A Regional Water Supplier's Seismic Response Plan as Part of the Organization's Overall Emergency Management Plan

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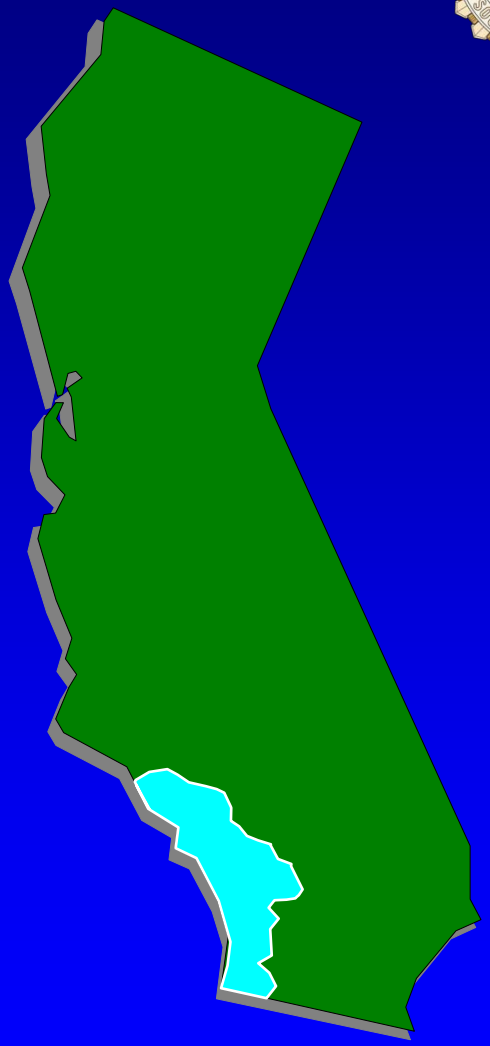
Presentation Outline

- Overview of Metropolitan Water District of Southern California (MWD)
- Emergency Management Plan
- Seismic Safety Program
- Seismic Response Plan

Mission

The mission of the Metropolitan Water District of Southern California is to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way.

Metropolitan Water District of Southern California



- **Regional Water Wholesaler to 6 counties**
  - 240 cities
  - 5,200 square miles
- **26 Member Agencies**
- **37 Member Board**
- **18+ million people**
- **Projected population growth: ~170,000 people / year**
- **Regional economy: $800+ billion**
- **Water Supplies: Meets about half of retail demands**

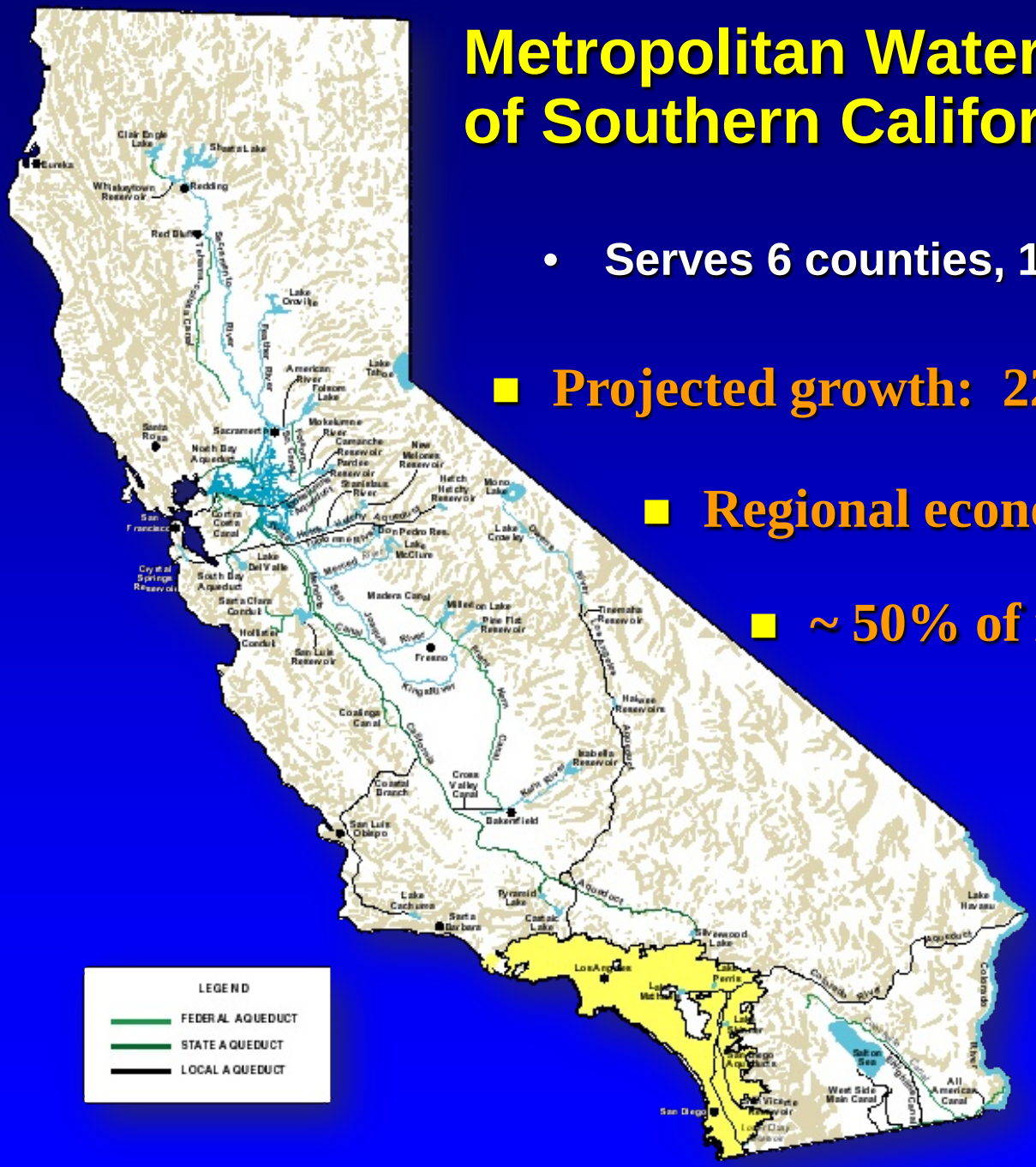
Organization

Incorporated:	December 6, 1928 by Act of California State Legislature
Legislative Charter:	To provide supplemental water to the Southern California coastal plain and to educate residents on water-related issues.
Water Sources:	Colorado River Aqueduct State Water Project
Service Area:	About 5,200 square miles (13,500 km^2)
Population Served:	18 million

