ABSTRACT & POWERPOINT PRESENTATION

Energy-Efficient Aquifer Storage, Recovery, and Replenishment: South Ord Recycled Water Project Overview

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Managed Aquifer Recharge Symposium
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Irvine, California

Symposium Organizers:

- National Water Research Institute
- Orange County Water District
- Water Research Foundation

www.nwri-usa.org/rechargesymposium2011.htm

Energy-Efficient Aquifer Storage, Recovery, and Replenishment

By Jim Heitzman, Marina Coast Water District

The Marina Coast Water District (MCWD) is working with other agencies in the Monterey area to use more of the area's recycled water resource. Currently, about 24,000 acre feet per year (afy) of recycled water is available in Northern Monterey County, but approximately 10,000 afy continues to be discharged to the ocean due to its seasonal availability. Using more recycled water will require development of additional storage to address the seasonal imbalance between supply and demand. This paper presents an approach to storage in a "perched" aquifer, with extraction for irrigation and injection for groundwater replenishment.

The perched water is present in a dune-sand aquifer near the coast. Recovery would occur at downgradient wells closer to the coast line. Key issues that need to be addressed include recharge and extraction rates, and natural treatment system benefits. A particular challenge will be potential conflict between recharge conditions versus extraction rates – favorable recharge rates may lead to excessive "pancaking" of recharge water, making extraction more difficult from vertical wells. To address these issues several extraction options are being evaluated, including horizontal wells. The potential for vertical downward leakage of recharged water into underlying potable aquifers is also being evaluated.

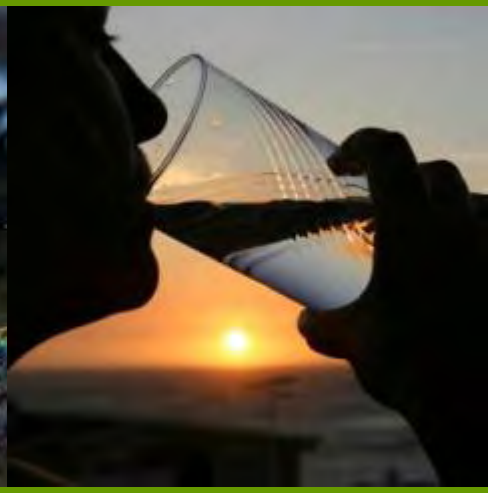
Potential use of the extracted water includes irrigation reuse, as well as injection into a seawater barrier to protect potable inland groundwater resources. Because injection would introduce the water into a potable aquifer, the level of treatment and resulting quality of produced water is of critical importance. To address this issue, water quality benefits associated with natural treatment during recharge and subsurface movement of the water (soil aquifer treatment, "SAT") will be evaluated, as well as benefits of pretreatment such as ozonation, and constructed wetlands within and/or adjacent to the recharge basins. For the constructed wetlands pretreatment alternative, the tradeoff between water quality benefits and recharge rates associated with incorporating natural habitat in the ponds is being examined. Key water quality parameters include defining required detention times to achieve removals of total organic carbon (TOC), nitrogen, contaminants of emerging concern (CEC) and pathogens.

