Engineering, Operations, & Technology Committee

Strategic Infrastructure Resilience Plan Development

Item 6b

February 12, 2024

Item 6b
Infrastructure Resilience Update

Subject

Infrastructure resilience update

Purpose

- Provide updates on:
  - The Strategic Infrastructure Resilience Plan (SIRP)
  - Annual seismic resilience activities

Next Steps

- Continue development of the SIRP and inform CAMP4W
- Continue improvement of infrastructure seismic resilience

Presentation Outline

- Strategic Infrastructure Resilience Plan (SIRP)
  - Purpose
  - Development Roadmap
  - Assessment of Resilient Infrastructure
  - Maturity Level Survey
  - Next Steps
- Seismic Resilience Annual Update

Purpose of Strategic Infrastructure Resilience Plan (SIRP)

- Establish a framework to enhance and expand Metropolitan's long-term organization-wide infrastructure resilience program for its water and electric power systems
- The SIRP will:
  - Assess the maturity level of Metropolitan's current resilience
  - Develop goals and objectives to achieve the desired level of resilience maturity
  - Develop metrics to measure improvement over time
  - Establish a flexible process to adapt to changing conditions

SIRP Development Road Map

Phase 1 Tasks

- Initiate SIRP Development
- Identify Characteristics of Resilient Infrastructure Systems
- Resilient to which Hazards
- Develop Maturity Scale
- Survey: Resilience Maturity, Hazards, and Priorities

Phase 2 Tasks

- Establish Target Maturity Levels
- Assess Resilience Gaps
- Strategies to Close the Gaps

Phase 3 Tasks

- Develop Implementation Plan
- FINAL DRAFT Strategic Infrastructure Resilience Plan

Assessment of Resilient Infrastructure – Characteristics

- The characteristics serve as objectives to improve infrastructure resilience

  Redundancy
  Robustness
  Rapidity
  Resourcefulness

  Planning
  Preparedness
  Mitigation
  Response & Recovery

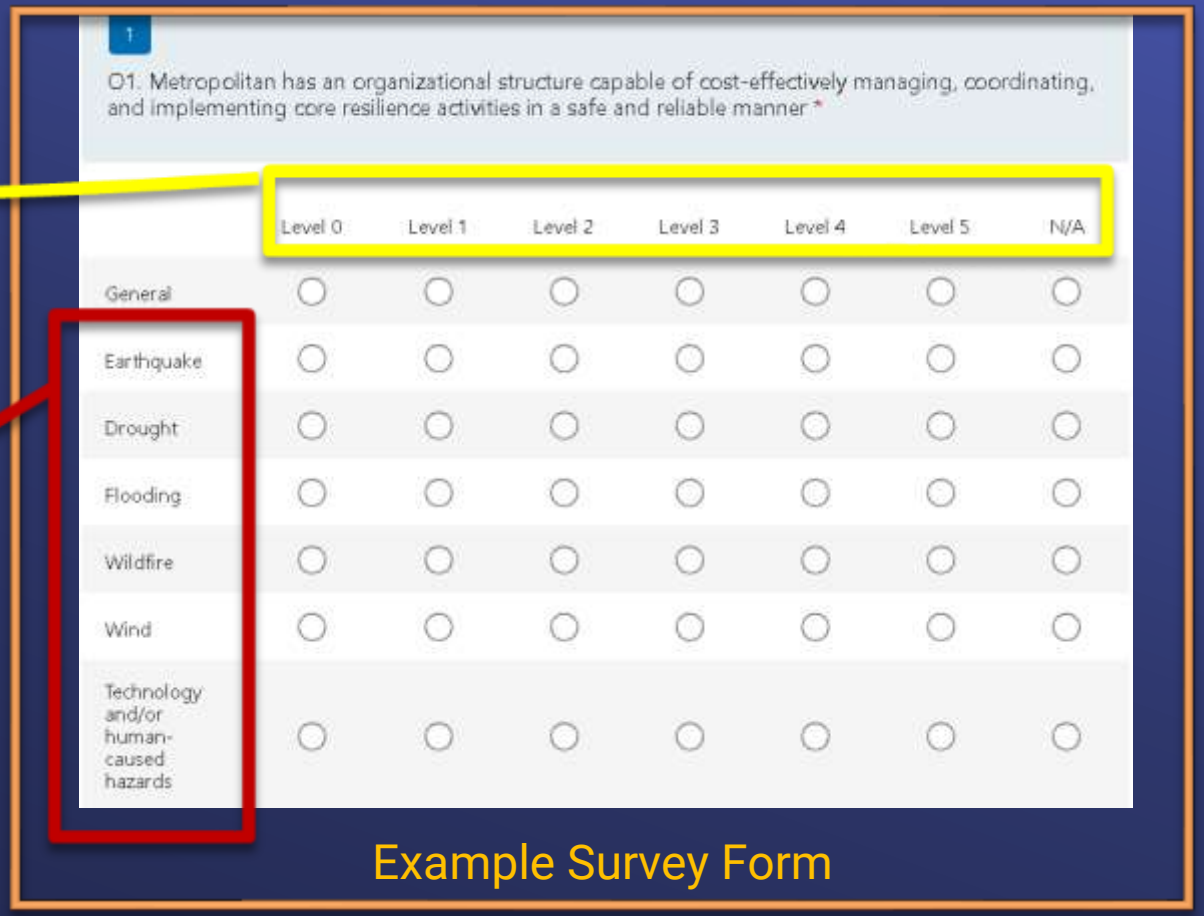
- The characteristics are divided into four categories:
  - Organizational
  - Technical
  - Social
  - Economic

Assessment of Resilient Infrastructure - Maturity Level

- The proposed methodology defines maturity levels on a scale from 0 to 5, with each level representing a different stage of the organizational process
  - Level 0: No intent to develop processes for resilience
  - Level 1: No formalized processes for resilience but with intent to develop
  - Level 2: Some basic processes in place for some resilience aspects
  - Level 3: Process are defined and documented
  - Level 4: Resilience is measurable and managed
  - Level 5: A culture of continuous improvement exists