Metropolitan Water District of Southern California

- Serves 6 counties, 18 million people

- **Projected growth: 220,000 people/yr.**
- **Regional economy >$800 billion**
- **~ 50% of region's water supply**



Slide

Where Southern California Gets its Water

Local Supplies
L.A. Aqueduct

Colorado River Aqueduct

State Water Project Entitlement

Local Supplies
Groundwater & Recycling

Facilities

242 Miles CRA Aqueducts, Tunnels

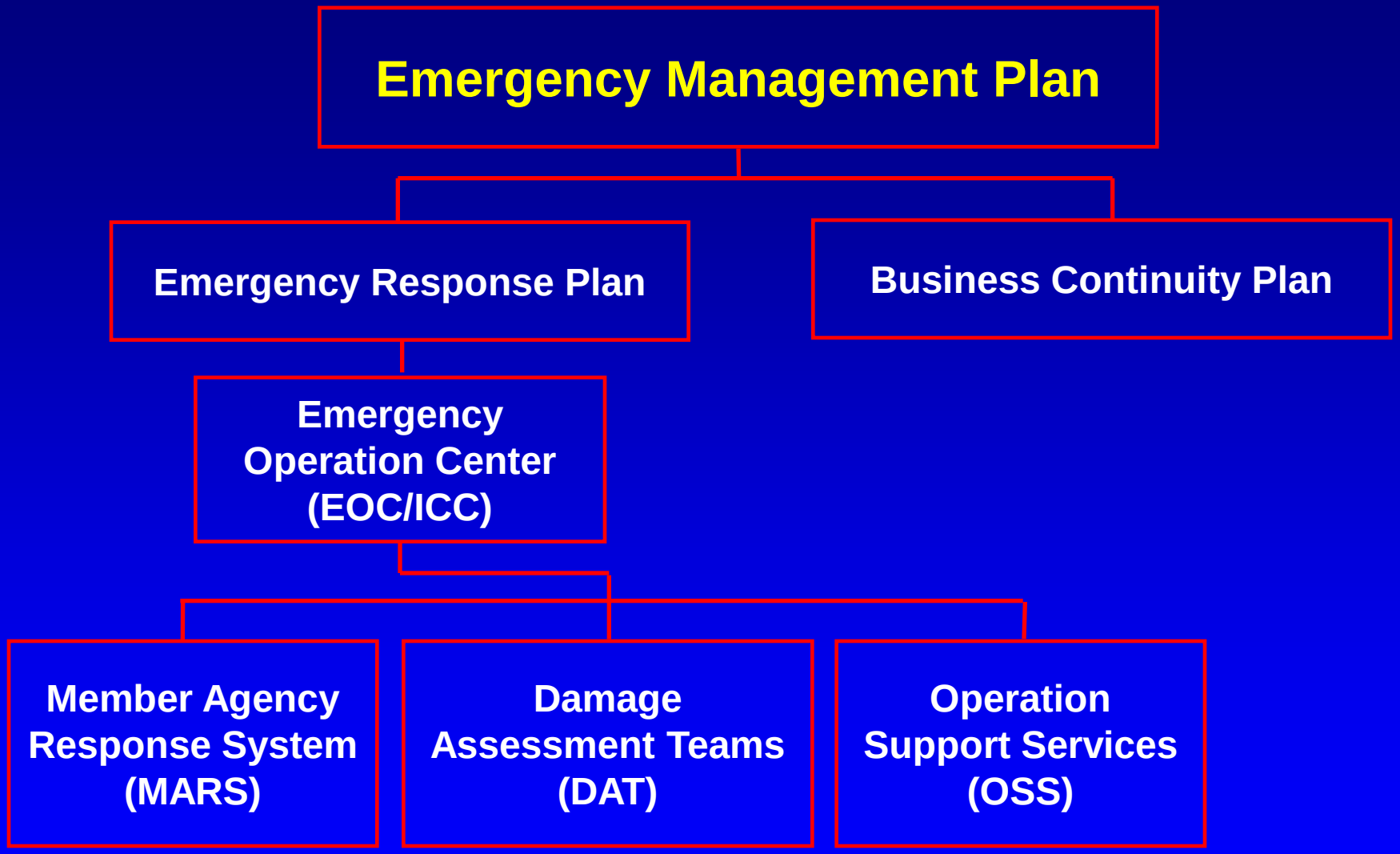
