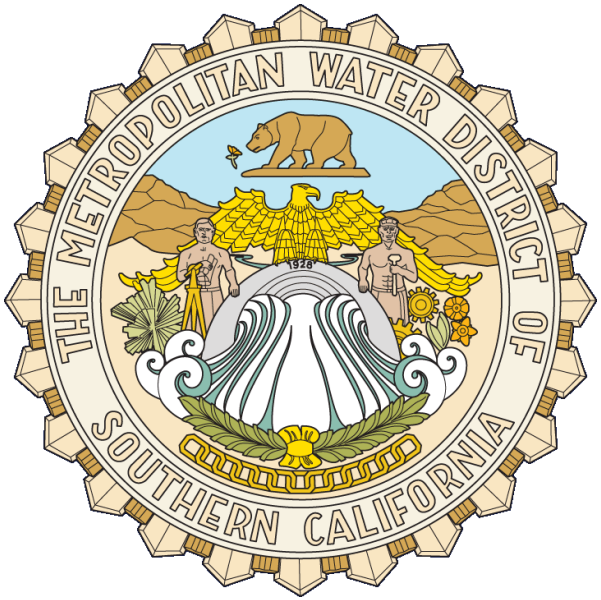
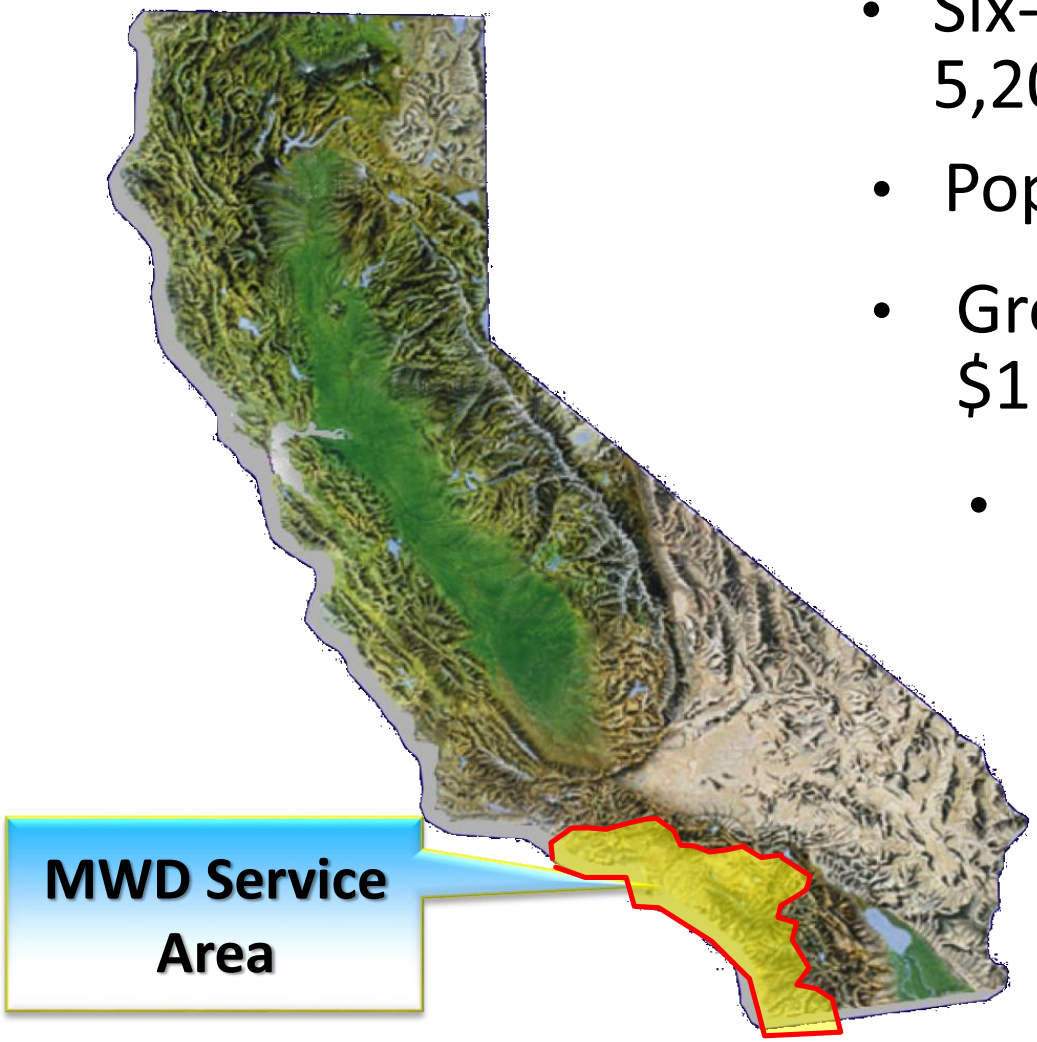
Metropolitan's PCCP Rehab Program



