

GLWA Board of Directors Meeting

October 27, 2021

June 25/26 and July 16, 2021
Post Event Analysis

Ed Hogan, PE



Dave Nitz, PE

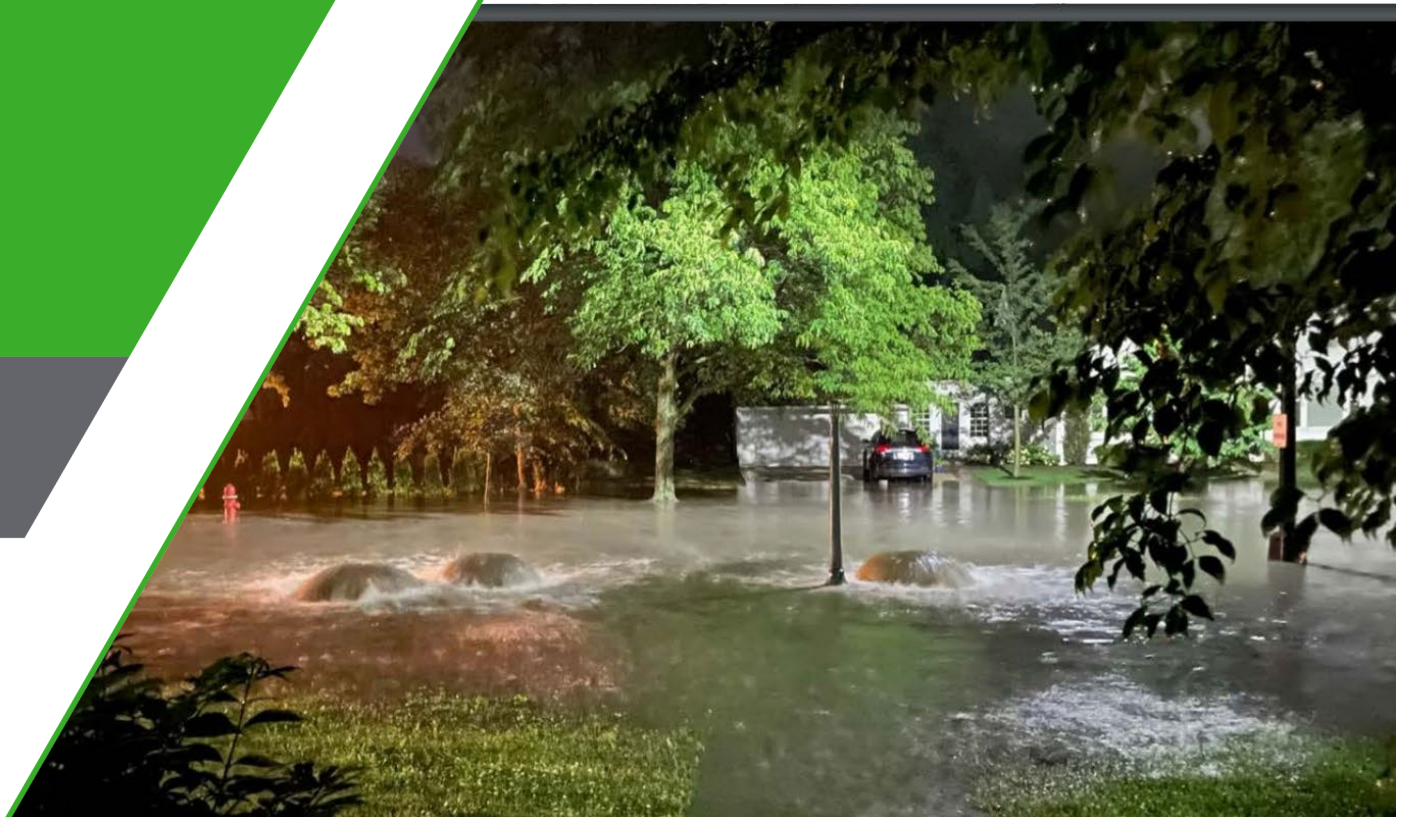


Photo Credit: June 25-26 Rain Event Update, June 28, 2021, Grosse Pointe Farms Special Council Meeting

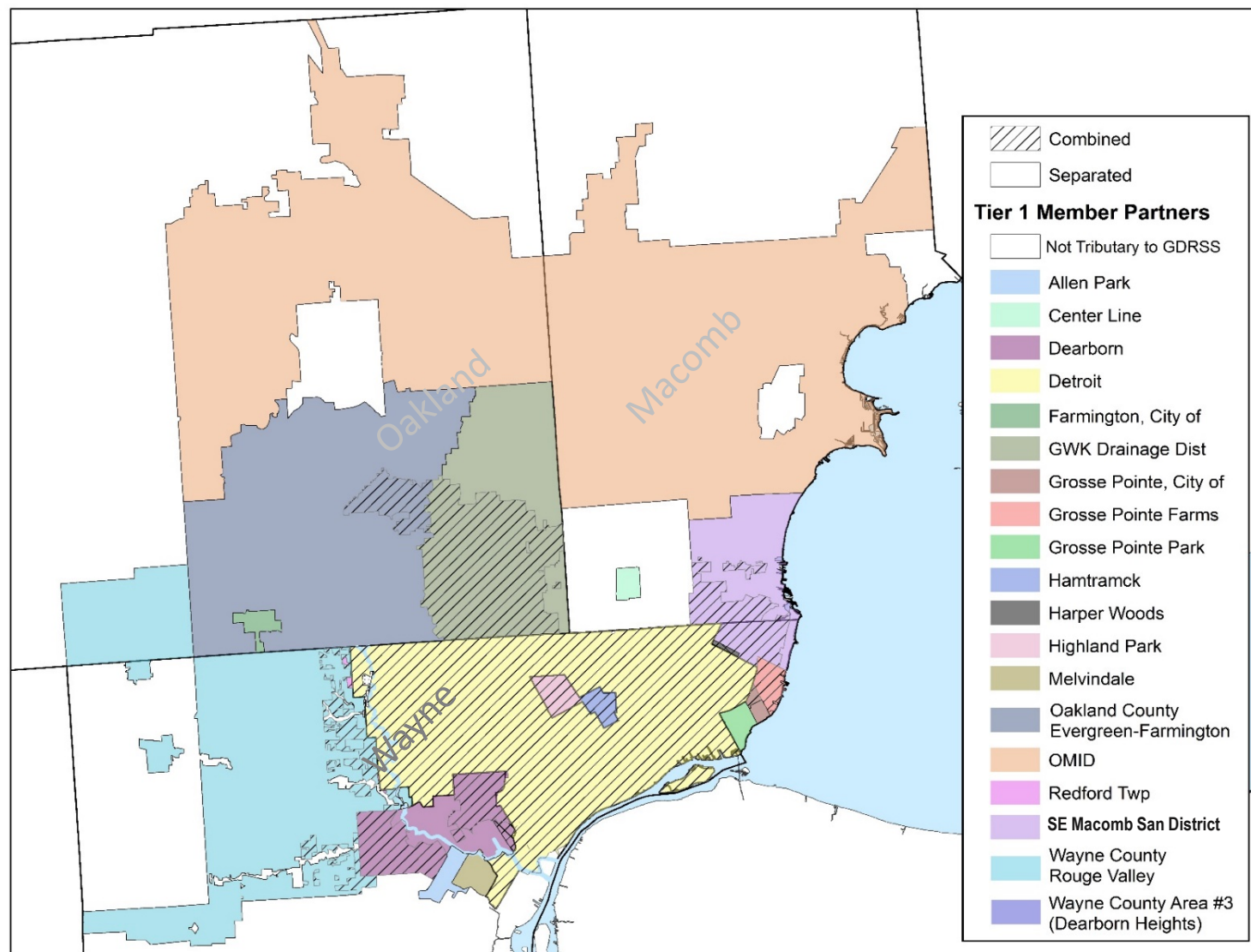
Agenda

1. Collection System Description
2. Rainfall, Flooding & System Response
3. Event Response
 - Investigation Overview
 - Power Considerations
 - System Operations
 - East Side
 - GLWA Staffing
 - Conner Creek CSO Facility Influent System
 - Fox Creek Enclosure Hydraulic Capacity
 - West Side - CSO Facilities
 - System Wide
 - In-System Storage Devices
 - Level Sensors
4. Major Findings

Collection System Description

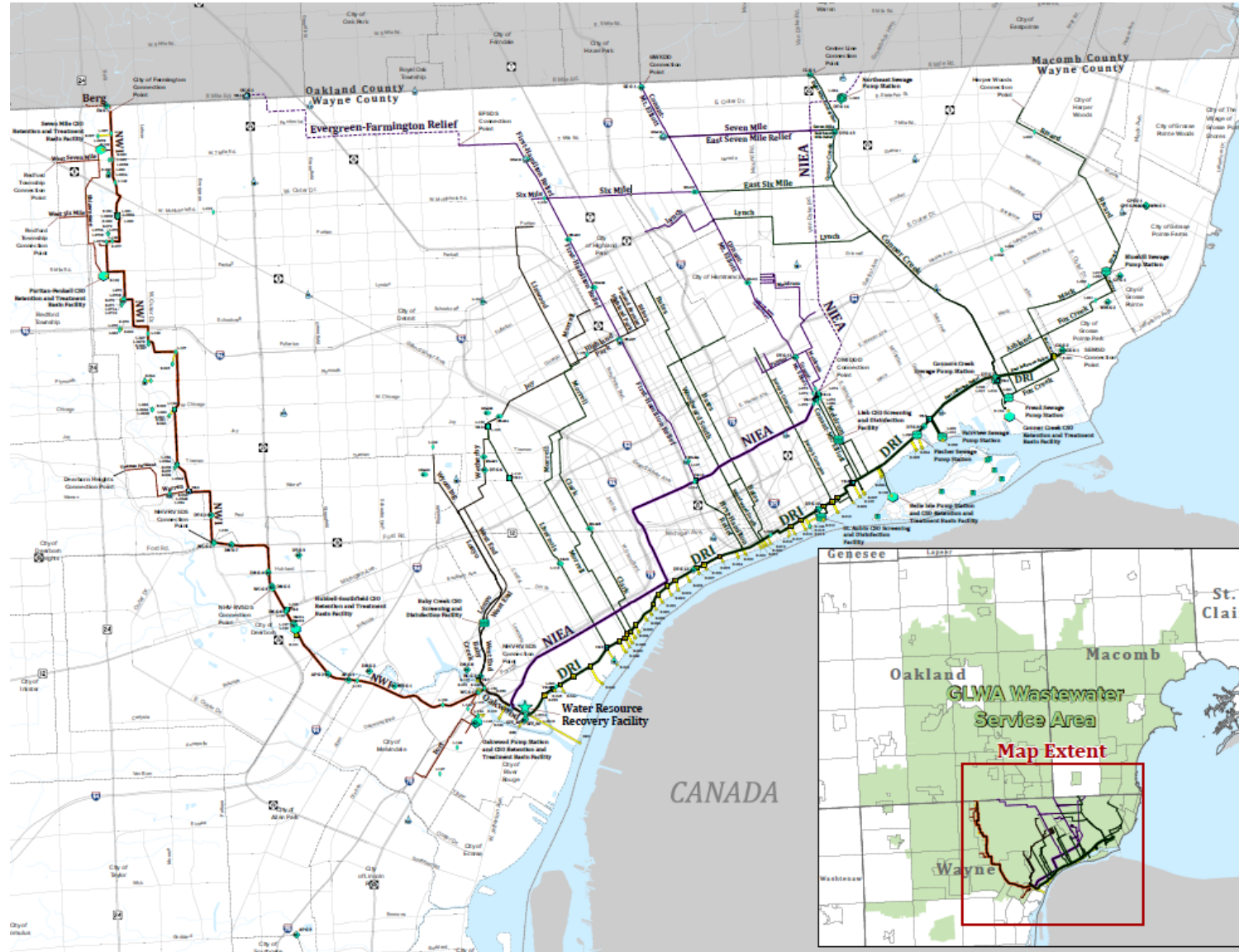
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GLWA Tributary Area



