

# WET WEATHER PROJECTS IN THE CITY OF ANN ARBOR

Public Services Area

# Introductions

- Craig Hupy, PE – Public Services Area Administrator
- Cresson Slotten, PE – Systems Planning Manager
- Nick Hutchinson, PE – City Engineer
- Troy Baughman, PE – Systems Planning Engineer
- Jennifer Lawson, CSM – Water Quality Manager

# Presentation/Discussion Approach

- Present high level overviews on three major, technical projects
- We will pause at the end of each project discussion for questions on that specific presentation
- Overall Q & A at the end of the full presentation
- We will gather “Parking Lot” items that fall outside of the scopes of the three specific projects

# Agenda

- What happens to rain water?
- Recent Wet Weather Projects
  - ▣ Sanitary Sewer Wet Weather Evaluation Project (SSWWE)
  - ▣ Stormwater Model Calibration & Analysis Project (SWM)
  - ▣ Upper Malletts Stormwater Conveyance Study
- Looking Ahead
- Q & A



## What Happens to Rain Water

Cresson Slotten, PE

# What Happens to Rain Water

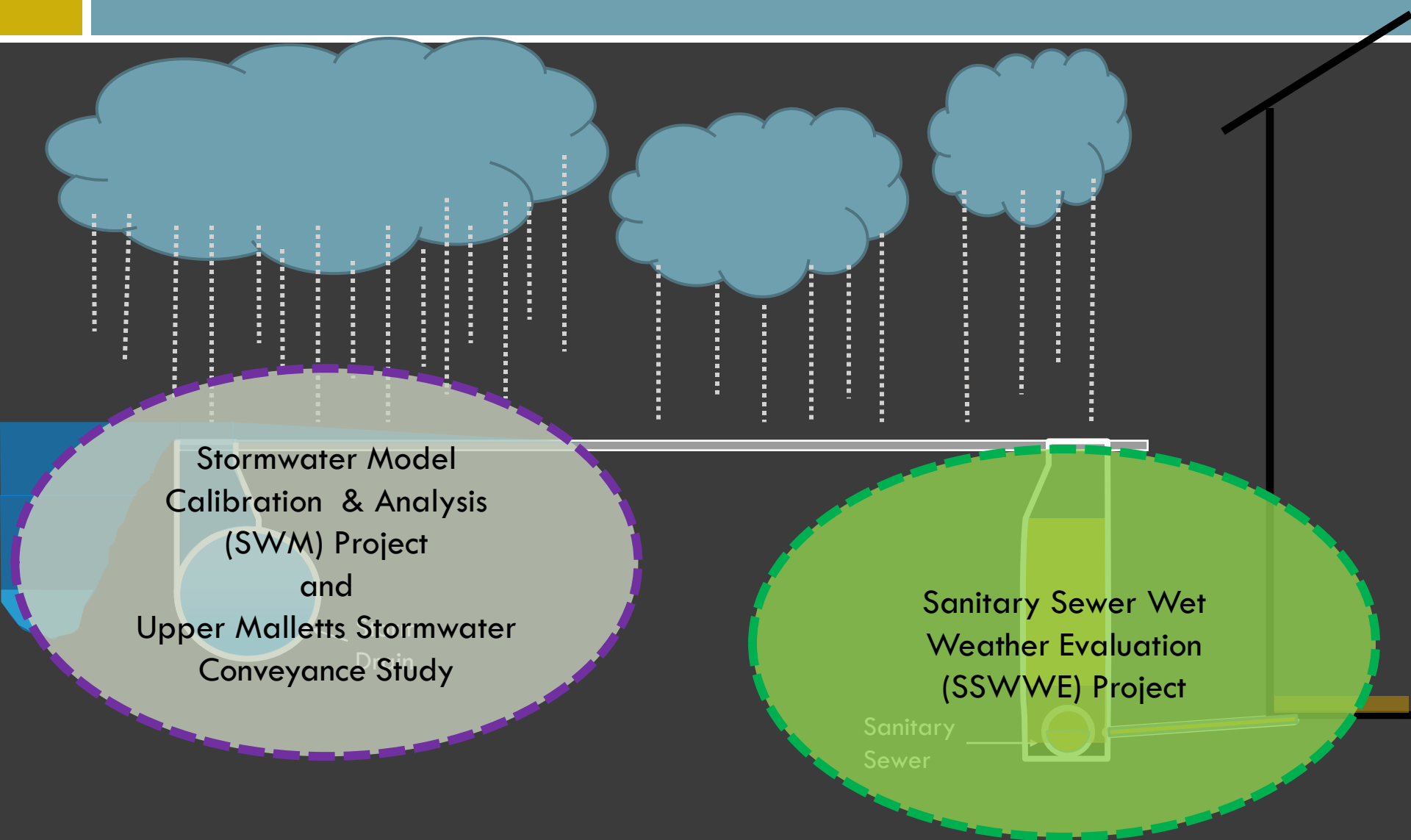
## Sanitary Sewer System

- To take sanitary waste from homes & businesses
  - ▣ Not intended to receive significant stormwater flow
- City sanitary system
  - ▣ Contract flows from AA Twp, Scio Twp & Pittsfield Twp
- **362** miles of pipe

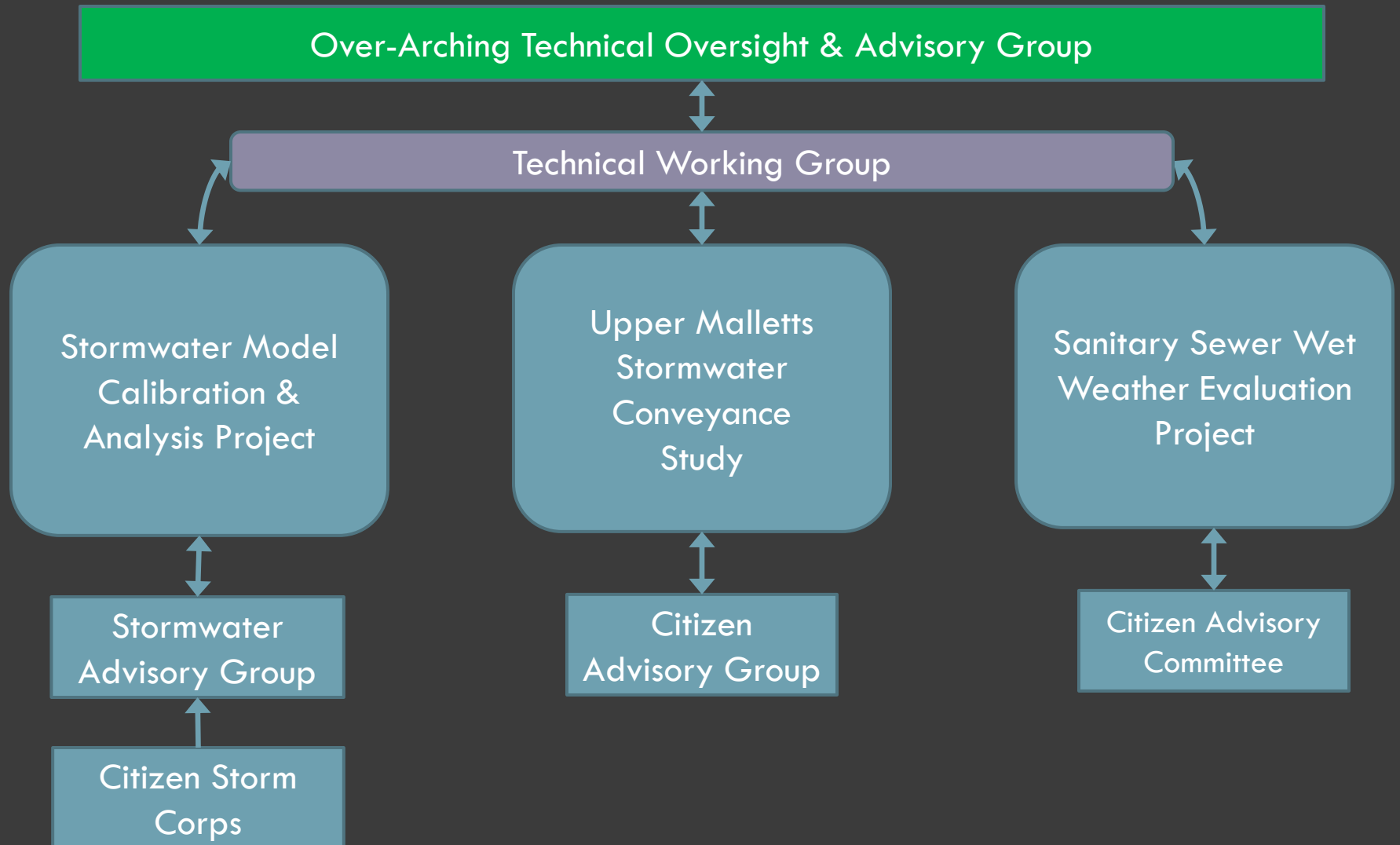
## Stormwater Management System

- To take stormwater runoff that the ground can't capture
- Multiple, interacting jurisdictions
  - ▣ City, WCWRC and UM
- Multiple types of facilities
  - ▣ Pipes, creeks, ponds, BMPs
- **541** miles of pipes and drains