775 Miles of Pipelines

5 Treatment Plants

15 Hydro Plants

6 Pump Plants

33 Dams and Reservoirs

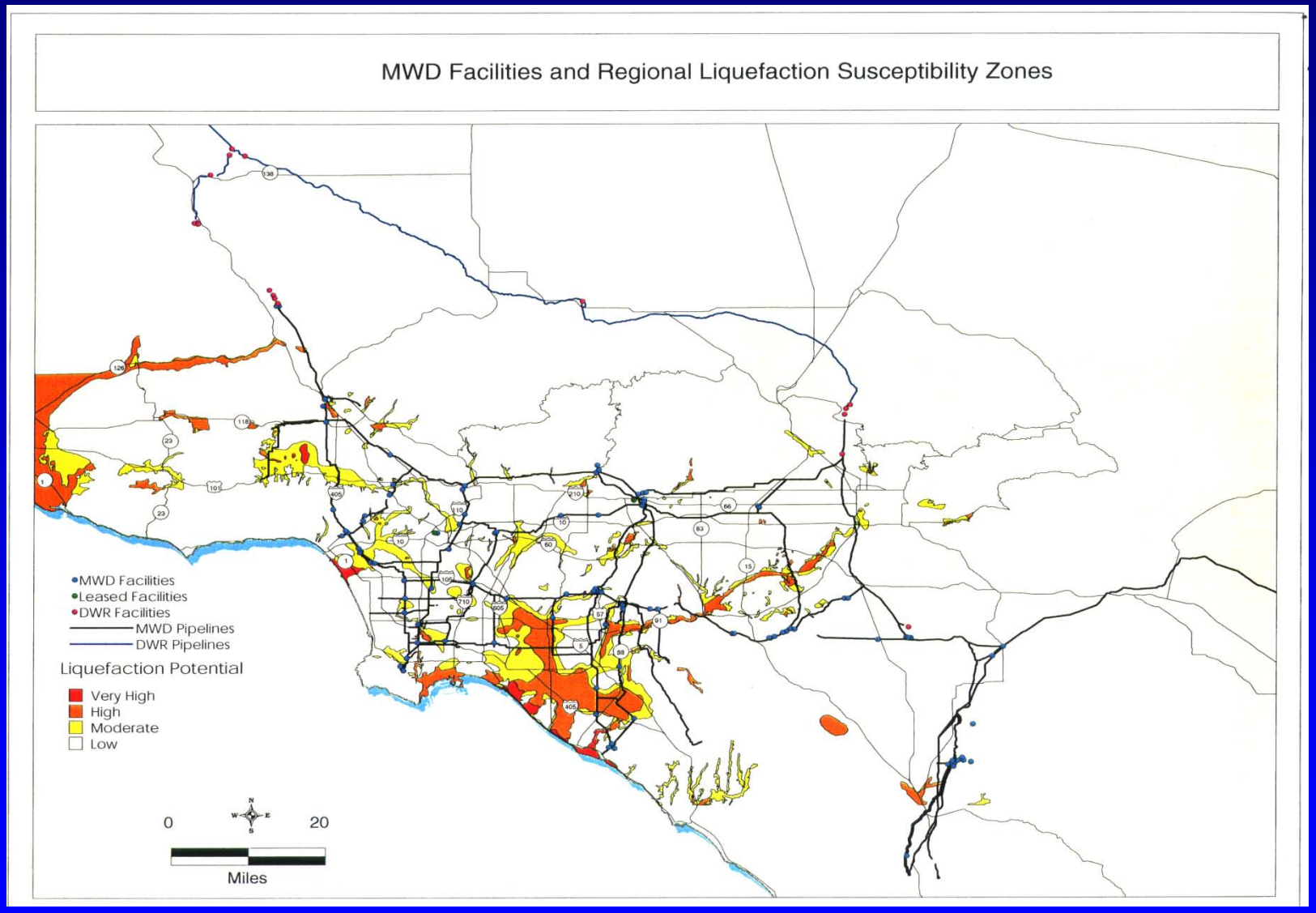

Emergency Management Plan
Emergency Response Plan
Business Continuity Plan
Emergency Operation Center (EOC/ICC)
Member Agency Response System (MARS)
Damage Assessment Teams (DAT)
Operation Support Services (OSS)

MWD's Seismic Safety Program

Goal: Ensure continuous water system operations immediately after a major earthquake.

