City of Ann Arbor

Sanitary Sewer Improvements
Preliminary Engineering (SSIPE) Project

Neighborhood Public Meeting
December 5, 2017
Welcome & Introduction

Brian Slizewski
Team Overview

• City of Ann Arbor:
  – Brian Slizewski – Project Manager
  – Troy Baughman – Modeling and Data Support

• Technical and Public Engagement Consultants:
  – Robert Czachorski, Consultant Project Manager
  – Mackenzie Johnson, Engineering Analysis
  – Lori Byron, Public Engagement
Meeting Outcomes

- Background on sanitary sewer system and previous projects
- Overview of the SSIPE project
- Findings in your neighborhood
- Next steps
Project Background

Troy Baughman
Definitions – Stormwater System

• **Storm sewer** conveys most of the stormwater runoff from buildings and streets.

• **Catch basin** is a part of a storm drain that is designed to trap debris so that it cannot enter the drainage pipes.

• **Roof drains** convey storm water from the roof to the storm sewer or retaining area.
Definitions – Sanitary Sewer System

- **Sanitary sewer** conveys domestic and commercial sewage, as well as some groundwater and stormwater that finds its way into the system.

- **Footing drain** drain pipes beneath a structure to drain ground water away.

- **Basement backup** the backup of flow from the sanitary pipe into a basement.
Property owner is responsible for the **footing drains, cleanout** and **sanitary sewer lateral connection**, all the way until it taps into the **sanitary main**.
Ann Arbor’s Sanitary Sewer System

360+ Miles of sewer pipes

Decade of construction

Allen School Area
Wet Weather Projects

- Sanitary Sewer Wet Weather Evaluation Project
- Footing Drain Disconnection Program
- Stormwater Model Calibration and Analysis
- Upper Malletts Drainage Study
- Sanitary and Stormwater Systems Asset Management Plan

PLUS: continuous annual sewer maintenance and improvements (sewer televising, sewer cleaning, manhole repair, sewer lining, etc.)

- Green Streets Program
Wet Weather Projects

Sanitary Sewer Wet Weather Evaluation Project – 2013-2014

Sanitary Sewer Improvements Preliminary Engineering Project – 2016-2017

Capital Improvements Program funded construction projects (if needed) – 2019 or later
Wet Weather Projects


Sanitary Sewer Improvements Preliminary Engineering Project – 2016-2017

Capital Improvements Program funded construction projects (if needed) – 2018 or later
Sanitary Sewer Wet Weather Evaluation (SSWWE)

SSWWE project objectives:

• Evaluate the overall capacity of the sanitary sewer collection system
• Evaluate the past Footing Drain Disconnection (FDD) program and assess the future risk of sewer backups in the City
• Recommended methods to further reduce wet weather impacts to the sanitary sewer system
SSWWE Project Findings

SSWWE project looked at the sanitary sewer across the entire city and found five areas with potential capacity issues *during wet weather*, including the Allen School expansion area.

These five areas are being analyzed in depth, as the **Sanitary Sewer Improvements Preliminary Engineering (SSIPE) project.**
Wet Weather Projects

Sanitary Sewer Wet Weather Evaluation Project – 2013-2014

Sanitary Sewer Improvements Preliminary Engineering Project – 2016-2017

Capital Improvements Program funded construction projects (if needed) – 2018 or later
SANITARY SEWER IMPROVEMENTS PRELIMINARY ENGINEERING PROJECT

The goal of the Sanitary Sewer Improvements Preliminary Engineering (SSIPE) Project is to find the cause of five observed hydraulic issues in Ann Arbor and to determine the best solution for each area, based on community values, cost and effectiveness. The project also includes an operational improvement, Area F, the Diversion Structure, to divert flow from one area of the system to another.