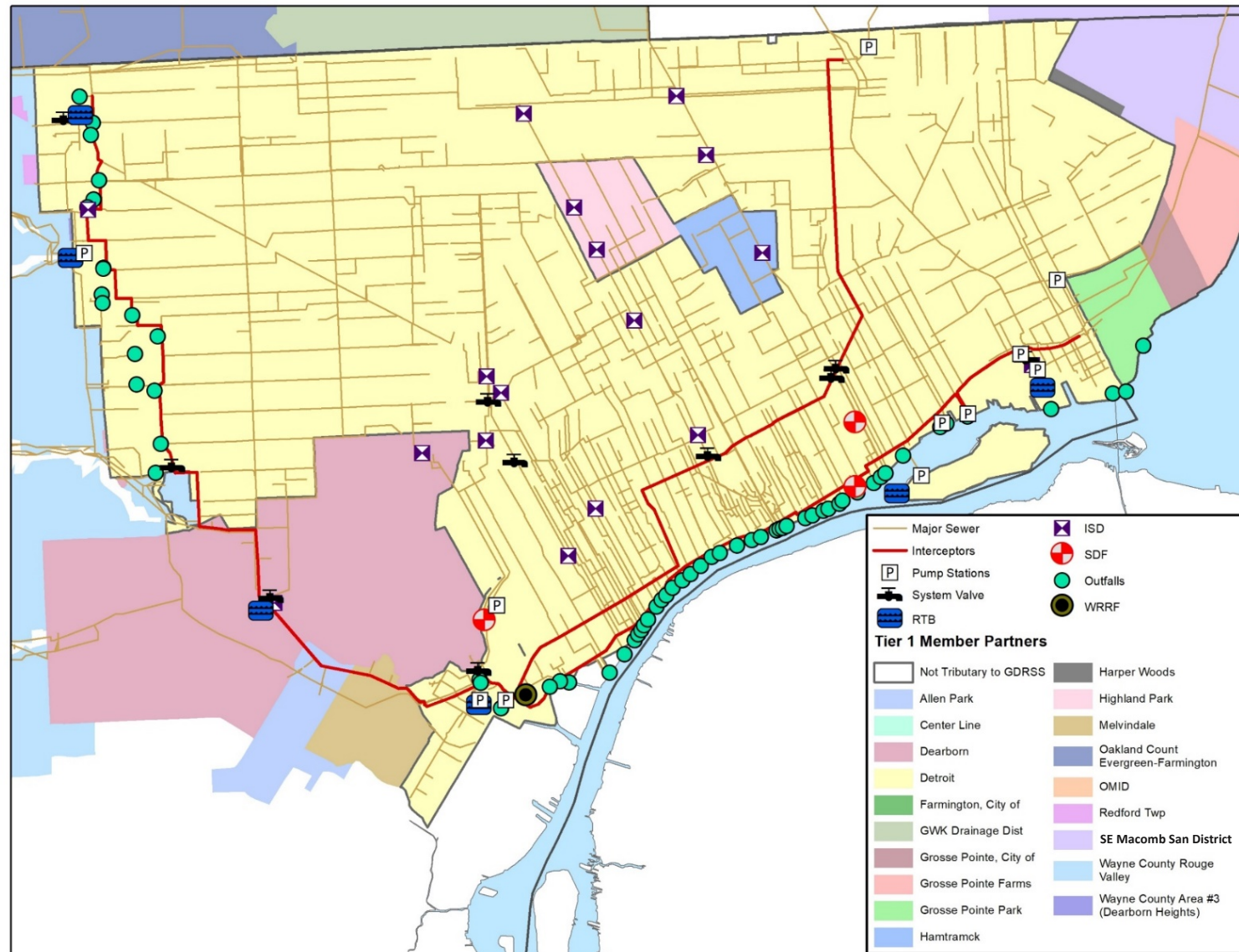
Preliminary, subject to further investigation and analysis

GLWA Collection System



Preliminary, subject to further investigation and analysis

GLWA Wet Weather Facilities



Preliminary, subject to further investigation and analysis

Rainfall, Flooding & System Response

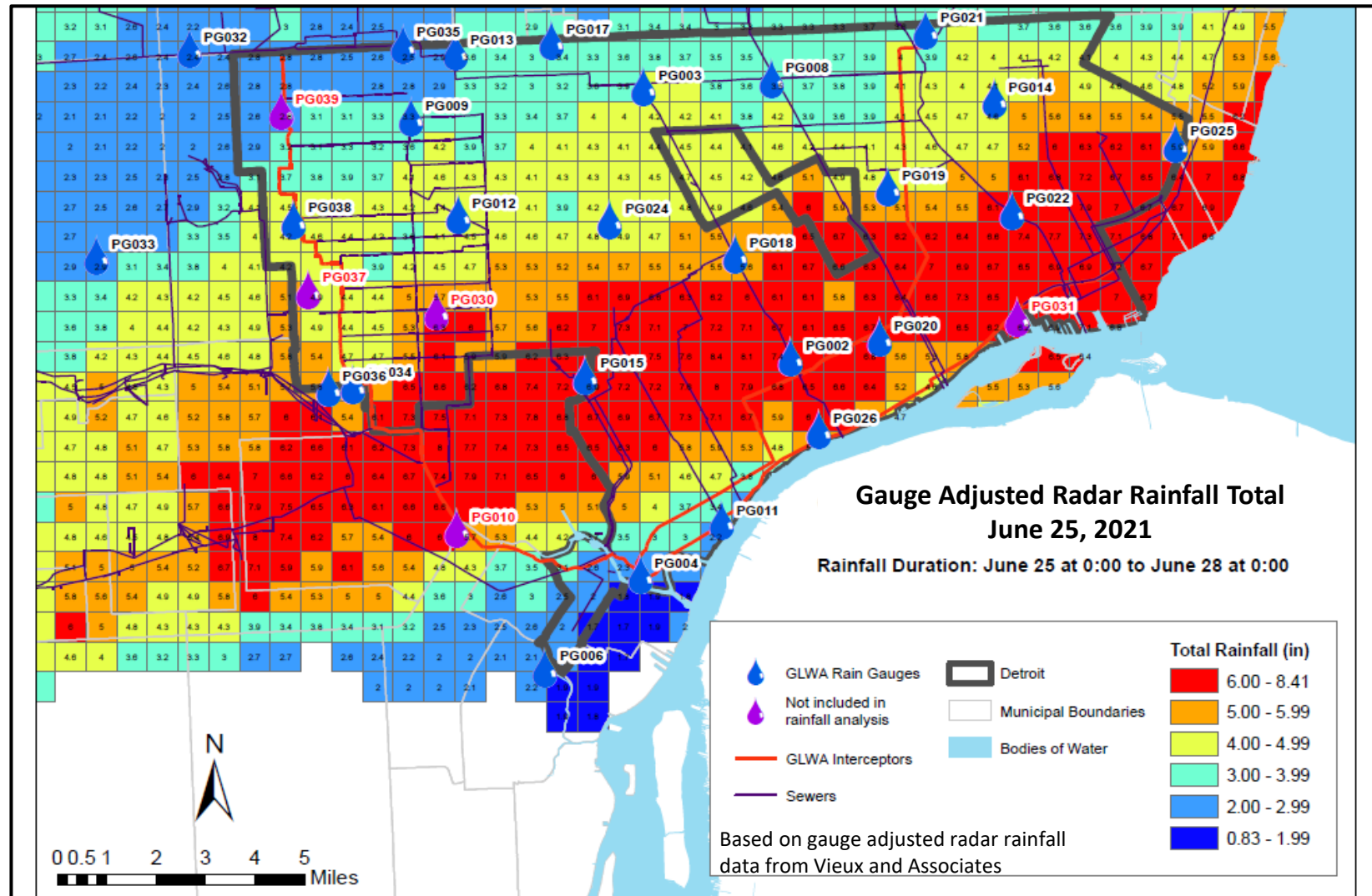
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Rainfall, Flooding & Response

- Recall there were three bursts of rain on June 25th and 26th
 - First two bursts delivered approximately one inch of rain
 - Third burst added approximately another six inches of rain
- As a result of the first two bursts
 - Collection and treatment systems were at or near capacity
 - Conner CSO facility was full and the facility was already discharging
 - The WRRF was operating at full capacity processing 1750+ MGD
- During and following the third burst
 - Collection system was surcharged, most level sensors were maxed out, and water was flooding to the ground surface level
 - Treatment facilities were functioning at or near their maximum capacities
 - Outfalls were discharging untreated flow to both the Detroit and Rouge Rivers
 - WRRF was operating at capacity and continued dewatering the system for the next 6 days

