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Construction Considerations for a CHP Facility Conversion in a Clustered Urban Setting

Charter Street Heating Plant
University of Wisconsin – Madison, WI

Project Timeline and Picture

Sierra Club Files Lawsuit
(Court finds 3 projects violated the Clean Air Act NSR provisions)
2007

Broke Ground
October 25th
2010

Substantial Completion
November
2013

- Street Plant is one of two power plants run by the university
- Plants serve 42,000 students and 330 buildings
- A true tri-generation plant
- Plant can never afford to go offline for extended period due to service needs
- Charter Street Plant is on a constrained site, surrounded by a bustling urban area:
  - Student housing, urban development, sporting venues, bike path, roads, and a rail line

Our Mission:

Convert plant from coal to gas without disrupting service to the university.

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Scope of Work

$140M Joint Venture with AMEC converting plant from coal to gas.

Demolition scope included:

- Four underground fuel oil tank’s
- Four coal boilers
- Coal handling equipment (yard and internal transfer)
- Two baghouses, stack and ash handling equipment

Installation of the following major components:

- Four ultra low NOx natural gas/fuel oil package boilers
- 71,000 SF for new boiler, control room and water treatment
- Plant of Plant including a 920,000 gal fuel oil storage tank
- Digital controls for both campus heating/cooling plants
- Electrical system upgrades and additions(13.8-KV switchyard)
- Fire protection for the existing plant and expansion

All work completed while the plant remained on line. A prolonged outage was out of the question.

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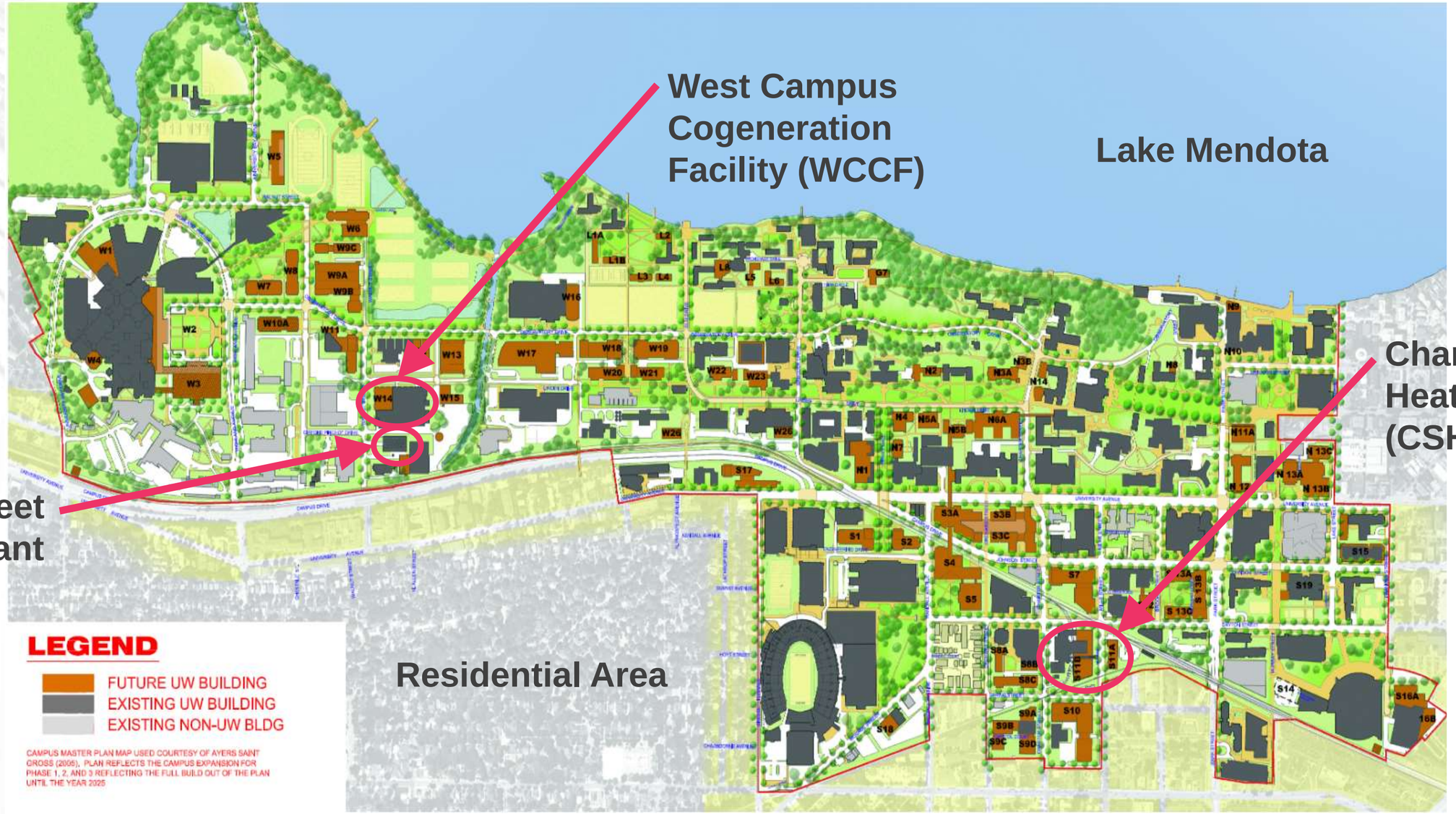
Setting

