

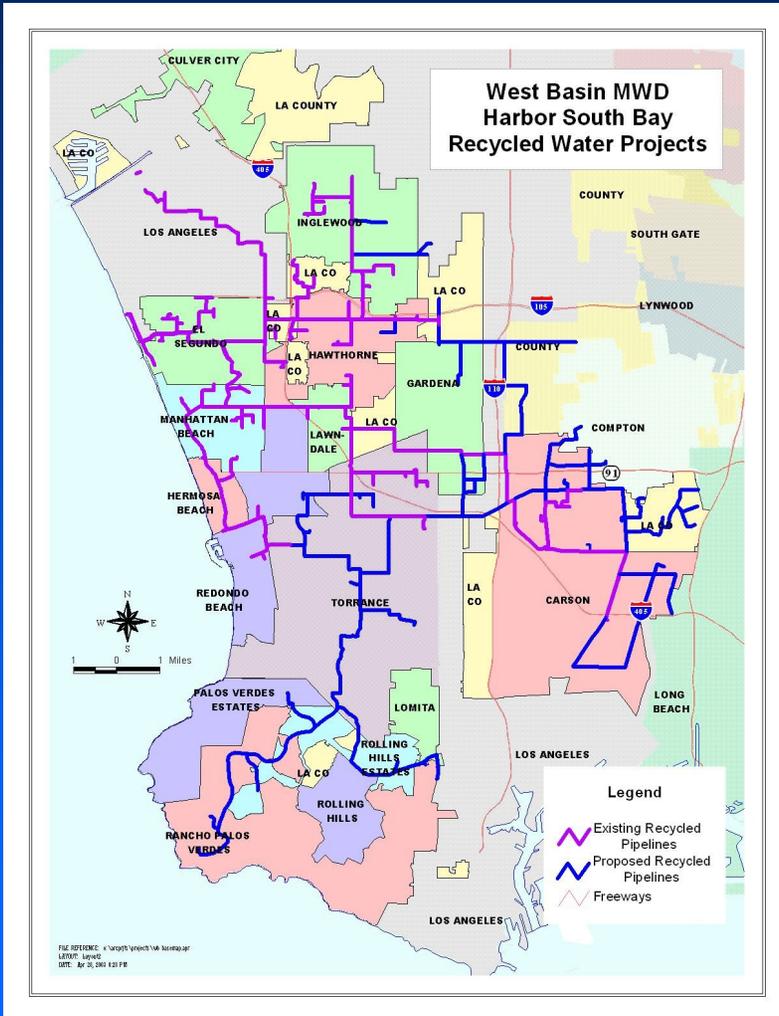
# Water Recycling & Emerging Contaminants (CECs)

SWRCB Water Education Workshop

February 24, 2008



# West Basin Water Recycling Background



- 100 miles of pipeline
- Invested \$500 million in 12 years
- Expanded plant 3 times

# West Basin Water Recycling Background

100 billion gallons of imported water  
**SAVED** by West Basin water recycling!



# West Basin Water Recycling Plant

5 QUALITIES → Application User Specific

1. Tertiary: Irrigation
2. Nitrified: Cooling Tower
3. MF/RO/AOP: Barrier Injection
4. Single RO: Low-pressure boiler feed
5. Double RO: High-pressure boiler feed