Faults in Southern California

Liquefaction Susceptibility Zones

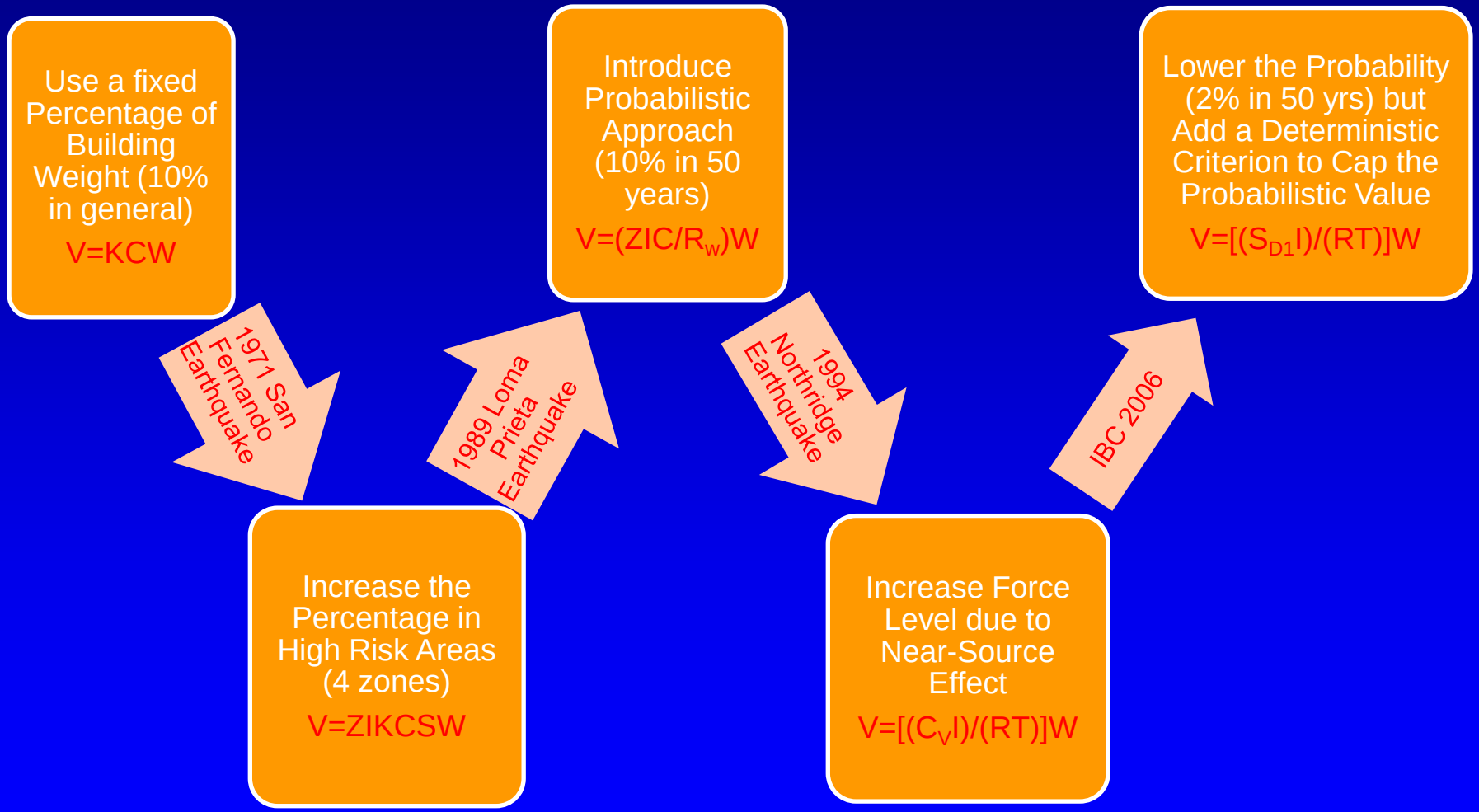


Seismic Risk

Over $3 million Damage to Jensen Filtration Plant While Under Construction in 1971

MWD's Seismic Safety Program

Major Changes on Building Code Seismic Design Forces



Seismic Performance Level

- New Structures:
  - Essential – related to water system operation (ASCE 7 Occupancy Category IV)
  - Important – not related to water system operation but necessary for business operation (ASCE 7 Occupancy Category III)
  - Regular – all other structures (ASCE 7 Occupancy Category II)
- Existing Structures
  - Essential – related to water system operation (FEMA 341 Immediate Occupancy Performance Level)
  - Regular – all other structures (FEMA 341 Life Safety Performance Level)

MWD's Seismic Safety Program

Existing Facility Seismic Evaluation

Three Steps Approach:

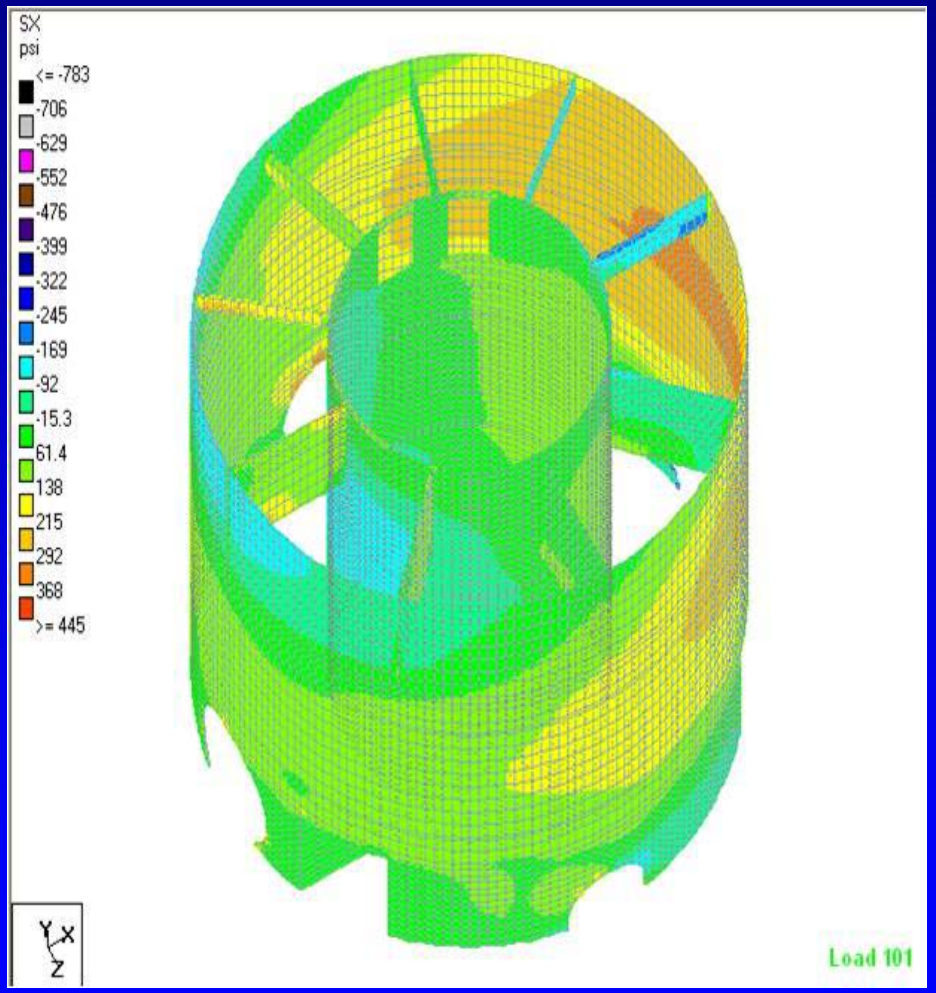
- Rapid Evaluation of all Facilities
- Detailed Evaluation of Facilities with Deficiencies
- Retrofit Design and Construction to Mitigate Identified Deficiencies

