

“Pushing the Limits of Constructability Pushes the Limits of Project Planning”

Case Study: Myrtle-Morehead SDIP City of Charlotte, North Carolina



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WOOLPERT

Southeast Stormwater Association
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Presentation Outline

- Overview of Charlotte's Flood Control Program
- Myrtle-Morehead Project History
- Phase 1 Constructability Issues Realized
- Phase 2 Constructability Issues Under Design
- Lessons Learned
- Questions and Answers



City Flood Control Projects

- Drainage system improvements for watersheds up to one square mile
- Typical planning, design and construction duration – 5 to 7 years
- Typical costs range from \$500,000 - \$10 million
- Annual Funding of \$17.3 million



Flood Control Project Types

Problems:

- Roadway flooding
- Structural flooding
- Stream erosion
- Deteriorating infrastructure



11024 Blue Heron Drive



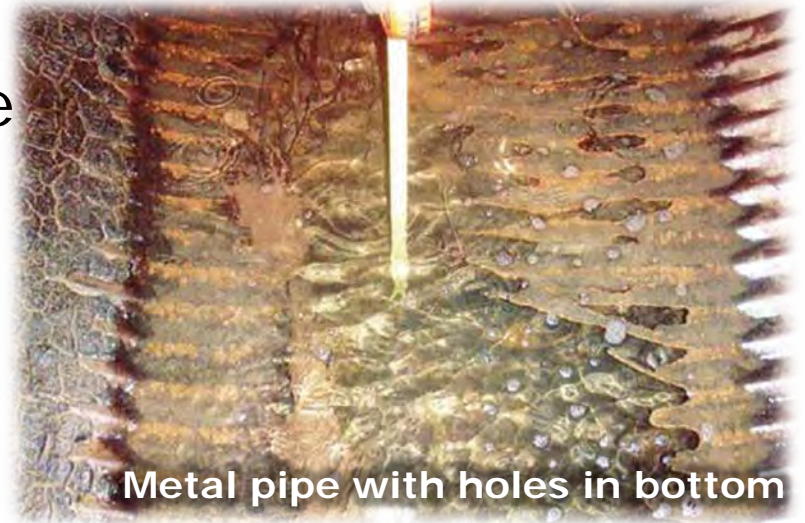
Kingfisher Drive



Myrtle/Morehead Project

Problems:

- Road Flooding - 6 Roads
- Structure Flooding - 20 structures
- Deteriorating Infrastructure