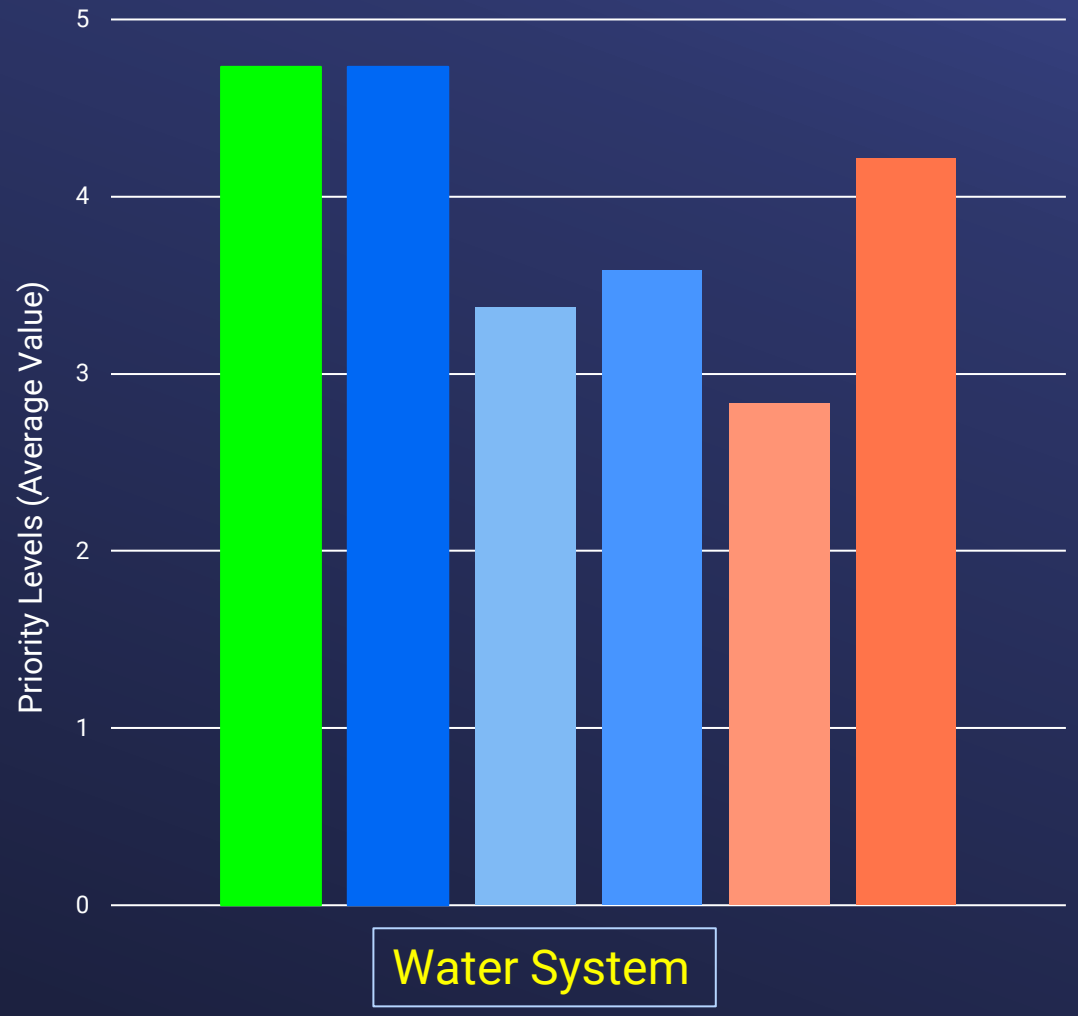
Maturity Level Survey

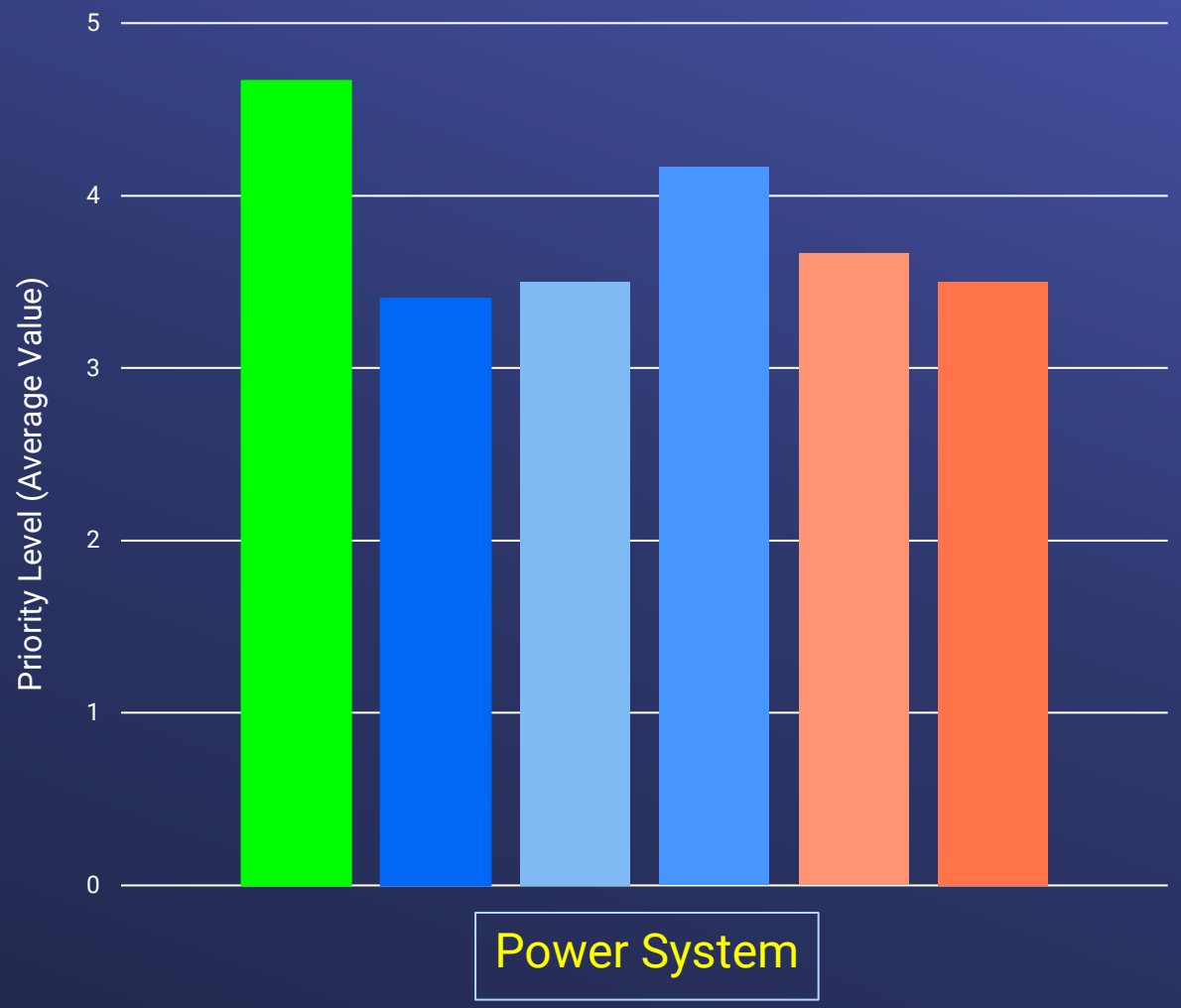
- A survey was conducted to gather information on the infrastructure resilience maturity level and priorities (self assessment)
- The Survey included
  - 18 characteristics
  - General system resilience
  - 6 hazard types
- Participants/Respondents:
  - Metropolitan staff
  - 28 for Water/6 for Electric Power



