Status on Updated ASCE/EWRI Guidelines on Managed Aquifer Recharge

Presented by

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Clear Creek Associates

16th Biennial Symposium on Managed Aquifer Recharge

March 7, 2018, San Diego, CA

Managed Aquifer Recharge

- A system for the purposeful recharge of available water into an aquifer system for intended recovery and use or environmental protection as a component of long-term water resources management.

- Artificial recharge, Aquifer Storage and Recovery

NRC 2008; Australia NRMMC–EPHC–NHMRC 2009; NGWA 2014
Dillon, 2005; Sheng and Zhao 2014

Why are Guidelines Needed?

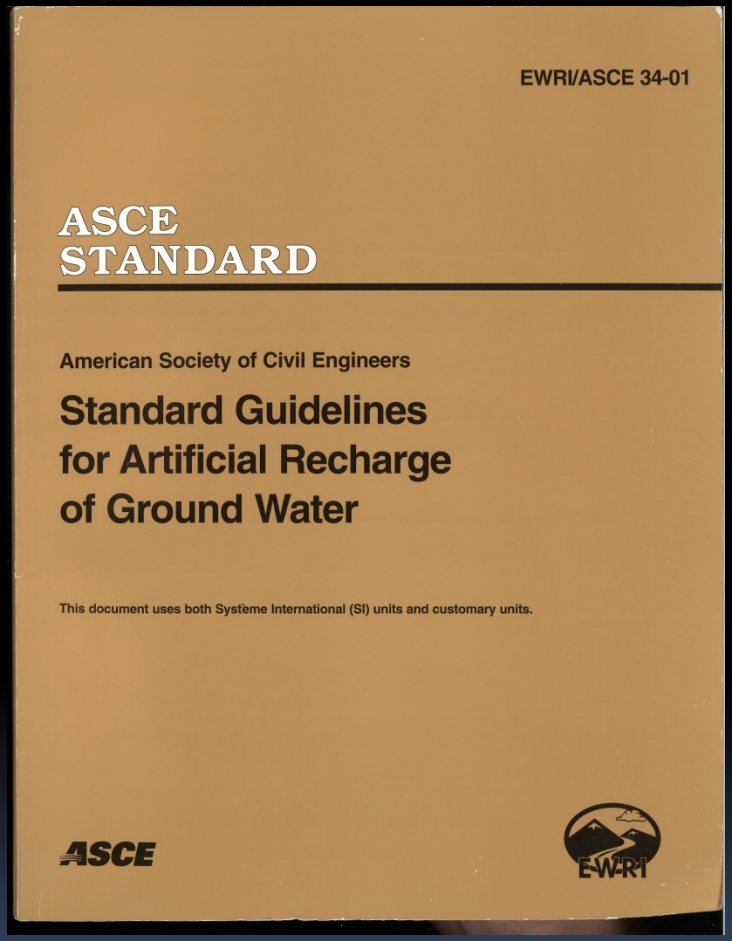
- Provides an information resource for entities new to aquifer recharge projects
- Provides a consistent process with all steps in development of a MAR project discussed
- Alerts MAR developers of potential problems so solutions can be added during design process

MAR Guidelines Subcommittee

Mr. Peter Barkmann	Chair	Colorado Geological Survey, Denver, CO
Dr. Gordon McCurry	Editor	McCurry Hydrology, LLC, Boulder, CO
Ms. Phyllis Stanin	Secretary	Todd Groundwater, Alameda, CA
Mr. Ben Willardson	Past-Chair	CWE, Fullerton, CA
Dr. Zhuping Sheng	Member	Texas A&M University, El Paso, TX
Mr. R. Douglas Bartlett	Member	Clear Creek Associates, Scottsdale, AZ
Mr. Dennis McGrane	Member	McGrane Water Engineering LLC, CO
Mr. Peter Dillon	Member	CSIRO, Australia
Ms. Stephanie Moore	Member	Daniel B. Stephens & Associates, Austin, TX
Mr. Adam Hutchinson	Member	Orange County Water Dist, Fountain Valley, CA
Mr. Greg Woodside	Member	Orange County Water Dist, Fountain Valley, CA
Mr. Cortney Brand	Member	Leonard Rice Engineers, Inc., Denver, CO
Mr. Devin Galloway	Member	USGS, Sacramento, CA