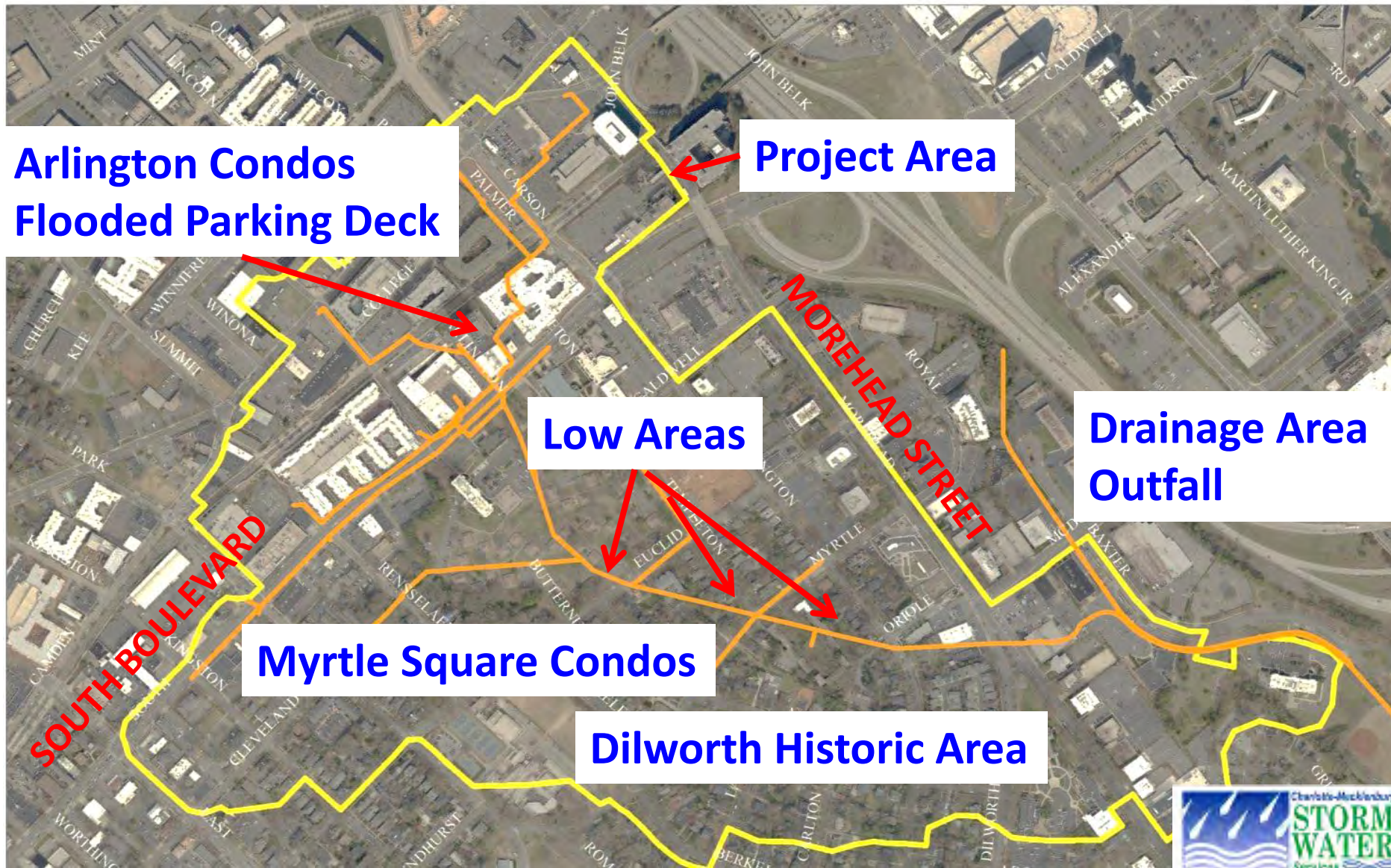


Project History/Existing System Problems

- Project initiated in 2000 due to chronic flooding of Myrtle Square Apartments, Euclid Avenue, Myrtle Avenue, and Lexington Avenue
- Dilworth area was developed around a creek that was piped with various undersized culverts
- Existing culvert is located underneath and behind numerous houses and apartments
- Dilworth area is a designated Historic Area with homes exceeding \$1M in value



Project Study Area



Project Study Area – Urban & Residential



McDowell Avenue



Oriole Avenue



Project Study Area - Residential



- **Narrow Tree Lined Streets**
- **OH Utilities**
- **On-Street Parking**



Project Study Area - Residential



Project Study Area - Residential



Euclid Avenue "Sump"

