

### APPENDIX E CALCULATIONS

Attachment E-1      Reach AB

Attachment E-2      Reach BC

**ATTACHMENT E-1**

**REACH AB**

# PARSONS

Client : Honeywell Job No. 446794

Sheet: 1 of 4

Subject : Ninemile Creek – Temporary Culvert Analysis Reach AB By: MBS

Date: 12/4/12

Swale flow and rip rap analysis Checked : RDD

Rev. A

## 1.0 INTRODUCTION

### 1.1 Objective of Analysis

The objective of this analysis is to design temporary culverts below a temporary road along the right bank of Ninemile Creek.

### 1.2 Assumptions

The following assumptions were made in this calculation:

- Either of the two current locations that discharge stormwater into Ninemile Creek could receive the flow from the elevated areas on Wastebeds 1-8.
- A 100-year, 24-hour design storm was used for calculation.

## 2.0 Calculations

Calculations were performed in accordance with the following:

- New York State Department of Environmental Conservation “New York State Standards and Specifications for Erosion and Sediment Control” , August 2005;
- U.S. Department of Agriculture “Technical Release 55, Urban Hydrology for Small Watershed” , June 1986;
- U.S. Department of Transportation FHWA “Hydraulic Design of Highway Culverts - Hydraulic Design Series No. 5, September 2005

This design is for the right bank of Ninemile Creek in reach AB where a temporary road will cross existing stormwater discharges.

### 2.1 Peak Storm Flow

To estimate peak storm flow, the areas uphill of the temporary road were divided into catchment areas based upon the existing site slope and features to be constructed. Three catchment areas were delineated, ranging in size from 0.7 acres to 2.1 acres.

Peak storm flow for the catchment areas was estimated using the United States Department of Agriculture (USDA) Technical Release 55 (TR-55) method. The curve number of 77 was used for all catchment areas based on the “Brush – Fair Condition” cover description in Table 2-2c of the TR-55 manual. The peak discharge was calculated based on a type II, 100 year, 24 hour storm with a time of concentration of 50 minutes. Peak discharge was calculated using the equation:

$Q_p = Q_u A_m Q_{Fp}$  where,

$Q_p$  = peak discharge (cfs)

Qu = unit peak discharge (csm/in) taken from Exhibit 4-II

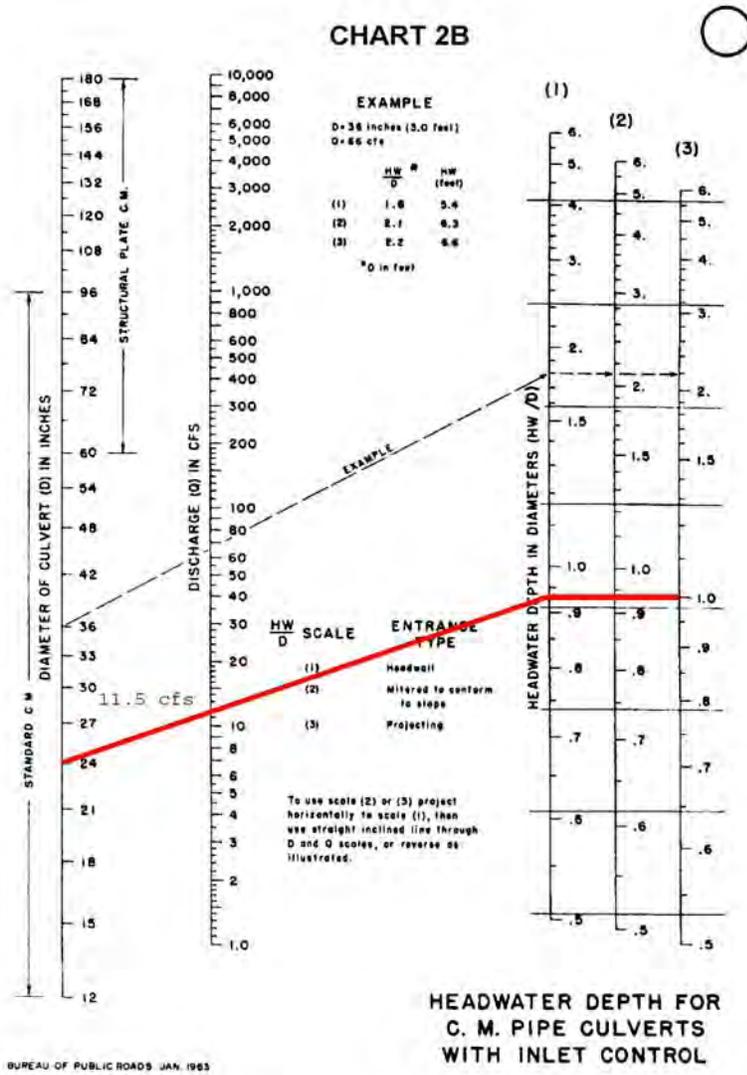
Am = catchment area (in square miles)