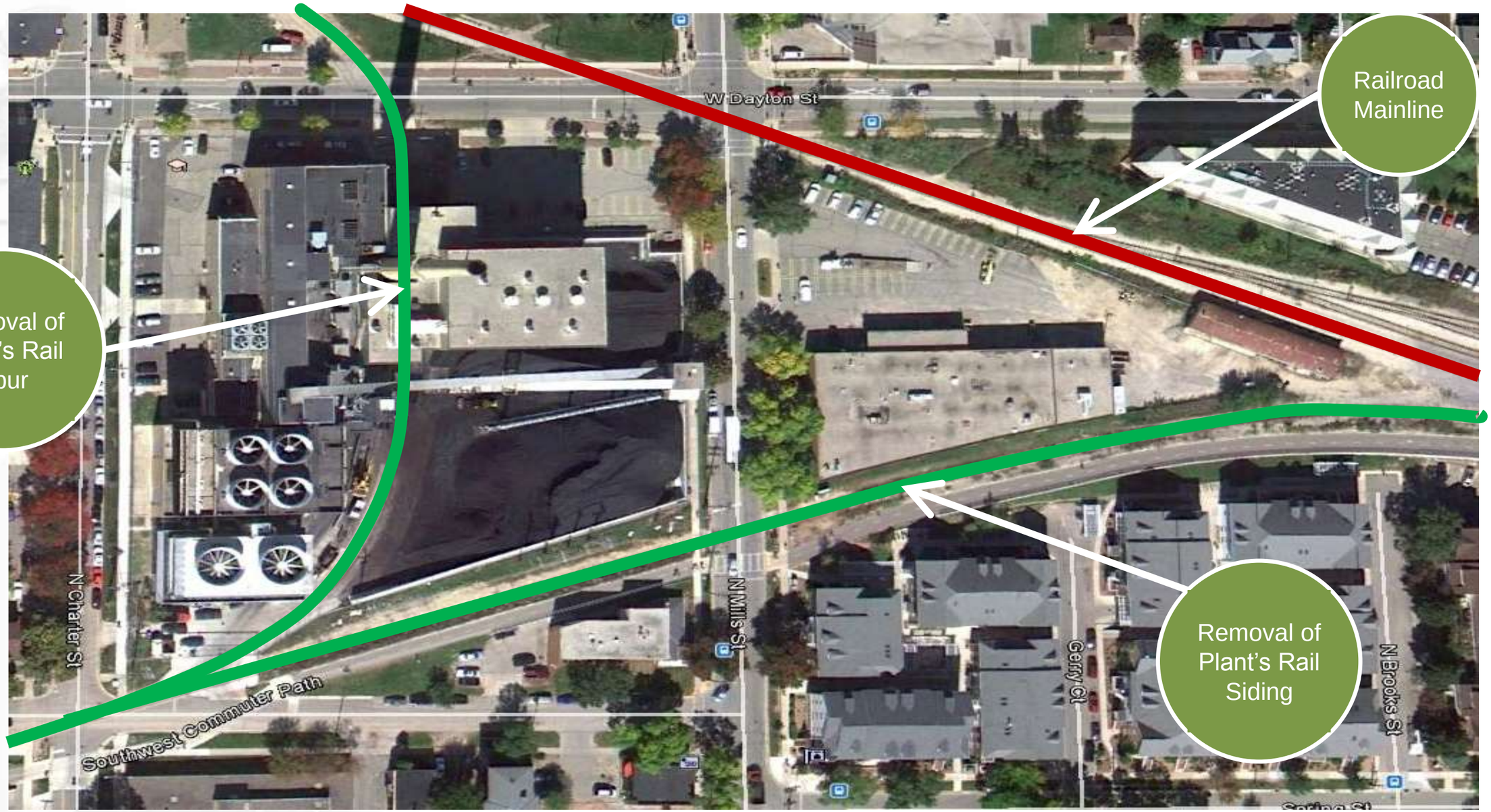

West Campus Cogeneration Facility (WCCF)
Lake Mendota
Charter Street Heating Plant (CSHP)
Walnut Street Heating Plant (WSHP)
Residential Area
LEGEND
FUTURE UW BUILDING
EXISTING UW BUILDING
EXISTING NON-UW BLDG
CAMPUS MASTER PLAN MAP USED COURTESY OF AYERS SAINT GROSS (2005). PLAN REFLECTS THE CAMPUS EXPANSION FOR PHASE 1, 2, AND 3 REFLECTING THE FULL BUILD OUT OF THE PLAN UNTIL THE YEAR 2025