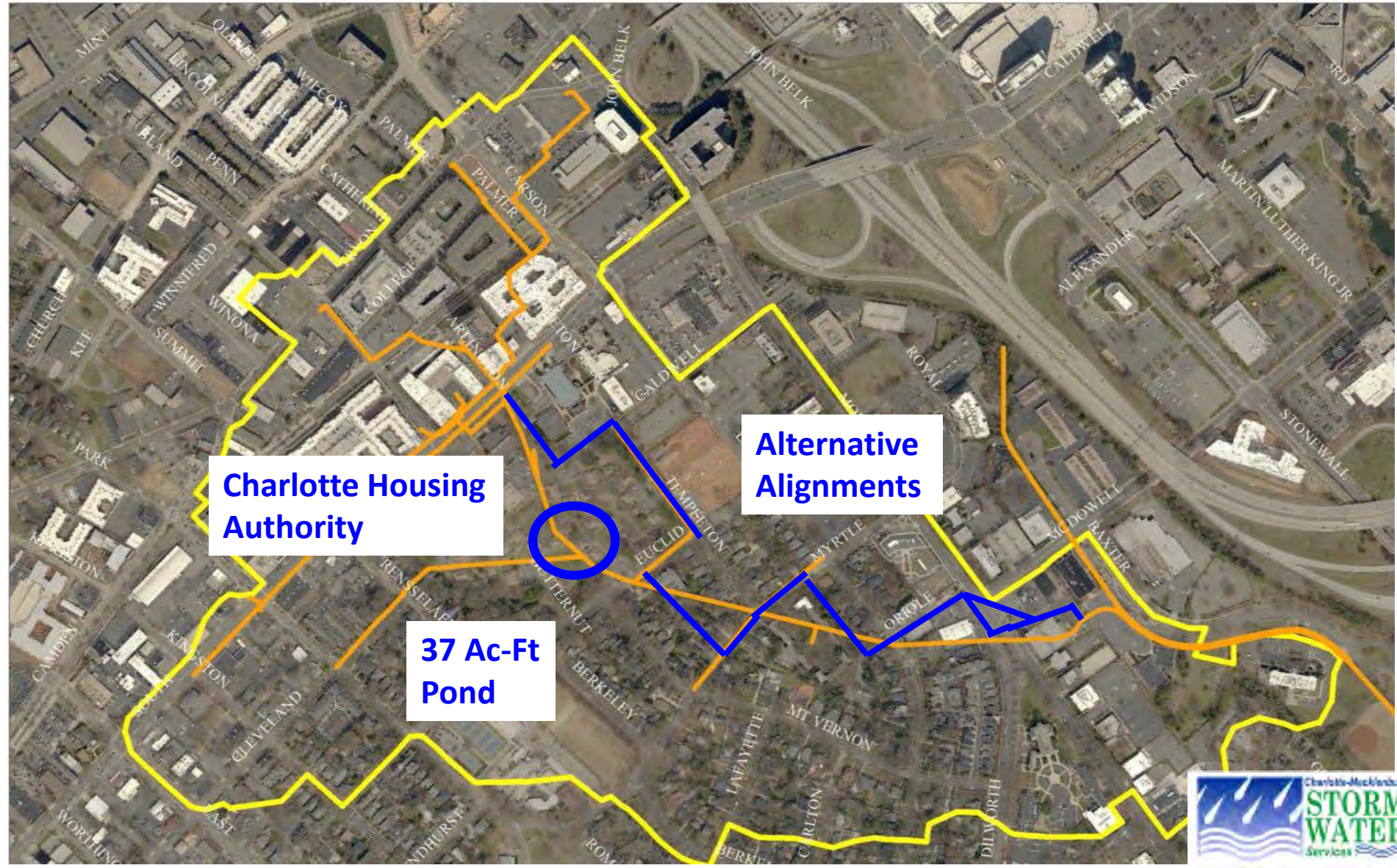


Alternatives Considered

- Rehabilitation of Existing System
 - Results in Less than 2 Year LOS
- Upstream Detention for 10 Year LOS
 - Required 37 Ac-Ft of Storage
- Numerous Alignments for New Culvert
- Other Potential Solutions
 - Linear Storage
 - Storm Water Pump Station