Metropolitan Water District

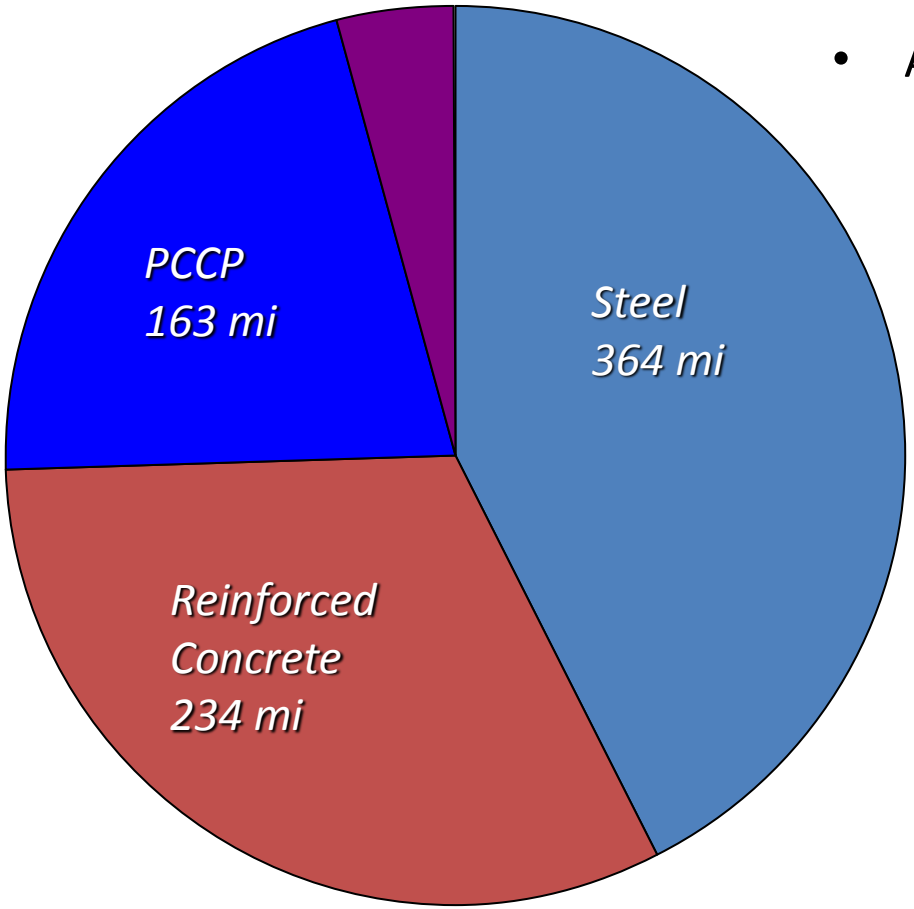
- Special district of the State of California
- Formed in 1928, under authority of MWD Act
- Primary purpose: provide supplemental water at wholesale rates to its member agencies
- 26 member public agencies
  - 14 cities
  - 11 municipal water districts
  - one county water authority
- Governed by 37-member Board of Directors

Metropolitan Water District of So. California



- Six-County Service Area: 5,200 square miles
- Population: 19 million
- Gross Domestic Product: $1 Trillion
- Projected growth: ~220,000 people/year
- MWD provides 40 to 60 percent of Southern California's water supply

Metropolitan Pipelines



- Approx. 793 total miles

- PCCP Challenges for MWD
  - Assessment Program for PCCP
    - Assessment
    - Protection
    - Determine when to fix distressed PCCP
    - Determine method for fixing distressed PCCP
  - Systematic Rehabilitation of Most at Risk PCCP

PCCP Assessment Strategy

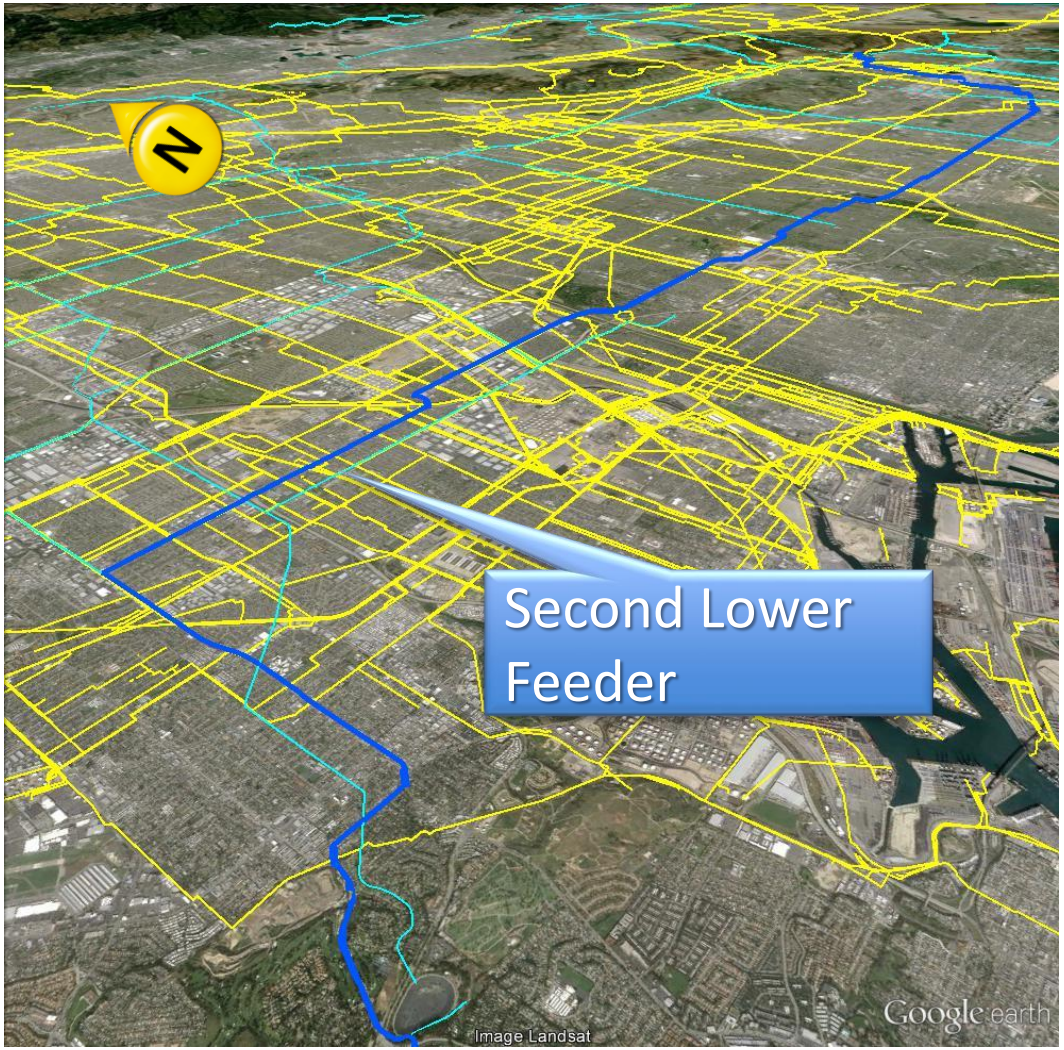
- Began comprehensive program in 1996
- Program Components
  - Inspect
  - Protect
  - Evaluate
  - Repair

