



Stormwater in A2

CITY OF ANN ARBOR – SYSTEMS PLANNING UNIT

STORMWATER MANAGEMENT AND PROGRAM UPDATE

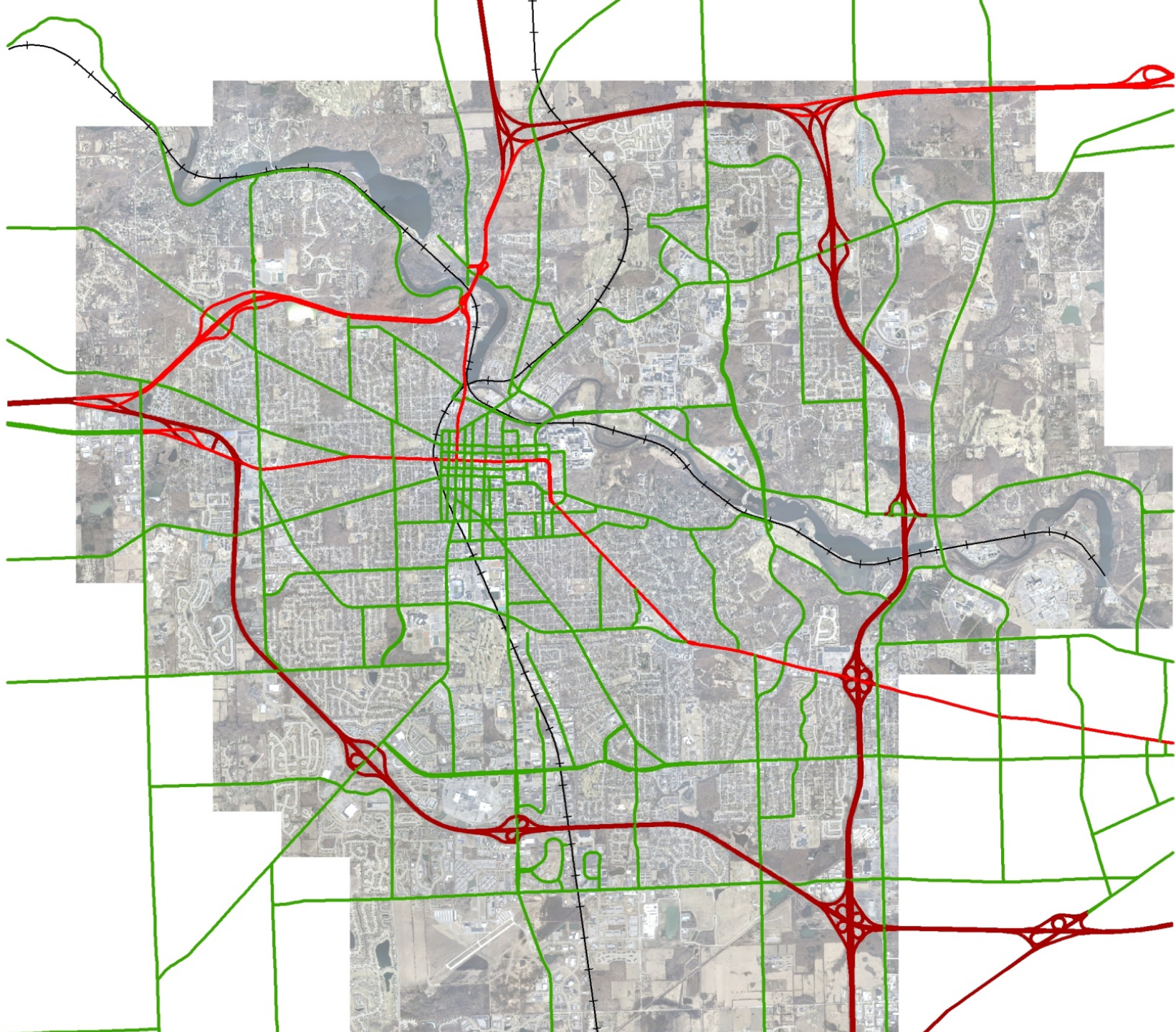
ENVIRONMENTAL COMMISSION – MARCH 2019

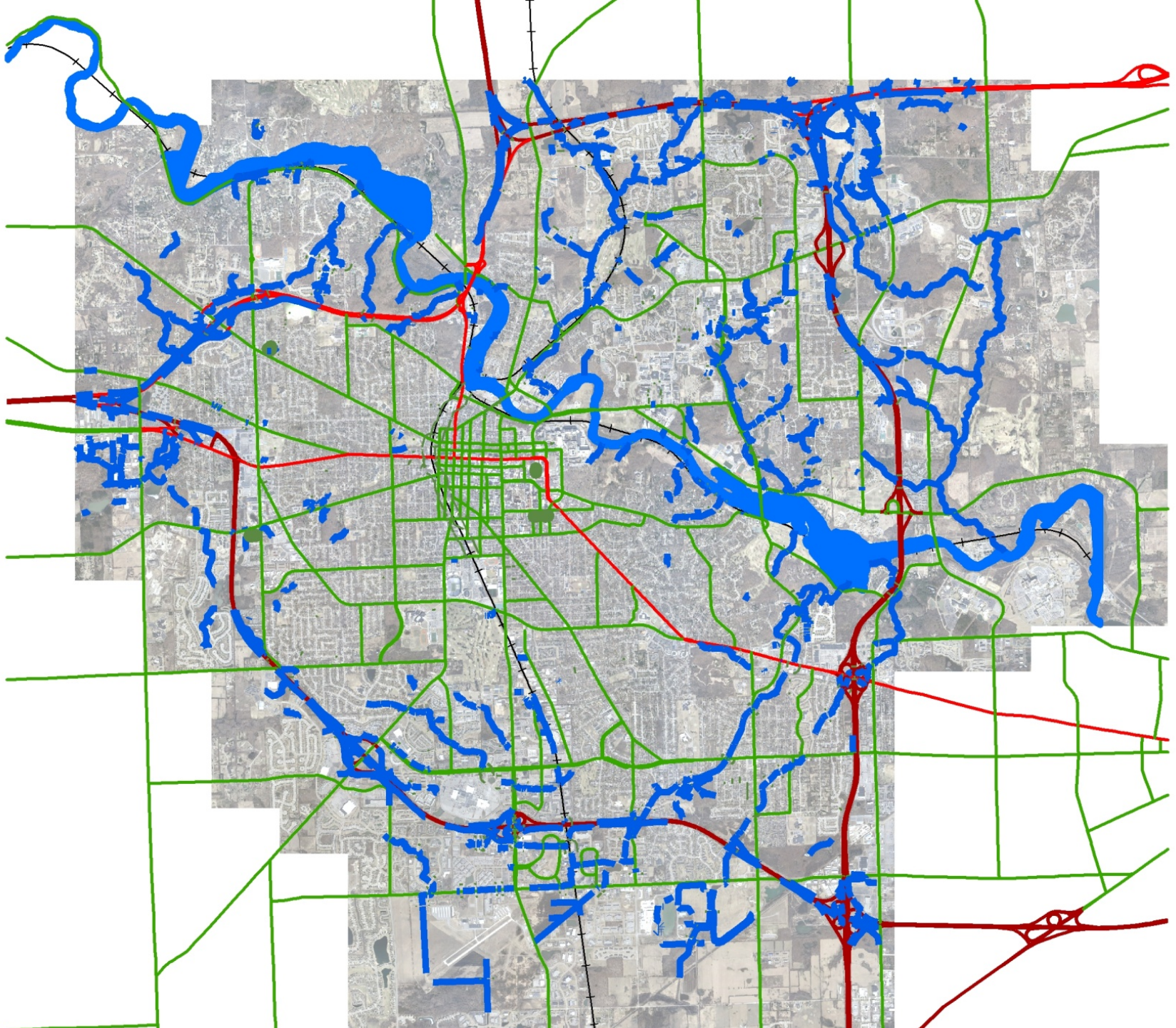
Discussion Topics

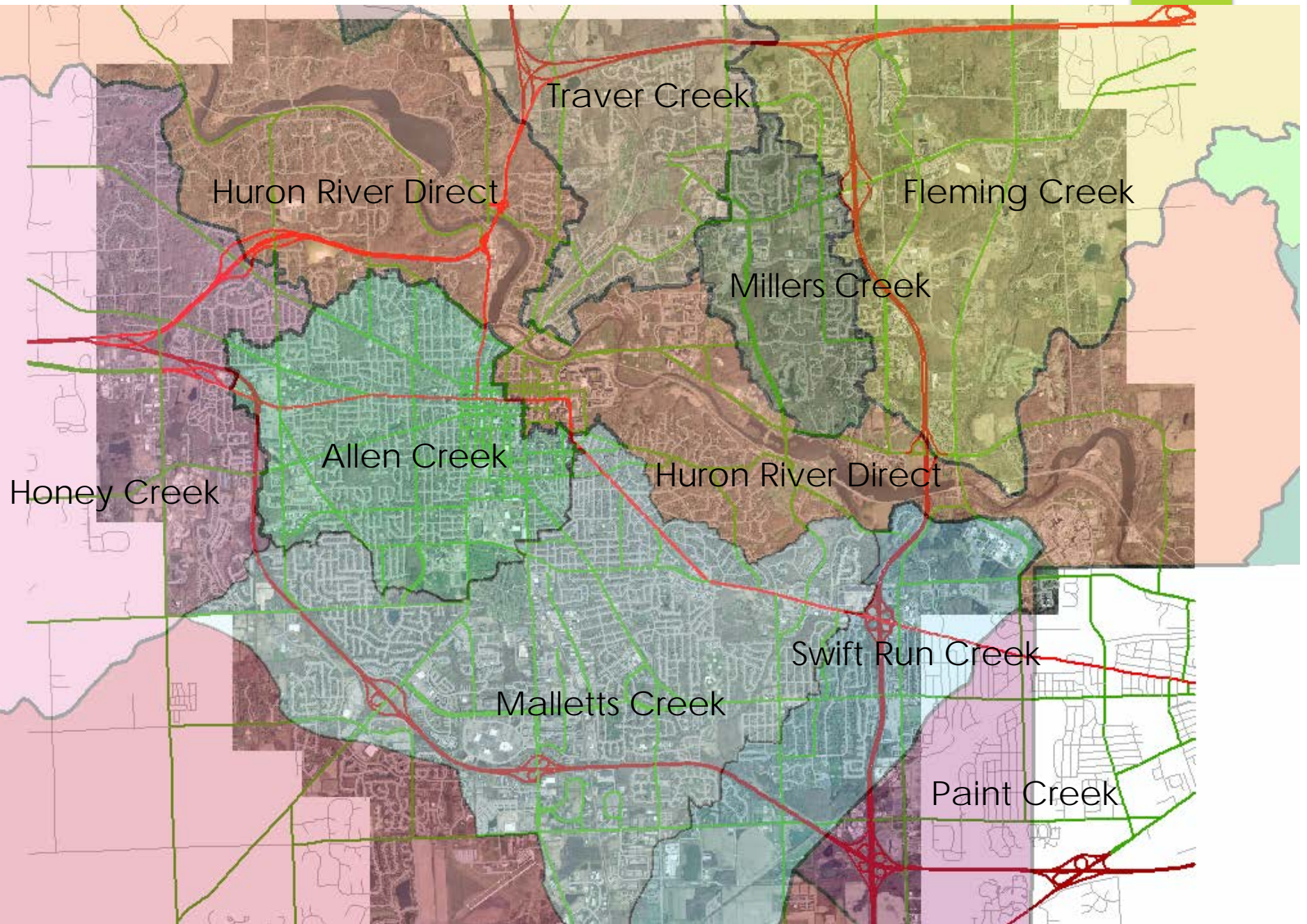
- ▶ Context and Background