Example Survey Form

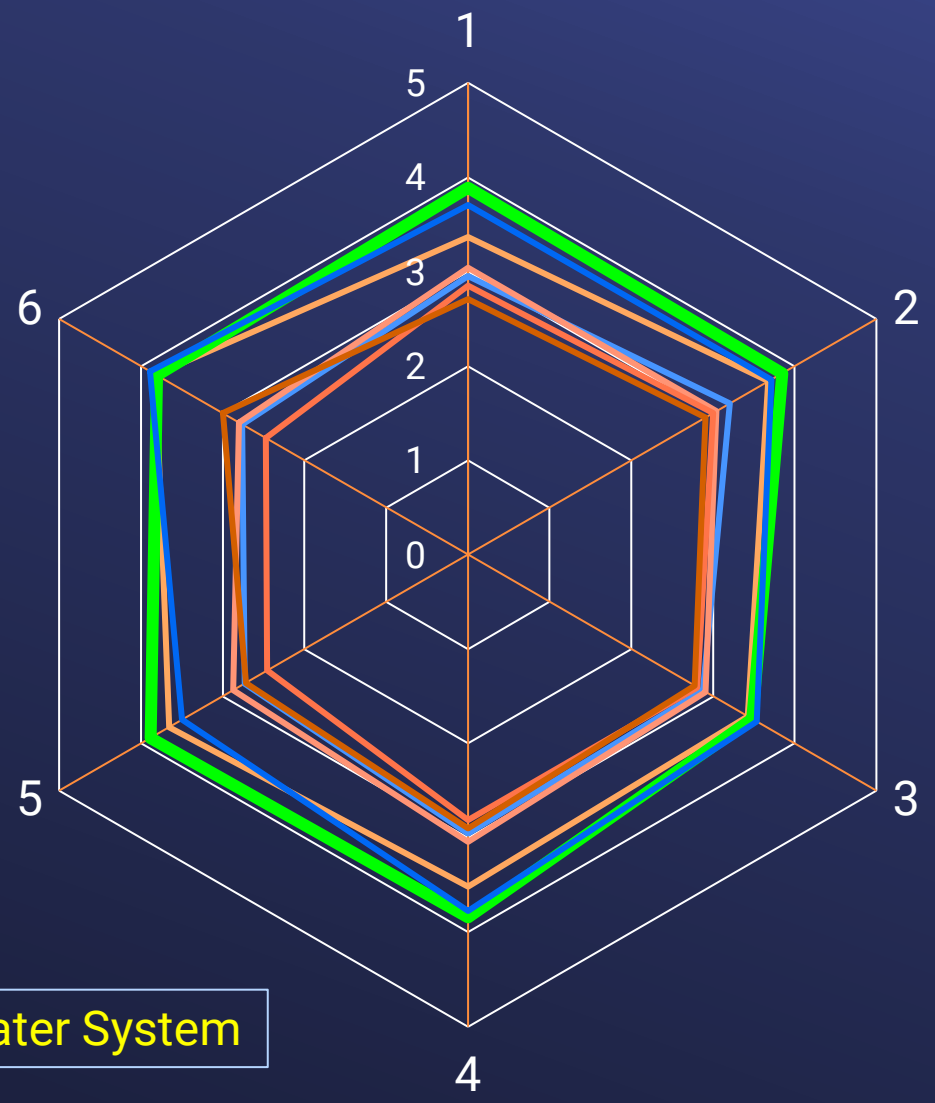
Priority Level of Hazards





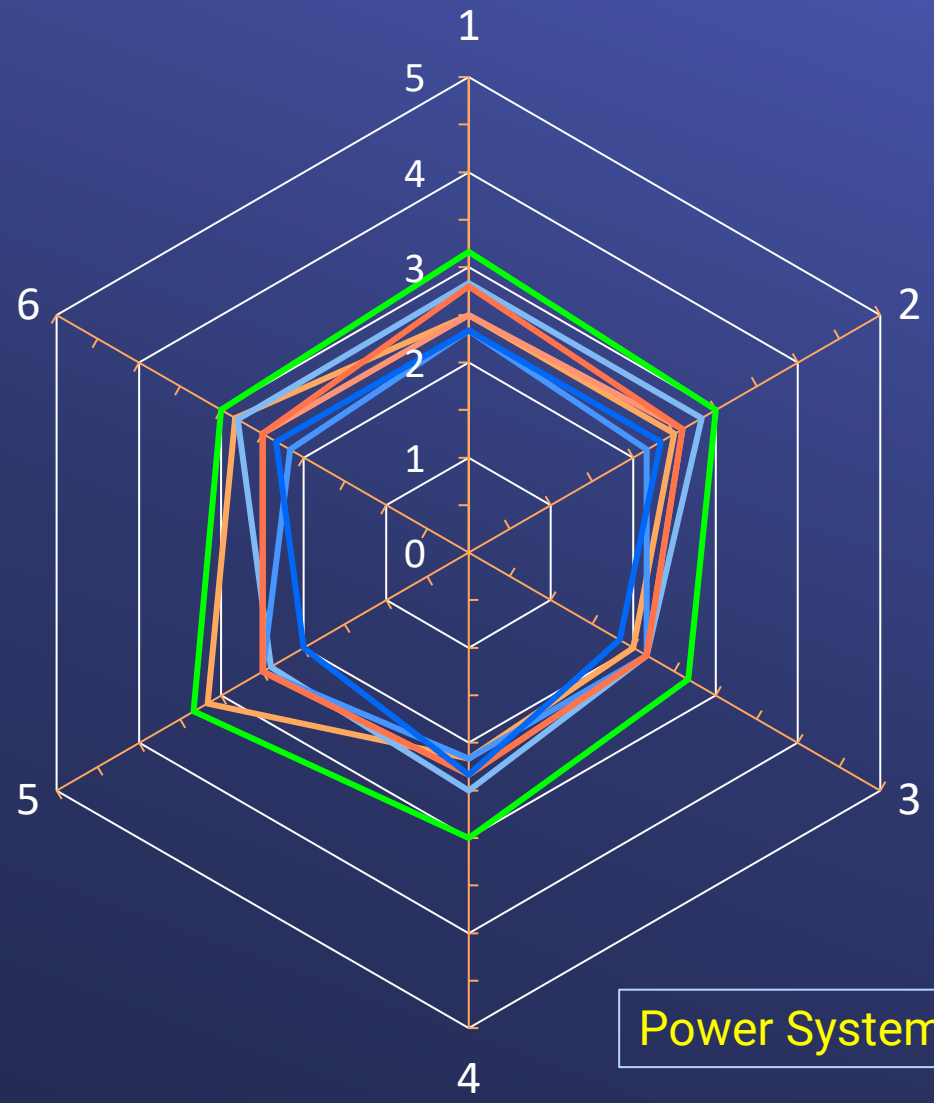
Series1 Series2 Series3 Series4 Series5 Series6

