

# EMERGENCY CONDENSATE LINE REPLACEMENT; UNIQUE SOLUTIONS UNDER DIFFICULT CONDITIONS

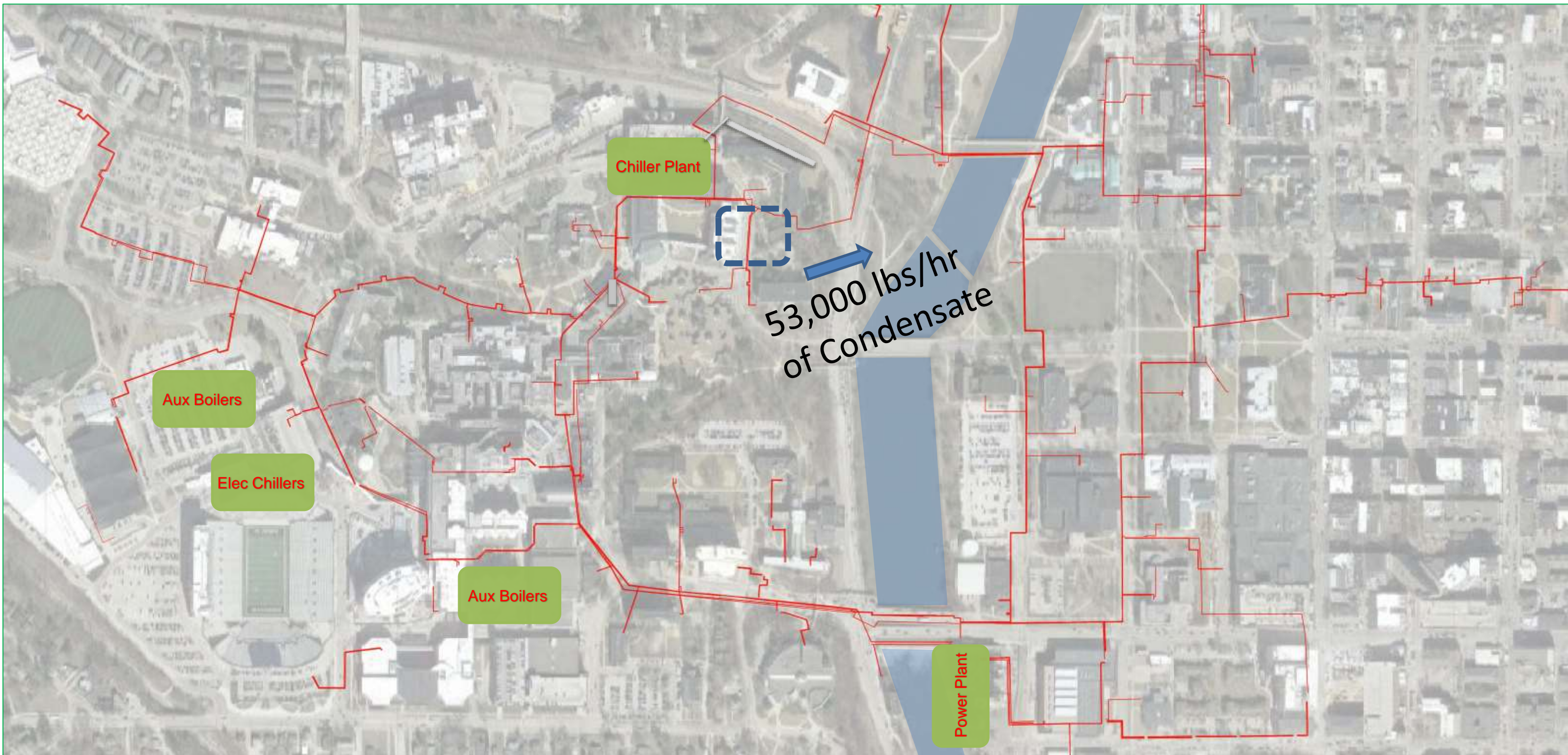


**SHIVEHATTERY**  
ARCHITECTURE+ENGINEERING

- **Condensate Corrosion Issues**
- **Preliminary Study**
  - **Pipe Material Options**
  - **Installation Routing & Techniques**
- **Project Scope and Schedule**
- **Design Challenges**