Electromagnetic Inspections

- Electromagnetic conducted annually
  - Analysis identifies wirebreak locations (+/- 6”)
  - Analysis quantifies number of wire breaks
- 35-40 miles inspected yearly
- One cycle of inspection (163 miles) takes 5 years
- All 163 miles – inspected 2-3 times

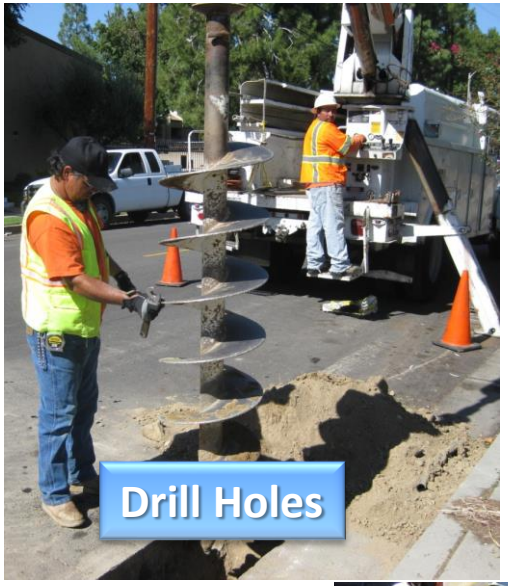
Protection - Stray Current

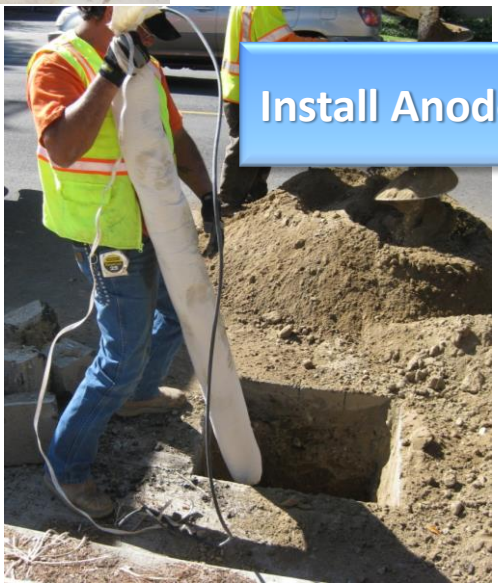
- Cathodic protection systems on other oil & gas lines affect MWD pipelines
- Stray current leads to metal loss on PCCP
- High levels of stray currents
- To Protect PCCP MWD conducts corrosion surveys every 1-2 years



Protection - Stray Current Drain Installations

- Prevent metal loss
- Over 80 stray current installation last 3 years
- Project costs over $5 million





