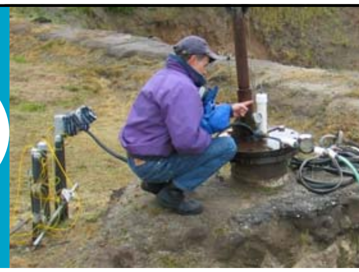
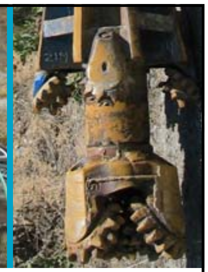
EXHIBIT 3-A

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT





Potential Changes in Groundwater Quality Resulting from Introducing New Sources of Water into the Seaside Groundwater Basin

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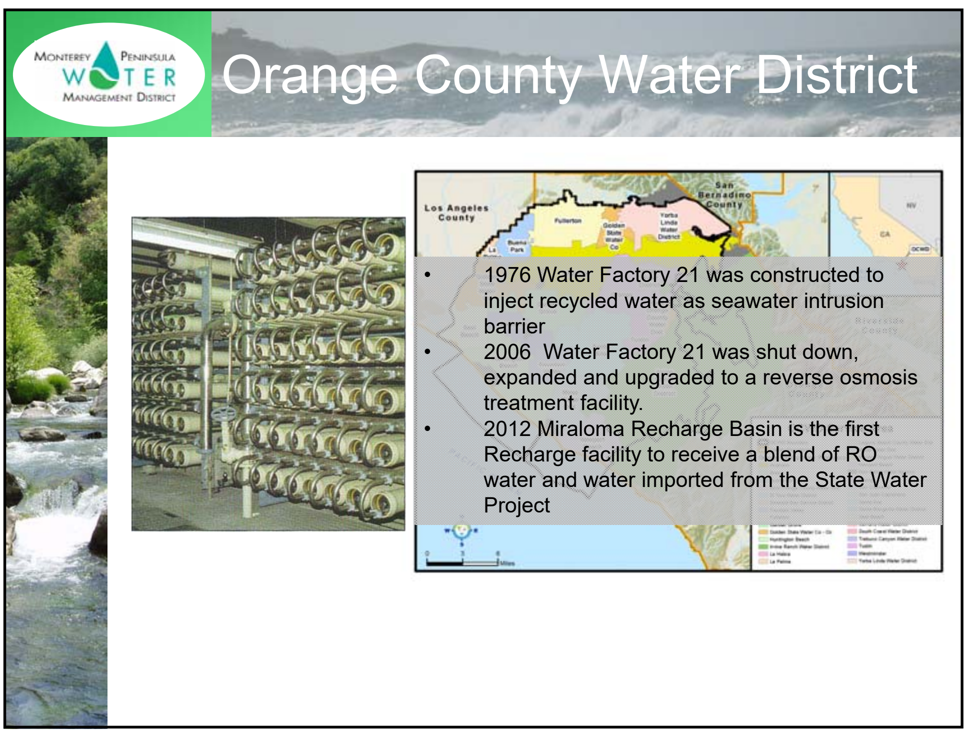
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

Potential Geochemical Reactions

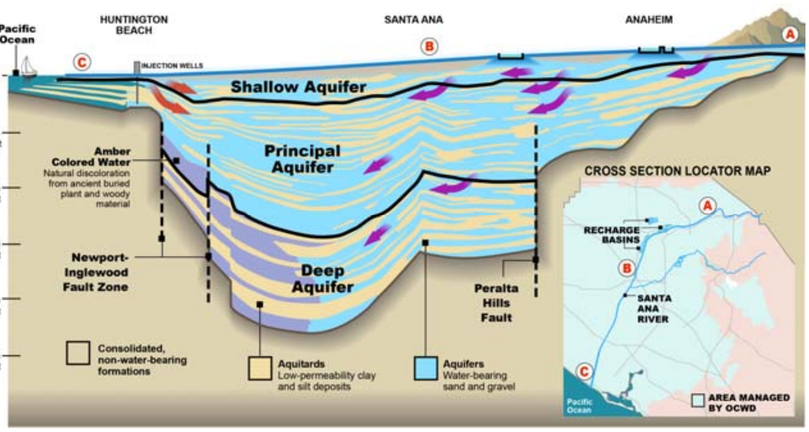
Presentation Overview

- **Case study: Orange County Water District**
- **Mission to protect and augment water supplies**
- **Water Supply Gap**
- **Plan to use Seaside Basin as storage for all sources of supplemental "new" supplies**
- **Water quality differences**
- **Project operations**
- **Geochemical interactions between different water types and aquifer mineralogy**