- ▶ Managing the Stormwater....Utility!
- ▶ Creekshed Projects
- ▶ Citywide Programs
- ▶ Data
- ▶ Discussion

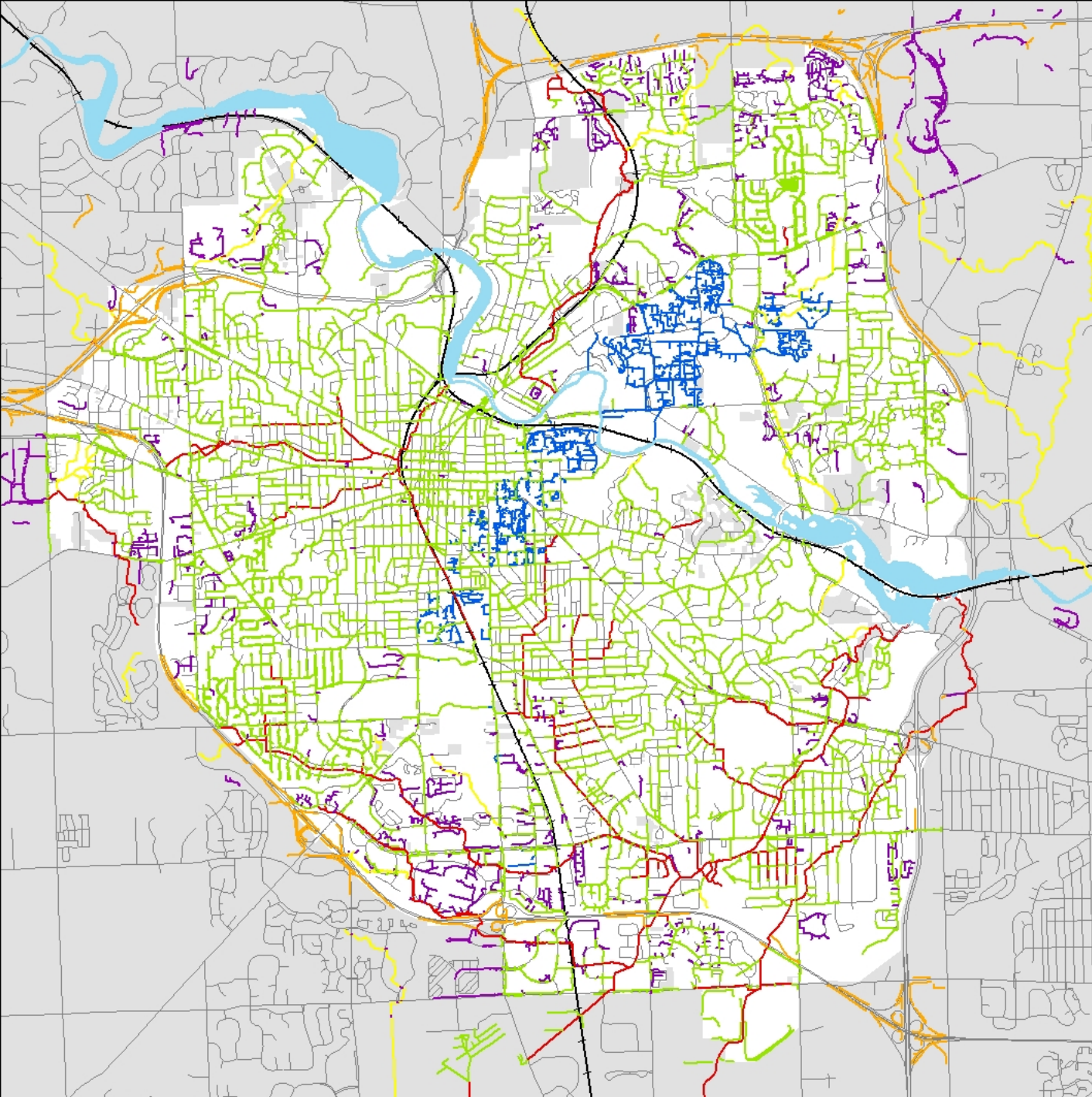


Context & Background









Storm Network

Ownership

- City
- U of M
- County Drains
- State/Interstate Highways
- Water of the State
- Private

