Presentation to the

Southern California Association of Governments

Seawater Desalination Concerns & Benefits

Presented by

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Long Beach Water Department

December 11, 2003

Outline

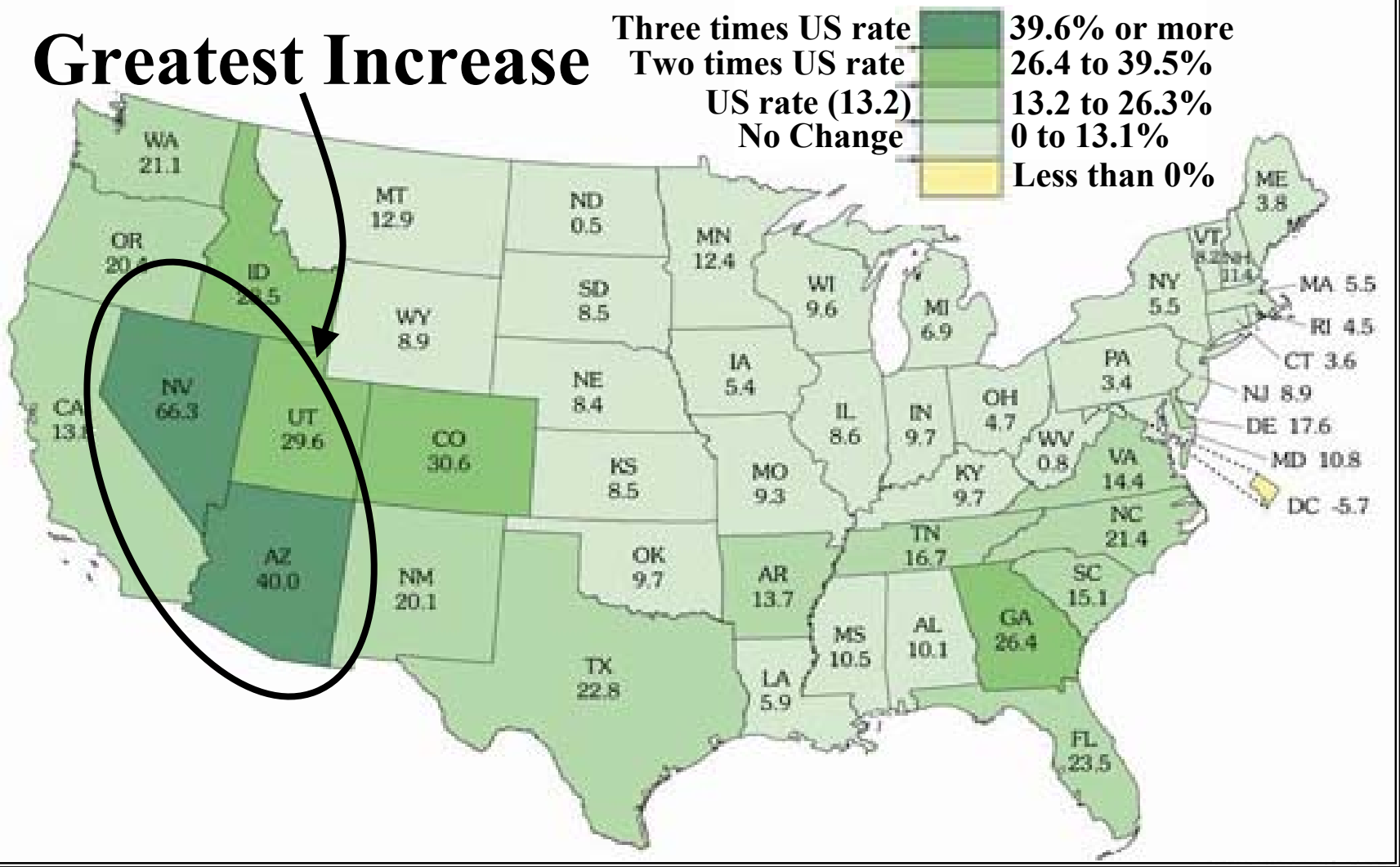
Seawater Desalination

- National
- State
- Local

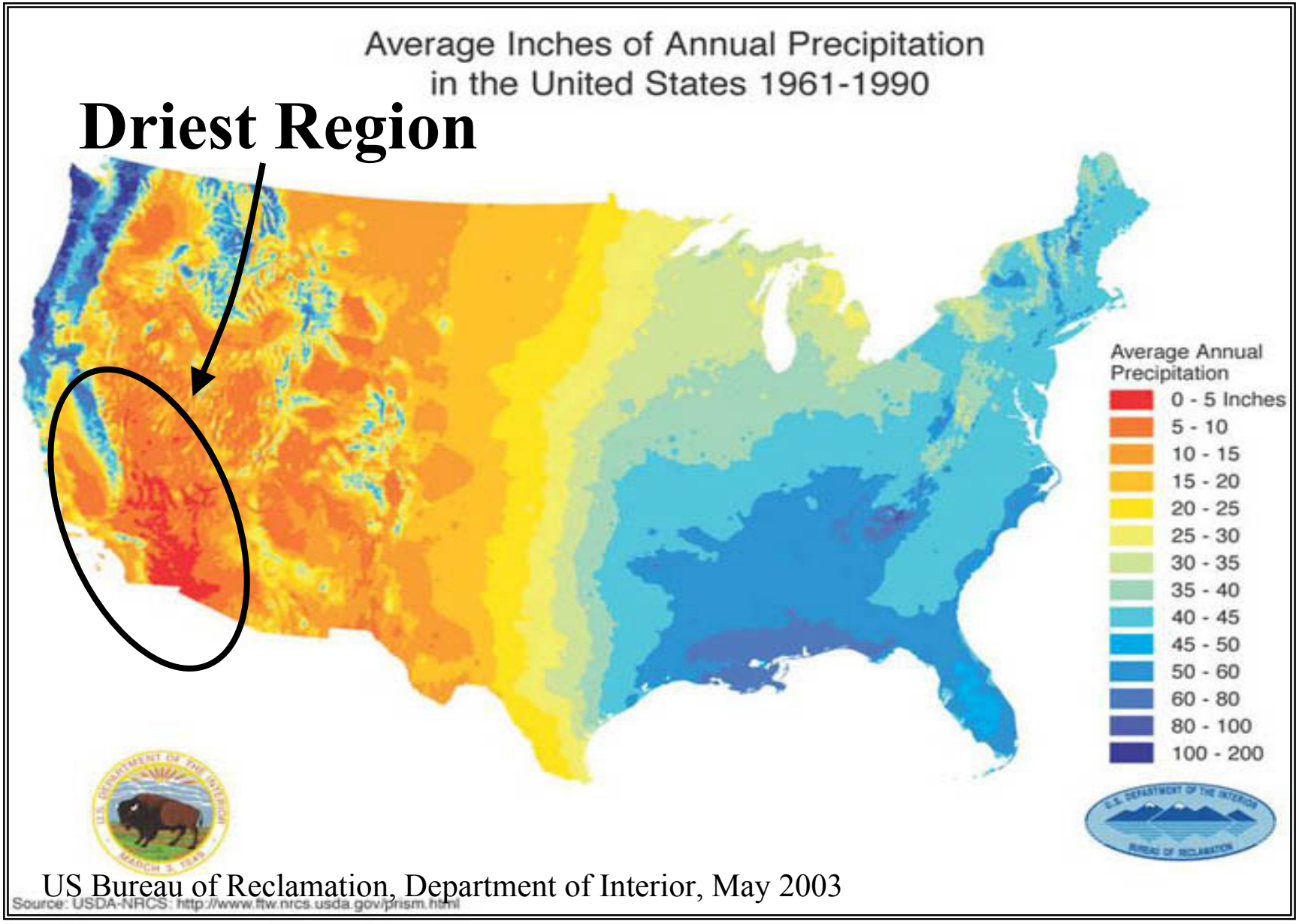
National Focus:

Research

Federal Interest in Desalination: Change in Population 1900 - 2000



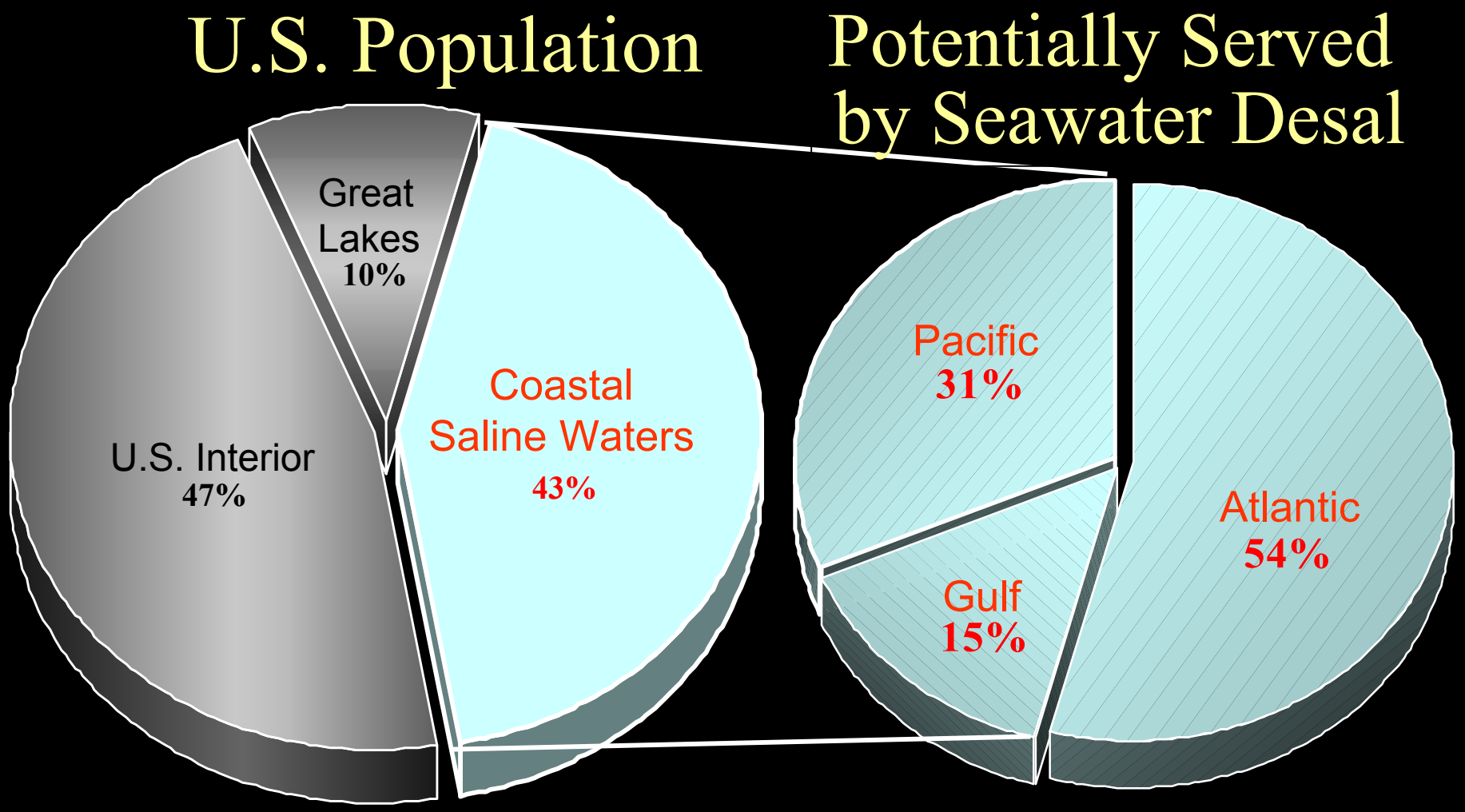
Federal Interest in Desalination: Precipitation



