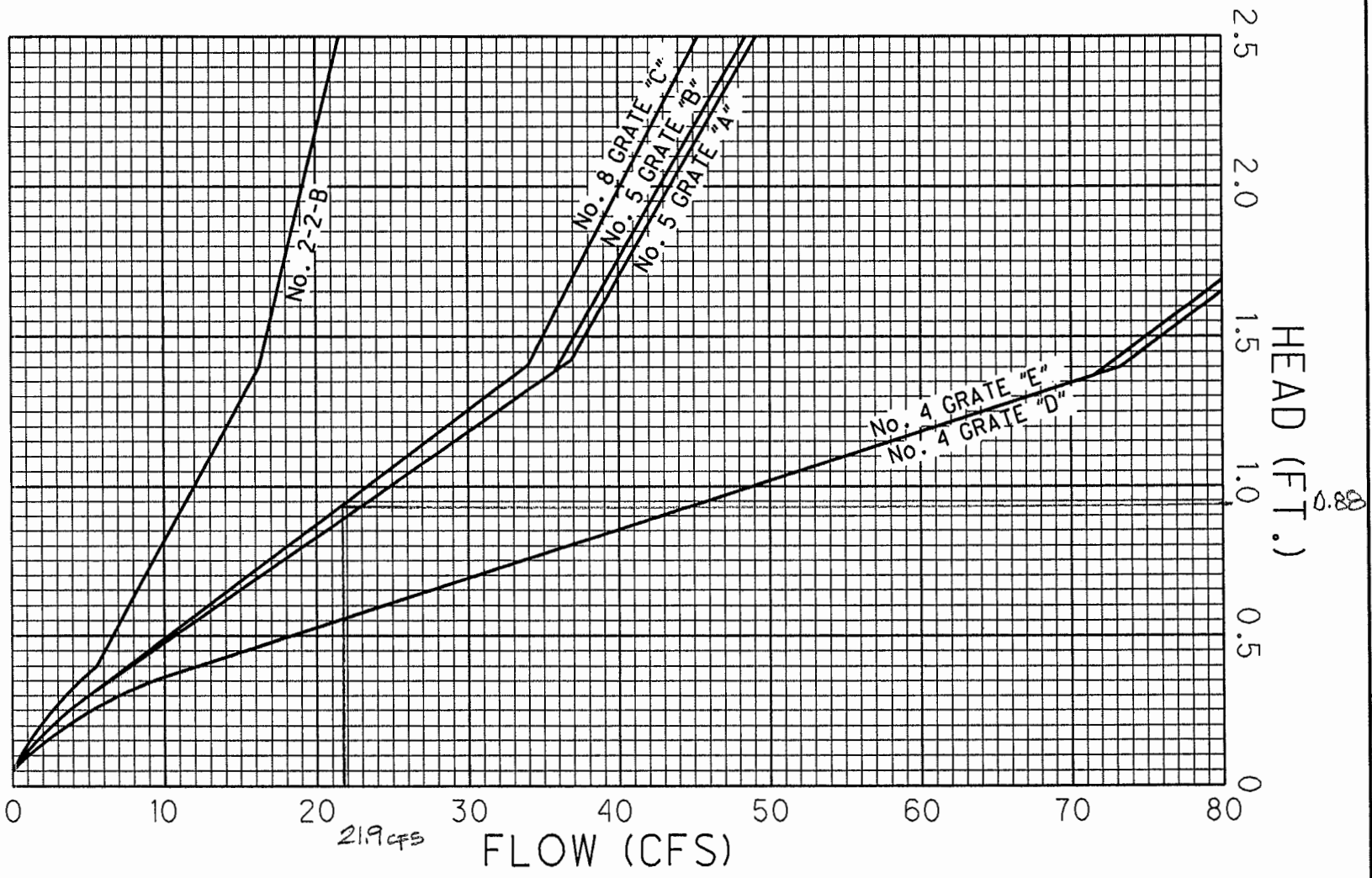
L =	171.42

Td = 5.781 min.

Total Td= 12.381 min.

CB-8 @ STA. 1+71 SB 222+71 LT.

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)

CB - 8

NORMAL DEPTH = 0.88

TOTAL DESIGN FLOW = 10.63 CFS

X2 FOR PARTIAL CLOGGING = 21.26 CFS

GRATE CAPACITY = 21.9 CFS > 21.3 CFS, CAPACITY OF GRATE "O.K."

DITCH ANALYSIS

PID : 89464 **Date :** 06/19/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB, 283+50 Lt Side Ditch Design Drainage Area (D13-D15) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
382+25	382+50	L	24.99	3.33			0.0125	0.02	0.02	0.70	0.01	Seed	5.15	5	0.030	6.30	0.79	0.07	0.07	0.09	1.51
												Seed	6.19	10	0.040	6.37	0.68	0.08	0.08	0.11	1.68
382+50	383+25	L	74.73	4.00	6.00	2.50	0.0293	0.04	0.06	0.73	0.04	Seed	4.93	5	0.030	7.42	1.07	0.09	0.22	0.05	4.41
												Seed	5.84	10	0.040	7.64	0.98	0.11	0.26	0.06	4.53
283+25	384+00	L	24.91	4.00	3.00	2.00	0.0522	0.06	0.12	0.66	0.08	Seed	4.89	5	0.030	7.67	1.64	0.19	0.39	0.06	4.29
												Seed	5.77	10	0.040	7.91	1.47	0.24	0.46	0.08	4.38

Ramp D6, Drainage Area (D8) & (D13)

Time of Overland Flow in Minutes

C =	0.50
L =	35.12
s =	3.94

(percent)

To = 4.052 min.

Time of Overland Flow in Minutes

C =	0.50
L =	12.22
s =	10.39

(percent)

To = 1.730 min.

Total Td= 5.782 min.

I-70 WB

DITCH ANALYSIS

DITCH ANALYSIS

PID : 89464 **Date :** 07/10/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : I-70 WB, STA 550+00 to STA 550+87 LT Ditch Design Drainage Area (D16) **Designer :** DNO

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
550+00	550+87	L	87.00	7.00	10.00	2.00	0.0070	0.31	0.31	0.78	0.24	Seed	5.48	5	0.030	4.72	1.09	0.07	1.32	0.15	8.84
												Seed	6.66	10	0.040	4.88	0.97	0.09	1.61	0.20	9.42

DITCH ANALYSIS

PID : 89464 **Date :** 07/10/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : I-70 WB STA 552+00 to STA 550+87 Lt Ditch Design Drainage Area (D17) **Designer :** DNO

Rainfall Area : C

Allowable Shears

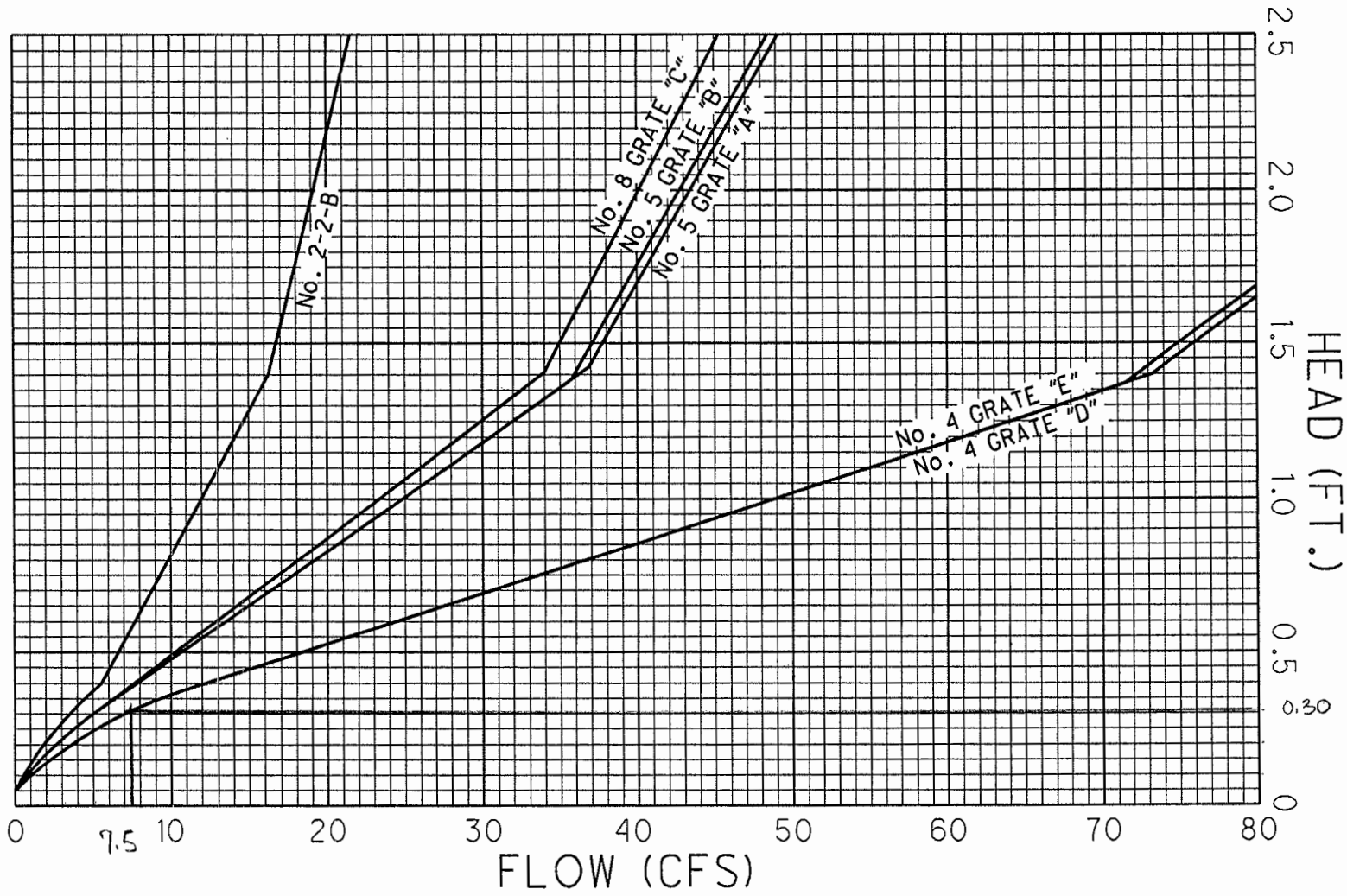
		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
552+00	550+87	L	117.00	7.00	10.00	2.00	0.0142	0.37	0.37	0.77	0.28	Seed	5.56	5	0.030	4.35	1.46	0.12	1.58	0.14	8.66
												Seed	6.79	10	0.040	4.51	1.31	0.16	1.93	0.18	9.19

TRANS. I-76 WB (EAST) STA. 2194+25 LT. "SAG"

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)

CB - 4

NORMAL DEPTH = 0.30

TOTAL DESIGN FLOW = 3.27 CFS

X2 FOR PARTIAL CLOGGING = 6.54 CFS

GRATE CAPACITY = 7.5 CFS > 6.54 CFS, CAPACITY "O.K."

Transitional

I-71 SB

DITCH ANALYSIS

DITCH ANALYSIS

PID : 89464 **Date :** 06/19/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Transitional I-71 SB, 384+55 to 384+00 Lt Ditch Design Drainage Area **Designer :** DNO

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
384+55	384+00	L	55.00	2.00	2.00	2.00	0.0593	0.06	0.06	0.70	0.04	Seed	5.71	5	0.030	6.29	1.83	0.23	0.24	0.06	2.25
												Seed	6.19	10	0.040	6.38	1.55	0.29	0.26	0.08	2.31

DITCH ANALYSIS

PID : 89464 **Date :** 06/27/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Trans 71 SB STA 390+00 to STA 389+50 LT **Designer :** DNO

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
390+00	389+50	L	50.00	2.00	12.50	3.00	0.0238	0.03	0.03	0.50	0.02	Seed	6.31	5	0.030	1.47	0.94	0.06	0.09	0.04	2.67
												Seed	8.05	10	0.040	1.54	0.83	0.09	0.12	0.06	2.92

DITCH ANALYSIS

PID : 89464 **Date :** 06/27/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Trans 71 SB STA 386+57 to STA 389+50 LT **Designer :** DNO

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
386+57	389+50	L	291.00	2.00	12.50	3.00	0.0239	0.03	0.03	0.50	0.01	Seed	5.22	5	0.030	5.93	0.82	0.06	0.07	0.04	2.58
												Seed	6.14	10	0.040	6.53	0.73	0.07	0.08	0.05	2.75

INLET SPACING

Mound & Short Street

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 11/15/2019 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Mound Street Inlet Spacing - RIGHT - Sta. 13+73.55, area (M2) **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 18.50 **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.)
13+92	Begin																	
13+74	CB-3A	18.86	0.74	0.02	0.00	0.39	10.00	0.0106	0.0160	0.0160	8.00	0.0417	3.69	0.06	0.00	0.06	0.045	2.79

INLET SPACING DESIGN

PID : 89464 **Date :** 04/09/2015 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Mound Street Inlet Spacing - RIGHT - Sta. 15+22.56, area (M1) **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 18.50 **Allowable Depth (ft.)** 0.42

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.)	
17+01	Begin																		
15+22	CB-3	182.10	0.76	0.20	0.00	1.92	10.00	0.0149	0.0160	0.0160	8.00	0.0417	3.69	******	******	0.56	0.097	6.06	Sag
13+92	Begin																		
15+22	CB-3	131.27	0.73	0.18	0.00	1.32	10.00	0.0187	0.0160	0.0160	8.00	0.0417	3.69	******	******	0.47	0.087	5.44	End

SUMP DATA

Total Flow (cfs) : 1.04 **Ponded Depth (ft.) :** 0.091 **Spread on Pavement (ft.) :** 4.47

INLET SPACING DESIGN

5YR CHECK @ SAGS

PID : 89464 **Date :** 04/09/2015 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Mound Street Inlet Spacing - RIGHT - Sta. 15+22.56, area (M1) - 5 yr check **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 18.50 **Allowable Depth (ft.)** 0.42

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.)	
17+01	Begin																		
15+22	CB-3	182.10	0.76	0.20	0.00	1.85	10.00	0.0149	0.0160	0.0160	8.00	0.0417	4.50	******	******	0.69	0.104	6.52	Sag
13+92	Begin																		
15+22	CB-3	131.27	0.73	0.18	0.00	1.27	10.00	0.0187	0.0160	0.0160	8.00	0.0417	4.50	******	******	0.58	0.094	5.86	End

SUMP DATA

Total Flow (cfs) : 1.27 **Ponded Depth (ft.) :** 0.109 **Spread on Pavement (ft.) :** 5.61

INLET SPACING DESIGN

PID : 89464 **Date :** 09/26/2014 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Mound-RIGHT Inlet Spacing - Sta. 19+24 to Sta 17+50 **Designer :** JAP/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

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.)
19+24	Begin																	
17+50	CB-3	174.20	0.90	0.05	0.00	2.43	10.00	0.0138	0.0160	0.0160	0.00	0.0417	4.50	0.22	0.00*	0.22	0.069	4.33

* 0.0cfs Bypass Flow To Be Carried To Short Street

INLET SPACING DESIGN

PID : 89464 **Date :** 09/26/2014 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Mound 17+50 Rt to Short 10+04 Lt **Designer :** JAP/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 11.75 **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.)
17+50	Begin																	
10+27	CB-3	519.80	0.61	0.22	0.00	11.67	11.67	0.0029	0.0160	0.0160	0.00	0.0417	3.48	0.42	0.05	0.46	0.122	7.63

INLET SPACING DESIGN

PID : 89464 **Date :** 09/26/2014 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Short Street Inlet Spacing - RIGHT - Sta. 10+04 to Sta. 14+50 **Designer :** JAP/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 11.75 **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.)
14+50	Begin																	
13+65	CB-3	38.60	0.51	0.75	25.62	0.74	26.36	0.0029	0.0160	0.0160	0.00	0.0417	2.33	0.68	0.21	0.89	0.156	9.76
10+45	CB-3	320.00	0.90	0.02	0.00	8.05	10.00	0.0029	0.0160	0.0160	0.00	0.0417	3.69	0.28	0.00	0.29	0.102	6.39
10+28	CB-3	20.00	0.60	0.02	0.00	0.73	10.00	0.0029	0.0156	0.0156	0.00	0.0417	3.69	0.05	0.00	0.05	0.051	3.27

Short Street 13+65 - Drainage Area (S6)

1 **Time of Overland Flow in Minutes**

C =	0.40	grass
L =	57.80	
s =	3.38	(percent)

To = 6.383 min.

2 **Time of Overland Flow in Minutes**

C =	0.50	gravel
L =	398.60	
s =	4.32	(percent)

To = 13.239 min.

3 **Time of Overland Flow in Minutes**

C =	0.40	grass
L =	13.51	
s =	4.22	(percent)

To = 2.866 min.

4 **Time of Overland Flow in Minutes**

C =	0.90	walk
L =	7.68	
s =	1.26	(percent)

To = 0.924 min.

Total Td= 23.412 min.

INLET SPACING DESIGN

PID : 89464 **Date :** 12/09/2017 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Mound Street Inlet Spacing- LEFT- Sta. 1+43 (Mira) - Sta. 27+43 (Mound) **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00, VAR. #1 **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.)	
27+43	Begin																		
26+50	CB-3A	79.00	0.87	0.10	0.00	0.64	10.00	0.0393	0.0160	0.0160	0.00	0.0417	4.50	0.30	0.08	0.39	0.070	4.38	
25+20	CB-3A	130.00	0.88	0.22	0.00	0.77	10.00	0.0492	0.0160	0.0160	0.00	0.0417	4.50	0.60	0.37	0.97	0.095	5.93	
24+20	CB-3A	108.20	0.89	0.19	0.00	0.70	10.00	0.0358	0.0160	0.0160	0.00	0.0417	4.50	0.66	0.49	1.15*	0.107	6.71	Parking
23+16	CB-3A	106.40	0.85	0.11	0.00	0.69	10.00	0.0457	0.0160	0.0160	0.00	0.0417	4.50	0.56	0.33	0.89	0.093	5.83	
4+37	CB-3A	179.00	0.88	0.37	0.00	1.17	10.00	0.0124	0.0484	0.0484	0.00	0.0417	4.50	1.36	0.43	1.79	0.234	4.84	
3+30	CB-3A	212.00	0.79	0.27	0.00	1.14	10.00	0.0252	0.0482	0.0482	0.00	0.0417	4.50	1.15	0.24	1.39	0.186	3.86	
19+02	CB-3A	178.00	0.77	0.13	0.00	1.20	10.00	0.0469	0.0160	0.0160	0.00	0.0417	4.50	0.46	0.22	0.68	0.084	5.23	
18+45	CB-3A	41.00	0.00	0.00	0.00	0.00	0.00	0.0363	0.0408	0.0408	0.00	0.0417	0.00	1.07	0.26	1.32**	0.160	3.93	
17+50	CB-3	96.00	0.56	0.12	0.00	0.89	10.00	0.0235	0.0160	0.0160	0.00	0.0417	4.50	0.46	0.10	0.56	0.089	5.55	
15+24	EX. CB-3	226.00	0.61	0.28	0.00	3.54	10.00	0.0049	0.0129	0.0129	0.00	0.0417	4.50	0.46	0.42	0.88	0.130	10.08	

#1 = 1) TWO LANES W/O PARKING, 6' SPREAD. 2) TWO LANES WITH PARKING, 13' SPREAD. 3) MULTIPLE LANES, MAINTAIN ONE THRU LANE EACH DIRECTION FREE OF WATER

* = 0.40 CFS BYPASS FLOW IS BEING CONTRIBUTED FROM LUDLOW STREET INLET.