Energy Efficient Aquifer Storage, Recovery, and Replenishment

South Ord Recycled Water Project Overview

January 26, 2011



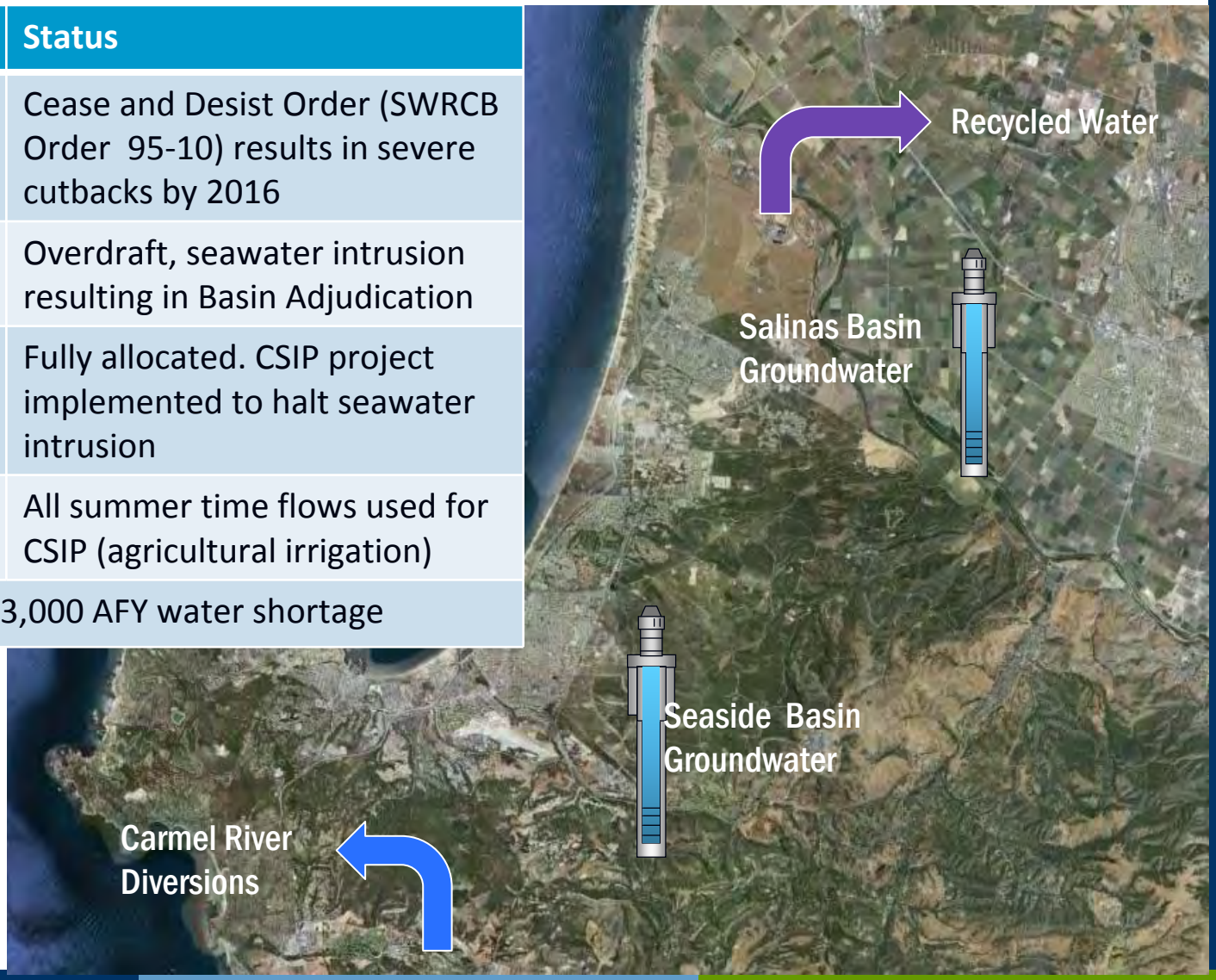
Marina Coast Water District
Monterey County Water Resources Agency

Regional Setting

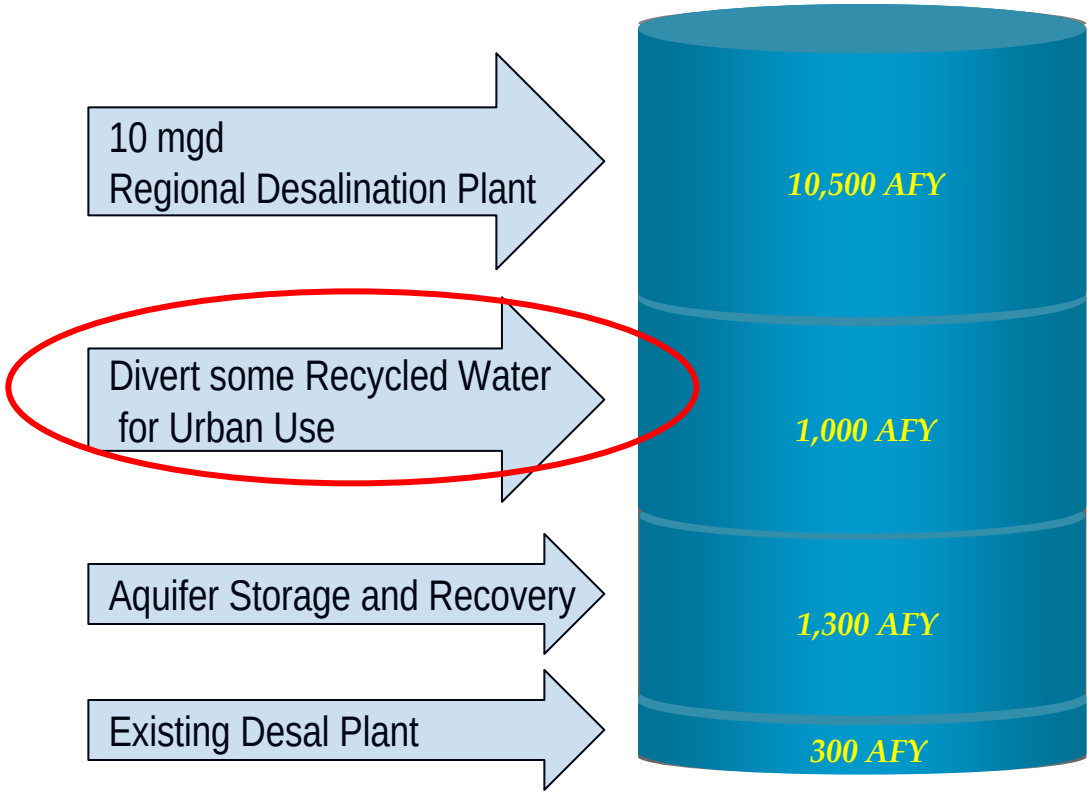
- Mediterranean climate
- Major environmental resources
  - Monterey Bay National Marine Sanctuary
  - Los Padres National Forest
  - 3 ASBS
- Two major rivers
  - Salinas River
  - Carmel River
- Two dams
  - Nacimiento
  - San Antonio
- Two groundwater basins
  - Salinas Valley Groundwater Basin
  - Seaside Groundwater Basin

