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# An Innovative Approach to Emergency Response Planning

CES501695

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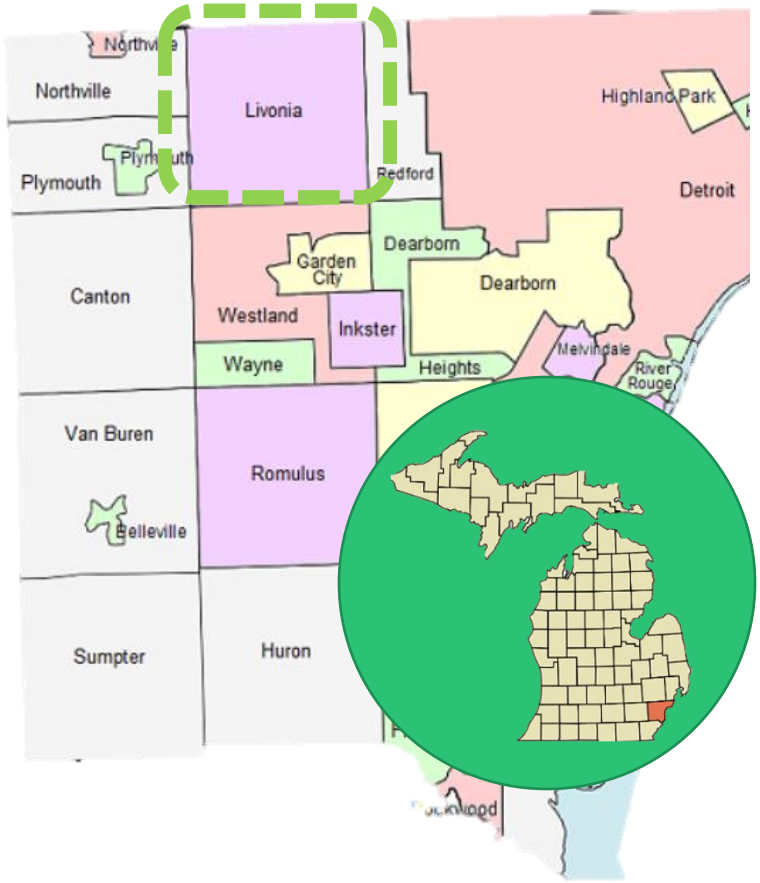
# City of Livonia, Michigan

- Located in Northwest Wayne County
- Michigan's ninth most populated municipality
- Approximately 36 square miles
- Population: 95,535

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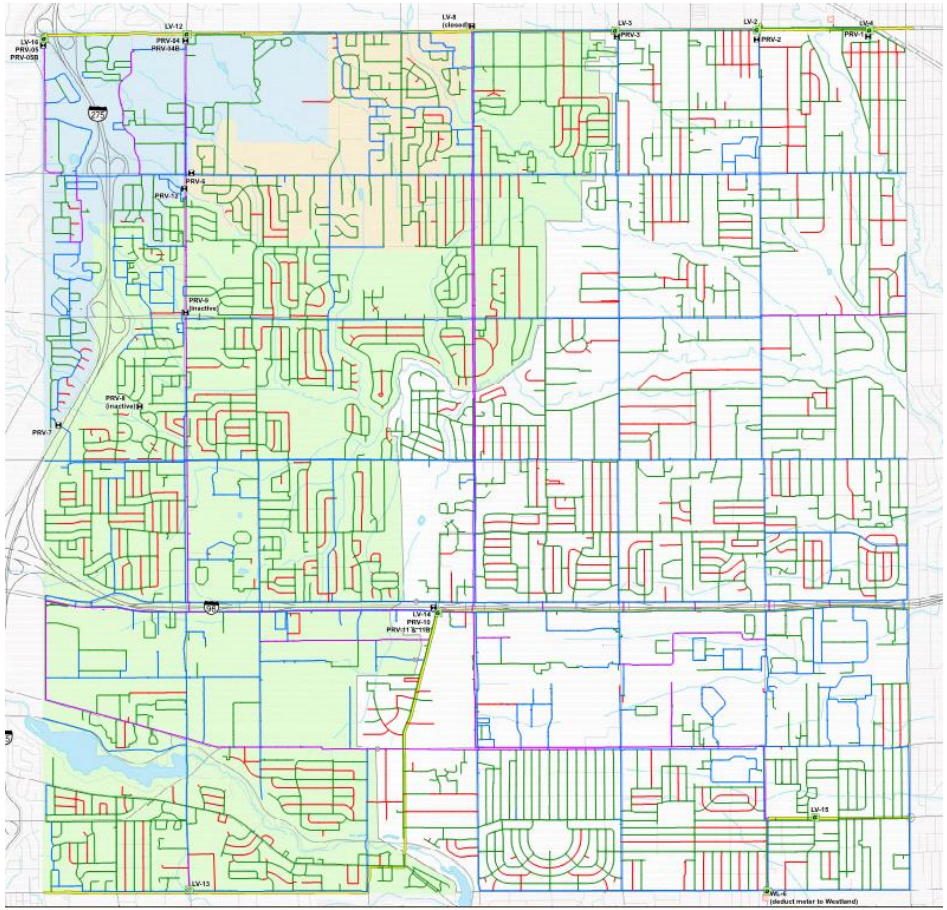
# Water System

- Approximately 485 miles of water main
- Diameter range: 6” to 36”
- Age range: 1920’s to present
- Material: cast iron, ductile iron, HDPE, concrete, and asbestos cement
- Purchases water from the Great Lakes Water Authority (GLWA)

| Demand Scenario | Demand (MGD) |
|---|---|
| Average Day | 11 |
| Maximum Day | 21 |
| Peak Hour | 29 |