Maturity Level for Organizational Characteristics (O1 through O6)



Water System

Org. Characteristics
O1
Org. Structure
O2
Stability & Capacity
O3
Adequate Resources
O4
Advanced Planning
O5
Response Protocols
O6
Continuity



Power System

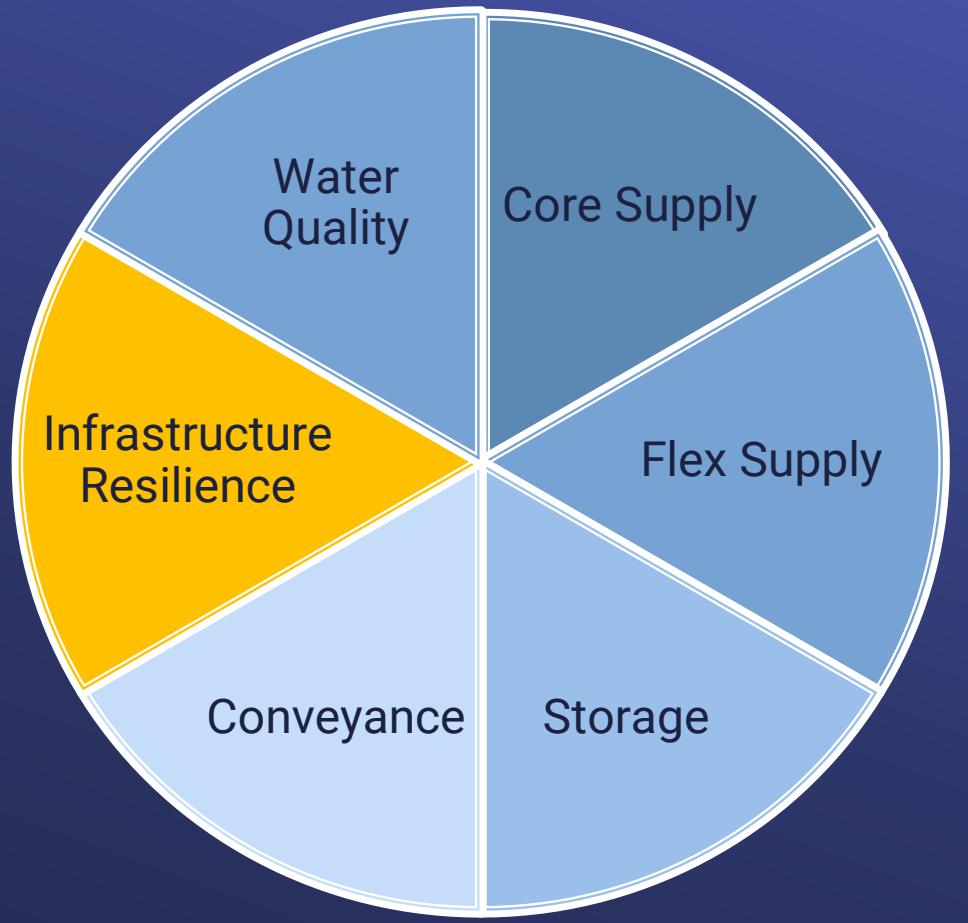
SERIES1 SERIES2 SERIES3 SERIES4 SERIES5 SERIES6 SERIES7

Summary of Maturity and Priority Survey Results

- Survey consisted of a self-assessment conducted by staff with knowledge of Metropolitan's water and power infrastructure
- The survey results provide a perceived baseline of where we are now and serve us in informing the organization as we move forward
- Earthquake, drought, and wildfire are perceived as having higher priority than other hazards
- Higher maturity level on the water system than the power system
- Seismic resilience is perceived to be more mature than other hazards

Next Steps on SIRP Development

- Establish target maturity levels
- Determine maturity gaps
- Develop strategies to narrow identified gaps in priority order
- Ensure strategies are consistent with CAMP4W criteria and targets
- Prepare draft SIRP
- Plan to complete the draft by December 2025 for review