Existing Water Supplies are Fully Utilized with Existing Infrastructure

Source	Status
Carmel River	Cease and Desist Order (SWRCB Order 95-10) results in severe cutbacks by 2016
Seaside Groundwater Basin	Overdraft, seawater intrusion resulting in Basin Adjudication
Salinas Groundwater Basin	Fully allocated. CSIP project implemented to halt seawater intrusion
Recycled Water	All summer time flows used for CSIP (agricultural irrigation)
Net Result: 13,000 AFY water shortage	



Local Agencies have developed a Regional Project to fill 13,000 AFY Water Deficit

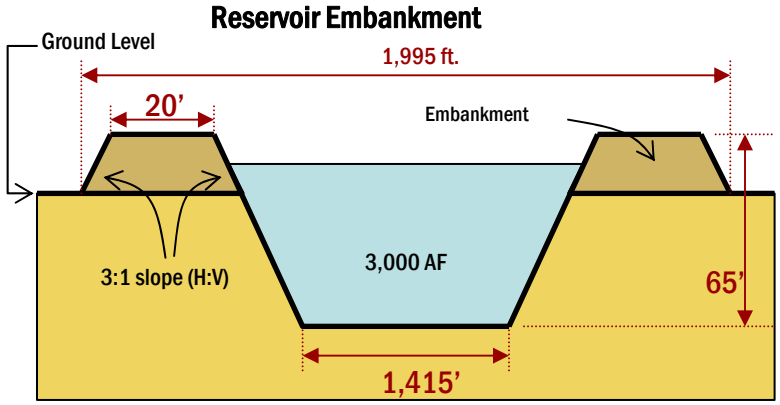


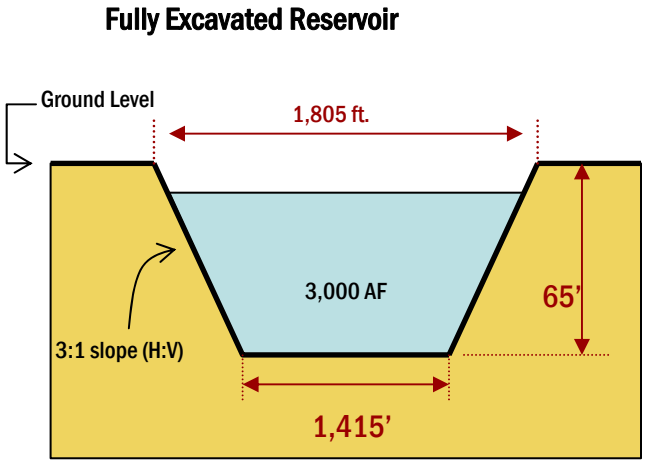
Imbalance of Timing Between Recycled Water Supply and Demand

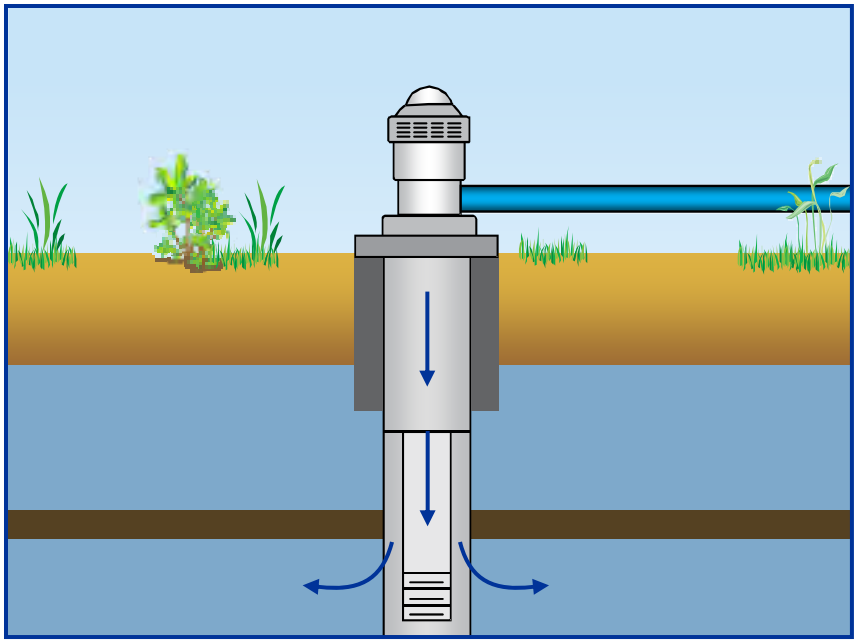
Recycled water is available in winter and urban irrigation demands exist in the summer