Evaluation of RFEC Results

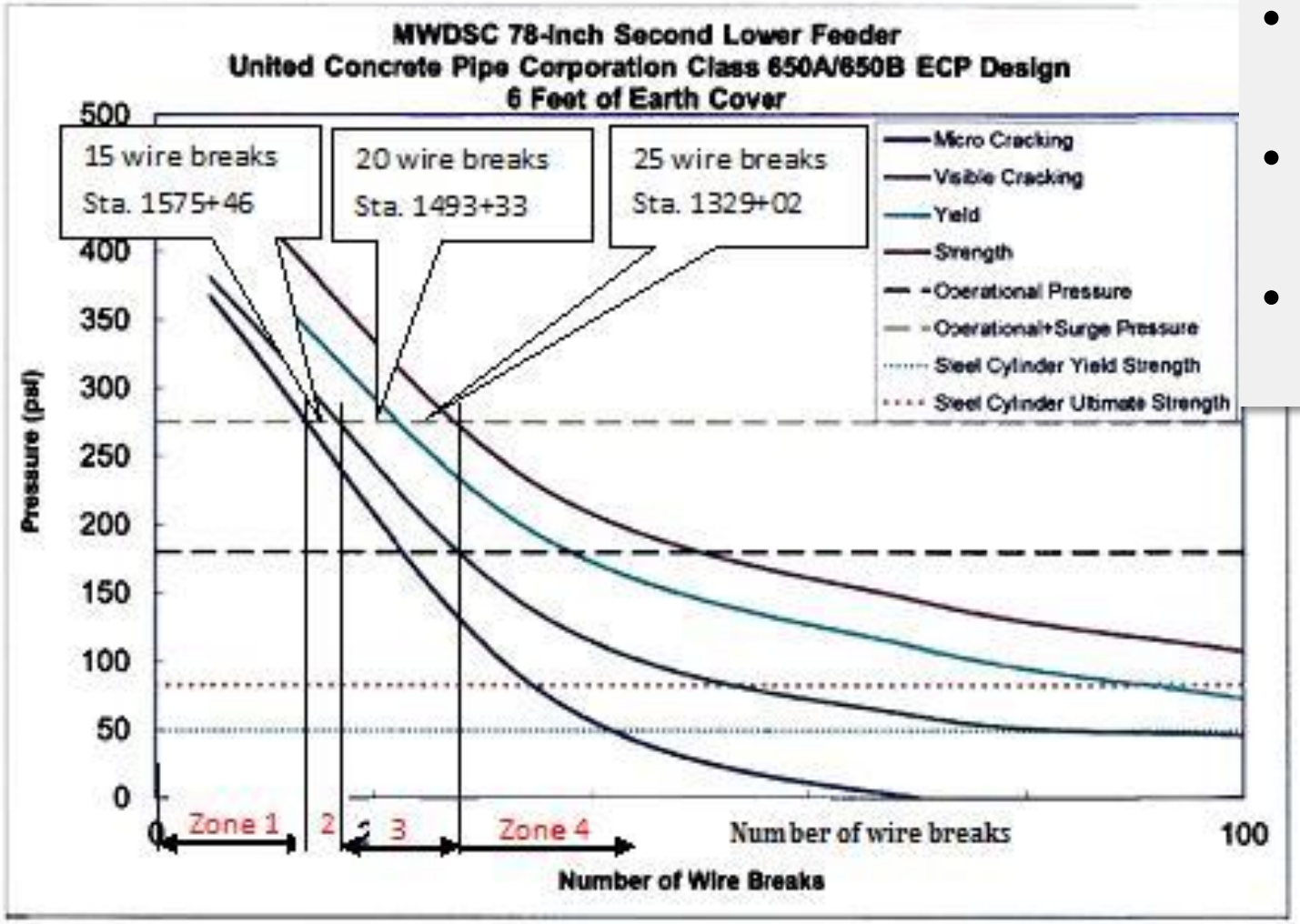
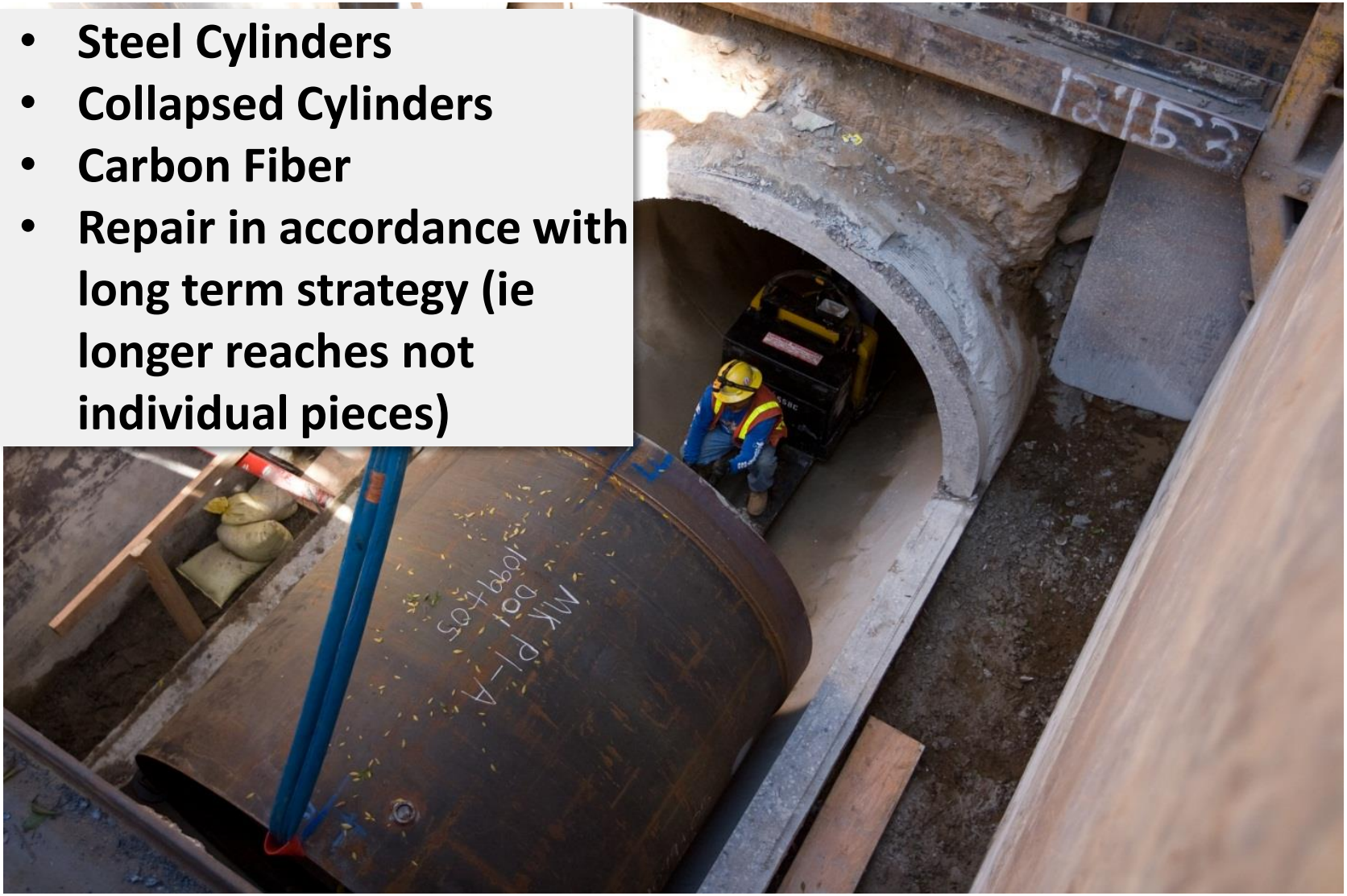