# What Happens to Rain Water



# Wet Weather Projects







## Sanitary Sewer Wet Weather Evaluation Project

Nick Hutchinson, PE

# Topics of Presentation

- Background & Purpose
  - ▣ Public Engagement
- Major Findings
  - ▣ SSWWE
  - ▣ FDD Program
- Next Steps
- Questions



# Background and Purpose

# Team Overview

- City of Ann Arbor
- OHM Advisors
- Project Innovations
- Famous in Your Field
- Citizen Advisory Committee (CAC)



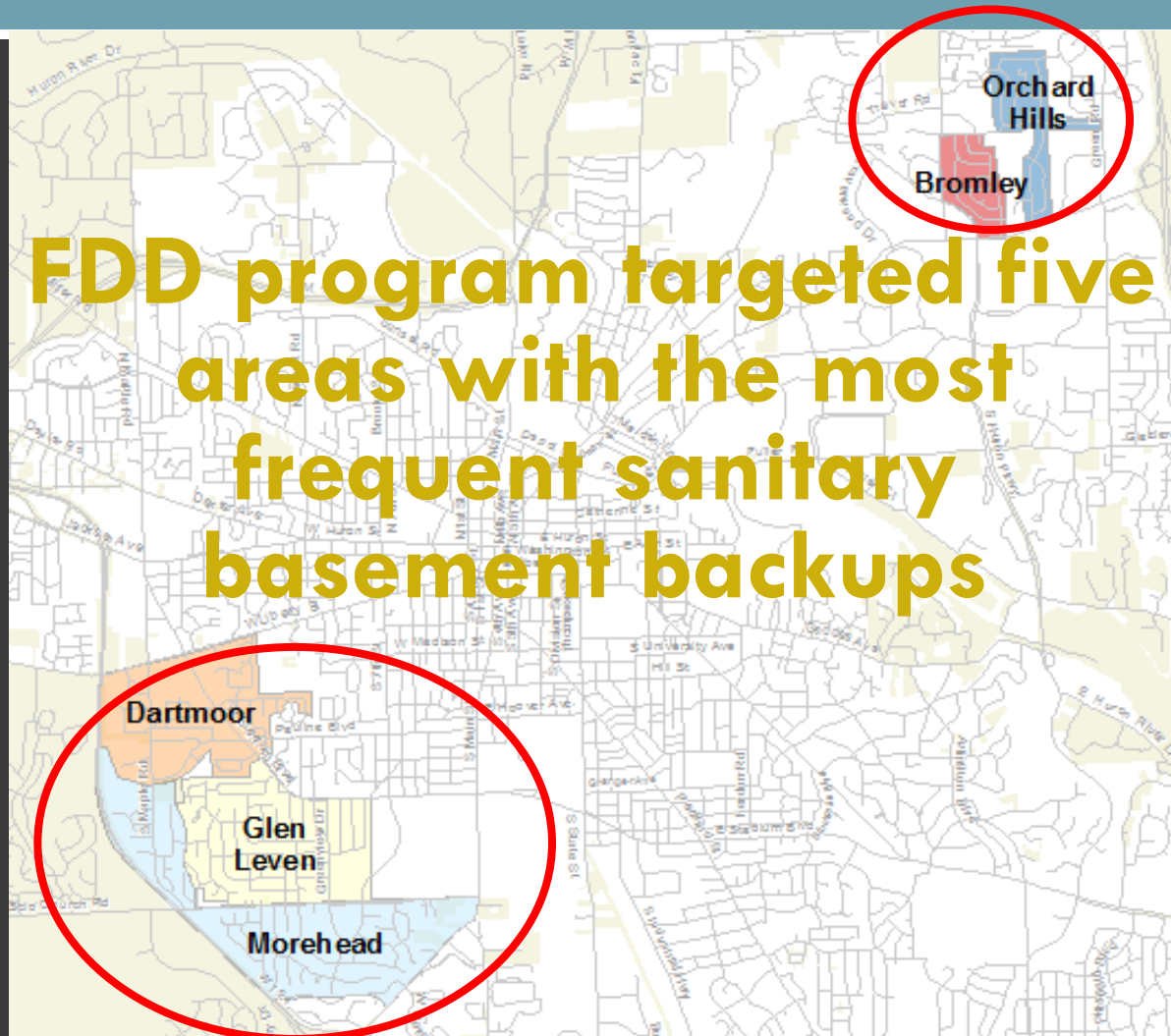
# Why was the FDD Program Initiated in 2001?

- Combining sewage and stormwater can cause havoc in basements during larger storms
- The FDD Program's goal was to remove that risk



# FDD Target Areas

**FDD program targeted five areas with the most frequent sanitary basement backups**





# SSWWE Purpose and Objectives

- Evaluate the effectiveness of the FDD program using data-based approach
  - 10-years passed
  - Reaching end of 5 study areas
  - Need was identified in the CIP
- Assess future risk of basement backups
- Evaluate alternatives and set direction for addressing basement backup risks



# Public Engagement

- Conducted 4 public meetings, 16 CAC meetings & 3 subcommittee meetings
- CAC attendance averaged 10-12 participants
- CAC members displayed remarkable dedication to their task over a very long period of time, and their work was greatly appreciated
- Developed and maintained project library web site with all documents, CAC's on-line discussions, and videos of meetings. Located at: [www.a2gov.org/SSWWE/Library](http://www.a2gov.org/SSWWE/Library)



## Major Findings

# Sanitary Sewer Wet Weather Evaluation

# Summary Results

- FDD program significantly reduced the risk of basement backups in the target areas
- Additional mandatory FDDs no longer required in target areas
- Five potential future problem areas outside the original five target districts
- WWTP has capacity to serve existing and future system needs
- Results of Public Engagement & Citizen Survey on previous FDD Program