231 Miles of Stormwater Pipe

241 Miles from Ann Arbor to Chicago

WEB IMAGES VIDEOS MAPS NEWS MORE

bing ann arbor, mi

Sign in
1 of 5

Directions My places Map apps

Road Bird's eye Traffic

Fullscreen Print Share

A Ann Arbor, MI
B Chicago, IL

add destination show options

Clear Go

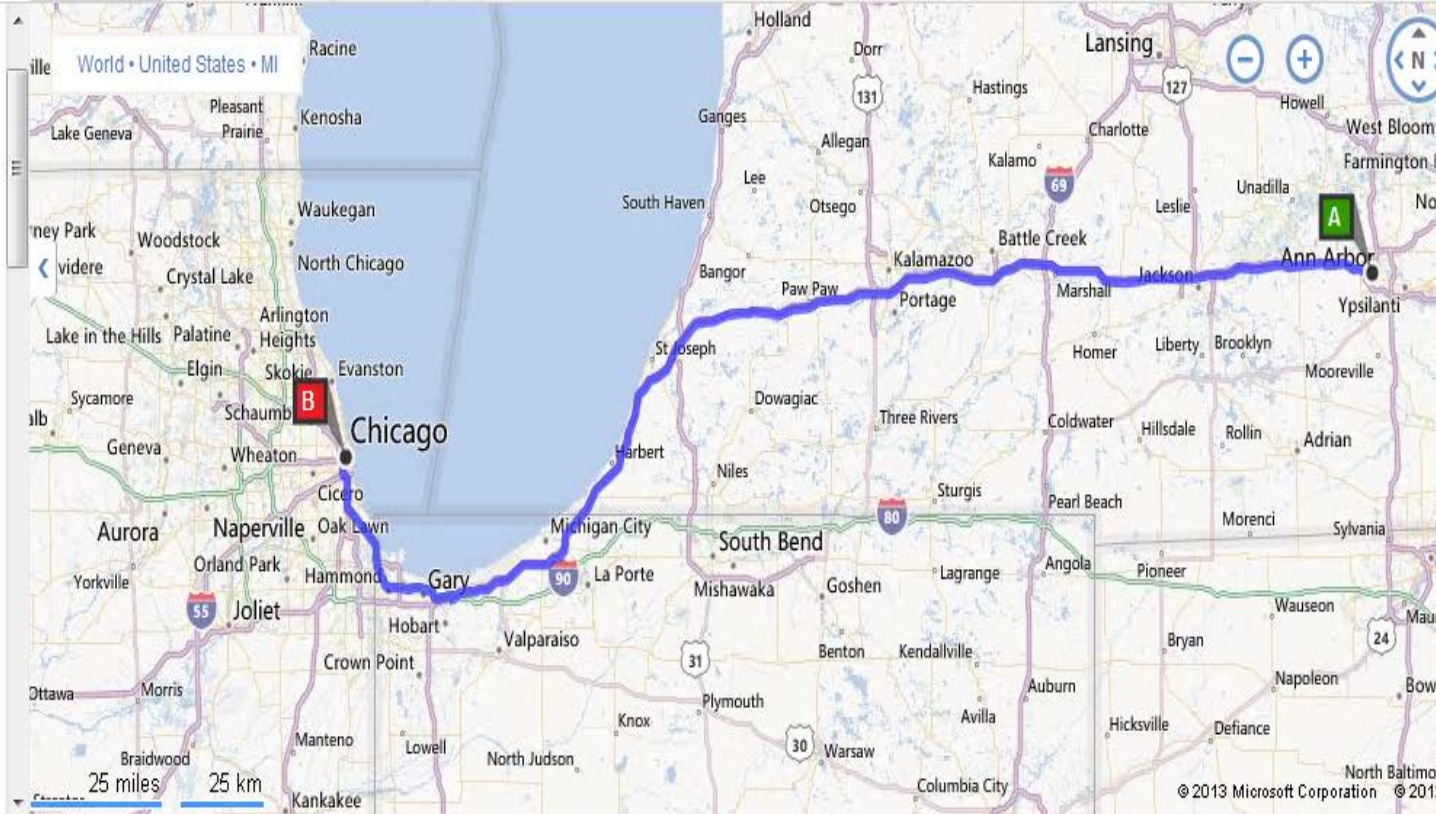
We found 3 more results for Chicago

241.8 mi, 3 hr 33 min driving

3 hr 44 min with traffic
view route based on traffic

A Ann Arbor, MI

Depart US-23 Branch / N Main St
toward S Main St



How Old is That City-Owned Pipe?

| Decade Constructed | Feet of Main | Miles of Main | Percent of Total | |
|--------------------|--------------|------------------|------------------|--------|
| 1900s | | 410 | 0.08 | 0.03% |
| 1910s | 21.8% | 52,545 | 9.95 | 4.29% |
| 1920s | | 135,768 | 25.71 | 11.09% |
| 1930s | | 40,451 | 7.66 | 3.30% |
| 1940s | | 37,775 | 7.15 | 3.09% |
| 1950s | | 53.2% | 197,359 | 37.38 |
| 1960s | 303,638 | | 57.51 | 24.80% |
| 1970s | 149,789 | | 28.37 | 12.24% |
| 1980s | 25% | 69,027 | 13.07 | 5.64% |
| 1990s | | 114,035 | 21.60 | 9.32% |
| 2000s | | 60,835 | 11.52 | 4.97% |
| 2010s | | 6,689 | 1.27 | 0.55% |
| unknown | | 55,837 | 10.58 | 4.56% |
| TOTAL | | 1,224,158 | 231.85 | |



Managing the Stormwater

What is Stormwater Management?

- Asset Management
 - Operations
 - Maintenance Scheduling/Work Orders
 - Asset Inventory
- Capital Improvements
- Regulatory Programming & Enforcement
 - State/Federal Water Quality Regulations
 - Floodplain Programming and Implementation
- Forestry (Street Trees)
- Green Streets Policy
 - Capital investment of public stormwater system
 - Green infrastructure



What is a Stormwater Utility?

- A dedicated funding source to support an administrative organization that plans, designs, constructs and maintains a stormwater management system, sediment and flood control programs and projects, and provides education.
 - Functions like the City's water and wastewater utilities
- Customers' fee are based on Impervious Area
 - Not used for first-time service (i.e., Special Assessment District)