Q = runoff (In) calculated using equations 2-3 and 2-4)

The peak storm flow was found to be 6.6 cubic feet per second (cfs). A summary of peak storm flows calculated, and the values used in calculation, is included in **Table 1**.

## 2.2 Culvert Sizing

The culvert was analyzed using nomographs from HDS-5 (FHWA, 2005) as shown below. Based on this analysis, a 24-inch diameter HDPE culvert will convey over 11 cfs, more than the 6.6 cfs calculated for a 100-year storm event.



## **PARSONS**

Client : Honeywell Job No. 446794

Sheet: 3 of 4

Subject : Ninemile Creek – Temporary Culvert Analysis Reach AB By: MBS

Date: 12/4/12

Swale flow and rip rap analysis Checked : RDD

Rev. A

### **3.0 Conclusions**

The following conclusions apply to this analysis:

- A 24-inch diameter HDPE culvert will convey flows greater than expected in a 100-year storm.

### **4.0 References**

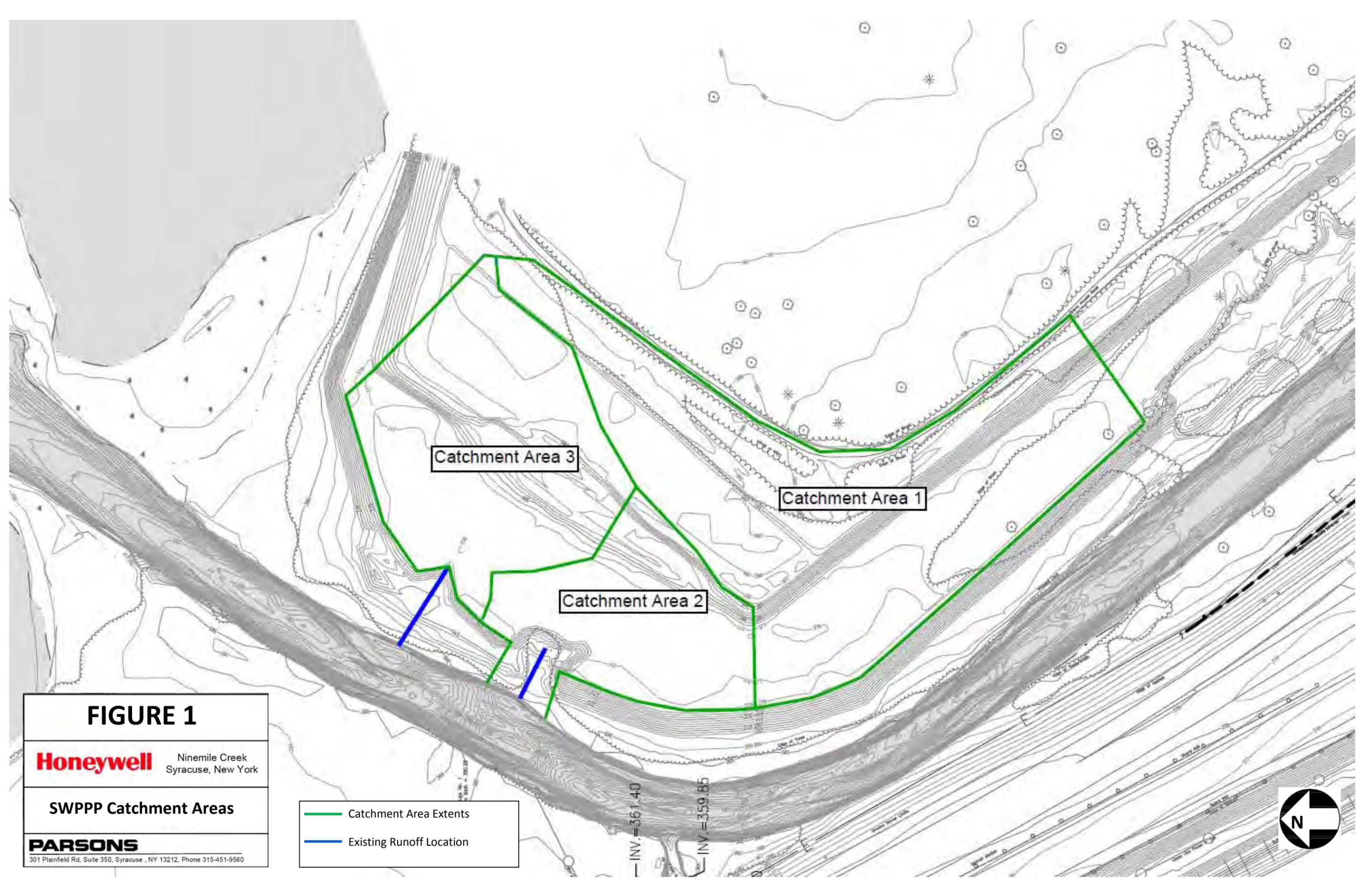
1. New York State Department of Environmental Conservation, August 2005. *New York State Standards and Specifications for Erosion and Sediment Control*
2. U.S. Department of Agriculture, June 1986. *Technical Release 55, Urban Hydrology for Small Watershed*
3. U.S. Department of Transportation FHWA “Hydraulic Design of Highway Culverts - Hydraulic Design Series No. 5, September 2005