# Sample FDD Evaluation Results

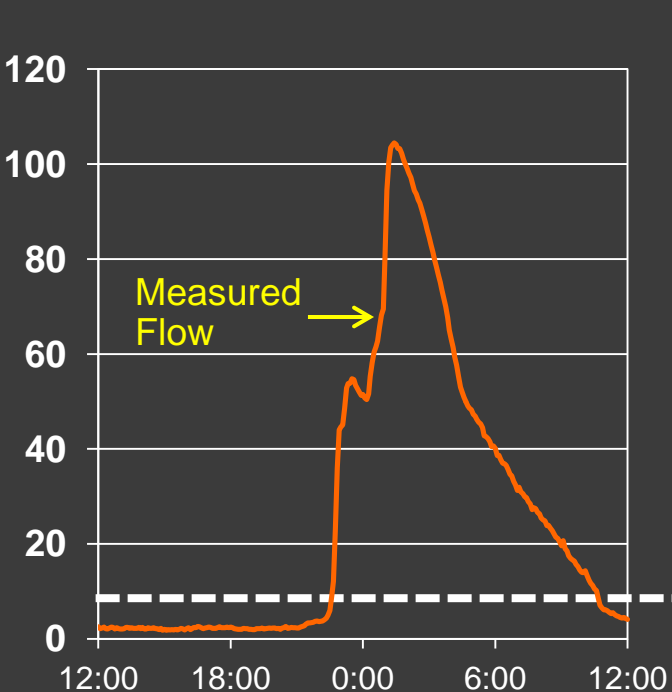
## 2000: No FDDs

June 25, 2000

2.9 inches of rain

0.5-inch peak hour

peak flow level of 104 inches



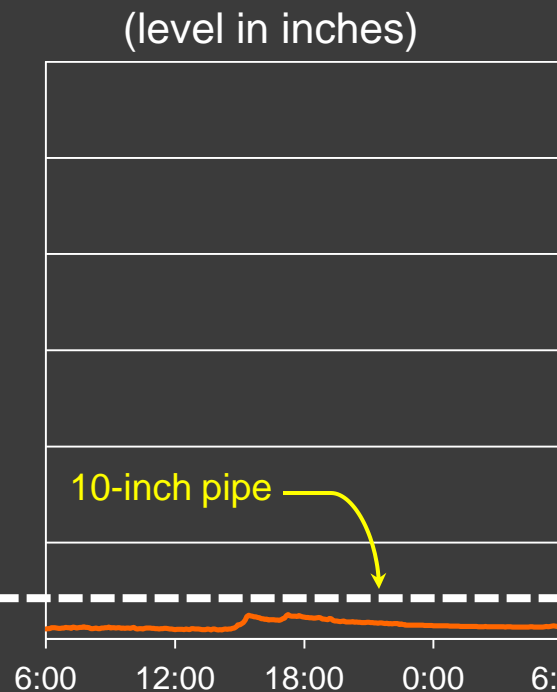
## 2013: FDD 99% Complete

June 27, 2013

2.6 inches of rain

1.7-inch peak hour

peak level of 5 inches

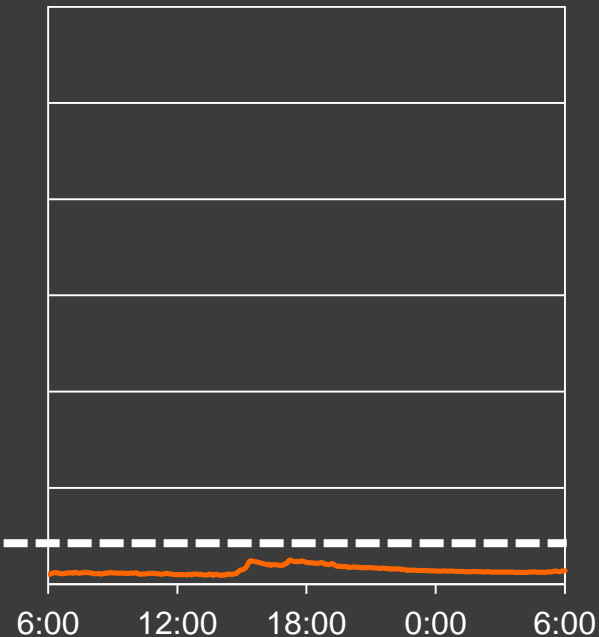


August 12, 2013

3.0 inches of rain

1.6-inch peak hour

peak level of 3.3 inches

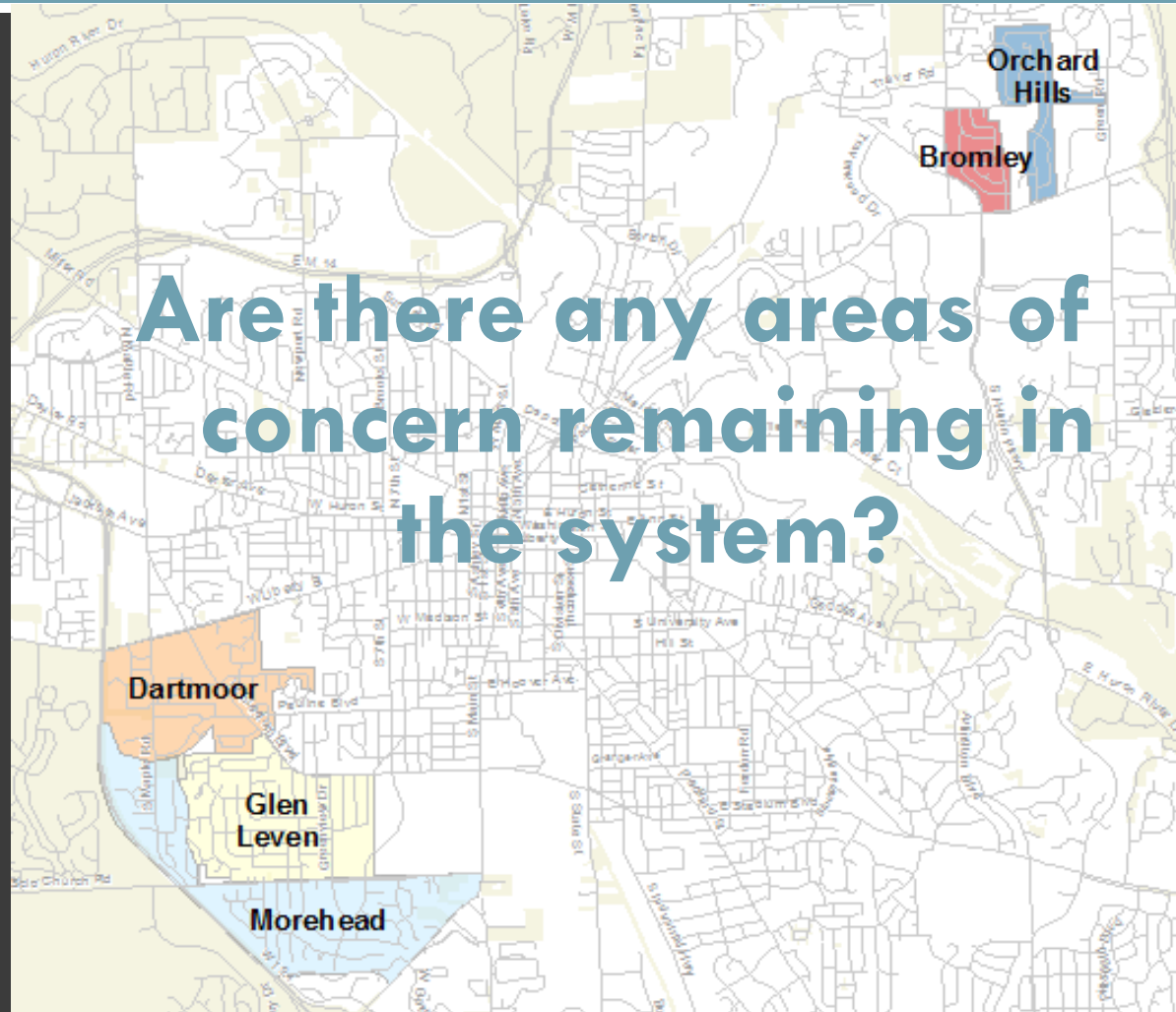


# Meter Data FDD Evaluation Results

Meter District	Percent of FDDs Completed	Flow Removed	Reported June Basement Backups	
			2000	2013
Orchard Hills	99%	77%	9	0
Bromley	99%	68%	4	1*
Morehead	63%	65%	17	0
Dartmoor	89%	40%	10	0
Glen Leven	56%	17%	12	0
(Flow removed is average from 3 methods)			52	1*

\* Determined not to be caused by the City system.

# Hydraulic Capacity Assessment



**A:**  
Huron West Park

**B:**  
High Level-  
1st Street

**Preliminary Modeled Flow Analysis  
(Modeled Likelihood of Flow  
Reaching Pipe Capacity)**

**Legend**

Low  $h/D < 0.8$   
Medium  $0.8 \leq h/D < 1$   
High  $h/D \geq 1$

 Waste Water Treatment Facility

**E:**  
Glen Leven

**C:**  
High Level-  
State & Hoover

**D:**  
Pittsfield Valley

Ann Arbor  
Waste Water  
Treatment Plant

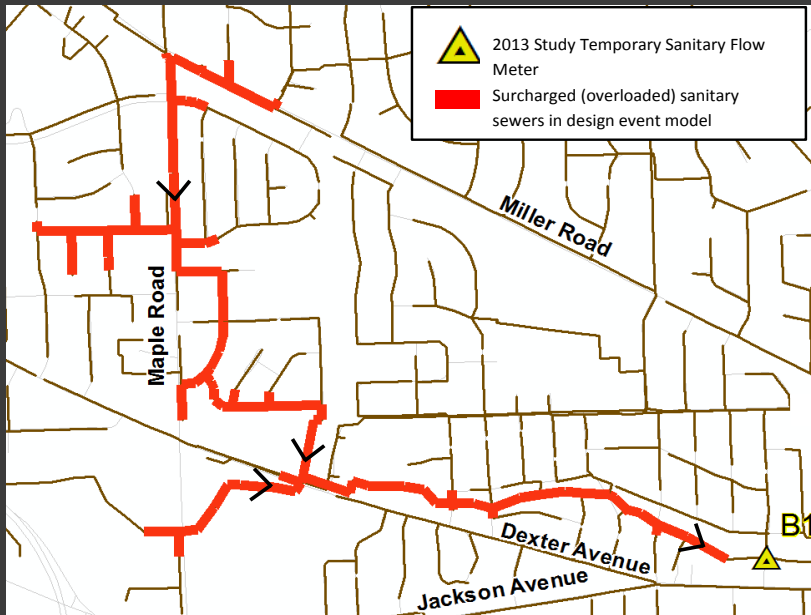
CITY OF ANN ARBOR  
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# Five Action Plans Identified

## Project Area (A) Huron/ West Park



## Sanitary Model Background

1. Existing sanitary sewer model was calibrated to downstream sanitary meter (B1) using metering data. Sanitary flow distribution upstream of this meter in the current model is as identified in previous (2002) model.
2. Sanitary model includes sanitary sewer infrastructure updates performed by the City since the development of the original sanitary model (2002).