Existing Facility Seismic Evaluation

- **Rapid Evaluation**
  - **Funded under O&M budget**
  - **Visual Inspection**
  - **Drawing Review**
  - **Preliminary Calculation**
  - **Determine Seismic Adequacy**

Existing Facility Seismic Evaluation

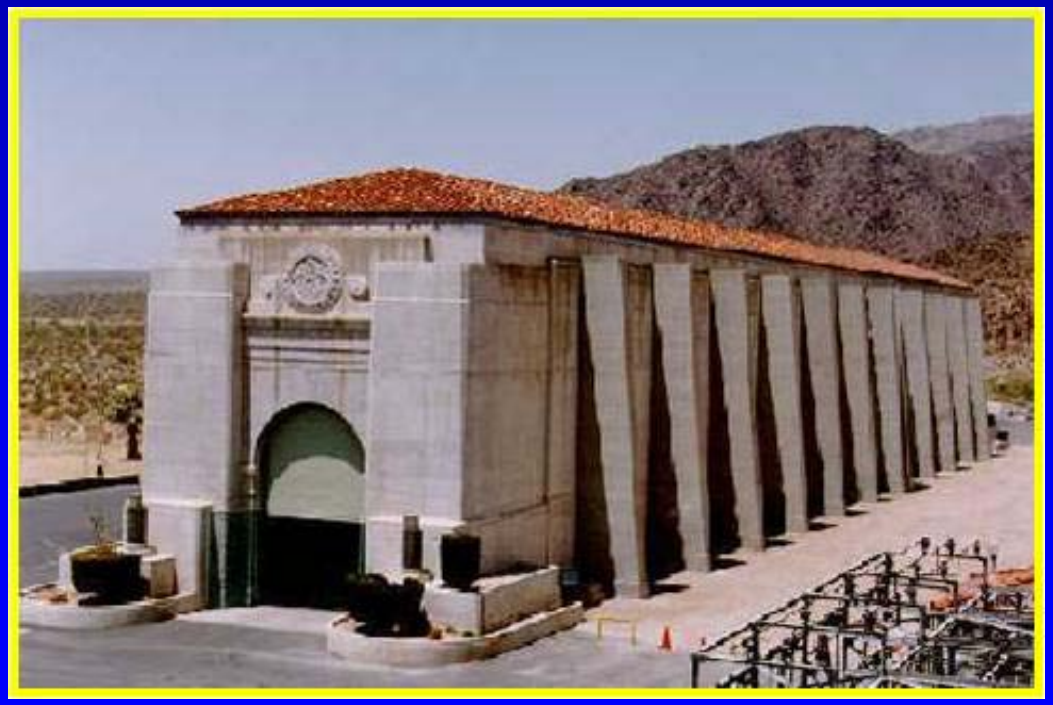
- **Detailed Evaluation**
  - Capital Improvement Projects
  - Structural Modeling
  - Comprehensive Evaluation
  - Material Testing If Necessary
  - Retrofit Schemes Development and Cost Estimate



Existing Facility Seismic Evaluation

- **Retrofit Design and Construction**
  - **Capital Improvement Projects**
  - **Final Design to Mitigate Identified Deficiencies**
  - **Retrofit Construction**

During



After

MWD's Seismic Safety Program

Seismic Inspection

Voluntary periodic inspection to ensure adequacy of pipe bracing and equipment anchorage.

Seismic Inspection

- **Mandatory periodic inspection (at lease once every five years) on pipes and Equipment containing regulated substances**