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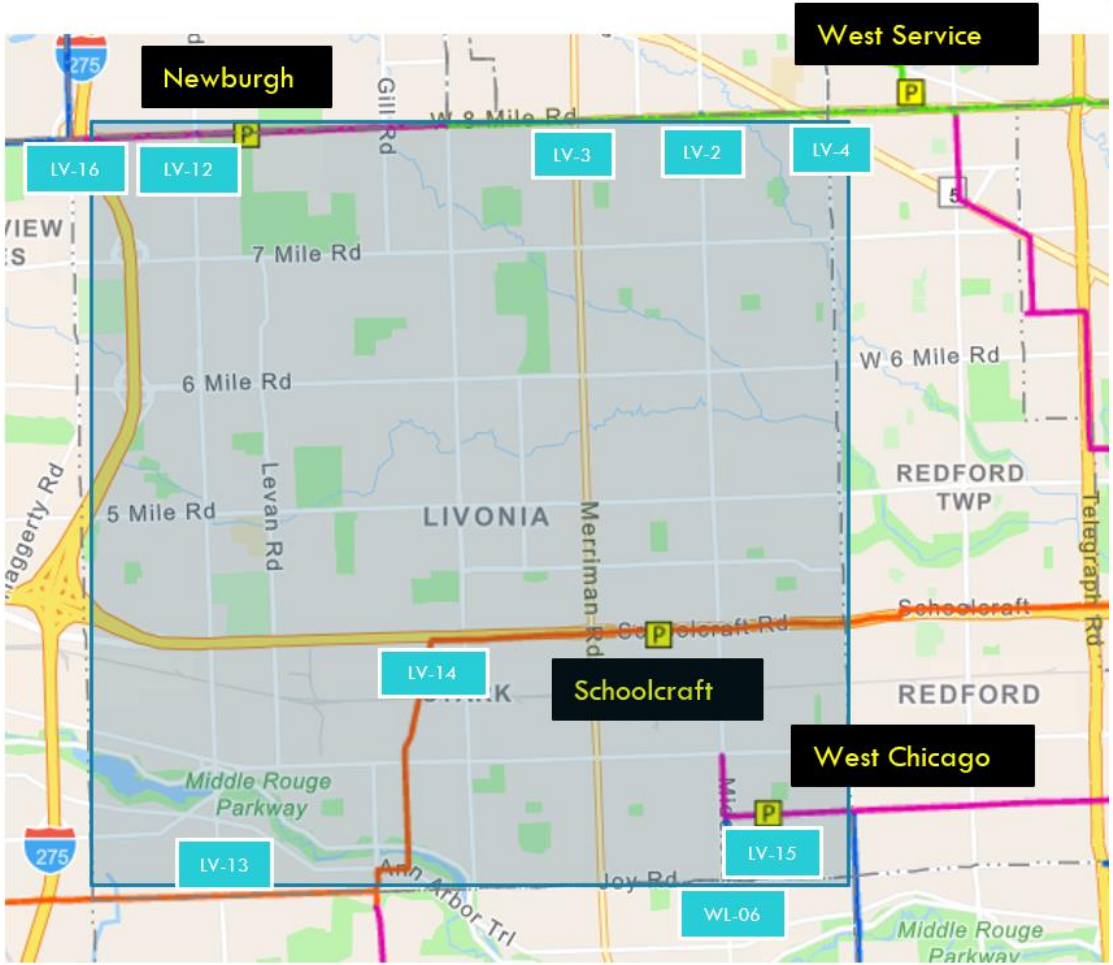
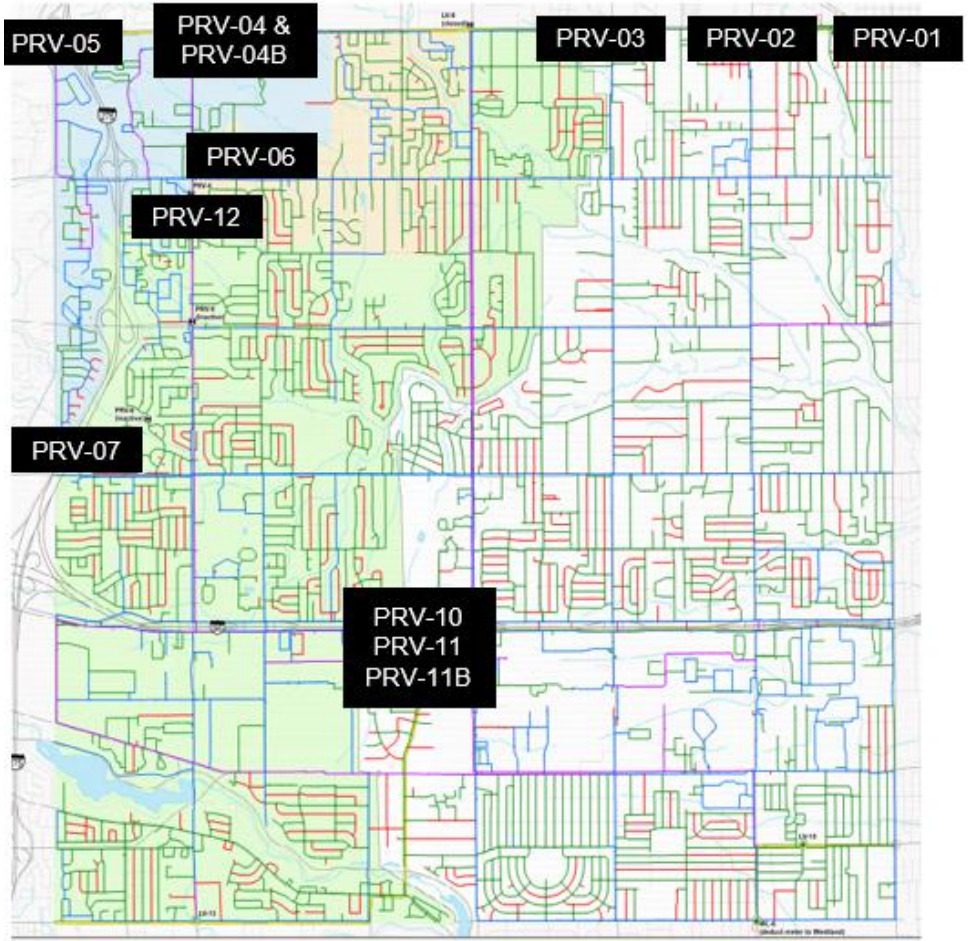
# GLWA System

- Newburgh Pump Station
- West Service Center
- Schoolcraft Pump Station
- West Chicago Pump Station
- Master Meter Feeds (8)
  - LV-02
  - LV-03
  - LV-04
  - LV-12
  - LV-13
  - LV-14
  - LV-15
  - LV-16