** = BYPASS CONTRIBUTED FROM CIVIC CENTER DRIVE

INLET SPACING DESIGN

PID : 89464 **Date :** 04/16/2015 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Civic Center Drive Inlet Spacing - LEFT- Sta. 4+17 to Sta. 2+53 **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 12.00-19.00 Ⱦ **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.)
4+17	Begin																	
3+09	CB-3A	250.77	0.86	0.71	0.00	2.06	10.00	0.0043	0.0611	0.0611	0.00	0.0417	4.50	1.99	0.76	2.75	0.366	5.99
2+53	CB-3	56.88	0.89	0.32	0.00	0.29	10.00	0.0245	0.0408	0.0408	0.00	0.0417	4.50	1.65	0.39	2.04	0.203	4.98

Ⱦ 12.00' WITHOUT PARKING, 19.00' W/ PARKING
* BYPASS FLOW CARRIED TO CB-3A @ STA. 18+45, MOUND STREET LEFT.

INLET SPACING DESIGN

PID : 89464 **Date :** 12/09/2019 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ludlow Street Inlet Spacing- LEFT, bypass carried to Mound street inlet spacing **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 5 **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.)
6+71	Begin																	
5+30	CB-3A	137.00	0.90	0.42	0.00	0.57	10.00	0.0450	0.0404	0.0404	0.00	0.0417	4.50	1.30	0.40*	1.70	0.169	4.17

* = BYPASS FLOW CARRIED TO CB-3A @ MOUND STREET STA. 24+20 LEFT

INLET SPACING DESIGN

PID : 89464 **Date :** 10/02/2014 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Mound Street Inlet Spacing - Right - Sta. 23+18 - Sta. 27+72 **Designer :** JAP/TAZ

Rainfall Area: C **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.)
27+43	Begin																	
25+30	CB-3	185.00	0.90	0.21	0.00	1.13	10.00	0.0492	0.0160	0.0160	0.00	0.0417	4.50	0.62	0.23	0.85	0.090	5.65
23+18	CB-3	211.00	0.90	0.21	0.00	1.27	10.00	0.0457	0.0160	0.0160	0.00	0.0417	4.50	0.73	0.34	1.07	0.100	6.24

RAMP C3

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 05/21/2021 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp C3 RT STA 3011+60 to STA 3015+35 **Designer :** DLT

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.24

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.)
3011+68	Begin																	
3015+35	I-3D	367.00	0.90	0.08	0.00	2.12	10.00	0.0507	0.0400	0.0160	6.00	0.0000	5.30	0.33	0.06	0.39*	0.095	2.36

* FLOW IS UNDER 0.70 CFS, BARRIER INLET NOT NEEDED. USE TIED CONCRETE BLOCK MAT TO DRAIN TO PAVED DITCH

RAMP D6

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 09/05/2014 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D6 Inlet Spacing, Right, for Sta. 6003+25.00, bypass to ditch **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **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.)
263+12	Begin																	
6003+25	I-3D	390.43	0.90	0.51	9.82	1.37	11.19	0.0580	0.0600	0.0600	5.50	0.0417	5.06	1.42	0.88	2.30	0.209	3.48

RAMP D7

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 07/15/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D7 Inlet Spacing, Left, for Sag Sta. 7011+93.68 **Designer :** TAZ/DNO

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 6.00 **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.)	
17006+07	Begin																		
17006+87	I-3D	80.00	0.90	0.01	0.00	0.84	10.00	0.0336	0.0400	0.0160	6.00	0.0417	5.30	0.06	0.00	0.06	0.051	1.27	
7011+44	I-3D	457.00	0.90	0.07	0.00	4.36	10.00	0.0164	0.0400	0.0160	6.00	0.0417	5.30	0.32	0.00	0.32	0.109	2.73	
7011+94	I-3D	50.00	0.90	0.01	0.00	1.42	10.00	0.0031	0.0400	0.0160	6.00	0.0417	5.30	******	******	0.04	0.070	1.74	Sag
7013+13	Begin																		
7011+93	I-3D	120.00	0.90	0.02	0.00	2.68	10.00	0.0036	0.0400	0.0160	6.00	0.0417	5.30	******	******	0.10	0.092	2.29	End

SUMP DATA

Total Flow (cfs) : 0.14 **Ponded Depth (ft.) :** 0.027 **Spread on Pavement (ft.) :** 0.58

INLET SPACING DESIGN

PID : 89464 **Date :** 07/15/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D7 Inlet Spacing, Left, for Sag Sta. 7011+93.68 - 50 year **Designer :** TAZ/DNO

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 6.00 **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.)	
17006+07	Begin																		
17006+87	I-3D	80.00	0.90	0.01	0.00	0.77	10.00	0.0336	0.0400	0.0160	6.00	0.0417	7.10	0.08	0.00	0.08	0.057	1.42	
7011+44	I-3D	457.00	0.90	0.07	0.00	4.01	10.00	0.0164	0.0400	0.0160	6.00	0.0417	7.10	0.43	0.00	0.43	0.122	3.04	
7011+94	I-3D	50.00	0.90	0.01	0.00	1.30	10.00	0.0031	0.0400	0.0160	6.00	0.0417	7.10	******	******	0.06	0.078	1.95	Sag
7013+13	Begin																		
7011+93	I-3D	120.00	0.90	0.02	0.00	2.46	10.00	0.0036	0.0400	0.0160	6.00	0.0417	7.10	******	******	0.13	0.102	2.55	End

SUMP DATA

Total Flow (cfs) : 0.19 **Ponded Depth (ft.) :** 0.033 **Spread on Pavement (ft.) :** 0.70

Bridge Spread Design for Scuppers

RAMP D7

																10 Year		50 year	
1372B		STATION	#	AREA (acres)	LENGTH (ft)	LONG. SLOPE (%)	C	k	V (fps)	CALC. Td (min)	Td (min)	I-10 YR	I-50 YR	Q-10 YR (cfs)	Q-50 YR (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)
	RT	17006+21	High Point																
		17008+90	51	0.1644	269.00	1.84	0.90	0.62	2.75	1.63	10.00	5.30	7.10	0.78	1.05	0.6910	0.0927	0.8920	0.1584

Hydraulic Analysis Report

Project Data

Project Title: 1372B

Designer: TAZ/DNO

Project Date: 6/24/2019

Project Units: U.S. Customary Units

Notes: Bridge 1372B, Ramp D7 over Short St.

Curb and Gutter Analysis: Scupper-7008+90-RT_10yr

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0184 ft/ft

Cross-Slope of Pavement: 0.0470 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0470 ft/ft

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Design Flow: 0.7800 cfs

Gutter Result Parameters

Width of Spread: 3.3519 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.2640 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.8904 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 3.5000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.6909 cfs

Bypass Flow: 0.0891 cfs

Approach Velocity: 2.9543 ft/s

Splash-over Velocity: 6.7813 ft/s

Efficiency: 0.8494

Hydraulic Analysis Report

Project Data

Project Title: 1372B

Designer: TAZ/DNO

Project Date: 6/24/2019

Project Units: U.S. Customary Units

Notes: Bridge 1372B, Ramp D7 over Short St.

Curb and Gutter Analysis: Scupper-7008+90-RT_50yr

Notes: 50 Year Check for use at down stream sag point

Gutter Input Parameters

Longitudinal Slope of Road: 0.0184 ft/ft

Cross-Slope of Pavement: 0.0470 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0470 ft/ft

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Design Flow: 1.0500 cfs

Gutter Result Parameters

Width of Spread: 3.7471 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.3300 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.1134 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 3.5000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.8919 cfs

Bypass Flow: 0.1581 cfs

Approach Velocity: 3.1822 ft/s

Splash-over Velocity: 6.7813 ft/s

Efficiency: 0.8857

INLET SPACING DESIGN

PID : 89464 **Date :** 01/23/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D7 Inlet Spacing, Right, for Sag Sta. 7011+93.68 **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 4.00 **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.)	
7008+90	Begin																		
7011+44	I-3D	254.00	0.00	0.00	0.00	0.00	0.00	0.0164	0.0400	0.0160	4.00	0.0417	0.00	0.82	0.12	0.94	0.162	4.15	
7011+94	I-3D	50.00	0.90	0.03	0.00	0.91	10.00	0.0031	0.0400	0.0160	4.00	0.0417	5.30	******	******	0.28	0.142	3.54	Sag
7013+10	Begin																		
7011+94	I-3D	116.00	0.90	0.08	0.00	1.81	10.00	0.0036	0.0400	0.0160	4.00	0.0417	5.30	******	******	0.39	0.155	3.87	End

SUMP DATA

Total Flow (cfs) : 0.67 **Ponded Depth (ft.) :** 0.078 **Spread on Pavement (ft.) :** 1.54

INLET SPACING DESIGN

PID : 89464 **Date :** 01/23/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Ramp D7 Inlet Spacing, Right, for Sag Sta. 7011+93.68 - 50 yr **Designer :** TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 4.00 **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.)	
7008+90	Begin																		
7011+44	I-3D	254.00	0.00	0.00	0.00	0.00	0.00	0.0164	0.0400	0.0160	4.00	0.0417	0.00	1.03	0.26	1.30	0.183	5.43	
7011+94	I-3D	50.00	0.90	0.03	0.00	0.87	10.00	0.0031	0.0400	0.0160	4.00	0.0417	7.10	******	******	0.48	0.172	4.76	Sag
7013+10	Begin																		
7011+94	I-3D	116.00	0.90	0.08	0.00	1.87	10.00	0.0036	0.0400	0.0160	4.00	0.0417	7.10	******	******	0.52	0.173	4.79	End

SUMP DATA

Total Flow (cfs) : 1.00 **Ponded Depth (ft.) :** 0.101 **Spread on Pavement (ft.) :** 2.01

I-71 SB

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 03/19/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Inlet Spacing, Left, for Sag @ 220+62.76 **Designer :** SSR/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 10 **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.)	
216+61	Begin																		
219+83	I-3D	322.39	0.90	0.26	0.00	3.89	10.00	0.0035	0.0400	0.0160	10.00	0.0417	5.30	1.21	0.05	1.26	0.242	6.05	
220+63	I-3D	80.00	0.90	0.07	0.00	1.47	10.00	0.0025	0.0400	0.0160	10.00	0.0417	5.30	******	******	0.36	0.161	4.02	Sag
228+30	Begin																		
221+36	I-3D	691.66	0.90	0.84	0.00	5.41	10.00	0.0054	0.0400	0.0160	10.00	0.0417	5.30	2.78	1.25	4.02	0.345	8.63	
220+63	I-3D	73.00	0.90	0.06	0.00	0.97	10.00	0.0027	0.0400	0.0160	10.00	0.0417	5.30	******	******	1.53	0.274	6.84	End

SUMP DATA

Total Flow (cfs) : 1.89 **Ponded Depth (ft.) :** 0.155 **Spread on Pavement (ft.) :** 3.51

INLET SPACING DESIGN

50 YR CHECK @ SAG

PID : 89464 **Date :** 03/19/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Inlet Spacing, Left, for Sag @ 220+62.76 - 50 yr check **Designer :** SSR/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 50 **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.)	
216+61	Begin																		
219+83	I-3D	322.39	0.90	0.26	0.00	3.57	10.00	0.0035	0.0400	0.0160	10.00	0.0417	7.10	1.55	0.14	1.69	0.270	6.76	
220+63	I-3D	80.00	0.90	0.07	0.00	1.31	10.00	0.0025	0.0400	0.0160	10.00	0.0417	7.10	******	******	0.55	0.189	4.74	Sag
228+30	Begin																		
221+36	I-3D	691.66	0.90	0.84	0.00	4.97	10.00	0.0054	0.0400	0.0160	10.00	0.0417	7.10	3.39	2.00	5.39	0.385	9.63	
220+63	I-3D	73.00	0.90	0.06	0.00	0.86	10.00	0.0027	0.0400	0.0160	10.00	0.0417	7.10	******	******	2.39	0.323	8.08	End

SUMP DATA

Total Flow (cfs) : 2.94 **Ponded Depth (ft.) :** 0.208 **Spread on Pavement (ft.) :** 4.72

INLET SPACING DESIGN

PID : 89464 **Date :** 05/28/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Inlet Spacing, Right, for Sag @ 220+62.76 **Designer :** SSR/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.00* **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.)	
214+55	Begin																		
218+20	I-3C	365.25	0.90	0.15	0.00	5.12	10.00	0.0035	0.0400	0.0160	5.00	0.0417	5.30	0.73	0.00	0.73	0.198	4.95	
219+75	I-3C	154.50	0.90	0.07	0.00	2.60	10.00	0.0035	0.0400	0.0160	5.00	0.0417	5.30	0.31	0.00	0.31	0.143	3.58	
220+63	I-3C	88.26	0.90	0.04	0.00	3.35	10.00	0.0006	0.0400	0.0160	5.00	0.0417	5.30	******	******	0.18	0.161	4.03	Sag
242+79	Begin																		
226+41	I-3D	1596.73	0.90	1.44	0.00	5.02	10.00	0.0424	0.0400	0.0227	12.00	0.0417	5.30	2.53	4.35	6.87	0.287	7.17	
225+71	I-3D	70.57	0.90	0.02	0.00	0.27	10.00	0.0372	0.0400	0.3580	8.58	0.0417	5.30	2.00	2.44	4.43	0.249	6.23	
225+06	I-3D	65.63	0.90	0.01	0.00	0.31	10.00	0.0325	0.0400	0.0370	5.80	0.0417	5.30	1.43	1.07	2.50	0.206	5.16	
224+41	I-3D	65.57	0.90	0.01	0.00	0.40	10.00	0.0278	0.0400	0.0370	4.15	0.0417	5.30	0.86	0.25	1.11	0.157	3.92	
223+76	I-3D	65.51	0.90	0.01	0.00	0.60	10.00	0.0230	0.0400	0.0300	3.10	0.0417	5.30	0.29	0.00	0.29	0.098	2.44	
221+36	I-3D	240.22	0.90	0.06	0.00	3.62	10.00	0.0054	0.0400	0.0150	5.00	0.0417	5.30	0.27	0.00	0.27	0.125	3.12	
220+63	I-3C	73.24	0.90	0.03	0.00	2.88	10.00	0.0006	0.0400	0.0160	5.00	0.0417	5.30	******	******	0.15	0.151	3.77	End

SUMP DATA

Total Flow (cfs) : 0.32 **Ponded Depth (ft.) :** 0.048 **Spread on Pavement (ft.) :** 0.99

* Varies, look at gutter width for allowable spreads

INLET SPACING DESIGN

50 YR CHECK @ SAG

PID : 89464 **Date :** 05/28/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Inlet Spacing, Right, for Sag @ 220+62.76 - 50 yr check **Designer :** SSR/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 5.00* **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.)	
214+55	Begin																		
218+20	I-3C	365.25	0.90	0.15	0.00	5.09	10.00	0.0035	0.0400	0.0160	5.00	0.0417	7.10	0.98	0.01	0.98	0.221	6.29	
219+75	I-3C	154.50	0.90	0.07	0.00	2.37	10.00	0.0035	0.0400	0.0160	5.00	0.0417	7.10	0.42	0.00	0.42	0.161	4.03	
220+63	I-3C	88.26	0.90	0.04	0.00	3.07	10.00	0.0006	0.0400	0.0160	5.00	0.0417	7.10	******	******	0.24	0.180	4.50	Sag
242+79	Begin																		
226+41	I-3D	1596.73	0.90	1.44	0.00	4.61	10.00	0.0424	0.0400	0.0227	12.00	0.0417	7.10	3.01	6.20	9.21	0.320	8.00	
225+71	I-3D	70.57	0.90	0.02	0.00	0.25	10.00	0.0372	0.0400	0.3580	8.58	0.0417	7.10	2.48	3.84	6.32	0.285	7.12	
225+06	I-3D	65.63	0.90	0.01	0.00	0.28	10.00	0.0325	0.0400	0.0370	5.80	0.0417	7.10	1.91	2.02	3.92	0.244	6.13	
224+41	I-3D	65.57	0.90	0.01	0.00	0.35	10.00	0.0278	0.0400	0.0370	4.15	0.0417	7.10	1.31	0.77	2.08	0.198	5.02	
223+76	I-3D	65.51	0.90	0.01	0.00	0.47	10.00	0.0230	0.0400	0.0300	3.10	0.0417	7.10	0.70	0.11	0.81	0.144	3.78	
221+36	I-3D	240.22	0.90	0.06	0.00	3.15	10.00	0.0054	0.0400	0.0150	5.00	0.0417	7.10	0.47	0.00	0.47	0.154	3.85	
220+63	I-3C	73.24	0.90	0.03	0.00	2.64	10.00	0.0006	0.0400	0.0160	5.00	0.0417	7.10	******	******	0.20	0.169	4.21	End

SUMP DATA

Total Flow (cfs) : 0.43 **Ponded Depth (ft.) :** 0.058 **Spread on Pavement (ft.) :** 1.21

* Varies, Look at Gutter Width for Allowable Spreads

INLET SPACING DESIGN

PID : 89464 **Date :** 02/26/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Inlet Spacing, Right, for End of Barrier @ 209+83.55 **Designer :** SSR/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.00 **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.)
214+55	Begin																	
209+84	I-3C	471.20	0.90	0.13	0.00	5.42	10.00	0.0068	0.0400	0.0160	5.00	0.0417	5.30	0.61	0.00	0.61	0.163	4.07