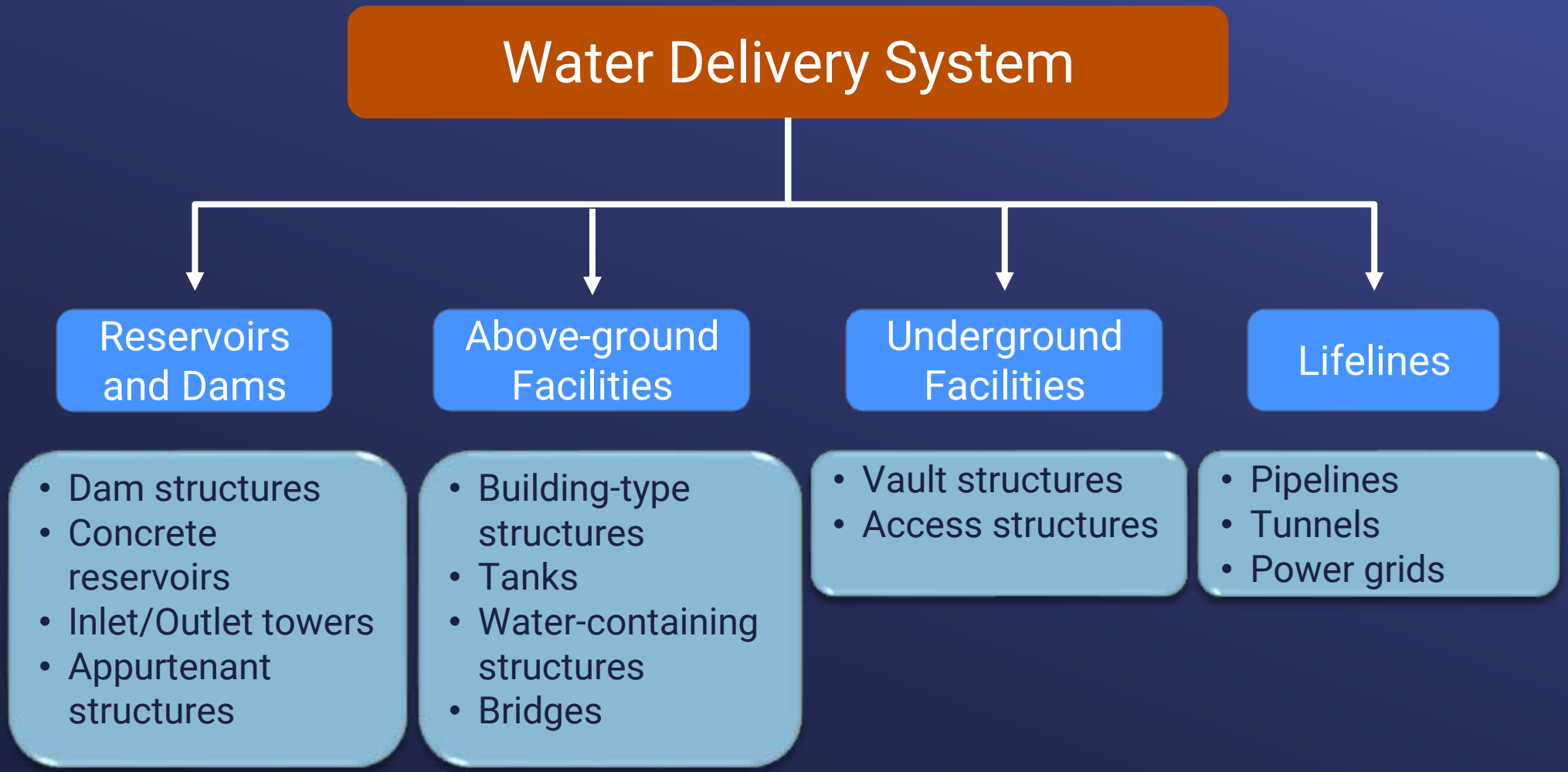
Climate Decision-Making Framework

CAMP4W
Climate Adaptation Master Plan for Water

Infrastructure Resilience Update – Seismic Resilience

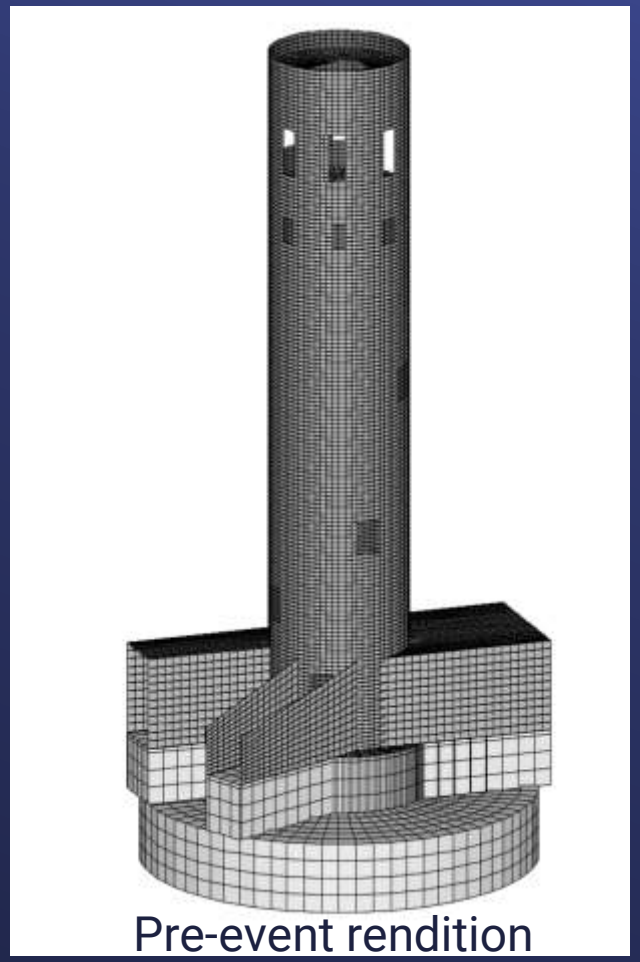
- Definition
  - The ability to maintain, or quickly restore, water deliveries after a seismic event (2018 Seismic Resilience Report)
- Approach to enhance resilience
  - Pre-event mitigation
    - Minimize impacts of seismic events on water delivery
  - Post-event restoration
    - Quickly restore system capacity to prevent lasting adverse effects

Infrastructure Inventory

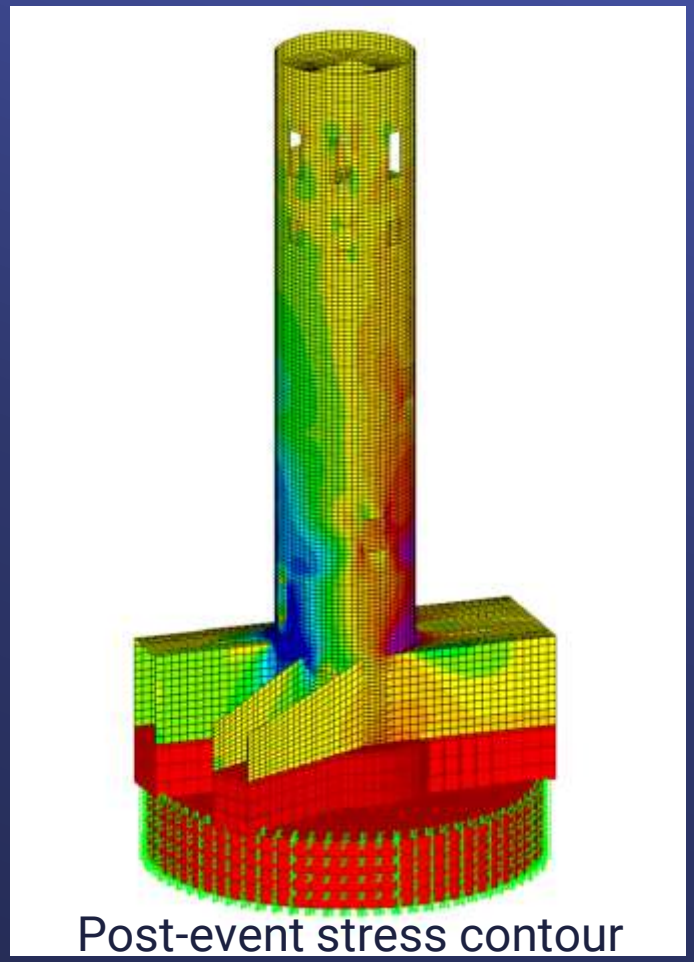


Seismic Risk Mitigation Update

- Reservoirs and Dams
  - Advanced analysis for Lake Skinner Outlet Tower
  - Final design for Garvey Reservoir Outlet Tower seismic upgrade
  - Final design of real-time monitoring system at Diamond Valley Lake and Garvey Reservoir