Figure ES.1: Performance Curve for the 78-Inch Class 650A/650B Pipe Design

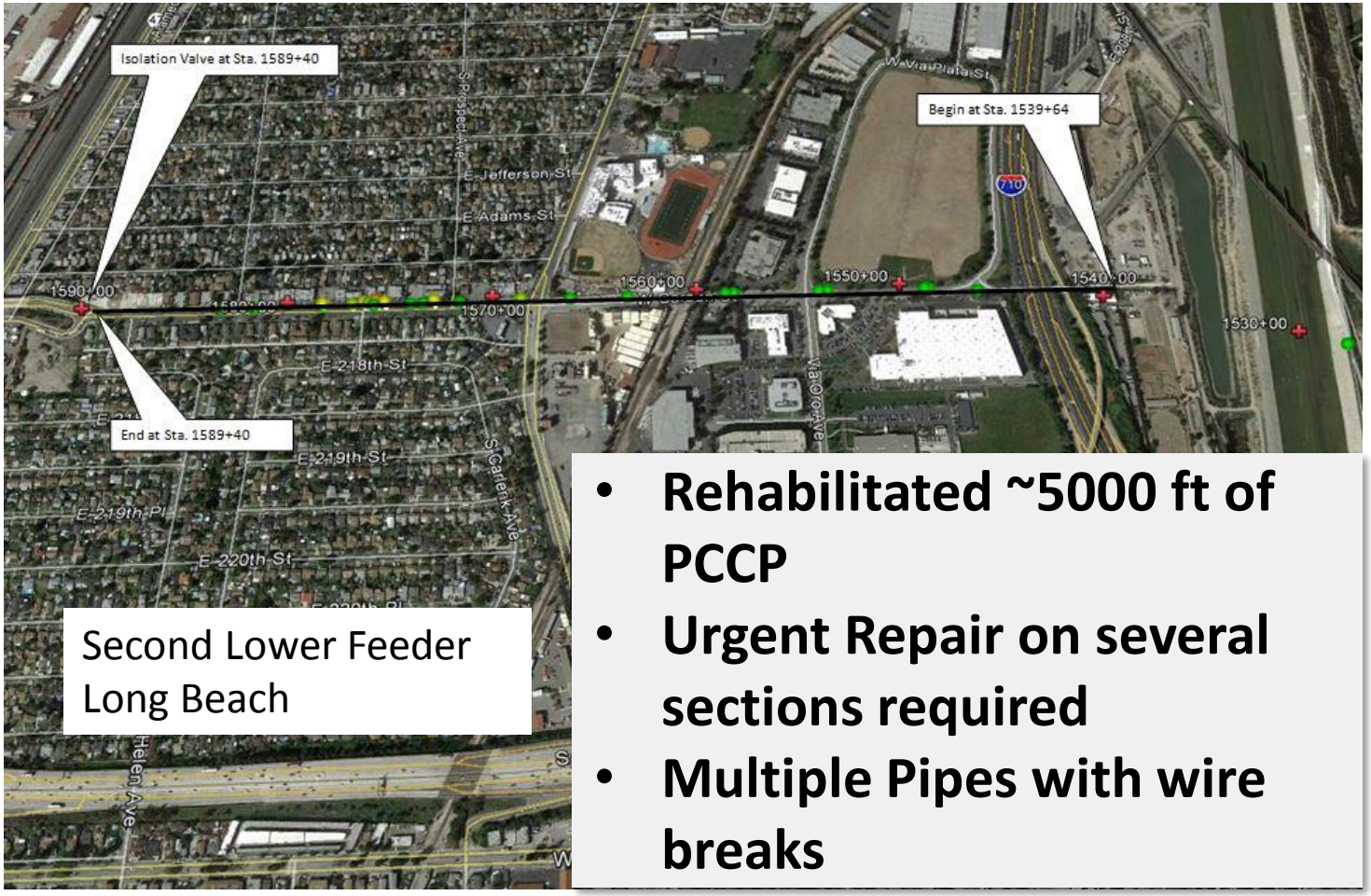
- **Zone 1 – Monitor**
- **Zone 2 – Plan repair**
- **Zone 3 & 4 – Urgent Repair**

Urgent Repairs -Methods

- **Steel Cylinders**
- **Collapsed Cylinders**
- **Carbon Fiber**
- **Repair in accordance with long term strategy (ie longer reaches not individual pieces)**



Urgent Repairs -Example

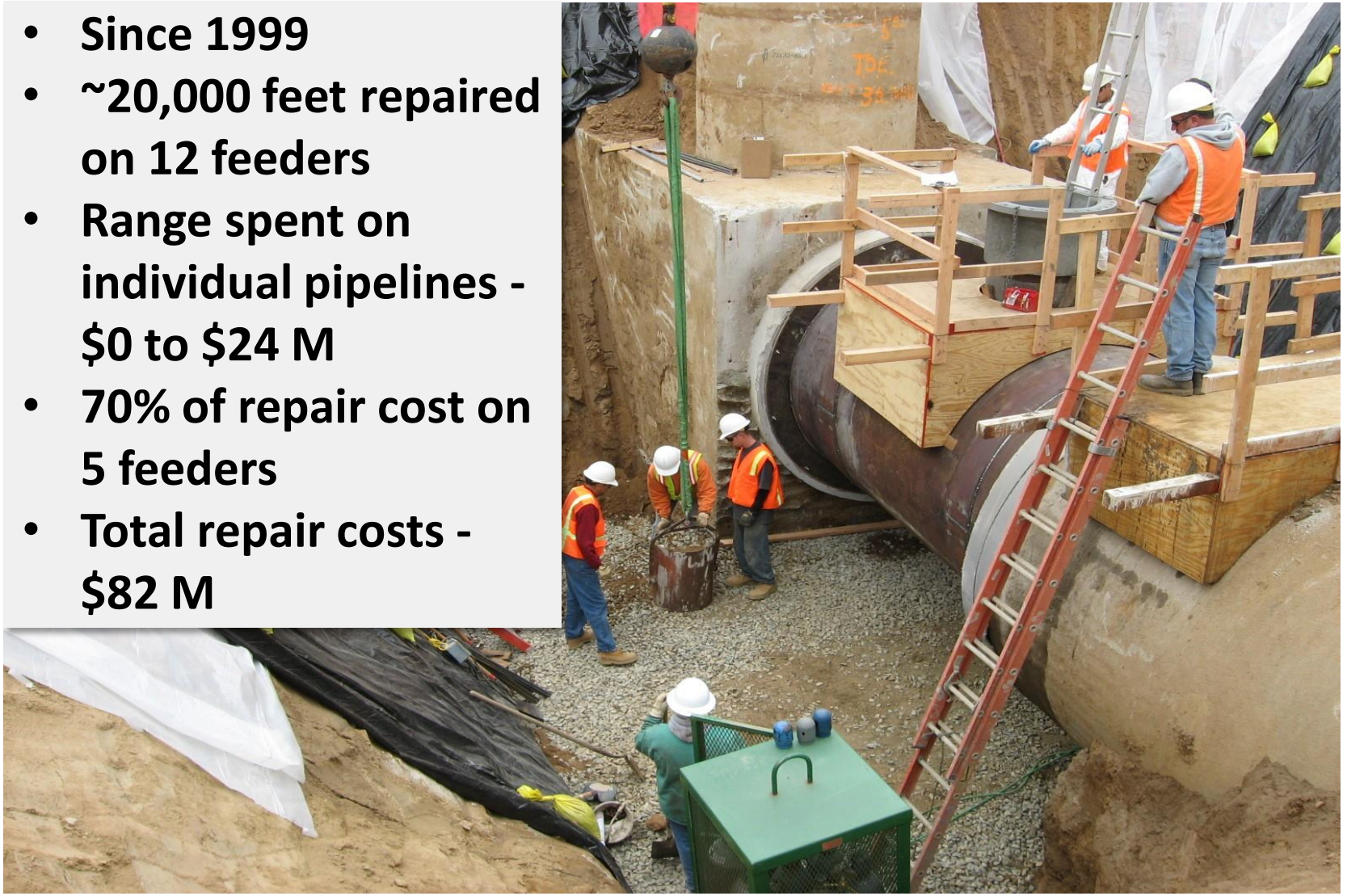


Second Lower Feeder
Long Beach

- **Rehabilitated ~5000 ft of PCCP**
- **Urgent Repair on several sections required**
- **Multiple Pipes with wire breaks**