Recycled Water Availability in Northern Monterey County

Surface and Subsurface Storage Evaluations have been Conducted







Subsurface Storage Area for ~3,000 AF of Recycled Water

South Ord Storage Area is Adjacent to Recycled Water Pipeline – Saves Cost

Recycled Water Pipeline

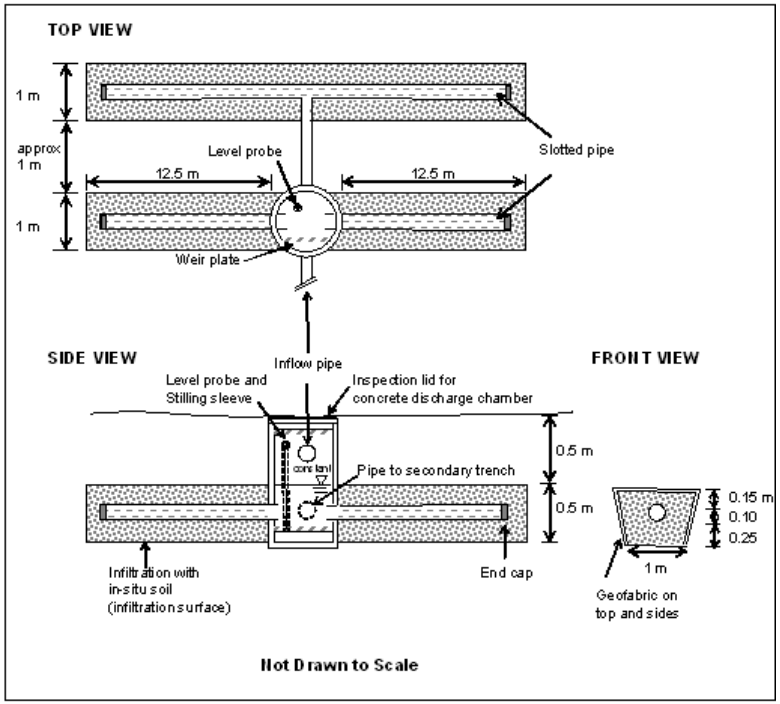
South Ord Subsurface Storage Area

Fatal Flaw Analysis is the First Step to Determine Subsurface Storage Feasibility at South Ord Site

- Technical Aspects
  - How much water can be stored?
  - Expected recharge and extraction rates
- Regulatory Concerns
  - Diluent ratio, travel time/distance
- Water Quality and Treatment Considerations
  - Natural treatment system benefits
- Environmental Issues
  - Sensitive receptors, sensitive species impacts