## Observations

- 1- Sanitary sewer model shows sanitary flows that exceed the sanitary sewer pipe capacities as identified in the adjacent figure, resulting in modeled surcharging as high as ~15 ft. above the sanitary sewer bottom.
- 2- The City had previously recognized this as a problem area and constructed a relief sanitary sewer downstream of meter B1. Further work was planned but extent of improvements needed was yet to be identified.
- 3- The City complaint data (sanitary sewer backup report) does not show reported sanitary backups in this area.

Therefore, we do not have high confidence in the surcharging identified by the sanitary sewer model and recommend action items listed below before making significant capital investments.

## Suggested Action Plan for Further Investigation

### Tasks Associated with Project

1. Identify locations for additional temporary sanitary metering and other data collection (e.g. video inspection) in order to better understand actual sanitary system performance.
2. Perform temporary sanitary flow metering and data collection.
3. Revise sanitary model based on findings.
4. Re-run sanitary model for design event to identify deficiencies.

### Expected Outcome

1. Sanitary flow metering and data collection report.
2. Revised sanitary sewer model.
3. Proposed plan to address sanitary sewer deficiencies, including capital improvements to be included in the City's capital improvement plan.

- **Estimated investigation cost:** less than \$100,000
- **Estimated timeline to complete:** approximately 8 months

# Wastewater Treatment Plant

- The WWTP has adequate capacity to handle existing and future flow
- No recommendations are made for capacity improvements at the WWTP





# SSWWE Project Recommendations

- Perform the tasks outlined in the five action plans
- Install a series of permanent flow meters in critical areas to track long-term system performance
- Formalize and execute an asset management program for the sanitary system

The CAC unanimously supported these recommendations

# Developer Offset Mitigation (DOM)

- Because there are still areas of concern in the system, DOM should continue
- Modify DOM program based on CAC recommendations
- Periodically revisit and review the program

# Major Findings

## FDD Program

# FDD Survey

The survey was conducted at the request of the CAC to:

- Document Problems
- Identify Common Issues
- Develop Recommendations

2350 Surveys mailed; 850 responses plus many comments

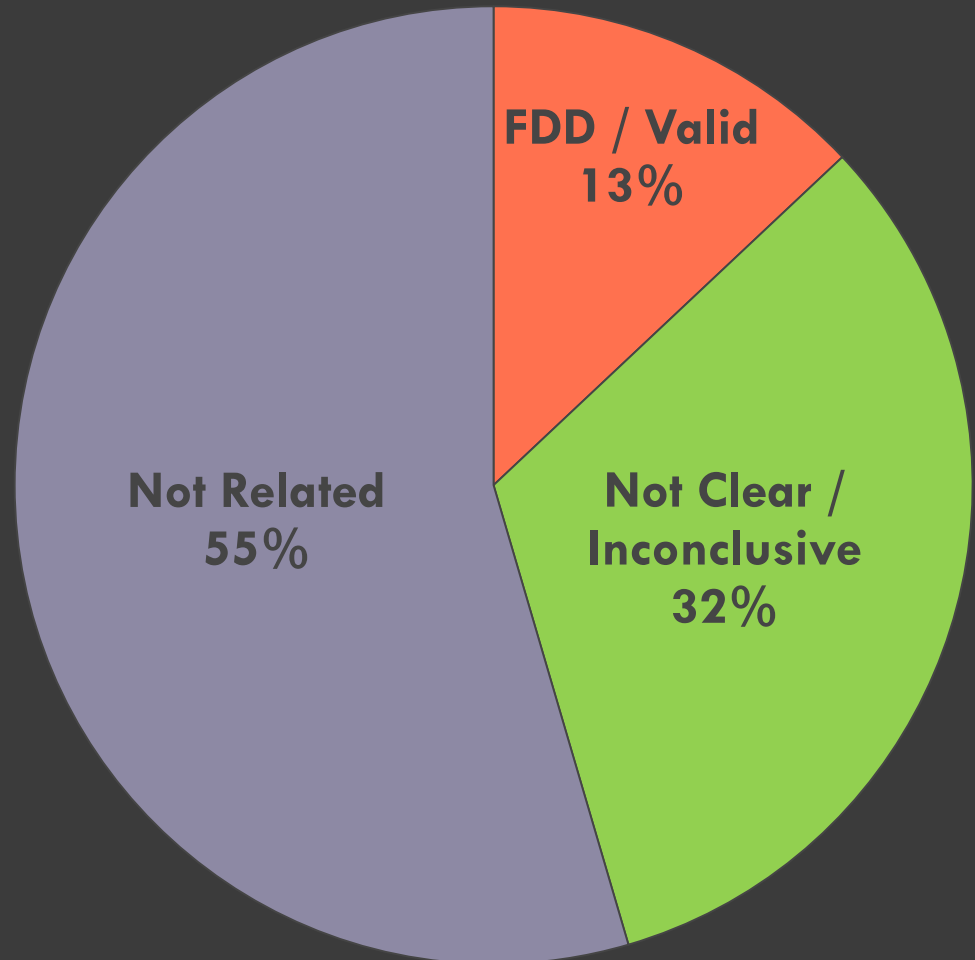
# Survey Follow-up Results

## Question:

What caused complaint of water in basement?

## Answer:

<b>FDD</b>	<b>10</b>
<b>Not Clear</b>	<b>25</b>
<b>Not FDD</b>	<b>42</b>
<b>Total</b>	<b>77</b>



# CAC Recommendations on FDD

- Any future FDD should be voluntary, with modifications from previous program (best practices)
- Initiate a program to correct problematic installations and educate citizens on operating and maintaining their sump pumps
- Include task to explore different rate classes in future rate study
- Support for seniors and economically disadvantaged residents

# CAC Recommendations on FDD, continued

## Additional CAC Recommendations:

- Provide backup systems
  - ▣ Financially not feasible
- Pay damages claimed to result from problematic installations
  - ▣ Claim process exists to receive and review claims
  - ▣ No claims for problematic installations submitted to date

