

# City of Grand Ledge

Water Supply Studies

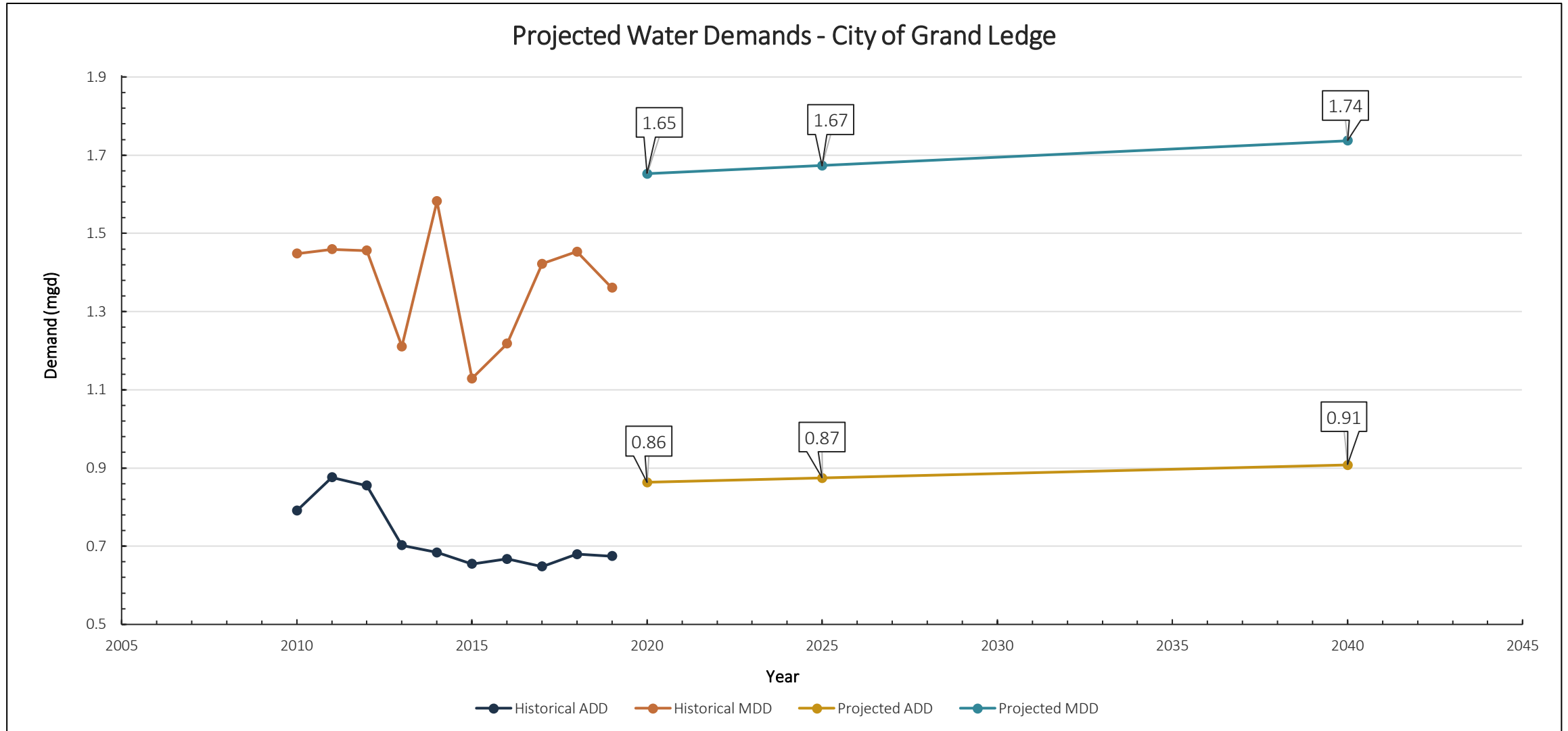
September 28, 2020



# Studies Overview

- Existing iron removal plant approaching end of useful life
- Three studies to evaluate water supply replacement:
  - New iron removal treatment system
  - New water softening treatment system
  - Connection and water supply from Lansing Board of Water and Light
- Compare costs of options/present worth analysis