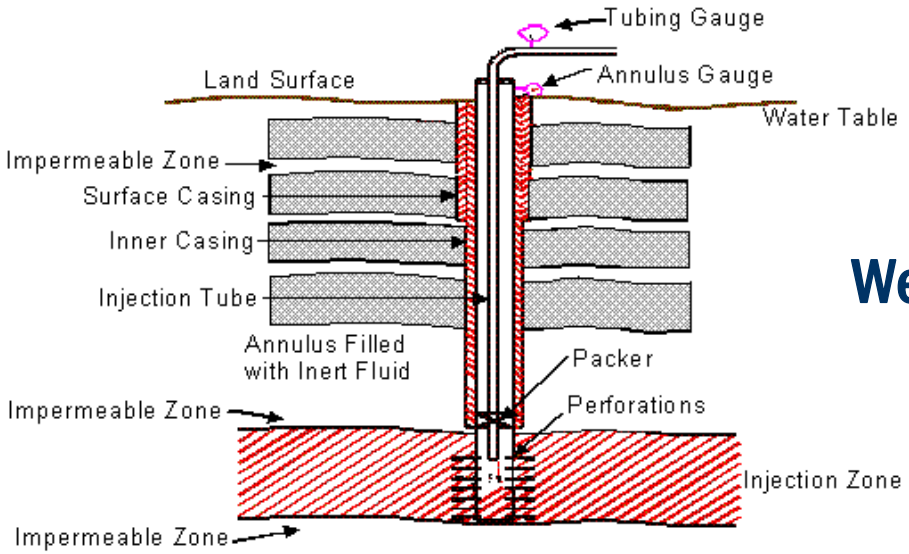
Alternatives for recharge

http://3dparks.wr.usgs.gov/3Dbayarea/html/LosGatos.htm

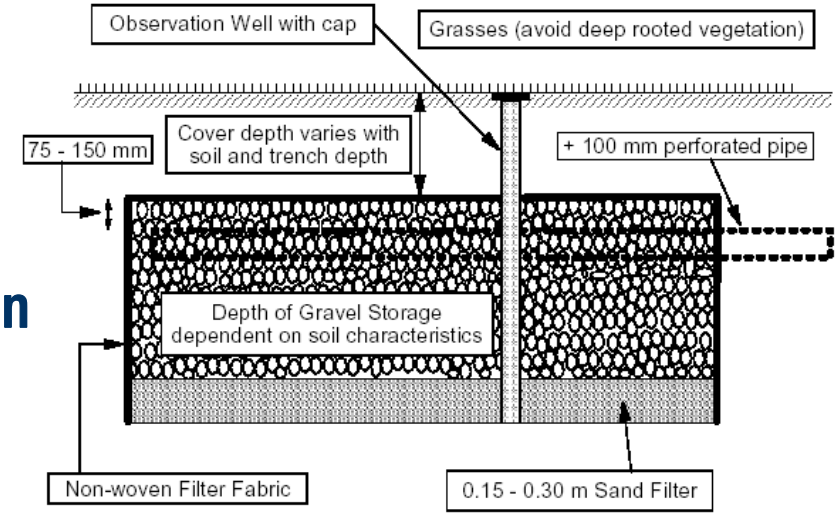


http://www.clw.csiro.au/research/urban/reuse/projects/water_quality_floreat.html

More alternatives for recharge



Wells



Subsurface Percolation

http://www.ene.gov.on.ca/envision/gp/4329e_4.htm

Key Issues to Address

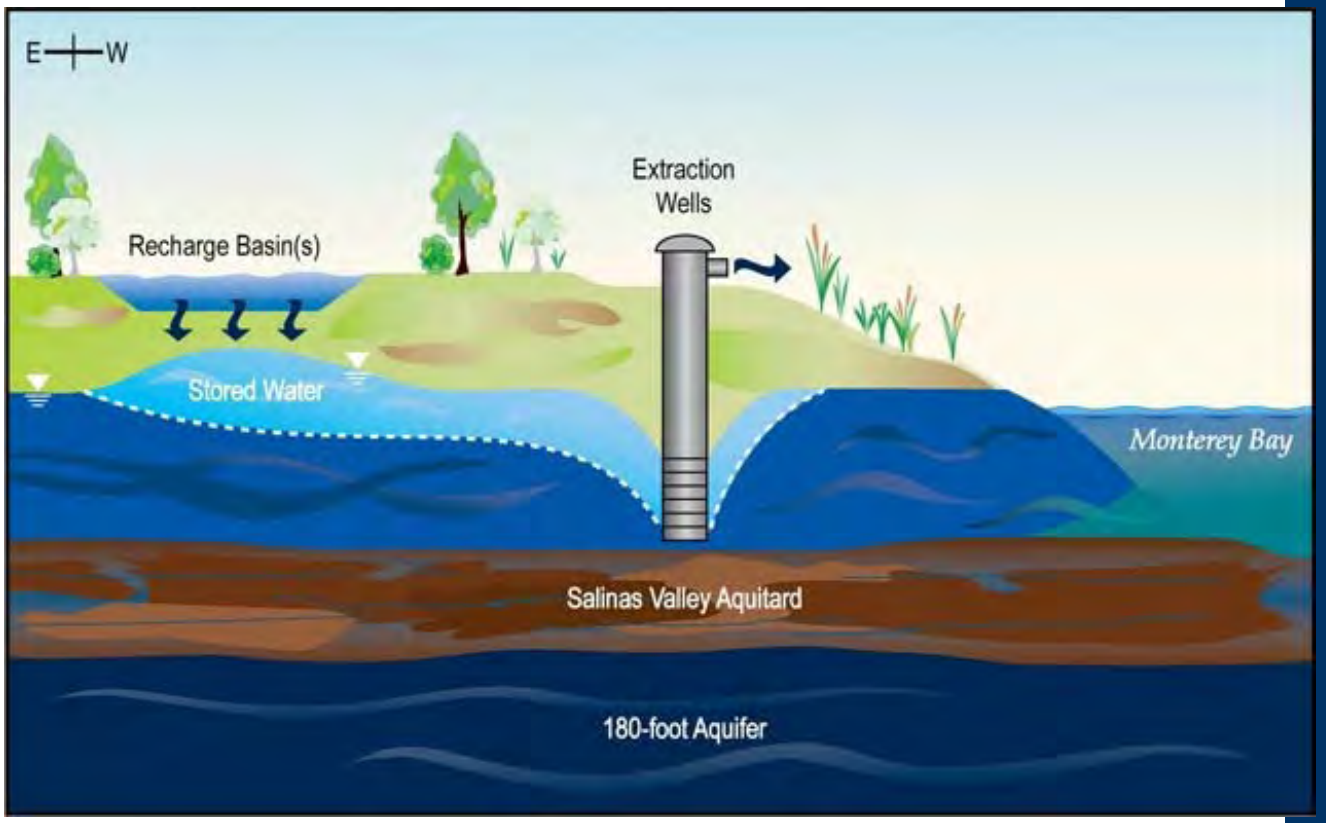
- Recharge and extraction rates
- Natural treatment system benefits
- Incorporation of ozone treatment