US Bureau of Reclamation, Department of Interior, May 2003

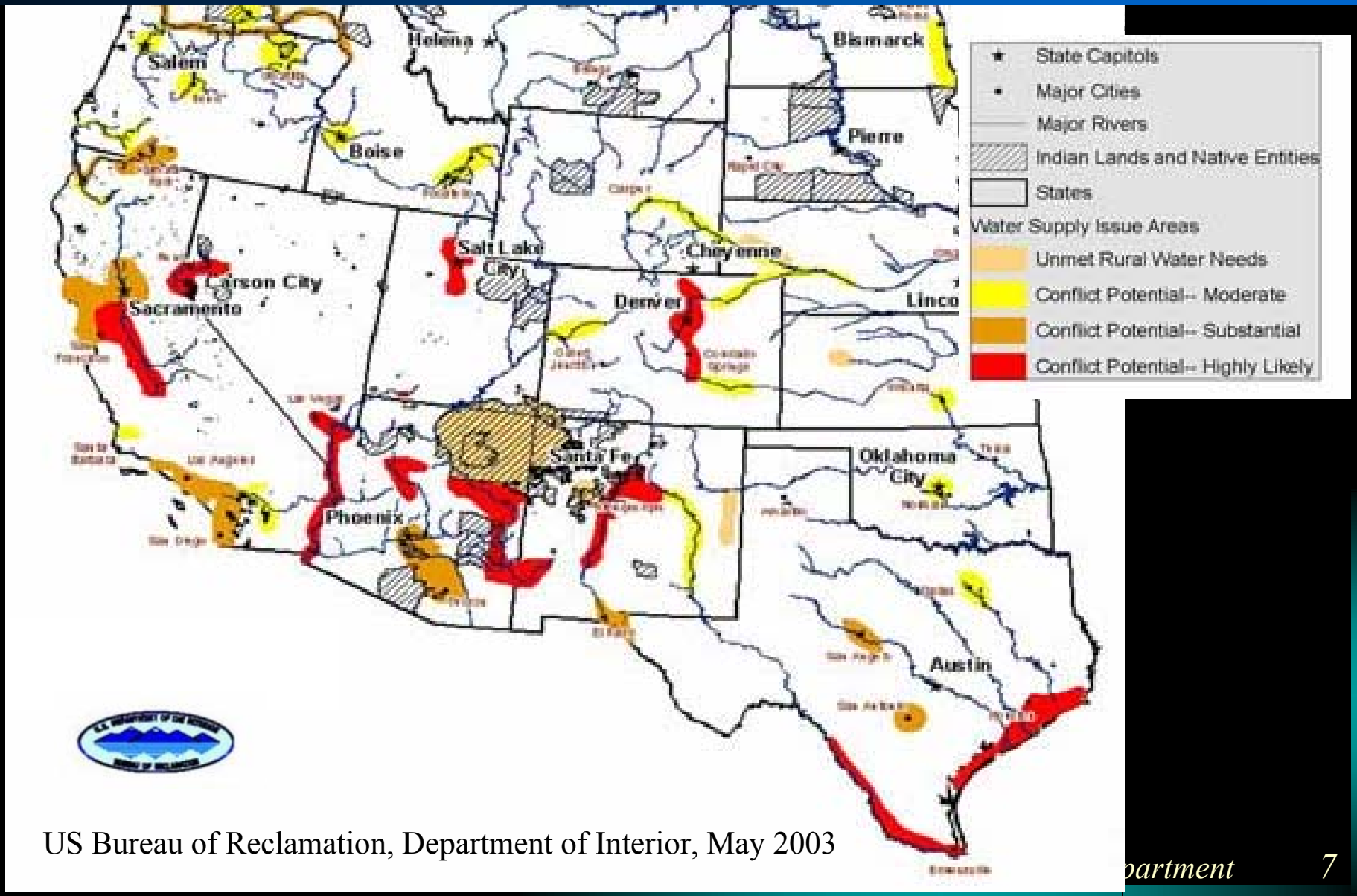
Federal Interest in Seawater Desalination:

Potential for Seawater Desalination



* Estimate of 1994 U.S. population, Population Distribution Branch, US Bureau of the Census

Federal Interest in Desalination: Potential Water Crisis - 2025



US Bureau of Reclamation, Department of Interior, May 2003

Federal Desalination & Water Purification Technology Roadmap

- January 2003
- 30 participants
  - Consultants
  - Membrane Manufacturers
  - Engineering firms
  - Water agencies
  - Research institutes
  - Legislative representatives
  - Federal government
  - Universities

Report available at http://www.usbr.gov/pmts%5Cwater/desalroadmap.html

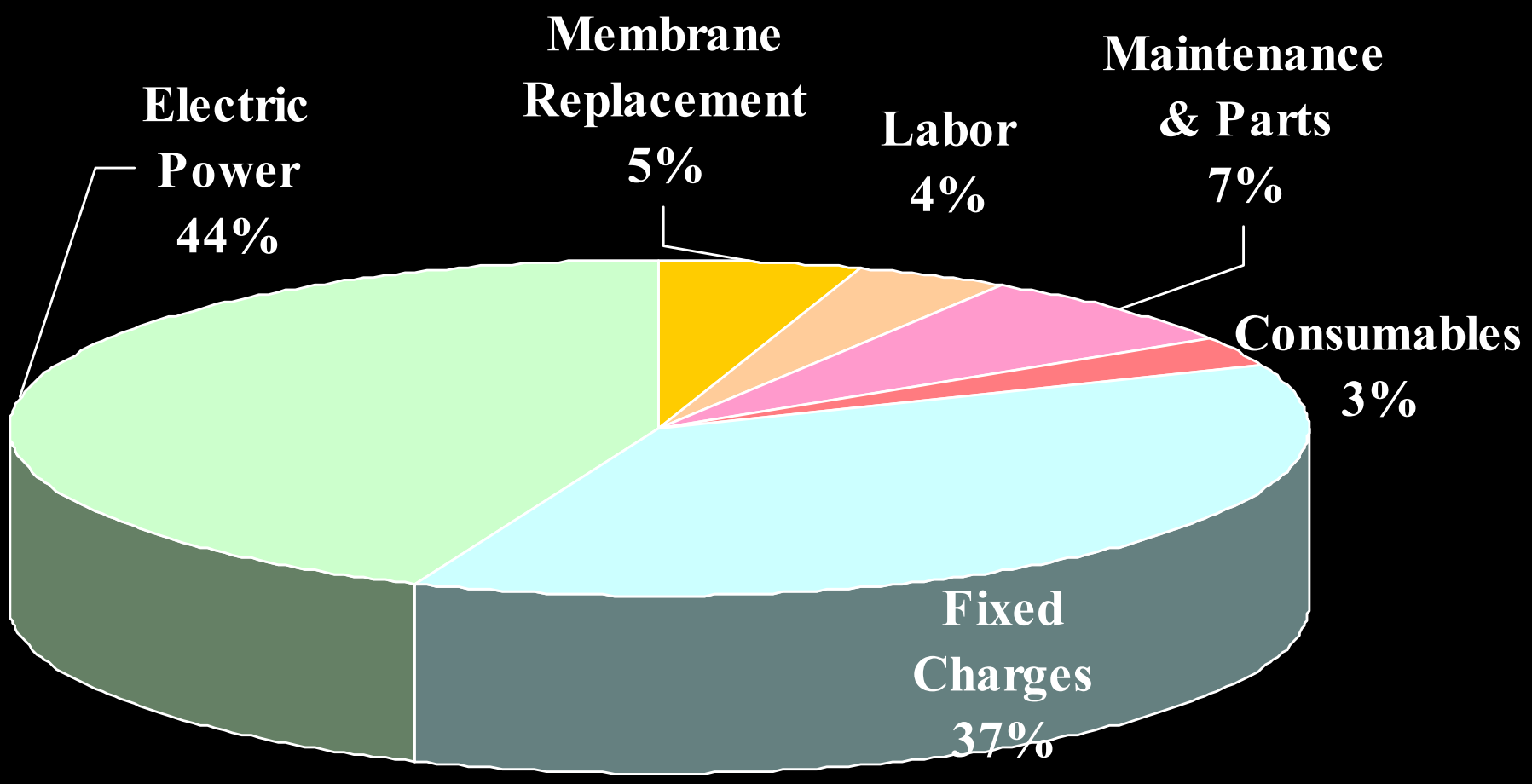
Federal Desalination & Water Purification Technology Roadmap

"**The Achilles Heel of these desalination technologies, however, is cost – they are currently expensive to purchase and operate.**" *(exec summary)*