# Pressure Reducing Valves (12)

- PRV-01
- PRV-02
- PRV-03
- PRV-04 & PRV-04B
- PRV-05
- PRV-06
- PRV-07
- PRV-10
- PRV-11 & 11B
- PRV-12

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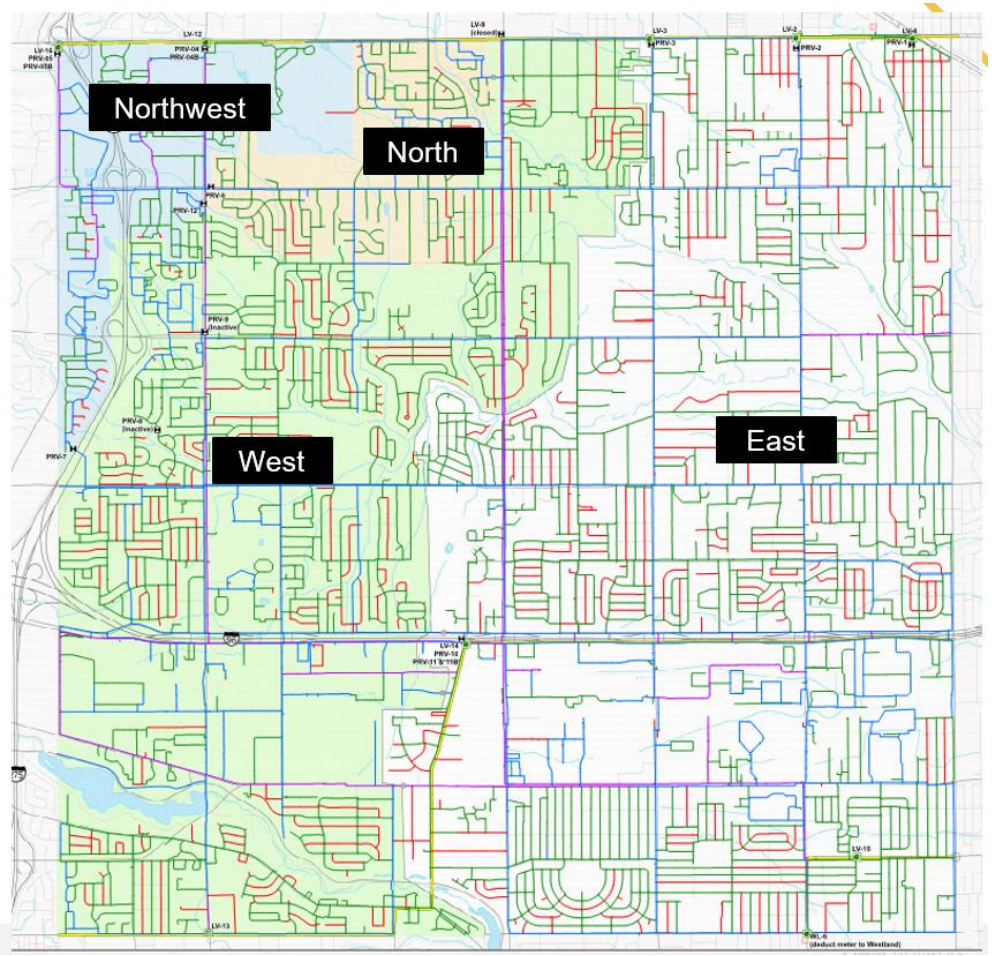
# Pressure Districts (4)

- North
- Northwest
- West
- East

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# Hydraulic Modeling History

?? (previous consultant) → 2010 (update) → 2018 (rebuild) → 2021 (conversion)

**WaterCAD**

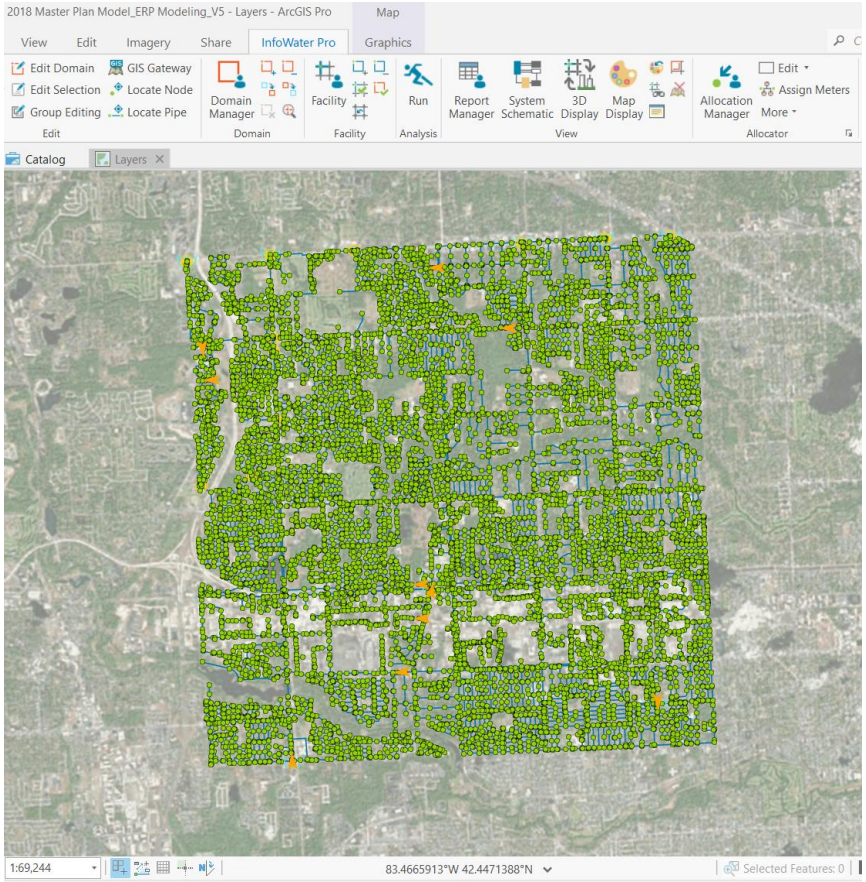
**H20MAP**

**InfoWater**

**InfoWater Pro**

# Hydraulic Model Usage

- Water master planning/capital planning
- Water main permitting – basis of design
- Pressure checks
- Fire protection checks
- System optimization
- ISO help
- Emergency help

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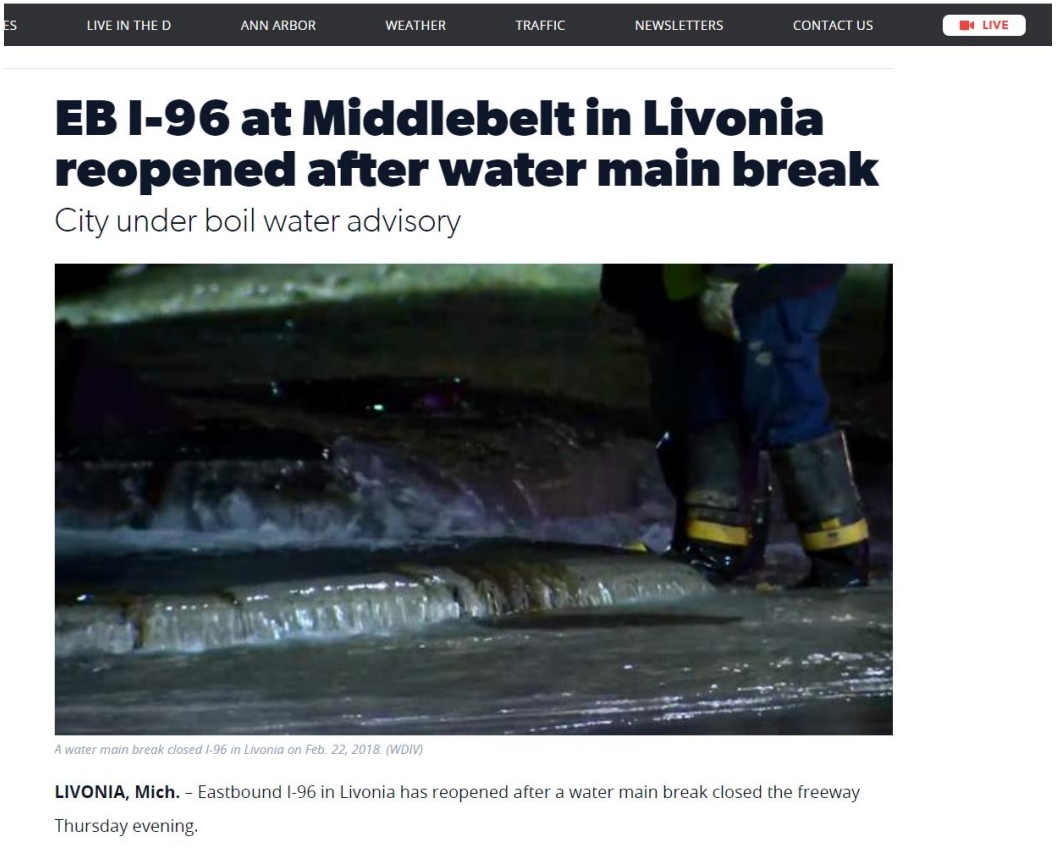
# Project Background