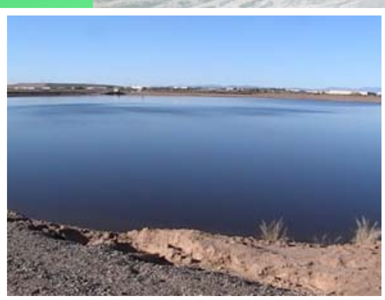

Monterey Peninsula
WATER
Management District
OCWD replenishes the aquifer using its recharge facilities along the Santa Ana River in Anaheim.
5


Monterey Peninsula
WATER
Management District
Orange County Water District
• 1976 Water Factory 21 was constructed to inject recycled water as seawater intrusion barrier
• 2006 Water Factory 21 was shut down, expanded and upgraded to a reverse osmosis treatment facility.
• 2012 Miraloma Recharge Basin is the first Recharge facility to receive a blend of RO water and water imported from the State Water Project

Cross Section of OCWD



Arsenic Occurrences in Groundwater



- Following mixing of water delivered from the State Water Project with Reverse Osmosis water produced at the upgraded Factory 21 plant, the Water District began to detect spikes of Arsenic in the groundwater.

- Arsenic spikes were transient and were later linked to the recharge of higher blend ratios of Reverse Osmosis water at the recharge facilities.

- Recharged water from Factory 21 had a resonance time in the ground from 6 months to 2 years, but the Arsenic spikes were not related to residence time.

- Stanford Professor, Scott Fendorf, discovered that is was not the residence time creating the Arsenic spikes, but rather the initial geochemical interactions between the clays in the aquifer and the low TDS RO water.

- Naturally occurring Arsenic was locked in the clays by Calcium and Magnesium ions. Naturally recharging water was not able to unlock the Arsenic, but RO water low in Calcium dissolved the ions from the clays and released the Arsenic.

Take Home Message

"It only takes a little Arsenic or other elements to contaminate a big aquifer. In Orange County the contaminant was Arsenic, but in other areas it may be Uranium, Chromium, Selenium, or Boron, as other examples" – Scott Fendorf

Take Home Message:

Mixing different water types can cause unexpected changes in geochemistry when reacting with aquifer matrix minerals.

District Mission Statement

- The Monterey Peninsula Water Management District's mission is to promote or provide for a long-term sustainable water supply, and to manage and protect water resources for the benefit of the community and the environment.
- Seaside Adjudication – Water quality implications and Material Damage

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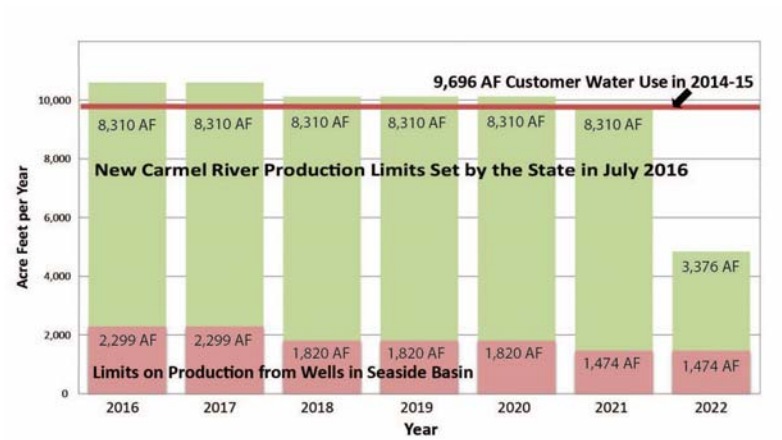
The Supply Gap