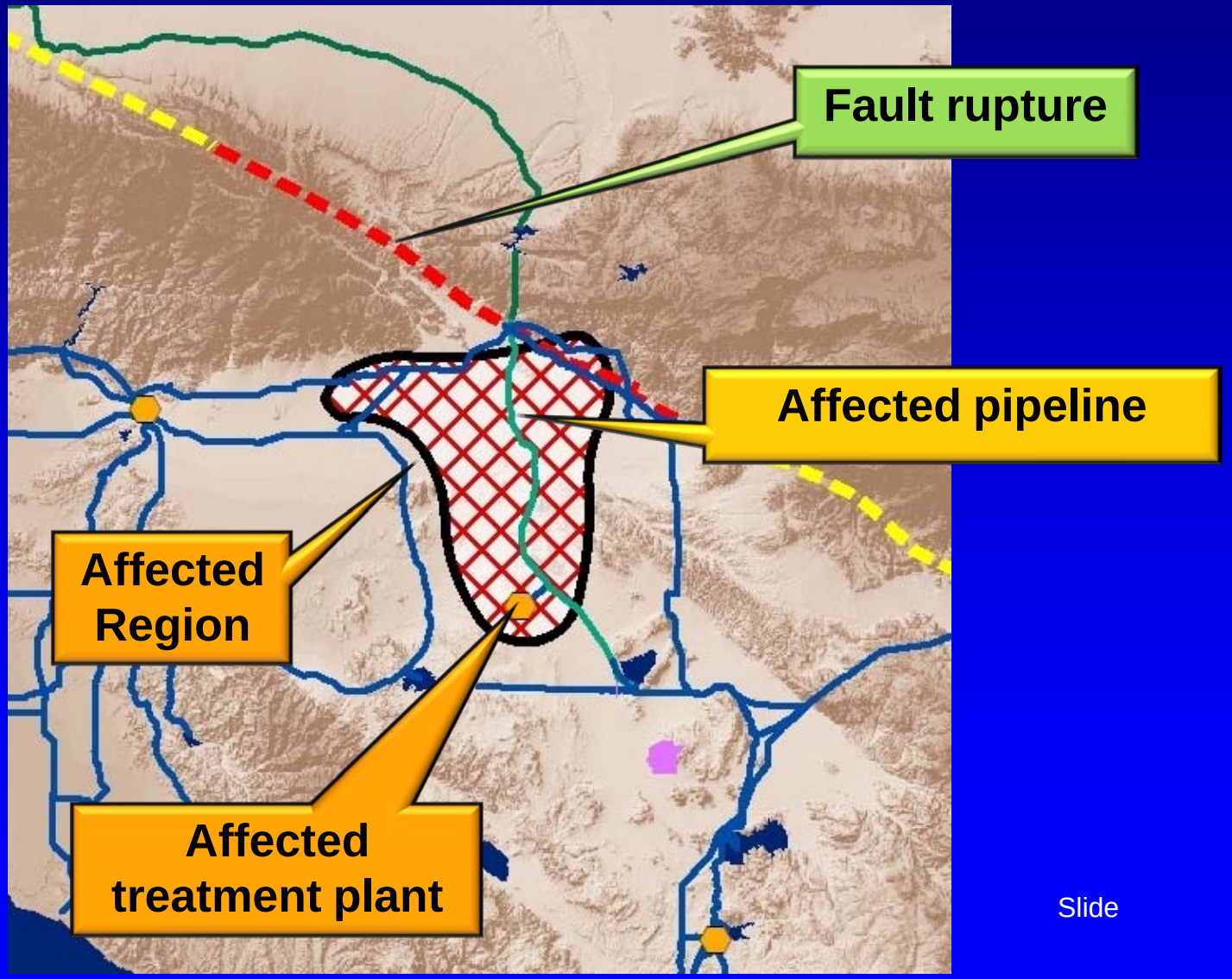
Seismic Inspection

- **Periodic inspection on special structures such as base isolated bridge**
  - **Every six months by maintenance crew**
  - **Every five years by a structural engineer**
  - **Immediately following a large earthquakes by a structural engineer**