# Basis of Design



# Basis of Design

- Treatment plant capacity of 4.0 mgd identified for other studies
- 4.0 mgd unable to be supplied by LBWL
- 2.0 mgd - peak capacity supplied by LBWL
  - Some growth in service area along transmission routes
  - Emergency capacity higher (2.84 mgd) as tank levels drawn down
  - Significant LBWL investment required to supply a higher capacity than 2.0 mgd and maintain service to LBWL customers



# LBWL Supply Pros and Cons

<b>Advantages</b>	<b>Disadvantages</b>
<ul style="list-style-type: none"><li>• Regionalization of water supply</li></ul>	<ul style="list-style-type: none"><li>• High infrastructure capital costs for new transmission main and existing LBWL system (for northern route)</li></ul>
<ul style="list-style-type: none"><li>• Eliminate need to expand raw groundwater capacity</li></ul>	<ul style="list-style-type: none"><li>• Commodity charges from LBWL and Delta Township increase costs to final users</li></ul>
<ul style="list-style-type: none"><li>• Provide softened water to City customers</li></ul>	<ul style="list-style-type: none"><li>• Less control of water rates</li></ul>
<ul style="list-style-type: none"><li>• Existing staffing sufficient to operate new booster station(s)</li></ul>	<ul style="list-style-type: none"><li>• Requires coordination with other municipal entities</li></ul>
<ul style="list-style-type: none"><li>• Potentially increase service area</li></ul>	

# Storage Analysis

- **Recommended Storage**
  - 1.34 MG
- **Existing Useable Storage**
  - 0.99 MG currently
  - 0.89 MG if Front Street tank abandoned
- **Additional Storage**
  - Additional 0.45 MG recommended
  - 0.50 MG ground storage tank assumed for all LBWL connection alternatives