# LV-14 Master Meter Emergency

- 2/22/2018 – GLWA pressure surge
- Loss of LV-14 source
- Multiple WM breaks in city
- City wide boil water advisory
- EB I-96 closed



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## EB I-96 at Middlebelt in Livonia reopened after water main break

City under boil water advisory

*A water main break closed I-96 in Livonia on Feb. 22, 2018. (WDIV)*

**LIVONIA, Mich.** – Eastbound I-96 in Livonia has reopened after a water main break closed the freeway Thursday evening.

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Amber Ainsworth

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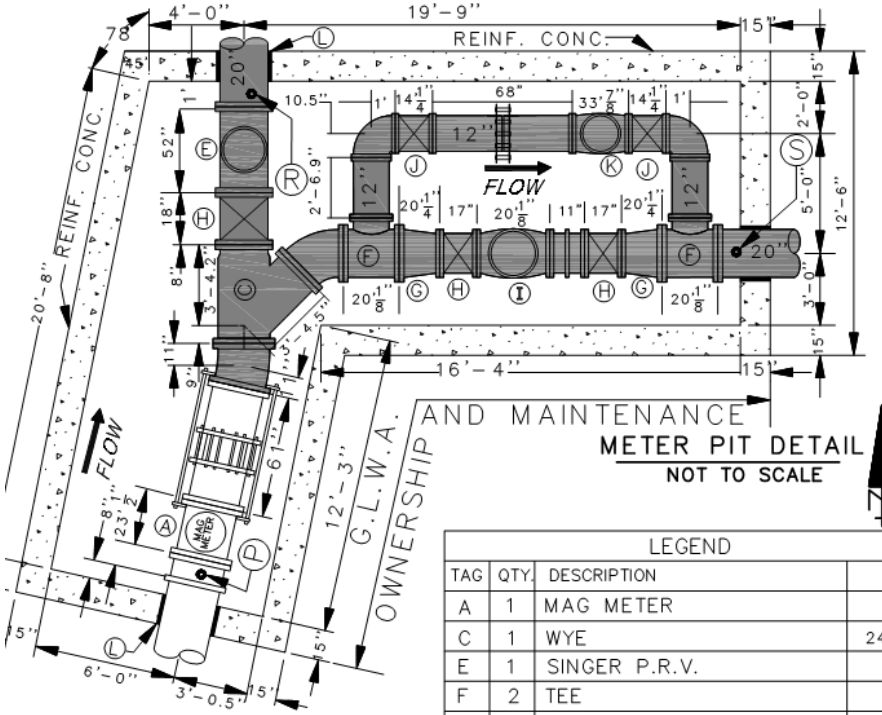
# EXHIBIT–A LV–14

## STARK & SCHOOLCRAFT

## CITY OF LIVONIA




METER PIT DETAIL

NOT TO SCALE

| LEGEND | | | |
|---|---|---|---|
| TAG | QTY. | DESCRIPTION | SIZE |
| A | 1 | MAG METER | 24" |
| C | 1 | WYE | 24"X20"X |
| E | 1 | SINGER P.R.V. | 20" |
| F | 2 | TEE | 20"X1 |
| G | 2 | REDUCER | 20"X1 |
| H | 2 | GATE VALVE | 16" |
| I | 1 | SINGER P.R.V. | 16" |
| J | 2 | GATE VALVE | 12" |
| K | 2 | SINGER P.R.V. | 12" |
| L | 3 | SLEEVES | – |
| | | | |

ITY OF LIVONIA O&M

AL PRESSURE LOSS THRU METER

| R TYPE | P.S.I. LOSS |
|---|---|
| URI | 1 To 2 |
| | 0 |
| INE | 4 – 6 |

# Reactive Response

**Generalized Communication**

- City Wide Boil Water Advisory
- Social Media Updates

**Critical User Impacts**

- Michigan Dairy: Production Impacts
- Medical Care Facilities
- Hotels

**Consultant Contact**

- Guidance
- Hydraulic Modeling Analysis Recommendations

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# AWIA and Enhanced ERP 2018