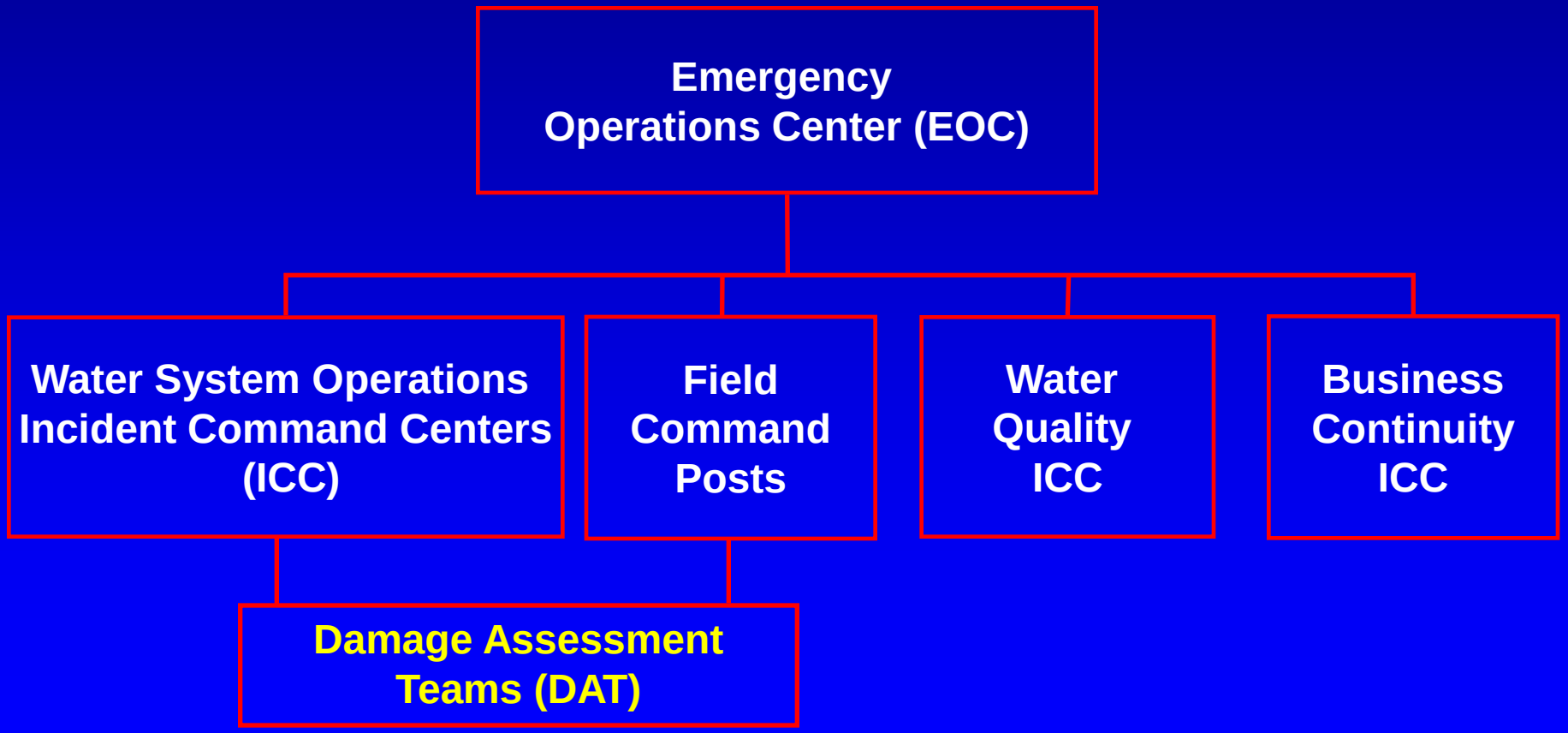
MWD's Seismic Safety Program

Vulnerability Assessment

Areas Impacted by Postulated Earthquake

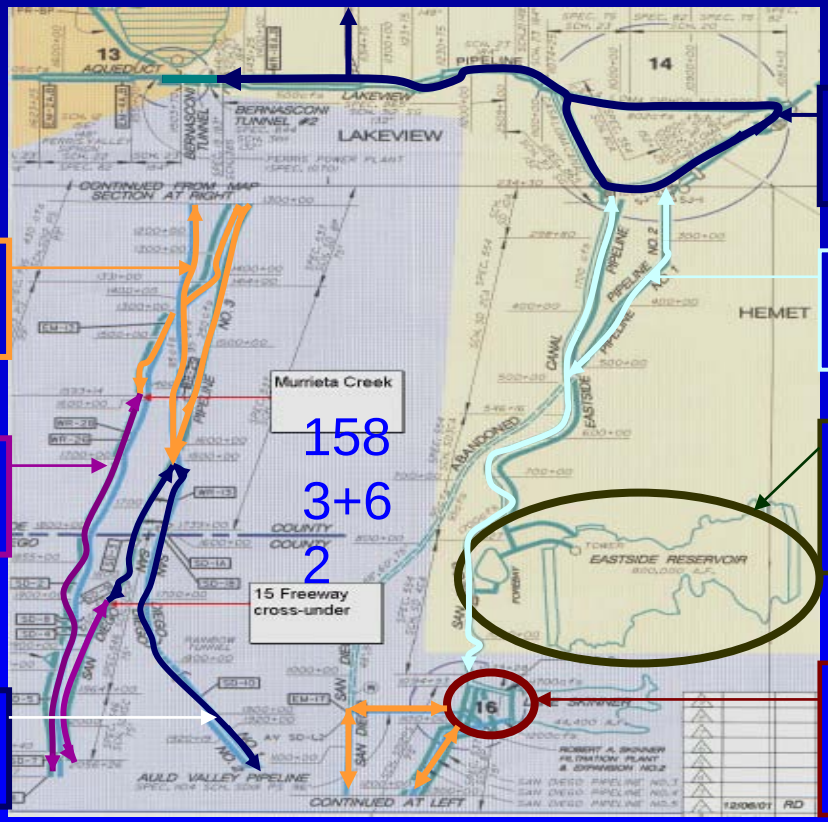


Emergency Response Plan



Emergency Response Plan (ERP)

Example: Skinner Area Patrol Route



Emergency Response Run LS-5B

Emergency Response Run LS-7

Emergency Response Run LS-6

Emergency Response Run LS-3

Emergency Response Run LS-4

Emergency Response Run LS-8

Emergency Response Run LS-5A, C, & D.

How to respond to an emergency

- Roles and responsibilities
- Equipment
- Material
- Communications

Damage Assessment

Established patrol routes

- **Automatic mobilization**
- **Pre-defined patrol routes**
- **Primary and secondary patrollers**

Damage assessment teams

- **8 multi-discipline teams (2 engineers per discipline)**
  - Structural
  - Civil
  - Mechanical
  - Electric
  - Construction

Response Resources Strategy

Scenario	Oversee	Project Management	Design	Construct
Single Random Event	MWD	MWD	MWD	MWD
Moderate Event (M6.5-M6.75) 2 to 4 pipeline breaks[1]	MWD	MWD	MWD and Consultant	MWD and Contractors
Extreme Event (>M7.5) 5 or more pipeline breaks[2]	MWD	MWD and Consultant	MWD and Consultants	MWD and Contractors

1. Mobilize consultants and contractors from existing capital projects to respond to more than 2 pipeline breaks
2. May also involve mutual assistance from outside agencies

Internal MWD Capability
(Pipeline Repair)

Planning scenario - two simultaneous pipeline breaks

- 8 to 12 foot dia. x 60 ft long pre-stressed pipe, in an open area
- 8 to 12 foot dia. x 40 ft long pre-stressed pipe, in traffic area

Goal

- Return to service within 7 days

Critical Resources

Skills

- ✓ Pipeline engineers
- ✓ Crane and heavy equipment operators
- ✓ Welders
- ✓ Coaters

Equipment

- ✓ Heavy equipment*
- ✓ Shop equipment**

•Recommending augmenting heavy equipment resources with additional excavator, hydraulic breakers and trench shoring.

** Recommending augmenting shop capability with additional plate roll and sub arc system

Critical Resources

Vendor relationships and contracts

- ✓ Concrete
- ✓ Gunite
- ✓ Steel*
- ✓ Concrete demolition
- ✓ Heavy equipment rentals
- ✓ Welding supplies
- ✓ Temp agency labor

* Currently maintain stock of plate steel at La Verne Shop for rolling pipe.