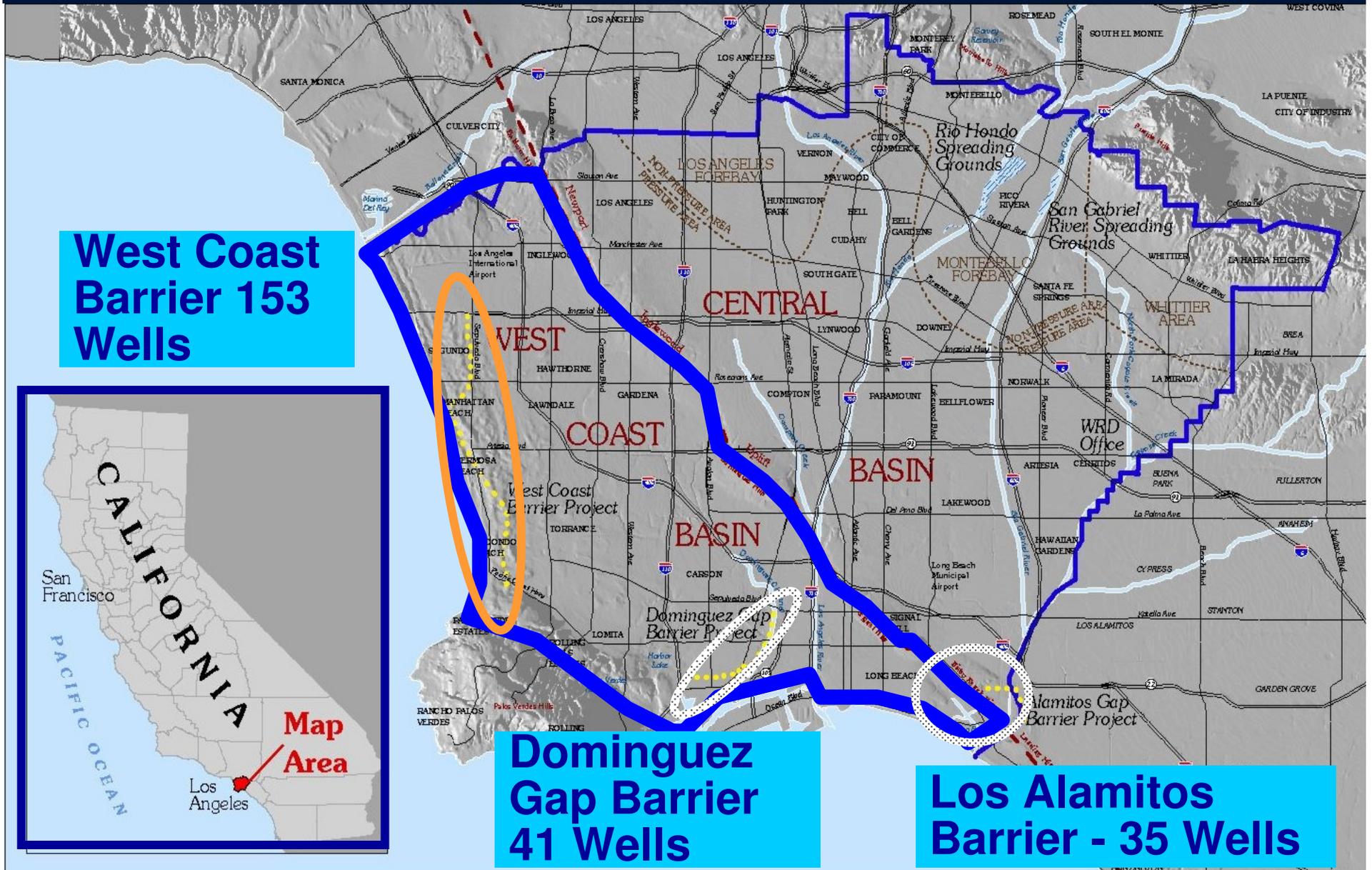
# West Coast Basin Barriers

**West Coast  
Barrier 153  
Wells**

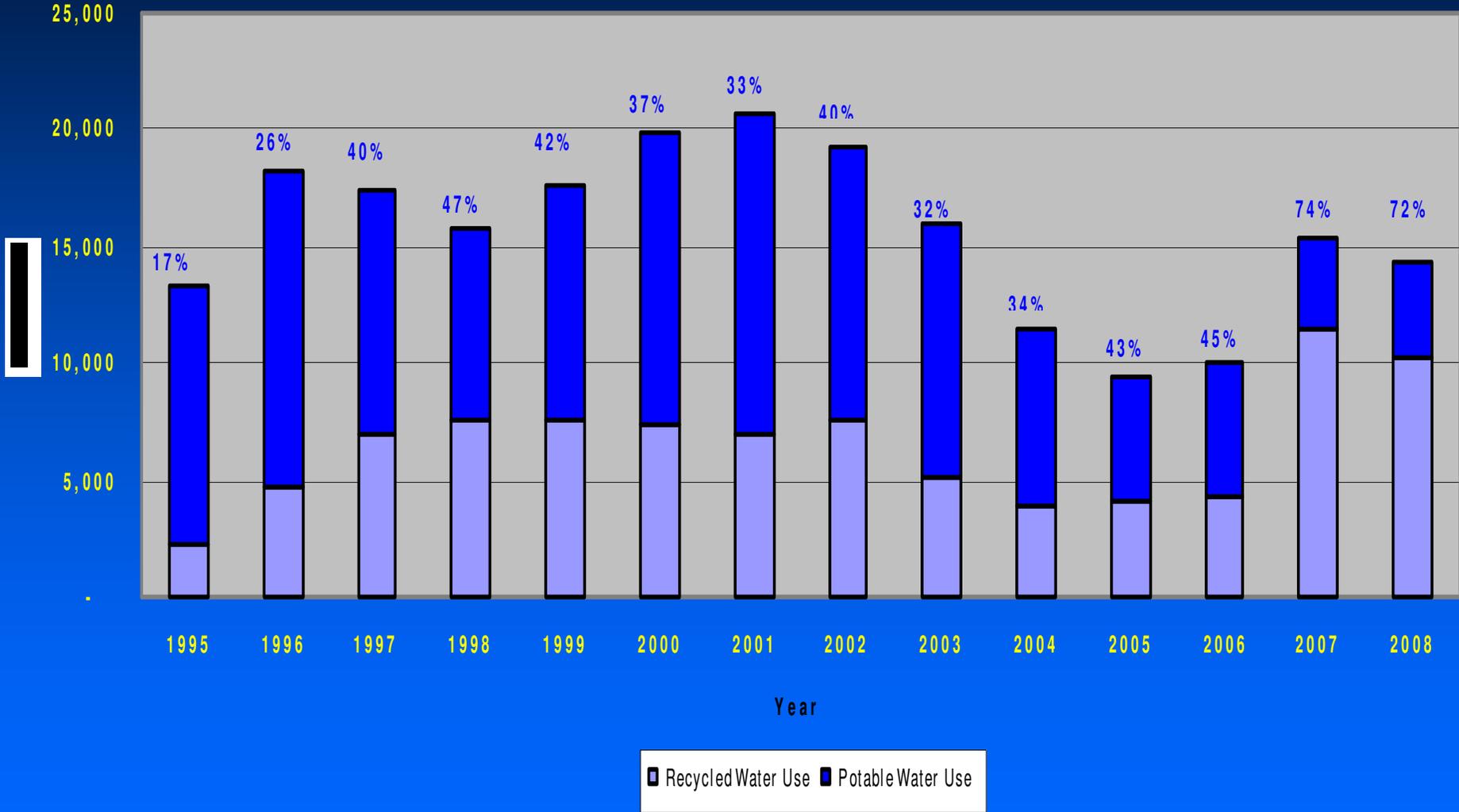


**Dominguez  
Gap Barrier  
41 Wells**

**Los Alamitos  
Barrier - 35 Wells**



# PERCENTAGE OF INJECTED RECYCLED WATER



# West Basin's Case Study on CECs

- Two (2001 and 2007) ExPert Panels to review increasing injection from 50% to 100%.
- Begin investigating CEC issue with 2001 Panel.
- Very few reproducible analytical methods available.
- Dr. David Sedlak of UC Berkeley.