2323

2335

1320

Glendaloch Cir

13

2341

1330

1336

1342

2347

2350

2355

2511

2517

2521

2541

2561

2360

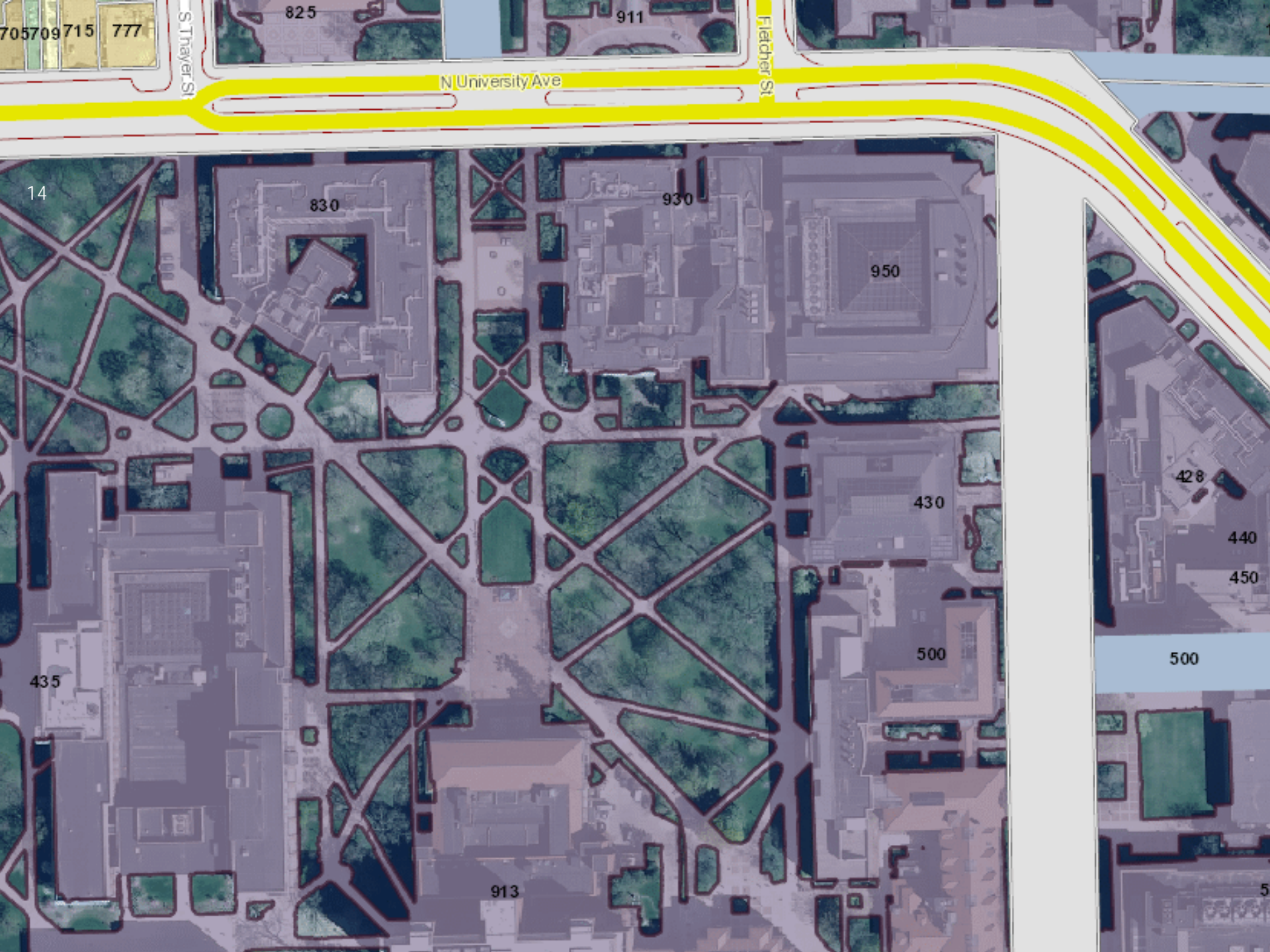
Londonderry Rd

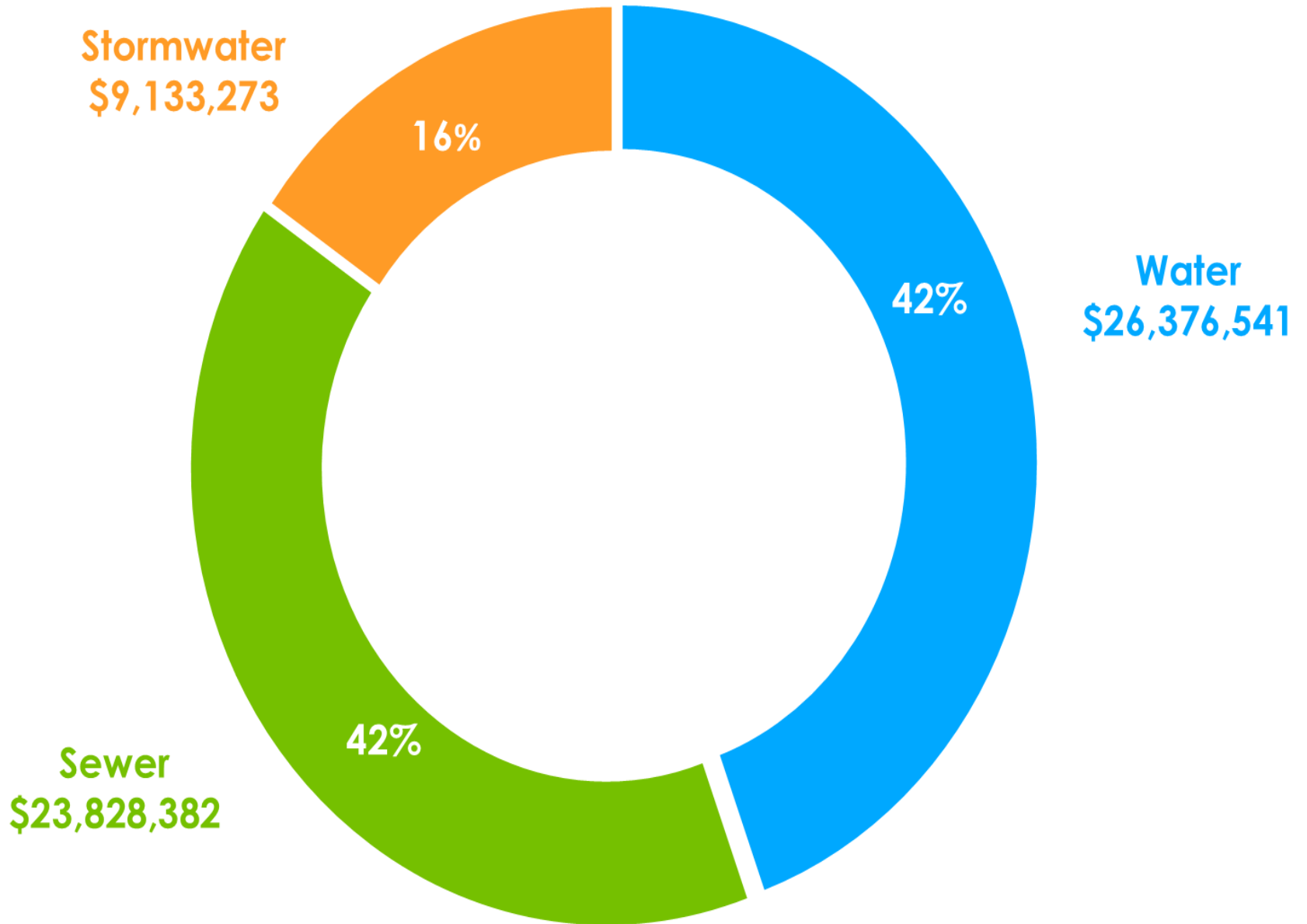
Hawthorn Rd

Shannondale Rd

2405

2514

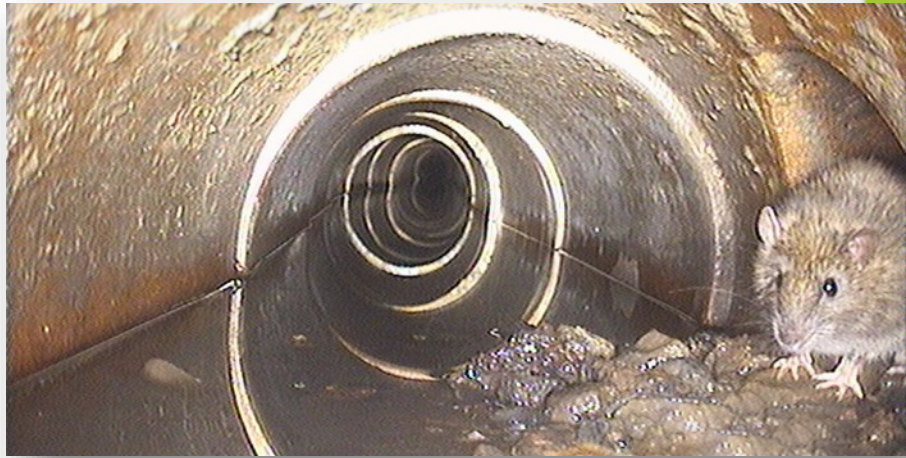












Stormwater vs. Wastewater

- ▶ City has a separate storm sewer system
- ▶ Stormwater goes ultimately to Huron River
 - ▶ None receives advanced treatment

Goals For The Stormwater Program

- ▶ Quantity
- ▶ Quality



Green Infrastructure

How much Stormwater is treated Annually in the City of Ann Arbor?