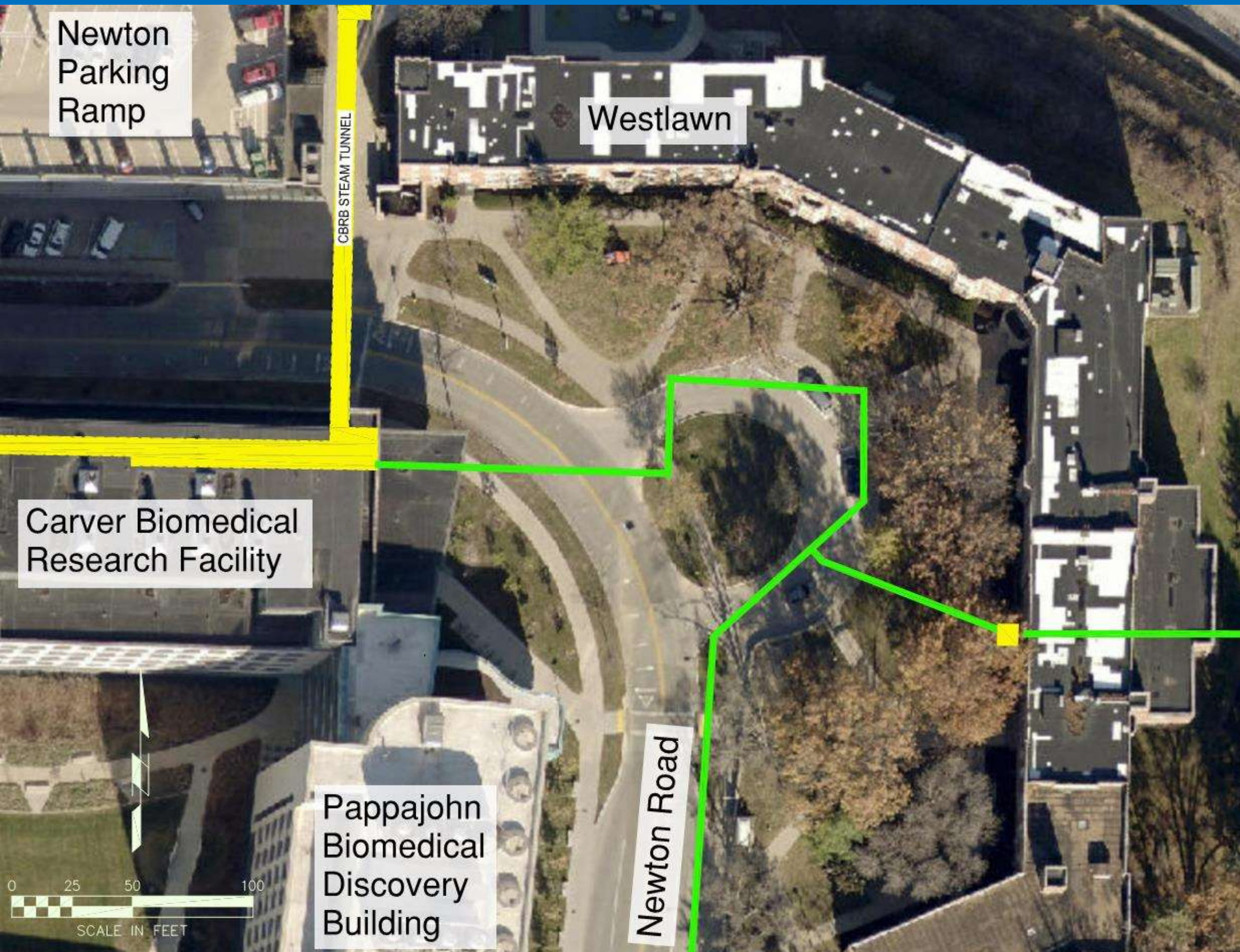


# Condensate Corrosion Issues





# Condensate Corrosion Issues



**Prefabricated 8" stainless steel  
(2001)**

**Critical during cooling season**

**Minor leaking at vault**

**Cost of sewered condensate**

**Below road and drive that are  
heavily salted**

**Corrosion analysis**

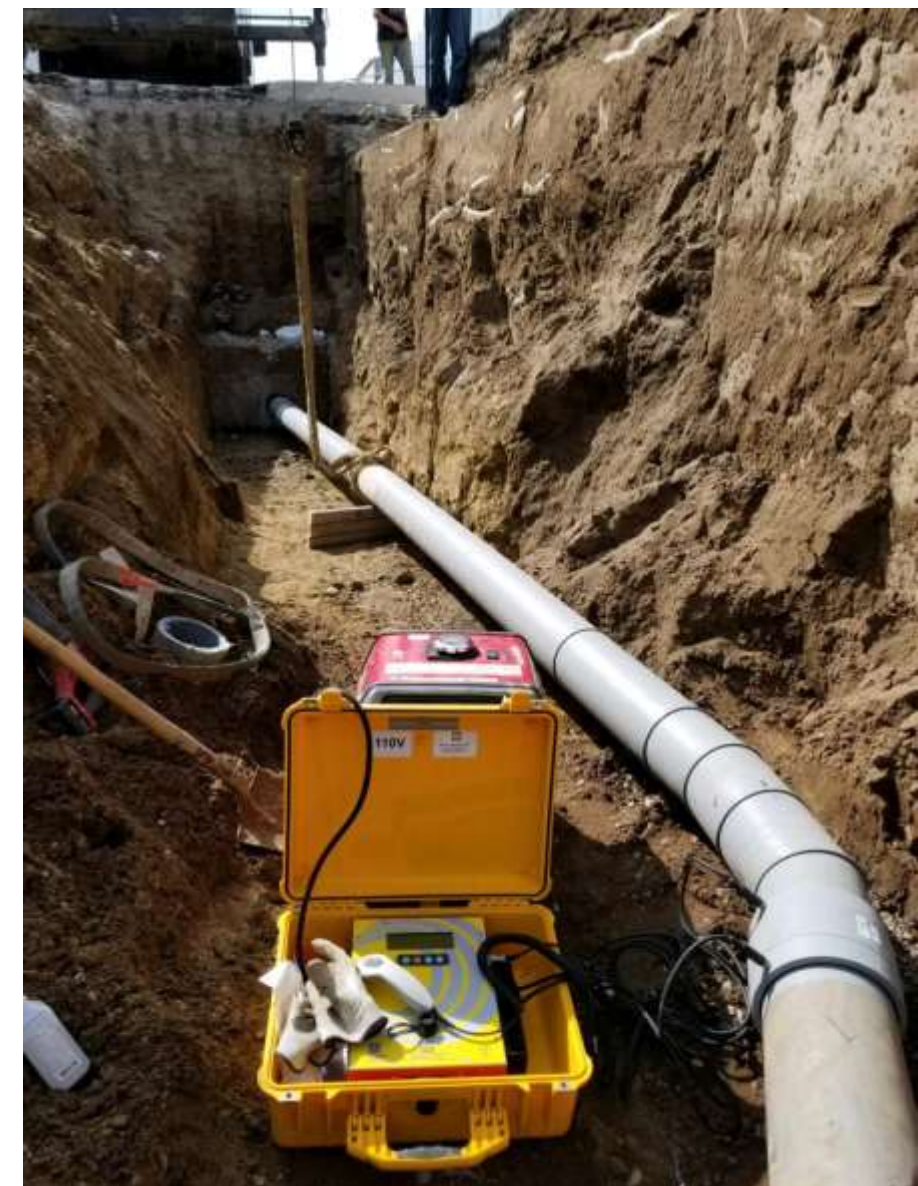




**Pre-Insulated Piping**



**Steel Pipe  
w/Insulation Envelope**



**PP-RCT  
(ASTM F2389)**



	Temperature Rating	Pressure Rating
Current Design Standard	500°F	175 psig
Actual Operating Conditions	180°F	<50 psig
PP-RCT Ratings (SDR-11)	203°F	75 psig

## PP-RCT

- **Corrosion resistant**
- **Good insulator (200x > carbon)**
- **Light weight (5x < steel)**
- **Resistant to stray currents**
- **Cost effective**



	Coefficient of Thermal Expansion	Movement in/100ft @ 200°F
Carbon Steel	$6.7 \times 10^{-6}$	1.2
Stainless Steel	$9.6 \times 10^{-6}$	1.7
PP-RCT	$1.94 \times 10^{-5}$	3.5