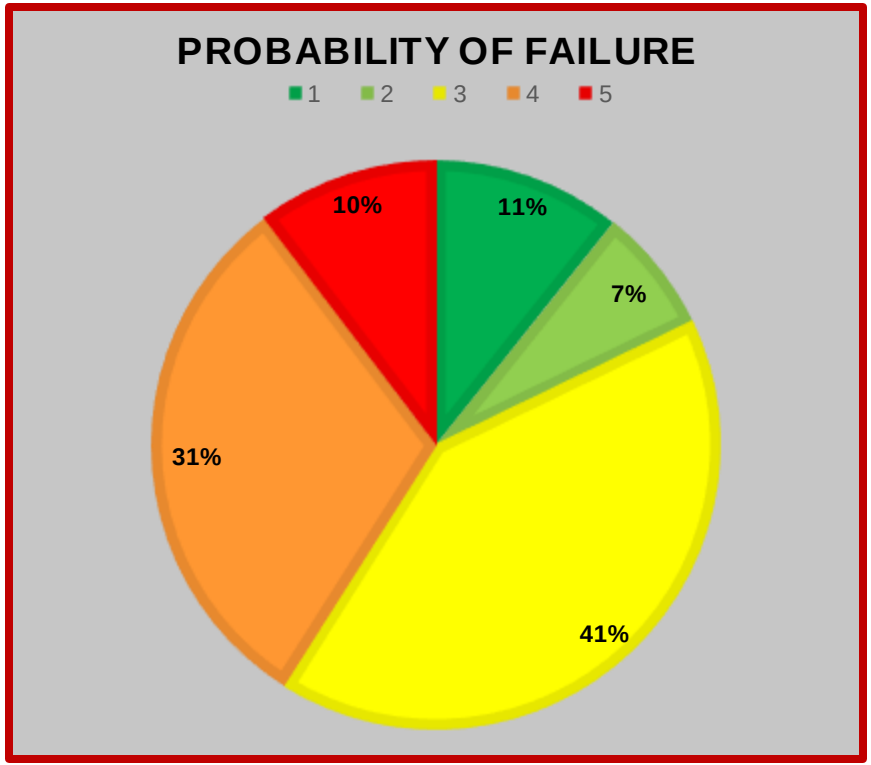
# AWIA 2018

- America's Water Infrastructure Act (AWIA) Became Law: October 2018
- EPA Requirement: Risk and Resilience Assessment (RRA) Must Be Prepared
  - Deadline for certification: December 31, 2020 (for population served between 50,000 and 99,999)
- Required Emergency Response Plan (ERP), 6 months after completing RRA
- Certify documents every 5 years

# Enhanced ERP

## City Challenges

- Aging assets
- Effective communication
- Detailed operational guidance
  - Emergency and planned disruptions
- Inexperienced workers



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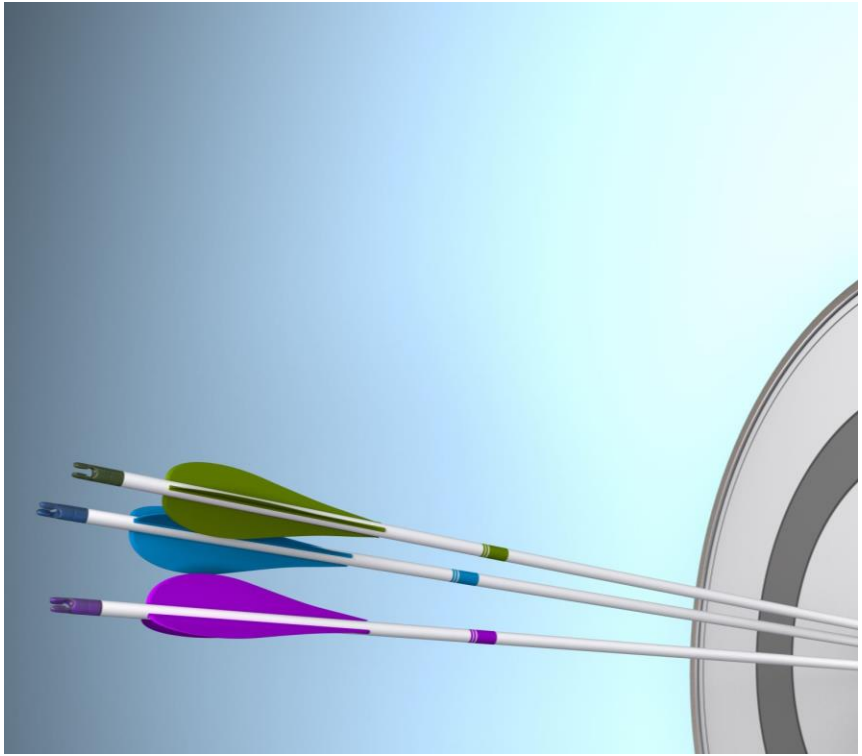
# Enhanced Emergency Response Plan

# Goals

- Improve communication strategy
- Understand and model potential service disruption scenarios
- Document service disruption scenarios
- Educated inexperienced staff



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# Critical Customers and Communication

Understanding ALL Critical Customers and Their Needs

- Minimum pressure requirements

Communication Improvement

Documented list of:

- Contact name
- Contact number
- Contact email address

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# Enhanced ERP Modeling

- Emergency/Unplanned scenarios: max day system demands
- Planned service disruption scenarios: average day system demands

**40+ Scenarios**

Loss of Master Meter Feeds

Loss of Key City Facilities

# Level of Service Goals

**Planned Service Disruptions**

**Emergency Service Disruption**

| 1 | 2 | 3 |
| --- | --- | --- |
| Strive to provide minimum desired pressure requirements at critical customers | Strive to provide 35 psi and above everywhere in the city's system | Strive to provide 20 psi and above everywhere in the city's system |

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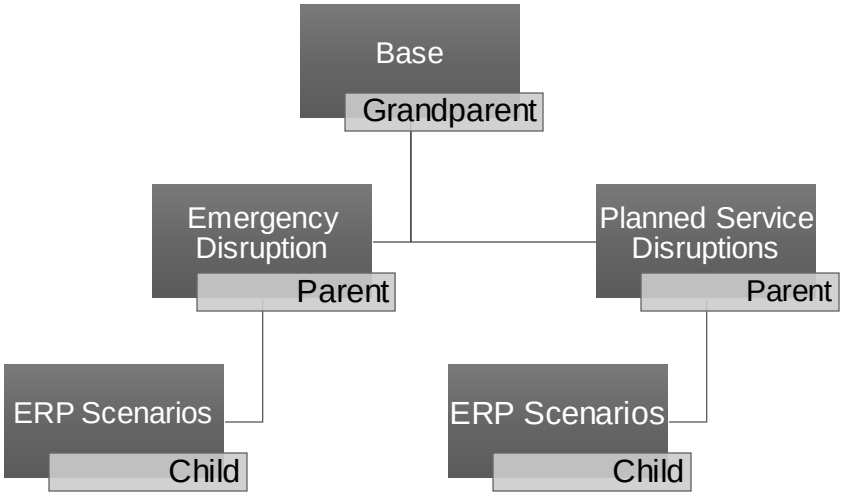
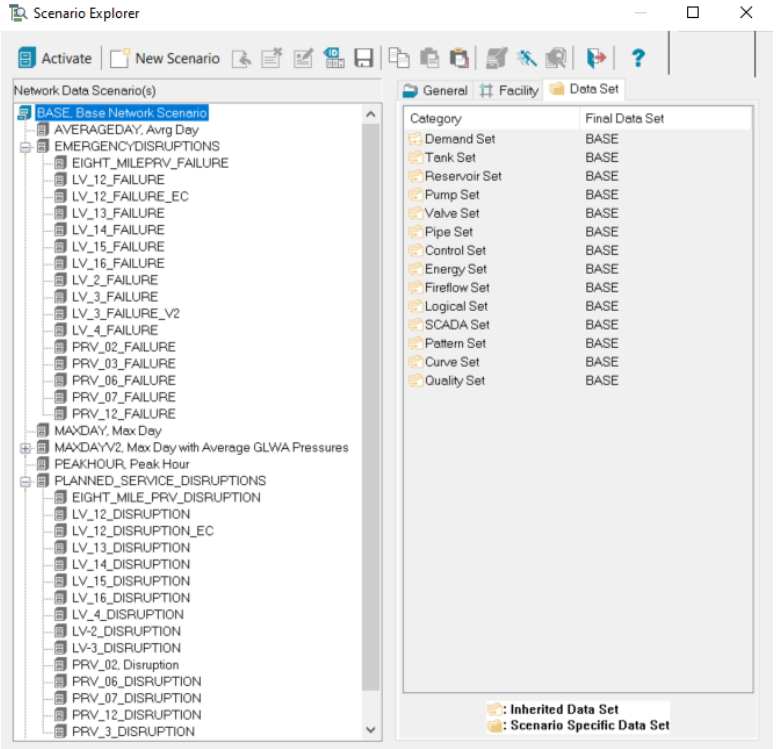
# Model Organization