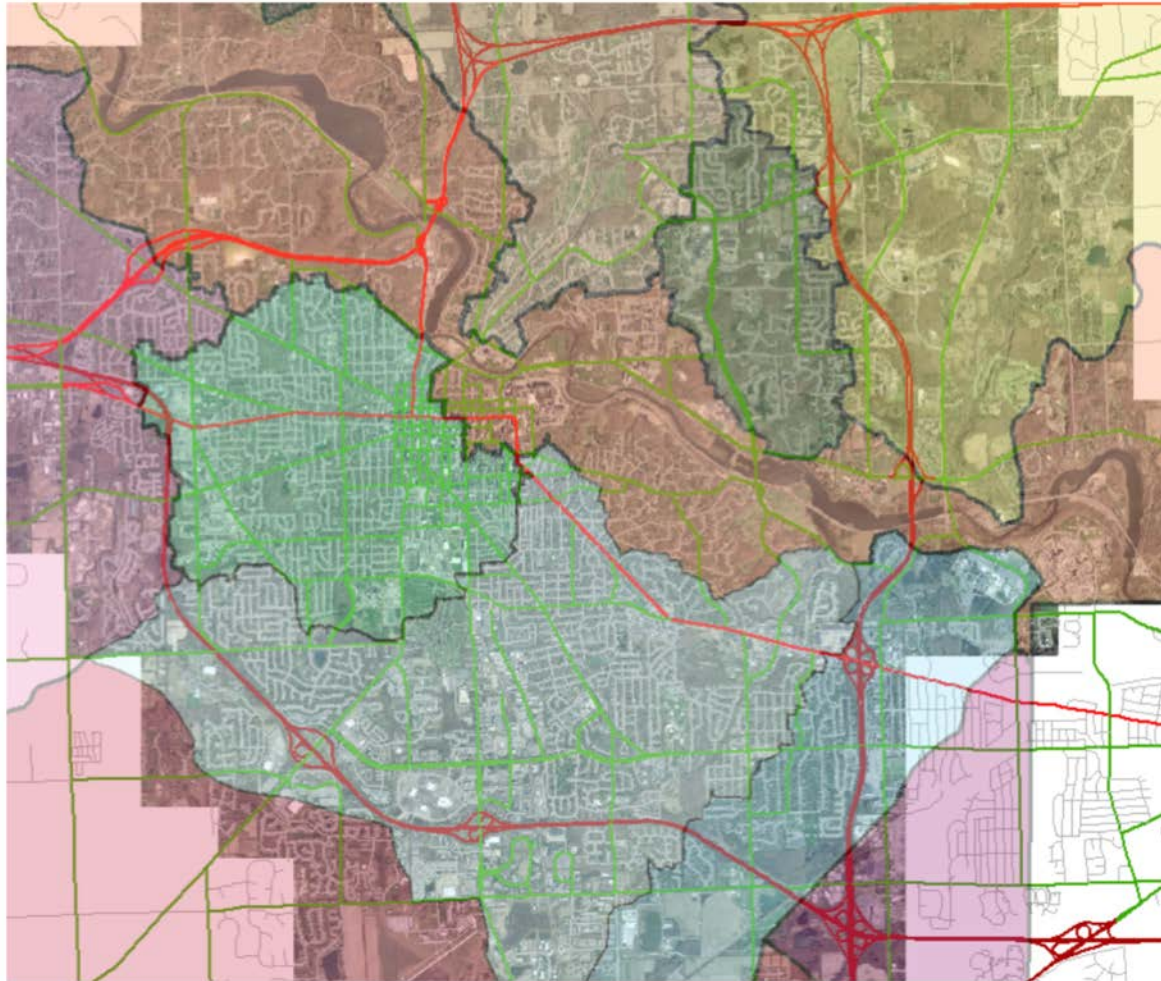
124 City-owned Rain Gardens/Bioswales/Green Infrastructure

403 Million Gallons of Stormwater

277 Residential Rain Gardens

3 Million Gallons of Stormwater

Creekshed Projects



Creeksheds by the Numbers...

| | | Spent | Land Area Coverage | Impervious % | Watershed Health Indicator Index Score |
|------------|-------------------------|-------|--------------------|--------------|--|
| Allen | \$ 11,536,589.00 | 36% | 17% | 49% | 5 |
| Citywide | \$ 7,738,750.00 | 24% | 100% | 39% | 30 |
| Traver | \$ 1,035,673.00 | 3% | 10% | 24% | 34 |
| Direct | \$ 2,883,535.00 | 9% | 23% | 22% | 48 |
| Millers | \$ 1,076,733.00 | 3% | 8% | 34% | 21 |
| Malletts | \$ 6,897,760.00 | 22% | 27% | 41% | 27 |
| Swift Run | \$ ~125,000.00 | 0% | 5% | 26% | 18 |
| Honey | \$ 333,608.00 | 1% | 5% | 30% | 54 |
| Fleming | \$ - | 0% | 4% | 28% | 73 |
| SUM | \$ 31,627,648.00 | | | | |

Citywide Projects

| | |
|--------|--|
| 9892 | 2010 Sewer Lining |
| 739833 | Cost Of Service |
| 9360 | Urban Forest Management Plan |
| 9431 | GIS Storm Conversion & Model |
| 9445 | 2017 Sanitary & Storm Sewer Televising |
| 9464 | 2014/15 SRF Tree Planting |
| 9466 | 2016 SRF Tree Planting |
| 9467 | 2017 SRF Tree Planting |
| 9468 | 2018 SRF Tree Planting |
| 9737 | Tree Inventory |
| 9746 | SRF Tree Planting Project |
| 9748 | 2013 SRF Tree Planting |
| 9818 | 2009 Local Street Resurfacing |
| 9895 | Storm Hydraulic Model Cal/Analys |
| 9909 | Capital Budget Contingency FY09 |
| 9084 | 2014 Annual Street Resurfacing |
| 9130 | 2014 Sewer Lining |

\$ 7,738,750

Millers

Millers Creek Bank Stabilization

Huron Pkwy/Nixon Intersection Improvements

Management of Millers Creek Sediment - Report

\$ 1,076,733

Malletts

- 9074 Forest Ave Improvements
- 9144 Springwater Subdivision Improvements II
- 9169 Ferdon/Wells Storm Sewer
- 9714 Malletts Creek Culvert @ S State
- 9838 Arbor Oaks Water Main
- 9867 Stone School Road Improvements
- 9735 Easy Street Alternative Design
- 9743 S. State Storm @ Malletts Creek
- 9885 Chaucer Ct Drainage Improvements
- 9890 Arbor Oaks Rain Gardens
- 9086 Springwater Improvements
- 9087 Village Oaks-Chaucer Storm Improvements
- 9867 Stone School Road Improvements
- 9456 Burns Park Porous Alley
- Malletts Streambank Stabilization
- County Farm Streambank Stabilization

\$ 6,897,760

Traver

| | |
|------|---|
| 9142 | Dhu Varren Culvert Replacement |
| 9153 | Traver Storm Sewer Crossing -AAR |
| 9740 | Plymouth Rd Wetland Restoration |
| 9874 | Pontiac Trail Imp-Skydale to M-14 |
| | Leslie Park GC Streambank Stabilization |

\$ 1,035,673

Fleming

NO PROJECTS

Swift Run

ROW Rain Gardens

\$ ~125,000

Huron River

| | |
|--------|--|
| 409890 | Londonderry Storm Sewer |
| 9138 | Londonderry/Devnshire/Belmont Water Main |
| 9430 | Bird-Newport-Warrington Utility Improvements |
| 9614 | Huron River Dr-N Main To Bird |
| 9708 | Northside Submain (Phase I) |
| 9777 | Geddes Ave Improvements |
| 9860 | Northside Interceptor Sewer Relocation |
| 9886 | Harvard Drain/Nichols Arboretum |
| 9889 | Newport Creek Culvert Crossing |

\$ 2,883,535

Honey

9223 Sister Lakes Stormwater Retrofit

\$ 333,608

Allen

\$11,536,589

| | |
|--------|--|
| 409887 | N Main/Railroad Storm Sewer |
| 9080 | Duncan Street Improvements |
| 9133 | Lawrence-Summit Water Mains |
| 9137 | Stadium - Hutchins to Kipke |
| 9226 | Maxwell Wakefield Lutz Water |
| 9278 | Snyder/Edgewood Area Storm Improvements |
| 9284 | S University (State-E University) |
| 9692 | W Liberty Road Reconstruction |
| 9703 | E Stadium Bridges Replacement |
| 9821 | W Stadium At Pauline Improvements |
| 9828 | Miller Ave - Maple to Newport |
| 9836 | W Stadium Improvements/Suffolk-Hutchins |
| 9846 | Vaughn/Nob Hill/Copley/Harbal |
| 9869 | E Stadium Water Main & Resurfacing |
| 9870 | Fourth Ave Water & Resurfacing |
| 9873 | Madison Improvements-Seventh to Main |
| 9888 | Oakwood/Edgewood Storm Sewer |
| 9891 | Sylvan Ave Porous Pavement |
| 9893 | West Park Storm System Modification |
| 9257 | 128 Felch Demo |
| 9258 | Allen Creek RR Berm |
| 9449 | Kingsley Rain Garden Project |
| 9721 | 721 N Main Storage Bldgs Demolition |
| 9734 | Allen Creek R/R Berm Feasibility Study |
| 9739 | West Park Storm Water Improvements |
| 9136 | McKinley-White-Arch Storm Vault |
| 9715 | Wagner Rd Reconstruction-WCRC |
| 9857 | Dexter Ave Impr-W Huron/N Maple |
| 9894 | Willard St Reconstruction |
| 9193 | Fifth Ave Improvements (Kingsley - Cath) |