71-SB

Approach Slab - Sta. 230+89

															10-yr		
1503L		STATION	#	AREA (acres)	LENGTH (ft)	LONG. SLOPE (%)	C	k	V (fps)	CALC. Td (min)	Td (min)	I-10 YR	I-50 YR	Q-10 YR (cfs)	Q-50 YR (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	
	RT	230+89	53	1.143	1150.91	5.000	0.90	0.62	4.54	4.22	10.00	5.30	7.10	5.4487	7.3029	3.7160	1.7327	NO SCUPPER REQUIRED

																10-yr		50-yr		
1503L		STATION	#	AREA (acres)	LENGTH (ft)	LONG. SLOPE (%)	C	k	V (fps)	CALC. Td (min)	Td (min)	I-10 YR	I-50 YR	Q-10 YR (cfs)	Q-50 YR (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	
	RT	242+79.26	High Point																	
		244+50.00	71	0.16	170.74	1.470	0.90	0.62	2.46	1.16	10.00	5.30	7.10	0.7627	1.0223	0.7380	0.0247	0.9740	0.0483	
		247+36.70	67	0.28	286.70	2.470	0.90	0.62	3.20	1.49	10.00	5.30	7.10	1.3595	1.8373	1.2670	0.0925	1.6660	0.1713	
		249+06.29	72	0.16	169.59	1.040	0.90	0.62	2.07	1.36	10.00	5.30	7.10	0.8552	1.1935	0.8240	0.0312	1.1300	0.0635	
		249+80.28	55	0.07	73.99	0.410	0.90	0.62	1.30	0.95	10.00	5.30	7.10	0.3649	0.5108	0.3590	0.0059	0.4980	0.0128	
		250+29.00	57	0.045	49.00	0.104	0.90	0.62	0.65	1.25	10.00	5.30	7.10	0.2204	0.3003	0.2130	0.0074	0.2980	0.0023	SAG
		263+11.70	High Point																	
		252+56.00	58	0.97	1055.70	0.601	0.90	0.62	1.57	11.18	11.18	5.06	6.76	4.4198	5.9050	3.6340	0.7858	4.4000	1.5050	
		250+80.00	60	0.15	176.00	0.432	0.90	0.62	1.33	2.20	10.00	5.30	7.10	1.5009	2.4634	0.6010	0.8999	2.2730	0.1904	
		250+29.00	59	0.044	51.00	0.108	0.90	0.62	0.67	1.27	10.00	5.30	7.10	1.3300	0.7718	1.3300	0.0000	0.7718	0.0000	END SEGMENT

																10-yr		50-yr		
1503L		STATION	#	AREA (acres)	LENGTH (ft)	LONG. SLOPE (%)	C	k	V (fps)	CALC. Td (min)	Td (min)	I-10 YR	I-50 YR	Q-10 YR (cfs)	Q-50 YR (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	
	LT	263+11.70	High Point																	
		271+00	64	0.1413	778.39	0.800	0.90	0.62	1.82	7.14	10.00	5.30	7.10	0.6736	0.9028	0.0000	0.6736	0.0000	0.9028	Spread Check "ok"
		277+61.67	65	0.0877	653.82	4.000	0.90	0.62	4.06	2.68	10.00	5.30	7.10	1.0916	1.4631	0.0000	1.0916	0.0000	1.4631	APPROCH SLAB NO SCUPPER REQUIRE

																10-yr		50-yr		
1503L		STATION	#	AREA (acres)	LENGTH (ft)	LONG. SLOPE (%)	C	k	V (fps)	CALC. Td (min)	Td (min)	I-10 YR	I-50 YR	Q-10 YR (cfs)	Q-50 YR (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	
	RT	263+11.70	High Point																	
		271+00	62	0.9518	778.39	0.800	0.90	0.62	1.82	7.14	10.00	5.30	7.10	4.5372	6.0813	0.0000	4.5372	0.0000	6.0813	Spread Check "ok"
		277+61.67	63	0.948	653.82	4.000	0.90	0.62	4.06	2.68	10.00	5.30	7.10	9.0564	12.1382	0.0000	9.0564	0.0000	12.1382	APPROCH SLAB NO SCUPPER REQUIRE

RAMP D4

																10-yr		50-yr		
		STATION	#	AREA (acres)	LENGTH (ft)	LONG. SLOPE (%)	C	k	V (fps)	CALC. Td (min)	Td (min)	I-10 YR	I-50 YR	Q-10 YR (cfs)	Q-50 YR (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)	
1503L	LT	263+11.70	High Point																	
		4021+79	56	0.4950	1005.00	0.680	0.90	0.62	1.67	10.00	10.00	5.30	7.10	2.3595	3.1625	2.1100	0.2495	2.6570	0.5055	
		4019+50	66	0.2270	229.00	0.460	0.90	0.62	1.38	2.77	10.00	5.30	7.10	1.3316	1.9558	1.2760	0.0556	1.7970	0.1588	
		4018+92	61	0.068	54.94	0.108	0.90	0.62	0.67	1.37	10.00	5.30	7.10	0.3798	0.5933	0.3790	0.0008	0.5900	0.0033	End Run

Hydraulic Analysis Report

Project Data

Project Title: 1503L-10 YEAR

Designer: TAZ

Project Date: Thursday, October 10, 2018

Project Units: U.S. Customary Units

Notes: 10 year rain event

Curb and Gutter Analysis: 230+89-RT_53

Notes: Spread Meet, No Scupper Needed

Gutter Input Parameters

Longitudinal Slope of Road: 0.0500 ft/ft

Cross-Slope of Pavement: 0.0375 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 6.3713 ft

Gutter Result Parameters

Design Flow: 5.4487 cfs

Gutter Depression: 0.3600 in

Area of Flow: 0.9411 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 3.2271 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 3.8515 cfs

Bypass Flow: 1.5972 cfs

Approach Velocity: 5.7895 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.7069

Curb and Gutter Analysis: 244+50-RT_71

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0147 ft/ft

Cross-Slope of Pavement: 0.0600 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 2.9760 ft

Gutter Result Parameters

Design Flow: 0.7627 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.2657 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.1427 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.7377 cfs

Bypass Flow: 0.0250 cfs

Approach Velocity: 2.8706 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9672

Curb and Gutter Analysis: 247+36.70-RT_67

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0247 ft/ft

Cross-Slope of Pavement: 0.0600 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.3536 ft

Gutter Result Parameters

Design Flow: 1.3595 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.3374 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.4146 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 1.2666 cfs

Bypass Flow: 0.0929 cfs

Approach Velocity: 4.0295 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9317

Curb and Gutter Analysis: 248+50-RT_72

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0104 ft/ft

Cross-Slope of Pavement: 0.0600 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.3148 ft

Gutter Result Parameters

Design Flow: 0.8552 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.3296 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.3866 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.8237 cfs

Bypass Flow: 0.0315 cfs

Approach Velocity: 2.5944 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9631

Curb and Gutter Analysis: 249+80.28-RT_55

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0041 ft/ft

Cross-Slope of Pavement: 0.0476 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.3142 ft

Gutter Result Parameters

Design Flow: 0.3649 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.2614 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.8931 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.3587 cfs

Bypass Flow: 0.0062 cfs

Approach Velocity: 1.3959 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9829

Curb and Gutter Analysis: 250+29-RT_57-sag

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0010 ft/ft

Cross-Slope of Pavement: 0.0389 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.9167 ft

Gutter Result Parameters

Design Flow: 0.2147 cfs

Gutter Depression: 0.1584 in

Area of Flow: 0.3776 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.9867 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.2134 cfs

Bypass Flow: 0.0013 cfs

Approach Velocity: 0.5686 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9939

Curb and Gutter Analysis: 252+56-RT_58

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0060 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 8.7632 ft

Gutter Result Parameters

Design Flow: 4.4198 cfs

Gutter Depression: 3.4560 in

Area of Flow: 2.3424 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 5.1385 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 3.6335 cfs

Bypass Flow: 0.7863 cfs

Approach Velocity: 1.8869 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.8221

Curb and Gutter Analysis: 250+80-RT_60

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0043 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 6.2181 ft

Gutter Result Parameters

Design Flow: 1.5009 cfs

Gutter Depression: 3.4560 in

Area of Flow: 2.0373 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.6499 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 1.4526 cfs

Bypass Flow: 0.0483 cfs

Approach Velocity: 0.7367 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9678

Curb and Gutter Analysis: 250+29-RT_59-end

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0011 ft/ft

Cross-Slope of Pavement: 0.0390 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Design Flow: 1.3300 cfs

Gutter Result Parameters

Width of Spread: 7.7064 ft

Gutter Depression: 0.1440 in

Area of Flow: 1.2301 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 3.7506 in

Inlet Input Parameters

Inlet Location: Inlet in Sag

Percent Clogging: 0.0000 %

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Perimeter: 9.0000 ft

Effective Perimeter: 9.0000 ft

Area: 7.2000 ft^2

Effective Area: 7.2000 ft^2

Depth at center of grate: 0.1344 ft

Computed Width of Spread at Sag: 3.9071 ft

Flow type: Weir Flow

Efficiency: 1.0000

Curb and Gutter Analysis: 271+00-LT_64-Spreadcheck

Notes: Spread check at longitudinal grade change

Gutter Input Parameters

Longitudinal Slope of Road: 0.0080 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 5.5000 ft

Width of Spread: 4.1020 ft

Gutter Result Parameters

Design Flow: 0.6736 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.3365 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.9690 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.6386 cfs

Bypass Flow: 0.0350 cfs

Approach Velocity: 2.0016 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9481

Curb and Gutter Analysis: 277+62-LT_65-Approch Slab

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0400 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 5.5000 ft

Width of Spread: 3.6355 ft

Gutter Result Parameters

Design Flow: 1.0916 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.2643 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.7450 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.9759 cfs

Bypass Flow: 0.1157 cfs

Approach Velocity: 4.1296 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.8940

Curb and Gutter Analysis: 271+00-RT_62-Spreadcheck

Notes: Spread check at longitudinal grade change

Gutter Input Parameters

Longitudinal Slope of Road: 0.0080 ft/ft

Cross-Slope of Pavement: 0.0450 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 7.7924 ft

Gutter Result Parameters

Design Flow: 4.5372 cfs

Gutter Depression: 0.0000 in

Area of Flow: 1.3662 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.2079 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 3.7184 cfs

Bypass Flow: 0.8188 cfs

Approach Velocity: 3.3209 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.8195

Curb and Gutter Analysis: 277+62-RT_63-Approch Slab

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0400 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 8.0380 ft

Gutter Result Parameters

Design Flow: 9.0564 cfs

Gutter Depression: 0.0000 in

Area of Flow: 1.2922 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 3.8582 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 5.5638 cfs

Bypass Flow: 3.4926 cfs

Approach Velocity: 7.0086 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.6144

Hydraulic Analysis Report

Project Data

Project Title: 1503L-50 YEAR

Designer: TAZ

Project Date: Wednesday, October 10, 2018

Project Units: U.S. Customary Units

Notes: 50 year rain event "CHECK at SAGS"

Curb and Gutter Analysis: 230+89-RT_53

Notes: Spread Meet, No Scupper Needed

Gutter Input Parameters

Longitudinal Slope of Road: 0.0500 ft/ft

Cross-Slope of Pavement: 0.0375 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 7.1110 ft

Gutter Result Parameters

Design Flow: 7.3029 cfs

Gutter Depression: 0.3600 in

Area of Flow: 1.1281 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 3.5599 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 4.7899 cfs

Bypass Flow: 2.5130 cfs

Approach Velocity: 6.4735 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.6559

Curb and Gutter Analysis: 244+50-RT_71

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0147 ft/ft

Cross-Slope of Pavement: 0.0600 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.3215 ft

Gutter Result Parameters

Design Flow: 1.0223 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.3310 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.3915 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.9738 cfs

Bypass Flow: 0.0485 cfs

Approach Velocity: 3.0887 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9525

Curb and Gutter Analysis: 247+36.70-RT_67

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0247 ft/ft

Cross-Slope of Pavement: 0.0600 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.7545 ft

Gutter Result Parameters

Design Flow: 1.8373 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.4229 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.7033 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 1.6662 cfs

Bypass Flow: 0.1711 cfs

Approach Velocity: 4.3446 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9069

Curb and Gutter Analysis: 248+50-RT_72

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0104 ft/ft

Cross-Slope of Pavement: 0.0600 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.7561 ft

Gutter Result Parameters

Design Flow: 1.1935 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.4232 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.7044 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 1.1299 cfs

Bypass Flow: 0.0636 cfs

Approach Velocity: 2.8199 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9467

Curb and Gutter Analysis: 249+80.28-RT_55

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0041 ft/ft

Cross-Slope of Pavement: 0.0476 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 3.7597 ft

Gutter Result Parameters

Design Flow: 0.5108 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.3364 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.1476 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.4980 cfs

Bypass Flow: 0.0128 cfs

Approach Velocity: 1.5183 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9749

Curb and Gutter Analysis: 250+29-RT_57-sag

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0010 ft/ft

Cross-Slope of Pavement: 0.0389 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Design Flow: 0.3003 cfs

Gutter Result Parameters

Width of Spread: 4.4419 ft

Gutter Depression: 0.1584 in

Area of Flow: 0.4630 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.2319 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.2975 cfs

Bypass Flow: 0.0028 cfs

Approach Velocity: 0.6487 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9908

Curb and Gutter Analysis: 252+56-RT_58

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0060 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 9.7689 ft

Gutter Result Parameters

Design Flow: 5.9050 cfs

Gutter Depression: 3.4560 in

Area of Flow: 2.4914 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 5.3316 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 4.4397 cfs

Bypass Flow: 1.4653 cfs

Approach Velocity: 2.3701 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.7518

Curb and Gutter Analysis: 250+80-RT_60

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0043 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Design Flow: 2.4634 cfs

Gutter Result Parameters

Width of Spread: 7.4877 ft

Gutter Depression: 3.4560 in

Area of Flow: 2.1765 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.8936 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 2.2729 cfs

Bypass Flow: 0.1905 cfs

Approach Velocity: 1.1318 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9227

Curb and Gutter Analysis: 250+29-RT_59-end

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0011 ft/ft

Cross-Slope of Pavement: 0.0390 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Design Flow: 0.7718 cfs

Gutter Result Parameters

Width of Spread: 6.2838 ft

Gutter Depression: 0.1440 in

Area of Flow: 0.8420 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 3.0848 in

Inlet Input Parameters

Inlet Location: Inlet in Sag

Percent Clogging: 0.0000 %

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Perimeter: 9.0000 ft

Effective Perimeter: 9.0000 ft

Area: 7.2000 ft^2

Effective Area: 7.2000 ft^2

Depth at center of grate: 0.0935 ft

Computed Width of Spread at Sag: 2.8587 ft

Flow type: Weir Flow

Efficiency: 1.0000

Curb and Gutter Analysis: 271+00-LT_64-Spreadcheck

Notes: Spread check at longitudinal grade change

Gutter Input Parameters

Longitudinal Slope of Road: 0.0080 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 5.5000 ft

Width of Spread: 4.5782 ft

Gutter Result Parameters

Design Flow: 0.9028 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.4192 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.1975 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.8418 cfs

Bypass Flow: 0.0610 cfs

Approach Velocity: 2.1536 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9325

Curb and Gutter Analysis: 277+62-LT_65-Approch Slab

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0400 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 5.5000 ft

Width of Spread: 3.3856 ft

Gutter Result Parameters

Design Flow: 0.9028 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.2292 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.6251 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.8238 cfs

Bypass Flow: 0.0790 cfs

Approach Velocity: 3.9381 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9125

Curb and Gutter Analysis: 271+00-RT_62-Spreadcheck

Notes: Spread check at longitudinal grade change

Gutter Input Parameters

Longitudinal Slope of Road: 0.0080 ft/ft

Cross-Slope of Pavement: 0.0450 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 8.6971 ft

Gutter Result Parameters

Design Flow: 6.0813 cfs

Gutter Depression: 0.0000 in

Area of Flow: 1.7019 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.6964 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 4.8022 cfs

Bypass Flow: 1.2791 cfs

Approach Velocity: 3.5733 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.7897

Curb and Gutter Analysis: 277+62-RT_63-Approch Slab

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0400 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 12.0000 ft

Width of Spread: 8.9711 ft

Gutter Result Parameters

Design Flow: 12.1382 cfs

Gutter Depression: 0.0000 in

Area of Flow: 1.6096 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.3061 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 6.9407 cfs

Bypass Flow: 5.1975 cfs

Approach Velocity: 7.5410 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.5718

Hydraulic Analysis Report

Project Data

Project Title: 1503L-RAMP D4

Designer: TAZ

Project Date: Thursday, February 08, 2018

Project Units: U.S. Customary Units

Notes: Ramp D4 10 year design, 50 year check

Curb and Gutter Analysis: 4021+79-LT_56-10yr

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0080 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 0.3798 cfs

Gutter Result Parameters

Width of Spread: 3.3089 ft

Gutter Depression: 2.8800 in

Area of Flow: 1.2876 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 3.5153 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.3791 cfs

Bypass Flow: 0.0007 cfs

Approach Velocity: 0.2950 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9981

Curb and Gutter Analysis: 4019+50-LT_66-10yr

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0046 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 1.3316 cfs

Gutter Result Parameters

Width of Spread: 5.8756 ft

Gutter Depression: 2.8800 in

Area of Flow: 1.4762 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.0081 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 1.2760 cfs

Bypass Flow: 0.0556 cfs

Approach Velocity: 0.9021 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9583

Curb and Gutter Analysis: 4018+92-LT_61-10yr

Notes: Ramp D4 continious to slope to the west to tie into SR 315 NB.