“Before” Aerial Image

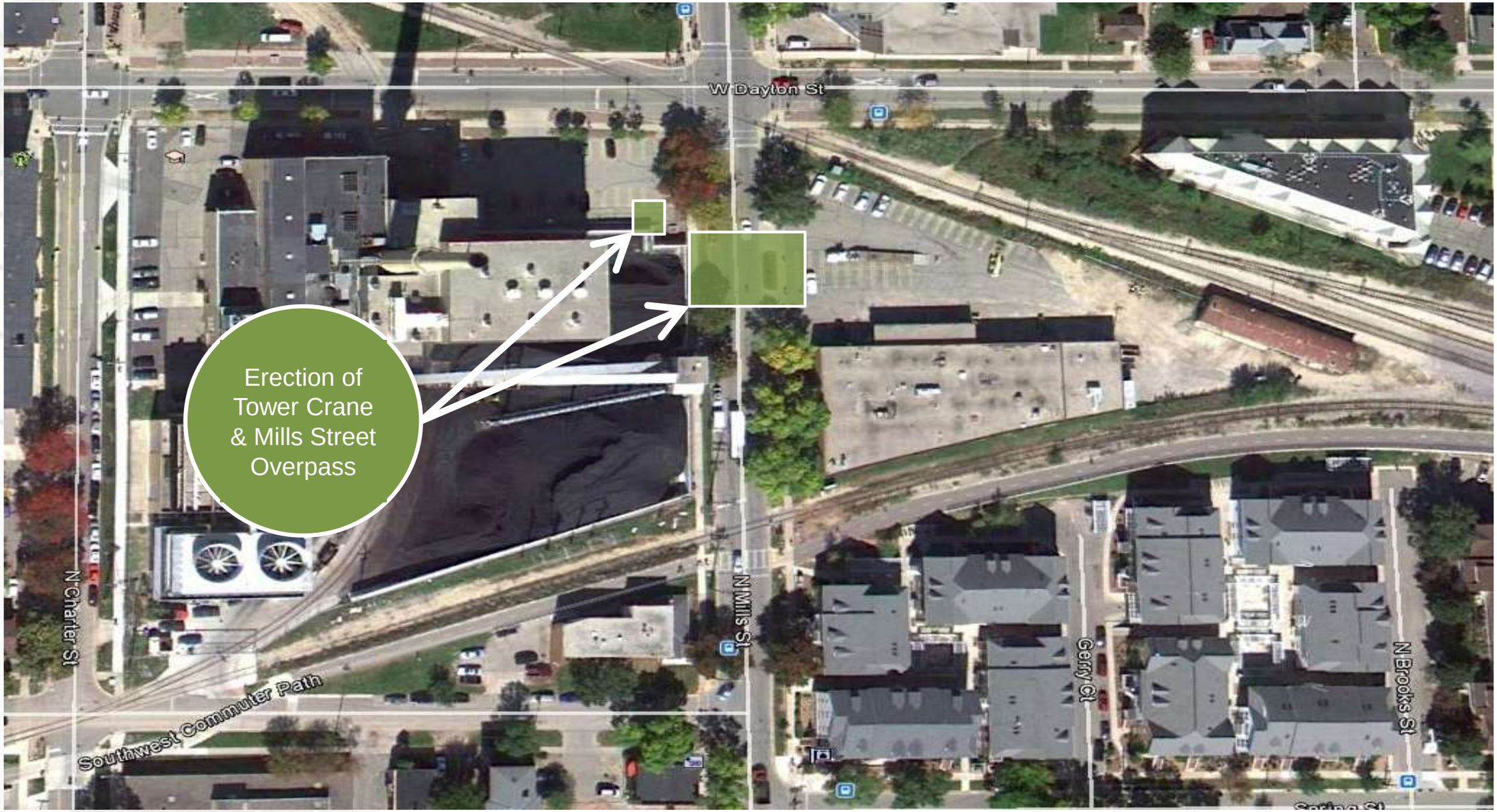
Work – Pre-Construction Phase

Work – Pre-Construction Phase

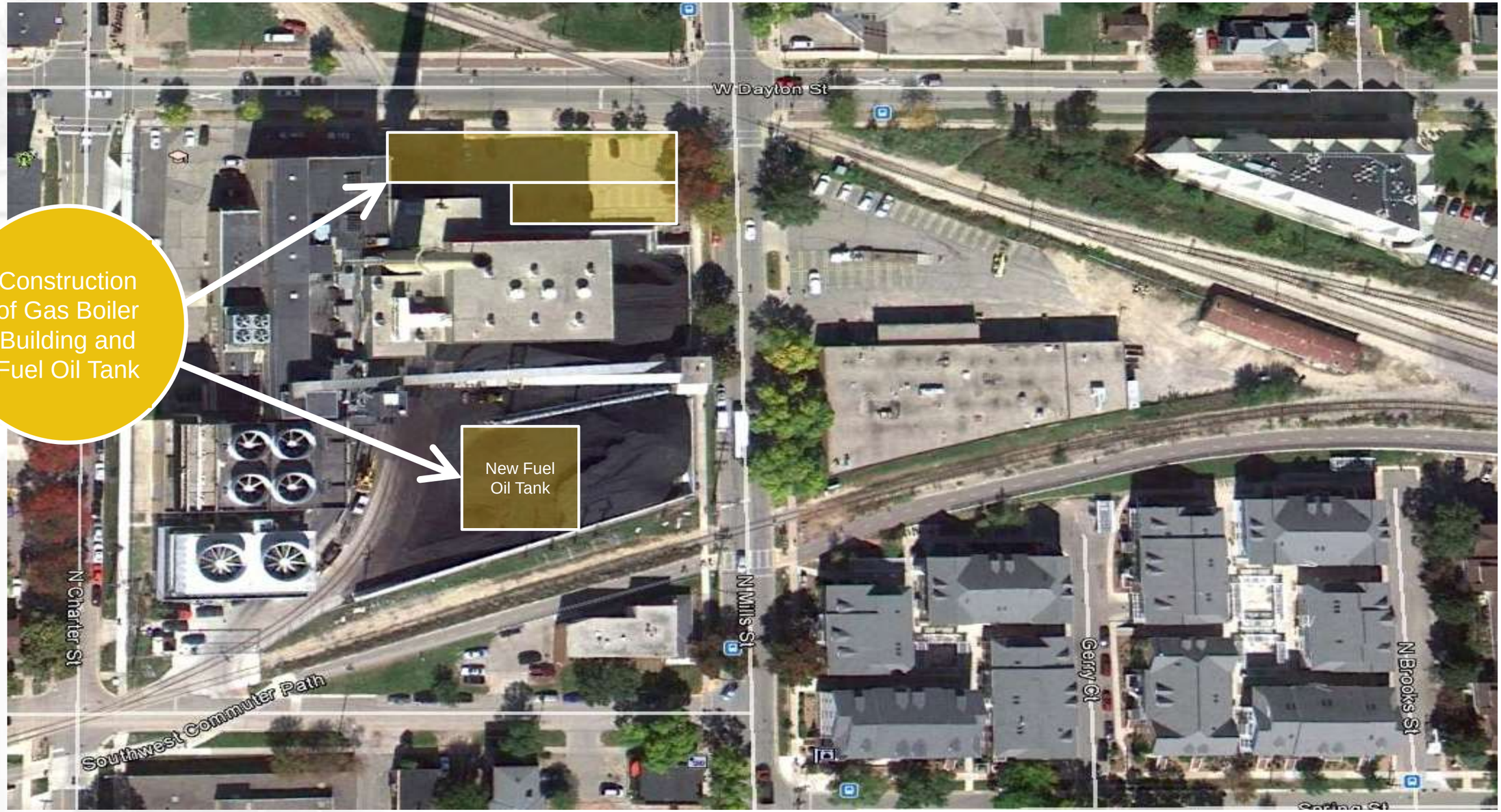