Water Quality and Treatment Evaluation Assesses Multiple Treatment Alternatives

1. No treatment prior to recharge and storage
2. Ozone treatment prior to recharge and storage
3. Ozone treatment of extracted water
4. Use of constructed wetlands for treatment prior to recharge and storage

Potential Challenges

- Recharge conditions vs. extraction rates
  - "Pancaking" effect in perched aquifer
- Leakage into underlying potable aquifers



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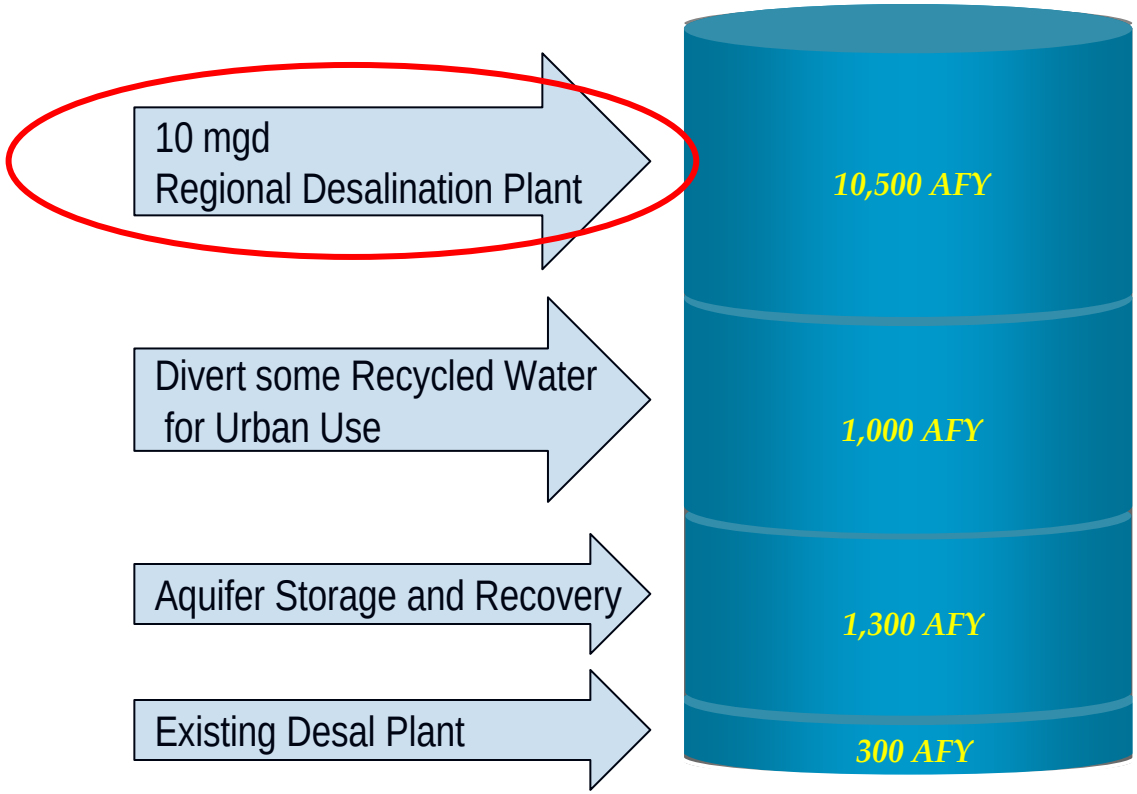