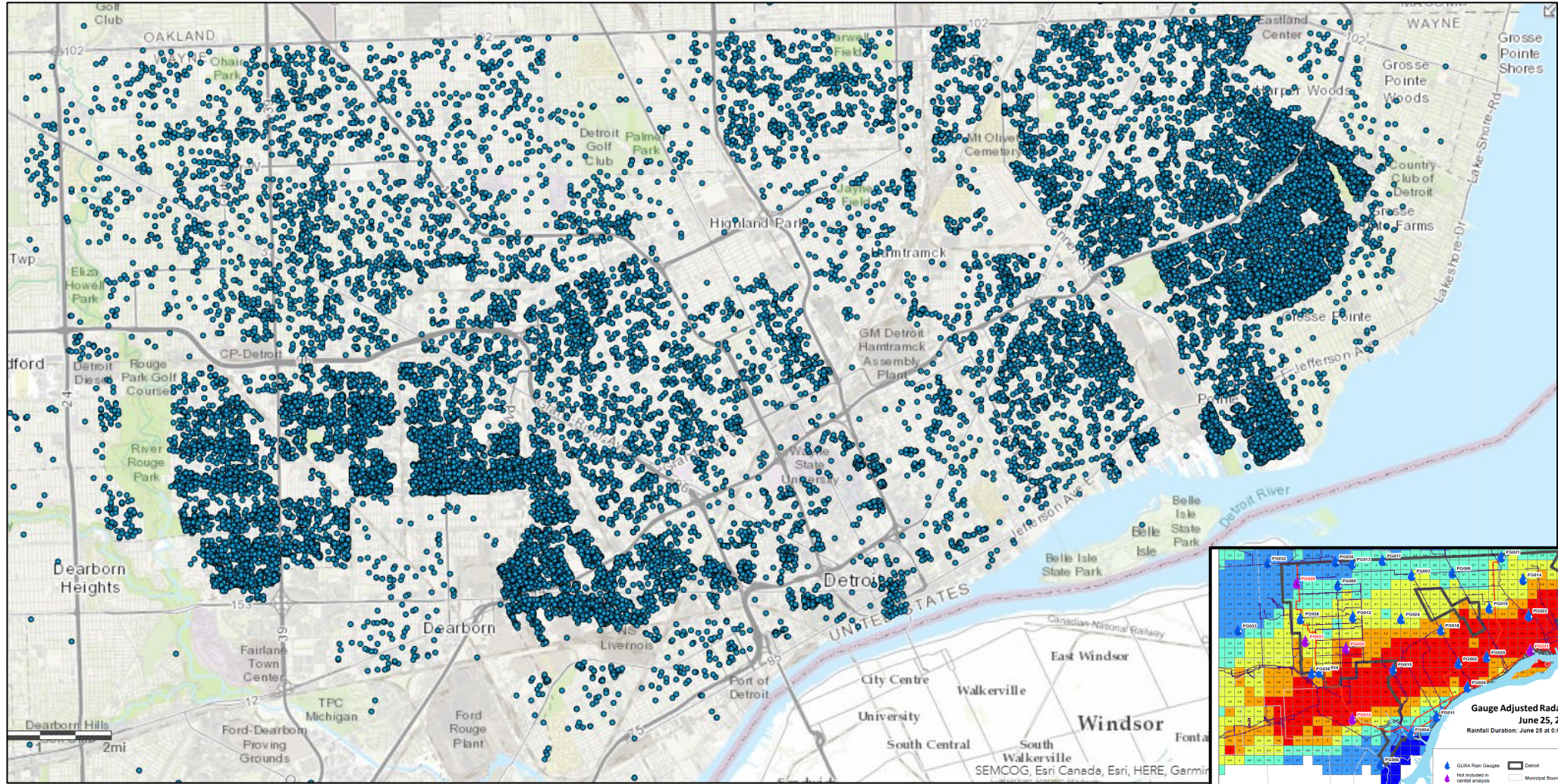
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Gauge Adjusted Radar Rainfall

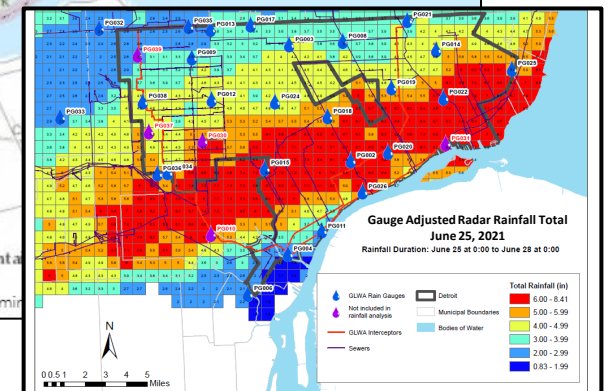


Preliminary, subject to further investigation and analysis

Mapping of Claimants



Source: DWSD



Preliminary, subject to further investigation and analysis

Event Response

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Investigation Overview - Wade Trim

Focus: Entire GLWA Collection System

- Conducted a regional system-wide storm response investigation and event reconstruction
- Interviewed operations, maintenance and supervisory personnel
- Collected, reviewed, analyzed, and trended literally millions of data points
- Modeled, analyzed, and compared the as-operated and as-designed regional system responses

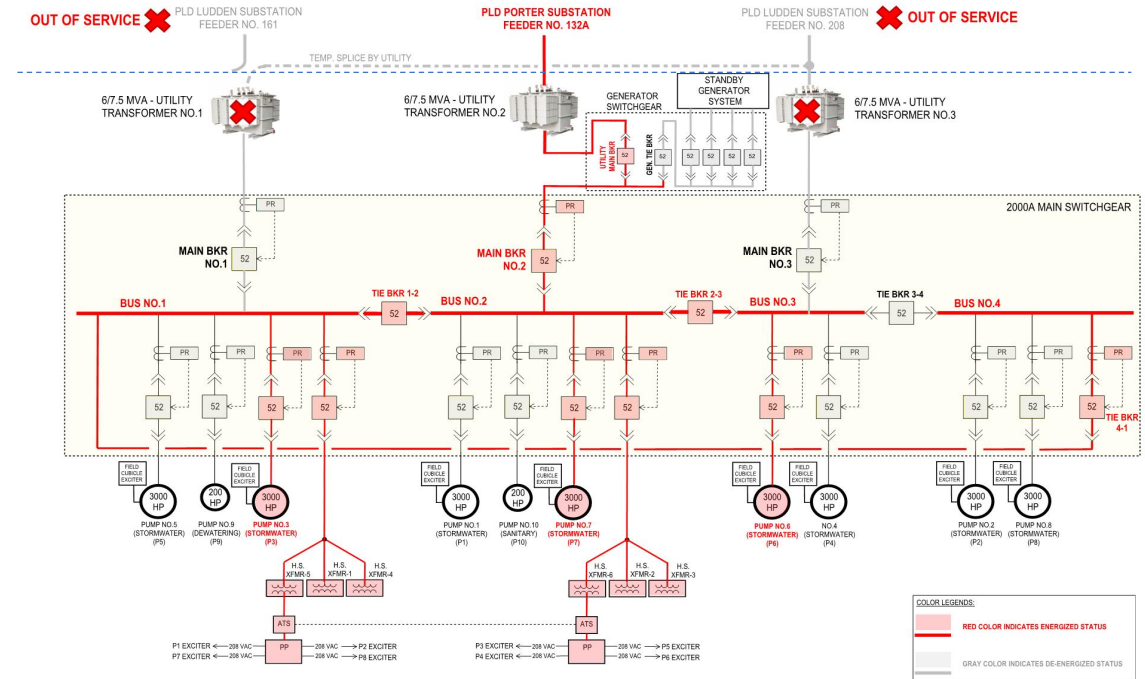
Investigation Overview – Brown and Caldwell

Focus: Power and Pumping for East Side Collection System Conners Creek, Freud, Fairview and Bluehill Pump Stations

- Conducted Pump Station Power Vulnerability Assessments
 - Post Event Data Acquisition/Analyses
 - Electrical Testing Coordination
 - Power Load Analyses
- Conducted Pump Station Operations Assessments
 - Rain Event Operations Data Analyses
 - GLWA Staff Interviews and Field Investigations
 - Sewer Condition Assessments
 - Wet Weather Event Observations and Troubleshooting

Power Considerations - Overview

- Power Supply Reliability
 - Freud PS – Feeder Ludden 161
 - Freud PS – Feeder Ludden 208
 - Standby Generator Systems
 - Outage Repair Time
 - Supply Conversion to DTE
- Power Quality



Preliminary, subject to further investigation and analysis

Power Supply Reliability - Outage Repair Time

Outage Date	Jun-21	Oct-21
Location	Freud Pump Station	Freud Pump Station
Feeder	Ludden 208	Ludden 208
Cause	Cable Cut	Cable Failure
GLWA Notified Supplier	6/23/21 6:00AM	10/12/21 1:30PM
Repair Initiated	Unknown	10/12/2021
Repair Tested by Supplier	6/25/2021	10/13/2021
Power Supply Restored	6/30/2021	10/13/2021
Duration from GLWA Notice to Power Supply Restored	7 Days	30 Hours