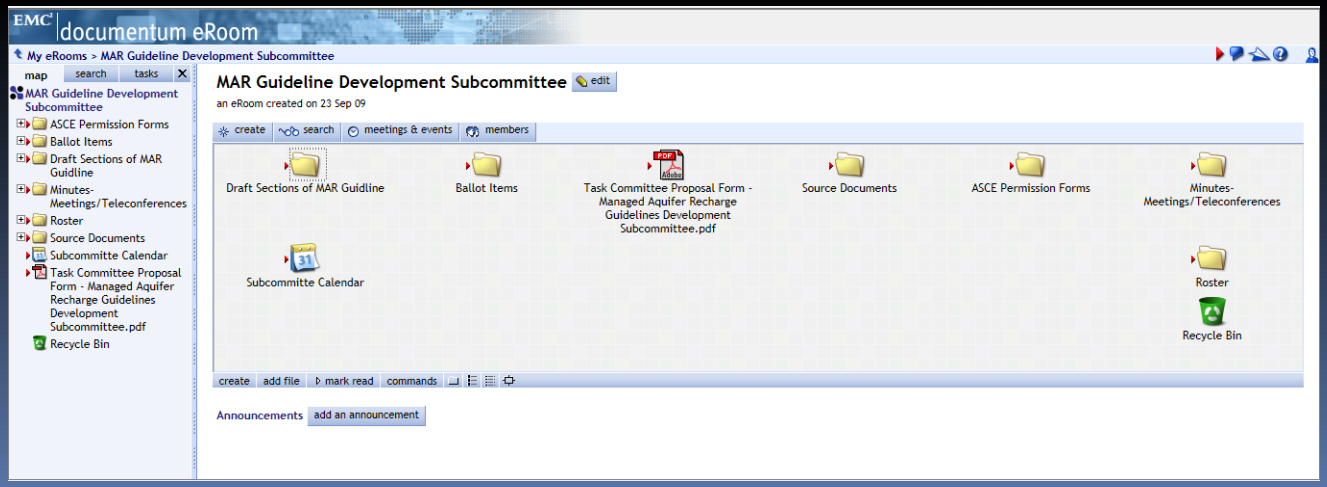
Development of MAR Guidelines

- 2001: ASCE/EWRI published standard guidelines for artificial recharge (EWRI/ASCE 34-01)
- 2005: Committee reorganized to review existing standard and propose changes/updates
- 2012: Committee balloted to withdraw 34-01; develop standard guidelines instead



ASCE/EWRI Process

- Development of new MAR guidelines done using consensus approach via emails, teleconferences and annual meetings
- As sections are completed, balloting of each section is accomplished through the ASCE web-based balloting process



ASCE/EWRI Process - 2

- Individual sections independently developed by subgroups and balloted by Committee
- If section does not pass balloting, resolutions to address negative comments are prepared
- Section is revised and re-balloted until it passes or is withdrawn
- Notification to EWRI Standards Development Council & ASCE Codes and Standards Committee

ASCE/EWRI Process - 3

- ASCE public comment period
- Public comments are resolved and approved by MAR committee through balloting process
- Final product based on consensus of committee and ASCE public
- ASCE Codes and Standard Committee approves the document for publication