**PARSONS**Client : Honeywell Job No. 446794

Sheet: 4 of 4

Subject : Ninemile Creek – Temporary Culvert Analysis Reach AB By: MBSDate: 12/4/12Swale flow and rip rap analysis Checked : RDDRev. A**Table 1:**

Name	Area (Acres)	Curve Number	Rainfall (in)	Rainfall distribution	Pond/swamp area (%)	Peak Discharge	Flows to
AB Catchment 1	2.12	77	5.2	II	0	3.77	AB Reach 1
AB Catchment 3	0.70	77	5.2	II	0	3.00	AB Reach 2
AB Catchment 5	1.15	77	5.2	II	0	2.95	AB Reach 1
AB Reach 1	-	98	5.2	II	0	6.15	AB Reach 2
AB Reach 2	-	98	5.2	II	0	6.61	Outlet (NMC)



Catchment Area 3

Catchment Area 1

Catchment Area 2

# FIGURE 1

**Honeywell** Ninemile Creek  
Syracuse, New York

**SWPPP Catchment Areas**

**PARSONS**  
301 Plainfield Rd, Suite 350, Syracuse, NY 13212, Phone 315-451-9560

-  Catchment Area Extents
-  Existing Runoff Location



WinTR-55 Current Data Description

--- Identification Data ---

User: RDD Date: 12/4/2012  
 Project: NMC Units: English  
 SubTitle: Reach AB Run-off Areal Units: Acres  
 State: New York  
 County: Onondaga  
 Filename: P:\Honeywell -SYR\446794 - NMC Final Design Pre-Const\10.0 Technical Categories\10.4 Calculations

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Catchment1	Catchment Area	Reach 1	2.12	77	0.816
Catchment3	Catchment Area	Reach 2	0.7	77	0.100
Catchment5	Catchment Area	Reach 1	1.15	77	0.470

Total area: 3.97 (ac)

--- Storm Data ---

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.6	3.2	3.8	4.5	4.8	5.2	2.2

Storm Data Source: Onondaga County, NY (NRCS)  
 Rainfall Distribution Type: Type II  
 Dimensionless Unit Hydrograph: <standard>

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.6	3.2	3.8	4.5	4.8	5.2	2.2

Storm Data Source: Onondaga County, NY (NRCS)  
Rainfall Distribution Type: Type II  
Dimensionless Unit Hydrograph: <standard>