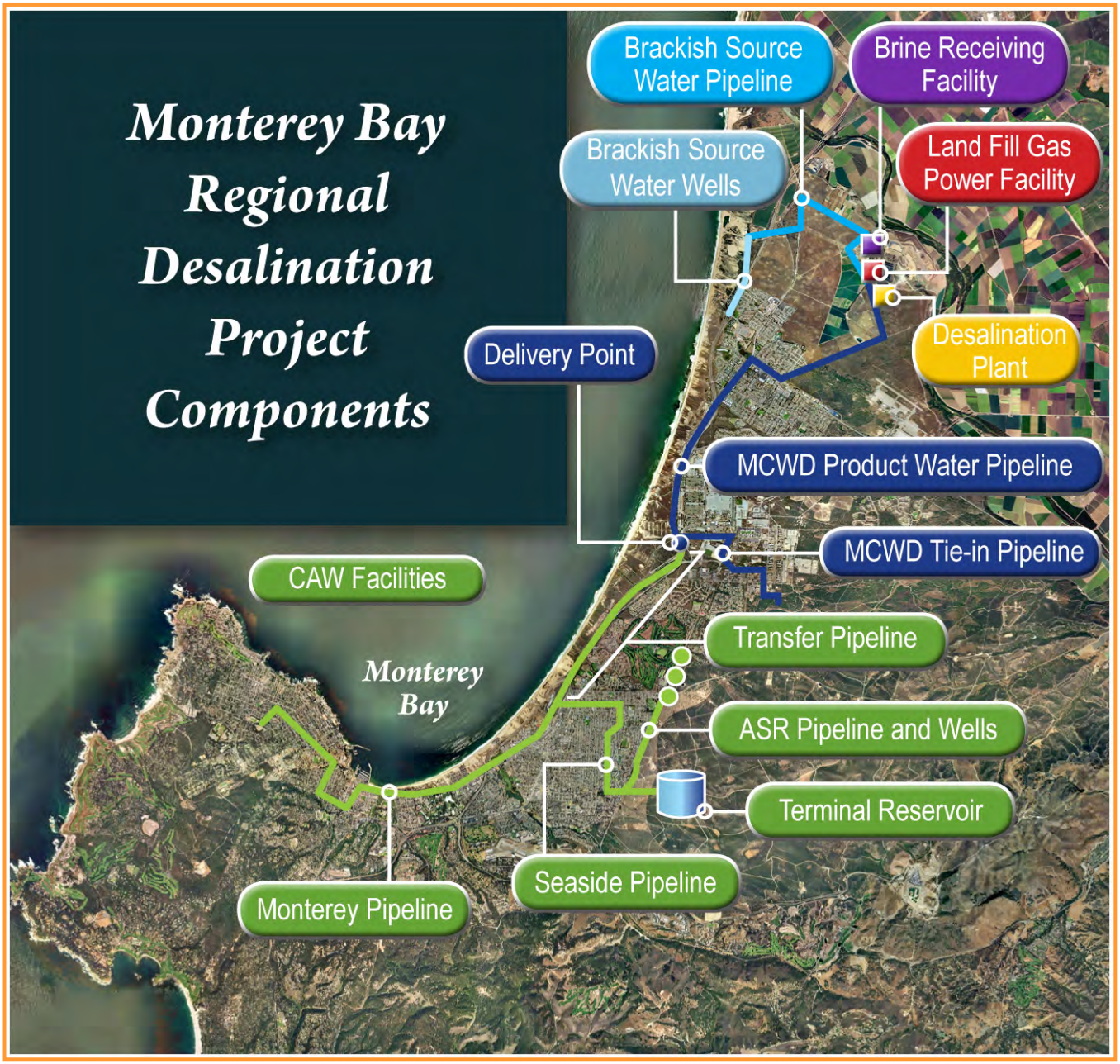
Monterey Bay Regional Desalination Project Components
Brackish Source Water Pipeline
Brine Receiving Facility
Brackish Source Water Wells
Land Fill Gas Power Facility
Delivery Point
Desalination Plant
MCWD Product Water Pipeline
MCWD Tie-in Pipeline
CAW Facilities
Transfer Pipeline
Monterey Bay
ASR Pipeline and Wells
Terminal Reservoir
Seaside Pipeline
Monterey Pipeline

Overview of Project Components

Project Component	Description	Ownership
Brackish Source Water Wells	Up to six vertical and/or slant wells drilled in seawater-intruded aquifer. Source water would be approximately 85% seawater and 15% seawater-intruded groundwater.	MCWRA
Brackish Source Water Pipeline	21,000 linear feet (LF) of 36 to 42-inch pipe	MCWRA and MCWD
Desalination Plant	Reverse osmosis treatment plant with a peak production rate of 10 mgd. On-site facilities include treatment processes, clearwells, distribution pump station, and non-process structures.	MCWD
Product Water Pipeline	43,500 LF of 24 to 36-in pipe	MCWD
Outfall Facilities	Pipeline and receiving station to convey brine conveyance to the outfall headworks	MRWPCA
California American Water Facilities	Distribution pipelines, Terminal reservoir, pump stations, ASR wells	CAW
Related Project		
Renewable Energy Facility	6 MW co-generation facility using landfill gas/natural gas to produce power for the desalination plant	MRWMD

Regional Project Provides Substantial Regional Benefits

- Fulfills SWRCB Order 95-10
- Lowest cost alternative for new water supply
- Avoid devastation of local economy ($1 billion in lost sales and 6,000 lost jobs) from severe water rationing as result of Cease and Desist Order.
- Protects adjudicated Seaside Basin
- Protects Carmel River for restoration of riparian and aquatic habitat
- Reduced carbon footprint thru green landfill gas power
- Reclaims intruded groundwater aquifer
- Diversify and create a reliable drought-proof water supply that meets the region's needs.
- Satisfy MCWD's obligations to provide water supply adequate for approved redevelopment of former Fort Ord.