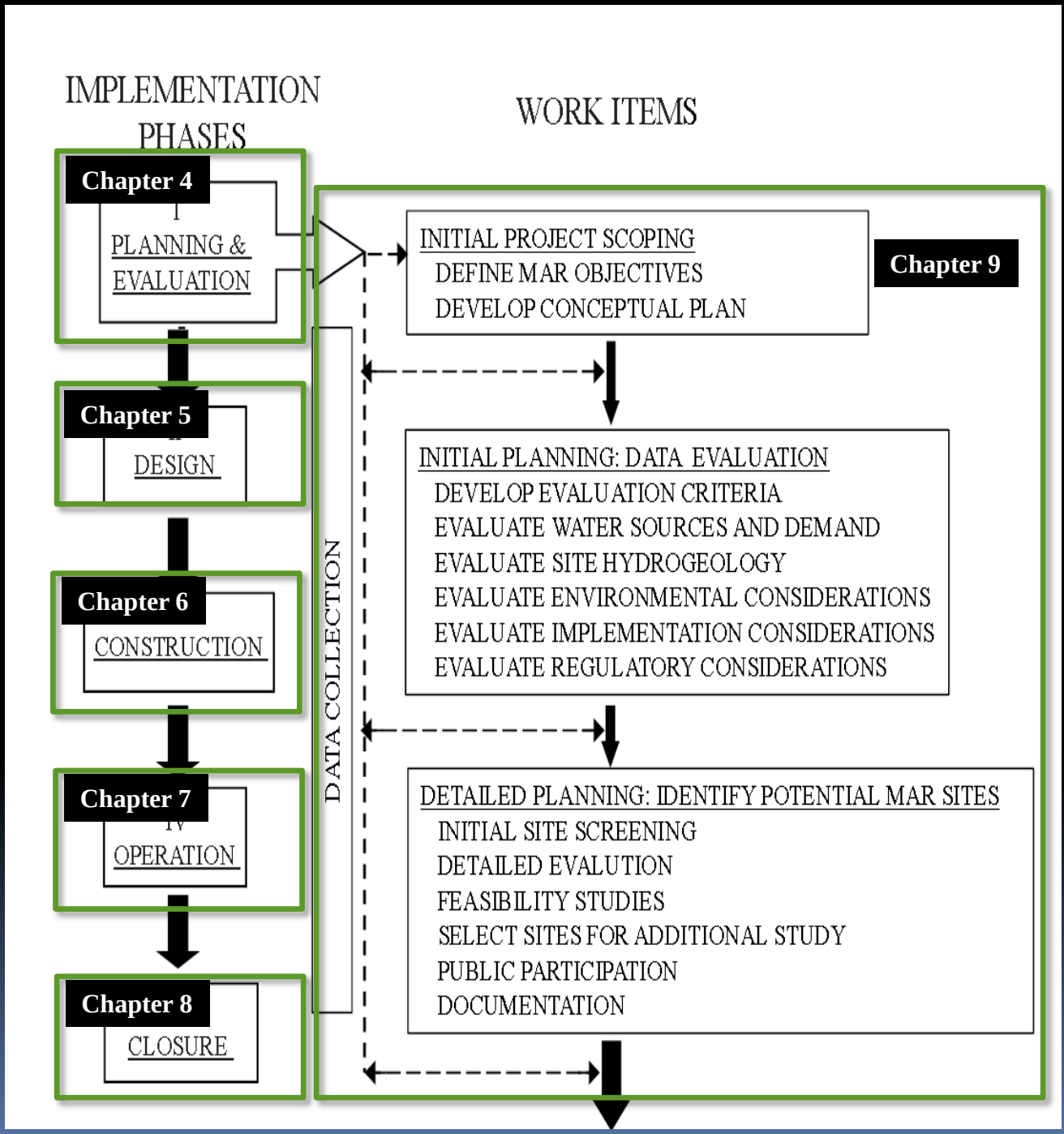
Final MAR Guidelines

- Includes the full range of scope of work of MAR projects
- Includes 12 case studies illustrating key steps in MAR development for a variety of surface and subsurface MAR facilities

Major Sections of MAR Guidelines

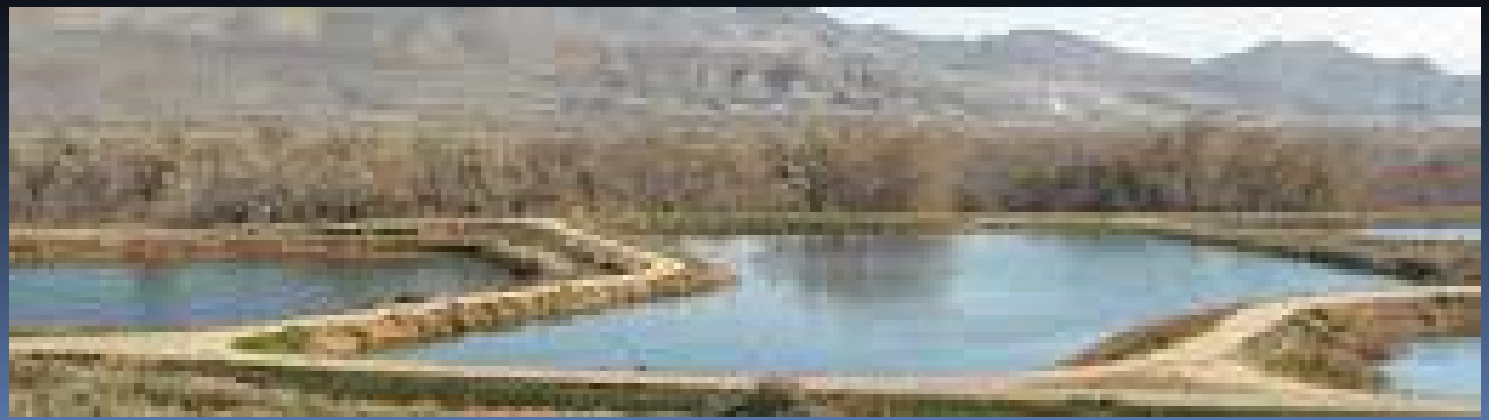
1. Introduction (approved by ballot)
2. Groundwater Fundamentals and Occurrence (approved by ballot)
3. Managed Aquifer Recharge Concepts (approved by ballot)
4. Planning (approved by ballot)
5. Design and Testing (approved by ballot)
6. Construction Monitoring and Records (approved by ballot)
7. Operations and Maintenance of MAR Facilities(approved by ballot)
8. Facility Closure (approved by ballot)
9. Data Collection and Analysis (approved by ballot)