Urgent Repairs

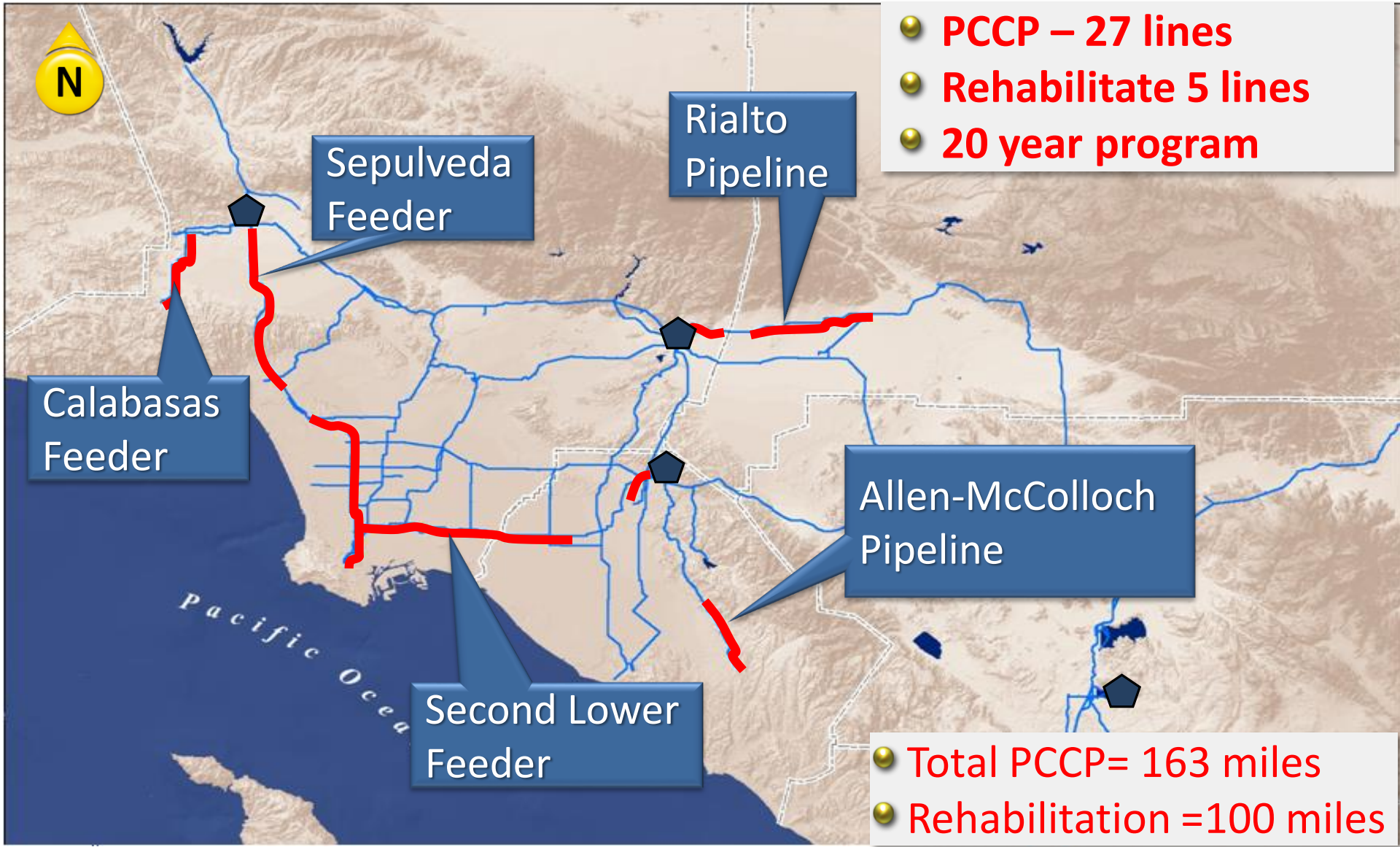
- **Since 1999**
- **~20,000 feet repaired on 12 feeders**
- **Range spent on individual pipelines - $0 to $24 M**
- **70% of repair cost on 5 feeders**
- **Total repair costs - $82 M**



New Strategy – Systematic Replacement

- Systematic Replacement of 5 most at risk pipelines
  - Cost of systematic rehabilitation is less than piecemeal approach
  - Extensive repair history
  - Located in corrosive soils
  - Proximity to stray currents
  - Systematically rehabilitate entire pipeline
- Little or no deterioration in the other 22 pipelines
- Continue to Monitor all PCCP Pipelines which are not experiencing significant degradation