City-wide Projects and Programs

Projects and Programs

- ▶ Asset Management
- ▶ Regulatory Permitting
- ▶ Floodplain Programming
- ▶ Capital Projects
- ▶ Hydraulic Modeling



Capital Improvement Projects

- ▶ Calibrated Hydraulic Model (SWMM)
- ▶ Floodplain Programming
- ▶ Urban Forestry/Street Trees
- ▶ Road Reconstruction Projects
 - ▶ Green Streets Policy
- ▶ Streambank Stabilization Projects
- ▶ Detention Pond Upgrades
- ▶ Infrastructure Rehab

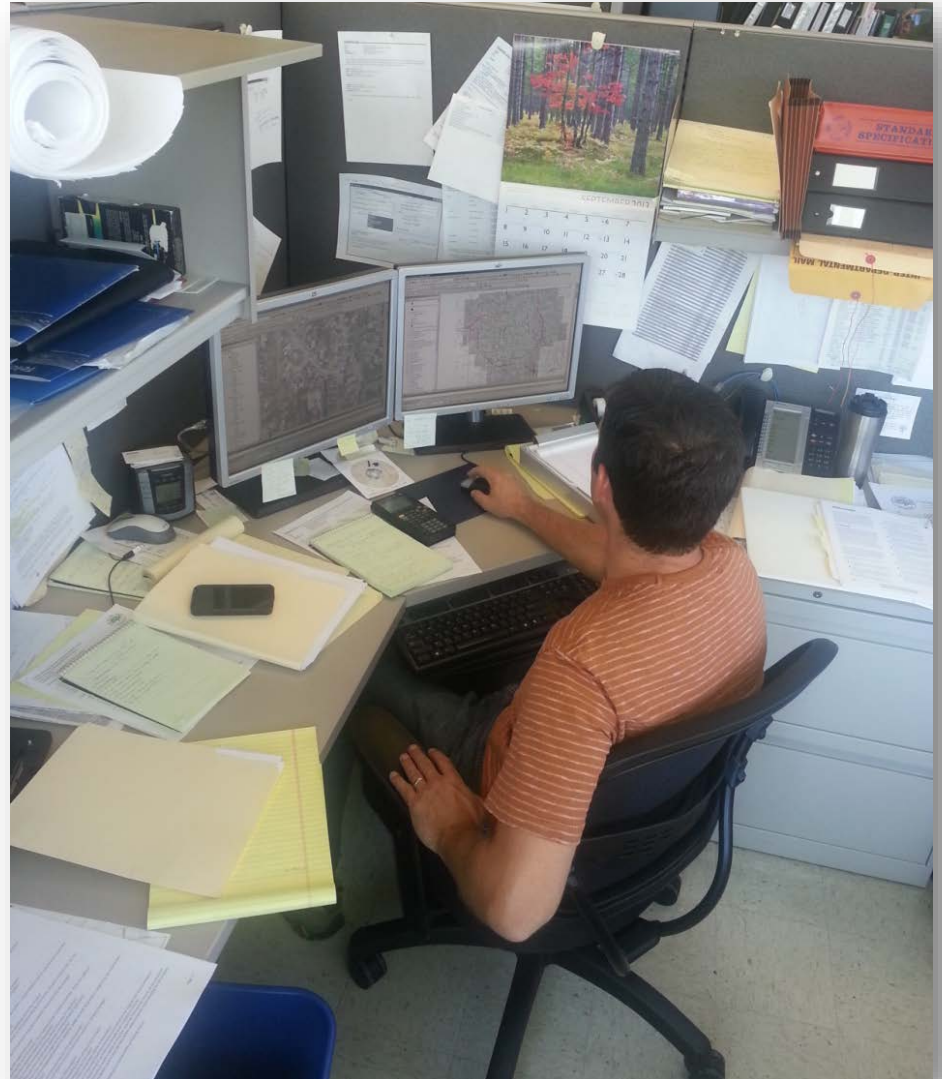
Partnerships for Projects & Programs

- ▶ WCWRC
 - ▶ Unique partnership
 - ▶ Transparency and project innovation



Data Collection & Decision Making

- Scientific Data
- Field Measurements
- Geospatial Reference
- Modeling
- Public Engagement



Data

- ▶ Available online
 - ▶ Stream gauges (USGS)
 - ▶ Rain gauges
- ▶ Project Specific data
 - ▶ Flow meters
 - ▶ Radar rainfall
- ▶ GIS analysis

SWMM – Stormwater Management Model

EPA United States Environmental Protection Agency

Español | 中文: 繁體版 | 中文: 简体版 | Tiếng Việt | 한국어

Learn the Issues | Science & Technology | Laws & Regulations | About EPA

Water Research

Storm Water Management Model (SWMM)

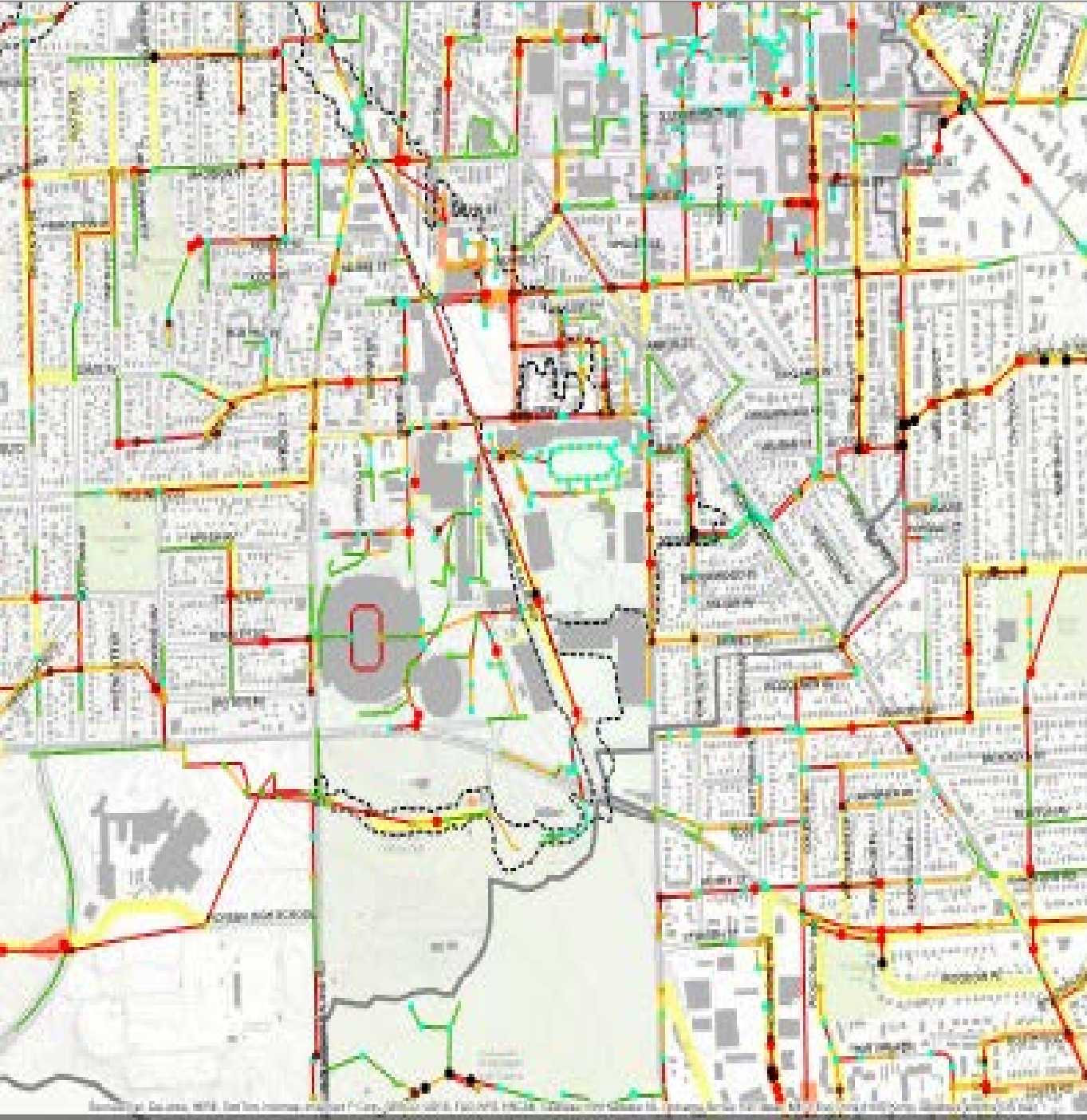
Version 5.1.007 with Low Impact Development (LID) Controls

