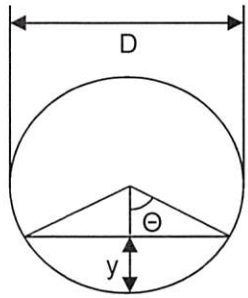
Pipe Flow calculations

Manning's Formula (for round pipe)



0.013	n	roughness coefficient
1.5	D	pipe diameter, ft
0.0113	S	head loss or slope, ft/ft
180	Θ	angle, degrees (180 = full pipe, 90 = half full pipe)
1.5	y	height of fluid in pipe, ft
1.767146	A	cross sectional area, sf
4.712389	WP	wetted perimeter, ft
0.375	R	hydraulic radius, ft (R = A / WP)
11.16626	Q	flow rate, cfs

(SINGLE 18")

2-18" = 22.33 CFS

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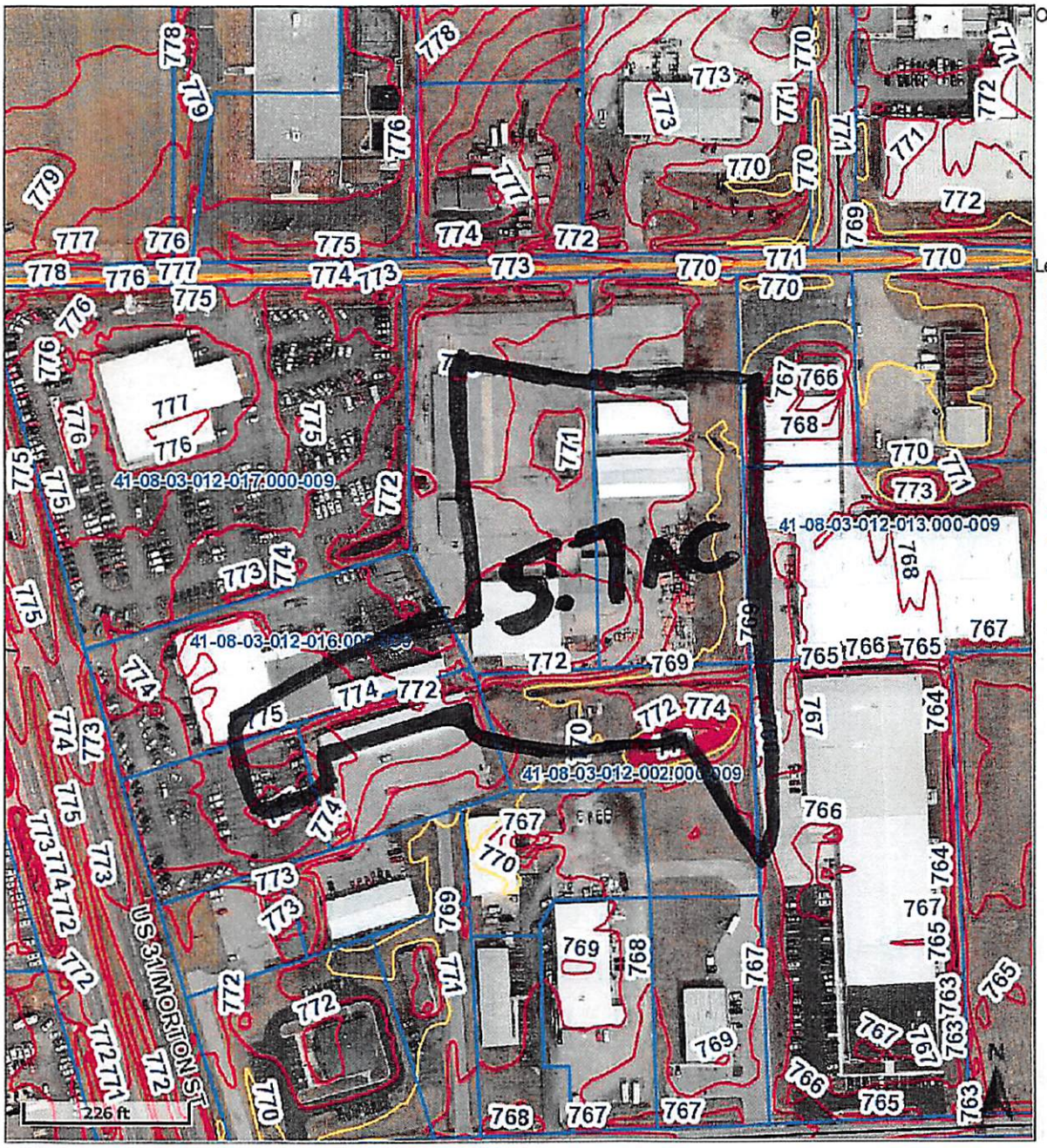
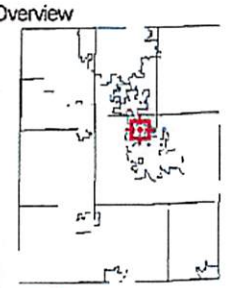
OVERALL BASIN TO 2-18" PIPES