# Next Steps

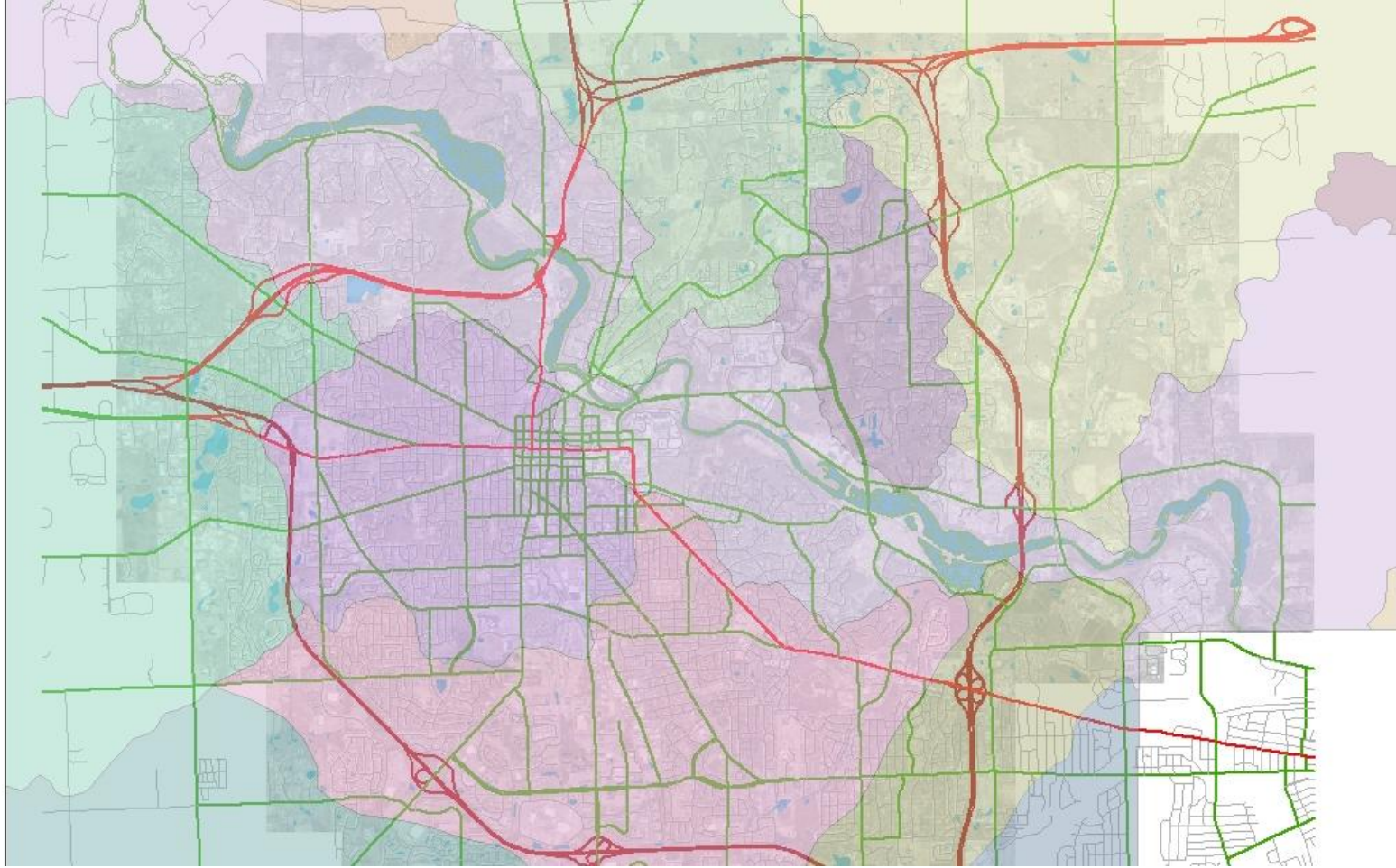


# Near Term Initiatives

- Initiate a program to correct problematic installations from the FDD program
- Make modifications to DOM Program
- Proceed with analysis of 5 areas of concern
- Include analysis of equitable rate structure in next rate study



Questions?



# Citywide Stormwater Model Calibration Project

Troy Baughman, PE

# Topics of Presentation

- Background & Purpose
  - ▣ Public Engagement
- Major Findings
- Next Steps
- Questions





# Background & Purpose

# Team Overview

- City of Ann Arbor
- CDM Smith
- Bridgeport Consulting
- Stormwater Advisory Group (SWAG)
- Citizen Storm Corps





# Project Background

- 2007-2008 project
  - ▣ Inventory of Stormwater System/GPS data collection
  - ▣ Creation of Stormwater GIS and base model



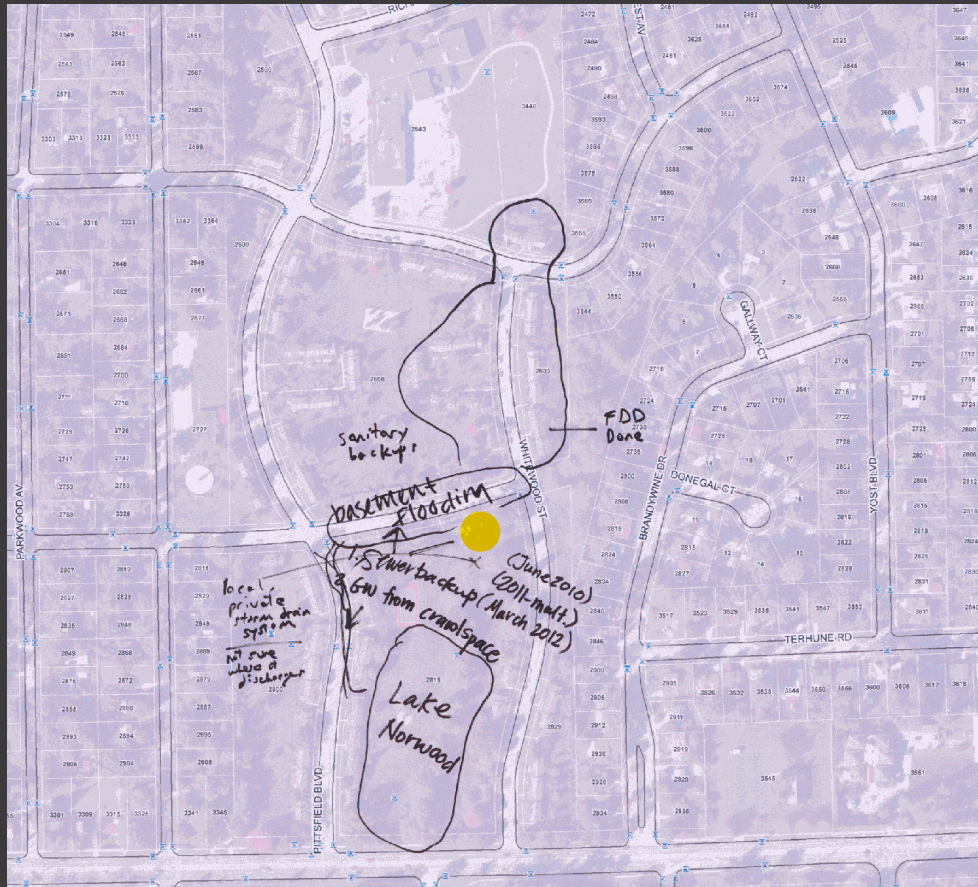
# Project Purpose

- 2012-2015 project
  - ▣ Calibrate city-wide stormwater model
  - ▣ Additional public engagement and awareness on stormwater management issues
  - ▣ Evaluation of existing stormwater system performance
  - ▣ Recommendations for improvements





# Public Engagement - Neighborhood Meetings



- 7 meetings held in 2013
- Approximately 150 attendees
- Discussed flooding issues on street/parcel level
- Gathered resident input on historical flooding areas
- Identified participants in Citizen Storm Corps

# Public Engagement

- Stormwater Survey
  - ▣ 295 Respondents
- Reached out to Business Community
- Stormwater Advisory Group
  - ▣ Huron River Watershed Council
  - ▣ Creekshed Groups
  - ▣ University of Michigan
  - ▣ Residents

# Monitoring Period/Data Collection

- 15 flow meters & 12 rain gauges
- 42 Surface Gauges  
(Citizen Storm Corps)
- Excellent wet season  
for monitoring!





# Major Findings

# Major Findings

- Majority of City meets current Design Standard Level of Service
  - ▣ 10% Chance Storm (2.9", 12-hr rainfall)
- Allen/Malletts – Flooding Predicted for 10% Storm
  - ▣ Some Areas Flood in 20% Chance Storm (1.4", 1-hr rainfall)





# Major Findings

- 16 Study Areas – Evaluated for Improvements
  - ▣ Prioritized based on flooding frequency and severity
  - ▣ Alternatives included – BMPs; Regional Storage; Pipe Upsizing
  - ▣ Over \$268,000,000 in Recommended Improvements to address the 10% chance storm
    - Note: Lower Allen Creek long-term strategy has a cost in excess of \$230,000,000



# Summary of Improvements

Site	Watershed	Recommendation	Cost Estimate
1. Lower Allen Creek – Main Branch	Allen	Combination	\$230 M-\$320M
2. Edgewood/Snyder	Allen	Conveyance-Storage	\$4.1M
3. Park Place Apartments	Allen	Conveyance	\$1.0M
4. Churchill Downs	Malletts	Conveyance-Storage	\$16M
5. S. University/E. University	Allen	BMP-Storage	\$3.6M
6. Mulholland Drive	Allen	Storage	\$2.4M
7. Scio Church/S. Seventh	Malletts	BMP-Storage	\$2.4M
8. Glendale/Charlton	Allen	Storage	\$1.2M
9. Glen Leven	Allen	Further Study Needed	--
10. Church St./Cambridge	Malletts	No Further Action	--
11. Village Oaks/Chaucer Ct.	Malletts	Storage	\$1.2M
12. Parkwood/Pittsfield Village	Malletts	Storage	\$0.5M
13. Signature Drive	Malletts	Conveyance	\$0.2M
14. S. Industrial/Packard Rd.	Malletts	No Further Action	--
15. Traver/Barton	Traver	Conveyance	\$0.2M
16. Glendale Circle/Virginia Park	Allen	BMP-Storage	\$5.1M

# Major Findings

## ■ Validated Citywide Stormwater Improvement Strategies

### ■ Green Streets

- Infiltration, Bioswales, etc.