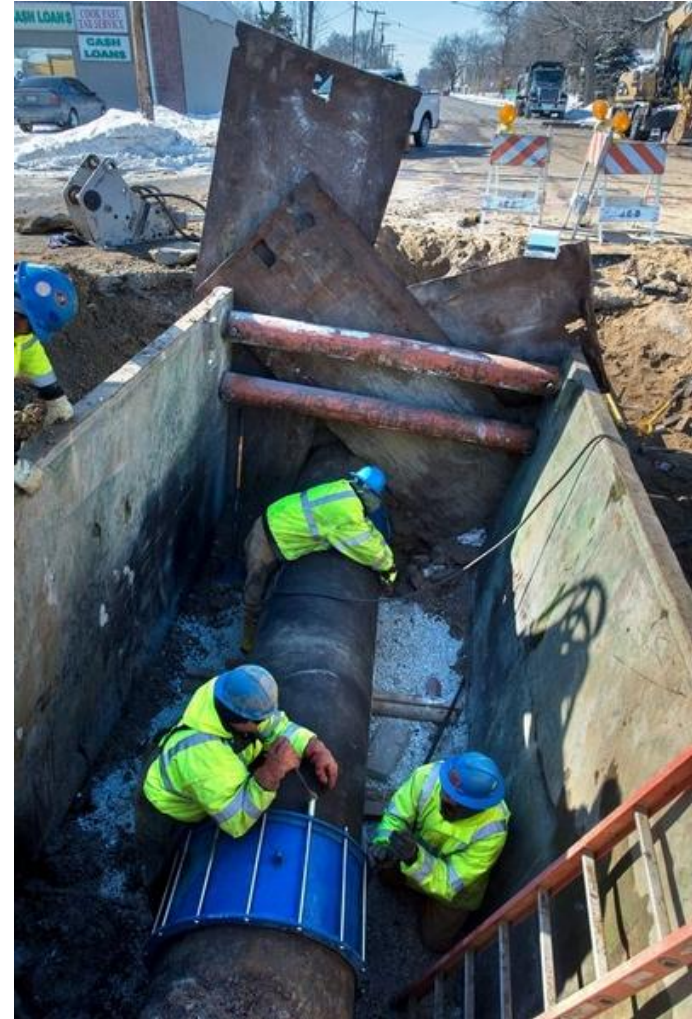


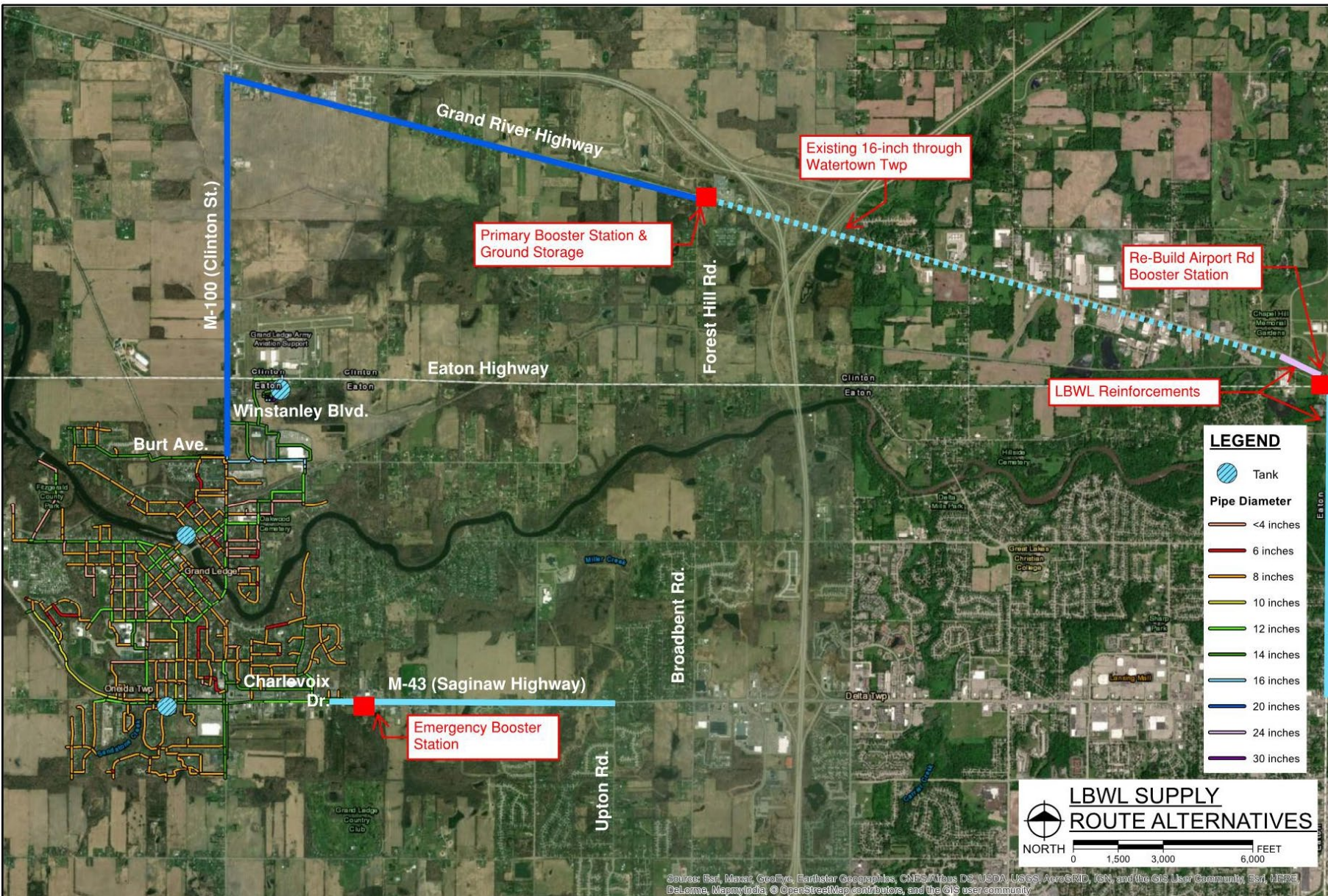
# Design Alternatives

- **Alternative 1 – Single Grand River Highway Feed**
  - Primary 20” transmission main from LBWL system at Grand River Highway and Forest Hill Road to north side of City distribution system
  - Redundant 16” supply through Delta Township along Saginaw Highway
- **Alternative 2 – Parallel Grand River Highway Feed**
  - Parallel 16” water mains from LBWL system at Grand River Highway and Forest Hill Road to north side of City distribution system
- **Alternative 3 – Parallel Saginaw Highway Feed**
  - Parallel 16” water mains from Delta Township system along Saginaw Highway from Upton Road to Charlevoix Drive near the southeastern City limits