Project Areas

A  Huron West Park Trunkline
B  High Level Trunkline (near 1st Street)
C  High Level Trunkline (near State/Hoover)
D  Pittsfield Valley
E  Winsted Lateral (Glen Leven Area)
F  Diversion Structure

Contact: Brian Slizewski, Project Manager  (734) 994-2493  bslizewski@a2gov.org

Public Engagement

Flow metering
CCTV Review
Manhole Inspections
Smoke Testing
Basement Elevation Surveys
Wet Weather Observation

Analyse Field Data
Model Update
Preliminary Engineering
Public Input & Solution(s) Determination
Capital Improvement Programming for Construction

2016
Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2017
Sanitary Sewer Improvements
Preliminary Engineering Project

Project goals:

1. Use field engineering techniques to determine if capacity issues exist.

2. Analyze field data and determine the cause of the capacity issues.

3. Determine the best solution for the area, based on public input and solution effectiveness.
Arbor Woods Area

SSWWE project’s computer modeling showed that some sanitary sewer pipes are overloaded during wet weather.
Arbor Woods Area

Questions and field investigation tools:
Q1: Is the computer model reflecting what’s happening in real world? (Flow metering)
Q2: Are residents seeing impacts of overloaded pipes? In what areas? (Resident survey)
Q3: Where are the flows coming from? (CCTV, manhole inspection, smoke testing)
Inflow & Infiltration (I&I)

How stormwater groundwater gets into the sanitary sewer system

**Infiltration:**
- Connected footing drain
- Broken sewer lateral
- Root intrusion into lateral
- Cracked or broken pipe

**Inflow:**
- Roof drain connection
- Uncapped cleanout
- Storm cross-connection
- Deteriorated manhole
I&I: Potential Sources

• Pipe Defects
• Manhole Defects
• Smoke Testing Sources (uncapped cleanouts, connected catch basins, roof drains)
• Connected Footing Drains
Field Investigation

• Resident Survey
• Flow Metering
• Sanitary Sewer Evaluation
  – CCTV
  – Manhole inspection
  – Smoke testing
Sanitary Sewer Improvements
Preliminary Engineering Project

Mackenzie Johnson
Field Investigation

- **Resident Survey**
- Flow Metering
- Sanitary Sewer Evaluation
  - CCTV
  - Manhole inspection
  - Smoke testing
Resident Survey

- 500 surveys mailed
  Sep 12, 2017
- 10 questions
- 111 responses
- 22% response rate
Resident Survey Findings

- 53% have a full basement
- 14% experienced sanitary sewage basement backups in the last 10 years
- 30% experienced basement flooding (groundwater or stormwater) in the last 10 years
- 34% have their private service leads cleaned or rodded every 1-5 years
Resident Survey Findings

A few respondents mentioned tree roots in the system.

Several experienced backups until private service leads were replaced.
Field Investigation

- Resident Survey
- **Flow Metering**
- Sanitary Sewer Evaluation
  - CCTV
  - Manhole inspection
  - Smoke testing
Field Investigation

Flow Metering: A flow meter is a device used to measure the flow rate of liquid moving through the sanitary sewer pipe. Field technicians installed flow meters at various locations in the area.
Flow Metering – Aug. 16, 2016
Arbor Woods Area Field Investigation

- Sanitary Sewer Evaluation
  - CCTV
  - Manhole inspection
  - Smoke testing
Sanitary Sewer Evaluation - CCTV

Closed Circuit Television (CCTV) is a technology used to inspect pipes in the sewer system. A small robotic device with a television camera is run through the sewer main to locate and identify sources of water entering the system, such as leaks, cracks, and broken pipe.
Pipeline Condition Grading System

• Defects within a pipe are graded based on the severity of the defect

• Scale ranges from Grade 1 to Grade 5 with a Grade 5 defect being the most severe
# Pipeline Condition Grading System

## Grade 4 defects
- Fracture Multiple (FM)
- Broken Pipe (B)
- Root Ball at a Joint (RBJ)
- Infiltration Runner (IR)

## Grade 5 defects
- Deformed Pipe (DR)
- Surface Damage Missing Wall (SMW)
- Infiltration Gusher (IG)
- Broken Soil Visible (BSV)
Grade 4 Defect Examples