Pre-event rendition



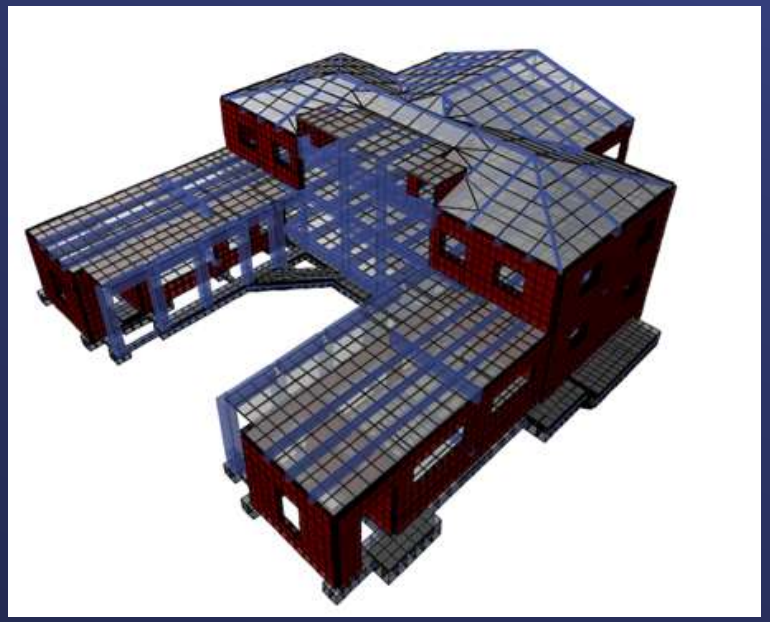
Post-event stress contour

Garvey Reservoir Outlet Tower 3-D Structural Model

Seismic Risk Mitigation Update

- Above-ground Facilities – Activities Underway
  - Construction of Weymouth Basins 5~8 Rehab
  - Construction of Foothill HEP/PCS seismic upgrade
  - Final retrofit design for Weymouth Admin & Control Buildings
  - Preliminary design for La Verne Water Quality Lab Rehab
  - Preliminary design for Diemer Wash Water Reclamation Plant No. 2

Weymouth Basins 5-8 – Wall Strengthening

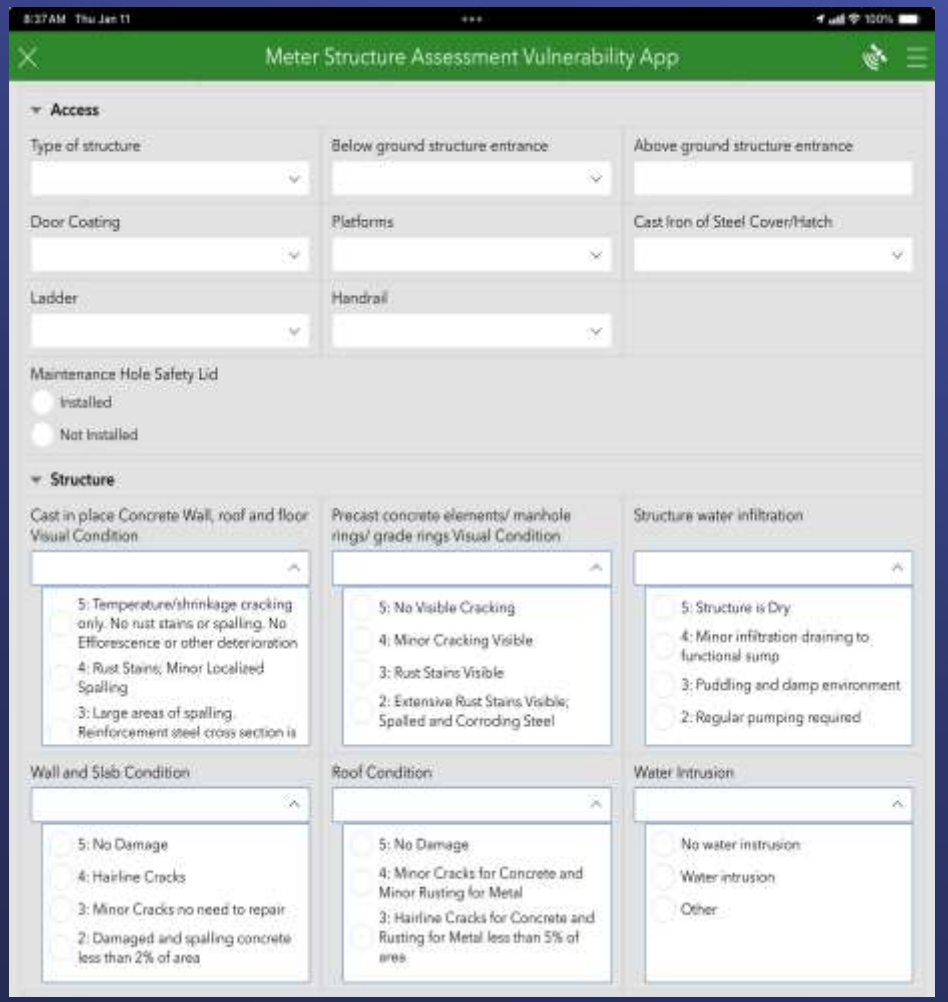


Weymouth Admin Building – 3-D Structural Model

Seismic Risk Mitigation Update

- Underground Facilities – Activities Completed
  - Condition assessment of meter structures in Orange County
  - Inspection of 94-meter structures in LA County
  - App to standardize data collection in the field to prepare for subsequent data analytics