## Scenarios

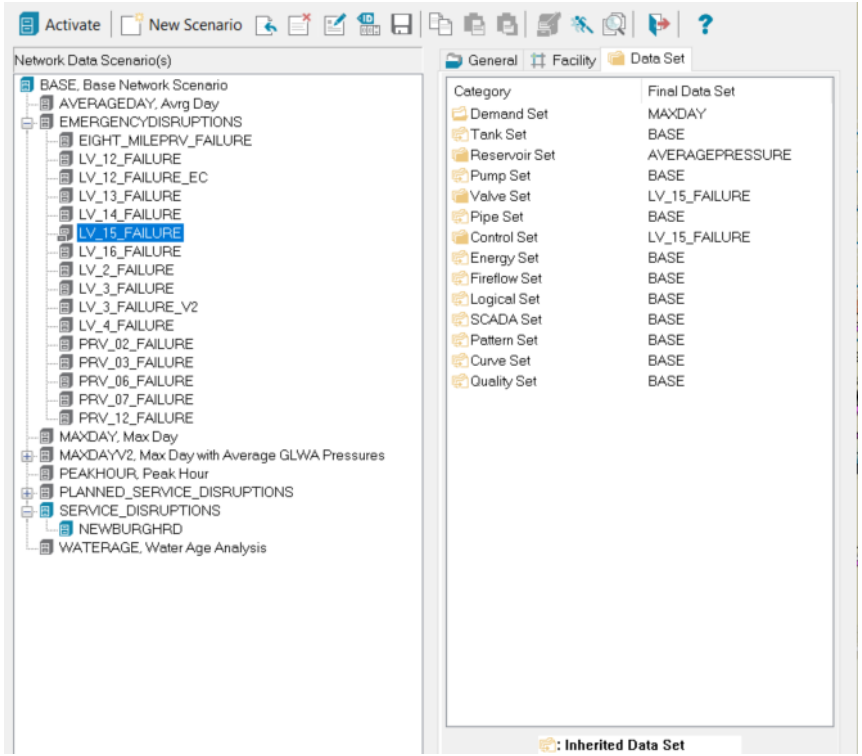


# Data Set Nomenclature

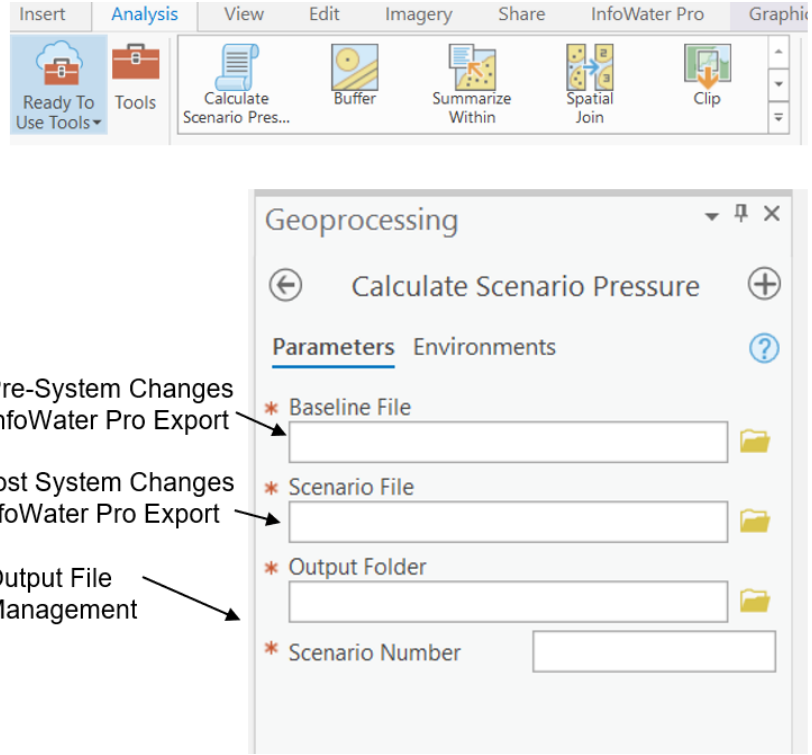
## DATA SET NAME = SCENARIO NAME

- Valve Set
  - BASE - if LOS goals are met with no changes
  - **Unique/NEW** – if PRV settings changes are required to meet LOS goals
- Pipe Set
  - BASE – if LOS goals are met with no changes
  - **Unique/NEW** – if new WM is recommended to meet LOS goals
- Control Set
  - **Unique/NEW** – Each scenario has a unique control set as valve closure/isolation is required for each scenario