"**...the treatment cost of a gallon of purified seawater today currently costs approximately five to six times the treatment cost of fresh water** (Water Treatment Estimation Routine User Manual, U.S. Bureau of Reclamation, Water Treatment Technology Program Report No. 43)…" *(pg 19)*

Cost

Federal Roadmap Estimate: Power + Debt = 81%



Federal Desalination & Water Purification Technology Roadmap

"If this objective [of reducing cost of desalination] is not met, the trend of increasing relative use [of available water supplies] by urban areas will jeopardize many other important water uses, such as the environment, agriculture, Native American water use, industry, and recreation." *(Introduction)*

" …Desalination technologies…offer the promise of local control of water supplies as they will reduce dependence on upstream or inland sources as well as considerable protection against drought – no matter how little rain falls, there is always water available in the oceans." *(page 27)*

Federal Desalination & Water Purification Technology Roadmap

"Even with this wealth, Southern California is unable to afford water purification and desalination plants without public sector funding to offset some portion of the up-front capital cost. If the economic powerhouse that is Southern California can't afford current-generation technologies without assistance, then smaller communities across the nation have even less of an opportunity to employ needed desalination technologies." *(page 40)*

...and hence the need for federal support of research

Federal Desalination & Water Purification Technology Roadmap

Short-term Federal Research Goals with Respect to Desalination Cost:

- 20% increase energy efficiency
- 20% lower capital cost
- 20% lower operating costs
- 20% lower zero-liquid-discharge cost

First Attempt in U.S. at Large-scale Seawater Desalination:

Tampa Bay, Florida

Technical Feasibility

- **Tampa Bay Water & Poseidon Resources**
- **$110 million capital cost**
- **Plant not fully operational** *(almost one year past scheduled start-up)*
  - **Once operational, operating costs expected to significantly exceed estimates**
- **Private developer no longer involved in project**
- **Three firms declare bankruptcy**
- **Declaration of bankruptcy by current contractor prevents public utility from replacing it**
- **Public utility eliminates plans for second seawater desalter**

California

- Desalination Task Force
- Coastal Commission

California State Desalination Task Force

Report available at http://www.owue.water.ca.gov/recycle/desal/desal.cfm

Comments based, in part, on Studies & Reports

- DWR Report to Legislature *(October 2003)*
- 28 participants; representing
  - State agencies
  - Federal agencies
  - Water agencies
  - Research agencies
  - Environmental agencies
  - County governments
  - City governments
  - Desalination industry

FINDINGS

- 41 Findings, including:
- Environmental impediments include
  - Feedwater intake
  - Concentrate disposal
  - Cost
  - Siting
  - Growth-inducement
- Current energy requirement of RO:
  ~130% of inter-basin transfers
- Viability may depend on cost of power
- Private-sector involvement raises unique issues

FINDINGS: Co-location with Power Plant

Benefits May Include

- Compatible land use
- Use of existing infrastructure for intake and outfall
- Location security
- Use of warmed cooling water as feed for desalter
- Potential to purchase power at below-retail rates

Drawbacks May Include

- May justify continued use of once-through cooling

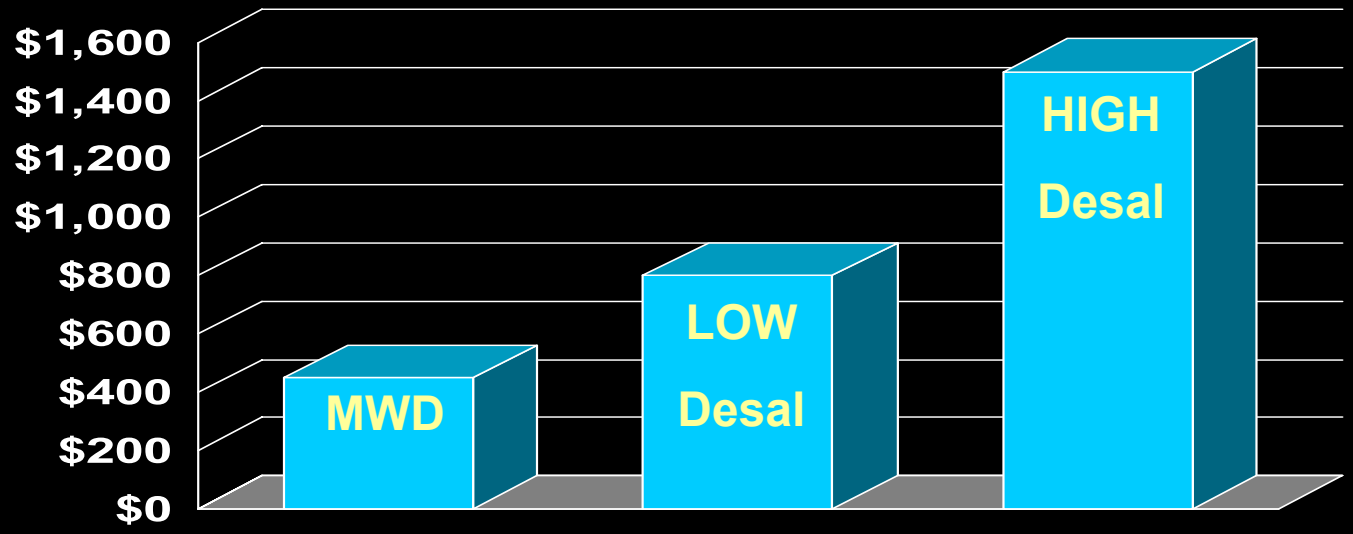
Size & Quantity of Plants Increasing

	Existing	Planned
Number	**12** *(5 know to be regularly active)*	**18**
# Private	*6*	*5*
# Public	*6*	*13*
Largest	**<1 mgd**	**50 mgd**
Total mgd	**<3 mgd**	**187 mgd**

MGD = Million gallons per day.

FINDINGS: Estimated Cost per Acre-foot

	Low	High
Desalination	$700	$1,200
Distribution	$100	$300
Total	$800	$1,500



RECOMMENDATIONS

- 29 major recommendations, covering:
  - General
  - Energy and Environmental
  - Planning and Permitting
- Funding Recommendations
  - Research
  - Projects with greatest public benefit *(environmental, improved water quality, environmental justice, agencies maximizing conservation and reclamation, etc.)*

Highlights of "Main Points" from California Coastal Commission's Draft
Seawater Desalination & the Coastal Act

Final report expected to be adopted January 2004
Draft report available at http://www.coastal.ca.gov/

"Main Points"

Economics: High Cost

- Desalination more expensive than other supplies
  - But some water providers may prefer it for its high reliability
- Recent technological changes have reduced energy requirements; yet energy remains the the single highest cost in producing desalinated seawater

"Main Points"

Private vs. Public Desalination Plants

- Privatization and commodification of a public trust resource (i.e., seawater) would represent a major shift in public policy
- International agreements and legal decisions: may hamper the ability of state and local governments to regulate the activities of multinational corporations
- Coast Act's priority use policies likely differ for public vs. private desalination proposals