- [Description](#)
- [Capabilities](#)
- [Applications](#)
- [Support](#)
- [Downloads](#)
- [Add-in Tools](#)
- [Helpful Resources](#)
- [Contact](#)

Description

EPA's Storm Water Management Model (SWMM) is used throughout the world for planning, analysis and design related to stormwater runoff, combined and sanitary sewers, and other drainage systems in urban areas. There are many applications for drainage systems in non-urban areas as well.

- ▶ Hydraulic computer model of stormwater system
- ▶ Determine water levels, hydraulic grade lines and routed flows through a network of pipes and open channels
- ▶ Analysis Options in SWMM Developed by US EPA in 1970



Legend

Peak HGL

- > 2ft below Grade
- < 2ft below Grade
- 0 - 0.5 ft above Grade
- 0.5 - 1ft above Grade
- 1 - 2 ft above Grade
- > 2 ft above Grade

Storm Sewer

- Exceeds Capacity
- Backwater
- Free Surface
- Open Channel

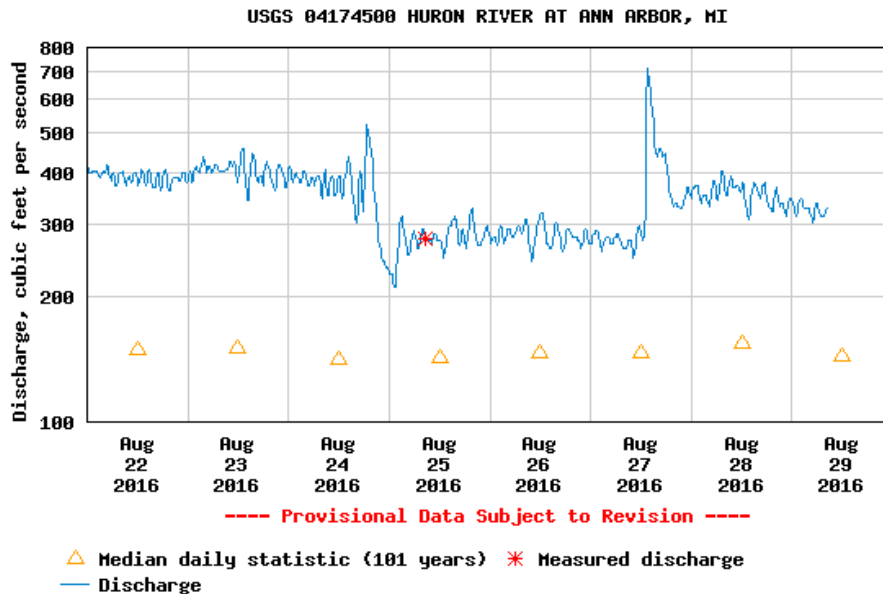
Overland Flow

- Overland Flow
- Ponding/Water Surface
- FEMA 100-Year Floodplain
- Watershed
- Building

[Summary of all available data for this site](#)
[Instantaneous-data availability statement](#)

Discharge, cubic feet per second

Most recent instantaneous value: 308 08-29-2016 09:15 EST



Add up to 2 more sites and replot for "Discharge, cubic feet per second"

[Add site numbers](#) [Note](#)

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

GO

Create [presentation-quality](#) / [stand-alone](#) graph. Subscribe to [WaterAlert](#)

[Share this graph](#) | [f](#) [t](#) [g+](#) [e](#)

Daily discharge, cubic feet per second -- statistics for Aug 29 based on 101 years of record [more](#)

| Min (1934) | 25th percentile | Median | Mean | 75th percentile | Most Recent Instantaneous Value Aug 29 | Max (2007) |
|------------|-----------------|--------|------|-----------------|--|------------|
| 28 | 116 | 144 | 193 | 268 | 308 | 613 |

Gage height, feet

Systems Planning

Asset Management

Development Review

Planning Areas

Resources

Rain Gauges

Home » Departments » Systems Planning » Rain Gauges

Gauge Data

Which gauge do you want to see ?

Barton Pond ▾

On which date do you want the data to start?

8/22/2016

and end?

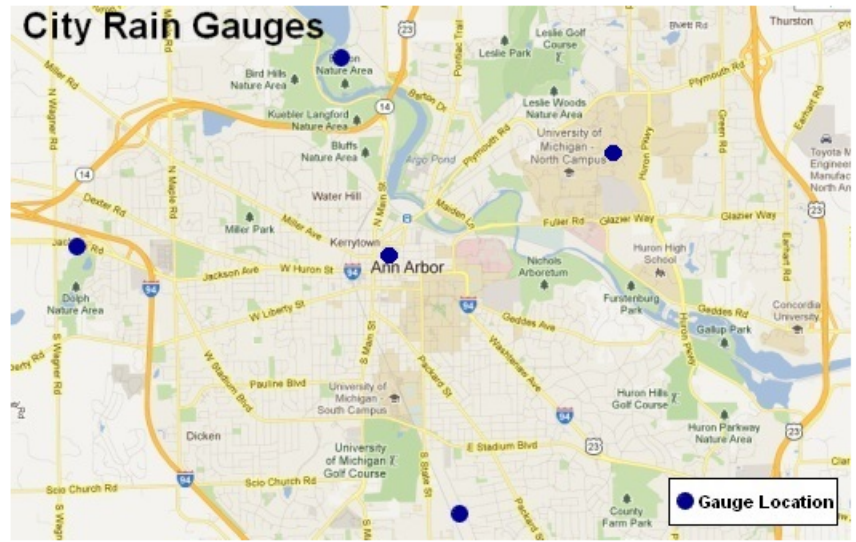
8/29/2016

Data Interval:

daily

15 minutes

Get Data

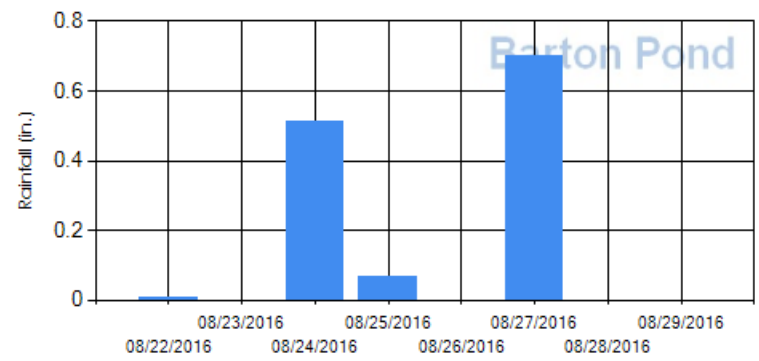


Barton Pond

| Reading Date ▲ ▾ | Rainfall (in.) ▲ ▾ |
|------------------|--------------------|
| 08/22/2016 | 0.01 |
| 08/23/2016 | 0.00 |
| 08/24/2016 | 0.51 |
| 08/25/2016 | 0.07 |
| 08/26/2016 | 0.00 |
| 08/27/2016 | 0.70 |
| 08/28/2016 | 0.00 |
| 08/29/2016 | 0.00 |