Alternatives Considered



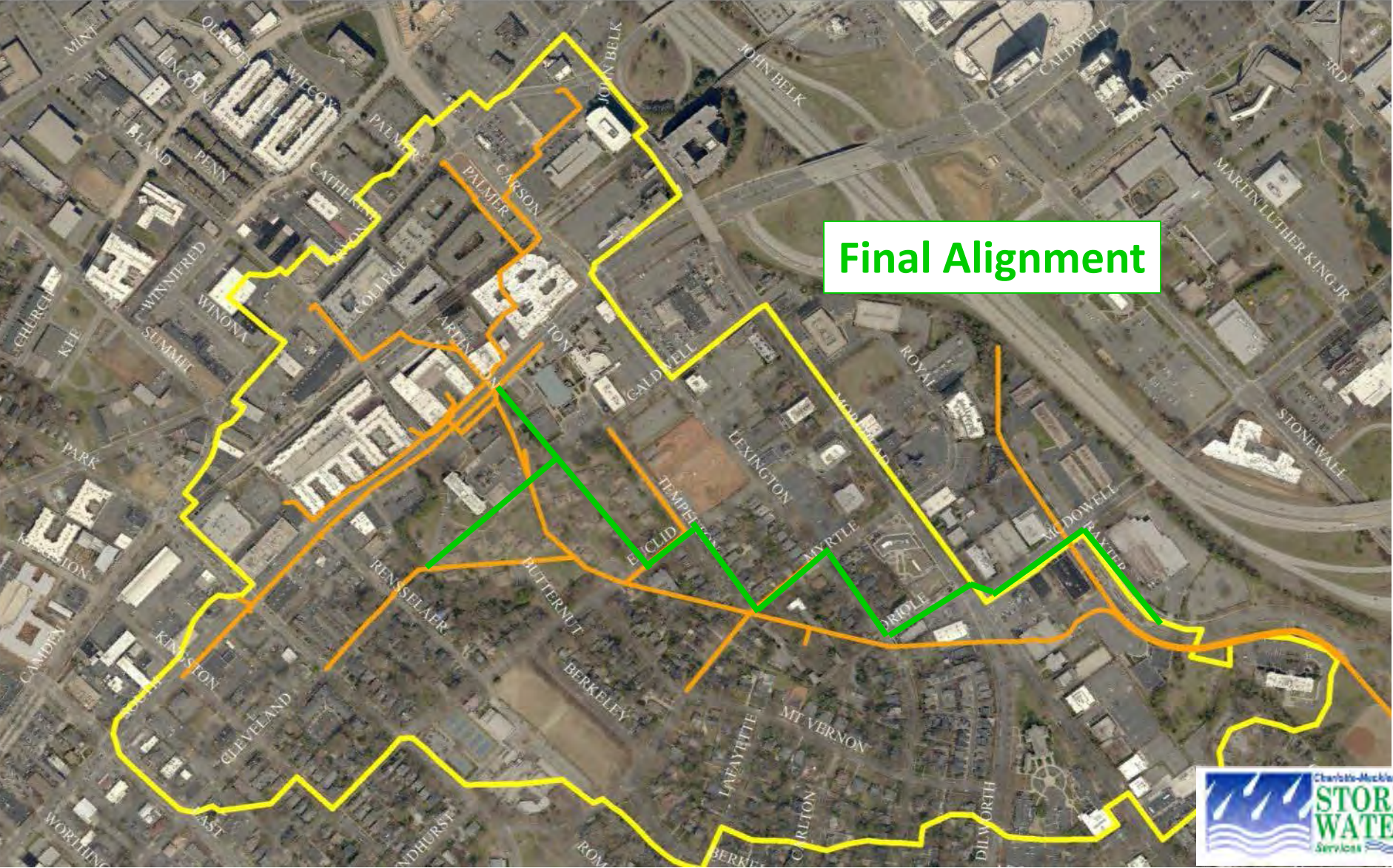
Charlotte Housing Authority

37 Ac-Ft Pond

Alternative Alignments



Alternative Chosen



Project Design & Constructability Challenges

- Routing a 78" to 90" by-pass culvert through the Dilworth neighborhood streets at depths between 20 and 30 feet
- Tunneling under Morehead Street and replacing 80' of the 54" water main (NCDOT Encroachment)
- Installing 90" culvert by open cut in McDowell Street (NCDOT Encroachment)
- Installing box culvert by squeezing it between a Public Relations firm and a Duke Over Head Transmission Line

Results in a monumental challenge of project planning & stakeholder involvement !