"Main Points"

Desalination Not a Priority Use

- Desalination plants may not be a "priority use" of the coastal zone
  - Coastal-dependent facilities have a priority in the coastal zone; the actual desalination facility may not be coastal-dependent

Growth-inducement

- In some areas along the coast, the water supply provided by desalination may remove the primary constraint to growth and substantially affect coastal resources

"Main Points"

Proposed Plants Must Identify and Incorporate

- Feasibility of desalter
  - Economic, environmental, social, and technological feasibility
- Feasibility of alternatives
  - Conservation, use of reclaimed water, reallocating existing supplies, and market-based measures

"Main Points"

Marine Environment

- May cause significant adverse effects on marine organisms
  - Impingement
  - Entrainment
  - Brine discharge
  - Discharge of biocides, cleaning compounds, and other chemicals
- Must evaluate alternative locations and feasible mitigation measures
  - Including use of Beach Wells

"Main Points"

Co-location with Power Plant

- Advantages
  - Assume power plant entrainment mortality of 100% in +1 billion gallons per day of intake water
  - Intake and outfall structures exist
  - Requires little to no electrical transmission capacity
  - Other existing infrastructure such as parking lots and security
  - Cooling water reducing salinity of seawater concentrate

"Main Points"

Co-location with Power Plant

- Concerns
  - Once-through cooling, sited 50 years ago, was not subject to current standards of environmental review
  - Entrainment studies 20 to 30 years old
  - Desalter entrainment when power plant not operational
  - Impact on desalter of potential future requirement of power plant to reduce take of seawater
  - If desalter not "coastal-dependent", then siting at power plant may be non-conforming use

Other Major Issues Expressed by Environmental and Other Interests

Other Issues Raise by Community

- Alternative supplies may be preferable
  - Lower cost: Potentially lower capital and/ or operating costs (conservation, reclaimed water, conjunctive use, etc.)
  - Less environmental impact
- Co-location may extend life of coastal power plants
- Coastal community incurs cost (forced to site industrial plant) while inland community receive benefits (reliable water)
- Private sector ownership
  - Grants = taxpayer subsidy of corporate profits
  - Loss of control of essential public resource (water)
  - Potential repeat of problems in Tampa Bay

Local

- MWD
- Long Beach

Metropolitan Water District (MWD)

Seawater Desalination Program

- 5 proposals received at $250/af
- MWD commitment awaiting adoption of IRP
  - Current commitment: 50,000 af
  - Proposed IRP commitment:
    - 150,000 af; ~3% of region's water supply of 5 maf/yr

	LADWP	Long Beach	MWDOC	SDCWA	WBMWD
Proposed Capacity	12mgd	9.4 mgd	25mgd	50mgd	20mgd
Estimated Cost/AF	$1,033	$711 to $1,170	$860 to $1,007	$909	$904

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Service Area

Water service to the economy and the ~1/2 million people of California's 5th largest city

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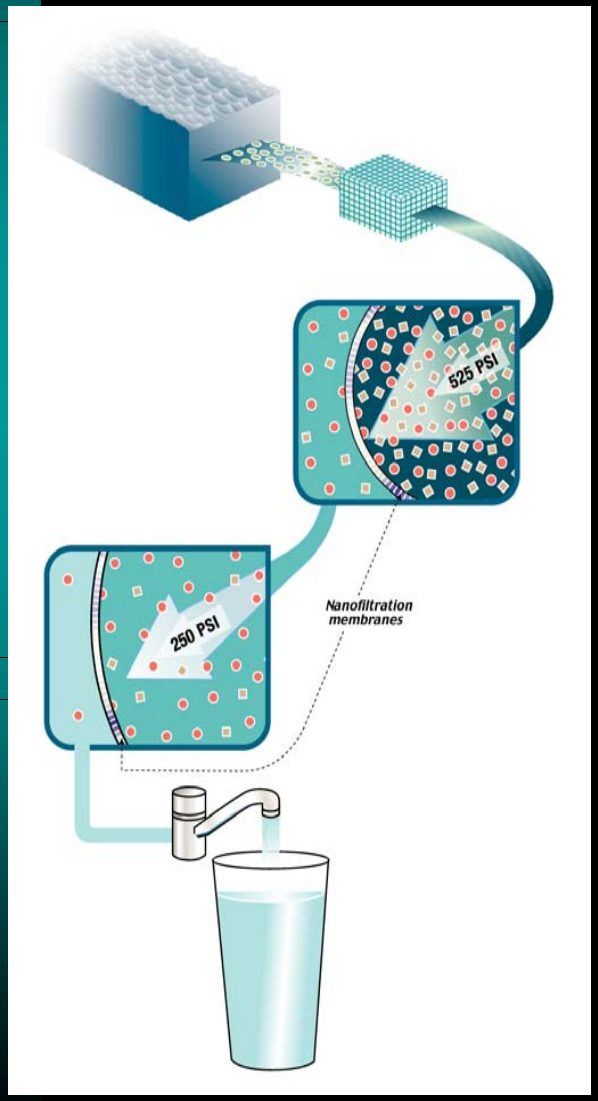
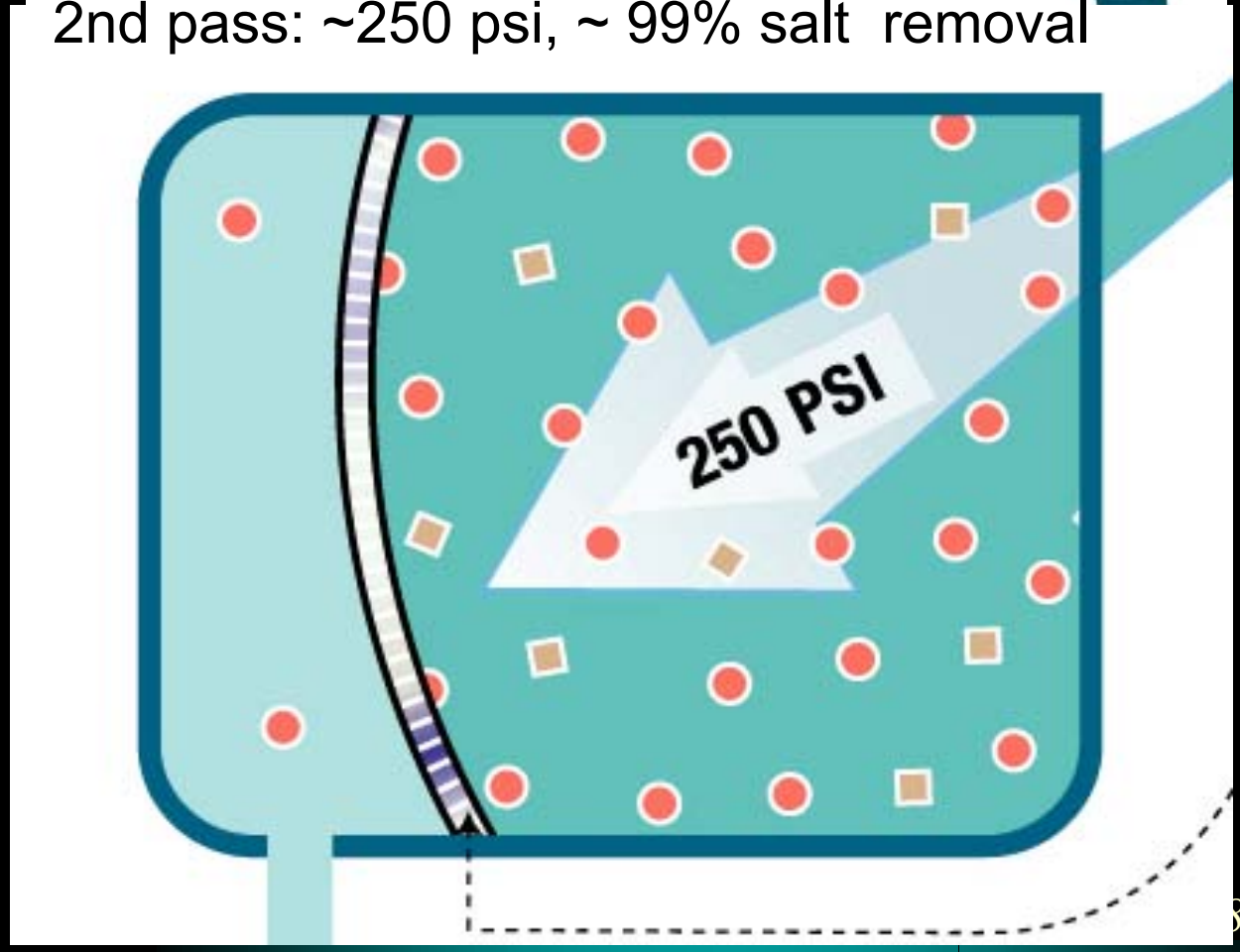
2-pass Nanofiltration Process