# Redundancy Considerations for All Alternatives

- No single point of failure
- Limit service interruption from LBWL to Grand Ledge or existing LBWL customers
- Capable of providing at least 1.0 mgd demand with largest unit out of service
  - Pump or transmission main
  - Maintenance or failure
- Existing City groundwater wells not used
  - Need emergency chloramine provisions
  - Ongoing maintenance, testing, standby challenges





# Alternative 1 Route and Reinforcements

# Alternative 1 Pros and Cons

Advantages	Disadvantages
<ul style="list-style-type: none"><li>• Best redundancy - connects to 2 points in LBWL system and 2 separate locations in City</li></ul>	<ul style="list-style-type: none"><li>• Construct 3 booster stations at connections and LBWL system</li></ul>
<ul style="list-style-type: none"><li>• Backup connection could be used for regular use if demands exceed 2.0 mgd projection</li></ul>	<ul style="list-style-type: none"><li>• High water age at system connection point</li></ul>

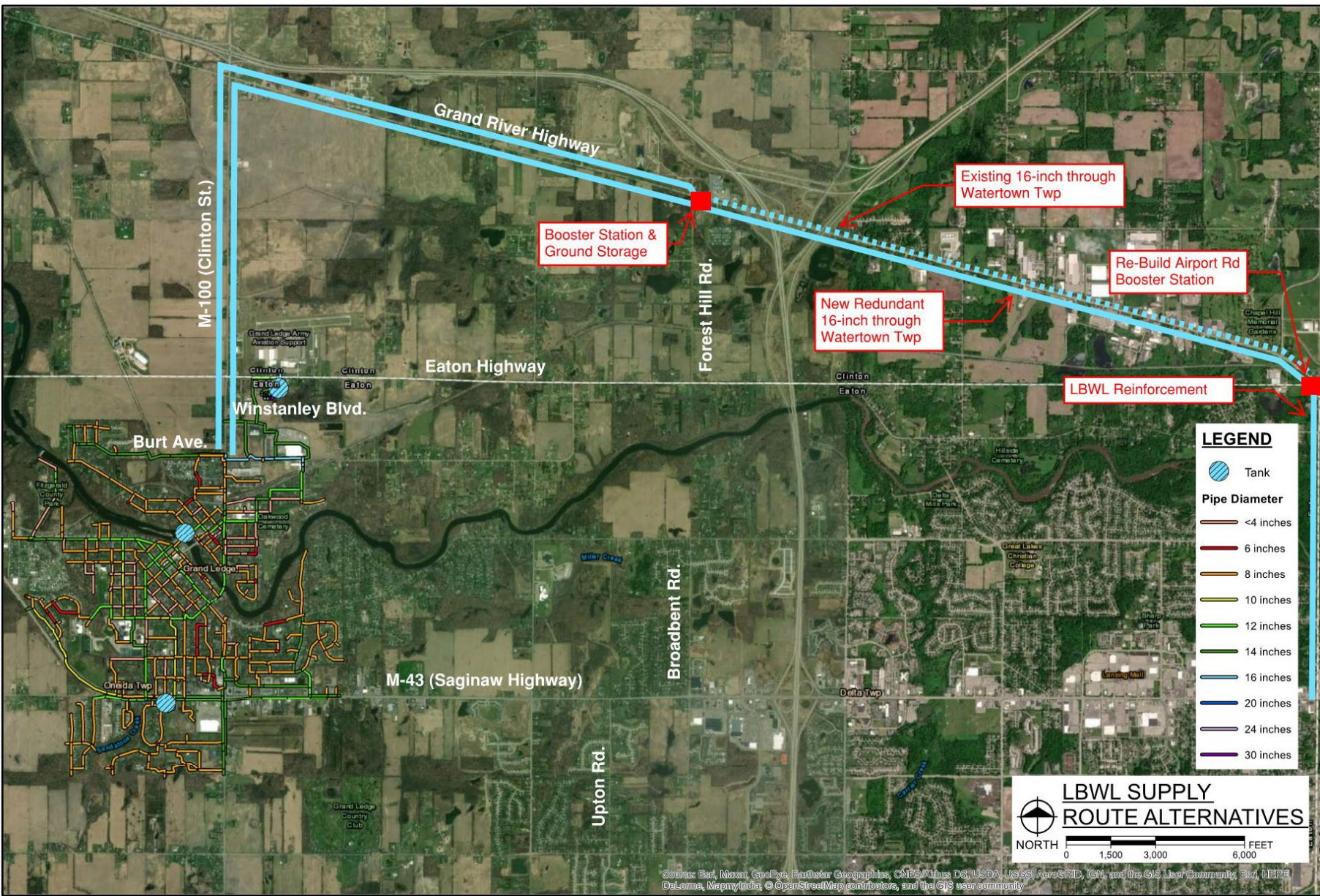


# Alternative 1 Costs

Summary of Project Costs	
Cost Category	Estimated Costs
LBWL Reinforcements	\$8,157,000
Transmission Main	\$13,541,000
North Booster Station & Storage Tank	\$4,522,000
South Emergency Booster Station	\$2,829,000
City Distribution Improvements	\$2,183,000
Decommissioning and Demolition	\$287,000
Corrosion Control Study	\$180,000
<b>Total Project Capital Cost</b>	<b>\$31,699,000</b>

O&M Costs for the Alternative	
O&M Cost Items	Annual Cost
Labor	\$32,500
Chemical Usage	\$49,000
Electrical Usage	\$20,000
Gas Usage	\$2,500
LBWL Water Commodity Charges*	\$1,176,100
<b>Annual O&amp;M Costs</b>	<b>\$1,280,700</b>

\*Subject to LBWL annual increases



# Alternative 2 Route and Reinforcements

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community.

# Alternative 2 Pros and Cons

Advantages	Disadvantages