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period			
	ANALYSIS: (cfs)	25-Yr (cfs)	50-Yr (cfs)	100-Yr (cfs)
-----				
SUBAREAS				
Catchment1	2.19	2.97	3.32	3.77
Catchment3	1.77	2.38	2.64	3.00
Catchment5	1.72	2.32	2.59	2.95
REACHES				
Reach 1	3.58	4.82	5.39	6.15
Down	3.58	4.82	5.39	6.15
Reach 2	3.85	5.19	5.79	6.61
Down	3.85	5.19	5.79	6.61
OUTLET	3.85	5.19	5.79	6.61

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Hydrograph Peak/Peak Time Table

Sub-Area Peak Flow and Peak Time (hr) by Rainfall Return Period  
or Reach ANALYSIS: 25-Yr 50-Yr 100-Yr  
Identifier (cfs) (cfs) (cfs) (cfs)  
(hr) (hr) (hr) (hr)

-----  
SUBAREAS

Catchment1 2.19 2.97 3.32 3.77  
12.41 12.38 12.37 12.35

Catchment3 1.77 2.38 2.64 3.00  
11.94 11.94 11.93 11.93

Catchment5 1.72 2.32 2.59 2.95  
12.17 12.17 12.17 12.16

REACHES

Reach 1 3.58 4.82 5.39 6.15  
12.26 12.26 12.26 12.25  
Down 3.58 4.82 5.39 6.15  
12.26 12.26 12.26 12.25

Reach 2 3.85 5.19 5.79 6.61  
12.26 12.23 12.24 12.25  
Down 3.85 5.19 5.79 6.61  
12.26 12.23 12.24 12.25

OUTLET 3.85 5.19 5.79 6.61

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Catchment1	2.12	0.816	77	Reach 1	Catchment Area
Catchment3	.70	0.100	77	Reach 2	Catchment Area
Catchment5	1.15	0.470	77	Reach 1	Catchment Area
Total Area:	3.97 (ac)				

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	10	CHANNEL
Reach 2	Outlet	70	CHANNEL

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
-----							
Catchment1							
User-provided							0.816
					Time of Concentration		0.816
							=====
Catchment3							
User-provided							0.100
					Time of Concentration		0.100
							=====
Catchment5							
User-provided							0.470
					Time of Concentration		0.470
							=====

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Catchment1	CN directly entered by user	-	2.12	77
	Total Area / Weighted Curve Number		2.12 ====	77 ==
Catchment3	CN directly entered by user	-	.7	77
	Total Area / Weighted Curve Number		.7 ==	77 ==
Catchment5	CN directly entered by user	-	1.15	77
	Total Area / Weighted Curve Number		1.15 ====	77 ==

RDD

NMC  
Reach AB Run-off  
Onondaga County, New York

Reach Channel Rating Details

Reach Identifier	Reach Length (ft)	Reach Manning's n	Friction Slope (ft/ft)	Bottom Width (ft)	Side Slope
Reach 1	10	0.025	0.22	56	2 :1
Reach 2	70	0.025	0.22	6	2 :1

Reach Identifier	Stage (ft)	Flow (cfs)	End Area (sq ft)	Top Width (ft)	Friction Slope (ft/ft)
Reach 1	0.0	0.000	0	56	0.22
	0.5	493.443	28.5	58	
	1.0	1572.654	58	60	
	2.0	5037.692	120	64	
	5.0	23992.817	330	76	
	10.0	81513.913	760	96	
	20.0	298995.188	1920	136	
Reach 2	0.0	0.000	0	6	0.22
	0.5	55.156	3.5	8	
	1.0	186.387	8	10	
	2.0	677.158	20	14	
	5.0	4452.757	80	26	
	10.0	21550.224	260	46	
	20.0	116173.744	920	86	

**ATTACHMENT E-2**

**REACH BC**

# PARSONS

Client : Honeywell Job No. 446794

Sheet: 1 of 4

Subject : Ninemile Creek – Culvert Sizing Calculation BC By: MBS

Date: 12/3/12

Flow and Culvert Size Analysis \_\_\_\_\_ Checked : RDD

Rev. A

## 1.0 INTRODUCTION

### 1.1 Objective of Analysis

The objective of this analysis is to design a culvert below a temporary access road that crosses a NYSDOT swale discharge to Ninemile Creek.