# Pharmaceutical RO Treatment

ibuprofen	10	ng/L	91	ND
naproxen	10	ng/L	250	ND
gemfibrozil	10	ng/L	1300	ND
diclofenac	10	ng/L	59	ND
ketoprofen	10	ng/L	55	ND
indometacine	10	ng/L	ND	ND
ciprofloxacin	20	ng/L	220	ND
sulfamethoxazole	20	ng/L	180	ND
sulfumethazine	20	ng/L	ND	ND

Note\* - pilot size

# **PAST RESULTS OF CEC MONITORING**

# West Basin Water Quality Analysis

- Use 8 labs: ELAP certified in-house lab + 7 outside labs
- More than 19,000 samples analyzed for barrier water only
- More than 30,000 analyses completed in-house and 4,500 subcontracted
- \$600,000/year for barrier water alone
- Additional ongoing R&D



# Monitored Chemicals of Concern

## Notification Levels

- Boron 1
- n-Butylbenzene
- sec-Butylbenzene
- tert-Butylbenzene
- Carbon disulfide
- Chlorate
- 2-Chlorotoluene
- 4-Chlorotoluene
- Dichlorodifluoromethane (Freon 12)
- 1,4-Dioxane
- Ethylene glycol
- Formaldehyde
- HMX
- Isopropylbenzene
- Manganese
- Methyl isobutyl ketone (MIBK)
- Naphthalene
- N-Nitrosodiethylamine (NDEA)
- N-Nitrosodimethylamine (NDMA)
- N-Nitrosodi-n-propylamine (NDPA)
- Propachlor
- n-Propylbenzene
- RDX
- Tertiary butyl alcohol (TBA)
- 1,2,3-Trichloropropane (1,2,3-TCP)
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2,4,6-Trinitrotoluene (TNT)
- Vanadium



# Monitored Chemicals of Concern

- Drinking water MCL-compounds
- Priority pollutants
- Other compounds with Basin Plan objectives
- UCMRs
- CECs (From: *2004 CDPH Draft GWR Regulations*)
  - Acetaminopen
  - 17-b Estradiol
  - 17-a Ethynylestradiol
  - Estrone
  - Bisphenol A
  - Caffeine
  - Gemfibrozil
  - Ibuprofen
  - Tricolsan
  - PDBE – 100
  - PDBE – 153
  - PDBE – 154
  - PDBE – 47



Not all have commercial labs on the west coast who can analyze these

# Barrier Product Water all Non-Detect Except:

- Chlorate 1.5 ppb (NL – 800 ppb)
- NDEA 4.5 ppt (NL – 10 ppt)
- NDMA 6.1 ppt (NL – 10 ppt)
- Formaldehyde 126 ppb (NL – 100 ppb)
  - Expert panel recommendation to study this compound and issue report by 2010



# Lessons Learned

- For Advanced Treatment (Microfiltration – Reverse Osmosis – Ultra Violet – Hydrogen Peroxide).
- Don't worry too much unless chemical is:
  1. Water Soluble
  2. Low molecular weight
  3. Non-Polar
- Narrowed the field of CECs

# 2008 Expert Panel List of CECs

Most concerned about early warning of a breach of treatment system list of criteria:

- **8 Selection Criteria for West Basin:**
  1. Molecular weight
  2. Water solubility
  3. Hydrophobicity/Ionogenicity
  4. Occurrence in secondary wastewater
  5. Removal by MF
  6. Removal by RO
  7. Removal by AOP
  8. Availability of analytical method w/ standards



# 2008 Panel Recommended Target Compounds

- Atrazine
- Boron
- Carbamazepine
- DEET<sub>1,4</sub>
- Dioxane
- Estrone
- Gemfibrozil
- Iopromide
- Meprobamate
- Phenytoin
- Sulfamethoxazole
- TCEP



# Conclusions/Thoughts

- **Level of CEC Investigation should be geared to intended use:**
  - a. recharge**
  - b. irrigation**
  - c. discharge**
- **Treatment and volume of use should be key elements in guiding decisions on CEC monitoring**
- **Practical ability to reproduce analytical results**

# Final Thought

- **Injection projects have a contemporary list**
- **Strong knowledge for percolation recharge projects by IEUA, OCWD, LACSD**

Gracias

Obrigado!

ขอบคุณ

THANK  
YOU

Grazie

Merci

شكراً

Vielen  
Dank