Gutter Input Parameters

Longitudinal Slope of Road: 0.0014 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Width of Spread: 6.0360 ft

Gutter Result Parameters

Design Flow: 0.8011 cfs

Gutter Depression: 2.8800 in

Area of Flow: 1.4915 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.0389 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.7865 cfs

Bypass Flow: 0.0146 cfs

Approach Velocity: 0.5371 ft/s

Splash-over Velocity: 9.6630

ft/s Efficiency: 0.9818

Curb and Gutter Analysis: 4021+79-LT_56-50yr

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0080 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 0.5933 cfs

Gutter Result Parameters

Width of Spread: 3.9113 ft

Gutter Depression: 2.8800 in

Area of Flow: 1.3224 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 3.6310 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 0.5896 cfs

Bypass Flow: 0.0037 cfs

Approach Velocity: 0.4487 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9937

Curb and Gutter Analysis: 4019+50-LT_66-50yr

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0046 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 1.9558 cfs

Gutter Result Parameters

Width of Spread: 6.7867 ft

Gutter Depression: 2.8800 in

Area of Flow: 1.5685 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.1830 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 1.7971 cfs

Bypass Flow: 0.1587 cfs

Approach Velocity: 1.2469 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9188

Curb and Gutter Analysis: 4018+92-LT_61-50yr

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0014 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Width of Spread: 7.2978 ft

Gutter Result Parameters

Design Flow: 1.3290 cfs

Gutter Depression: 2.8800 in

Area of Flow: 1.6261 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 4.2812 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8 - 4

Grate Width: 1.5000 ft

Grate Length: 6.0000 ft

Local Depression: 0.2500 in

Inlet Result Parameters

Intercepted Flow: 1.2689 cfs

Bypass Flow: 0.0601 cfs

Approach Velocity: 0.8173 ft/s

Splash-over Velocity: 9.6630 ft/s

Efficiency: 0.9548

Transitional I-71 SB

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 06/19/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Transitional LT shoulder **Designer :** DNO

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.70

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.)	
382+21	Begin																		
386+57	I-3B	436.00	0.90	0.26	0.00	1.96	10.00	0.0366	0.0400	0.0185	10.00	0.0420	7.10	1.07	0.58	1.65	0.173	4.32	
388+75	I-3D	218.00	0.90	0.28	0.00	1.10	10.00	0.0142	0.0760	0.0760	10.00	0.0420	7.10	2.01	0.38	2.39	0.302	3.97	
389+25	I-3D	50.00	0.90	0.07	0.00	0.48	10.00	0.0059	0.0700	0.0700	10.00	0.0420	7.10	******	******	0.80	0.229	3.27	Sag
390+07	Begin																		
389+50	I-3D	57.00	0.90	0.08	0.00	0.76	10.00	0.0029	0.0698	0.0698	10.00	0.0420	7.10	0.48	0.00	0.48	0.216	3.09	
389+25	I-3D	25.00	0.90	0.03	0.00	0.31	10.00	0.0059	0.0700	0.0700	10.00	0.0420	7.10	******	******	0.21	0.139	1.98	End

SUMP DATA

Total Flow (cfs) : 1.01 **Ponded Depth (ft.) :** 0.102 **Spread on Pavement (ft.) :** 1.38

Transitional I-71SB STA 377+98 to STA 384+41 RT

													5-yr	
Transitional I-71SB		**STATION**	**#**	**AREA (acres)**	**LENGTH (ft)**	**LONG. SLOPE (%)**	**C**	**k**	**V (fps)**	**CALC. Td (min)**	**Td (min)**	**I-10 YR**	**Q-10 YR (cfs)**	**Intercepted Flow (cfs)**	**Bypass Flow (cfs)**
		377+98													
		382+00		0.202	402.00	3.18	0.90	0.62	3.63	1.85	10.00	5.30	0.9635	0.8390	0.1245
		384+00		0.0598	200.00	1.72	0.90	0.62	2.67	1.25	10.00	5.30	0.4098	0.3910	0.0188

Hydraulic Analysis Report

Project Data

Project Title: Phase 6R

Designer:

Project Date: Monday, June 24, 2019

Project Units: U.S. Customary Units

Notes:

Curb and Gutter Analysis: STA 382+00 RT

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0318 ft/ft

Cross-Slope of Pavement: 0.0160 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 3.6217 ft

Gutter Result Parameters

Design Flow: 0.9635 cfs

Gutter Depression: 1.1520 in

Area of Flow: 0.2969 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.8474 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 1.5000 ft

Grate Length: 3.0000 ft

Local Depression: 0.0420 in

Inlet Result Parameters

Intercepted Flow: 0.8388 cfs

Bypass Flow: 0.1247 cfs

Approach Velocity: 3.2448 ft/s

Splash-over Velocity: 9.9703 ft/s

Efficiency: 0.8706

Curb and Gutter Analysis: STA 384+00 RT

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0172 ft/ft

Cross-Slope of Pavement: 0.0140 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0400 ft/ft

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 2.9494 ft

Gutter Result Parameters

Design Flow: 0.4098 cfs

Gutter Depression: 1.2480 in

Area of Flow: 0.2689 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.7435 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 1.5000 ft

Grate Length: 3.0000 ft

Local Depression: 0.0420 in

Inlet Result Parameters

Intercepted Flow: 0.3914 cfs

Bypass Flow: 0.0184 cfs

Approach Velocity: 1.5240 ft/s

Splash-over Velocity: 9.9703 ft/s

Efficiency: 0.9552

Transitional I-70 WB

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 06/19/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description : Transitional I-70 WB STA 639+25 to STA 643+00 RT **Designer :** DNO

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.40

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.)
639+25	Begin																	
639+99	I-3B	74.00	0.90	0.08	0.00	0.33	10.00	0.0976	0.0400	0.0160	18.49	0.0420	5.30	0.32	0.04	0.36	0.081	2.03
643+00	I-3D	301.00	0.90	0.17	0.00	2.13	10.00	0.0177	0.0400	0.0366	10.00	0.0420	5.30	0.76	0.10	0.86	0.155	3.88

INLET SPACING DESIGN

PID : 89464 **Date :** 06/25/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/71/SR 315 Interchange

Description : Transitional I-70 WB STA 626+91 to STA 639+25 RT SAG STA 633+25 **Designer :** DNO

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 10.00 **Allowable Depth (ft.)** 0.04

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.)
626+91	Begin																	
629+00	I-3D	209.00	0.90	0.27	0.00	1.22	10.00	0.0215	0.0400	0.0155	10.00	0.0420	5.30	1.00	0.30	1.30	0.174	4.36
631+00	I-3D	200.00	0.90	0.31	0.00	1.06	10.00	0.0230	0.0400	0.0150	10.00	0.0420	5.30	1.23	0.57	1.80	0.195	4.86
632+00	I-3D	100.00	0.90	0.17	0.00	0.56	10.00	0.0247	0.0400	0.0215	10.00	0.0420	5.30	1.02	0.37 *	1.39	0.174	4.36
639+25	Begin																	
637+00	I-3D	225.00	0.90	0.22	0.00	1.69	10.00	0.0239	0.0158	0.0260	10.00	0.0420	5.30	0.61	0.44	1.05	0.111	7.05
635+50	I-3D	150.00	0.90	0.16	0.00	1.03	10.00	0.0210	0.0271	0.0260	10.00	0.0420	5.30	0.83	0.36	1.19	0.146	5.40
633+98	I-3D	152.00	0.90	0.17	0.00	1.33	10.00	0.0127	0.0223	0.0260	10.00	0.0420	5.30	0.83	0.33 *	1.15	0.148	6.63

* Bypass flow carried to Scupper calculations

Transitional I-70 WB STA 626+91 to STA 639+25 SAG STA 633+25 RT

													5-yr	
Short St. Bridge		STATION	#	AREA (acres)	LENGTH (ft)	LONG. SLOPE (%)	C	k	V (fps)	CALC. Td (min)	Td (min)	I-5 YR	Q-5 YR (cfs)	Intercepted Flow (cfs)	Bypass Flow (cfs)
		632+00													0.3700
		633+10		0.1152	110.00	0.24	0.90	0.62	1.00	1.84	10.00	5.30	0.9195	0.3960	0.5235
		633+25		0.0159	15.00	0.24	0.90	0.62	1.00	0.25	10.00	5.30	0.5993	0.5993	0.0000
		633+98													0.3300
		633+40		0.0624	58.00	0.33	0.90	0.62	1.17	0.83	10.00	5.30	0.6276	0.3170	0.3106
		633+25		0.0159	15.00	0.24	0.90	0.62	1.00	0.25	10.00	5.30	0.3865	0.3865	0.0000
													0.9858		

Hydraulic Analysis Report

Project Data

Project Title: Phase 6R

Designer:

Project Date: Tuesday, July 02, 2019

Project Units: U.S. Customary Units Notes:

Curb and Gutter Analysis: 633+10 RT

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0024 ft/ft

Cross-Slope of Pavement: 0.0230 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0230 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 0.9195 cfs

Gutter Result Parameters

Width of Spread: 8.1644 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.7666 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.2534 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 1.5000 ft

Grate Length: 0.5000 ft

Local Depression: 0.0833 in

Inlet Result Parameters

Intercepted Flow: 0.3965 cfs

Bypass Flow: 0.5230 cfs

Approach Velocity: 1.1995 ft/s

Splash-over Velocity: 4.0789 ft/s

Efficiency: 0.4312

Curb and Gutter Analysis: 633+25 RT

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0024 ft/ft

Cross-Slope of Pavement: 0.0230 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0230 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 0.5993 cfs

Gutter Result Parameters

Width of Spread: 6.9536 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.5561 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.9192 in

Inlet Input Parameters

Inlet Location: Inlet in Sag

Percent Clogging: 0.0000 %

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 1.5000 ft

Grate Length: 0.5000 ft

Local Depression: 0.0833 in

Inlet Result Parameters

Perimeter: 3.5000 ft

Effective Perimeter: 3.5000 ft

Area: 0.6750 ft^2

Effective Area: 0.6750 ft^2

Depth at center of grate: 0.1482 ft

Computed Width of Spread at Sag: 7.1953 ft

Flow type: Weir Flow

Efficiency: 1.0000

Curb and Gutter Analysis: 633+40 RT

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0033 ft/ft

Cross-Slope of Pavement: 0.0230 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0230 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 0.6276 cfs

Gutter Result Parameters

Width of Spread: 6.6649 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.5108 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.8395 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 1.5000 ft

Grate Length: 0.5000 ft

Local Depression: 0.0830 in

Inlet Result Parameters

Intercepted Flow: 0.3166 cfs

Bypass Flow: 0.3110 cfs

Approach Velocity: 1.2286 ft/s

Splash-over Velocity: 4.0789 ft/s

Efficiency: 0.5044

Curb and Gutter Analysis: 633+25 RT

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0024 ft/ft

Cross-Slope of Pavement: 0.0230 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0230 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 0.3865 cfs

Gutter Result Parameters

Width of Spread: 5.8990 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.4002 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.6281 in

Inlet Input Parameters

Inlet Location: Inlet in Sag

Percent Clogging: 0.0000 %

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 1.5000 ft

Grate Length: 0.5000 ft

Local Depression: 0.0830 in

Inlet Result Parameters

Perimeter: 3.5000 ft

Effective Perimeter: 3.5000 ft

Area: 0.6750 ft^2

Effective Area: 0.6750 ft^2

Depth at center of grate: 0.1107 ft

Computed Width of Spread at Sag: 5.5611 ft

Flow type: Weir Flow

Efficiency: 1.0000

Curb and Gutter Analysis: 633+25 RT

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0024 ft/ft

Cross-Slope of Pavement: 0.0230 ft/ft

Depressed Gutter Geometry

Cross-Slope of Gutter: 0.0230 ft/ft

Manning's n: 0.0150

Gutter Width: 10.0000 ft

Design Flow: 0.9858 cfs

Gutter Result Parameters

Width of Spread: 8.3804 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.8077 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.3130 in

Inlet Input Parameters

Inlet Location: Inlet in Sag

Percent Clogging: 0.0000 %

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 1.5000 ft

Grate Length: 0.5000 ft

Local Depression: 0.0833 in

Inlet Result Parameters

Perimeter: 3.5000 ft

Effective Perimeter: 3.5000 ft

Area: 0.6750 ft^2

Effective Area: 0.6750 ft^2

Depth at center of grate: 0.2066 ft

Computed Width of Spread at Sag: 9.7313 ft

Flow type: Weir Flow

Efficiency: 1.0000

SR 315 SB

INLET SPACING

INLET SPACING DESIGN

PID : 89464 **Date :** 02/26/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :SR-315 SB Inlet Spacing, Left, to Sta 706+47.37 **Designer :** SSR/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.70 **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.)
699+15	Begin																	
704+05	I-3C	489.13	0.90	0.18	0.00	5.64	10.00	0.0055	0.0400	0.0138	12.70	0.0417	5.30	0.83	0.01	0.84	0.191	4.78
705+59	I-3C	154.50	0.90	0.09	0.00	2.73	10.00	0.0024	0.0400	0.0032	12.70	0.0417	5.30	0.46	0.00	0.46	0.178	4.45
706+47	I-3C	88.26	0.90	0.05	0.00	1.75	10.00	0.0025	0.0400	0.0032	12.70	0.0417	5.30	0.25	0.00	0.25	0.142	3.54

INLET SPACING DESIGN

PID : 89464 **Date :** 02/26/2015 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :SR 315 SB, Left, for End of Barrier @ 695+68.16 **Designer :** SSR/TAZ

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 13.00 **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.)
699+15	Begin																	
695+68	I-3C	347.32	0.90	0.12	0.00	4.21	10.00	0.0061	0.0400	0.0160	13.00	0.0417	5.30	0.55	0.00	0.55	0.160	4.00

STORM SEWER DESIGN

City Streets Storm Sewer Design

STORM SEWER SYSTEM

PID : 105588 **Date :** 07/22/2021 **Project :** Project 6A\6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Mound/Short Street Routing, Outlet at end of Short Street Work Limits **Designer :** TAZ

Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 5 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 706.15

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (5 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (5 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'
0	MD29	26+50		0.10	0.09	5.00	5.41	8.40	0.5	0.7	12	19.0	0.0800	746.59	5.86	9.39	0.0005	746.78	754.09	7.31	6.50	CB 3A
begin		26+50		0.10	0.09									745.07				745.75	754.67			0.015
MD29	MD28	26+50		0.00	0.00	5.05	5.40	8.15	0.5	0.7	12	150.0	0.0497	745.07	5.02	7.40	0.0005	745.29	754.67	9.38	8.60	MH 3
		25+00		0.10	0.09									737.62				738.29	747.62			0.015
0	MD28	25+30		0.21	0.19	5.00	5.41	8.36	1.0	1.6	12	41.0	0.0224	738.54	4.74	4.98	0.0026	738.94	748.54	9.60	9.00	CB 3
begin		25+00		0.31	0.27									737.62				738.39	747.62			0.015
0	MD28	25+20		0.22	0.20	5.00	5.41	8.40	1.1	1.7	12	27.0	0.1281	741.08	8.91	11.89	0.0029	741.34	748.08	6.74	6.00	CB 3A
begin		25+00		0.53	0.47									737.62				738.39	747.62			0.015
LD01	MD28	5+29		0.43	0.39	5.00	5.41	8.34	2.1	3.2	12	39.0	0.0079	737.93	3.85	2.96	0.0109	738.93	746.81	7.88	7.88	CB 3A
begin		25+00		0.96	0.86									737.62				738.50	747.62			0.015
MD28	MD26	25+00		0.00	0.00	5.55	5.30	8.09	4.5	6.9	15	80.0	0.0611	737.37	10.09	14.89	0.0154	738.00	747.62	9.62	9.00	MH 3
		24+20		0.96	0.86									732.48				733.63	744.40			0.015
0	MD26	24+20		0.13	0.12	5.00	5.41	8.41	0.6	1.0	12	25.0	0.3108	741.21	10.40	18.52	0.0010	741.37	743.67	2.30	1.46	CB 3A
begin		24+20		1.10	0.98									733.44				734.15	744.40			0.015
MD26	MD21	24+20		0.00	0.00	5.68	5.27	7.94	5.1	7.8	15	144.0	0.0629	732.48	10.57	15.11	0.0192	733.14	744.40	11.26	10.67	MH 3
		22+76		1.10	0.98									723.42				726.51	738.29			0.015

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (5 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (5 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'
0	MD24	23+22		0.21	0.19	5.00	5.41	8.41	1.0	1.6	12	11.0	0.0182	735.36	4.37	4.48	0.0026	735.95	739.73	3.78	3.37	CB 3
begin		23+11		1.30	1.16									735.16				735.93	739.50			0.015
MD24	MD21	23+11		1.03	0.92	5.04	5.41	8.38	6.0	9.3	15	51.0	0.1659	734.91	15.69	24.53	0.0277	735.47	739.50	4.03	3.34	MH 3
		22+76		2.33	2.09									726.45				727.66	738.29			0.015
0	MD22	23+20		0.12	0.11	5.00	5.41	8.37	0.6	0.9	12	24.0	0.0120	732.32	3.19	3.63	0.0008	732.75	739.82	7.07	6.50	CB 3A
begin		22+99		2.46	2.19									732.03				732.73	739.03			0.015
0	MD22	23+17		0.47	0.43	5.00	5.41	8.32	2.3	3.6	10	56.0	0.0132	735.61	4.52	2.35	0.0349	737.63	738.82	1.19	2.38	CB 2-2B
begin		22+99		2.93	2.62									734.87				735.68	739.03			0.015
MD22	MD21	22+99		0.00	0.00	5.21	5.37	8.30	2.9	4.4	12	36.0	0.1481	732.03	12.47	12.78	0.0204	732.45	739.70	7.25	6.67	MH 3
		22+76		2.93	2.62									726.70				727.64	738.29			0.015
MD21	MD20	22+76		0.00	0.00	5.91	5.22	7.94	13.7	20.8	18	38.0	0.0034	723.17	7.74	5.73	0.0522	726.51	738.29	11.78	13.62	MH 3
		22+42		2.93	2.62						Warning			723.04				724.53	736.61			0.015
0	MD20	4+39		0.38	0.34	5.00	5.41	8.37	1.8	2.8	12	32.0	0.0120	730.99	4.38	3.64	0.0083	731.74	735.91	4.17	3.92	CB 3A
begin		22+76		3.31	2.96									730.61				731.47	736.61			0.015
MD20	MD19	22+76		0.00	0.00	5.99	5.21	4.06	15.4	12.0	18	188.0	0.0282	723.04	9.87	16.46	0.0173	724.04	736.61	12.57	12.07	MH 3
		20+54		3.31	2.96									717.73				720.53	727.37			0.015
0	MD19	3+30		0.34	0.27	5.00	5.41	4.06	1.5	1.1	12	15.0	0.0120	718.41	4.15	3.64	0.0013	720.54	727.01	6.47	7.60	CB 3A
begin		20+54		3.66	3.23									718.23				720.53	727.37			0.015
MD19	MD18	20+54		0.00	0.00	6.31	5.14	4.06	16.6	13.1	18	29.0	0.0145	717.73	9.40	11.79	0.0207	720.53	727.37	6.84	8.14	MH 3
		20+25		3.66	3.23						Warning			717.31				719.93	726.69			0.015
MD18	MD17	20+25		0.00	0.00	6.36	5.13	4.06	16.6	13.1	18	131.0	0.0145	717.31	9.38	11.79	0.0207	719.93	726.69	6.76	7.88	MH 3
		18+93		3.66	3.23						Warning			715.41				717.22	720.23			0.015