The Actual Water Supply Portfolio

15,296 AFY

Desalination Project			6,252 AFY
ASR – Carmel River Water Rights	ASR – Treated Industrial and Storm water		4,800AFY
Los Padres Dam / Carmel River	Seaside Basin	Local Water Projects	4,244 AFY

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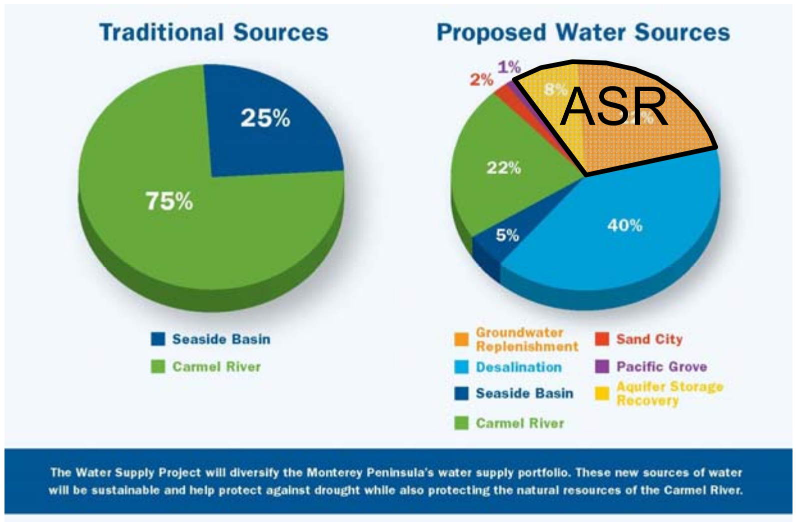
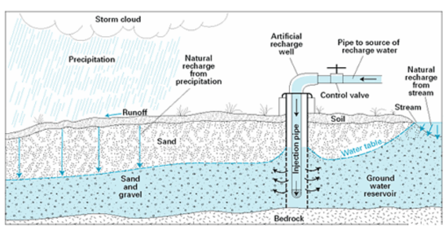
Traditional vs Proposed



Seaside Groundwater Basin



- As water supply projects are developed and begin to produce water to fill the supply gap, the Seaside Groundwater Basin is proposed to be utilized at the storage location for multiple sources of water.

Water Proposed to be Stored in Seaside Groundwater Basin

- **Native Seaside Groundwater** – Native groundwater in the Seaside Basin is devoid of dissolved oxygen, contains hydrogel sulfide, is fairly high in total dissolved solids, and has a oxidation reduction potential of – 220 mV.
- **Carmel River Water** – Water produced from Carmel Valley wells and treated at the BIRP plant. This water is relatively low in TDS, high in dissolved oxygen and contains a residual chlorine concentration from the treatment process.
- **PWM Product Water** – PWM water is highly treated wastewater and stormwater with RO and Micro Filtration. Product water will be chlorinated and post treated to restore minerals.
- **Desalinated Water** - Product water will be seawater treated to remove almos all salts and post treated to restore minerals.