Actions Under Way to Improve Response Capability

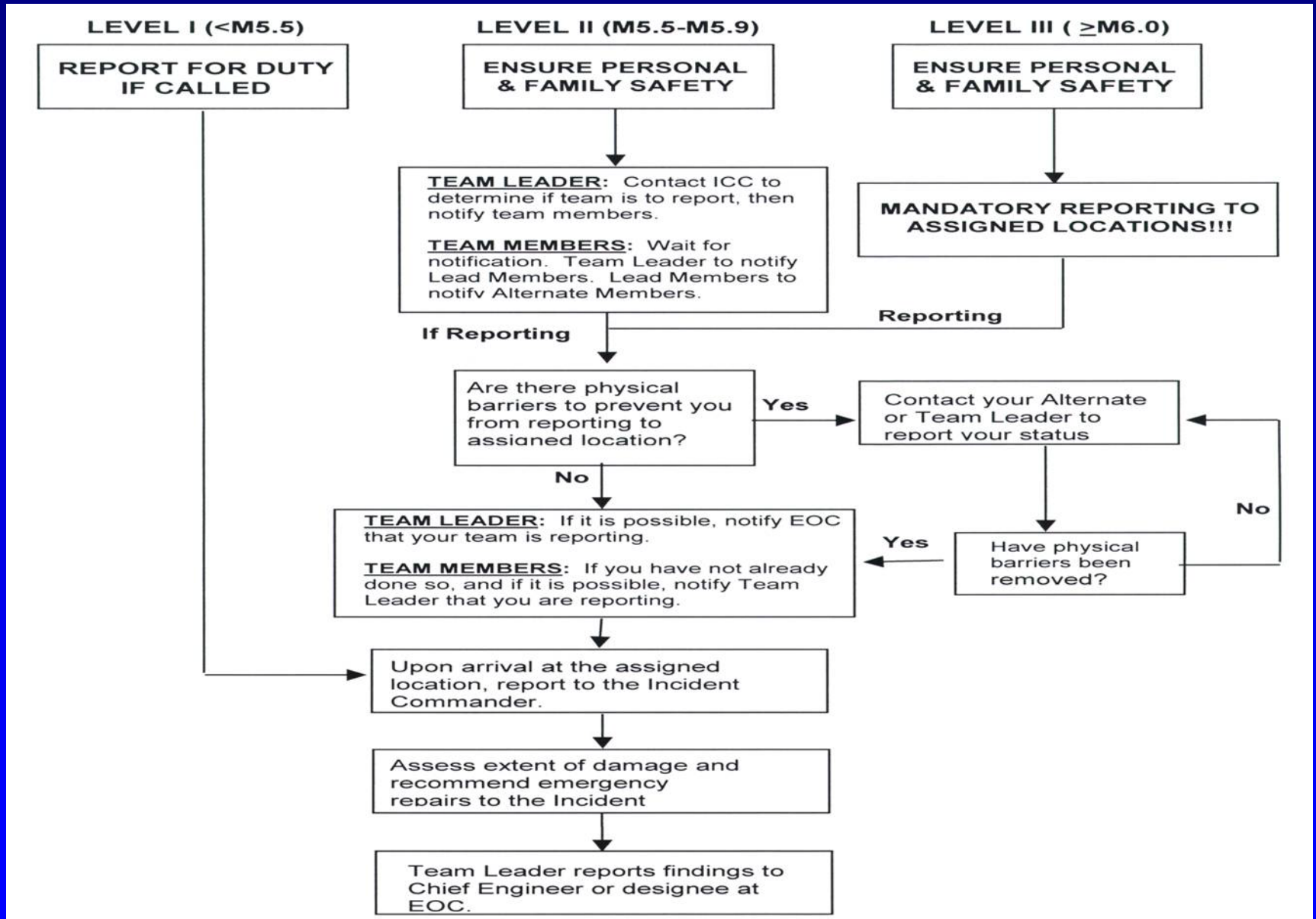
- Improve two-way radio system and buy satellite phones
- Complete standard pipeline repair drawings
- Prepare standard shoring plans
- Conduct exercises
- Procure additional critical equipment

Emergency Response

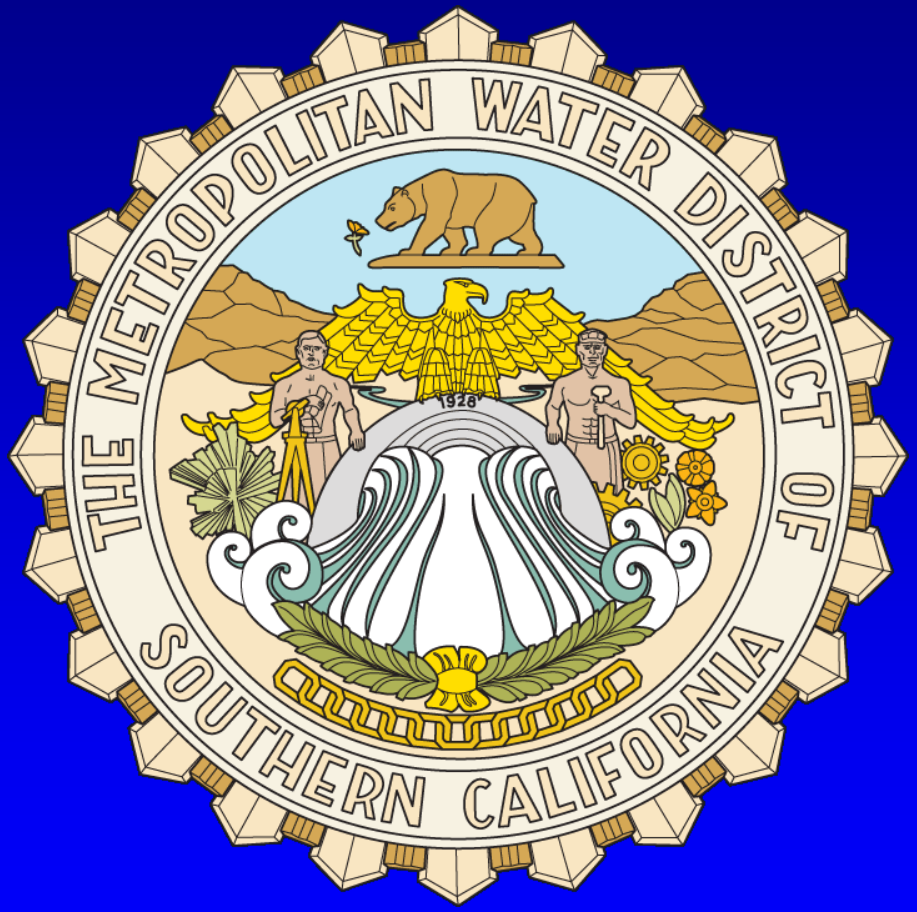
Engineering Services' Role after Earthquake:

- Immediately dispatch Damage Assessment Teams
- Work closely with Water System Operations Group and contractors
- Assist in restoring operations

DAT Response Flow Chart



Example – Pipeline Emergency Repair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SOUTHERN CALIFORNIA
1928