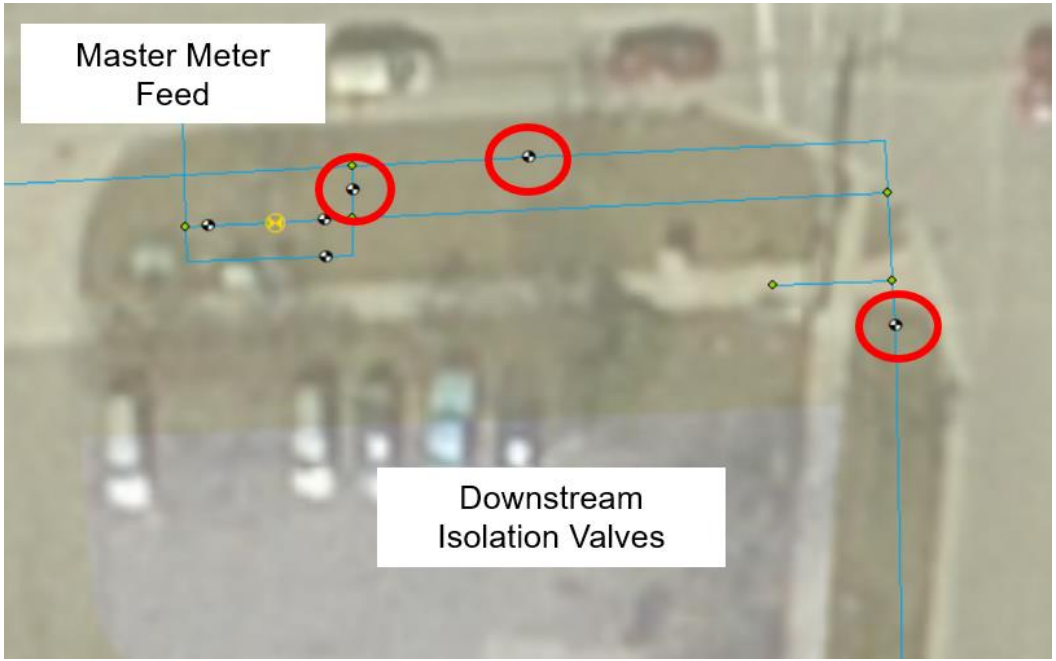
# GIS Tool Creation

- Improve workflow/increase project efficiency
- Combine data from pre and post model outputs
- Automatically calculated pressure difference between pre and post model outputs
- Remove unnecessary default model output data
  - 47 fields to 12 fields



# GIS Layers are KEY

- Valves
- Water main
- Control valves
- Service leads



# Workflow Summary

**Generate Baseline Files**

**Hydraulic Analysis of Scenario**

**Critical Customer Checks**

**Regulatory Pressure Requirement Checks**

# Workflow Summary Cont.

**Recommended System Changes**

**Geoprocessing Tool**

**ERP Deliverable**

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# ERP Deliverable

# ERP Deliverable

- Report and Maps

- Interactive ArcGIS Dashboard


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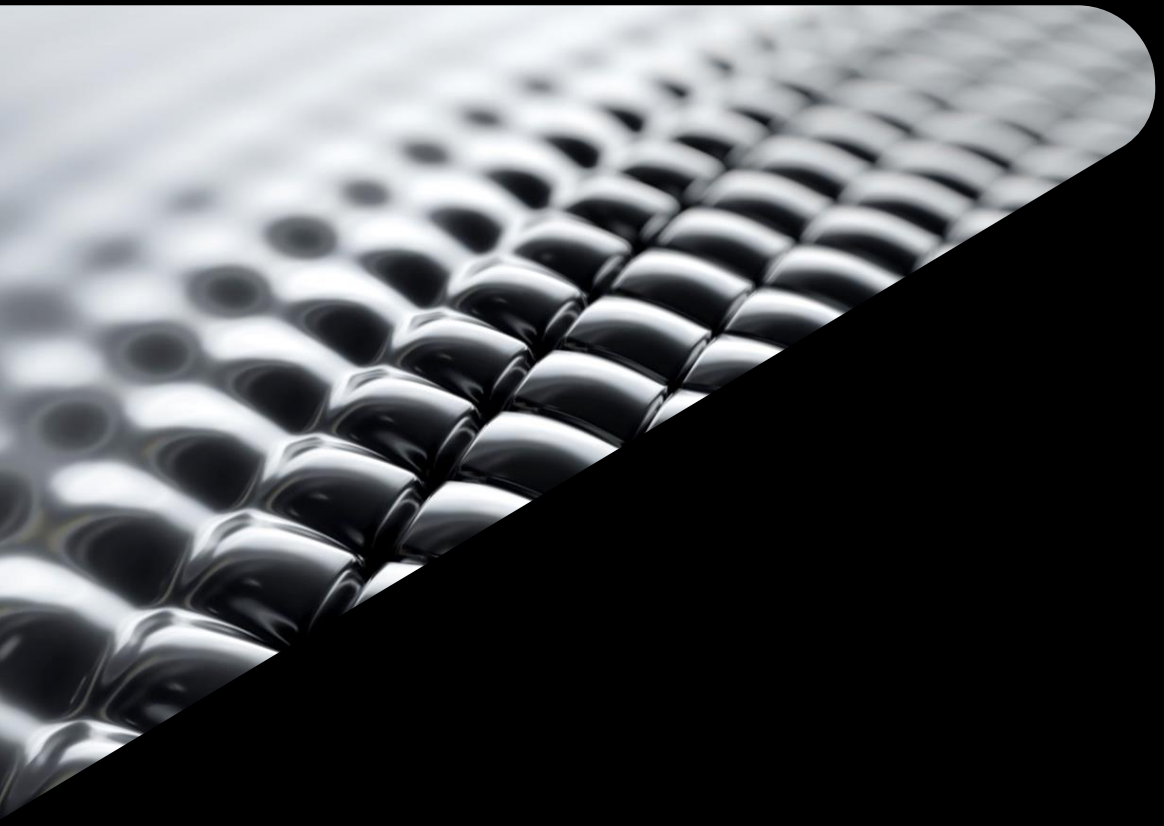
# Dashboard Demonstration

# Emergency Response Plan Implementation

- Review scenarios and recommendations with city staff
- Trial-Run of recommended system changes
  - GIS errors
  - Faulty valves
  - System limitations



# What’s Next?

Tim Medearis, PE
Autodesk

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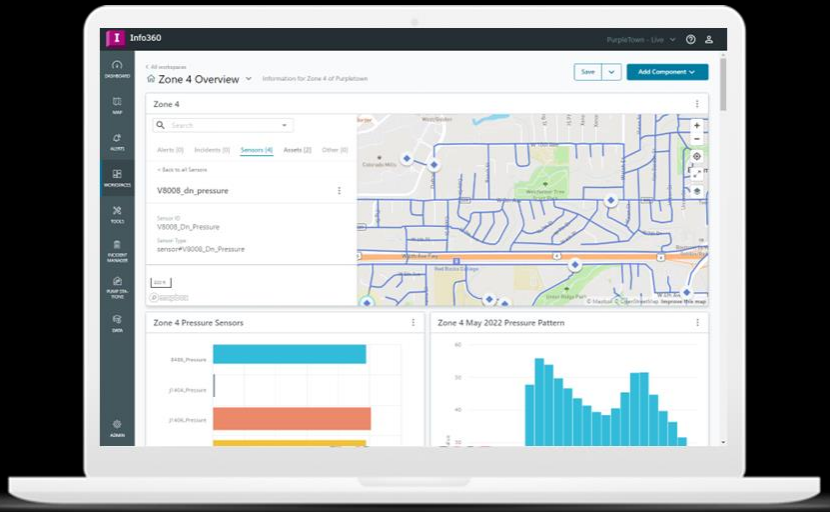
# Drive Smarter Water Decisions

What If You Could:

- Ensure Better Incident Responses
- Reduce Water Loss
- Increase Operator Productivity
- Promote Transparency
- Stretch Operating Expenses