Thank you.

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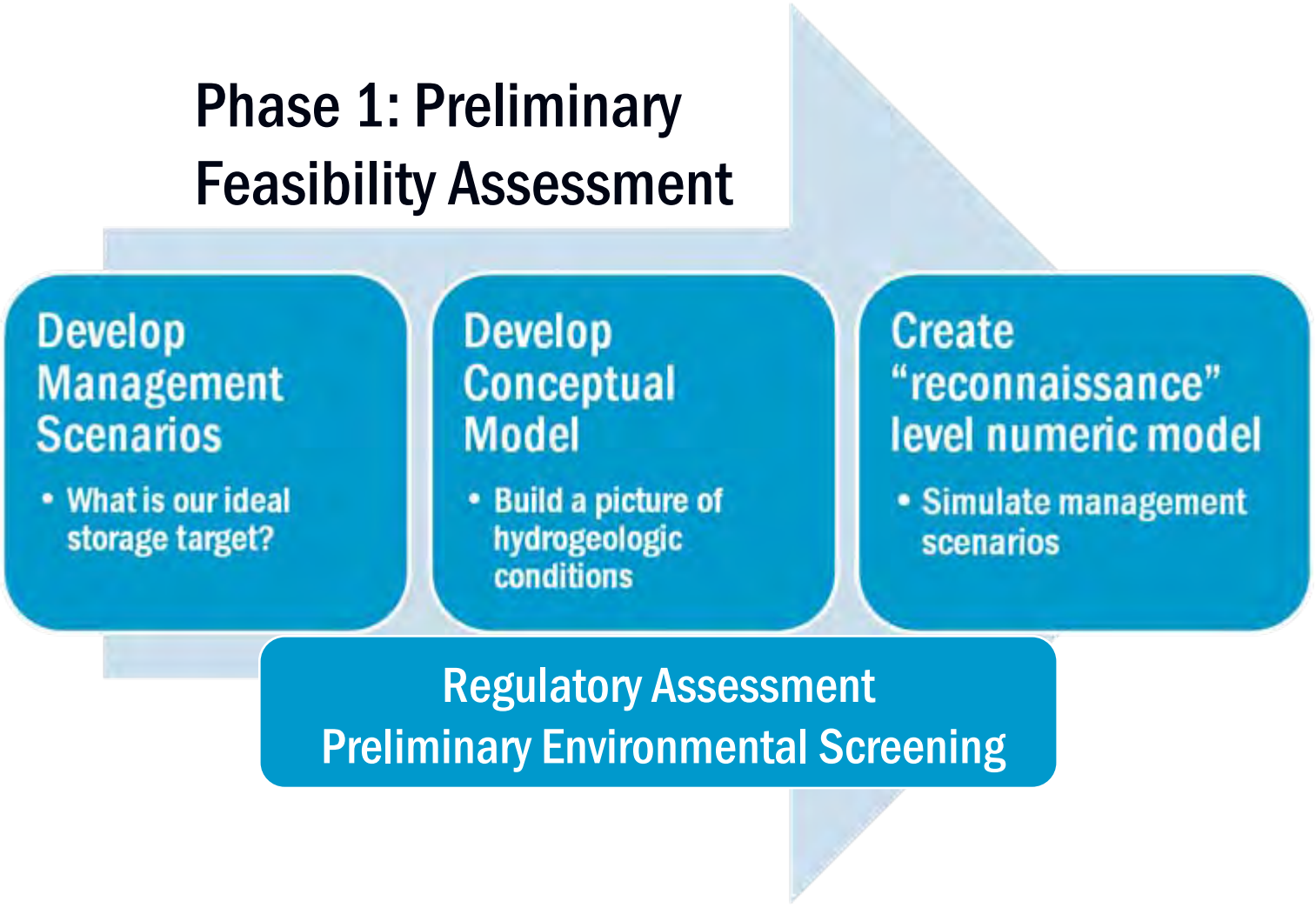
Work is Conducted in Two Phases to Provide Natural Decision Points and Cost Savings

- Phase 1: Preliminary Technical Assessment
  - Hydrogeologic Assessment
    - Data collection and review
    - Numeric model development
      - Performance testing
  - Regulatory Understanding
  - Environmental Screening Analysis

Allows for stop work decisions if initial hydrogeologic findings are unfavorable

- Phase 2: Water Quality/Treatment Analysis and Project Refinement

Approach for South Ord Project



Approach for South Ord Project (Continued)

Phase 2: Water Quality/Treatment Analysis and Project Refinement