Preliminary, subject to further investigation and analysis

Power Supply Reliability - Conversion to DTE

Energy Delivery Services Agreement – June 26, 2014

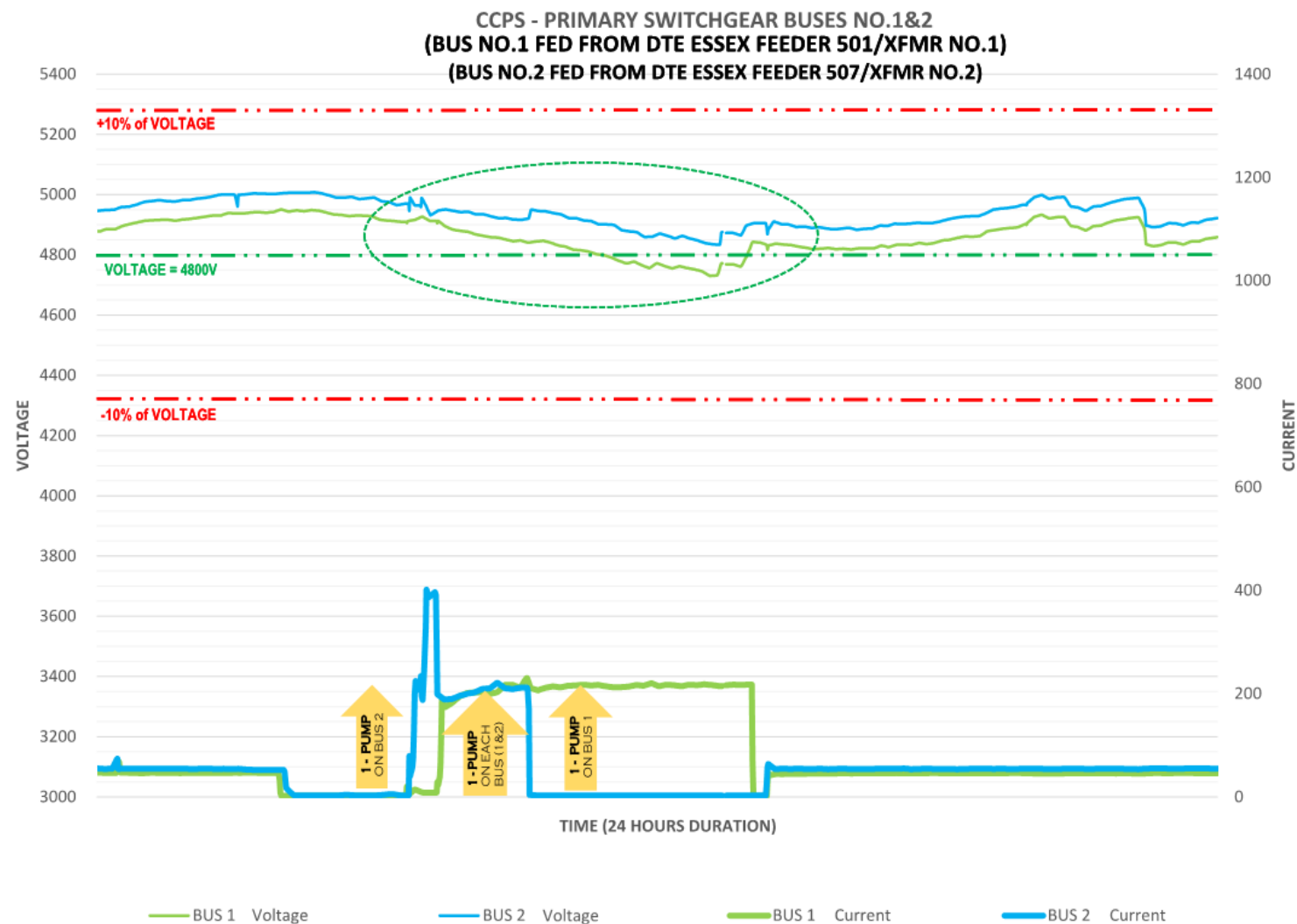
- Between DTE Electric Company and the City of Detroit
- "Conversion" refers to all activities necessary to convert former PLD customers to the DTE System
- Establishes Roles and Responsibilities as well as Emergency and Communication Protocols
- Estimated 5 - 7 Year System Conversion Plan
- June 25, 2021 would have been 7 years

Power Quality - Why does this matter?

- What is Power Quality?
 - Steady supply voltage
- What is the Impact of Poor Power Quality?
 - Unintended pump stoppages (pump trips)
 - Other faults that require manual intervention
- Power Quality Meters
 - August 2021 Rain Event Analysis

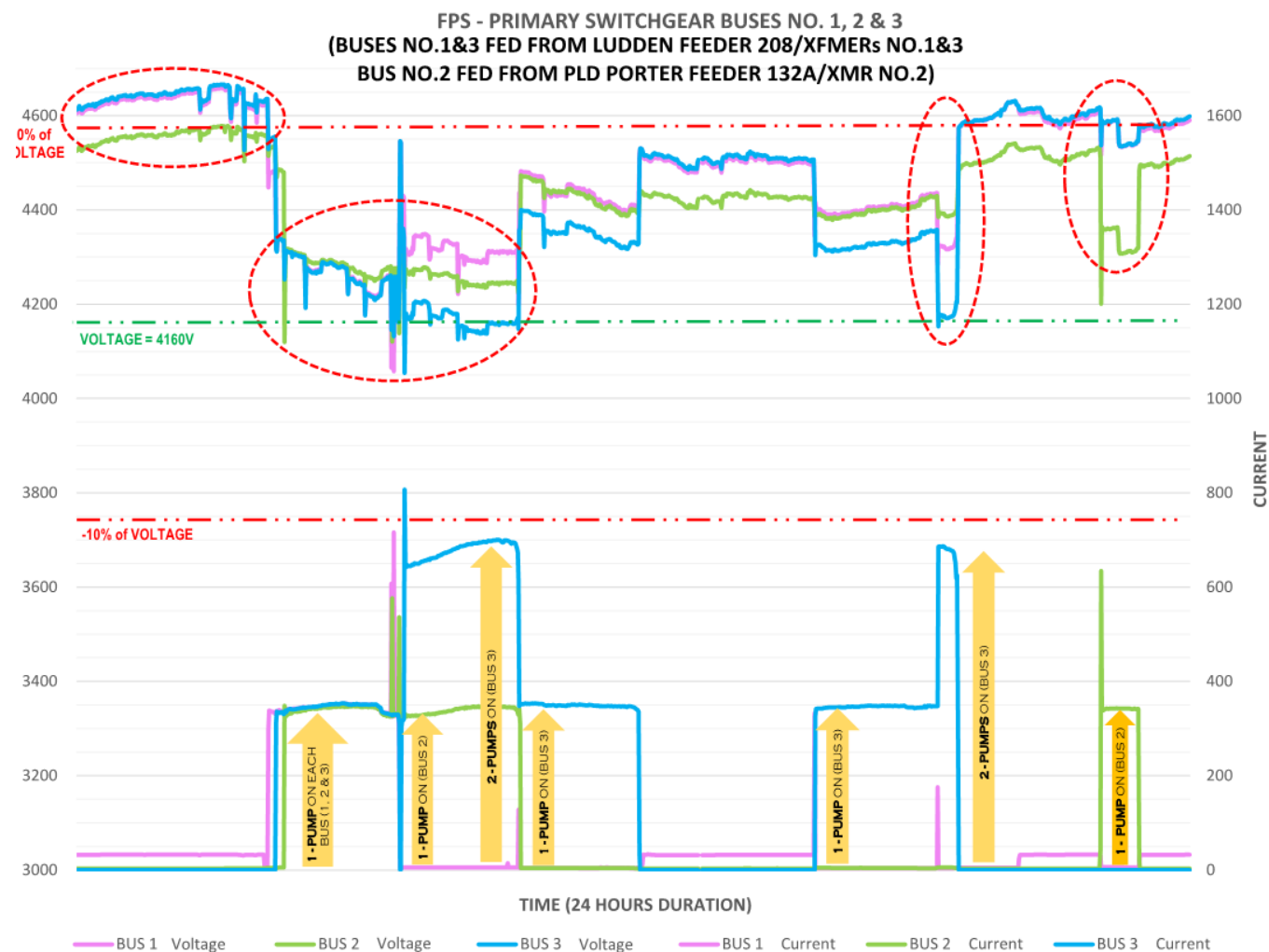
Power Quality – Conners Creek Pump Station

- Power Source = DTE Substation
- “Strong” Power Supply
 - Voltage recovery (good)



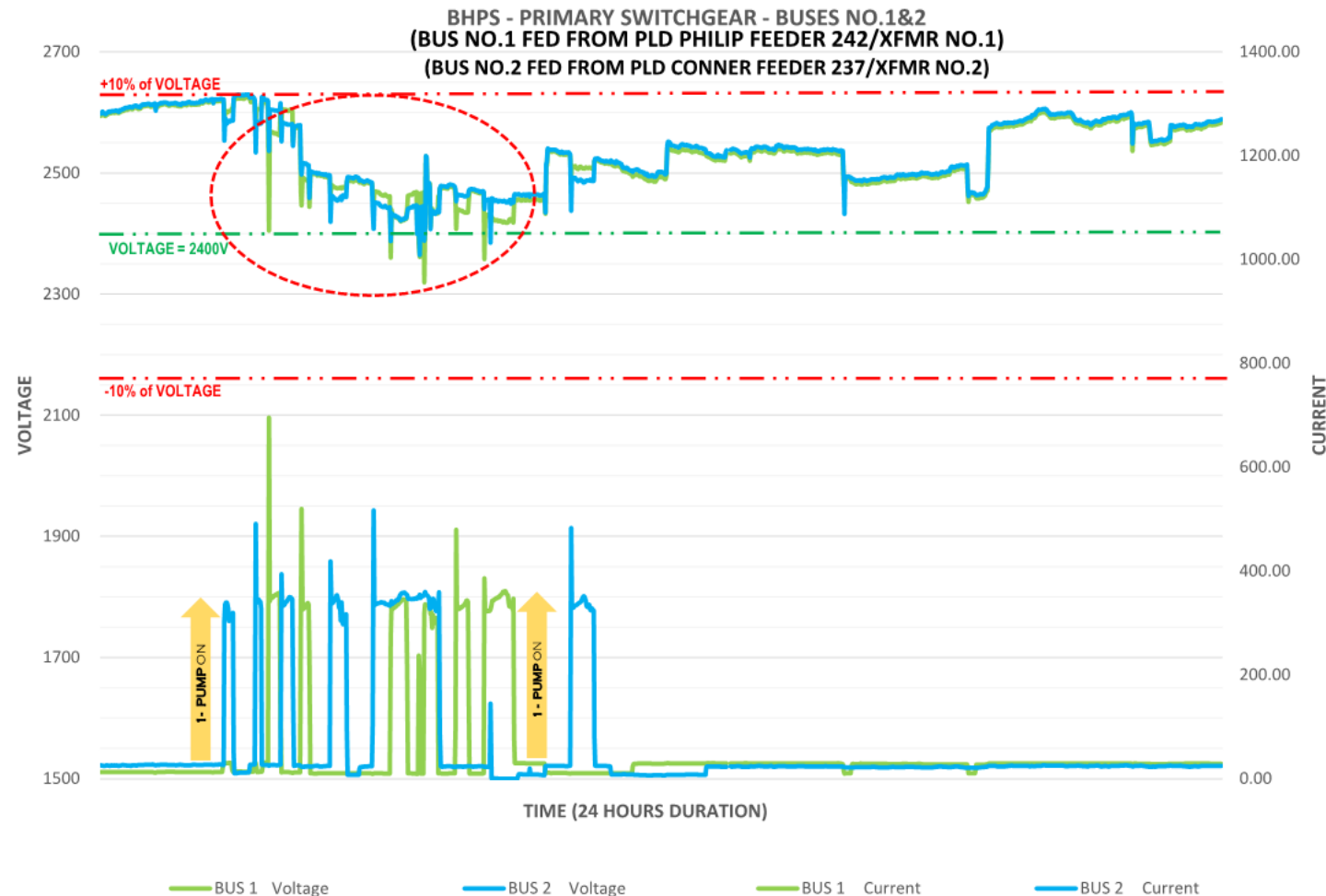
Power Quality – Freud Pump Station

- Power Source = PLD Substations
- “Weak” Power Supply:
 - Sustained voltage dip
 - Lack of power supply “stiffness”