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (5 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (5 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'
0	MD17	19+04		0.13	0.10	5.00	5.41	8.40	0.5	0.8	12	12.0	0.0200	717.65	3.77	4.70	0.0007	718.11	720.15	2.04	1.50	CB 3A
begin		18+93		3.78	3.33									717.41				718.10	720.23			0.015
MD17	MD14	18+93		0.00	0.00	6.60	5.09	4.06	16.9	13.5	18	43.0	0.1230	715.41	18.35	34.35	0.0219	717.22	720.23	3.01	3.32	MH 3
		18+72		3.78	3.33									710.12				716.27	719.34			0.015
MD14	MD12	18+72		0.00	0.00	6.63	5.08	4.06	16.9	13.5	18	120.0	0.0040	707.32	9.56	6.19	0.0219	716.27	719.34	3.07	10.52	MH 3
		17+50		3.78	3.33						**Warning**			706.84				713.64	715.49			0.015
0	MD12	17+50		0.05	0.05	5.00	5.41	4.06	0.3	0.2	12	7.0	0.0200	709.73	3.10	4.70	0.0000	713.64	714.73	1.09	4.00	CB 3
begin		17+50		3.84	3.38									709.59				713.64	715.49			0.015
MD12	MD05	17+50		0.14	0.13	6.84	5.04	4.06	17.7	14.2	18	34.0	0.0040	706.84	10.00	6.17	0.0244	713.64	715.49	1.85	7.15	MH 3
		17+16		3.98	3.51						**Warning**			706.71				712.81	714.21			0.015
0	CC01	3+08		0.71	0.61	6.36	5.13	7.70	3.1	4.7	12	55.0	0.0118	714.52	4.86	3.61	0.0233	716.10	718.52	2.42	3.00	CB 3A
begin		2+54		4.70	4.12									713.87				714.82	719.55			0.015
0	CC01	2+54		0.32	0.28	5.00	5.41	8.41	1.5	2.4	12	10.0	0.0200	714.07	5.07	4.70	0.0059	714.76	718.57	3.81	3.50	CB 3
begin		2+54		5.02	4.40									713.87				714.70	719.55			0.015
CC01	MD10	2+54		0.00	0.00	6.55	5.10	4.06	4.6	3.6	12	34.0	0.0332	713.87	7.99	6.06	0.0138	714.45	719.55	5.10	4.68	MH 3
		18+41		5.02	4.40									712.74				713.66	718.24			0.015
0	MD10	18+44		0.20	0.16	5.00	5.41	4.06	0.9	0.6	12	6.0	0.0200	712.86	4.33	4.70	0.0004	713.66	717.53	3.87	3.67	CB 3A
begin		18+41		5.21	4.56									712.74				713.66	718.24			0.015
MD10	MD08	18+41		0.00	0.00	6.62	5.08	4.06	5.4	4.3	15	91.0	0.0105	712.49	5.32	6.19	0.0058	713.66	718.24	4.58	4.50	MH 3
		17+50		5.21	4.56									711.53				713.13	715.47			0.015
0	MD08	17+50		0.12	0.07	5.00	5.41	4.06	0.4	0.3	12	8.0	0.0150	711.90	3.07	4.07	0.0001	713.13	714.72	1.59	1.82	CB 3
begin		17+50		5.33	4.63									711.78				713.13	715.47			0.015

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (5 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (5 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'
MD08	MD06	17+50		0.00	0.00	6.90	5.03	4.06	5.6	4.6	15	21.0	0.0100	711.53	5.20	6.02	0.0066	713.13	715.47	2.34	2.69	MH 3
		17+29		5.33	4.63									711.32				712.99	714.85			0.015
0	MD06	17+34		0.55	0.41	7.06	5.00	4.06	2.0	1.7	12	11.0	0.0200	709.82	5.48	4.70	0.0029	713.02	714.60	1.58	3.78	MH 3
begin		17+29		5.88	5.04									709.60				712.99	714.85			0.015
MD06	MD05	17+29		0.00	0.00	7.09	4.99	4.06	7.6	6.2	18	38.0	0.0884	709.45	13.17	29.12	0.0047	712.99	714.85	1.86	3.90	MH 3
		17+16		5.88	5.04									706.09				712.81	714.21			0.015
MD05	SH11	17+16		0.00	0.00	7.14	4.98	4.06	25.1	20.4	24	93.0	0.0030	705.59	7.99	11.57	0.0109	712.81	714.21	1.40	6.62	MH 3
		14+10		5.88	5.04						Warning			705.31				711.80	714.13			0.015
0	SH11	13+96		0.69	0.35	23.40	3.08	4.06	1.1	1.4	12	24.0	0.0200	710.35	4.61	4.70	0.0021	711.85	714.35	2.50	3.00	CB 2-2B
begin		14+10		6.57	5.39									709.87				711.80	714.13			0.015
SH11	SH08	14+10		0.00	0.00	23.49	3.08	4.06	16.6	21.9	24	73.0	0.0030	705.31	5.27	11.58	0.0124	711.80	714.13	2.33	6.82	MH 3
		13+38		6.57	5.39						Warning			705.09				710.90	713.37			0.015
0	SH09	13+66		0.99	0.49	13.47	4.03	4.06	2.0	2.0	12	34.0	0.0194	707.98	5.36	4.63	0.0041	711.07	712.98	1.91	4.00	CB 2-2B
begin		13+38		7.56	5.88									707.32				710.93	713.10			0.015
SH09	SH08	13+38		0.06	0.06	13.58	4.01	4.06	2.2	2.2	12	6.0	0.0200	707.32	5.58	4.70	0.0052	710.93	713.10	2.17	4.78	CB 3
		13+38		7.62	5.93									707.20				710.90	713.37			0.015
SH08	SH07	13+38		0.00	0.00	23.72	3.06	4.06	18.1	24.1	24	207.0	0.0030	705.09	5.78	11.54	0.0151	710.90	713.37	2.47	6.28	MH 3
		11+31		7.62	5.93						Warning			704.47				707.78	712.77			0.015
SH07	SH05	11+31		0.00	0.00	24.31	3.02	4.06	17.9	24.1	24	86.0	0.0030	704.47	5.70	11.60	0.0151	707.78	712.77	4.99	6.30	MH 3
		10+45		7.62	5.93						Warning			704.21				706.49	712.54			0.015
0	SH05	10+45		0.02	0.02	5.00	5.41	8.41	0.1	0.2	12	6.0	0.0200	707.28	2.36	4.70	0.0000	707.75	712.28	4.53	4.00	CB 3
begin		10+45		7.64	5.95									707.16				707.75	712.54			0.015

STORM SEWER SYSTEM

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (5 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (5 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'
SH05	SH02	10+45		0.00	0.00	24.57	3.00	4.06	17.9	24.2	24	16.0	0.0094	704.21	6.87	20.42	0.0152	706.49	712.54	6.05	6.33	MH 3
		10+30		7.64	5.95									704.06				706.25	713.20			0.015
0	SH03	10+28		0.22	0.13	5.00	5.41	4.06	0.7	0.5	12	23.0	0.0200	705.68	4.13	4.70	0.0003	706.26	712.22	5.96	5.54	CB 3A
begin		10+28		7.86	6.09									705.22				706.25	712.45			0.015
SH03	SH02	10+28		0.02	0.01	5.09	5.39	4.06	0.8	0.6	12	8.0	0.0200	705.22	4.21	4.70	0.0004	706.25	712.45	6.20	6.23	CB 3
		10+30		7.88	6.10									705.06				706.25	713.20			0.015
SH02	END	10+30		0.00	0.00	24.61	3.00	4.06	18.3	24.7	24	6.0	0.0023	704.06	5.82	10.22	0.0159	706.25	713.20	6.95	7.14	MH 3
final		10+24		7.88	6.10						**Warning**			704.05				706.15	708.15			0.015

METHODOLOGY FOR MOUND/SHORT ST. STORM SEWER DESIGN
ALONG SHORT ST. THE PROPOSED STORM SEWER TRUNKLINE SIZED OUT AT A 36" PIPE. THE PROJECT IS OUTLETTING TO AN EXISTING 24" RCP. A 24" PROPOSED STORM SEWER TRUNKLINE IS BEING MAINTAINED ALONG SHORT ST. IN ORDER TO KEEP THE HYDRAULIC GRADIENT IN CHECK, ABOUT 360' OF UPSTREAM STORM SEWERS, "FROM STRUCTURE #MD12", ALONG MOUND ST. WAS INCREASED ONE PIPE SIZE.

Civic Center Drive - Drainage Area (M7)

1 Time of Overland Flow in Minutes

C =	0.90	pvmt.
L =	75.40	
s =	2.08	(percent)

To = 2.449 min.

2 Time of Overland Flow in Minutes

C =	0.60	grass
L =	14.60	
s =	22.60	(percent)

To = 1.216 min.

Total Td= 6.357 min.

3 Time of Overland Flow in Minutes

C =	0.90	gravel
L =	105.10	
s =	7.61	(percent)

To = 1.876 min.

4 Velocity in fps

V=3.281ks0.5

k =	0.62	
s =	4.020	(percent)

V = 4.072

Travel Time for Shallow Swale or Channels

Td=L/60V

L =	143.30

Td = 0.587 min.

5 Velocity in fps

V=3.281ks0.5

k =	0.62	
s =	3.190	(percent)

V = 3.627

Travel Time for Shallow Swale or Channels

Td=L/60V

L =	49.90

Td = 0.229 min.

Short Street 13+65 - Drainage Area (S6)

1 **Time of Overland Flow in Minutes**

C =	0.40	grass
L =	57.80	
s =	3.38	(percent)

To = 6.383 min.

2 **Time of Overland Flow in Minutes**

C =	0.50	gravel
L =	398.60	
s =	4.32	(percent)

To = 13.239 min.

3 **Time of Overland Flow in Minutes**

C =	0.40	grass
L =	13.51	
s =	4.22	(percent)

To = 2.866 min.

Total Td= 23.412 min.

4 **Time of Overland Flow in Minutes**

C =	0.90	walk
L =	7.68	
s =	1.26	(percent)

To = 0.924 min.

Freeway Storm Sewer Design

West of Scioto River

STORM SEWER SYSTEM

PID : 89464 **Date :** 07/16/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 209+83.55 Rt. into ex. 18" conduit **Designer :** TAZ/DNO

Rainfall Area: C **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'
SB13	PIPE	209+84	0.24	0.22	10.00	5.30	6.48	1.2	1.4	18	6.0	0.0060	707.15	2.95	7.59	0.0002	708.09	718.12	10.03	9.47	I 3C
begin		209+82	0.24	0.22									707.11				708.09	708.61			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 03/06/2015 **Project :** Phase 6A **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 219+90.92 Rt. into ex. 15" conduit **Designer :** TAZ

Rainfall Area: C **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'
SB14	SB15	218+20	0.33	0.30	10.00	5.30	6.31	1.6	1.9	15	155.0	0.0100	712.98	3.91	6.02	0.0011	713.48	718.23	4.75	4.00	I 3C
begin		219+75	0.33	0.30									711.43				712.33	717.71			0.015
SB15	315A	218+20	0.16	0.14	10.66	5.16	6.29	2.3	2.8	15	17.0	0.0082	711.43	4.02	5.47	0.0024	712.29	717.71	5.42	5.03	I 3C
		219+91	0.49	0.44									711.29				712.25	714.38			0.015
SB16	315A	219+33	0.85	0.59	15.00	4.43	5.26	2.6	3.1	15	92.0	0.0050	697.13	3.45	4.26	0.0031	698.44	703.59	5.15	5.21	CB 8
begin		219+91	1.34	1.03									696.67				698.16	714.38			0.015
SB17	315A	219+83	0.26	0.24	10.00	5.30	6.45	1.3	1.5	15	59.0	0.0466	714.04	6.36	13.00	0.0007	714.34	719.29	4.95	4.00	I 3D
begin		219+91	1.60	1.27									711.29				712.16	714.38			0.015
SB20	SB21	221+36	0.88	0.79	10.00	5.30	6.46	4.2	5.1	15	41.0	0.0120	714.04	5.37	6.58	0.0083	714.97	719.29	4.32	4.00	I 3D
begin		221+36	2.48	2.06									713.55				714.63	716.46			0.015
SB22	SB21	221+36	0.06	0.05	10.00	5.30	6.35	0.3	0.3	15	8.0	0.1125	714.45	5.45	20.20	0.0000	714.56	719.70	5.14	4.00	I 3D
begin		221+36	2.54	2.11									713.55				714.33	716.46			0.015
SB21	SB19	221+36	0.00	0.00	10.13	5.27	6.35	4.4	5.3	15	74.0	0.0176	713.55	6.31	7.98	0.0091	714.33	716.46	2.13	1.66	MH 3
		220+63	2.54	2.11									712.25				713.48	717.50			0.015
SB18	SB19	220+63	0.13	0.11	10.00	5.30	6.35	0.6	0.7	15	53.0	0.0302	713.85	4.40	10.46	0.0002	714.08	719.10	5.02	4.00	I 3D
begin		220+63	2.66	2.22									712.25				713.48	717.50			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'
SB19	315A	220+63		0.12	0.11	10.32	5.23	6.35	5.6	6.7	15	72.0	0.0133	712.25	5.93	6.95	0.0145	713.48	717.50	4.02	4.00	I 3C
		219+91		2.78	2.33									711.29				712.44	714.38			0.015
315A	END	219+91		0.00	0.00	15.44	4.37	5.26	10.2	12.3	15	6.0	0.0050	696.67	8.30	4.26	0.0479	698.16	714.38	16.22	16.46	MH 3
final		219+95		2.78	2.33						**Warning**			696.64				697.87	697.89			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 03/06/2015 **Project :** Phase 6A **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 219+90.92 Rt. into ex. 15" conduit - 50 yr check at sags **Designer :** TAZ

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

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.)	(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'
SB14	SB15	218+20	0.33	0.30	10.00	5.30	6.91	1.6	2.1	15	155.0	0.0100	712.98	3.91	6.02	0.0013	713.50	718.23	4.73	4.00	I 3C
begin		219+75	0.33	0.30									711.43				712.34	717.71			0.015
SB15	315A	218+20	0.16	0.14	10.66	5.16	6.89	2.3	3.0	15	17.0	0.0082	711.43	4.02	5.47	0.0029	712.31	717.71	5.40	5.03	I 3C
		219+91	0.49	0.44									711.29				712.27	714.38			0.015
SB16	315A	219+33	0.85	0.59	15.00	4.43	5.79	2.6	3.4	15	92.0	0.0050	697.13	3.45	4.26	0.0037	698.57	703.59	5.02	5.21	CB 8
begin		219+91	1.34	1.03									696.67				698.23	714.38			0.015
SB17	315A	219+83	0.26	0.24	10.00	5.30	7.05	1.3	1.7	15	59.0	0.0466	714.04	6.36	13.00	0.0009	714.35	719.29	4.94	4.00	I 3D
begin		219+91	1.60	1.27									711.29				712.17	714.38			0.015
SB20	SB21	221+36	0.88	0.79	10.00	5.30	7.06	4.2	5.6	15	41.0	0.0120	714.04	5.37	6.58	0.0099	715.06	719.29	4.23	4.00	I 3D
begin		221+36	2.48	2.06									713.55				714.65	716.46			0.015
SB22	SB21	221+36	0.06	0.05	10.00	5.30	6.94	0.3	0.4	15	8.0	0.1125	714.45	5.45	20.20	0.0000	714.57	719.70	5.13	4.00	I 3D
begin		221+36	2.54	2.11									713.55				714.51	716.46			0.015
SB21	SB19	221+36	0.00	0.00	10.13	5.27	6.94	4.4	5.8	15	74.0	0.0176	713.55	6.31	7.98	0.0109	714.51	716.46	1.95	1.66	MH 3
		220+63	2.54	2.11									712.25				713.71	717.50			0.015
SB18	SB19	220+63	0.13	0.11	10.00	5.30	6.94	0.6	0.8	15	53.0	0.0302	713.85	4.40	10.46	0.0002	714.09	719.10	5.01	4.00	I 3D
begin		220+63	2.66	2.22									712.25				713.71	717.50			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'
SB19	315A	220+63		0.12	0.11	10.32	5.23	6.94	5.6	7.4	15	72.0	0.0133	712.25	5.93	6.95	0.0174	713.71	717.50	3.79	4.00	I 3C
		219+91		2.78	2.33									711.29				712.46	714.38			0.015
315A	END	219+91		0.00	0.00	15.44	4.37	5.79	10.2	13.5	15	6.0	0.0050	696.67	8.30	4.26	0.0580	698.23	714.38	16.15	16.46	MH 3
final		219+95		2.78	2.33						**Warning**			696.64				697.88	697.89			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 03/20/2015 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 222+62.21 Lt. into future ex. 18" pipe **Designer :** TAZ

Rainfall Area: C **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'
SB23	SB23	222+72	2.90	2.40	15.07	4.42	5.32	10.6	12.8	18	13.0	0.0029	698.72	6.01	5.29	0.0197	700.36	703.07	2.71	2.85	CB 8
begin		222+62	2.90	2.40						**Warning**			698.68				700.10	701.68			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 03/20/2015 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 223+76.00 Lt. into prop. Ditch **Designer :** TAZ

Rainfall Area: C **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'
SB29	SB28	226+41		1.38	1.24	10.00	5.30	6.48	6.6	8.1	15	17.0	0.0200	726.94	7.22	8.52	0.0207	728.14	732.01	3.87	3.82	I 3D
begin		226+41		1.38	1.24									726.60				727.78	728.85			0.015
SB28	SB27	226+41		0.00	0.00	10.04	5.29	6.45	6.6	8.0	15	70.0	0.0364	726.60	9.15	11.49	0.0205	727.41	728.85	1.44	1.00	MH 3
		225+71		1.38	1.24									724.05				725.23	726.30			0.015
SB30	SB27	225+71		0.02	0.02	10.00	5.30	6.41	0.1	0.1	15	17.0	0.0200	724.39	2.10	8.52	0.0000	724.88	729.76	4.88	4.12	I 3D
begin		225+71		1.40	1.26									724.05				724.88	726.30			0.015
SB27	SB26	225+71		0.00	0.00	10.17	5.26	6.41	6.6	8.1	15	65.0	0.0346	724.05	9.00	11.20	0.0208	724.88	726.30	1.42	1.00	MH 3
		225+06		1.40	1.26									721.80				722.98	724.05			0.015
SB31	SB26	225+06		0.01	0.01	10.00	5.30	6.38	0.1	0.1	15	14.0	0.0200	722.08	1.92	8.52	0.0000	722.67	727.64	4.97	4.31	I 3D
begin		225+06		1.41	1.27									721.80				722.67	724.05			0.015
SB26	SB25	225+06		0.00	0.00	10.29	5.24	6.38	6.7	8.1	15	65.0	0.0300	721.80	8.52	10.43	0.0210	722.67	724.05	1.38	1.00	MH 3
		224+41		1.41	1.27									719.85				721.03	722.10			0.015
SB32	SB25	224+41		0.01	0.01	10.00	5.30	6.34	0.0	0.1	15	12.0	0.0200	720.09	1.70	8.52	0.0000	720.76	725.73	4.97	4.39	I 3D
begin		224+41		1.42	1.28									719.85				720.76	722.10			0.015
SB25	SB24	224+41		0.00	0.00	10.41	5.21	6.34	6.7	8.1	15	65.0	0.0274	719.85	8.22	9.97	0.0210	720.76	722.10	1.34	1.00	MH 3
		223+76		1.42	1.28									718.07				719.25	720.32			0.015