### ■ Rain Garden Programs

### ■ Stormwater Compliance for Redevelopment Sites

- Commercial/multi-family properties

- School or University properties







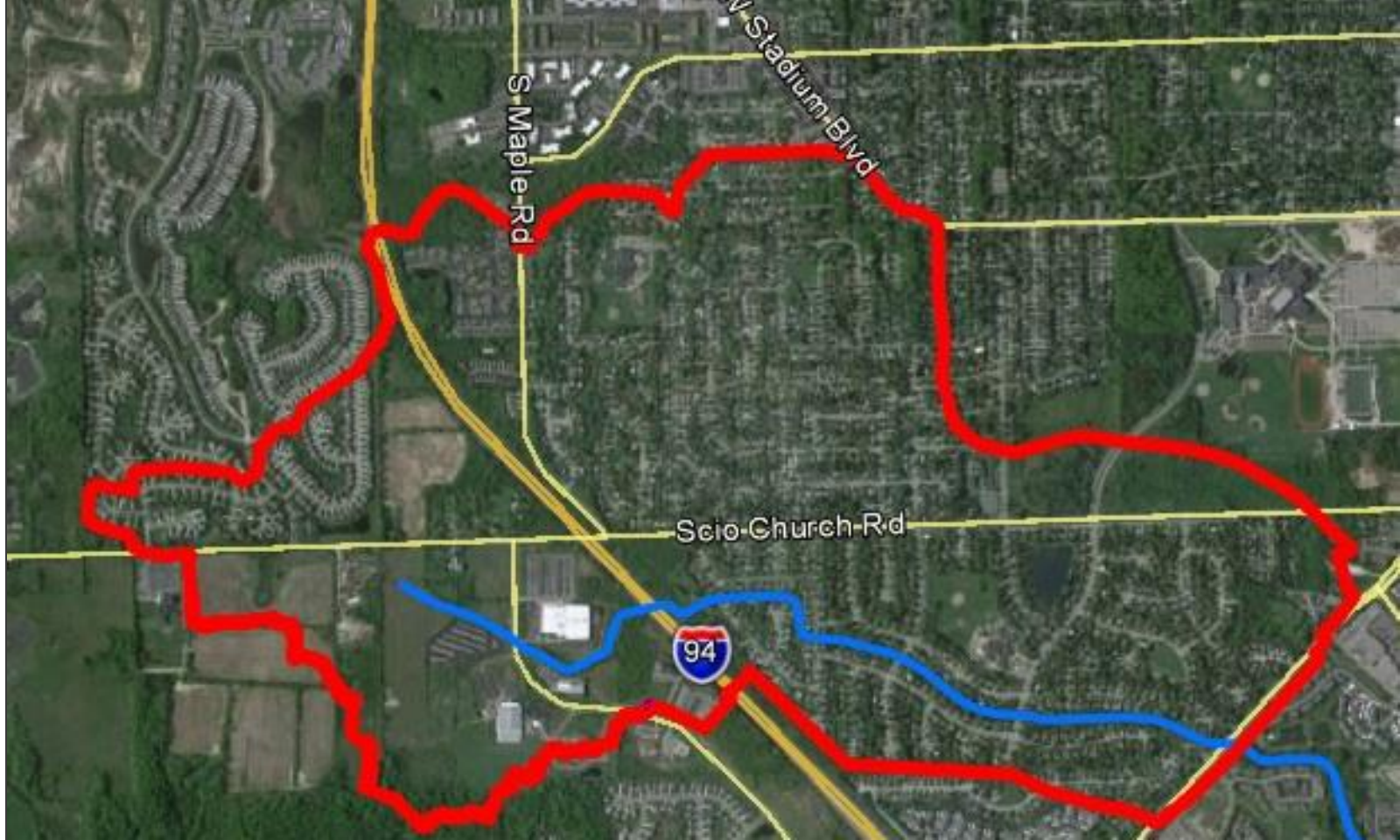
# Next Steps

# Next Steps

- CIP consideration
  - ▣ These recommended projects will be considered in next CIP process
  - ▣ Will be prioritized relative to all other stormwater needs across the City.
- Sufficient funding is presently **unavailable** for these projects.



Questions?



## Upper Malletts Stormwater Conveyance Study

Jennifer Lawson, CSM

# Topics of Presentation

- Background & Purpose
  - ▣ Public Engagement
- Major Findings
- Next Steps
- Questions



# Background & Purpose

# Team Overview

- Washtenaw County Water Resources Commissioner's Office (WCWRC)
- City of Ann Arbor
- Spicer Group
- Truscott Rossman
- Citizen Advisory Group (CAG)



# Background

- March 15, 2012 Rain Event
  - ▣ Hit the SW part of the City the hardest
- City Council passed Resolution R-12-373
  - ▣ Directed staff to work with the WCWRC to evaluate and identify opportunities for stormwater improvements in the Lansdowne area





# Purpose:

“To evaluate and identify opportunities for conveyance and stormwater improvements in the Churchill Downs and Lansdowne sub-watershed areas that may be necessary or appropriate to provide, improve and restore stormwater management and water quality protection functions within the drainage district.”

# Study Goals (determined through the public engagement process)

- Reduce probability of flooding during an event equal to the March 15, 2012 by improving stormwater management
- Identify cost of implementation per level of service
- Avoid adversely impacting downstream interests
- Maintain and/or enhance water quality
- Create long-term sustainability

# Design Goal (determined through the public engagement process)

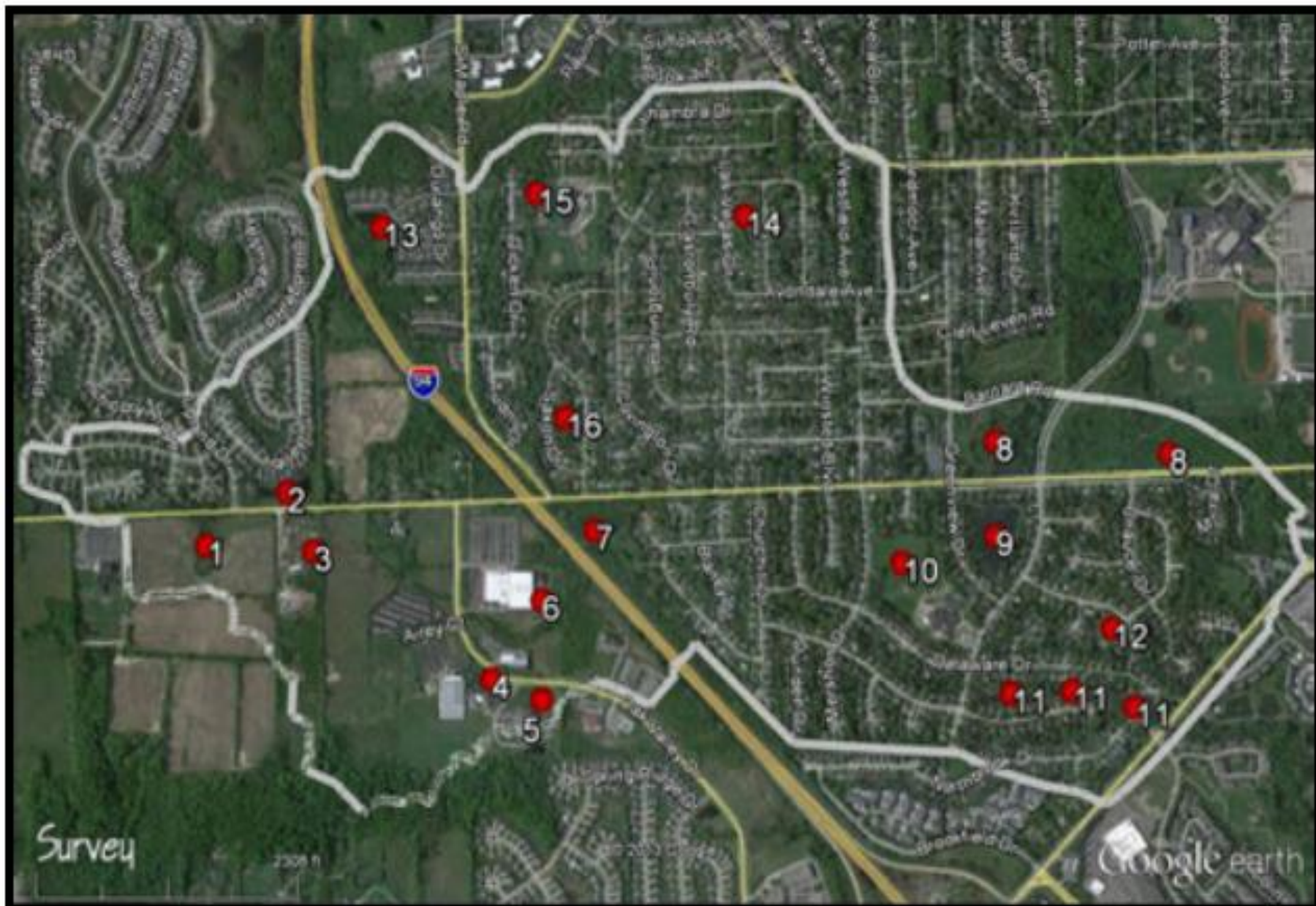
- Established Level of Service to address the March 15, 2012 storm event.
- Beyond the City of Ann Arbor's current level of service for a 10% Chance Storm (2.9", 12-hr rainfall)