<ul style="list-style-type: none"><li>• Reduces coordination with other municipal entities</li></ul>	<ul style="list-style-type: none"><li>• Highest capital costs of all evaluated alternatives</li></ul>
<ul style="list-style-type: none"><li>• Opportunities to expand City water service area in Watertown Township</li></ul>	<ul style="list-style-type: none"><li>• High water age at system connection point</li></ul>



# Alternative 2 Costs

Summary of Project Costs	
Cost Category	Estimated Costs
LBWL Reinforcements	\$14,240,000
Transmission Main	\$15,946,000
North Booster Station & Storage Tank	\$4,540,000
City Distribution Improvements	\$2,183,000
Decommissioning & Demolition	\$287,000
Corrosion Control Study	\$180,000
<b>Total Project Capital Cost</b>	<b>\$37,376,000</b>

O&M Costs for the Alternative	
O&M Cost Items	Annual Cost
Labor	\$32,500
Chemical Usage	\$49,000
Electrical Usage	\$19,000
Gas Usage	\$1,500
LBWL Water Commodity Charges*	\$1,176,700
<b>Annual O&amp;M Costs</b>	<b>\$1,278,700</b>

\*Subject to LBWL annual increases



# Alternative 3 Pros and Cons

Advantages	Disadvantages
<ul style="list-style-type: none"><li>• Lowest capital cost of all water supply alternatives</li></ul>	<ul style="list-style-type: none"><li>• Delta Township commodity surcharge assumed</li></ul>
<ul style="list-style-type: none"><li>• Fewer City distribution improvements needed</li></ul>	<ul style="list-style-type: none"><li>• Single water main connecting Delta Township system to LBWL</li></ul>
<ul style="list-style-type: none"><li>• Lowest water age of LBWL supply alternatives</li></ul>	



# Alternative 3 Costs

Summary of Project Costs	
Cost Category	Estimated Costs
LBWL Reinforcements	\$0
Transmission Main	\$6,064,000
South Booster Station & Storage Tank	\$4,416,000
City Distribution Improvements	\$1,407,000
Decommissioning & Demolition	\$287,000
Corrosion Control Study	\$180,000
<b>Total Project Capital Cost</b>	<b>\$12,354,000</b>