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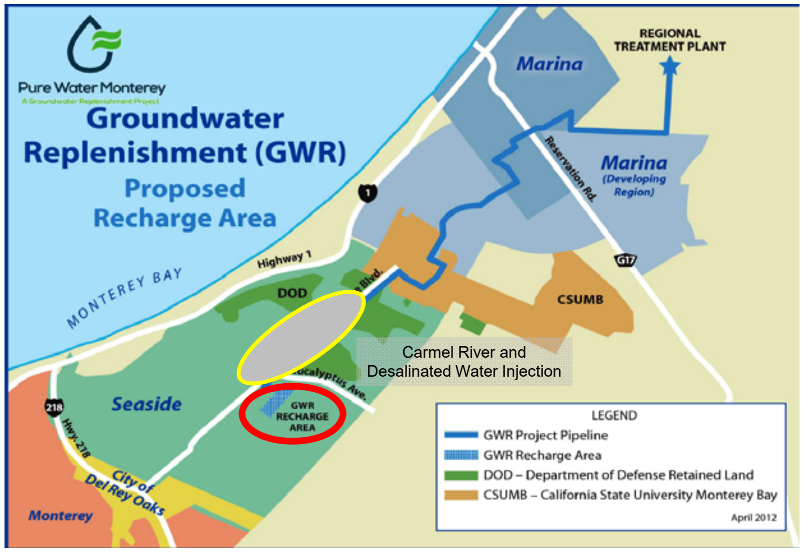
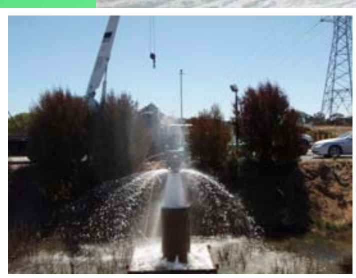
Locations of Storage



Project Operations



Climate drives the Carmel River ASR Injection Program and lower winter demand is proposed to drive the injection of desalinated water, but the PWM injection operations are proposed for 365 days a year. Due to the seasonality and climatic variability of the project operations, water mixing ratios in the Seaside basin will be transient.

Changes in Composition of Water

- **Wet Cycles** –System demand is low and Carmel River Water is available for injection which will result is a blend of PWM, Carmel River, and to a lesser extent, Desalinated water.
- **Drought** - Carmel River Water is unavailable so the blend of stored water will be more PWM and desalinated water banked in the winter.
- **Drought Reserve and Storage Payback** – PWM is proposing to establish a 1,000 AF drought reserve and CalAm has proposed to replenish the Seaside Groundwater Basin 700 AFY over 25 years.