Appendices


IMPLEMENTATION PHASES
WORK ITEMS
Chapter 4
I
PLANNING & EVALUATION
Chapter 5
II
DESIGN
Chapter 6
III
CONSTRUCTION
Chapter 7
IV
OPERATION
Chapter 8
V
CLOSURE
DATA COLLECTION
INITIAL PROJECT SCOPING
DEFINE MAR OBJECTIVES
DEVELOP CONCEPTUAL PLAN
Chapter 9
INITIAL PLANNING: DATA EVALUATION
DEVELOP EVALUATION CRITERIA
EVALUATE WATER SOURCES AND DEMAND
EVALUATE SITE HYDROGEOLOGY
EVALUATE ENVIRONMENTAL CONSIDERATIONS
EVALUATE IMPLEMENTATION CONSIDERATIONS
EVALUATE REGULATORY CONSIDERATIONS
DETAILED PLANNING: IDENTIFY POTENTIAL MAR SITES
INITIAL SITE SCREENING
DETAILED EVALUTION
FEASIBILITY STUDIES
SELECT SITES FOR ADDITIONAL STUDY
PUBLIC PARTICIPATION
DOCUMENTATION

Surface Basin Case Studies

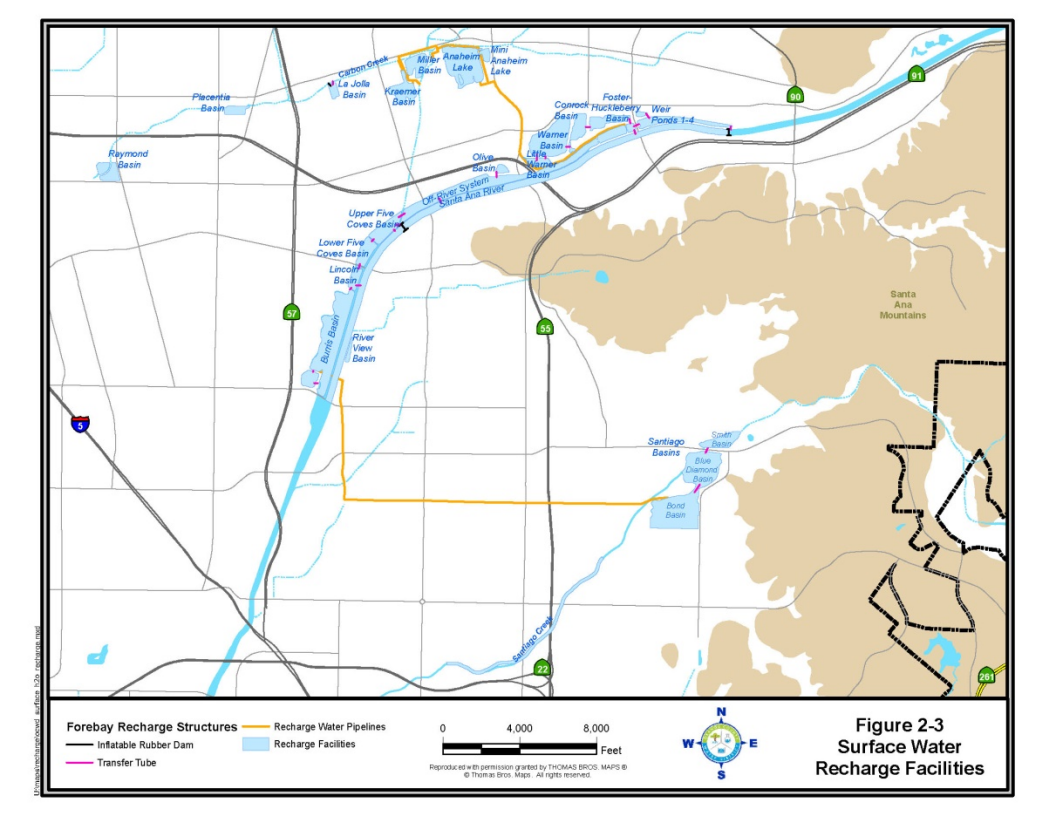
Surface Spreading Facilities	Year Constructed	Location	Size
Bear Canyon Demonstration Project	2009	Albuquerque, NM	3 MGD
OCWD Surface Water Recharge Operations	1936	Anaheim, CA	20-36 MGD
Rancho CA Water District	2000	Temecula, CA	25,000 AFY
Tamarak Ranch Recharge Project	2007	Sterling, CO	12,300 AFY
South Avra Valley Storage and Recover Project	2008	Tucson, AZ	65,100 AFY
Montebello Forebay Spreading Grounds	1937 to 1955	Pico Rivera, CA	133,000 AFY