## Flash Steam/Steam Traps

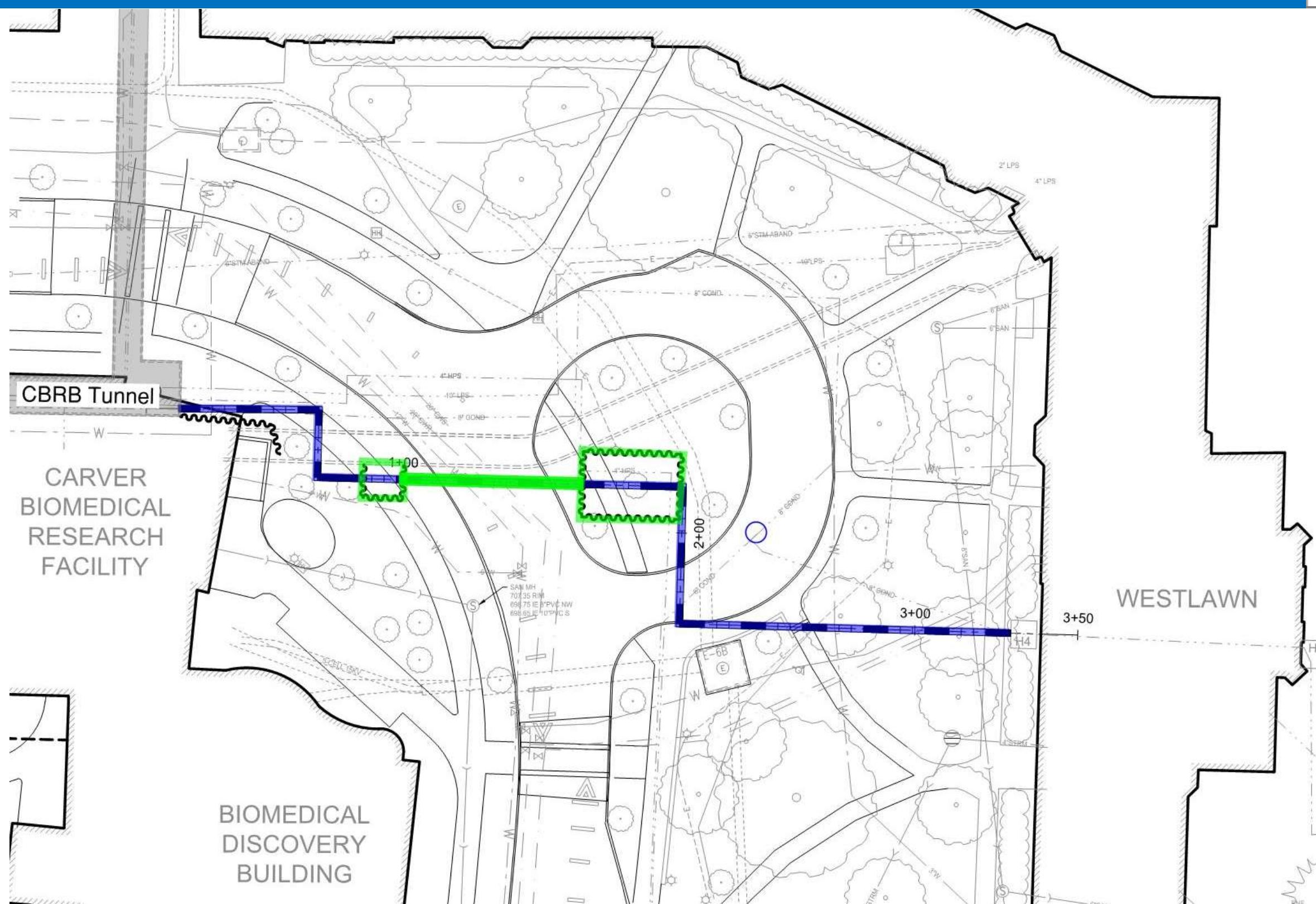
### Thermal Expansion

- PP-RCT expands 2X as stainless steel; 3X carbon steel
- PP-RCT exerts 85x less longitudinal force; cannot overcome soil friction