PCCP Lines To Be Rehabilitated



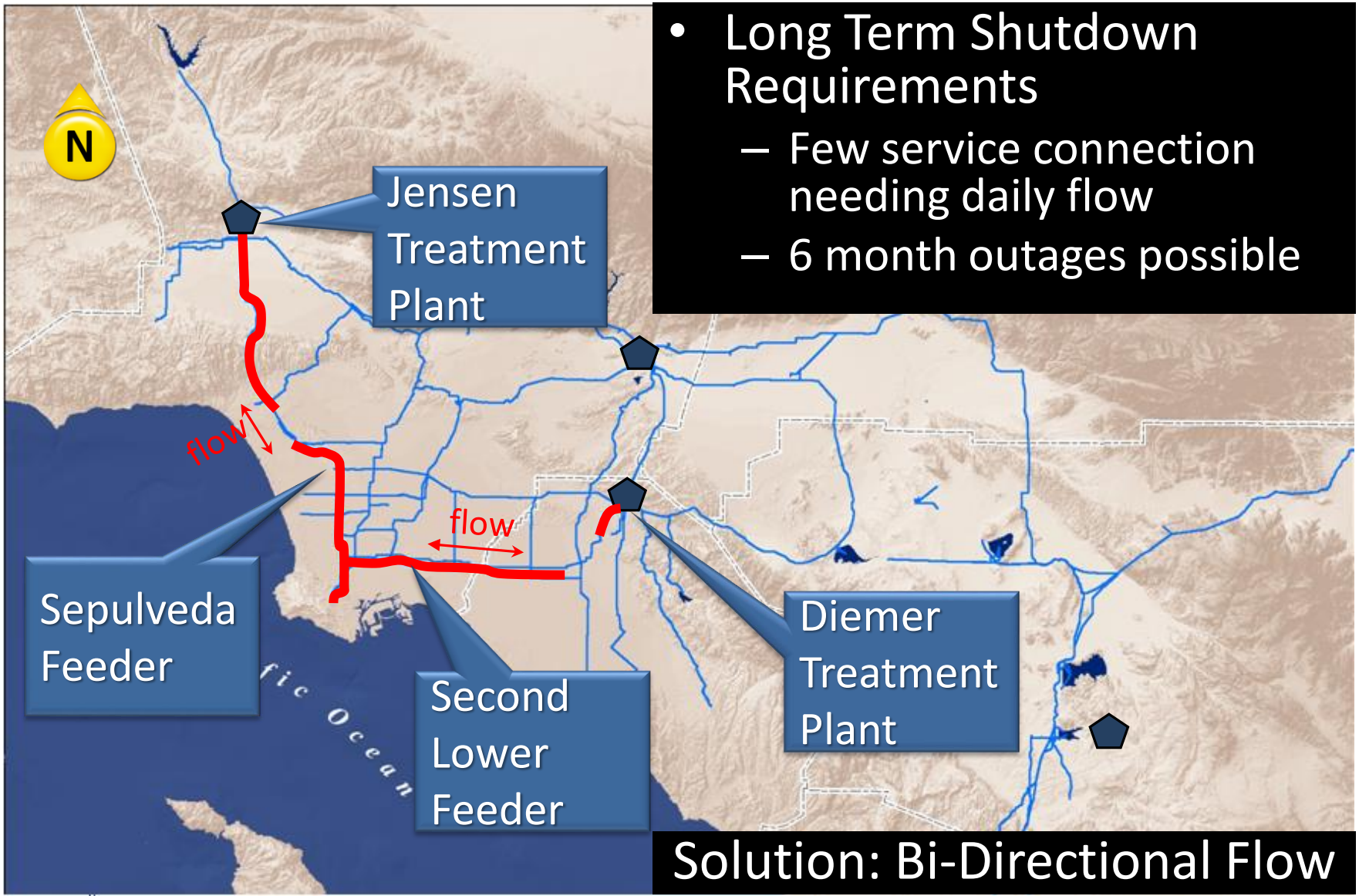
- PCCP – 27 lines
- Rehabilitate 5 lines
- 20 year program

- Total PCCP= 163 miles
- Rehabilitation =100 miles

PCCP Rehabilitation Challenges

- Shutdowns / Member Agency Demands
- Minimize Hydraulic Losses
- Environmental Clearance
- Valve Size, Type and Procurement strategy
  - Want to install valves and not have to store them
- Length of Program