Impact of Constructability Challenges on Construction Costs

- Only 2 Bidders: **\$12.15M & \$13.04M**
 - 150 LF of Tunnel 30 feet deep : **\$3.15M**
 - Sheeting and Shoring for Deep Open Cut: **\$600K**
 - Contaminated Soils and Groundwater: **\$520K**
 - 80 LF 54-inch Water Main Replacement: **\$300K**
 - Slow construction – 18 months for 1,400 LF : **\$7.58M**



Phase 1 – Under Construction



Stakeholders

- Property Owner and Businesses
- Charlotte Water – 54-inch WM Replacement and sewer relocation
- CDOT - Multiphase Traffic Control Plans
- Department of Water Quality
- Duke Energy – OH & Duct Banks
- AT&T – Duct Bank Crossing
- Piedmont Natural Gas – Existing & Abandoned Gas Mains
- NCDOT – Encroachment Permit & Design Approval



New 10'x6' RCBC Connection @ Sta. 0+00



Duke Energy OH Transmission Line Tower



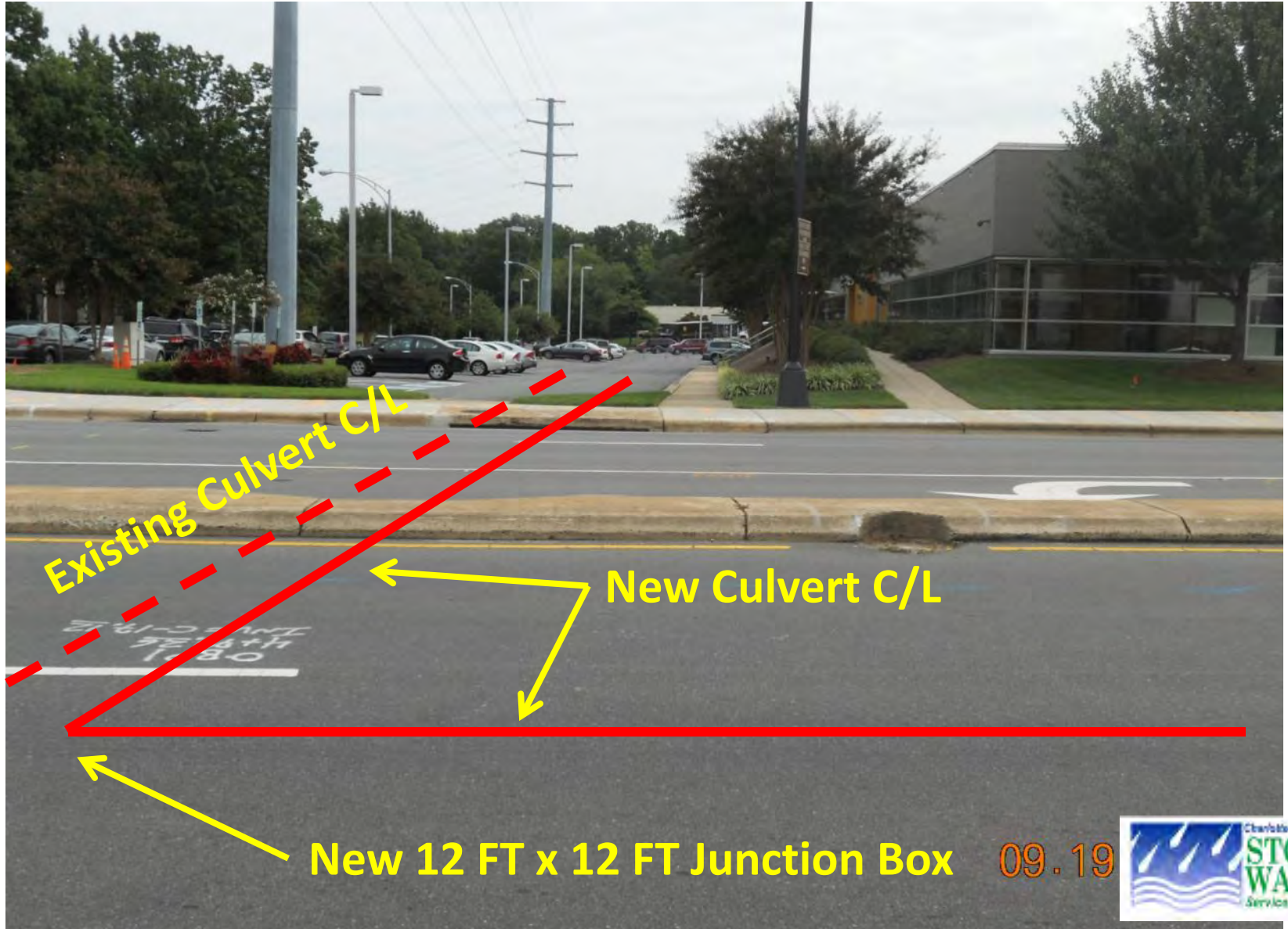
Required Nighttime/Weekend Work



Duke Energy Duct Bank Crossing



McDowell Street Junction Box



12' x 12' Junction Box



McDowell Street

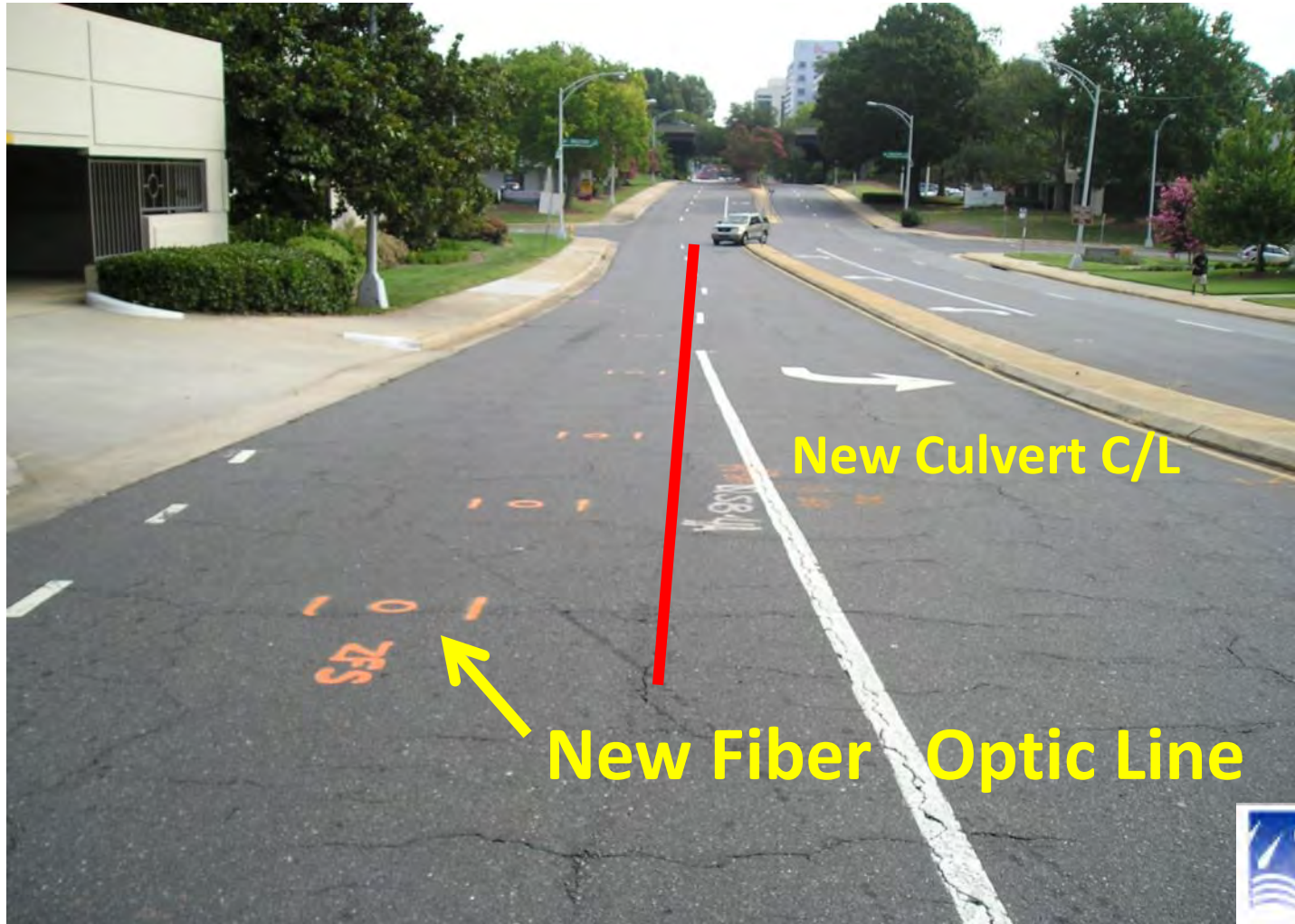


New Culvert C/L

09.19.2014



Oh No ! Another Utility Coordination



McDowell Street – Parking Garage Entrance



McDowell Street – Parking Garage Entrance - October 2015



Tunneling & Water Main Replacement



12' SEM Tunnel



54-Inch Water Main Replacement



54-Inch Water Main Replacement



Duke Endowment, Arts BBQ, H&R Block



Duke Endowment; Arts BBQ; & H&R Block



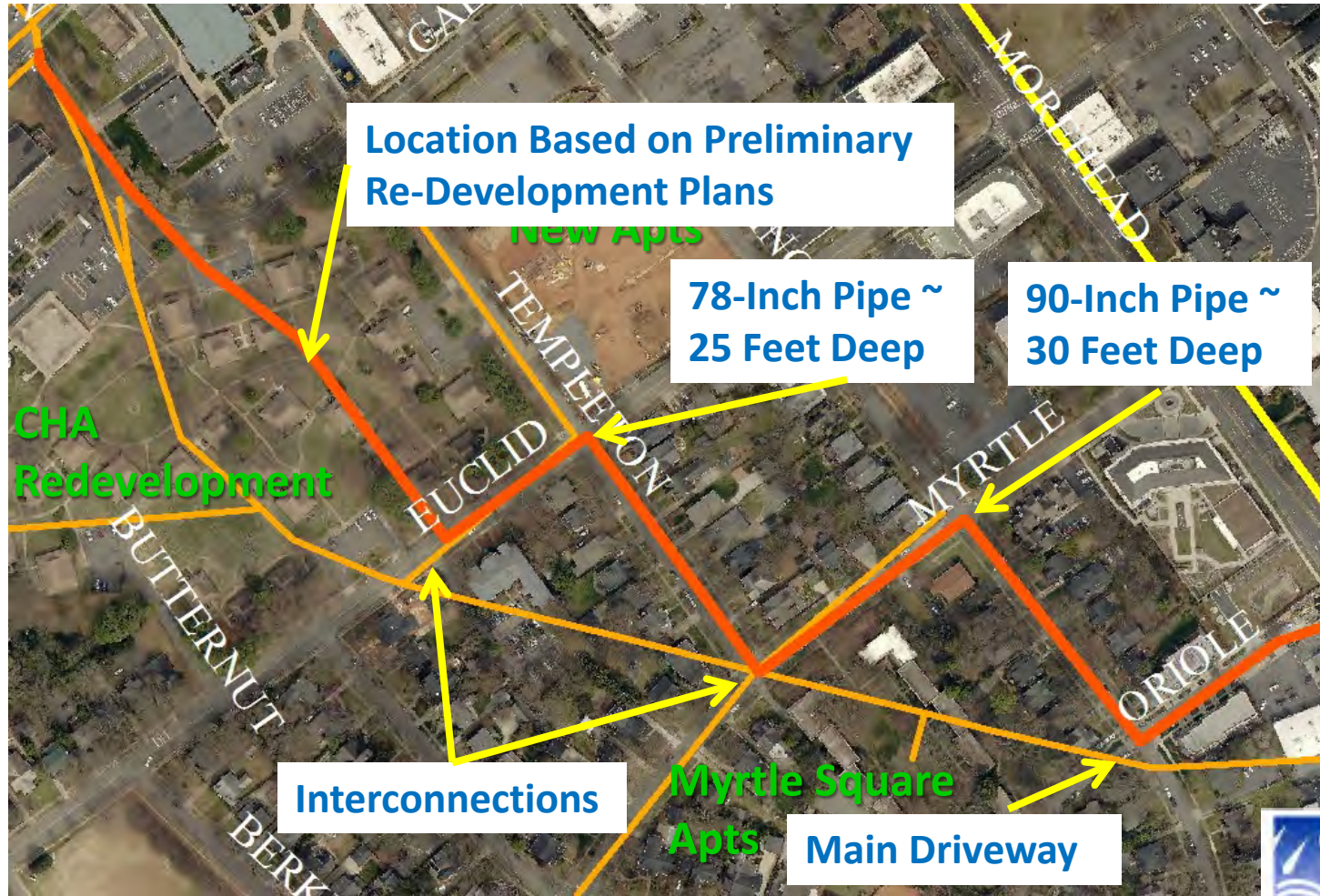
Duke Endowment; Arts BBQ; & H&R Block



Oriole Avenue Townhouses



Phase 2 – Final Design



Phase 2 –Sequence of Construction Prior to 90” & 78” Pipe Installation