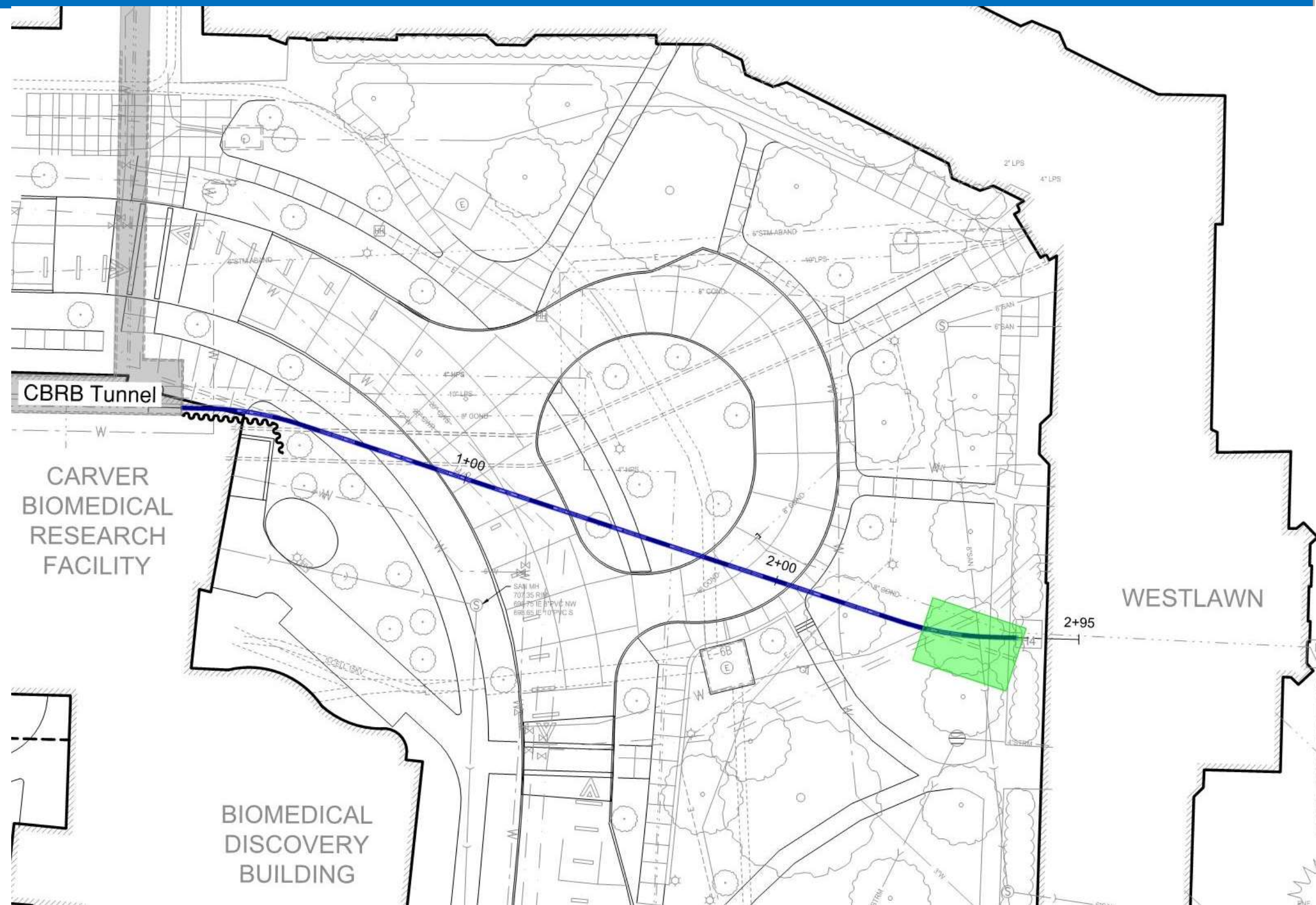






## Bore and Jack Installation





## Horizontal Directional Drilling Installation



	<u>Relative Estimated Costs</u>
• Open Cut –	1.0X
• Pre-Insulated Stainless Steel	
• Bore and Jack –	0.86X
• Pre-Insulated Stainless Steel	
• Horizontal Directional Drilling –	0.60X
• PP-RCT	