Work – Pre-Construction Phase



Work – Pre-Construction Phase



Work – Phase 1


Construction of Gas Boiler Building and Fuel Oil Tank
New Fuel Oil Tank
W Dayton St
N Charter St
Southwest Commuter Path
N Mills St
Gerry Ct
N Brooks St

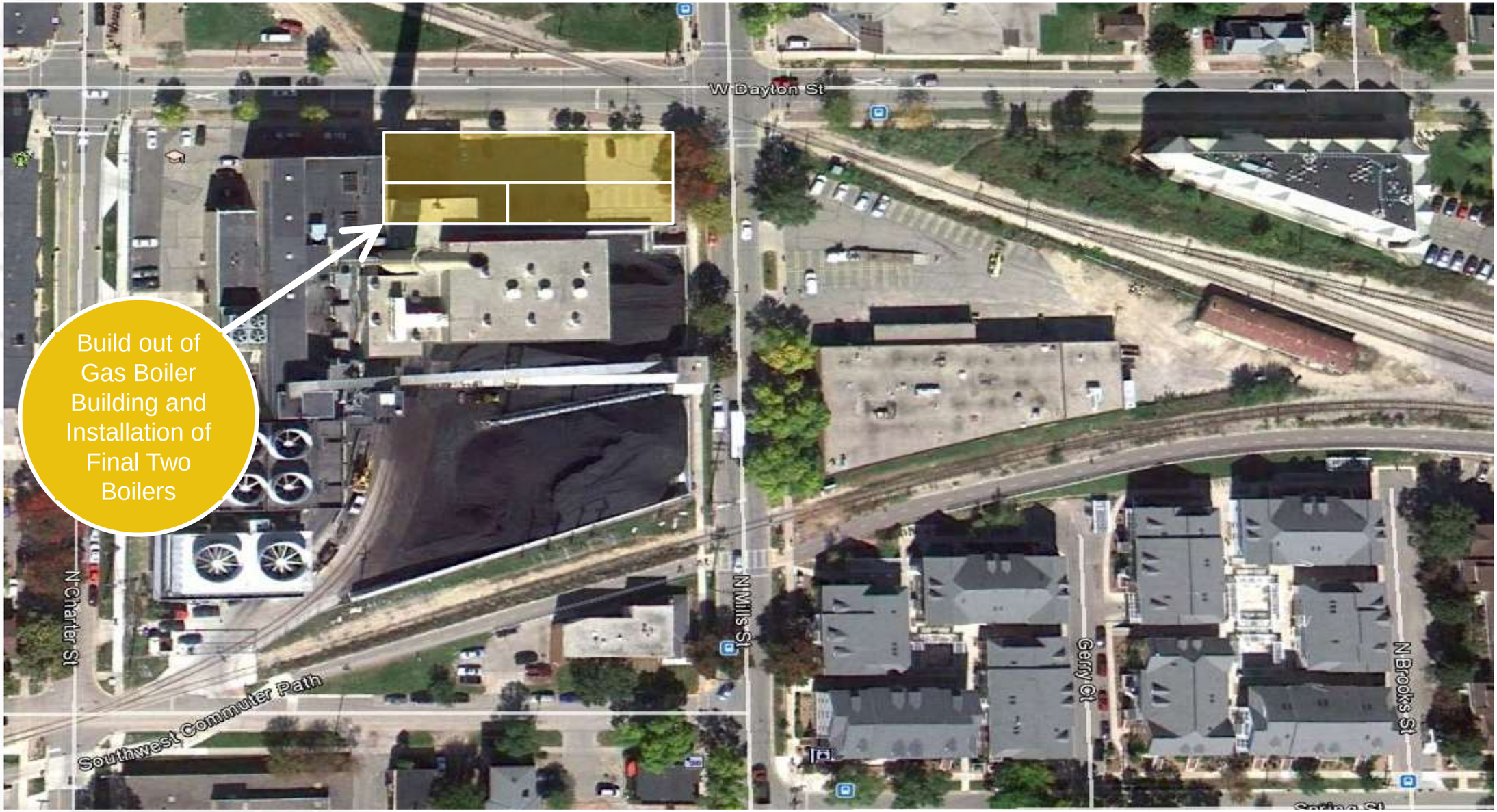
Work – Phase 1 Gas Boiler Building and Fuel Oil Tank