O&M Costs for the Alternative	
O&M Cost Items	Annual Cost
Labor	\$32,500
Chemical Usage	\$49,000
Electrical Usage	\$19,000
Gas Usage	\$1,500
LBWL Water Commodity Charges*	\$1,176,700
Delta Twp. Water Commodity Charges**	\$588,400
<b>Annual O&amp;M Costs</b>	<b>\$1,867,100</b>

\*Subject to LBWL annual increases

\*\*Subject to Delta Township annual increases

# Water Age Evaluation

- Tool to evaluate areas with potential for low disinfectant residual
- Highlight areas with largest change in age after LBWL connection
- Hydraulic model run with extended period simulation
  - Varying system demands and conditions (tanks, pumps, etc.)

Water Age Comparison		
Scenario	Age at Supply Point (hrs.)	Average Age (hrs.)
Existing System (WTP)	0.0	34.1
Alt. 1 – Northern Connection	90.0	141.8
Alt. 2 – Northern Connection	92.3	147.1
Alt. 3 - Southern Connection	50.4	91.3

# LBWL Supply Cost Summary

Treatment Alternative	Total Project Cost	Annual O&M Costs
Alternative 1 – Single Grand River Highway Feed	\$31,699,000	\$1,280,700*
Alternative 2 – Parallel Grand River Highway Feed	\$37,376,000	\$1,278,700*
Alternative 3 – Parallel Saginaw Highway	\$12,354,000	\$1,867,000**

\*Subject to LBWL annual increases; \*\*Subject to LBWL and Delta Township annual increases

# Present Worth Analysis of Alternatives

- Present worth is the sum which invested now at a given discount rate would provide exactly the funds required to pay all present and future costs
  - Option with lowest present worth represents the most economical solution
- Not representative of actual cash flow; tool to compare the economics of alternatives
- 3% discount rate, 20-year planning period
- Salvage value captures the remaining value of the assets at the end of 20 years
- For LBWL supply alternatives, annual O&M costs include water commodity charges
  - LBWL commodity cost (\$2.45/ccf) + variable chemical and electrical charge (\$0.20/ccf)
  - Delta Township surcharge assumed to be 1.5 x LBWL commodity charge

# Present Worth Analysis of Alternatives

Treatment Alternative	Capital Costs	Annual O&M Costs	Salvage Value	Net Present Value
Iron Removal	\$14,802,000	\$104,900	(\$3,763,000)	\$12,600,000
RO Softening	\$33,847,000	\$509,000	(\$7,237,000)	\$34,183,000
IX Softening	\$23,549,000	\$508,000	(\$5,634,000)	\$25,473,000
Lime Softening	\$30,856,000	\$637,000	(\$6,917,000)	\$33,416,000
LBWL Supply Alt. 1	\$31,699,000	\$1,280,700*	(\$12,991,000)	\$37,762,000
LBWL Supply Alt. 2	\$37,376,000	\$1,278,700*	(\$16,394,000)	\$40,006,000
LBWL Supply Alt. 3	\$12,354,000	\$1,867,000**	(\$4,816,000)	\$35,316,000

\*Subject to LBWL annual increases; \*\*Subject to LBWL and Delta Township annual increases

# Summary

- **Iron removal has lowest 20-year present worth**
  - Produces a similar finished water to existing WTP, no softening
- **Ion exchange is lowest present worth of all softened water alternatives**
  - Further consideration needed for brine wastewater disposal
  - Increases sodium concentration in finished water
- **LBWL supply connection through Delta Township has the lowest present worth of LBWL supply alternatives**
  - Commodity and surcharge rate negotiations with Delta Township may shift costs assessed to City up or down
  - Uncertainty on emergency backup and Delta system reinforcement requirements
  - Delta Township surcharge would need to be verified

# Next Steps

- Incorporate comments from review of draft studies and submit final reports
- After City Council evaluation and selection of alternative, request and award preliminary design engineering for selected water supply alternative to replace Iron Removal Plant
- Discussions with EGLE regarding design requirements
- Review potential funding sources
- Begin preliminary design