Bear Canyon RP, Albuquerque, NM

The Bear Canyon Recharge Demonstration Project was designed to recharge surface water to the Middle Rio Grande Basin aquifer through an instream infiltration system along the Bear Canyon Arroyo in northeast Albuquerque.

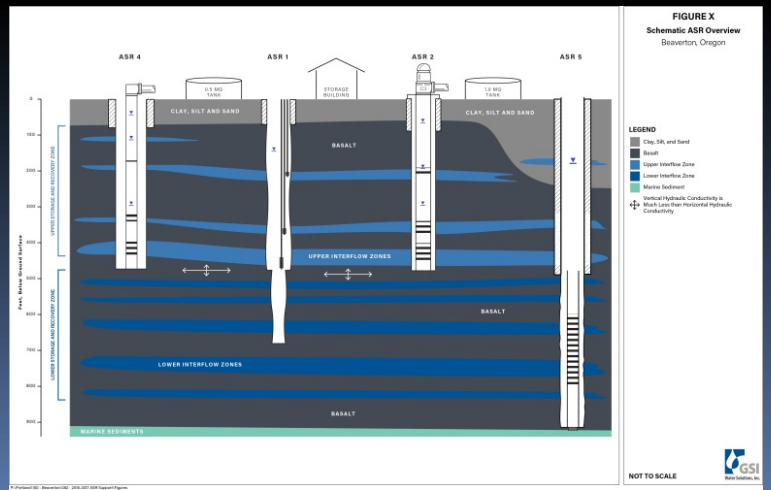
OCWD Surface Water Recharge Operations



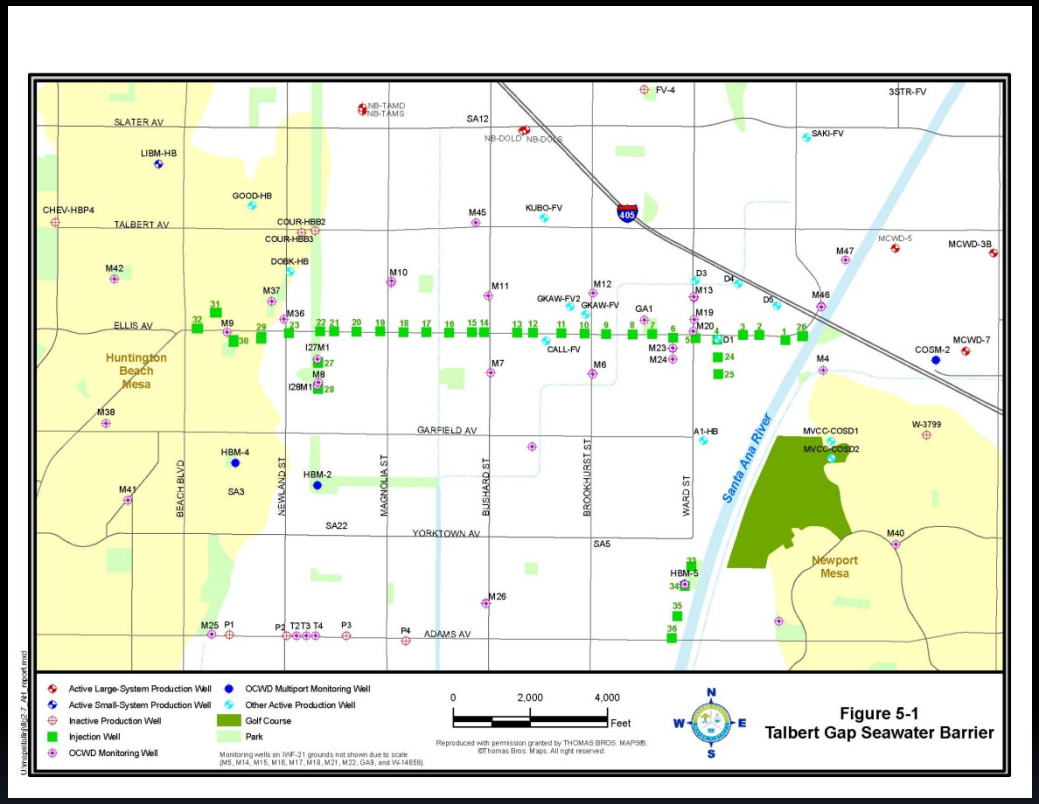
The Orange County Water District began its surface water recharge system in 1936 in the Santa Ana River channel. Over the years this system has expanded and now covers over 1,500 acres.

Well Injection Case Studies

Well Injection Projects	Year Constructed	Location	Size
Denver Basin Aquifer Recharge Demo. Proj.	1996	Denver, CO	1.3 AF in 4 years