### 1.2 Assumptions

The following assumptions were made in this calculation:

- A 100-year, 24-hour design storm was used for calculation (conservative).

## 2.0 Calculations

Calculations were performed in accordance with the following:

- New York State Department of Environmental Conservation “New York State Standards and Specifications for Erosion and Sediment Control”, August 2005;
- U.S. Department of Agriculture “Technical Release 55, Urban Hydrology for Small Watershed”, June 1986;
- U.S. Department of Transportation FHWA “Hydraulic Design of Highway Culverts - Hydraulic Design Series No. 5 Engineering Circular No. 15, Third Edition, Design of Roadside Channels with Flexible Linings”, September 2005

This design is for a location in Reach BC of Ninemile Creek where a temporary access road will cross an existing drainage swale that discharges onto NYSDOT structural armor stone on the banks.

### 2.1 Peak Storm Flow

To estimate peak storm flow, the area uphill of the swale was delineated and found to be 2.58 acres in size.

The peak storm flow for the catchment areas was estimated using the United States Department of Agriculture (USDA) Technical Release 55 (TR-55) method. The curve number of 71 was used based on the “Meadow” cover description for a Type C soil in Table 2-2c of the TR-55 manual. The peak discharge was calculated based on a type II, 100 year, 24 hour storm with a time of concentration of 15 minutes. Peak discharge was calculated using the equation:

$Q_p = Q_u A_m Q_{Fp}$  where,

$Q_p$  = peak discharge (cfs)

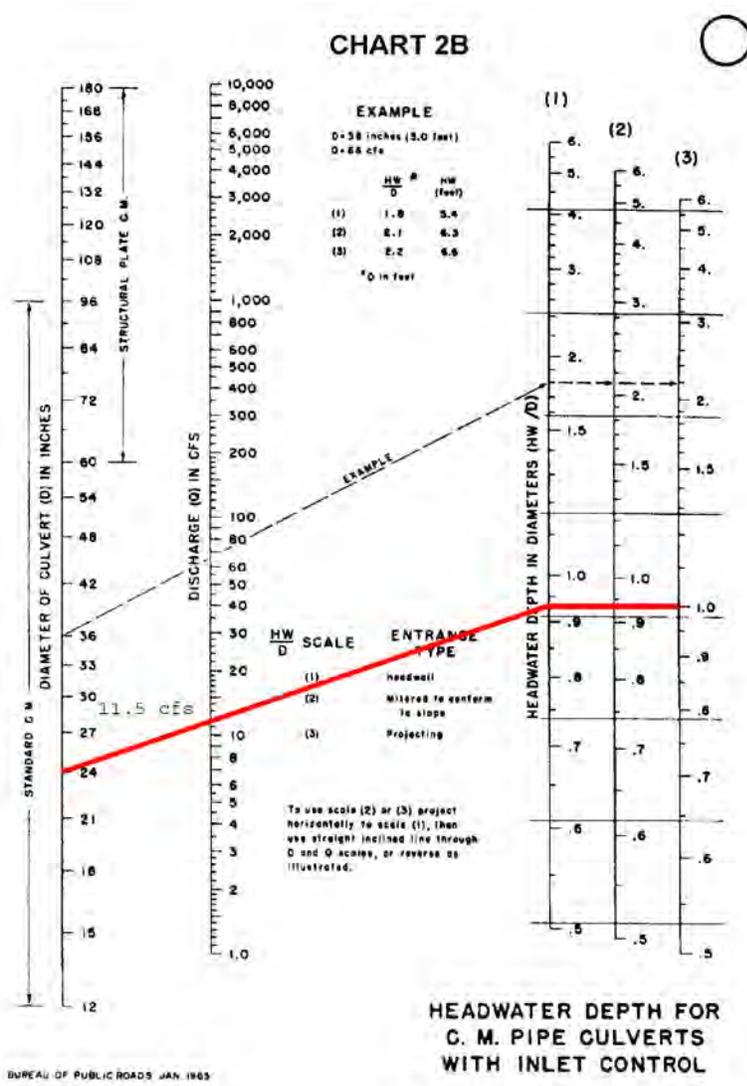
$Q_u$  = unit peak discharge (csm/in) taken from Exhibit 4-II

Am = catchment area (in square miles)  
 Q = runoff (In) calculated using equations 2-3 and 2-4

The peak storm flows were found to be 7.45 cfs. A summary of the peak storm flows calculated, and the values used in calculation, is included in **Table 1**.