Power Quality – Bluehill Pump Station

- Power Source = PLD Substations
- “Weak” Power Supply:
 - Sustained voltage dip
 - Lack of power supply “stiffness”

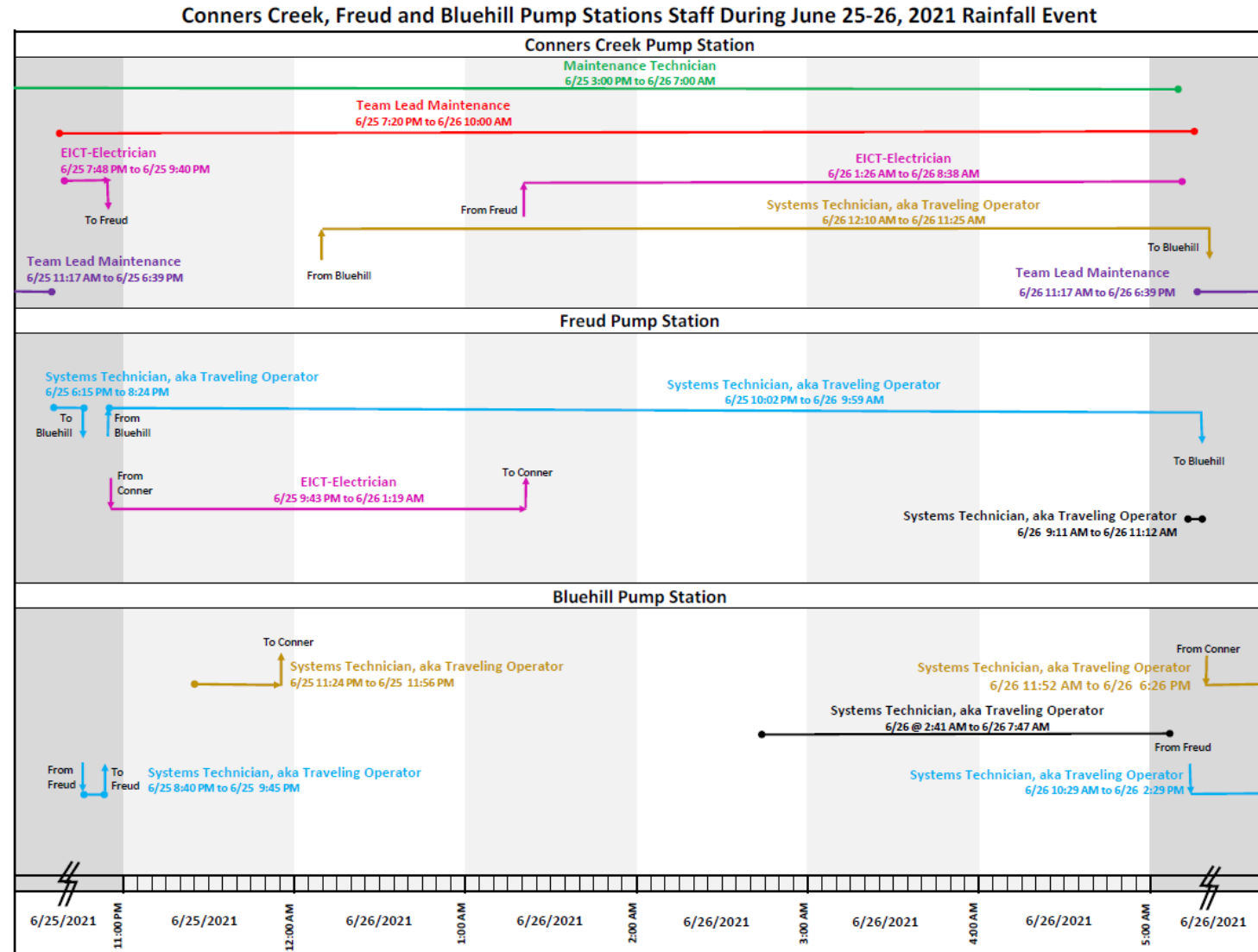


Power Quality - Why does this matter?

- What is the Impact of Poor Power Quality?
 - Unintended pump stoppages (pump trips)
 - In the June 25-26 event at Freud, this delayed GLWA's ability to get a third pump running.
 - Other faults that require manual intervention
 - In the July 16 event at Bluehill, this created an electrical upset which resulted in a reduced number of pumps running during the event.