# Public Engagement

- Citizen Advisory Group
  - ▣ Residents within the study area
- 6 Public Meetings from January 2013 to January 2014
- Stakeholders were also offered the option of having the project team visit their property to view historical flooding information and the impact of flooding on their property.
  - ▣ Fifteen individual homeowners were interviewed and their input was invaluable to accurately calibrate the model



# Major Findings



**Figure I-1: Screened Detention Locations**

# Major Findings



Complete elimination of flooding  
from all rain events is impossible.

# Major Findings

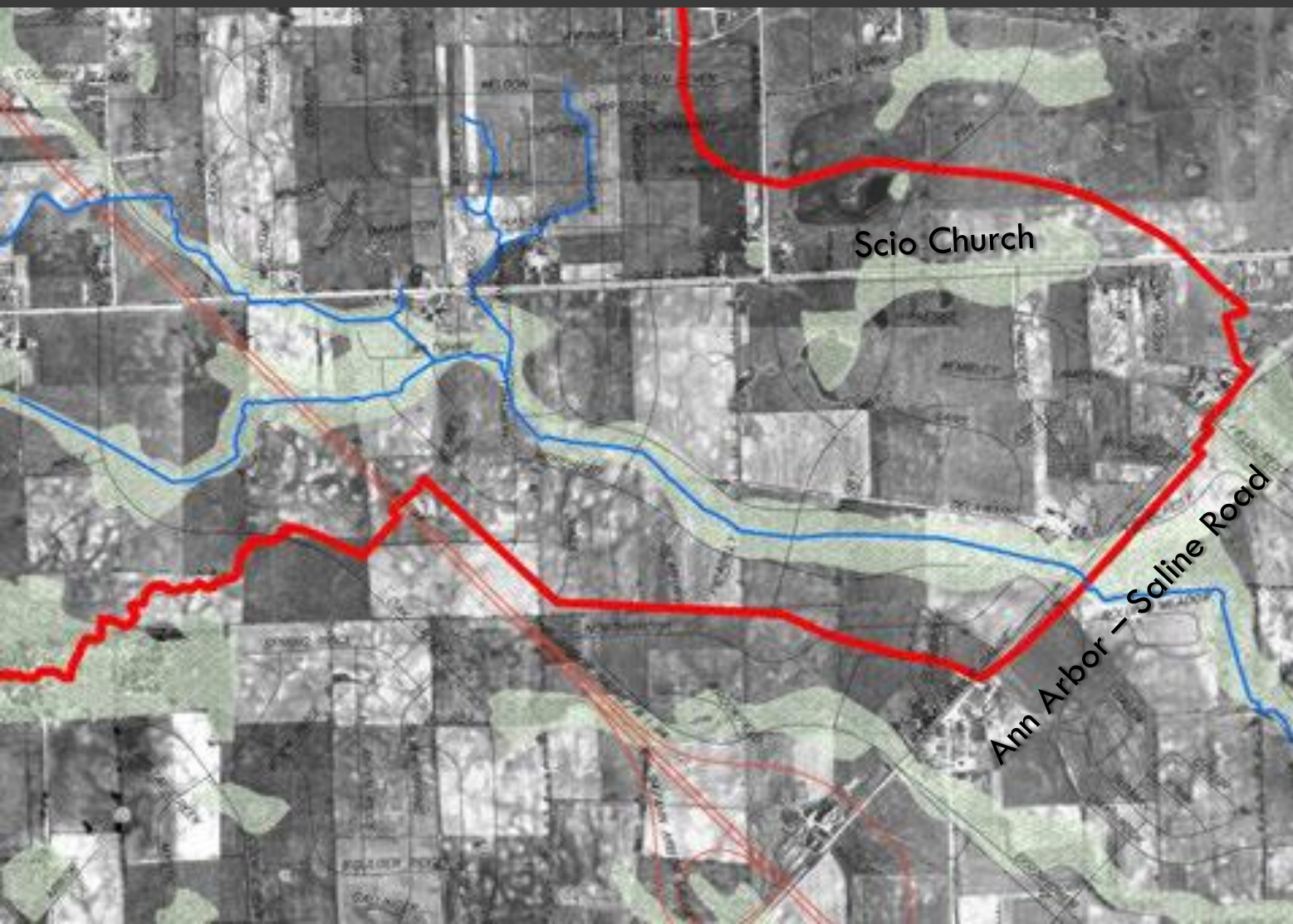
- The WCWRC and the City completed cleaning and storm sewer inspection of an estimated 65,000 feet of storm sewer ranging in size from 12" to 72" within the watershed.
- The storm sewer system was found to be in good condition and generally functioning properly.



# Major Findings

- A blockage of the 42" diameter inlet pipe west of Wiltshire Boulevard was likely a major contributing factor to the flooding experienced on March 15, 2012.
  - ▣ Corrective measures were completed
- The County worked with Pittsfield Township to resolve long-standing deficiencies with a large detention basin in Pittsfield Township.

# Major Findings



1947 Aerial



# Major Findings



**Building Footprints**

# Recommended projects

- \*\*\*to mitigate surface flooding in an event similar to the March 15, 2012 storm include:
  - ▣ Project A – Eisenhower Park - (\$2.1M)
  - ▣ Project B – Pioneer High School - (\$1.17M)
  - ▣ Project C – Lawton Park - (\$5.16M)

# Project A (\$2.1M)



Construct two detention basins in Eisenhower Park. The two basins together are 2.5 acres in size.



# Project B (\$1.17M)



Construct a detention basin along the north side of Scio Church Road just east of South Seventh Street.

# Project C (\$5.16M)

Scio Church

Construct an underground detention basin along the eastern edge of Lawton Park along with a new storm sewer under Scio Church Road and Mershon Drive.



## Next Steps



# Next Steps:

- Projects A, B and C are currently included in the City's CIP.
  - ▣ These recommended projects are prioritized relative to all other stormwater projects across the City.
- Sufficient funding is presently **unavailable** for these projects.



Questions?