STORM SEWER SYSTEM

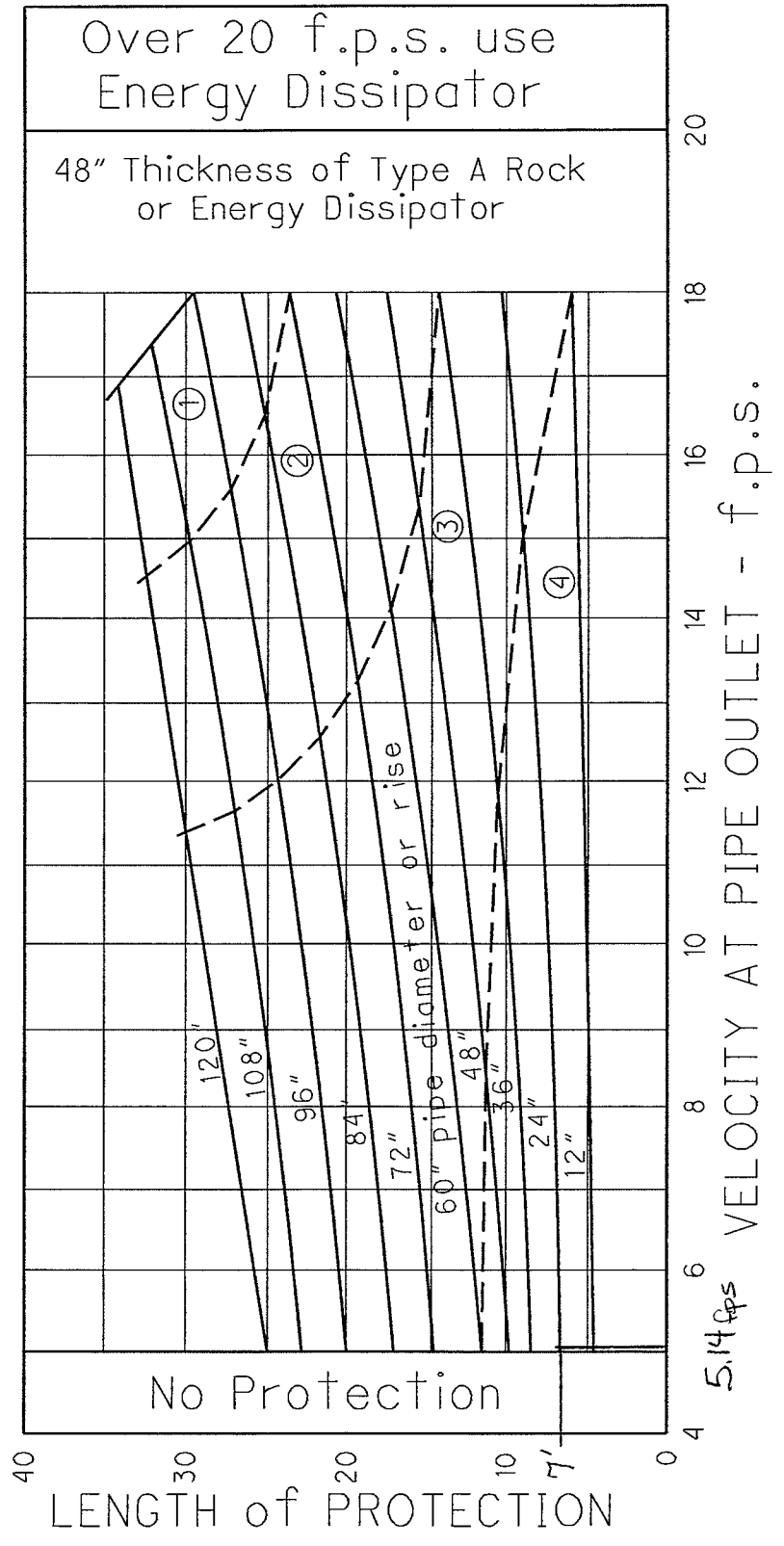
JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
SB33	SB24	223+76		0.01	0.01	10.00	5.30	6.46	0.0	0.0	15	11.0	0.0200	718.29	1.58	8.52	0.0000	718.73	723.94	5.21	4.40	I 3D
begin		223+76		1.43	1.29									718.07				718.73	720.32			0.015
SB24	HW04	223+76		0.00	0.00	10.55	5.19	6.29	6.7	8.1	18	54.0	0.0080	705.56	5.14	8.76	0.0079	706.86	720.32	13.46	13.26	MH 3
final		223+76		1.43	1.29									705.13				706.43	706.63			0.015

18" PIPE OUTLET @ STA. I-71SB 223+76.00 LT.

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1

REFERENCE SECTION
1107.2



ROCK TYPE
A
A
B
C

LEGEND
①48" of 18" rock
②36" of 18" rock
③30" of 12" rock
④18" of 6" rock

NOTES

Rock size (6", 12", 18") indicates the square opening on which 85% of the material, by weight, will be retained.

The width of protection shall be the width of the headwall, with 4' being the minimum.

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required.)

STORM SEWER SYSTEM

PID : 89464 **Date :** 05/26/2021 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at Ramp C3 Sta. 3008+62.50 Rt. into Phase 4R MH-3 **Designer :** TAZ

Rainfall Area: C **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'
C305	C306	3008+63	0.41	0.34	15.00	4.43	5.33	1.5	1.8	15	14.0	0.0150	741.00	4.47	7.38	0.0010	741.70	745.47	3.77	3.22	CB 5
begin		3008+50	0.41	0.34									740.79				741.68	750.00			0.015
C306	D215	3008+50	0.00	0.00	15.05	4.43	5.30	1.5	1.8	15	43.0	0.0133	726.52	4.26	6.93	0.0010	726.97	750.00	23.03	22.23	MH 3
final		3008+52	0.41	0.34									725.95				726.84	733.84			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 11/15/2019 **Project :** Phase 6A **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at Ramp C3 Sta. 3014+50 Lt. into 24" Jacked Conduit **Designer :** TAZ

Rainfall Area: C **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'
C301	C302	3014+29	2.47	1.39	17.18	4.14	4.64	5.8	6.4	18	32.0	0.0003	697.28	3.26	1.73	0.0050	701.32	702.02	0.70	3.24	MH 3
begin		3014+60	2.47	1.39						**Warning**			697.27				701.16	700.10			0.015
C302	SB57	3014+60	3.70	2.50	17.35	4.12	4.64	16.0	18.1	24	136.0	0.0020	697.27	5.10	9.40	0.0085	701.16	700.10	-1.06	0.83	CB 8
		3014+51	6.17	3.89						**Warning**			697.00				700.01	712.85			0.015
SB56	SB57	230+84	0.35	0.31	10.34	5.23	6.30	1.6	2.0	15	98.0	0.0150	706.12	4.58	7.38	0.0012	706.58	709.62	3.04	2.25	MH 3
begin		3014+51	6.52	4.20									704.65				705.55	712.85			0.015
SB57	SB58	3014+51	0.00	0.00	17.79	4.07	4.64	17.1	19.5	36	24.0	0.0008	697.00	2.69	17.95	0.0011	700.01	712.85	12.84	12.85	MH 3
		3014+36	6.52	4.20									696.98				699.98	704.94			0.015
SB58	EX	3014+36	1.10	0.94	17.94	4.05	4.64	20.8	23.8	36	316.0	0.0014	696.98	3.44	22.94	0.0017	699.98	704.94	4.96	4.96	CB 8A
final		3014+25	7.62	5.13									696.55				698.84	699.55			0.015

The existing 24" RCP under Ramp C and I-71 SB "C302 to SB58" currently flows backward based on survey. The 24" conduit needs to be replace due to loading from additional fill.
These calculation correct the backwars slope of the pipe, but is restrained by existing detention ponds to the west and a exiting tie in manhole to the east.

STORM SEWER SYSTEM

PID : 89464 **Date :** 05/07/2021 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Fly Over Bridge Supper Outlet to Ex. CB "9419" **Designer :** TAZ

Rainfall Area: C **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'
SB65	SB64		0.83 0.83	0.74 0.74	10.00	5.30	6.45	3.9	4.8	15	72.0	0.0294	718.37 716.25	7.45	10.33	0.0073	718.99 717.32	725.67 723.62	6.68	6.05	MH 3 0.015
SB64	SB63		0.17 1.00	0.16 0.90	10.16	5.26	6.27	4.7	5.6	15	233.0	0.0155	710.87 707.25	6.11	7.51	0.0102	711.72 708.36	723.62 712.00	11.90	11.50	MH 3 0.015
SB63	SB6A		0.00 1.00	0.00 0.90	10.80	5.14	5.13	4.6	4.6	15	158.0	0.0095	706.25 704.75	4.99	5.87	0.0068	708.13 707.06	712.00 716.00	3.87	4.50	MH 3 0.015
SB62	SB6A		0.44 1.44	0.33 1.23	15.00	4.43	5.13	1.5	1.7	15	23.0	0.0287	705.41 704.75	5.61	10.20	0.0009	707.08 707.06	707.41 715.14	0.33	0.75	CB 8 0.015
SB6A	SB61		0.00 1.44	0.00 1.23	15.07	4.42	5.13	5.4	6.3	15	169.0	0.0096	704.75 703.12	5.11	5.91	0.0127	707.06 704.91	716.00 708.37	8.94	10.00	MH 3 0.015
SB61	SB60		0.00 1.44	0.00 1.23	15.62	4.35	5.13	5.3	6.3	15	169.0	0.0088	703.12 701.63	4.88	5.65	0.0127	704.91 702.76	708.37 708.37	3.46	4.00	MH 3 0.015
SB60	EXMH		1.79 3.23	1.34 2.57	21.22	3.70	4.41	9.5	11.3	15	78.5	0.0833	699.98 693.44	13.69	17.38	0.0408	700.75 694.67	708.37 706.37	7.62	7.14	CB 8 0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 10/18/2018 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :I-71 SB Scupper outlet to existing Curb Inlet at San. Pump Station **Designer :** TAZ

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

Minimum Pipe Size : 10.00 **Tailwater Elevation (ft.):** 710.85*

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'
SB40	40A	247+37	0.27	0.24	10.00	5.30	6.45	1.3	1.5	10	20.0	0.0000	719.54	2.32	0.00	0.0066	720.37	770.37	50.00	50.00	MH
begin		247+46	0.27	0.24						**Warning**			719.54				720.23	720.37			0.015
40A	40B	247+46	0.00	0.00	10.14	5.27	6.45	1.3	1.5	10	19.1	0.4590	719.54	14.95	13.84	0.0066	719.73	720.37	0.64	0.00	
		247+55	0.27	0.24									710.79				711.48	711.62			0.015
40B	SB41	247+55	0.00	0.00	10.16	5.26	6.43	1.3	1.5	10	10.0	0.0150	710.79	4.35	2.50	0.0066	711.40	711.62	0.22	0.00	
final		247+60	0.27	0.24									710.64				711.33	713.10			0.015

* Elevation is from H.G.L. of 10" pipe between Structure # SB41 to # CBB. A 6" orifice plate is attached to the structure # SB41 at the inlet for 10" pipe. The orifice invert elevation matches the inlet elevation of the 10" pipe.

STORM SEWER SYSTEM

PID : 89464 **Date :** 10/18/2018 **Project :** Phase 6A **Location :** Columbus Ohio, I-70/I-71/SR 315 Interchange

Description :0.63 cfs outlet to existing Curb Inlet at San. Pump Station **Designer :** TAZ

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

Minimum Pipe Size : 10.00 **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'
SB41	CBB			0.13 0.13	0.12 0.12	10.26	5.24	6.40	0.6*	0.8	10	30.0	0.0727	710.64 708.46	6.35	5.51	0.0016	710.85*** 709.07	713.10 710.46	2.25	1.63	MH 3 0.015
CBB	CBC	247+72		0.31	0.18	10.34	5.23	6.32	1.6**	1.9	12	70.0	0.0117	707.20	4.19	3.59	0.0038	707.74	710.46	2.72	2.26	I 2A
final		248+35		0.44	0.30									706.38				707.17	709.82			0.015

* Orifice plate release rate

** Meets pre-construction conditions

*** Carried over to the tailwater elevations for the stormsewer run from junction SB40 to SB41

ORIFICE PLATE CALCULATIONS

Project Name: 71 SB fly over bridge outlet to existing CB "B" COLUMBUS, OH
Project No: 60-06188
Calculated By: TAZ **Date:** 10/18/2018
Checked By: **Date:**

Structure:	MH-3
25 yr H.G. Elev.	711.33
Center Elev of Orifice	710.89
Allowable Orifice Head	0.44
Allowable Discharge	0.63
Orifice Diameter, inches	5.92

Formula Q=CA(2gH)^1/2
C= coefficient of discharge = 0.6
A= Area of Orifice (ft^2)
g= acceleration due to gravity = 32.16 ft/s^2
H= head on Orifice = (ft)
Q= flow rate = cfs

TRIAL DIAMETER *(FT)*	**ORIFICE AREA** *(FT^2)*	**DISCHARGE** *(CFS)*
0.00	0.0000	0.0000
0.10	0.0079	0.0251
0.20	0.0314	0.1003
0.25	0.0491	0.1567
0.30	0.0707	0.2256
0.38	0.1104	0.3525
0.40	0.1257	0.4011
0.50	0.1963	0.6267
0.60	0.2827	0.9025
0.70	0.3848	1.2284
0.80	0.5027	1.6044
0.90	0.6362	2.0306
1.00	0.7854	2.5069
1.10	0.9503	3.0334
1.20	1.1310	3.6100
1.30	1.3273	4.2367
1.40	1.5394	4.9136
1.50	1.7671	5.6406
1.60	2.0106	6.4177
1.64	2.1124	6.7426

PROJECT: **Project 6A**
LOCATION: Pre-Post Const. Analysis of Ex CB-B @ Sanitary pump station
DATE: 10/16/2018 BY: TAZ
CK:

CB-B Pre-Construction

TOC = 10 min.
Area = 0.59
wc = 0.50
10 yr Q = 1.60 cfs

CB-B Post-Construction "Overland Flow to Ex. CB-B" only

TOC = 10 min.
Area = 0.31
wc = 0.59
10 yr Q = 0.97 cfs

I-71 SB Flyover Bridge Storm Water Contribution to CB-B from Structure # (SB40)

TOC = 10 min.
Area = 0.28
wc = 0.90
10 yr Q = 1.267 cfs

Design Outcome of I-71 SB Scupper Structure # SB40 Contribution to ex. Structure # CB-B

The total area contribution to structure # CB-B remains the same at 0.59 acres. The 10 year post-construction flow from CB-B is 0.64 cfs higher than the pre-construction flow because of a higher coefficient. This is due to additional pavement from the I-71 SB flyover bridge being added to the CB-B drainage basin. Both pre-construction and post-construction TOC have a calculated TOC of about 2 minutes to CB-B. Due to this, a default TOC of 10 minutes was used in developing these calculations.
An orifice plate has been analysis for structure # SB41 to keep the release rate for structure # SB40 at pre-construction levels. To achieve this structure # SB41 will require a ? orifice plate.