**2.2 Culvert Sizing**

The culvert was analyzed using nomographs from HDS-5 (FHWA, 2005) as shown below. Based on this analysis, a 24-inch diameter HDPE culvert will convey over 11 cfs, more than the 7.5 cfs calculated for a 100-year storm event.



**PARSONS**

Client : Honeywell Job No. 446794

Sheet: 3 of 4

Subject : Ninemile Creek – Culvert Sizing Calculation BC By: MBS

Date: 12/3/12

Flow and Culvert Size Analysis \_\_\_\_\_ Checked : RDD

Rev. A

**3.0 Conclusions**

The following conclusions apply to this analysis:

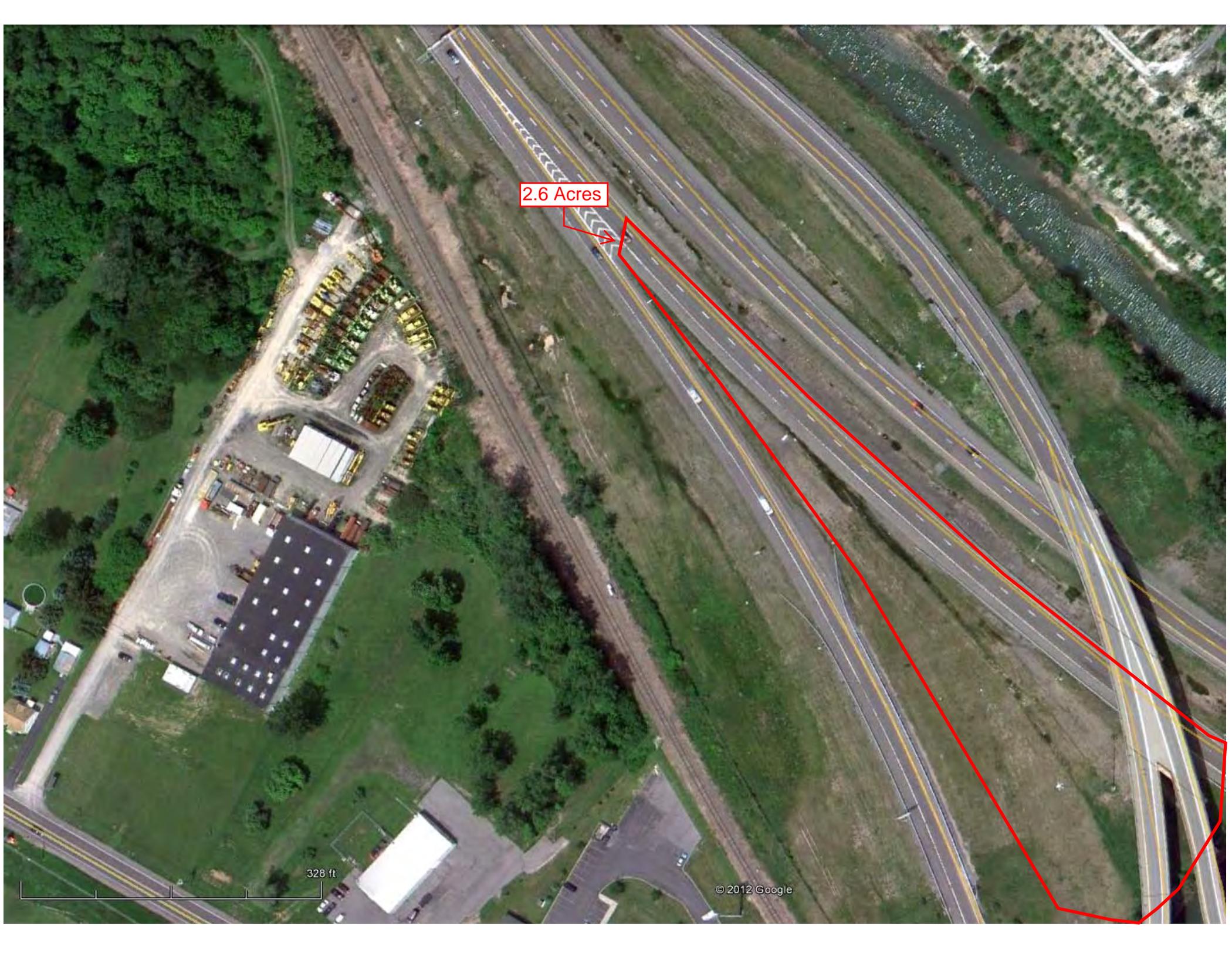
- A 24-inch diameter HDPE culvert will convey flows greater than expected in a 100-year storm.