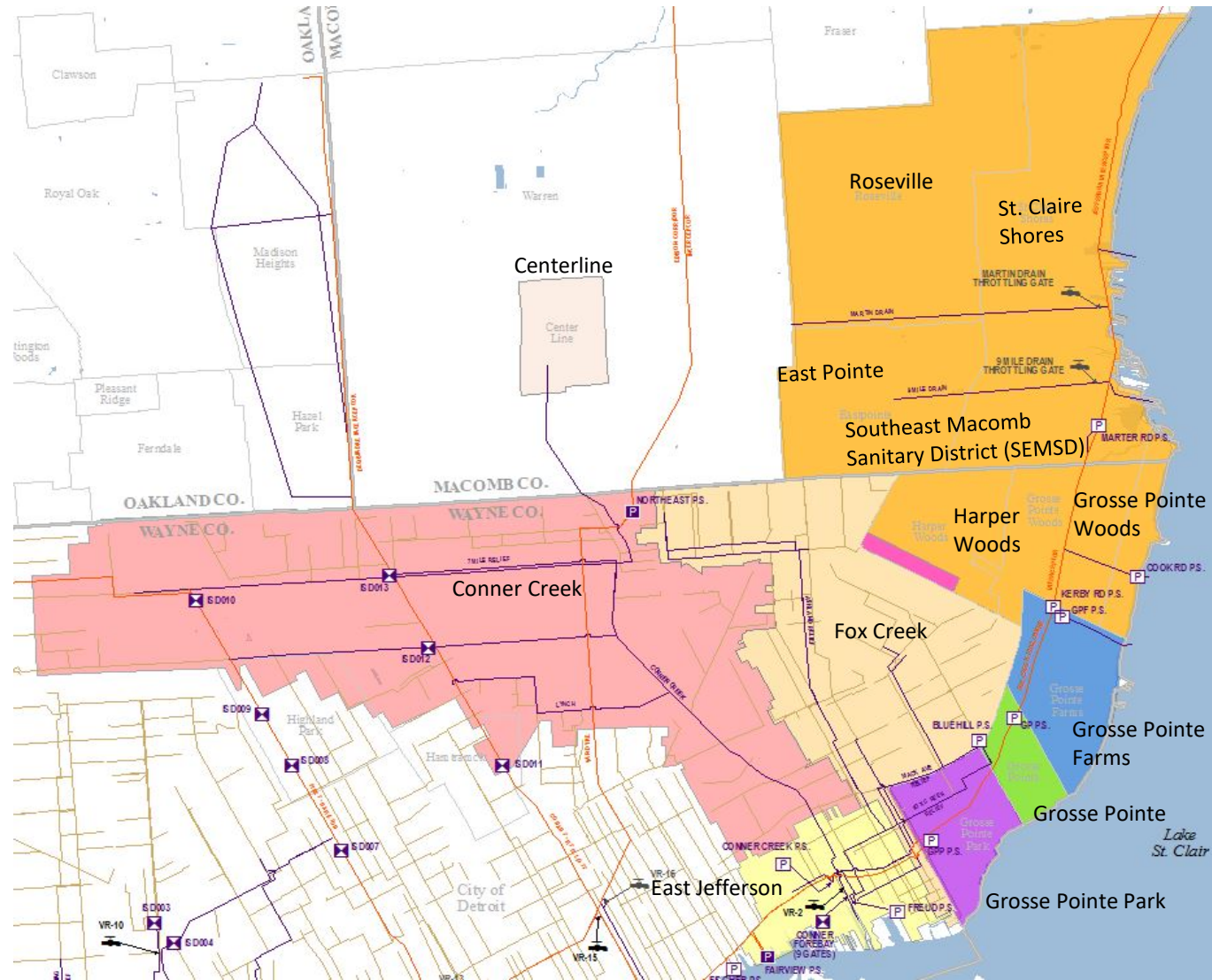
GLWA Staffing

Conners Creek and Freud Pump Stations were staffed throughout the storm event



Preliminary, subject to further investigation and analysis

System Operations - East Side



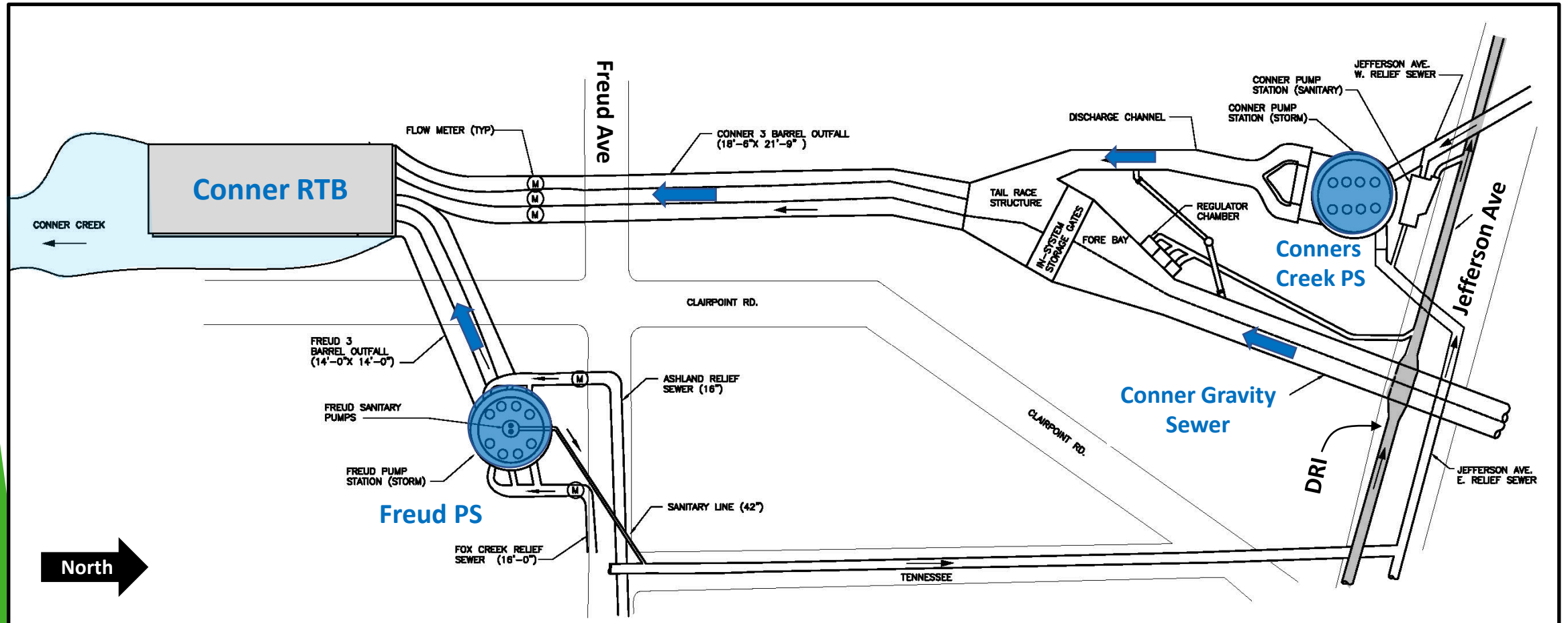
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System Operations - East Side

Conner Creek CSO Facility Influent System



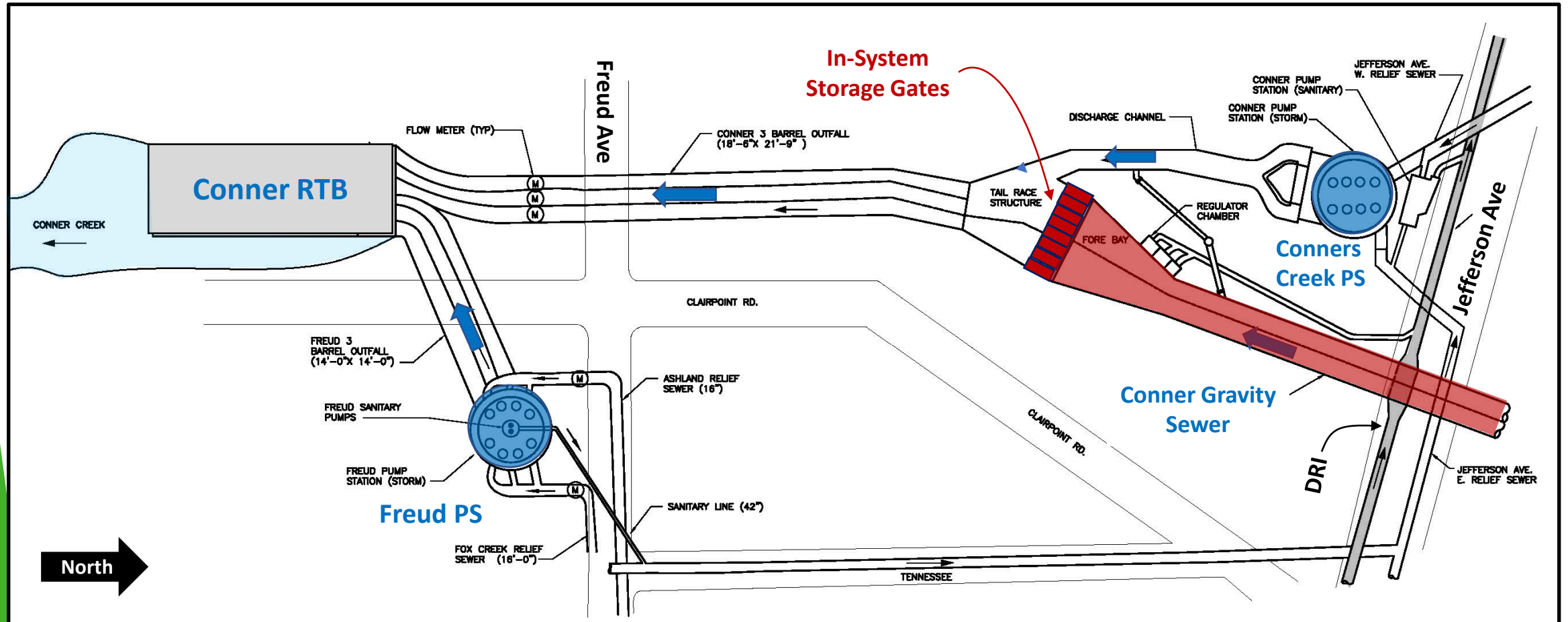
System Operations - East Side



Conner Creek CSO Facility Influent System

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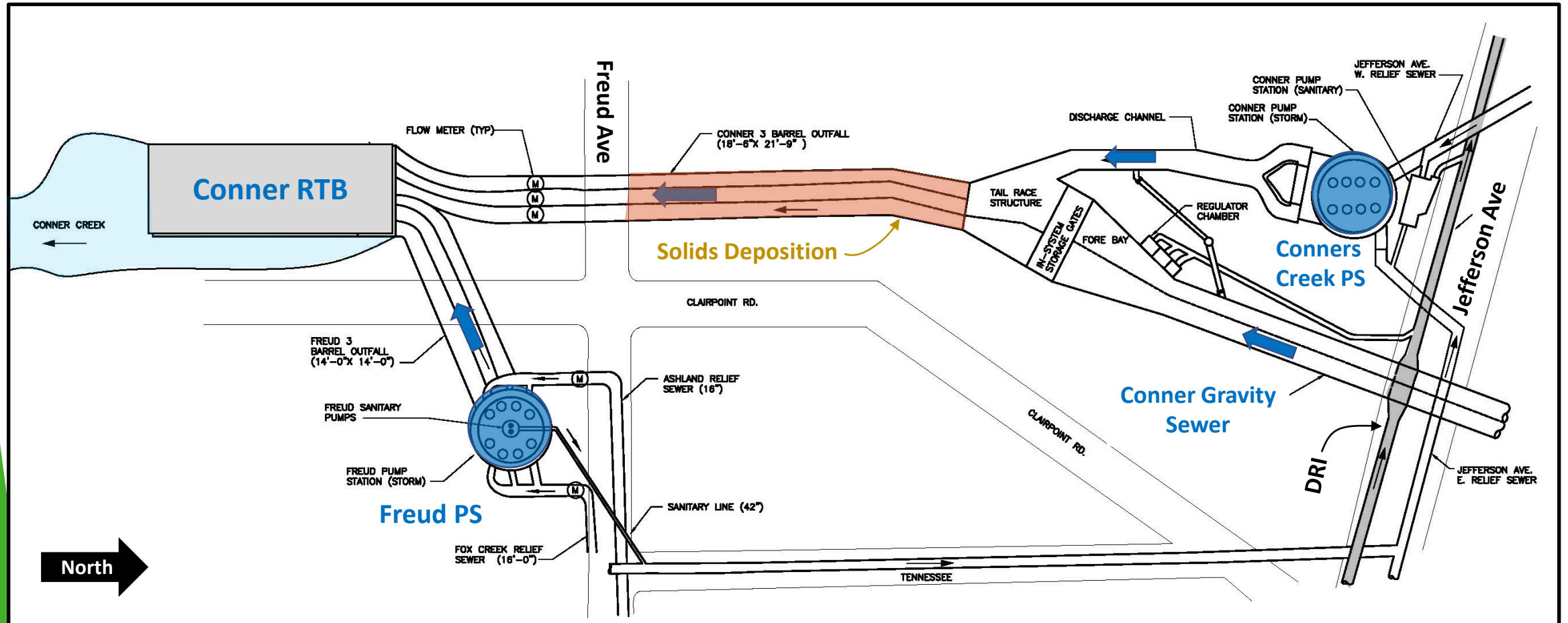
System Operations - East Side



Conner Creek CSO Facility Influent System

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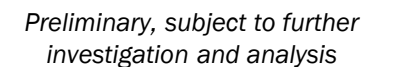
System Operations - East Side