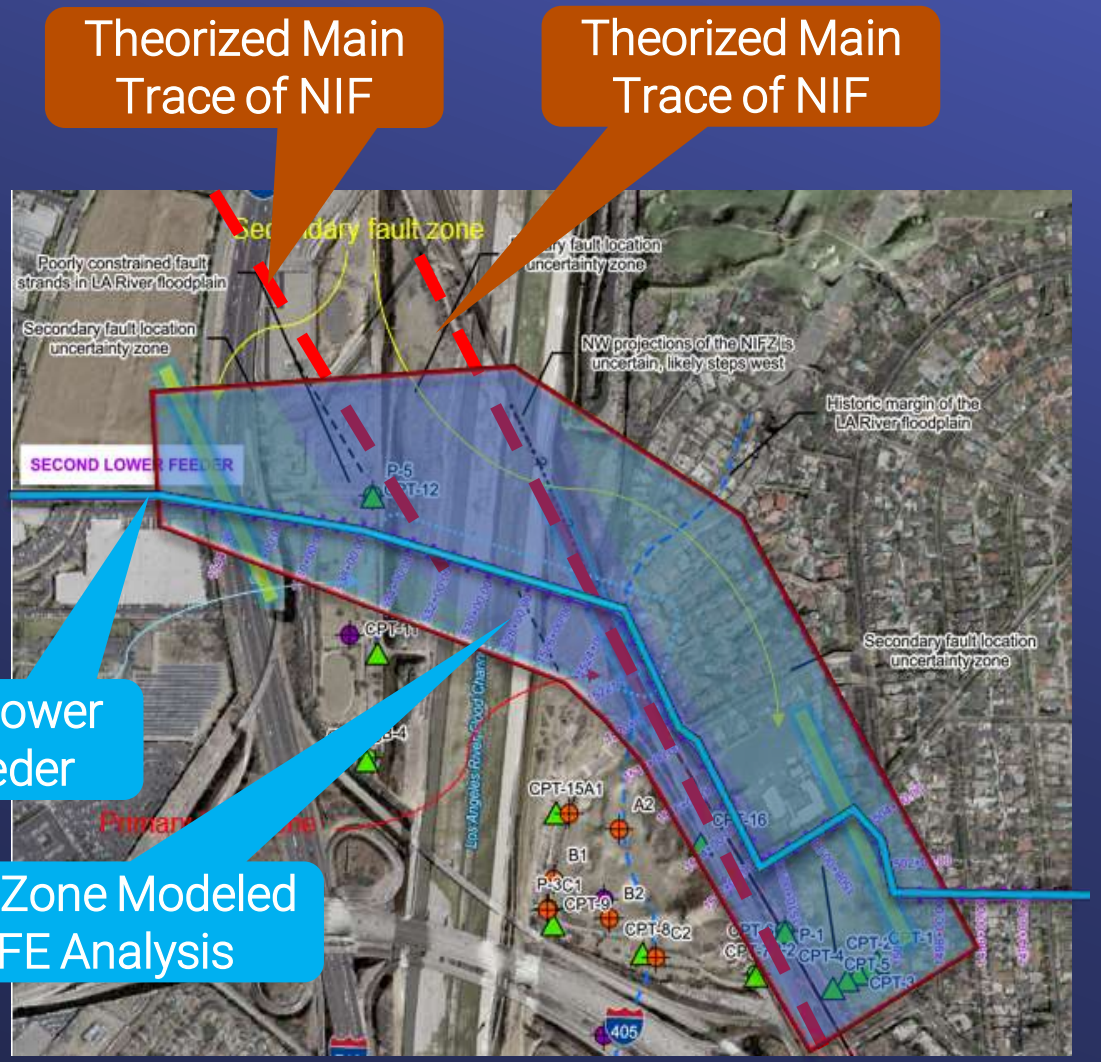
Meter Structure



Condition Assessment App

Seismic Risk Mitigation Update

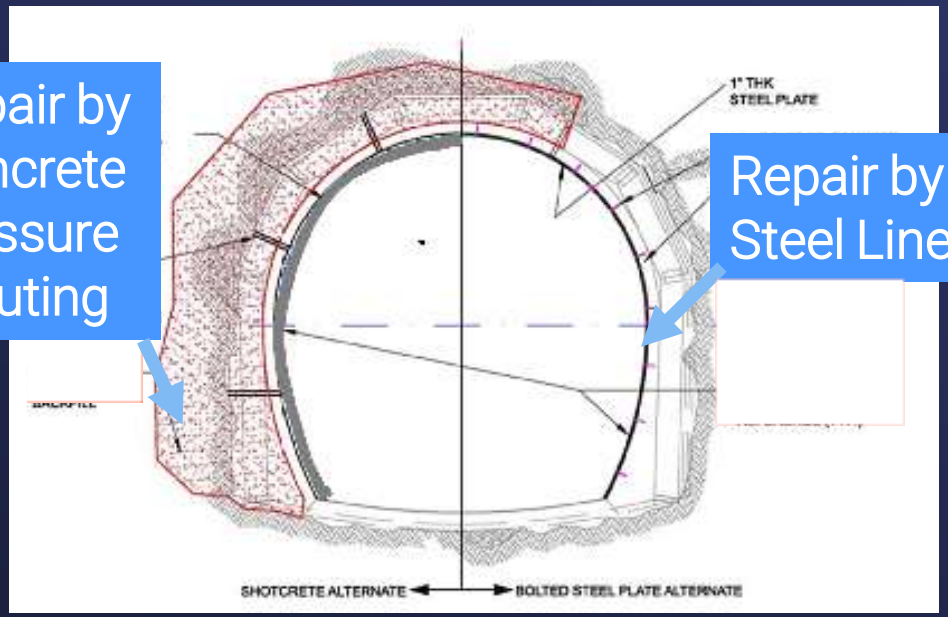
- Lifelines
  - Completed construction of Casa Loma Siphon No. 1 Fault-Crossing Mitigation
  - Performing preliminary design to mitigate seismic risk of Second Lower Feeder crossing Newport Inglewood Fault (NIF) Zone
  - Assessing seismic vulnerability of CRA tunnels
  - Updating pipeline seismic vulnerability study