1. Relocate Existing Private Utilities to New Location
2. Remove and Replace Existing Sanitary Sewer Mains in conflict with 90” & 78” Pipe
3. Re-instate Sewer Service Laterals to maintain sewer service during construction
4. Install temporary water main to remove existing water main in conflict with 90” & 78” Pipe



Stakeholders

- Property Owners and Businesses
- Duke Energy – Overhead Power Service
- Cable TV & Telephone – Overhead Service
- Piedmont Natural Gas – Existing & Abandoned Gas Mains
- Charlotte Water – Water and Sewer Service to Customers
- CDOT - Traffic Control Plans



Phase 2 –Sequence of Construction For 90” & 78” Pipe Installation

1. Setup 200’ max road closure
2. Trim tree branches to prevent damage
3. Install “active” shoring for open cut installation
4. Install 90” & 78” Pipe, MH’s, and Street Drainage
5. Install Temporary Pavement Restoration
6. At Completion of City Block – Install New Water System and Final Pavement Restoration



Lessons Learned

1. Improve Bid Advertising for Phase 2
 - Increase Number of Bidders
2. Additional Construction Location Restrictions
 - Oriole Street Started Earlier Than Expected
 - Construction Vehicle Parking, Material Deliveries
3. Stakeholder Involvement Increases During Construction
 - Significant Utility Coordination During Design – “Tip of Iceberg”
 - Property Owner Coordination - Unrealistic Requests
 - Day-to –Day Activities – Garbage Collection; Mail Delivery
4. Costs of “Handcuffing” Contractor
 - Unrealistic weekend closures

All These Lessons Learned Will Be Applied to Phase 2 !

We Are Confident There Will Be Others to Overcome !



Questions ??