Conner Creek CSO Facility Influent System

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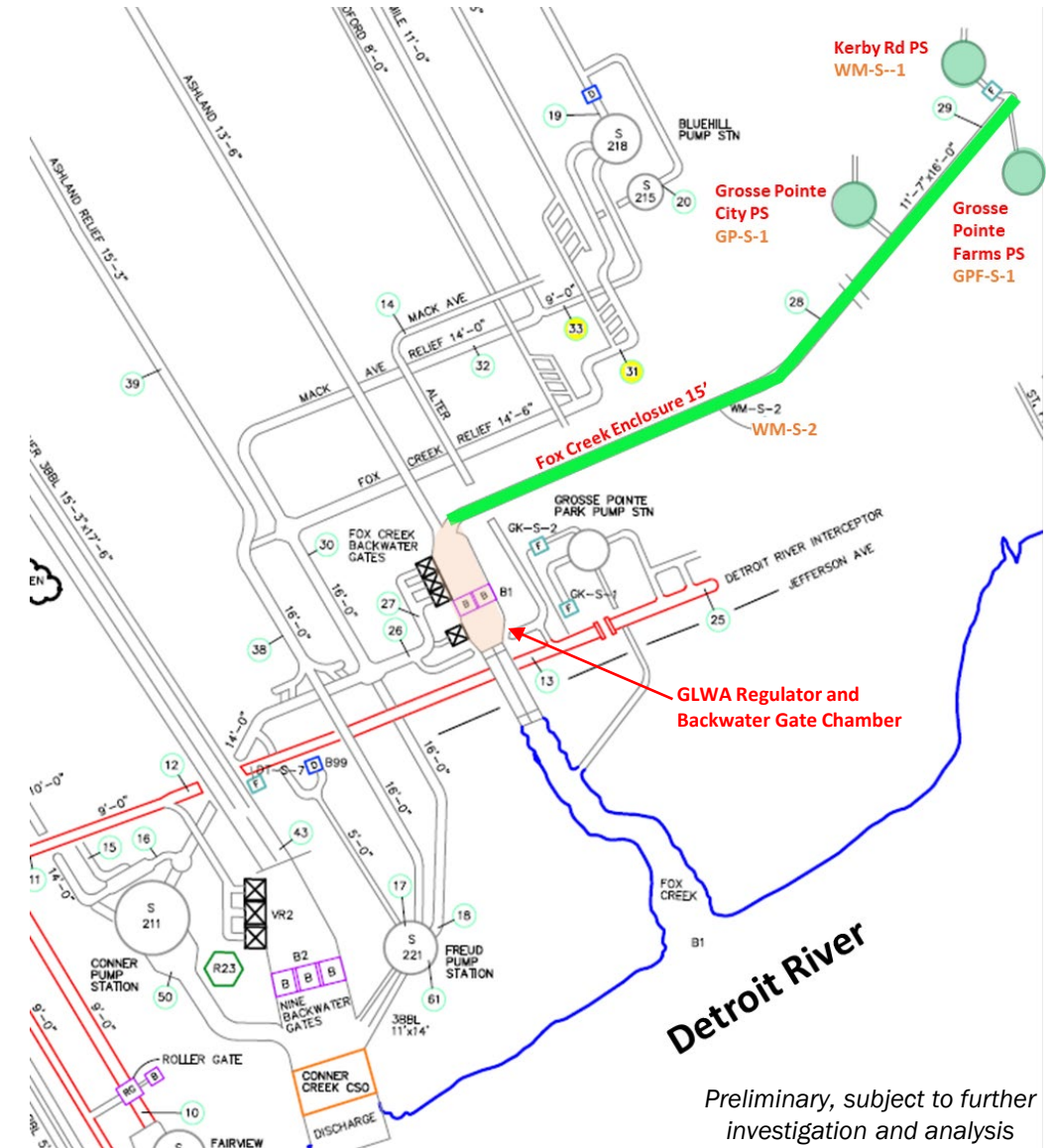
Fox Creek Enclosure



System Operations - East Side

Fox Creek Enclosure

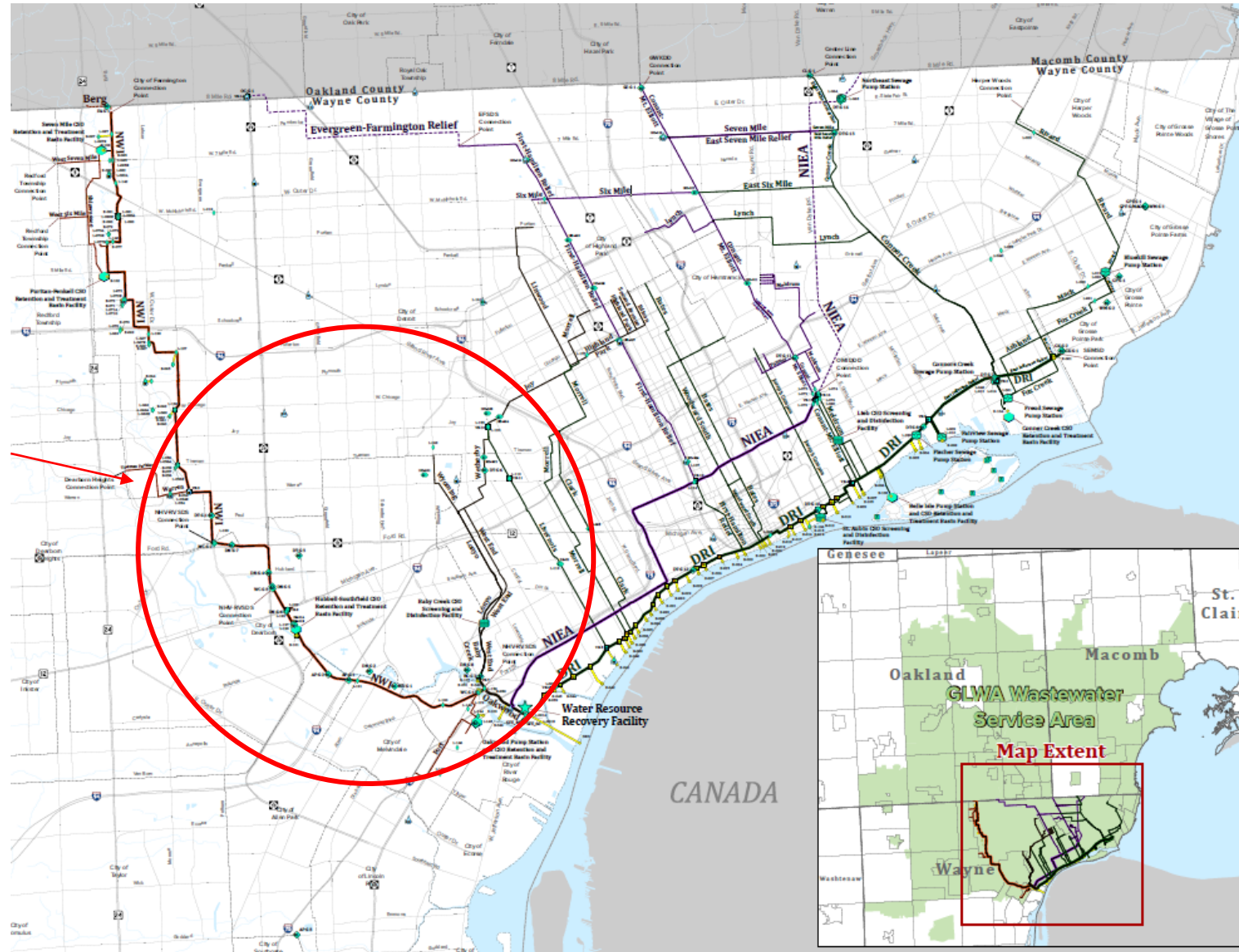
- Not owned and operated by GLWA
- Location and Size
 - Extends from Kerby Road and Chalfonte Ave. on the northeast to Ashland Street near Jefferson Ave. on the west
 - Approximately 3.25 miles in length
 - Shallow sewer (4-5' below grade in some locations)
 - Conveyance capacity of about 5-year storm
- Member Partners Served
 - Southeast Macomb Sanitary District
 - Grosse Pointe Farms
 - Grosse Pointe City