**4.0 References**

1. New York State Department of Environmental Conservation, August 2005. *New York State Standards and Specifications for Erosion and Sediment Control*
2. U.S. Department of Agriculture, June 1986. *Technical Release 55, Urban Hydrology for Small Watershed*
3. U.S. Department of Transportation FHWA “Hydraulic Design of Highway Culverts - Hydraulic Design Series No. 5 Engineering Circular No. 15, Third Edition, Design of Roadside Channels with Flexible Linings”, September 2005

**PARSONS**Client : Honeywell Job No. 446794Sheet: 4 of 4Subject : Ninemile Creek – Culvert Sizing Calculation BC By: MBSDate: 12/3/12Flow and Culvert Size Analysis \_\_\_\_\_ Checked : RDDRev. A**Table 1:**

Name	Area (Acres)	Curve Number	Rainfall (in)	Rainfall distribution	Pond/swamp area (%)	Peak Discharge	Flows to
BC Catchment1	2.58	71	5.2	II	0	7.45	BC Reach1
BC Reach 1	-	98	5.2	II	0	7.45	Outlet (NMC)



2.6 Acres

328 ft

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WinTR-55 Current Data Description

--- Identification Data ---

User: MBS Date: 11/21/2012  
Project: Units: English  
SubTitle: Areal Units: Acres  
State: New York  
County: Onondaga  
Filename: P:\Honeywell -SYR\446794 - NMC Final Design Pre-Const\9.0 Reports\SWPPP\Adendum (BC and AB)\TR-

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
BC Outlet	Runoff	Outlet	2.58	71	0.230

Total area: 2.58 (ac)

--- Storm Data ---

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.6	3.2	3.8	4.5	4.8	5.2	2.2

Storm Data Source: User-provided custom storm data  
Rainfall Distribution Type: Type II  
Dimensionless Unit Hydrograph: <standard>

MBS

Onondaga County, New York

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.6	3.2	3.8	4.5	4.8	5.2	2.2

Storm Data Source: User-provided custom storm data  
Rainfall Distribution Type: Type II  
Dimensionless Unit Hydrograph: <standard>

MBS

Onondaga County, New York

Watershed Peak Table

Sub-Area or Reach Identifier	ANALYSIS: (cfs)	Peak Flow by 10-Yr (cfs)	Rainfall 25-Yr (cfs)	Return Period 100-Yr (cfs)
-----				
SUBAREAS				
BC Outlet	1.57	4.03	5.69	7.45
REACHES				
OUTLET	1.57	4.03	5.69	7.45

MBS

Onondaga County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period			
	ANALYSIS: (cfs) (hr)	10-Yr (cfs) (hr)	25-Yr (cfs) (hr)	100-Yr (cfs) (hr)

-----

SUBAREAS				
BC Outlet	1.57	4.03	5.69	7.45
	12.07	12.05	12.05	12.03

REACHES

OUTLET	1.57	4.03	5.69	7.45
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MBS

Onondaga County, New York

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
BC Outlet	2.58	0.230	71	Outlet	Runoff
-----					
Total Area:	2.58 (ac)				

MBS

Onondaga County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
-----							
BC Outlet User-provided							0.230
						Time of Concentration	0.230 =====

MBS

Onondaga County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
-----				
BC Outlet	CN directly entered by user	-	2.58	71
Total Area / Weighted Curve Number			2.58	71
			====	==