Freeway Storm Sewer Design

East of Scioto River, West of Short Street

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/21/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at Mound Sta. 16+50 rt. into Ex STM Pipe **Designer :** TAZ/DNO

Rainfall Area: C **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'
D701	701A	7006+87		0.13	0.11	10.00	5.30	6.45	0.6	0.7	15	36.0	0.0200	738.07	3.81	8.52	0.0002	738.33	743.32	4.99	4.00	I 3D
begin		7006+87		0.13	0.11									737.35				738.14	738.60			0.015
701A	701B	7006+87		0.00	0.00	10.16	5.26	6.43	0.6	0.7	15	35.0	0.5271	737.35	11.98	43.72	0.0002	737.47	738.60	1.13	0.00	
		7006+87		0.13	0.11									718.90				719.69	720.15			0.015
701B	D702	7006+87		0.00	0.00	10.21	5.25	6.42	0.6	0.7	15	10.0	0.0100	718.90	2.97	6.02	0.0002	719.59	720.15	0.56	0.00	
		7006+87		0.13	0.11									718.80				719.59	726.91			0.015
D702	D703	7006+87		0.00	0.00	10.26	5.24	6.39	0.6	0.7	15	51.0	0.1500	718.80	7.70	23.32	0.0002	718.96	726.91	7.95	6.86	MH 3
		7007+38		0.13	0.11									711.15				711.94	712.40			0.015
D703	SH01	7007+38		0.30	0.17	15.00	4.43	5.30	1.3	1.5	15	50.0	0.0100	711.15	3.68	6.02	0.0007	711.59	714.84	3.25	2.44	CB 8
		14+36		0.43	0.28									710.65				711.52	715.01			0.015
SH01	MD01	14+36		0.00	0.00	15.23	4.40	5.25	1.3	1.5	15	70.0	0.0100	710.65	3.67	6.02	0.0007	711.09	715.01	3.92	3.11	MH 3
		16+60		0.43	0.28									709.95				710.82	714.10			0.015
MD01	EX02	16+60		0.00	0.00	15.54	4.36	5.13	1.2	1.5	15	137.0	0.0079	707.58	3.36	5.35	0.0007	708.04	714.10	6.06	5.27	MH 3
		15+23		0.43	0.28									706.50				707.36	713.03			0.015
EX01	EX02	15+24		0.35	0.21	10.00	5.30	6.46	1.1	1.3	15	20.0	0.0085	707.35	3.35	5.55	0.0006	708.05	712.88	4.83	4.28	CB 6
begin		15+23		0.77	0.49									707.18				708.03	713.03			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'
MD02	EX02	15+23		0.38	0.28	10.00	5.30	6.49	1.5	1.8	12	8.0	0.0512	707.29	7.08	7.52	0.0034	707.69	712.56	4.87	4.27	CB 3
begin		15+23		1.15	0.77									706.88				707.67	713.03			0.015
EX02	MD04	15+23		0.00	0.00	16.22	4.27	5.01	3.3	3.9	18	149.0	0.0046	706.34	3.54	6.62	0.0018	707.20	713.03	5.83	5.19	MH 3
		13+74		1.15	0.77									705.66				706.79	713.54			0.015
MD03	MD04	13+74		0.02	0.02	10.00	5.30	6.46	0.1	0.1	12	14.0	0.0200	708.14	2.22	4.70	0.0000	708.43	713.14	4.71	4.00	CB 3A
begin		13+74		1.17	0.79									707.86				708.43	713.54			0.015
MD04	EX03	13+74		0.00	0.00	16.92	4.17	4.92	3.3	3.9	18	125.0	0.0046	705.66	3.56	6.67	0.0018	706.52	713.54	7.02	6.38	MH 3
final		12+48		1.17	0.79									705.08				706.21	713.11			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 09/28/2020 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 264+63.45 lt. at Headwall, 6R's CFS carried over to SB05 **Designer :** TAZ

Rainfall Area: C **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'
SB05	SB06	269+82	0.98	0.88	11.68	4.97	5.99	4.4	5.3	15	69.0	0.0080	711.26	4.60	5.39	0.0088	712.41	714.51	2.10	2.00	MH 3
begin		269+23	0.98	0.88									710.71				711.80	715.26			0.015
SB06	SB07	269+23	0.00	0.00	11.93	4.92	5.89	4.3	5.2	18	80.0	0.0031	709.46	3.22	5.45	0.0032	710.72	715.26	4.54	4.30	MH 3
		268+40	0.98	0.88									709.21				710.40	716.17			0.015
SB07	SB08	268+40	0.00	0.00	12.34	4.85	5.25	4.3	4.6	18	135.0	0.0050	709.21	3.91	6.95	0.0026	710.21	716.17	5.96	5.46	MH 3
		267+20	0.98	0.88									708.53				709.87	718.18			0.015
SB08	SB8A	267+20	0.00	0.00	12.92	4.75	5.25	4.2	4.6	18	86.0	0.0040	708.53	3.54	6.16	0.0026	709.87	718.18	8.31	8.15	MH 3
		266+36	0.98	0.88									708.19				709.64	723.20			0.015
SB8A	SB8B	266+36	0.00	0.00	13.32	4.69	5.25	4.1	4.6	18	117.0	0.0043	708.19	3.63	6.40	0.0026	709.64	723.20	13.56	13.51	MH 3
		265+22	0.98	0.88									707.69				709.34	722.34			0.015
SB8B	SB09	265+22	0.00	0.00	13.86	4.60	5.25	4.1	4.6	18	42.0	0.0043	707.69	3.62	6.41	0.0026	709.34	722.34	13.00	13.15	MH 3
		264+82	0.98	0.88									707.51				709.24	722.00			0.015
SB9A	SB9B	265+00	0.87	0.51	15.00	4.43	5.31	2.2	2.7	18	57.4	0.0134	720.11	4.75	11.34	0.0009	720.63	740.59	19.96	18.98	EX MH
begin		264+86	1.85	1.39									719.34				720.40	734.83			0.015
SB9B	SB09	265+00	0.87	0.51	15.20	4.40	5.28	4.5	5.3	18	53.0	0.0100	719.34	5.12	9.79	0.0034	720.19	734.83	14.64	13.99	MH 3
		264+82	2.73	1.89									718.81				720.01	722.00			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'
SB09	HW01	264+82		0.00	0.00	15.37	4.38	5.25	8.3	9.9	18	47.0	0.0040	707.51	4.69	6.23	0.0119	709.24	722.00	12.76	12.99	MH 3
final		264+63		2.73	1.89						**Warning**			707.32				708.68	708.82			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/21/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Transitional I-70 WB STA 629+00 to STA 631+67 RT **Designer :** DNO

Rainfall Area: C **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'
WB50	WB51	629+00		0.27	0.24	10.00	5.30	6.31	1.3	1.5	15	200.0	0.0241	735.57	5.08	9.35	0.0008	735.93	739.82	3.89	3.00	I 3D
begin		631+00		0.27	0.24									730.75				731.62	735.00			0.015
WB51	WB53	631+00		0.32	0.28	10.66	5.16	6.27	2.7	3.3	15	64.0	0.0267	730.75	6.51	9.84	0.0035	731.27	735.00	3.73	3.00	I 3D
		631+64		0.59	0.53									729.04				730.03	733.55			0.015
WB53	EX50	631+64		0.11	0.10	10.82	5.13	6.22	3.2	3.9	15	58.0	0.0195	729.04	6.05	8.41	0.0048	729.66	733.55	3.89	3.26	I 3D
final		631+67		0.70	0.63									727.91				728.93	731.63			0.015

Freeway Storm Sewer Design

East of Short Street

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/21/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Transitional I-70 WB STA 633+98 to STA 633+94 RT **Designer :** DNO

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

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	JUNCTION To	STATION From	STATION 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'
WB54	WB01	633+98		0.12	0.11	10.00	5.30	6.49	0.6	0.7	15	7.0	0.0800	727.56	6.08	17.03	0.0002	727.79	732.31	4.52	3.50	I 3D
begin		633+94		0.12	0.11									727.00				727.79	738.56			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/20/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at trans I-71 SB Sta. 388+75 lt. into Ex MH **Designer :** DNO

Rainfall Area: C **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'
SB50	SB51	388+75		0.28	0.25	10.00	5.30	6.42	1.3	1.6	15	50.0	0.0082	725.44	3.49	5.45	0.0008	725.95	728.42	2.47	1.73	I 3D
begin		389+25		0.28	0.25									725.03				725.91	728.01			0.015
SB51	SB52	389+25		0.10	0.09	10.24	5.25	6.39	1.8	2.2	15	25.0	0.0044	725.03	3.00	3.99	0.0015	725.88	728.01	2.13	1.73	I 3D
		389+50		0.38	0.34									724.92				725.84	728.17			0.015
SB72	SB52	389+50		0.06	0.04	10.00	5.30	6.31	0.2	0.2	15	9.0	0.0389	725.27	3.44	11.88	0.0000	725.81	727.52	1.71	1.00	CB 2-2B
begin		389+50		0.44	0.38									724.92				725.81	728.17			0.015
SB52	WB14	389+50		0.08	0.07	10.38	5.22	6.31	2.3	2.8	15	52.0	0.0038	724.92	3.03	3.73	0.0025	725.81	728.17	2.36	2.00	I 3D
final		390+01		0.51	0.45									724.72				725.68	731.00			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/20/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at trans I-71 SB Sta. 388+75 lt. into Ex MH - 50 yr check **Designer :** DNO

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

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.)	(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'
SB50	SB51	388+75		0.28	0.25	10.00	5.30	7.03	1.3	1.8	15	50.0	0.0082	725.44	3.49	5.45	0.0010	725.97	728.42	2.45	1.73	I 3D
begin		389+25		0.28	0.25									725.03				725.92	728.01			0.015
SB51	SB52	389+25		0.10	0.09	10.24	5.25	6.91	1.8	2.4	15	25.0	0.0044	725.03	3.00	3.99	0.0018	725.90	728.01	2.11	1.73	I 3D
		389+50		0.38	0.34									724.92				725.85	728.17			0.015
SB72	SB52	389+50		0.06	0.04	10.00	5.30	6.91	0.2	0.3	15	9.0	0.0389	725.27	3.44	11.88	0.0000	725.86	727.52	1.66	1.00	CB 2-2B
begin		389+50		0.44	0.38									724.92				725.85	728.17			0.015
SB52	WB14	389+50		0.08	0.07	10.38	5.22	6.91	2.3	3.1	15	52.0	0.0038	724.92	3.03	3.73	0.0030	725.85	728.17	2.32	2.00	I 3D
final		390+01		0.51	0.45									724.72				725.70	731.00			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 02/09/2015 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at Tran_I-70 WB Sta. 2194+25 lt. into Ex MH **Designer :** TAZ

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

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	JUNCTION To	STATION From	STATION 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'
WB07 EXMH		2194+25		0.64	0.49	15.00	4.43	5.34	2.2	2.6	15	7.0	0.0429	731.29	7.26	12.47	0.0022	731.96	734.56	2.60	2.02	CB 4
begin		2194+24		0.64	0.49									730.99				731.94	739.29			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 02/09/2015 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at Tran_I-70 WB Sta. 2194+25 lt. into Ex MH - 50 yr check **Designer :** TAZ

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

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.)	(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'
WB07 EXMH		2194+25		0.64	0.49	15.00	4.43	5.88	2.2	2.9	15	7.0	0.0429	731.29	7.26	12.47	0.0027	731.98	734.56	2.58	2.02	CB 4
begin		2194+24		0.64	0.49									730.99				731.96	739.29			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 07/08/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SP 315 Interchange

Description : Transitional I-70 WB STA 643+00 to STA 642+46 RT **Designer :** DNO

Rainfall Area: C **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'
WB70	WB71	643+00		0.25	0.22	10.00	5.30	6.44	1.2	1.4	15	56.0	0.0200	729.69	4.64	8.52	0.0007	730.05	733.69	3.64	2.75	I 3D
begin		642+46		0.25	0.22									728.57				729.43	735.08			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/27/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/71/SR 315 Interchange

Description : Transitional I-71 SB STA 386+57 Lt to STA 642+46 LT **Designer :** DNO

Rainfall Area: C **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'
SB70	WB71	38657		0.26	0.23	10.00	5.30	6.42	1.2	1.5	18	68.0	0.0216	729.05	4.71	14.40	0.0003	729.39	734.38	4.99	3.83	I 3B
begin		642+46		0.26	0.23									727.58				728.56	735.08			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/21/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Transitional I-70 WB STA 637+00 to STA 635+10 RT **Designer :** DNO

Rainfall Area: C **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'
WB54A	WB02	633+98		0.80	0.56	10.00	5.30	6.29	3.0	3.5	15	111.0	0.0105	731.28	4.72	6.18	0.0040	731.99	733.67	1.68	1.14	CB 6
		635+08		0.80	0.56									730.11				731.25	735.43			0.015
WB02	WB56	635+08		0.00	0.00	10.39	5.22	6.29	2.9	3.5	15	47.0	0.0064	730.11	3.88	4.81	0.0040	731.25	735.43	4.18	4.07	MH 3
		635+09		0.80	0.56									729.81				731.06	734.09			0.015
WB55	WB56	637+00		0.22	0.20	10.00	5.30	6.29	1.0	1.2	15	190.0	0.0217	733.93	4.61	8.87	0.0005	734.26	738.18	3.92	3.00	I 3D
begin		635+09		1.02	0.76									729.81				731.06	734.09			0.015
WB56	WB57	635+09		0.20	0.18	10.69	5.16	6.29	4.8	5.9	15	11.0	0.0073	729.81	4.43	5.14	0.0111	731.06	734.09	3.03	3.03	I 3D
final		635+10		1.22	0.94									729.73				730.85	740.80			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/20/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 284+00 lt. into FRA-70-12.68's CB **Designer :** TAZ/DNO

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

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 727.84

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'
D704	D705	7011+44	0.07	0.06	10.00	5.30	6.44	0.3	0.4	15	32.0	0.0200	730.08	3.16	8.52	0.0000	730.27	733.83	3.56	2.50	I 3D
begin		7011+44	0.07	0.06									729.44				730.19	733.52			0.015
D705	D707	7011+44	0.20	0.18	10.17	5.26	6.38	1.3	1.5	15	50.0	0.0080	729.44	3.39	5.39	0.0007	729.95	733.52	3.57	2.83	I 3D
		7011+94	0.26	0.24									729.04				729.91	733.18			0.015
D706	D707	7011+94	0.03	0.03	10.00	5.30	6.43	0.1	0.2	15	32.0	0.0222	729.75	2.55	8.97	0.0000	729.87	733.50	3.63	2.50	I 3D
begin		7011+94	0.29	0.26									729.04				729.74	733.18			0.015
D707	D708	7011+94	0.12	0.10	10.41	5.21	5.04	1.9	1.9	15	131.0	0.0050	729.04	3.21	4.27	0.0011	729.64	733.18	3.54	2.89	I 3D
		7013+25	0.41	0.37									728.38				729.43	735.74			0.015
D708	D601	7013+25	0.00	0.00	11.09	5.08	5.04	1.9	1.9	15	124.0	0.0050	728.38	3.18	4.26	0.0011	729.43	735.74	6.31	6.11	MH 3
		6003+75	0.41	0.37									727.76				729.29	737.72			0.015
D602	D601	6003+75	0.29	0.21	15.00	4.43	5.33	0.9	1.1	15	19.0	0.0221	730.86	4.49	8.95	0.0004	731.28	732.78	1.50	0.67	CB 8
begin		6003+75	0.70	0.58									730.44				731.27	737.72			0.015
D601	D603	6003+75	0.00	0.00	15.07	4.42	5.04	2.6	2.9	15	42.0	0.0040	727.76	3.16	3.83	0.0027	729.29	737.72	8.43	8.71	MH 3
		6003+75	0.70	0.58									727.59				729.18	739.66			0.015
D604	D603	6004+75	0.92	0.59	15.00	4.43	5.28	2.6	3.1	15	112.0	0.0154	731.83	5.26	7.48	0.0031	732.42	736.08	3.66	3.00	CB 8
begin		6003+75	1.62	1.17									730.10				731.08	739.66			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'
D605	D603	6003+25		0.51	0.46	11.19	5.06	6.13	2.3	2.8	15	63.0	0.0470	737.06	7.60	13.05	0.0025	737.47	741.31	3.84	3.00	I 3D
begin		6003+75		2.12	1.62									734.10				735.06	739.66			0.015
D603	SB01	6003+75		0.00	0.00	15.35	4.38	5.04	7.1	8.2	21	149.0	0.0032	727.09	3.67	8.38	0.0035	729.18	739.66	10.48	10.82	MH 3
		382+15		2.12	1.62									726.61				728.65	744.92			0.015
SB10	SB01	382+00		0.20	0.18	10.00	5.30	6.44	1.0	1.2	15	45.0	0.0200	743.33	4.37	8.52	0.0004	743.65	747.08	3.43	2.50	CB 6
begin		382+15		2.32	1.80									742.43				743.27	744.92			0.015
SB01	SB03	382+15		0.00	0.00	16.03	4.29	5.04	7.7	9.1	21	185.0	0.0041	726.61	4.11	9.41	0.0044	728.65	744.92	16.27	16.56	MH 3
final		383+99		2.32	1.80									725.86				727.84	741.54			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 06/20/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR 315 Interchange

Description : Outlet at I-71 SB Sta. 284+00 lt. into FRA-70-12.68's CB - 50 year check **Designer :** TAZ/DNO

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

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 727.84

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'
D704	D705	7011+44		0.07	0.06	10.00	5.30	7.05	0.3	0.4	15	32.0	0.0200	730.08	3.16	8.52	0.0001	730.28	733.83	3.55	2.50	I 3D
begin		7011+44		0.07	0.06									729.44				730.19	733.52			0.015
D705	D707	7011+44		0.20	0.18	10.17	5.26	5.55	1.3	1.3	15	50.0	0.0080	729.44	3.39	5.39	0.0006	729.96	733.52	3.56	2.83	I 3D
		7011+94		0.26	0.24									729.04				729.94	733.18			0.015
D706	D707	7011+94		0.03	0.03	10.00	5.30	5.55	0.1	0.1	15	32.0	0.0222	729.75	2.55	8.97	0.0000	729.94	733.50	3.56	2.50	I 3D
begin		7011+94		0.29	0.26									729.04				729.94	733.18			0.015
D707	D708	7011+94		0.12	0.10	10.41	5.21	5.55	1.9	2.0	15	131.0	0.0050	729.04	3.21	4.27	0.0013	729.94	733.18	3.24	2.89	I 3D
		7013+25		0.41	0.37									728.38				729.76	735.74			0.015
D708	D601	7013+25		0.00	0.00	11.09	5.08	5.55	1.9	2.0	15	124.0	0.0050	728.38	3.18	4.26	0.0013	729.76	735.74	5.98	6.11	MH 3
		6003+75		0.41	0.37									727.76				729.60	737.72			0.015
D602	D601	6003+75		0.29	0.21	15.00	4.43	5.87	0.9	1.2	15	19.0	0.0221	730.86	4.49	8.95	0.0005	731.29	732.78	1.49	0.67	CB 8
begin		6003+75		0.70	0.58									730.44				731.28	737.72			0.015
D601	D603	6003+75		0.00	0.00	15.07	4.42	5.55	2.6	3.2	15	42.0	0.0040	727.76	3.16	3.83	0.0033	729.60	737.72	8.12	8.71	MH 3
		6003+75		0.70	0.58									727.59				729.46	739.66			0.015
D604	D603	6004+75		0.92	0.59	15.00	4.43	5.81	2.6	3.4	15	112.0	0.0154	731.83	5.26	7.48	0.0037	732.45	736.08	3.63	3.00	CB 8
begin		6003+75		1.62	1.17									730.10				731.10	739.66			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'
D605	D603	6003+25		0.51	0.46	11.19	5.06	6.72	2.3	3.1	15	63.0	0.0470	737.06	7.60	13.05	0.0030	737.49	741.31	3.82	3.00	I 3D
begin		6003+75		2.12	1.62									734.10				735.08	739.66			0.015
D603	SB01	6003+75		0.00	0.00	15.35	4.38	5.55	7.1	9.0	21	149.0	0.0032	727.09	3.67	8.38	0.0043	729.46	739.66	10.20	10.82	MH 3
		382+15		2.12	1.62									726.61				728.82	744.92			0.015
SB10	SB01	382+00		0.20	0.18	10.00	5.30	7.05	1.0	1.3	15	45.0	0.0200	743.33	4.37	8.52	0.0005	743.67	747.08	3.41	2.50	CB 6
begin		382+15		2.32	1.80									742.43				743.28	744.92			0.015
SB01	SB03	382+15		0.00	0.00	16.03	4.29	5.55	7.7	10.0	21	185.0	0.0041	726.61	4.11	9.41	0.0053	728.82	744.92	16.10	16.56	MH 3
final		383+99		2.32	1.80									725.86				727.84	741.54			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 07/11/2019 **Project :** Phase 6R **Location :** Columbus, Ohio, I-70/I-71/SR315 Interchange

Description : Transitional I-70 WB STA 639+99 Rt to STA 640+70 Lt **Designer :** DNO