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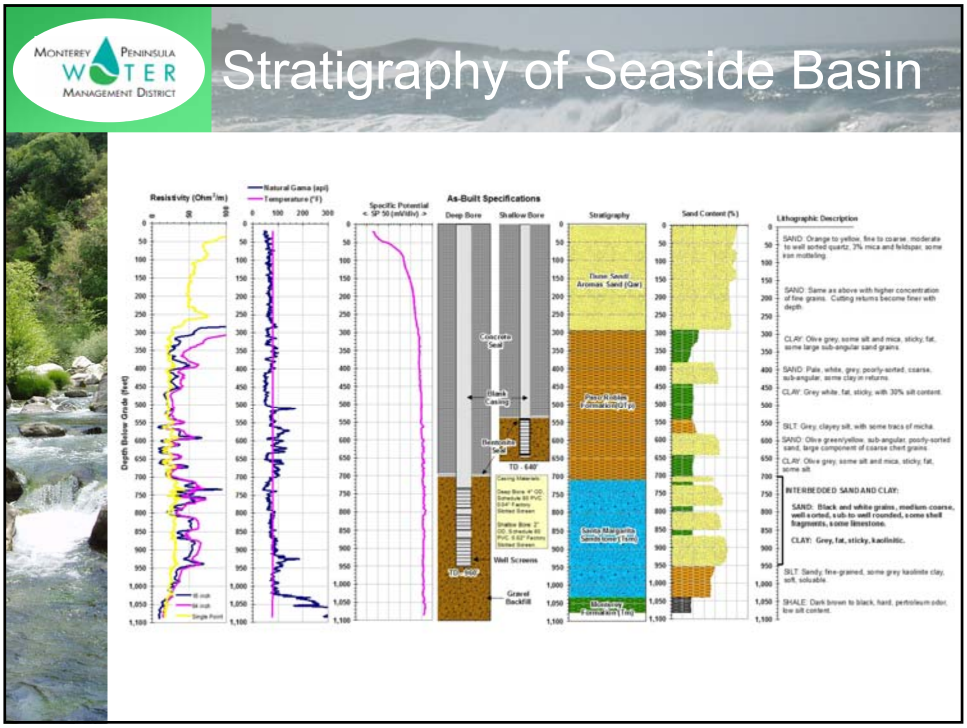
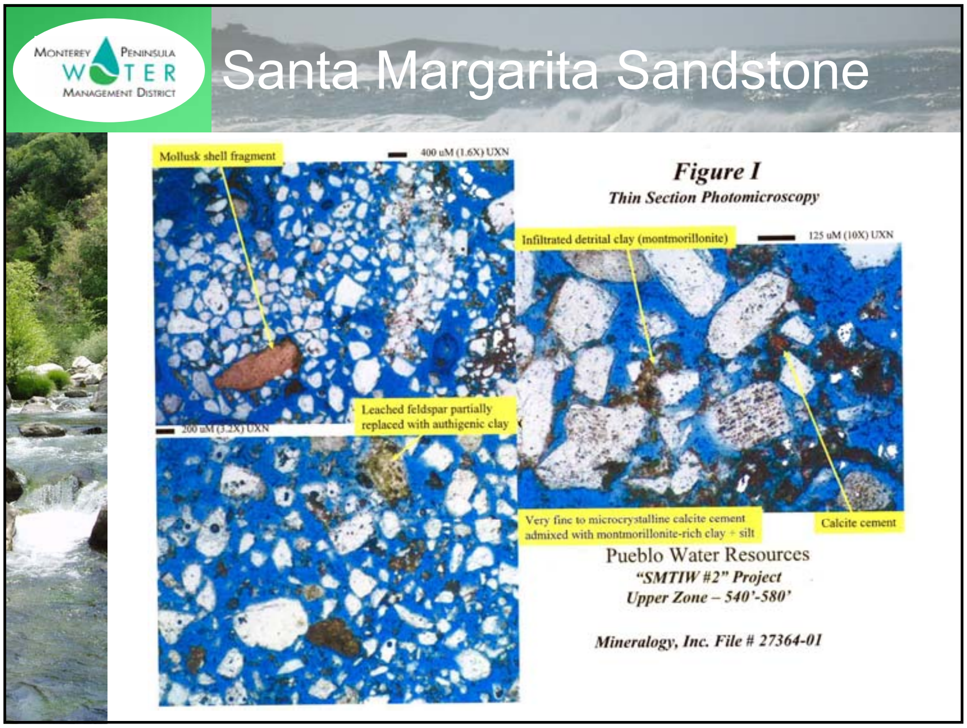
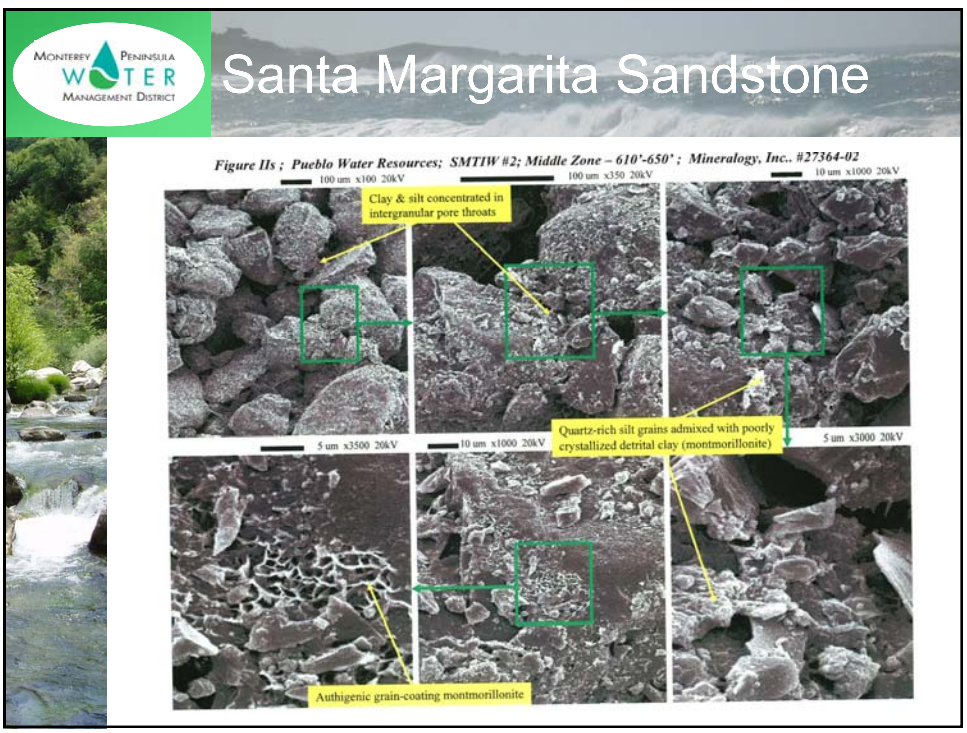