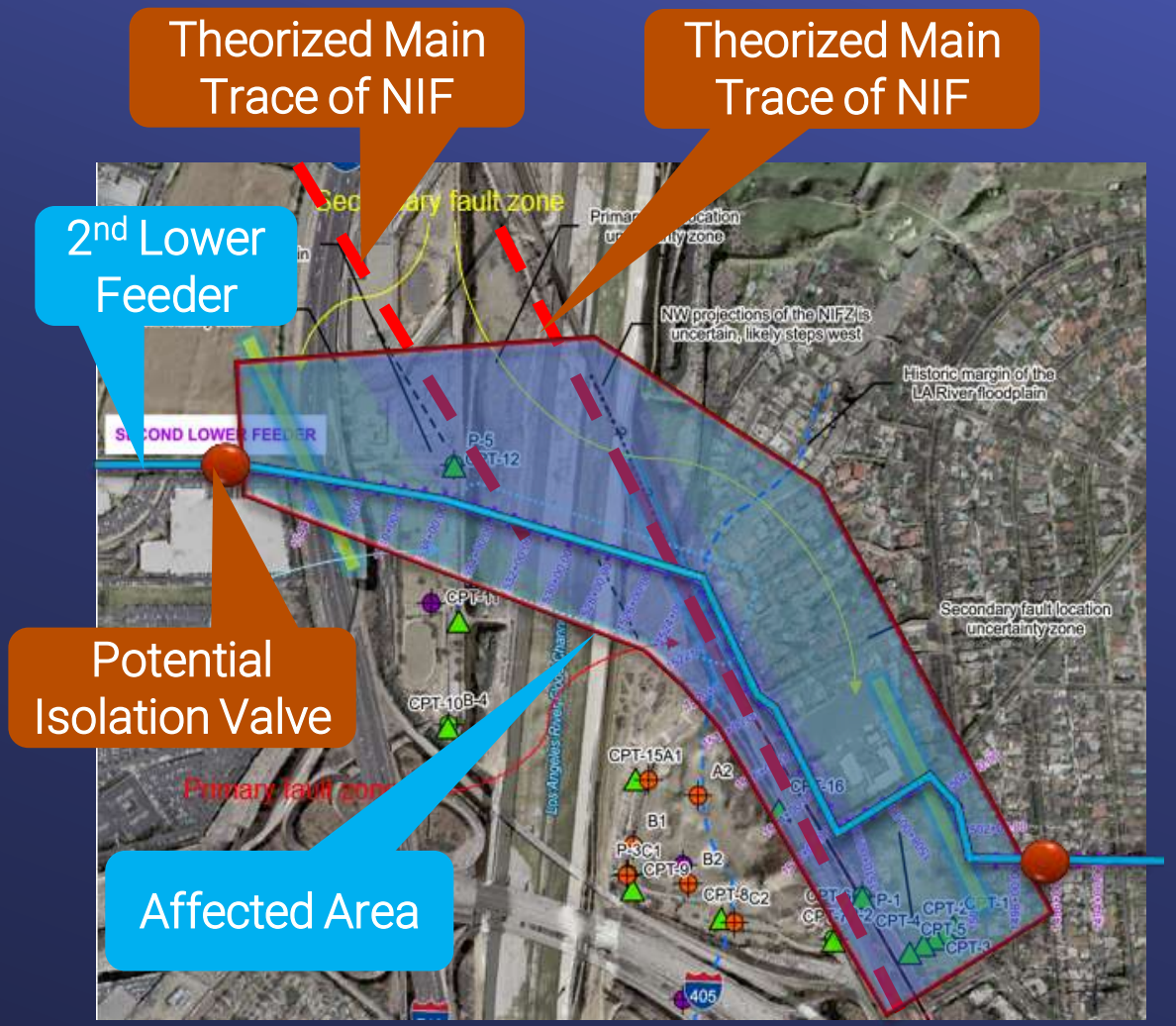
2nd Lower Feeder Fault Crossing Mitigation – Affected Area

Measures to Enhance Resilience against Extreme Events

- Advanced planning to facilitate recovery
  - Devise measures to isolate potential damage area
  - Pre-design construction documents
  - Pre-qualify emergency contractors



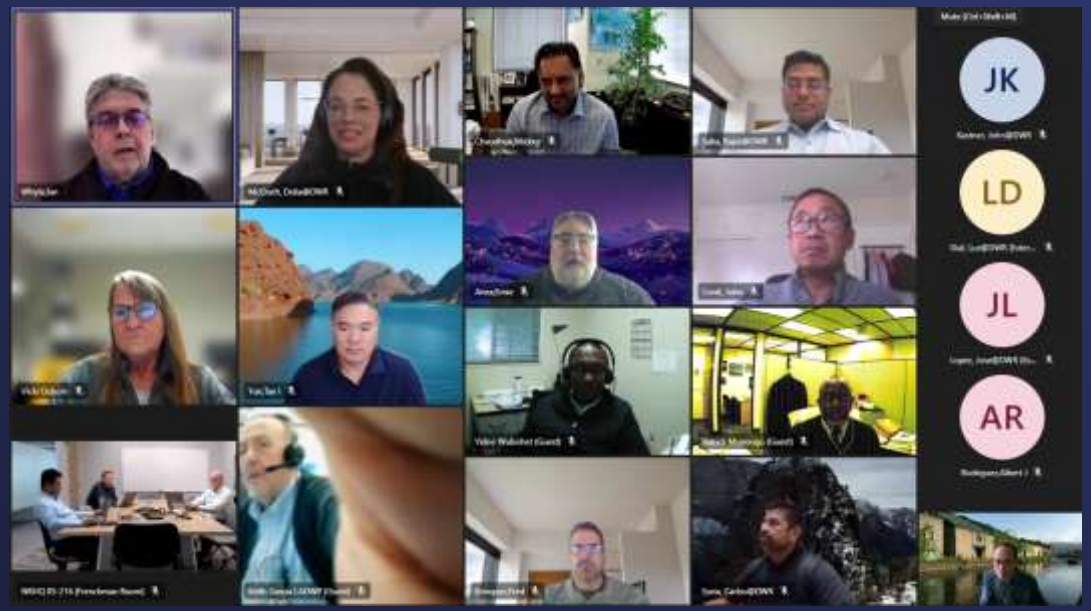
Pre-Designed Tunnel Repair Detail



2nd Lower Feeder Fault Crossing Mitigation – Affected Area

Measures to Enhance Resilience against Extreme Events

- Build up emergency response capability
  - Maintaining in-house resources & expertise
  - Upgrading La Verne shops to enhance capacity
  - Promoting inter-agency collaboration (Aqueduct Seismic Resilience Task Force)
  - Conducting emergency response exercises



Annual Task Force Meeting
(CalOES, CalWARN, DWR, LADWP, MWD)

Vertical Machine Center at La Verne Machine Shop

Next Steps

- Made significant progress in infrastructure reliability
- Maximizing benefits of limited resources with consideration of resilience measures to supplement retrofit/upgrade work
- Key initiatives in 2024
  - Working with research institutes to enhance seismic risk assessment tools
  - Quantifying seismic risk of CRA tunnels to develop mitigation strategies
  - Conducting tabletop exercise on proposed multi-agency emergency response plan to assess its effectiveness and identify gaps

Colorado River Aqueduct

California Aqueduct

Los Angeles Aqueduct


THE METROPOLITAN WATER DISTRICT OF
SOUTHERN CALIFORNIA
1928