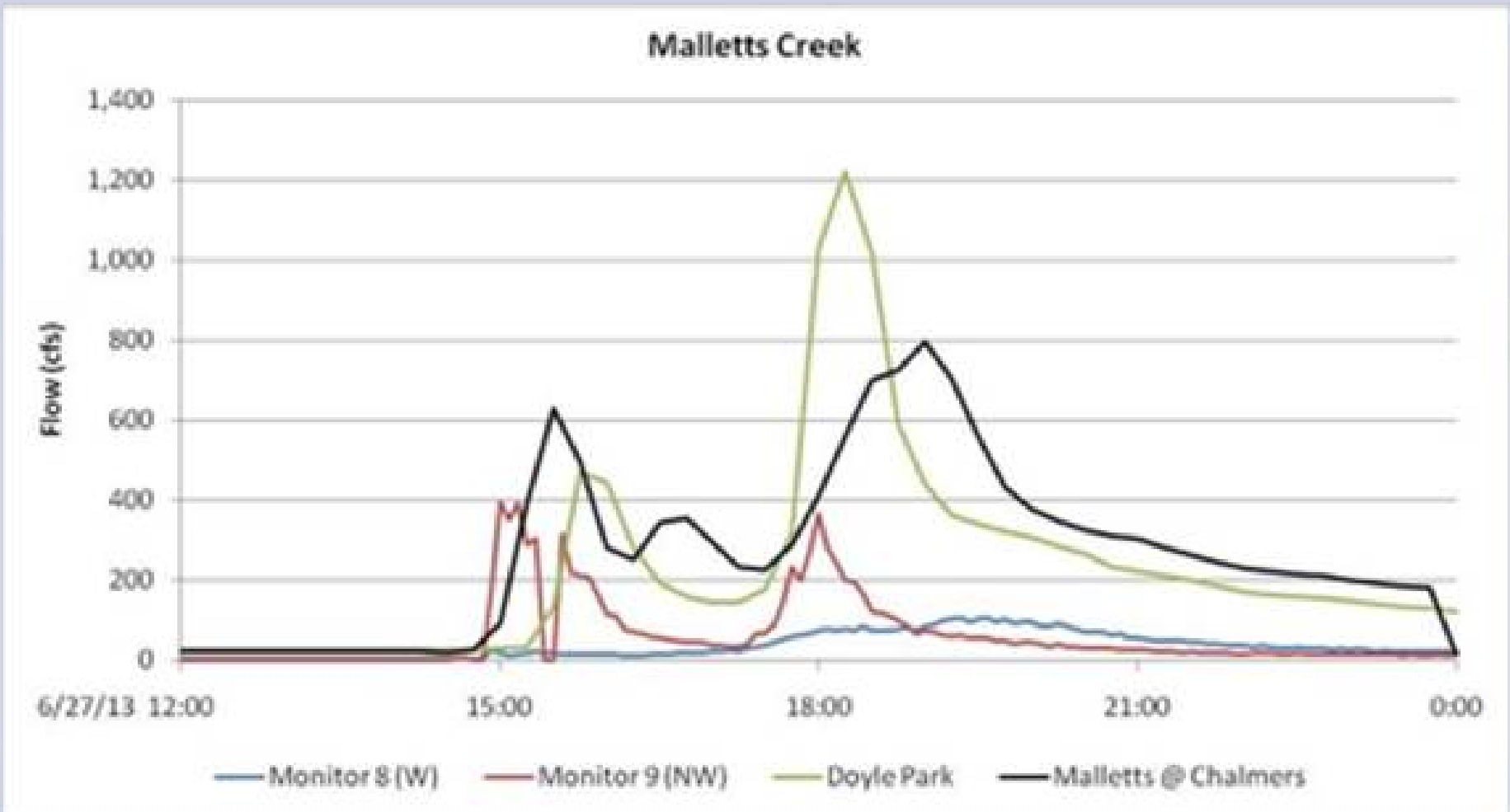
Total for period:

[export this data to .CSV \(Excel compatible\)](#)

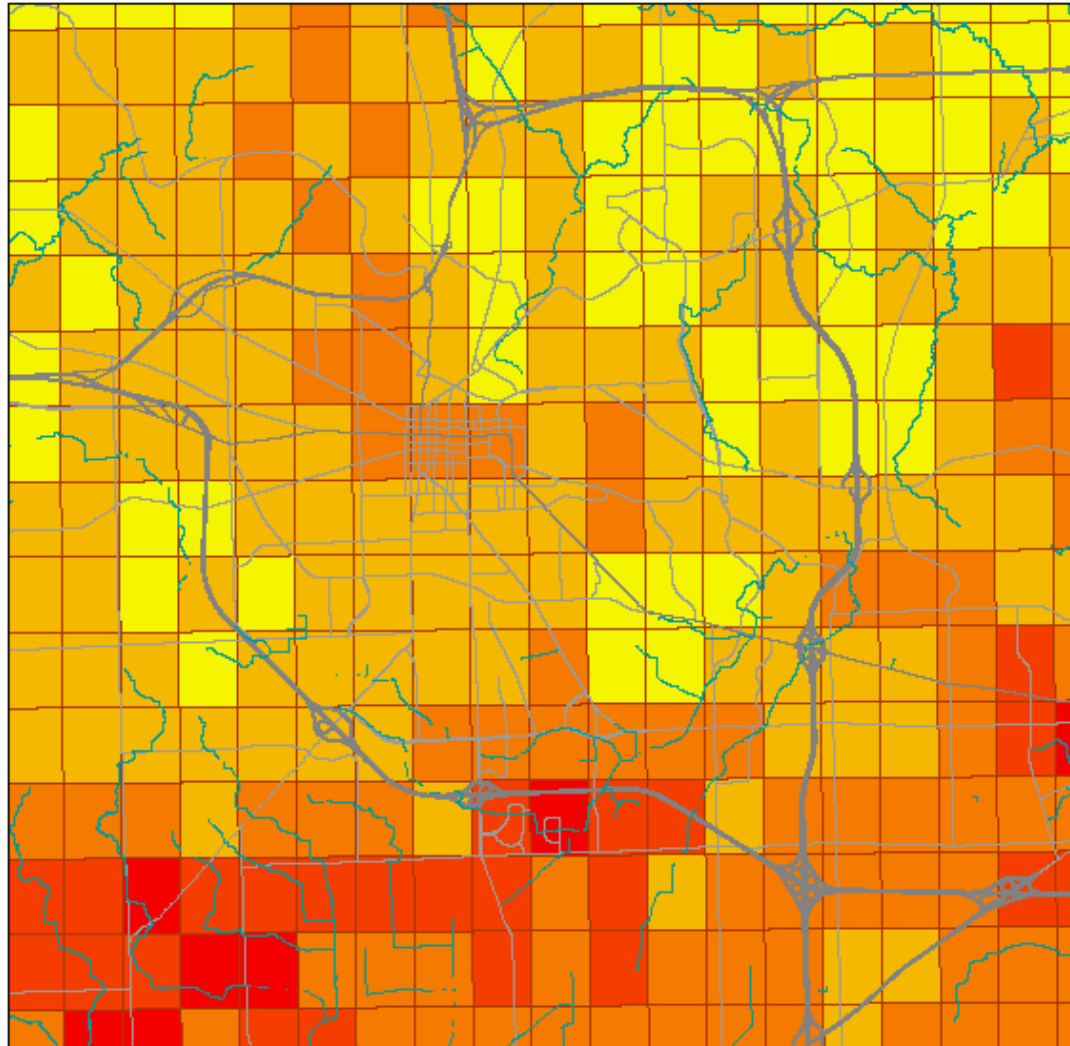


[Questions? Send mail to storm@a2gov.org](mailto:storm@a2gov.org)

Malletts Creek Flow Monitoring



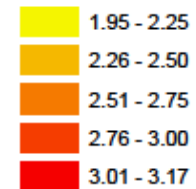
June 5-6, 2010 Storm Event Radar Rainfall Data*



* Rainfall Total Shown is for Duration of Storm Event (5:00 p.m. to 2:30 a.m.)

Radar Data Obtained From OneRain, Inc.
1 km x 1 km Pixel Data

Rainfall Total (in)





Discussion