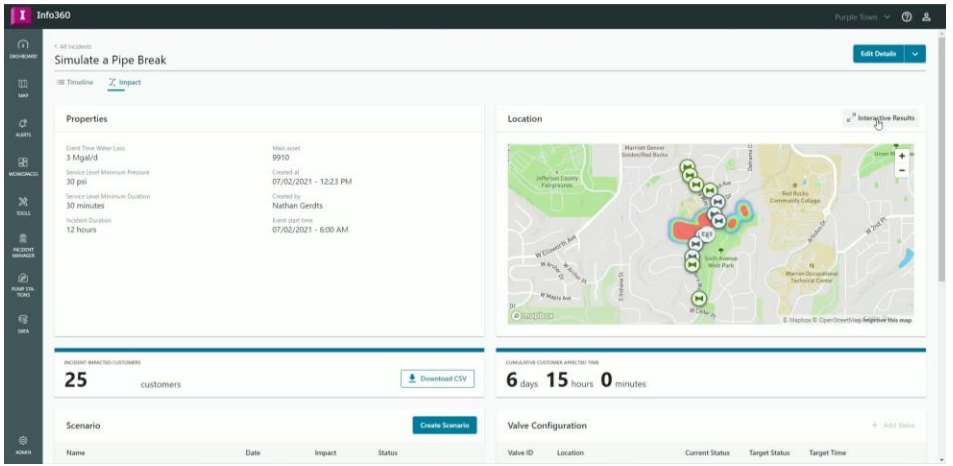

Info360 Insight

# Break Impact Assessment

Simulate a pipe break of estimated flow for any pipe in the system and understand the impact on customers. In addition, test out valve closure options to mitigate the system impact.

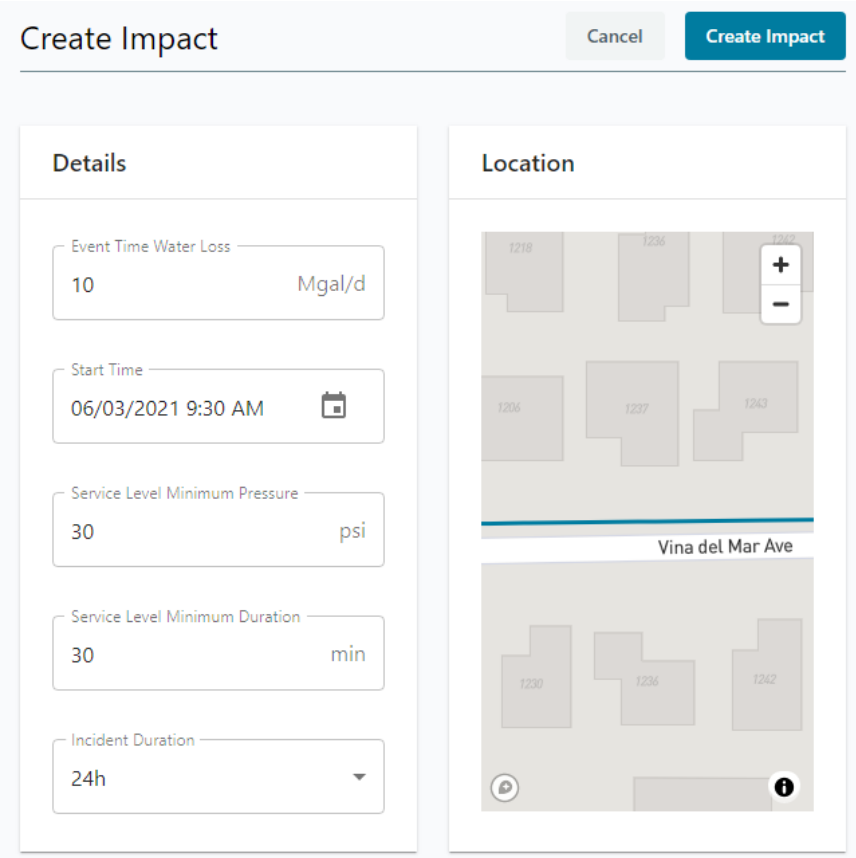
**Requirements:**

- Up-to-date hydraulic model of system
- Customer location points
- Isolation valve locations



# Methodology

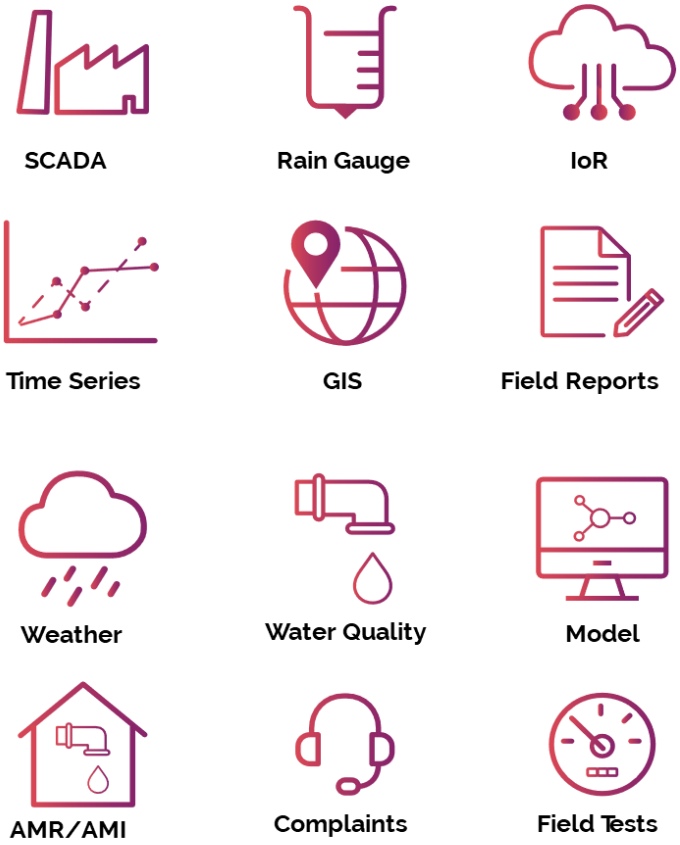
- User inputs pipe ID, time, duration, and flow estimate
- Info360 inserts emitter coefficient discharge in pipe to release specified flowrate
- Run model from designated time, applying initial conditions from SCADA where available
- Report all customers affected by pressure below service level for specified duration
- Find nearby closeable valves and offer scenarios to operate valves through the simulation and mitigate break impacts



# Your data can be a game-changer for:

- Non-revenue water
- Leakage Alerting
- Pump Performance
- Water Quality
- Hydraulic Model Calibration
- Operator Reporting
- Compliance

…and much more!



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# Thank you!
# Ask your questions!

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