## PROJECT SCHEDULE

Start Survey and Design

February 2, 2018

Submit Bid Documents

February 15, 2018

Bids Received

February 28, 2018

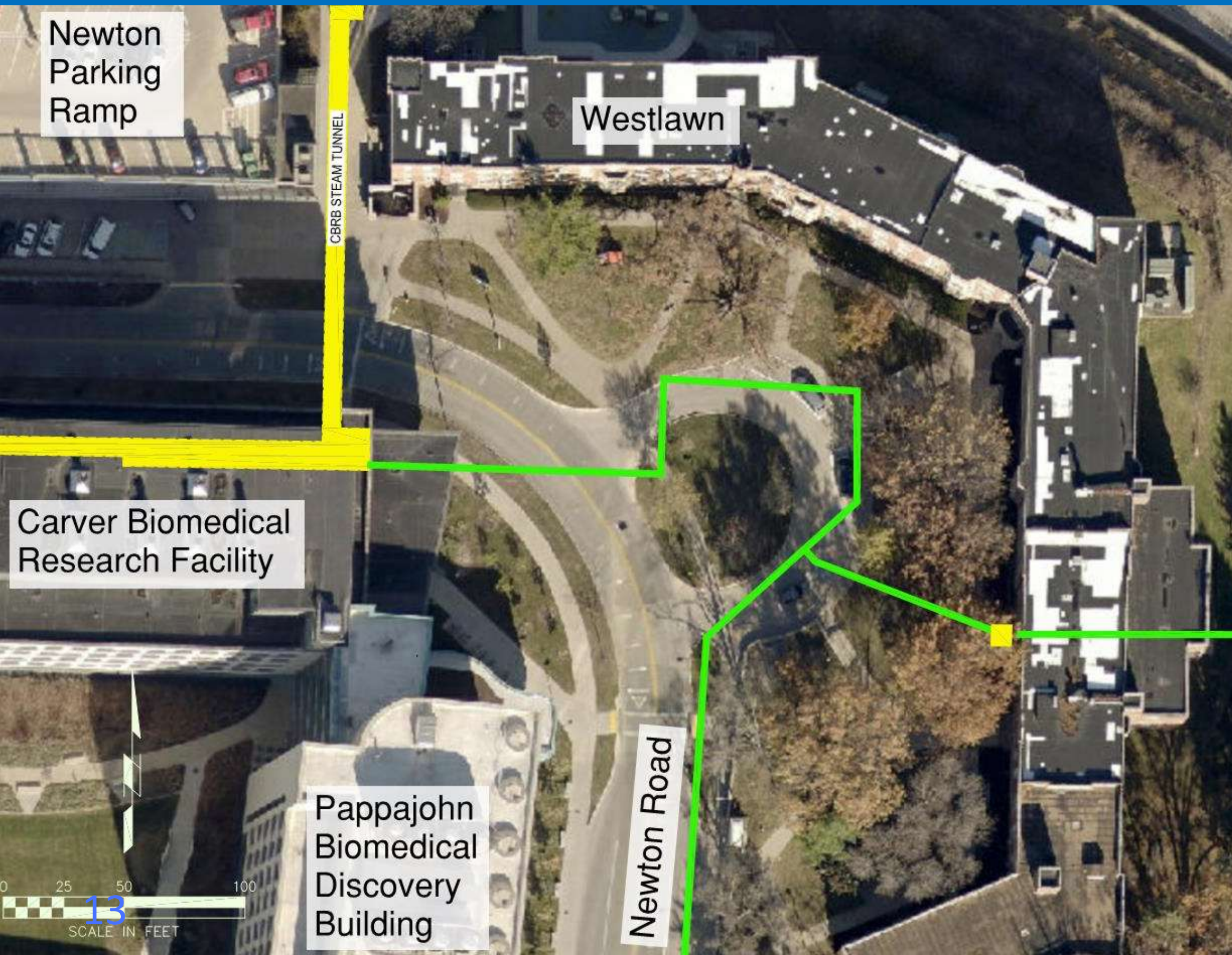
Substantial Completion

April 27, 2018

**\*Condensate to be Energized for Cooling Season**

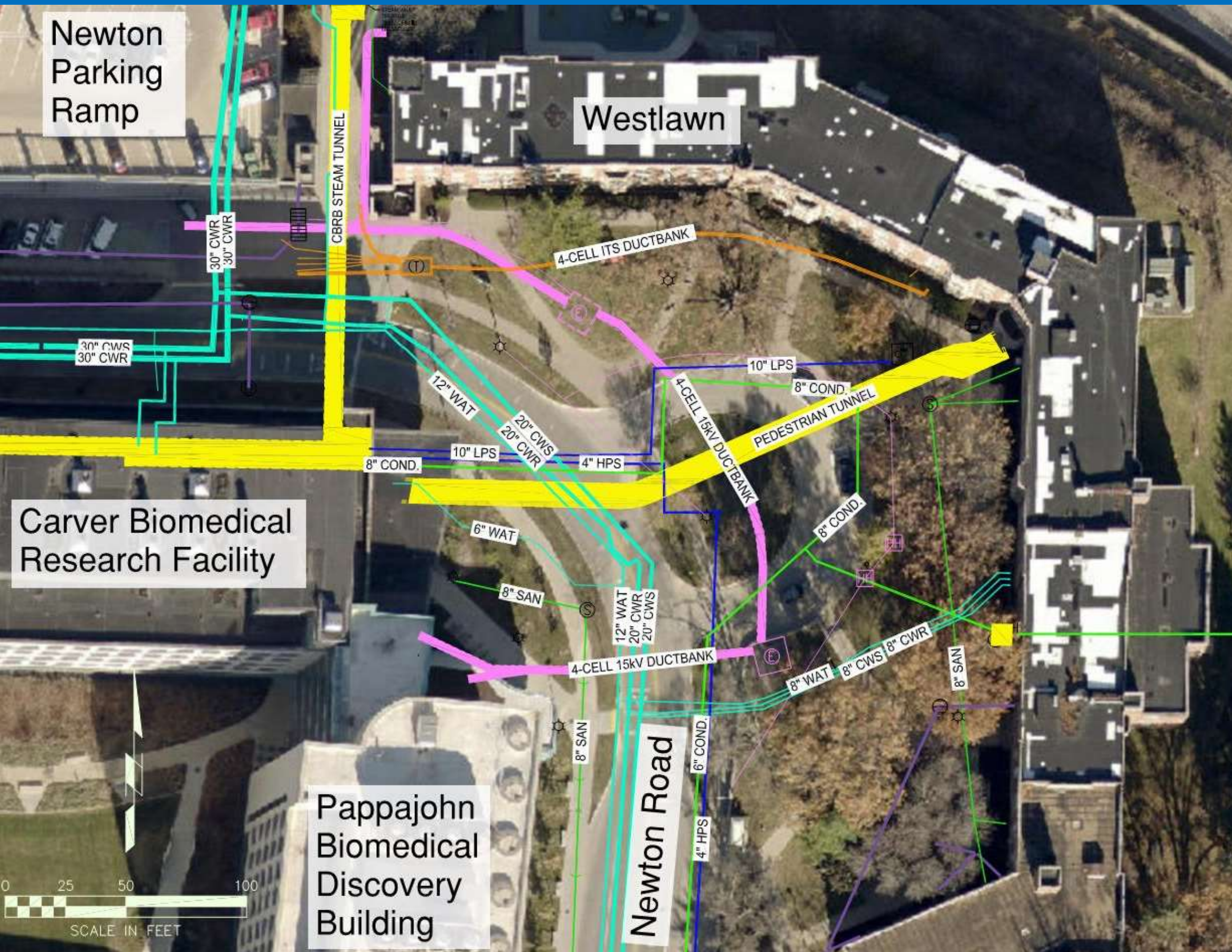


# Design Challenges



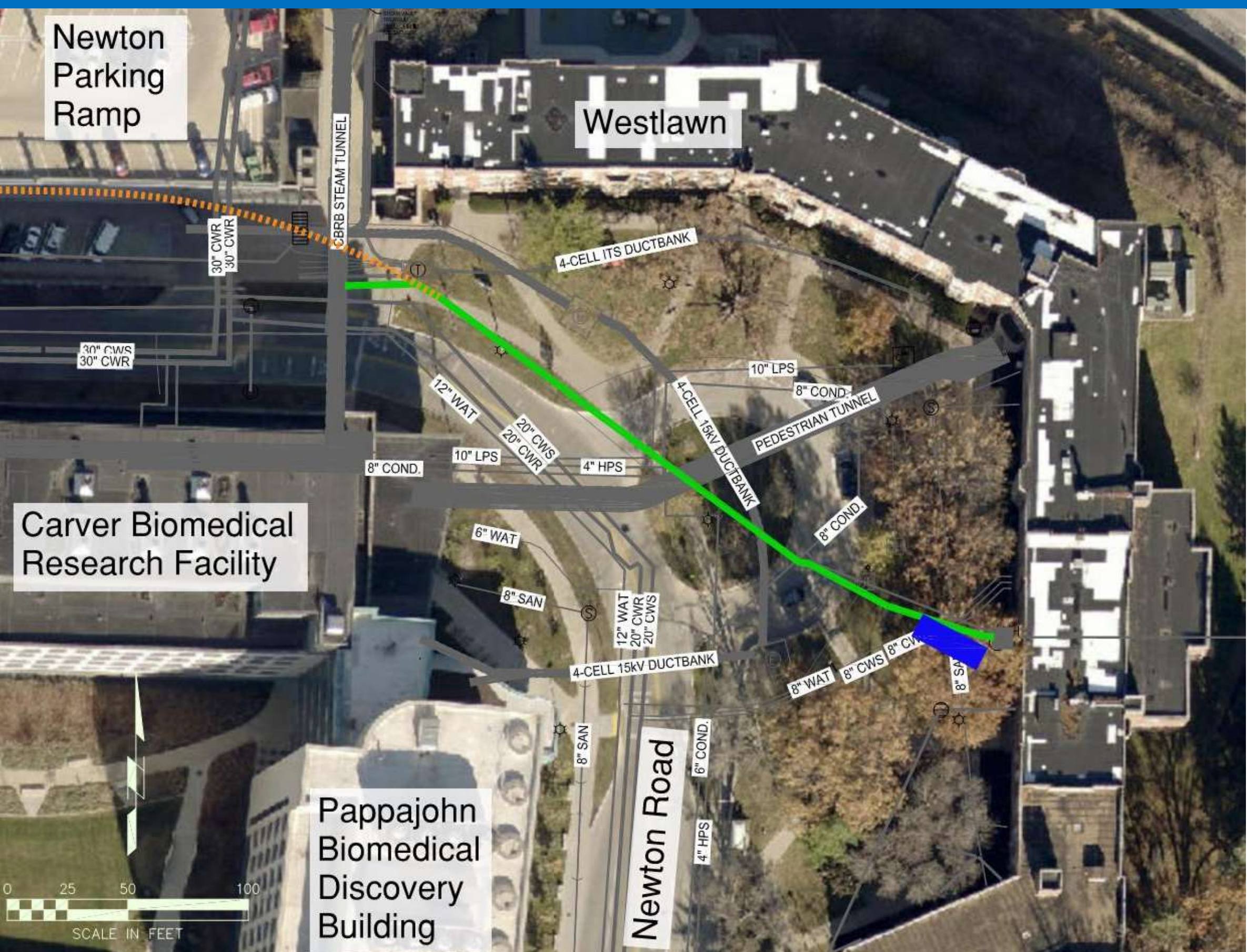


# Design Challenges





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## Contractor Familiarity with the product