Monterey Peninsula Water Management District
Stratigraphy of Seaside Basin


Monterey Peninsula Water Management District
Santa Margarita Sandstone


Monterey Peninsula Water Management District
Santa Margarita Sandstone
Mollusk shell fragment
400 uM (1.6X) UXN
Figure I
Thin Section Photomicroscopy
Infiltrated detrital clay (montmorillonite)
125 uM (10X) UXN
Leached feldspar partially replaced with authigenic clay
200 uM (3.2X) UXN
Very fine to microcrystalline calcite cement admixed with montmorillonite-rich clay + silt
Calcite cement
Pueblo Water Resources
"SMTIW #2" Project
Upper Zone – 540'-580'
Mineralogy, Inc. File # 27364-01


Monterey Peninsula Water Management District
Santa Margarita Sandstone
Figure IIs ; Pueblo Water Resources; SMTIW #2; Middle Zone – 610'-650' ; Mineralogy, Inc.. #27364-02
100 um x100 20kV
100 um x350 20kV
10 um x1000 20kV
Clay & silt concentrated in intergranular pore throats
5 um x3500 20kV
10 um x1000 20kV
Quartz-rich silt grains admixed with poorly crystallized detrital clay (montmorillonite)
5 um x3000 20kV
Authigenic grain-coating montmorillonite

Geochemical Modeling

Defining Some Terms that Drive Geochemical Reactions

- **Aqueous speciation** – the distribution of individual ions and ion pairs in water
- **Saturation** – the state of an aqueous solution in chemical equilibrium with a particular solid phase
- **Undersaturation** – phase is thermodynamically favored to dissolve

Geochemical Modeling

- **Supersaturation** – phase is thermodynamically favored to form
- **Kinetics** – the rates of geochemical reactions
- **Mass Transfer** – moving mass between phases (solid, aqueous, gas)
- **Reactive Transport** – coupling flow and chemical reactions

Geochemical Modeling

- Input Data – Good quality required!
- Water Chemistry - Use proper methods of filtration, preservation, and dilution
  - Measure field parameters (pH, Eh, D.O., temperature, alkalinity, specific conductance) at time of sample collection
  - Charge balance must be within acceptable limits
- Aquifer Material and Minerology
  - Thin section analysis
  - Electron scanning microscopy
  - Bench leaching tests

Modeling Process

- Reaction paths - solution composition as a function of reaction progress, quantities of secondary minerals formed, and composition of solid-solutions formed
- Time of reaction - kinetic rate laws and relative reaction rates based on temperatures and pressures

Output from Model

- Transport Processes – Advection, Hydrodynamic Dispersion and Diffusion
- Reactions on Mineral Surfaces, Adsorption, Ion exchange
- Mineral Dissolution and Precipitation, Thermodynamic model, Kinetic rate expressions
- Biochemical Processes

Tasks

- Identify the different water qualities, quantities, flow paths, and residence times
- Characterize minerology of Santa Margarita Sandstone
- Collect water quality data to populate geochemical model
- Construct geochemical model and evaluate the effects of mixing differing water types in the Seaside Groundwater Basin.

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Goals

- Create a model to evaluate geochemical reactions between differing water types and aquifer mineralogy to forecast best post-treatment conditioning for RO water
- Create a tool to evaluate and model water quality issues and forecast solutions if they arise after project operations begin
- Create a tool to test options and assist with permitting water projects

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ASR Water Quality Modeling

Questions?