Work – Phase 2


W Dayton St
N Mills St
Gerry Ct
N Brooks St
Southwest Commuter Path
Demo of Coal Handling Equipment, Ash Silo, Baghouse and Chimney

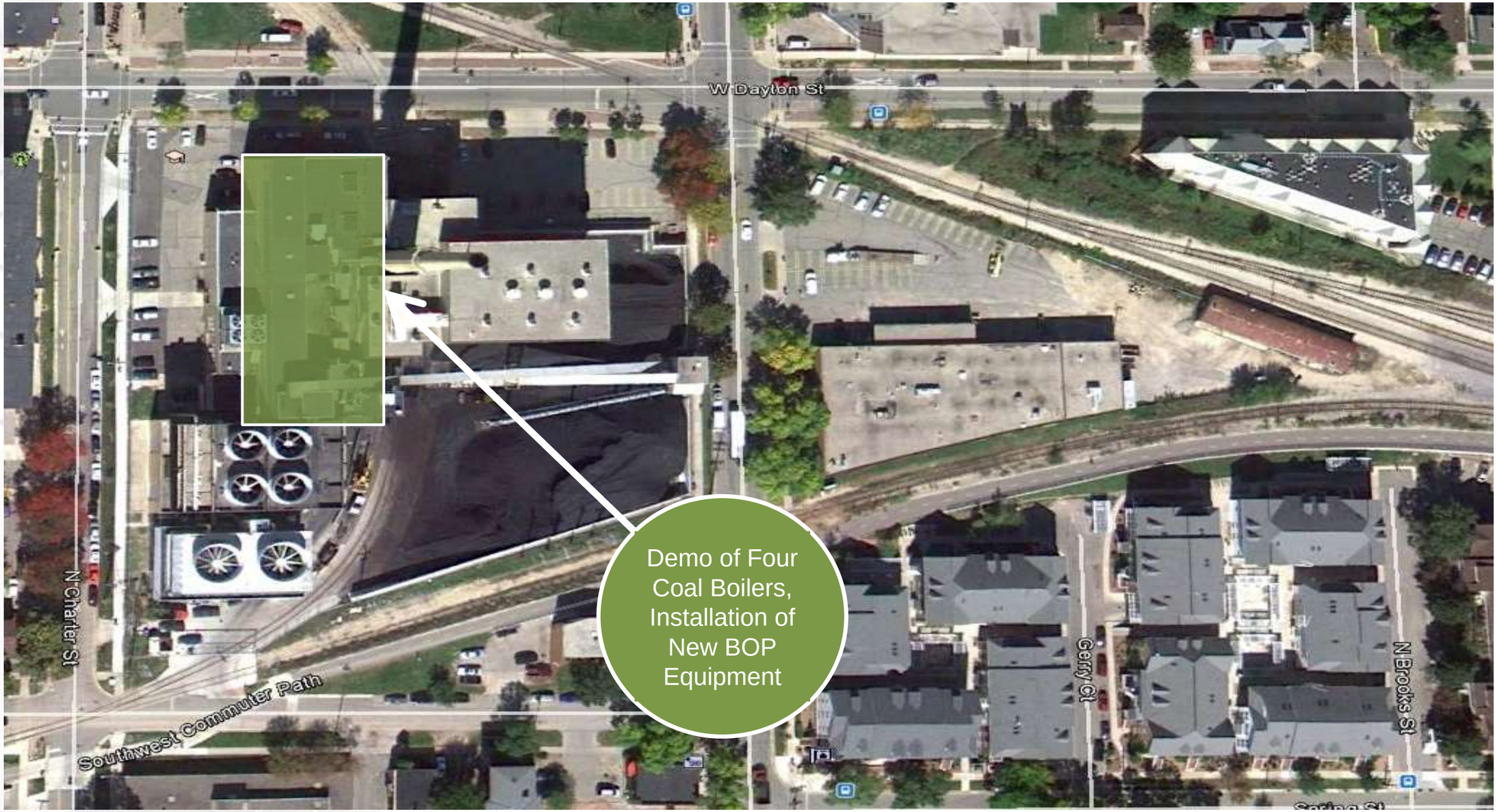
Work – Phase 2 – Coal Yard & Baghouse Demo

Work – Phase 3


Build out of Gas Boiler Building and Installation of Final Two Boilers
W Dayton St
N Charter St
Southwest Commuter Path
N Mills St
Gerry Ct
N Brooks St