1st pass: ~ 525 psi, ~ 90% salt removal

2nd pass: ~250 psi, ~ 99% salt removal



3-phase Applied Research

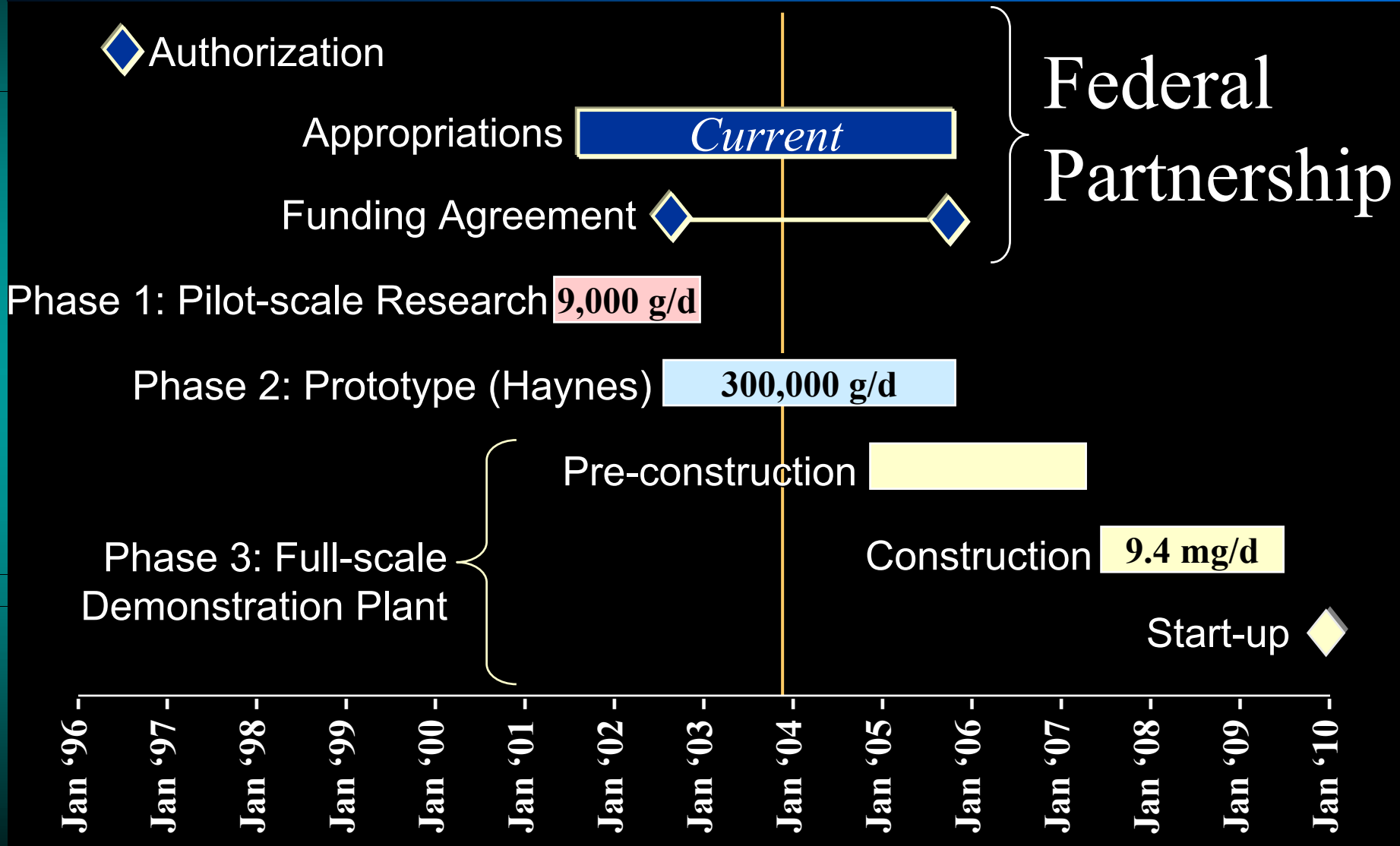
① **Pilot Plant** (concluding)

② **Prototype** (construction pending)