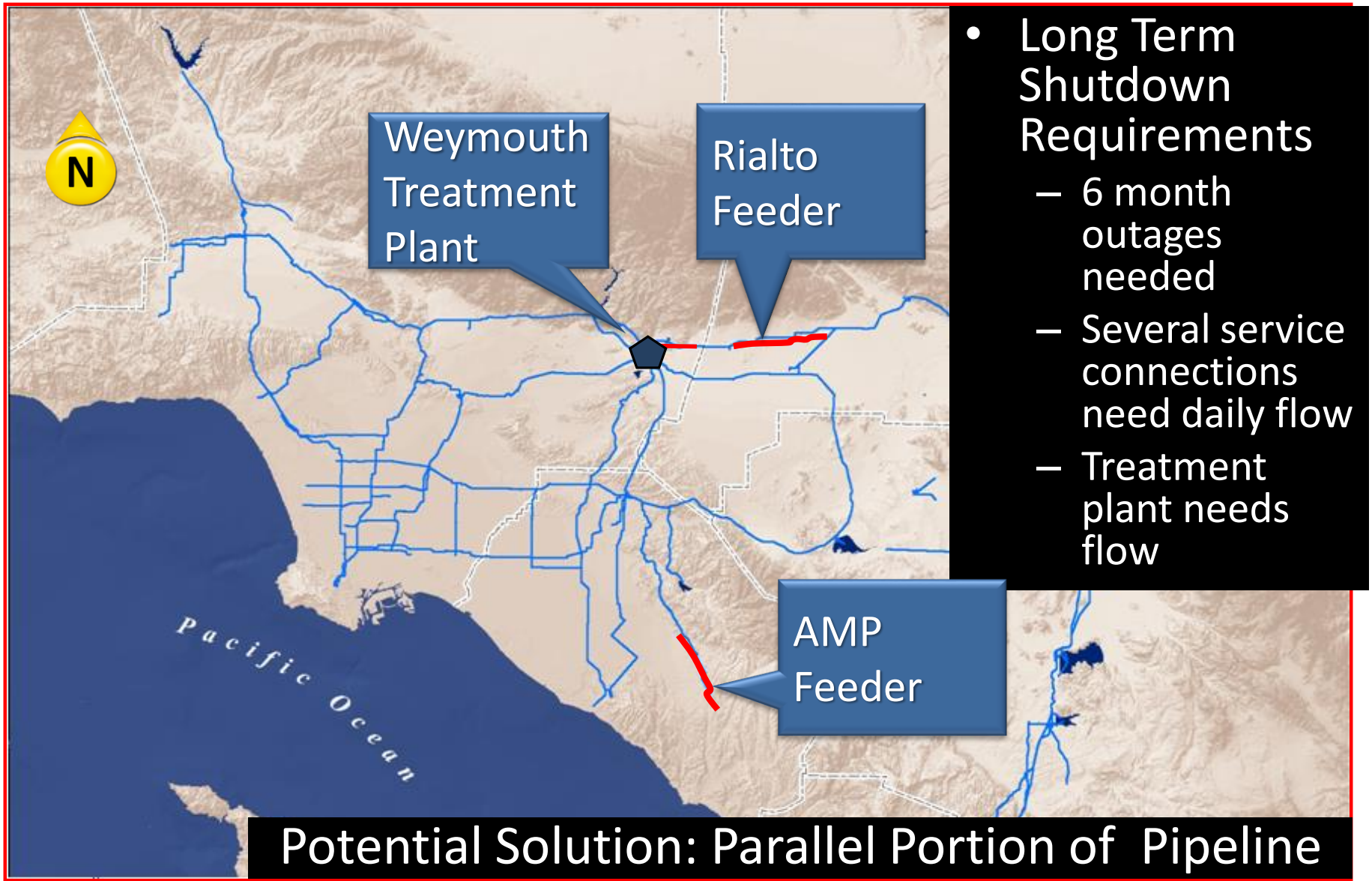
Shutdown Challenges



- Long Term Shutdown Requirements
  - Few service connection needing daily flow
  - 6 month outages possible

Solution: Bi-Directional Flow

Shutdown Challenges – Rialto/AMP



- Long Term Shutdown Requirements
  - 6 month outages needed
  - Several service connections need daily flow
  - Treatment plant needs flow

Potential Solution: Parallel Portion of Pipeline

Construction Methodology

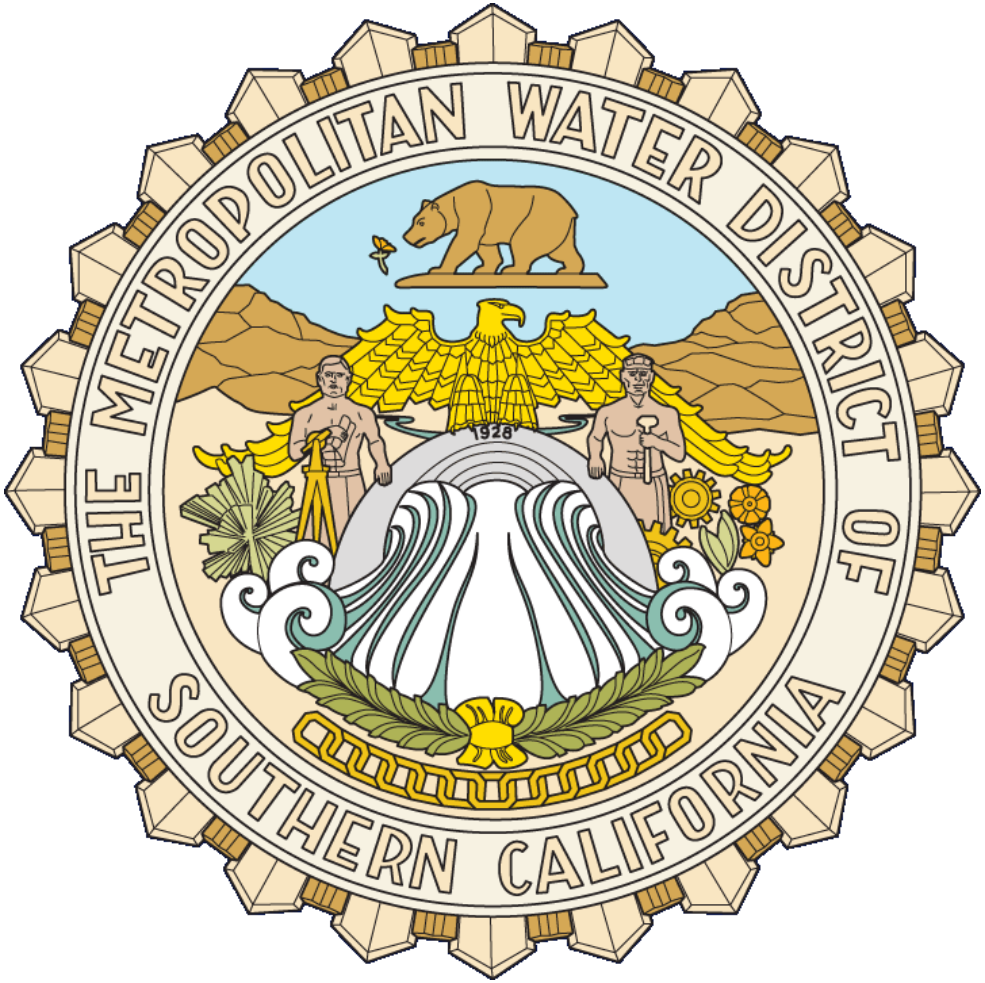
- Line PCCP w/ Steel Cylinders
- Identify Access Pits
  - Reduce Traffic Impacts
  - Minimize Utility Relocations
  - Space pits to allow welding
  - Ensure worker safety
- Reline with Collapsed Cylinders

Rehabilitate Entire Line

- Replace Sectionalizing Valves
- Replace Meters
- Replace Vacuum and Air Release Valves
- Add additional Sectionalizing Valves
  - Increase operational flexibility
  - Reduce dewatering time and amount water discharged to dewater line

Overall Program Benefits

- Proactive approach to rehabilitation of distressed PCCP
- Systematic, Comprehensive Plan
- Reduced cost by systematic replacement instead of monitor and piecemeal replacement
- Reduced risk of failure & service interruptions
- Planned Capital Expenditures
- Increase long term reliability


THE METROPOLITAN WATER DISTRICT OF
SOUTHERN CALIFORNIA
1928