Pipe Material	Allowable Pullback Force (lb)	Minimum Bending Radius (ft)
HDPE	27,600	23
Fused PVC	25,000	190
PP-RCT	21,450	215

\*Anticipated pullback force of 5,500 lb per design calculations





# Design Challenges







- **Quick installation**
- **Cost effective**
- **Corrosion resistant**



# Questions?

## **Richard A. Ney, Ph.D.**

Associate Director, Utilities Distribution  
Facilities Management

145 MSSB | Iowa City, IA 52242-1023

319.335.5146 | cell: 319.430.1793

[richard-ney@uiowa.edu](mailto:richard-ney@uiowa.edu)

[www.facilities.uiowa.edu](http://www.facilities.uiowa.edu)

## **Thomas J. Morgan, PE**

Senior Mechanical Engineer  
Shive-Hattery

2839 Northgate Drive | Iowa City, IA 52245

319.248.3385 | cell: 512.633.2747

[tmorgan@shive-hattery.com](mailto:tmorgan@shive-hattery.com)

## **Brent J. Amelon, PE**

Civil Engineer  
Shive-Hattery

2839 Northgate Drive | Iowa City, IA 52245

319.248.3412 | cell: 319.330.3324

[bamelon@shive-hattery.com](mailto:bamelon@shive-hattery.com)