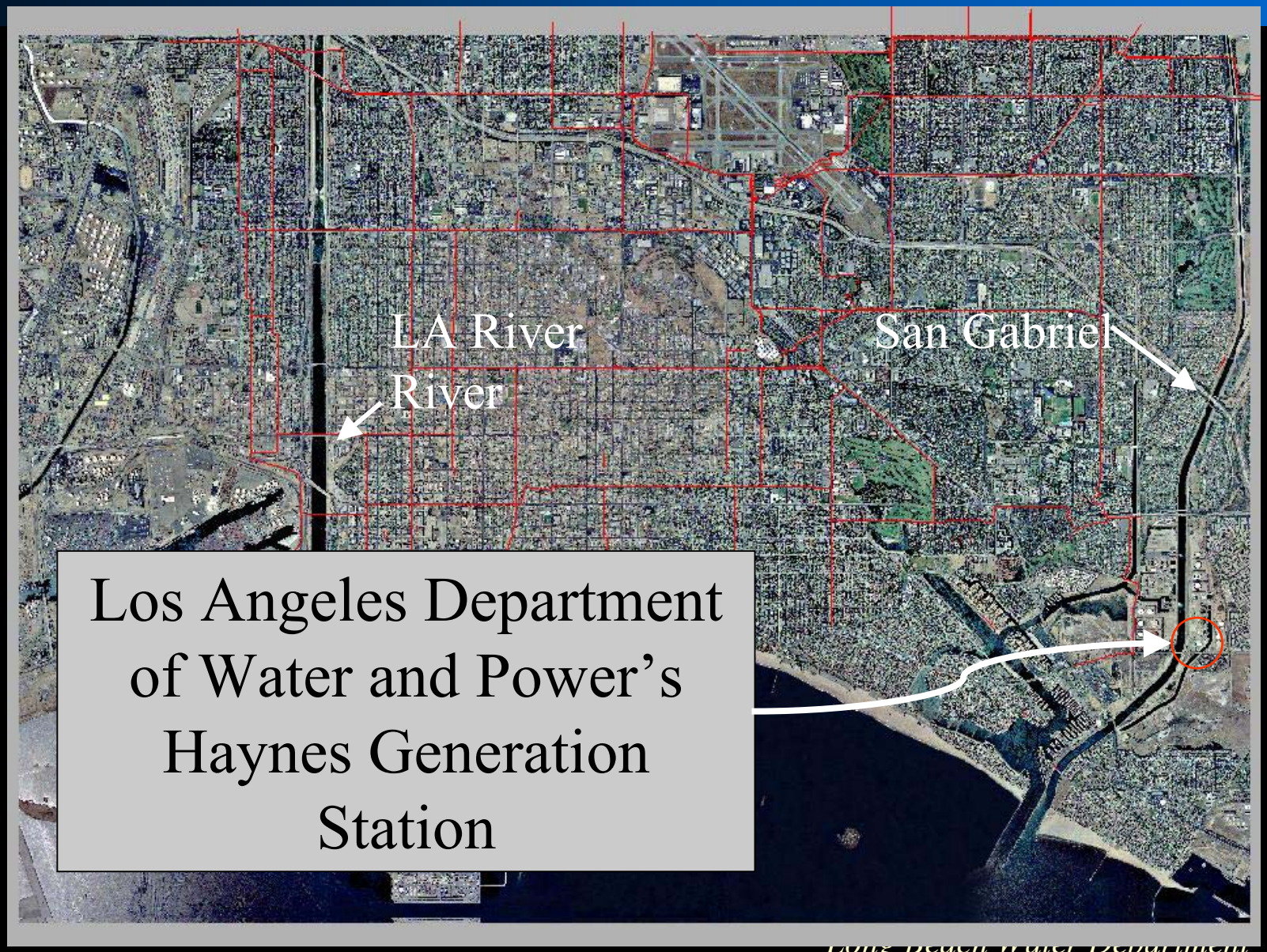
- USBR
- LADWP

③ **Production Plant** (~2010)

Schedule


Authorization
Appropriations
Current
Funding Agreement
Federal Partnership
Phase 1: Pilot-scale Research
9,000 g/d
Phase 2: Prototype (Haynes)
300,000 g/d
Pre-construction
Phase 3: Full-scale Demonstration Plant
Construction
9.4 mg/d
Start-up
Jan '96
Jan '97
Jan '98
Jan '99
Jan '00
Jan '01
Jan '02
Jan '03
Jan '04
Jan '05
Jan '06
Jan '07
Jan '08
Jan '09
Jan '10

Site of 2nd Phase Research



Focus of 2nd Phase Research

- **Optimize Process**
- **Cost information**
- **Information for regulators**
- **Pretreatment**
- **Boron removal**
- **Long-term membrane performance**
- **Treatment performance as a whole**
- **Post-treatment**
- **System Integration**
- **Brine discharge**