## Looking Ahead

Cresson Slotten, PE

# Looking Ahead

- Implementation of these recommendations will span decades
  - ▣ Particularly stormwater management improvements
    - Scale of work and funding limitations
- Recommendations being incorporated into the CIP process and programmed along with other system needs

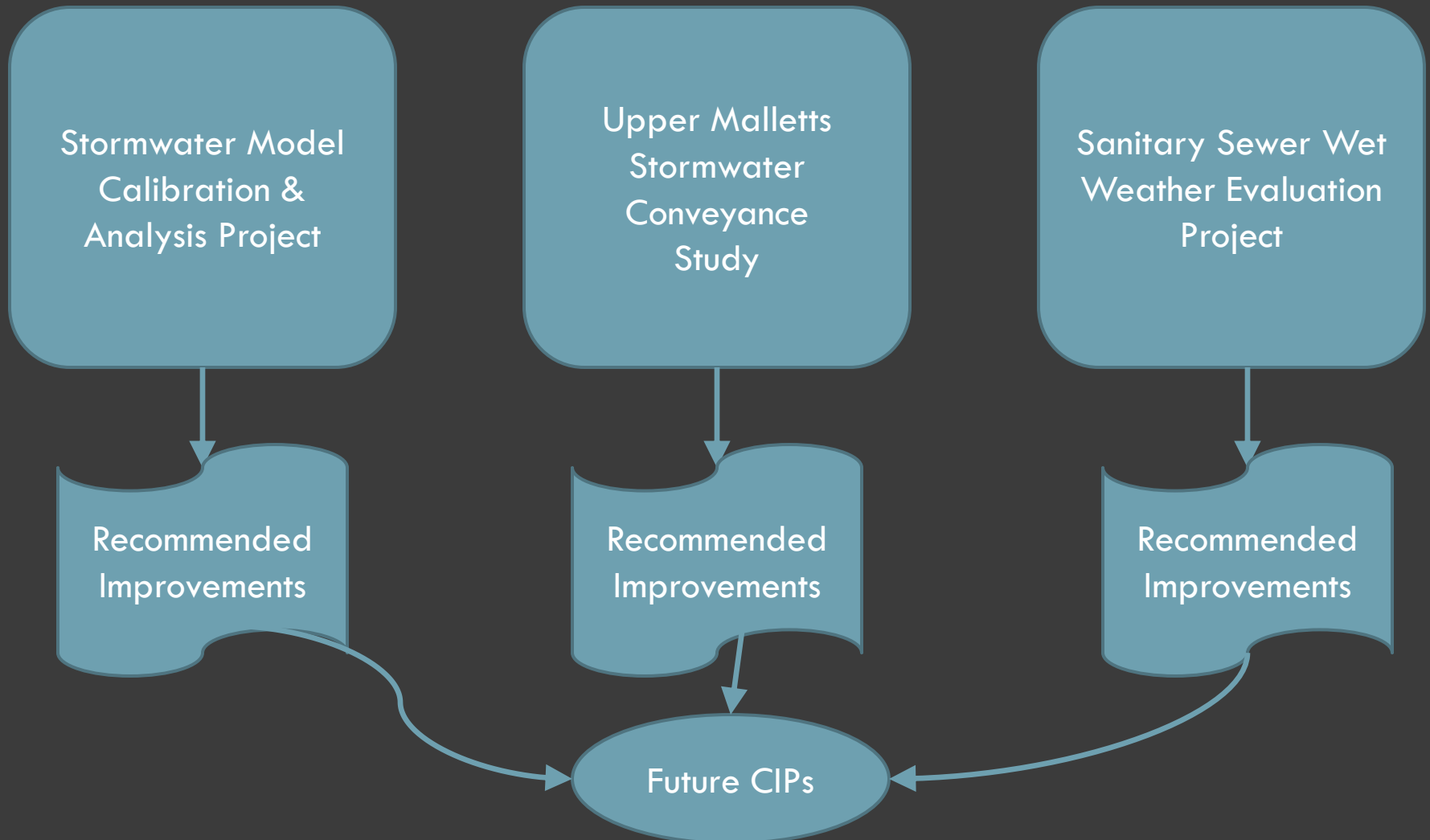
# CIP and related projects

## Capital Improvements Plan Project Revenues Summary By Category

ProjectID	Project Name	Prioritization Model Rank		Prior	Funding (in thousands) *							Beyond	
				Years	2016	2017	2018	2019	2020	2021	2022	Total	
Utilities - Sanitary Sewer													
UT-SN-01-09	Facilities Renovation	1	TOTALS	\$118,520.00	\$3,760.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$122,280.00	
UT-SN-16-05	High Level/State & Hoover: SSWWEP Project Area C	2	TOTALS	\$0.00	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$100.00	
UT-SN-16-04	High Level/1st Street Sanitary: SSWWEP Project Area B	3	TOTALS	\$0.00	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$100.00	
UT-SN-14-06	Sanitary Sewer Lining Projects	4	TOTALS	\$2,250.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$0.00	\$11,250.00	
UT-SN-16-13	High Level Trunkline Sanitary Sewer Rehabilitation	5	TOTALS	\$0.00	\$0.00	\$0.00	\$1,000.00	\$1,000.00	\$1,000.00	\$0.00	\$0.00	\$3,000.00	
UT-SN-16-12	Sanitary Manhole Lid and Casing Sealing Program	6	TOTALS	\$0.00	\$300.00	\$300.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$600.00	
UT-SN-16-07	Glen Leven Sanitary: SSWWEP Project Area E	7	TOTALS	\$0.00	\$20.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$20.00	
UT-SN-16-06	Pittsfield Valley Sanitary: SSWWEP Project Area D	8	TOTALS	\$0.00	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$100.00	
UT-SN-02-11	Wet Weather Mitigation (Long Term)	9	TOTALS	\$15,945.00	\$1,300.00	\$3,500.00	\$3,500.00	\$0.00	\$2,500.00	\$2,500.00	\$0.00	\$29,245.00	
UT-SN-03-29	Southside Interceptor Rehabilitation	10	TOTALS	\$5,370.00	\$2,000.00	\$1,600.00	\$1,600.00	\$1,600.00	\$0.00	\$0.00	\$0.00	\$12,170.00	
UT-SN-10-05	Manhole Rehabilitation/Replacement Project	11	TOTALS	\$600.00	\$275.00	\$0.00	\$275.00	\$0.00	\$275.00	\$0.00	\$0.00	\$1,425.00	
UT-SN-16-15	WWTP Asset Management Plan	12	TOTALS	\$0.00	\$400.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$400.00	
UT-SN-14-01	Glen/Fulter Diversion	13	TOTALS	\$300.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$300.00	
UT-SN-16-11	Sanitary Sewer Collection System Asset Management Plan	14	TOTALS	\$0.00	\$1,200.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,200.00	
UT-SN-16-03	Huron/West Park Sanitary: SSWWEP Project Area A	15	TOTALS	\$0.00	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$100.00	
UT-SN-06-01	Valhalla Sanitary Sewer Service Extension	16	TOTALS	\$110.00	\$0.00	\$0.00	\$0.00	\$1,190.00	\$0.00	\$0.00	\$0.00	\$1,300.00	
UT-SN-14-05	Lift Station Repair/Replacement Program	17	TOTALS	\$0.00	\$700.00	\$500.00	\$500.00	\$500.00	\$0.00	\$0.00	\$0.00	\$2,200.00	
UT-SN-10-11	2780 Packard Sanitary Extension	18	TOTALS	\$0.00	\$0.00	\$320.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$320.00	
UT-SN-10-13	2857 Packard Sanitary Extension	19	TOTALS	\$0.00	\$0.00	\$175.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$175.00	

\*Funding is rounded to the nearest thousands

# Wet Weather Projects



# Looking Ahead

- Continue to seek opportunities through other projects
  - ▣ Replace/rehab aging lines during road reconstructions
  - ▣ Continue sanitary and storm sewer lining programs
- Updated, detailed models available for decision making

# Looking Ahead

- Asset Management
  - ▣ Flood-proofing covers
  - ▣ Lining and replacing manholes
  - ▣ Undertaking broad examination of storm & sanitary AM programs





Questions/Discussion

# Questions/Discussion

- What happens when it rains?
- Sanitary Sewer Wet Weather Evaluation Project (SSWWE)
  - ▣ [www.a2gov.org/SSWWE](http://www.a2gov.org/SSWWE)
- Stormwater Model Calibration & Analysis Project (SWM)
  - ▣ <http://www.a2gov.org/departments/systems-planning/water-resources/stormwater-model-project/Pages/default.aspx>
- Upper Malletts Stormwater Conveyance Study
  - ▣ [http://www.ewashtenaw.org/government/drain\\_commissioner/project-status/uppermalletts](http://www.ewashtenaw.org/government/drain_commissioner/project-status/uppermalletts)
- Looking Ahead



□ Thank you for your time and attention