Preliminary, subject to further investigation and analysis

System Operations – West Side

**West Side
Focus Area**



*Preliminary, subject to further
investigation and analysis*

System Operations - West Side

CSO Facilities

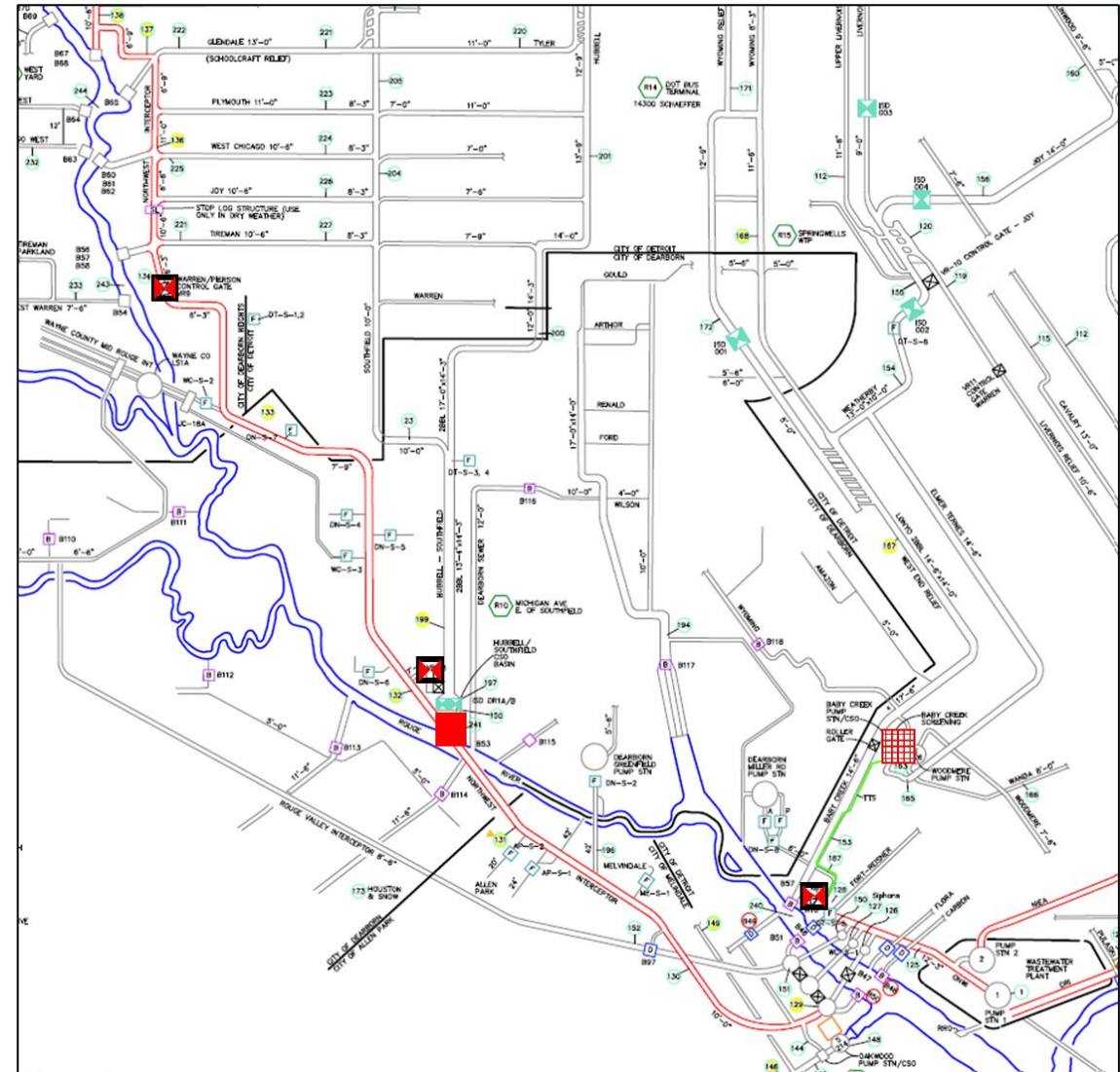
□ 17 Gravity Outfalls

■ Hubbell Southfield RTB

⊠ Valve Remotes

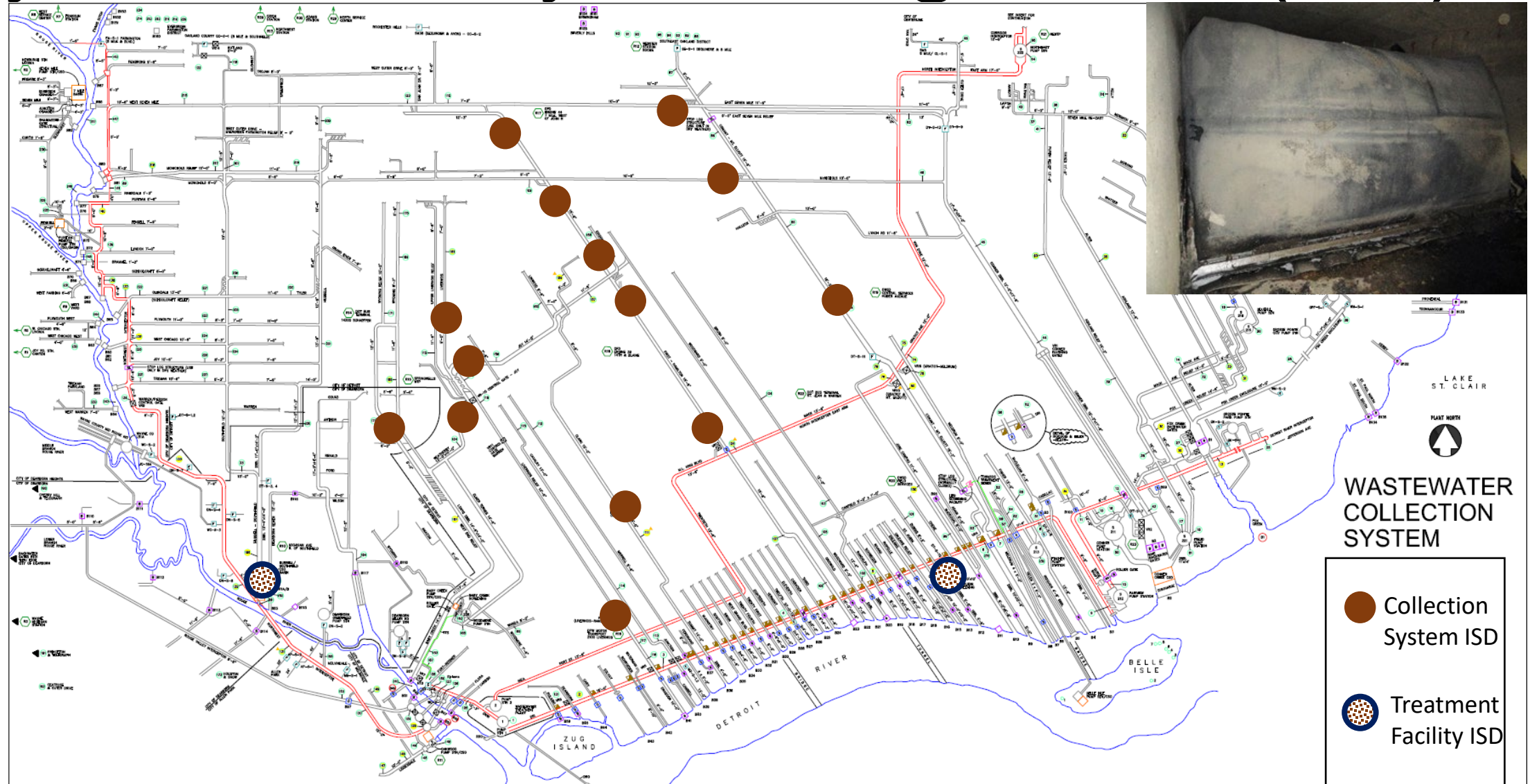
- VR-7
- VR-8
- VR-9

▣ Baby Creek SDF



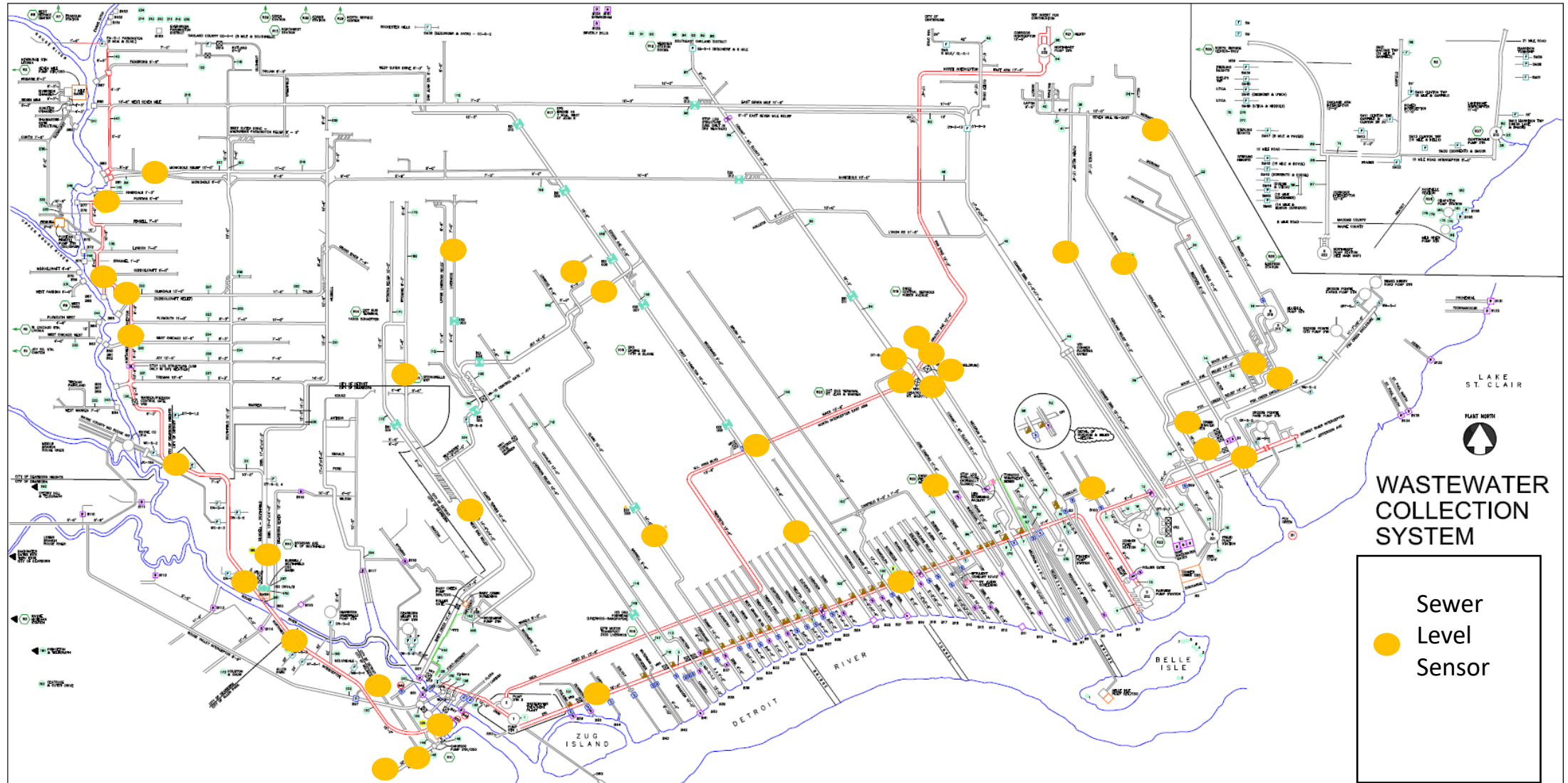
Preliminary, subject to further investigation and analysis

System Wide - In System Storage Devices (ISDs)



Preliminary, subject to further investigation and analysis

System Wide - Level Sensors



Preliminary, subject to further investigation and analysis

Major Findings

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Wade Trim's Major Findings

1. The intensity and magnitude of rainfall that occurred on June 25-26, 2021 significantly exceeded the design level for the collection and treatment system and was the primary cause of water-in-basements.
2. Singularly or collectively, the following circumstances may have exacerbated the depth, timing and/or duration of water-in-basements for the June 25-26 event but were not the primary cause.
 - GLWA System
 - Power Supply and Power Quality
 - Equipment Availability
 - Solids Deposition
 - Communications
 - Local Systems
 - May have experienced similar exacerbating circumstances as GLWA, as well as sewer misalignments, obstructed lateral sewers, inflow and infiltration, and competition for capacity in the local and regional systems
 - Private Property
 - May have sewer obstructions, clogged drains, root intrusion, and downspout connections

Preliminary, subject to further investigation and analysis

Wade Trim's Major Findings (cont'd)

3. During the July 16, 2021 event, external power supply and power quality issues (a brownout) at Bluehill Pump Station played a large role in reported water-in-basements upstream of that location
4. This presentation summarizes our analyses. A more detailed written technical report will follow.

Brown and Caldwell's Major Findings

1. Power supply reliability and quality are significant on-going vulnerabilities to the operations of Freud PS and Bluehill PS.
2. The timing of PLD/DTE power supply conversion was a critical factor in the number of pumps available at Freud PS during the June event and at Bluehill PS in the July event.
3. Many of the operational limitations of the pump stations will be addressed as part of on-going capital improvement projects in the next 10 years, including:
 - pump start-up-time
 - complexity
 - equipment availability/reliability
 - asset condition
 - sediment deposition

Thank you,
Questions?