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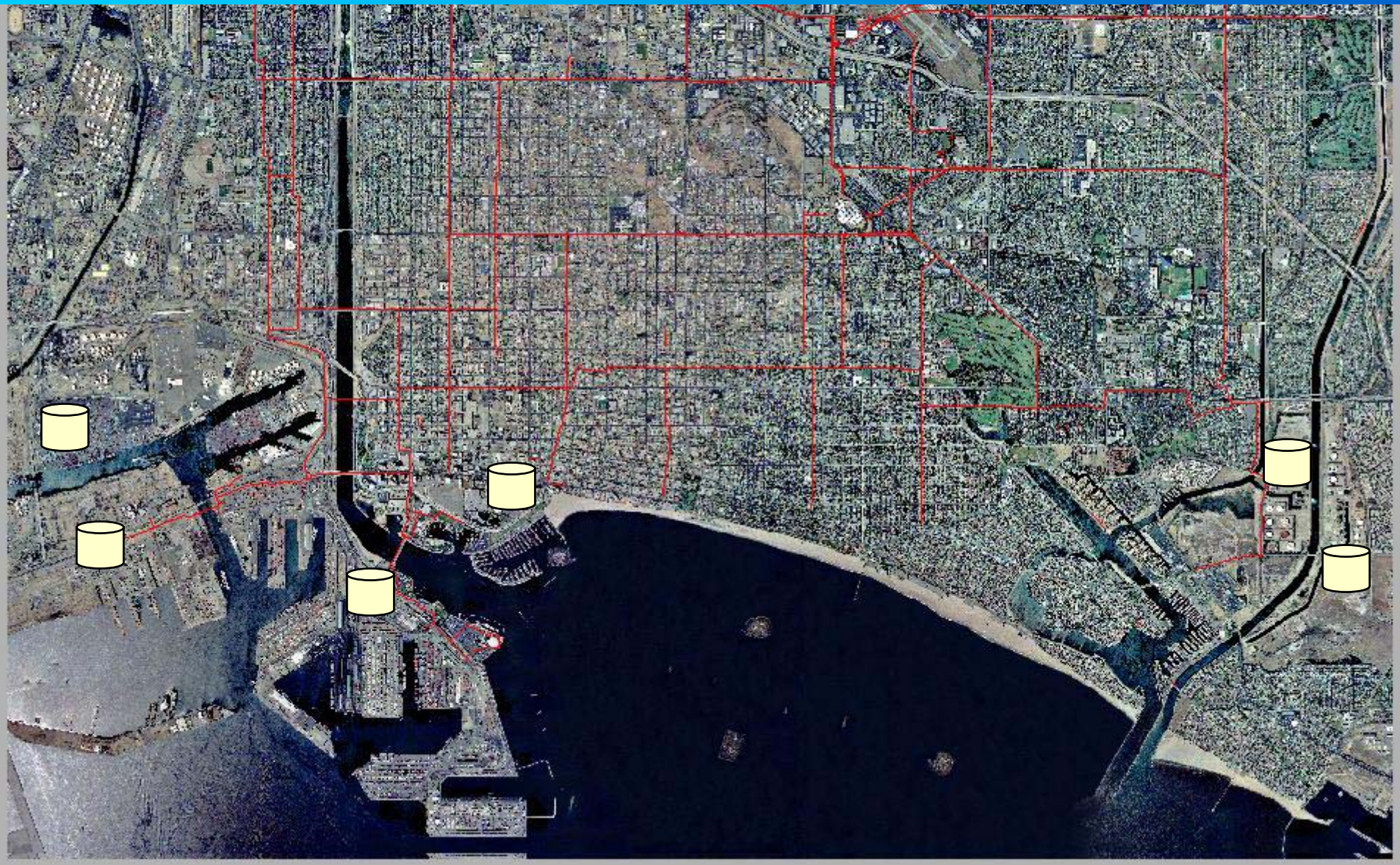
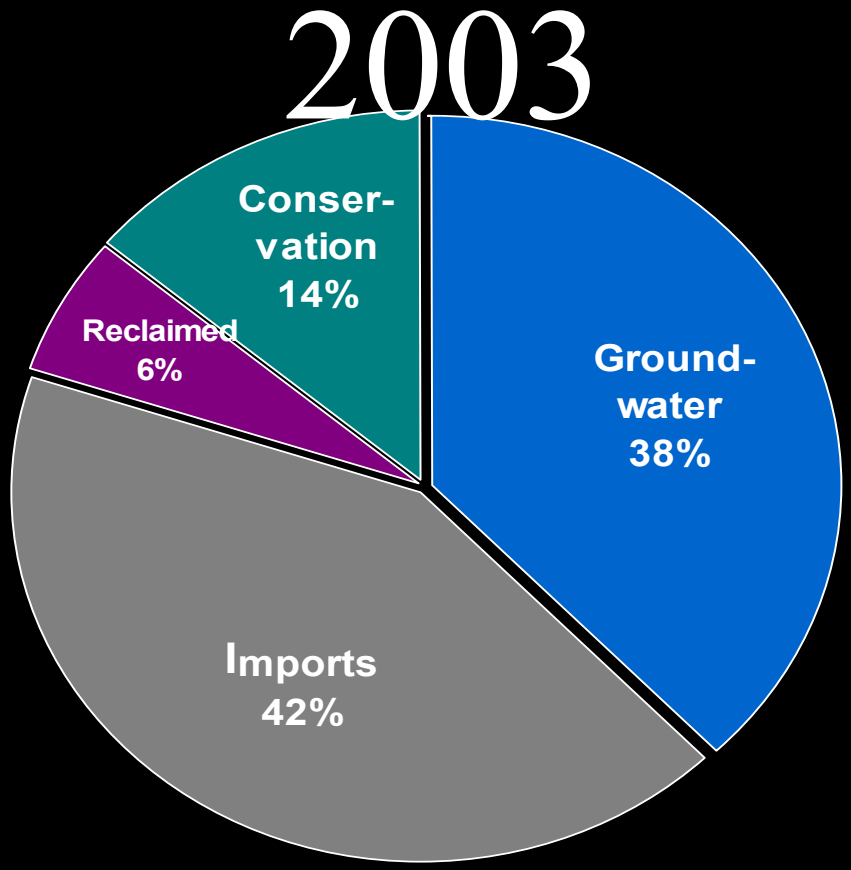
Potential Sites of 3rd Phase

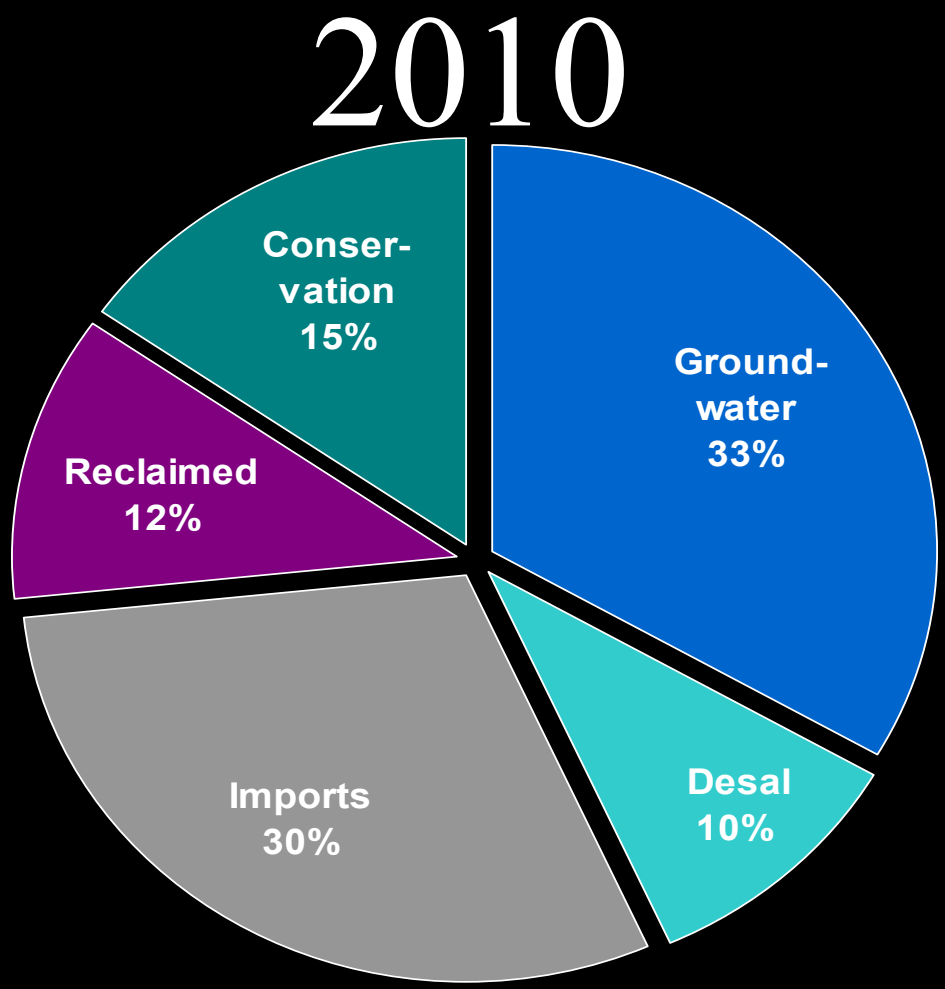


Purpose of 3rd Phase

- **Water for public consumption**
- **9 million gallons per day**
- **In partnership with the US Bureau of Reclamation**

Resource Mix





End of Presentation