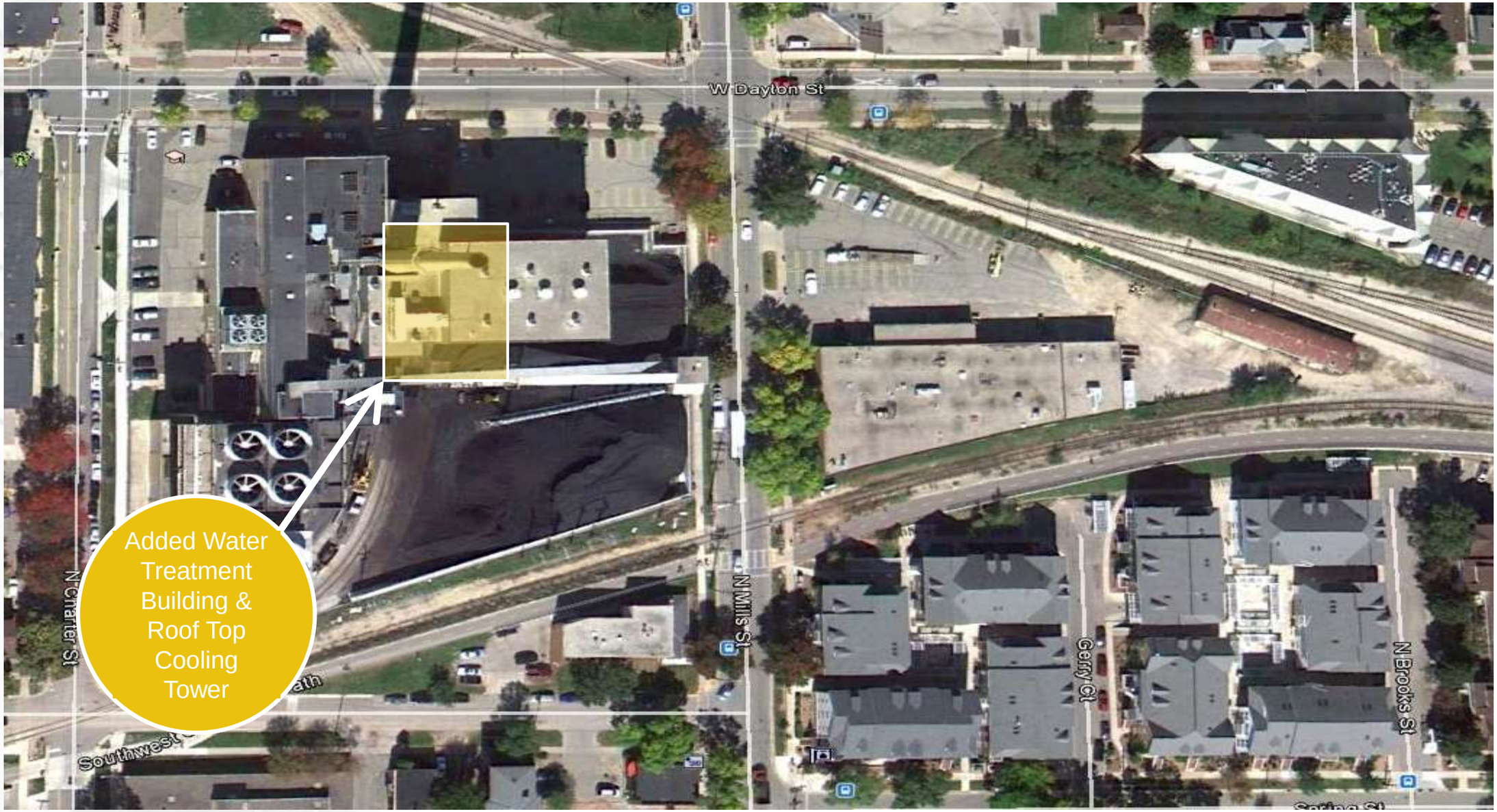
Work – Phase 3

Work – Phase 4


W Dayton St
N Charter St
Southwest Commuter Path
Gerry Ct
N Brooks St
Demo of Four Coal Boilers, Installation of New BOP Equipment

Work – Phase 4

Work – Phase 5


W Dayton St
N Charter St
N Mills St
Gerry Ct
N Brooks St
Added Water Treatment Building & Roof Top Cooling Tower

Work – Phase 5 - Cooling Tower/Water Treatment Building Installed

Work – Phase 6


N Charter St
N Mills St
Spring St
N Brooks St
Removal of Overpass, Completed Landscaping & Parking Lots

Typical Construction Considerations and Mitigation

- Safety
- Soils
- Groundwater
- Surface water management
- Dust
- Noise
- Weather-Related Planning
- Limited lay-down space required "just-in-time" deliveries to keep the project on schedule

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Unique Construction Considerations and Mitigation

- **Utilities (gas, electric, cable lines, sewer, water)**
- Fuel oil back-up
- Tall Structures Demo
- Traffic
- Campus event planning
- Crane size optimized for scope of work and logistics
- Extensive planning for crane picks

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Efficiency in Execution

- Elimination of waste through innovative Lean processes
- Repurposed many materials to add value to the project
- New gas boilers boosted plant's capacity by 80 percent (900,000 #/hr steam vs 500,000 #/hr steam)
- Efficiency in communication required between project players
- Smooth transition to operations

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Project is seeking LEED Gold certification

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Lessons Learned

- Use ILPD processes to keep everyone “in the know” of each other’s work, and accountable as a team player
- Work with plant personnel to make sure buy-in is early on and continue to verify often
- In clustered urban settings, plan logistics every day
- Keep a cross function/cross party management team for rapid decision-making
- Establish contingency budgets early, and who manages
- Build consensus plan with all interested parties before committing to price
- Deploy “just in time deliveries” where at all possible

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Questions

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