OCWD Talbert Gap Seawater Intrusion Barrier	1975	Anaheim, CA	20-36 MGD
City of Phoenix, AZ ASR Well 299	2010	Phoenix, AZ	2.5 MGD
Rio Rancho Direct Injection Demonstration Project	2013	Rio Rancho, NM	1 MGD
El Paso Reclaimed Water Recharge	1984	El Paso, TX	7.5 MGD
City of Beaverton ASR Program	2001, 2005	Beaverton, OR	8 MGD



OCWD Talbert Gap Seawater Intrusion Barrier

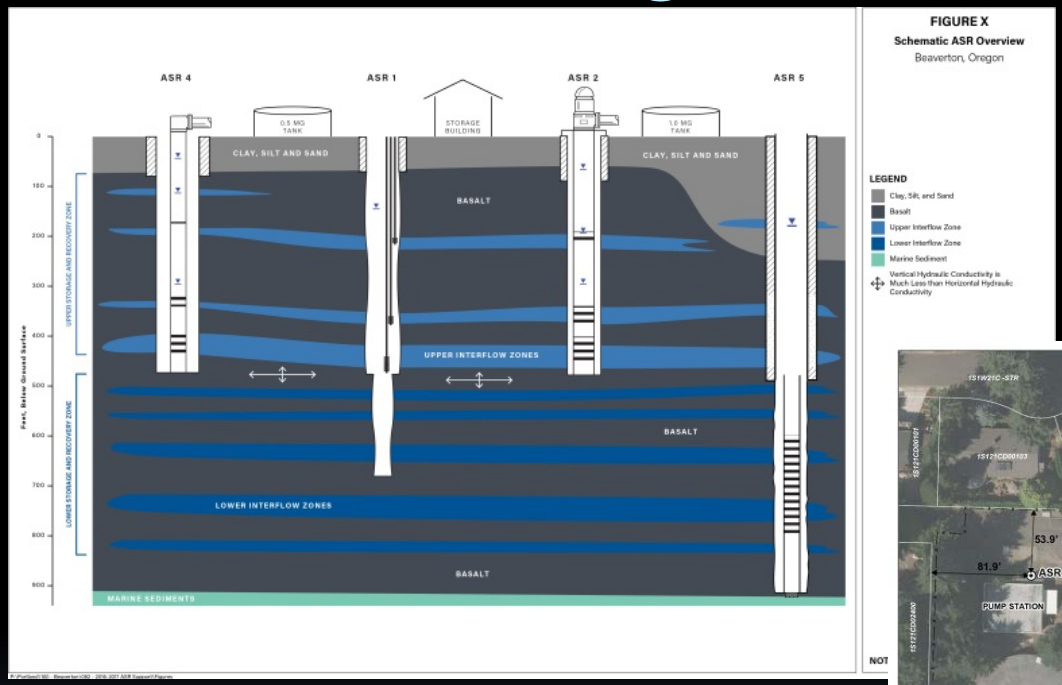


The Talbert Barrier consists of 36 injection well sites that recharge multiple aquifer zones to prevent seawater intrusion as well as to replenish the groundwater basin. Active since 1970's. Operates now at 20 to 36 MGD (75K – 136K m^3/day).