Rainfall Area: C **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'
WB58	WB59	639+99		0.08	0.08	10.00	5.30	6.36	0.4	0.5	15	74.0	0.0093	736.25	2.62	5.82	0.0001	736.51	739.25	2.74	1.75	I 3B
begin		640+70		0.08	0.08									735.56				736.32	737.81			0.015

STORM SEWER SYSTEM

PID : 89464 **Date :** 07/09/2019 **Project :** Phase 6R **Location :** Columbus Ohio, I-70/I-71/SR-315 Interchange

Description : Transitional I-71 SB STA 384+00 RT to STA 383+99 LT **Designer :** DNO

Rainfall Area: C **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'
SB11	SB03	384+00	0.06	0.05	10.00	5.30	6.43	0.3	0.3	15	43.0	0.0200	737.63	3.04	8.52	0.0000	737.81	741.38	3.57	2.50	CB 6
begin		383+99	0.06	0.05									736.77				737.51	741.54			0.015

MAINTENANCE OF TRAFFIC

STORM DESIGN

DITCH ANALYSIS

DITCH ANALYSIS

PID : 105523 **Date :** 05/24/2021 **Project :** Phase 6R "MOT" **Location :** Columbus Ohio, I-70/I-71/SR315 Interchange

Description :MOT Ditch design for TR-2 into TR-1, area (A-A1) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

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

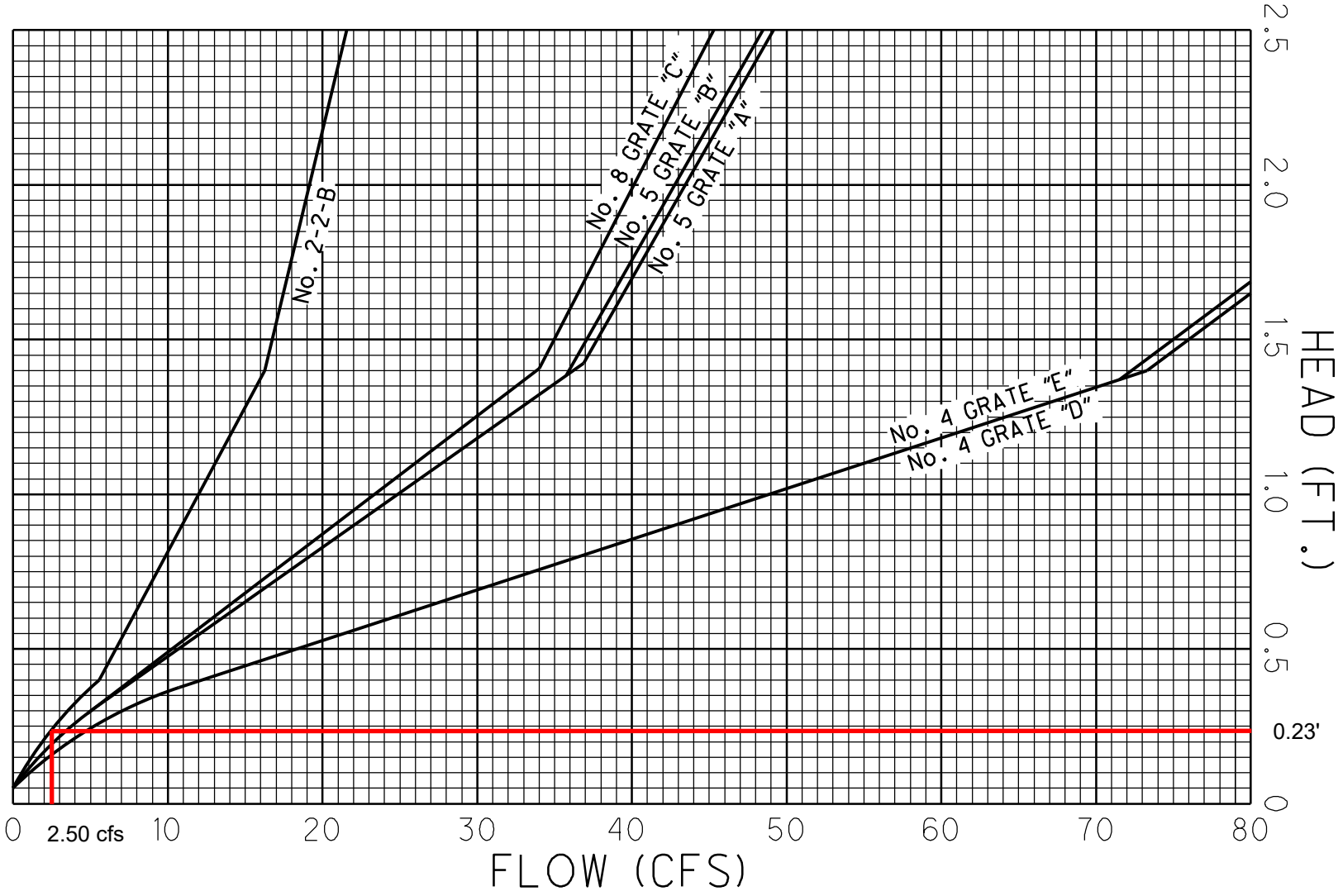
STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
111+75	114+50	L	242.90	3.00	2.00	2.00	0.0313	0.21	0.21	0.84	0.18	Seed	5.34	2	0.030	1.81	2.16	0.26	0.96	0.14	3.54
												Seed	5.23	2	0.040	2.16	1.79	0.31	0.94	0.16	3.63
114+50	14+98	L	45.40	4.00	2.00	2.00	0.0351	0.06	0.28	0.90	0.24	Seed	5.24	2	0.030	2.14	2.25	0.28	1.23	0.13	4.52
												Seed	5.12	2	0.040	2.57	1.87	0.33	1.21	0.15	4.60

MOT Grate Check 14+98 Lt

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)

CB-2-2B
NORMAL DEPTH = 0.23'

TOTAL DESIGN FLOW = 1.23 cfs
X2 FOR PARTIAL CLOGGING = 2.46 cfs
GRATE CAPACITY = 2.50 cfs, > 2.46 cfs, CAPACITY OF GRATE O.K.

Worksheet for MOT TR-1 14+98 Lt (A-A1)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03510	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	4.00	ft
Discharge	2.46	ft³/s

Results

Normal Depth	0.23	ft
Flow Area	1.02	ft²
Wetted Perimeter	5.03	ft
Hydraulic Radius	0.20	ft
Top Width	4.92	ft
Critical Depth	0.22	ft
Critical Slope	0.04104	ft/ft
Velocity	2.41	ft/s
Velocity Head	0.09	ft
Specific Energy	0.32	ft
Froude Number	0.93	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.22	ft
Channel Slope	0.03510	ft/ft

Worksheet for MOT TR-1 14+98 Lt (A-A1)

GVF Output Data

Critical Slope	0.04104	ft/ft

DITCH ANALYSIS

PID : 105523 **Date :** 05/24/2021 **Project :** Phase 6R "MOT" **Location :** Columbus Ohio, I-70/I-71/SR315 Interchange

Description :MOT Ditch design for TR-1, area (B) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

(*) 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.)
15+07	16+00	L	90.30	3.23	3.00	0.00	0.0188	0.13	0.13	0.87	0.11	Seed	5.60	2	0.030	0.96	1.54	0.14	0.62	0.12	3.58
												Seed	5.54	2	0.040	1.15	1.27	0.16	0.61	0.14	3.65

DITCH ANALYSIS

PID : 105523 **Date :** 05/24/2021 **Project :** Phase 6R "MOT" **Location :** Columbus Ohio, I-70/I-71/SR315 Interchange

Description :MOT Ditch design for TR-1, area (B1) **Designer :** TAZ

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	1.00	**Temporary Mat:**	1.25
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	7.00				

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

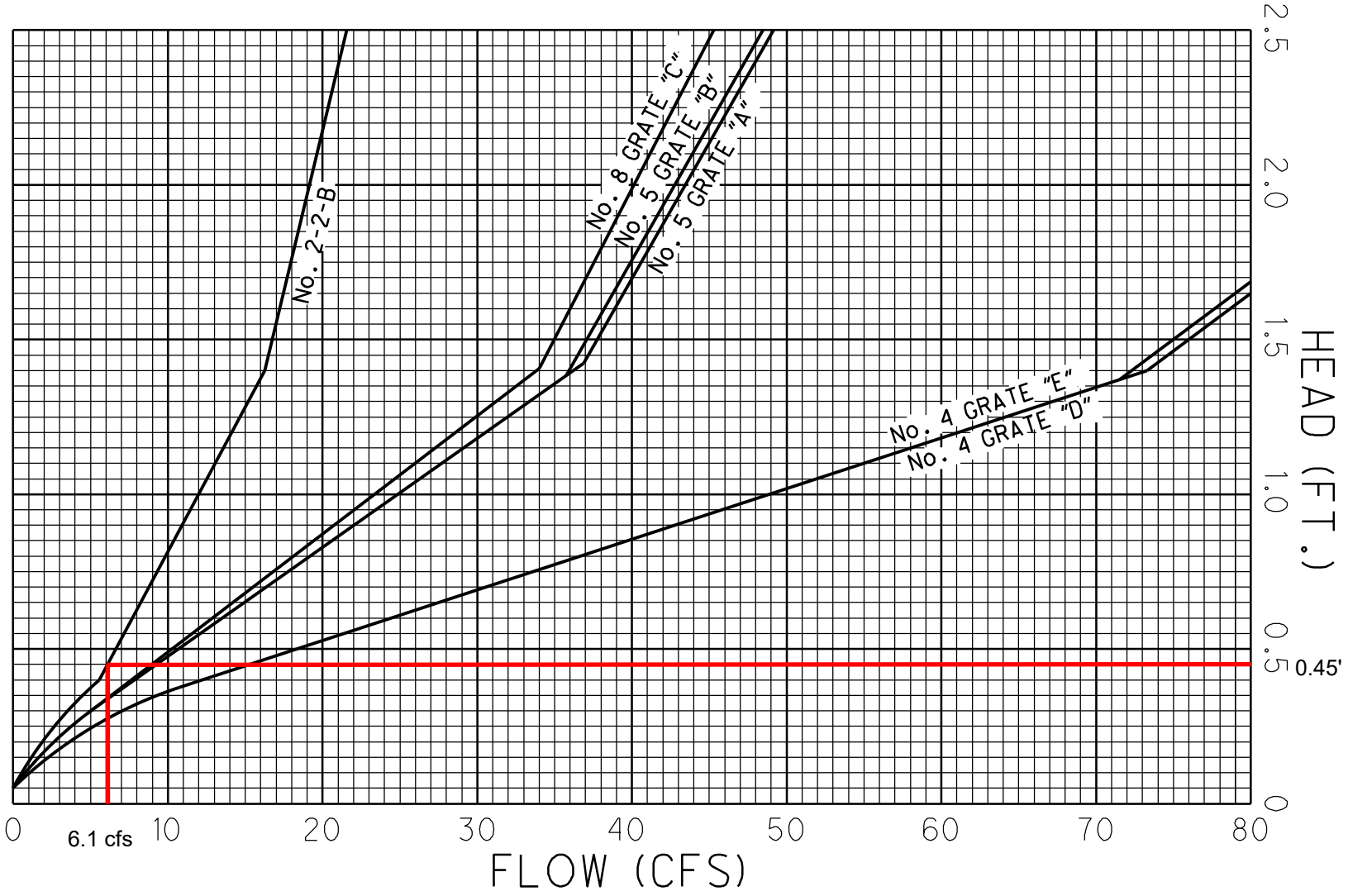
STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
16+87	16+00	L	86.70	3.23	3.00	0.00	0.0040	0.09	0.09	0.85	0.07	Seed	5.35	2	0.030	1.76	0.80	0.04	0.40	0.15	3.67
												Seed	5.26	2	0.040	2.08	0.66	0.04	0.39	0.17	3.75

MOT Grate Check 16+00 Lt (B-B1)

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)

CB-2-2B
NORMAL DEPTH = 0.45'

TOTAL DESIGN FLOW = 1.02 cfs
X2 FOR PARTIAL CLOGGING = 2.04 cfs
GRATE CAPACITY = 6.1 cfs, > 2.04 cfs, CAPACITY OF GRATE O.K.

Worksheet for MOT TR-1 16+00 Lt (B-B1)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.00400	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	0.00	ft/ft (H:V)
Bottom Width	3.23	ft
Discharge	2.04	ft³/s

Results

Normal Depth	0.45	ft
Flow Area	1.76	ft²
Wetted Perimeter	5.11	ft
Hydraulic Radius	0.35	ft
Top Width	4.58	ft
Critical Depth	0.22	ft
Critical Slope	0.04315	ft/ft
Velocity	1.16	ft/s
Velocity Head	0.02	ft
Specific Energy	0.47	ft
Froude Number	0.33	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.45	ft
Critical Depth	0.22	ft
Channel Slope	0.00400	ft/ft

Worksheet for MOT TR-1 16+00 Lt (B-B1)

GVF Output Data

Critical Slope	0.04315	ft/ft

STORM SEWER DESIGN

STORM SEWER SYSTEM

PID : 105523 **Date :** 05/24/2021 **Project :** Phase 6R "MOT" **Location :** Columbus Ohio, I-70/I-71/SR315 Interchange

Description :MOT Routing design for TR-1 alignment (MT01 - MT02) **Designer :** TAZ

Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 2 **Hydraulic Gradient Frequency (yrs.) :** 2

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 0.00

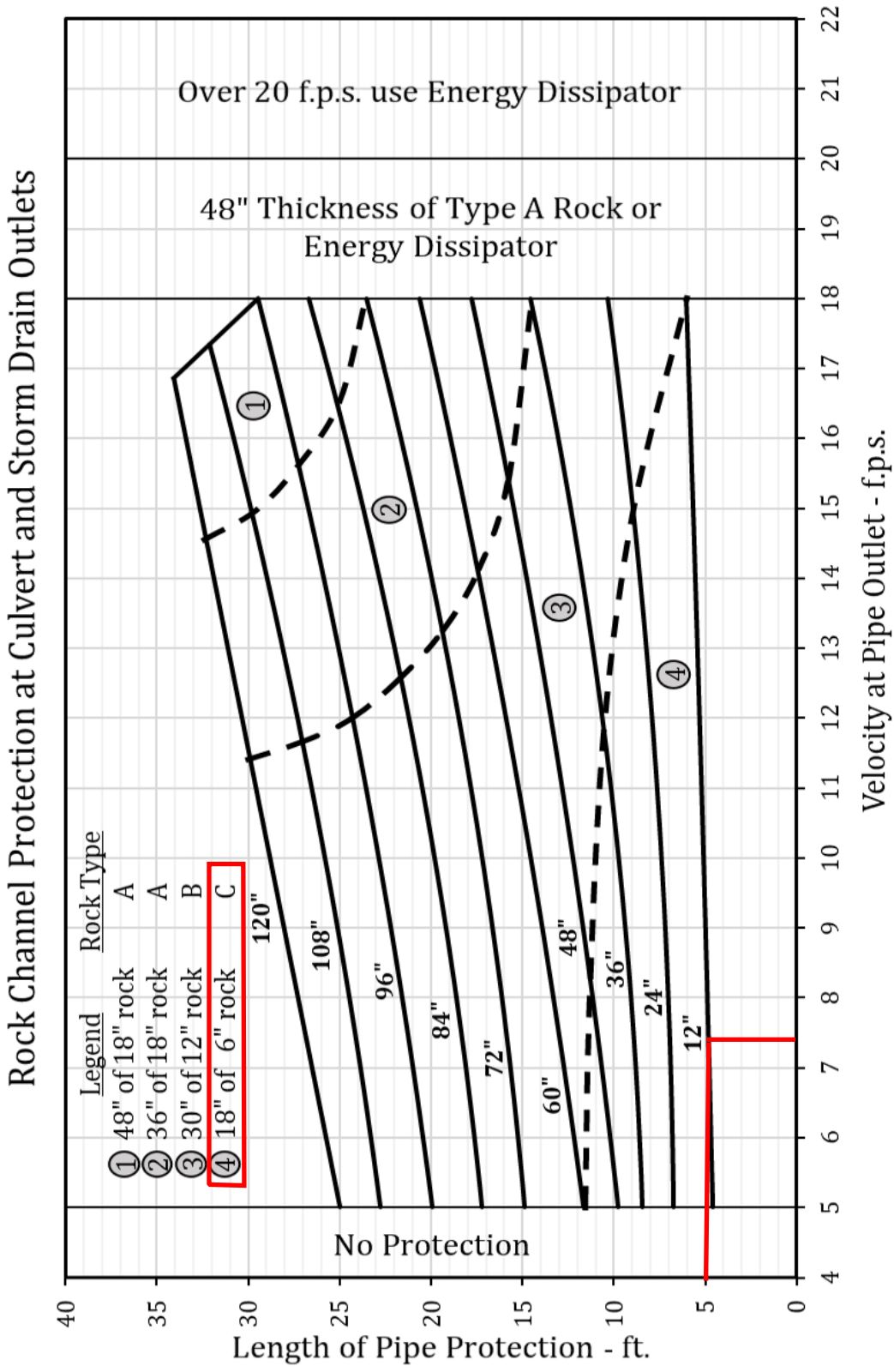
JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (2 yrs.)	(2 yrs.)	DISCHARGE (cfs.) (2 yrs.)	(2 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
MT01	MT02	14+98	0.28	0.24	15.00	3.12	3.11	0.7	0.7	12	64.0	0.1177	709.00	7.73	11.39	0.0006	709.18	714.50	5.32	4.50	CB 2-2B
begin		15+16	0.28	0.24									701.47				702.15	703.47			0.015

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1

REFERENCE SECTION 1107.2

MOT TR-1 (MT01 - MT02)



STORM SEWER SYSTEM

PID : 105523 **Date :** 05/24/2021 **Project :** Phase 6R "MOT" **Location :** Columbus Ohio, I-70/I-71/SR315 Interchange

Description :MOT Routing design for TR-1 alignment (MT03 - MT04) **Designer :** TAZ

Rainfall Area: C **Just Full Capacity Frequency (yrs.) :** 2 **Hydraulic Gradient Frequency (yrs.) :** 2

Minimum Pipe Size : 12.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (2 yrs.)	(2 yrs.)	DISCHARGE (cfs.) (2 yrs.)	(2 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'
MT03	MT04	16+00	0.22	0.19	15.00	3.12	3.11	0.6	0.6	12	49.0	0.1133	707.50	7.17	11.18	0.0003	707.66	712.50	4.84	4.00	CB 2-2B
begin		16+00	0.22	0.19									701.95				702.61	702.95			0.015

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1

REFERENCE SECTION 1107.2

MOT TR-1 (MT03 - MT04)