Date Created: 3/20/2015



Overview



Legend

- Cities
- Townships
- Parcels

Roads

- ACCESS RAMP
- INTERSTATE
- LOCAL
- MAJOR ARTERIAL
- MAJOR COLLECTOR
- MINOR ARTERIAL
- MINOR COLLECTOR
- PRIVATE ROAD

Contours

- 10
- 2
- 20

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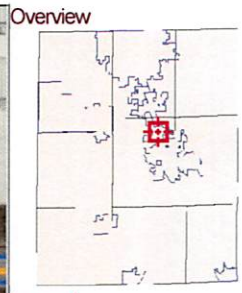
OVERALL BASIN T/C LINE

Date Created: 4/9/2015



Legend

- Cities
- Townships
- Parcels

Roads

- ACCESS RAMP
- INTERSTATE
- LOCAL
- MAJOR ARTERIAL
- MAJOR COLLECTOR
- MINOR ARTERIAL
- MINOR COLLECTOR
- PRIVATE ROAD

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TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 1

GMI OVERALL

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.240		0.011		
Flow length (ft)	= 98.0		202.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		2.64		0.00		
Land slope (%)	= 1.00		1.00		0.00		
Travel Time (min)	**= 1.73**	**+**	**36.38**	**+**	**0.00**	**=**	**38.11**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		168.00		0.00		
Watercourse slope (%)	= 0.00		1.00		0.00		
Surface description	= Paved		Unpaved		Paved		
Average velocity (ft/s)	=0.00		1.61		0.00		
Travel Time (min)	**= 0.00**	**+**	**1.74**	**+**	**0.00**	**=**	**1.74**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 39.85 min

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	7.970	1	40	19,128	------	------	------	GMI OVERALL

RAT GMI OVERALL.gpw	Return Period: 2 Year	Thursday, 04 / 9 / 2015

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 9 / 2015

Hyd. No. 1

GMI OVERALL

Hydrograph type	= Rational	Peak discharge	= 7.970 cfs
Storm frequency	= 2 yrs	Time to peak	= 40 min
Time interval	= 1 min	Hyd. volume	= 19,128 cuft
Drainage area	= 5.700 ac	Runoff coeff.	= 0.85
Intensity	= 1.645 in/hr	Tc by TR55	= 40.00 min
IDF Curve	= Central-05.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	12.48	1	40	29,950	------	------	------	GMI OVERALL

RAT GMI OVERALL.gpw	Return Period: 10 Year	Thursday, 04 / 9 / 2015

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 9 / 2015

Hyd. No. 1

GMI OVERALL

Hydrograph type	= Rational	Peak discharge	= 12.48 cfs
Storm frequency	= 10 yrs	Time to peak	= 40 min
Time interval	= 1 min	Hyd. volume	= 29,950 cuft
Drainage area	= 5.700 ac	Runoff coeff.	= 0.85
Intensity	= 2.576 in/hr	Tc by TR55	= 40.00 min
IDF Curve	= Central-05.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	18.26	1	40	43,818	------	------	------	GMI OVERALL

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 9 / 2015

Hyd. No. 1

GMI OVERALL

Hydrograph type	= Rational	Peak discharge	= 18.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 40 min
Time interval	= 1 min	Hyd. volume	= 43,818 cuft
Drainage area	= 5.700 ac	Runoff coeff.	= 0.85
Intensity	= 3.768 in/hr	Tc by TR55	= 40.00 min
IDF Curve	= Central-05.IDF	Asc/Rec limb fact	= 1/1