City of Phoenix Well 299

The first ASR well in the United States to incorporate the “reverse-siphon” injection method and deliver recovered supplies directly into the distribution system. Operates at 2.6 MGD (10K m^3/day)

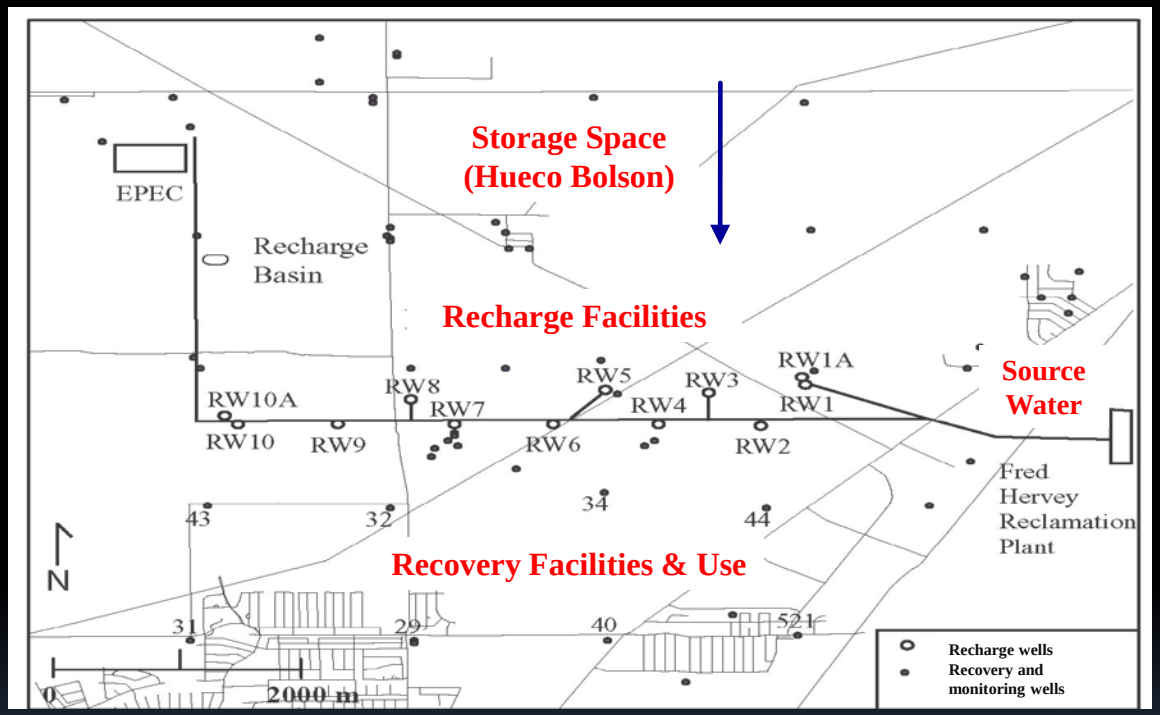
City of Beaverton ASR Well Program
Beaverton, Oregon



Recharge and recovery from interflow zones in continental basalt flows; Completed in 2001 and 2005; Peak flow = 5 MGD

Project Contacts: David Winship, PE and Brion Barnett PE.

City of El Paso, Texas Recharge of Reclaimed Water



MAR facilities includes 10 recharge wells constructed in 1984 and one recharge basin built in 2001. Flow rate up to 10 MGD (38,000 m^3/day)

Contact: Scott Reinert, Water Resources Manager

Anticipated Schedule

- Ballot Entire Document March, 2018
- Submit to ASCE/EWRI Standards Development Council by August 2018
- Public Comment – 4th Quarter 2018
- Submit to Publications for Printing – 1st Qtr 2019


Thank You!
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