Broken Pipe (B)
Grade 4 Defect Examples

Infiltration Runner (IR)
Grade 5 Defect Examples

Broken Soil Visible (BSV)
Map of Spot Issues Found

Orange = Grade 4 Defects

Purple = Grade 5 Defects
Arbor Woods Area Field Investigation

• Sanitary Sewer Evaluation
  – CCTV
  – Manhole inspection
  – Smoke testing
Sanitary Sewer Evaluation – Manhole Inspection

Field crews locate and collect information on manholes, their depth and condition.
Sanitary Sewer Evaluation – Manhole Inspection
Arbor Woods Area Field Investigation

- Sanitary Sewer Evaluation
  - CCTV
  - Manhole inspection
  - Smoke testing
Sanitary Sewer Evaluation – Smoke Testing

Smoke testing is a method to find ways that groundwater and stormwater are entering the sanitary sewer system.

A non-toxic mist travels throughout the system, identifying problems such as leaks, connected downspouts or roof drains.
Sanitary Sewer Evaluation – Potential Sources

Cleanout
Sanitary Sewer Evaluation – Potential Sources

Manhole Cone Wall
Sanitary Sewer Evaluation – Potential Sources

Ground
Smoke Testing Results

Yellow = Cleanout

Purple = Manhole Cone

Red = Ground

Orange = Manhole Frame Seal
Footing Drains

- Approximately 500 parcels in the Arbor Woods area
- Estimated 302 connected footing drains
- Estimated 25 footing drains disconnected through the Developer Offset Mitigation (DOM) program
- Estimated 169 homes with no basements (no footing drains)
Footing Drains

- Connected
- Disconnected through DOM

- Approximately 302
- 25
Inflow & Infiltration Water Budget

A water budget shows the components that make up the inflow and infiltration (I&I) in a system. In this project, the I&I sources are:

• Manhole defects
• Pipe defects
• Smoke testing
• Connected footing drains
Manhole Defects: 3%
Pipe Defects: 10%
Smoke Testing: 1%
Connected Footing Drains: 86%
Basis for Modeling Scenario

Computer modeling of the system using design flows recommended by the 2013-2014 Sanitary Sewer Wet Weather Evaluation project’s Citizens Advisory Committee (CAC):

- 25 year event frequency
- + 10% additional flow (for climate change, growth, etc.)
- + system conditions observed in the field
Model Results
## Improvement Options

**Option A: Pipe bursting—upsize pipes with insufficient capacity**

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<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Total Length</td>
<td>2000</td>
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<tr>
<td>Cost per Linear Foot</td>
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<tr>
<td>Total Cost</td>
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## Improvement Options

**Option B: Disconnect footing drains**

Disconnect approximately 30% of connected footing drains to eliminate surcharging with the existing pipes.

<table>
<thead>
<tr>
<th>Number of FDD</th>
<th>Cost per FDD</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>100</td>
<td>$10,000-$15,000</td>
<td>$1.0 - $1.5 M</td>
</tr>
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</table>
Group Discussion of Options

Brian Slizewski
Small Group Activity

1. Review improvement options A & B
2. Review engineers’ pros and cons considerations
3. Pick one person from your group to scribe and report out
4. Discuss the engineers’ pros and cons, and your own with your group
Small Group Activity

Discussion questions:
• What are your questions about the problem?
• What are your questions about the options?
• What concerns do you have about the pros and cons listed by engineers?
• What are the pros and cons from your group?
Summary & Next Steps

Brian Slizewski
What’s Next

1. Ongoing maintenance – clean, repair pipes with structural defects
2. Fix inflow sources found via smoke testing and uncapped cleanouts
3. Voluntary Developer Offset Mitigation program
4. Capital Improvement Programming – if warranted, residents will be engaged prior to construction
Project updates: A2gov.org/SSIPE