

# Seaside Groundwater Basin

## Phase 1 Aquifer Storage and Recovery Project

### Introduction

In the Monterey Peninsula area, surface and groundwater resources are managed by the Monterey Peninsula Water Management District (District). The District regulates all water distribution systems within its boundaries. California American Water (Cal-Am) owns and operates the largest distribution system within the District and serves approximately 95% of the water users in the area. Annual water production within the District is approximately 20,000 acre-feet (af), with Cal-Am producing about 15,000 acre-feet per year (afy) for customers in its main distribution system.

Cal-Am produces water from wells in the Carmel Valley alluvial groundwater basin and the Seaside groundwater basin. Although these basins are hydrologically separate, they are hydraulically connected by Cal-Am's distribution system. Both basins are presently stressed from excessive pumping.

To help address these problems, the District has proposed a phased Aquifer Storage and Recovery (ASR) Program that would divert water from the Carmel Valley alluvial groundwater basin during the high-flow rainy season for injection into the coastal subareas of the Seaside groundwater basin. This water, which would be treated and transmitted through the existing Cal-Am distribution system, would be extracted by dual-purpose injection/recovery wells to meet Cal-Am customer demand during the low-flow dry season.

The proposed Phase 1 ASR Project takes the existing elements -- excess winter flows in the Carmel River, unused production, treatment, and transmission capacities in the Cal-Am system, and available storage capacity in the Seaside basin - and combines them with new ASR wells to reduce diversions from the Carmel Valley alluvial aquifer, maintain groundwater storage, and improve Carmel River flow conditions during the dry season. The proposed project builds on the District's successful eight-year ASR Test Program. Since 1998, the District has injected 1,450 af into the Seaside basin and recovered 1,140 af.

### Carmel Valley Alluvial Groundwater Basin

The Carmel Valley alluvial groundwater basin provides approximately 65% of the water used in the Monterey Peninsula area. The alluvium consists of poorly consolidated boulders, gravel, sand, and silt deposited by the Carmel River. The alluvial aquifer is small, shallow, and unconfined.

Groundwater pumping from this alluvial aquifer has resulted in depleted storage, reduced streamflow in the Carmel River, and impaired habitat conditions for steelhead trout and red-legged frogs. Typically, during the dry season between June and November, the lower seven miles of the Carmel River are dewatered. In 1998, the State Water Resources Control Board determined that the Carmel River was fully appropriated during the dry season.

Recharge to the aquifer is derived mainly from river infiltration. During the rainy season when streamflow resumes, the alluvial aquifer fills in all years except during droughts. Annual streamflow in the lower reaches of the Carmel River is highly variable, ranging from zero af in 1977 to 367,00 af in 1983. Discharge to the ocean averages approximately 76,000 afy, with more than 96% of this total occurring between December and May.

### Seaside Groundwater Basin

The Seaside groundwater basin provides approximately 30% of the water used in the Monterey Peninsula area. The Seaside basin consists of a sedimentary sequence of three aquifers -- Santa Margarita, Paso Robles, and Aromas Sand/Older Dune - that has been structurally deformed by faulting and folding. Compared to the Carmel Valley alluvial aquifer, the aquifer system in the Seaside basin is large, deep, and includes confined, semi-confined, and unconfined areas.

Estimates of historical storage depletion in the coastal subareas of the Seaside Basin have ranged from 7,200 af to 20,000 af, depending on the area of the basin that is considered. More recently, based on the amount of available "drawup" in the proposed recharge area, the amount of available storage capacity in the Santa Margarita and Paso Robles aquifers was estimated to be at least 35,000 af. Since 1995, groundwater pumping from the coastal subareas of the Seaside basin has increased 50% and resulted in declining water levels and further storage depletion. The Seaside basin is in a state of overdraft and at risk of seawater intrusion.

Recharge to the coastal subareas of the Seaside basin is derived from deep percolation of rainfall, irrigation water, and pipe leaks and subsurface inflow from inland subareas within the basin. Estimates of annual recharge to the coastal subareas range from approximately 4,000 af to 5,700 af. For simulation purposes, it is assumed that this recharge occurs uniformly throughout the year.

### Phase 1 ASR Project Description

As proposed, the Phase 1 ASR Project would include two ASR wells with a combined injection capacity of 3,000 gallons per minute (gpm) and a recovery capacity of 3,500 gpm, with one well operating at a time. Diversions from the Carmel Valley alluvial aquifer for injection would be limited to the December through May period and would only be allowed when streamflow in the lower reach of the Carmel River exceeds the bypass flows recommended by the National Marine Fisheries Service. These bypass flows are based on the biological needs of steelhead for each phase of their lifecycle and range from 60 cubic feet per second (cfs) for upstream migration to 200 cfs for attraction. The bypass flows vary daily based on water year type, time of year, location, and flow conditions. During a water year with normal streamflow, the annual bypass flow requirement at the Carmel River lagoon would be approximately 34,000 af.

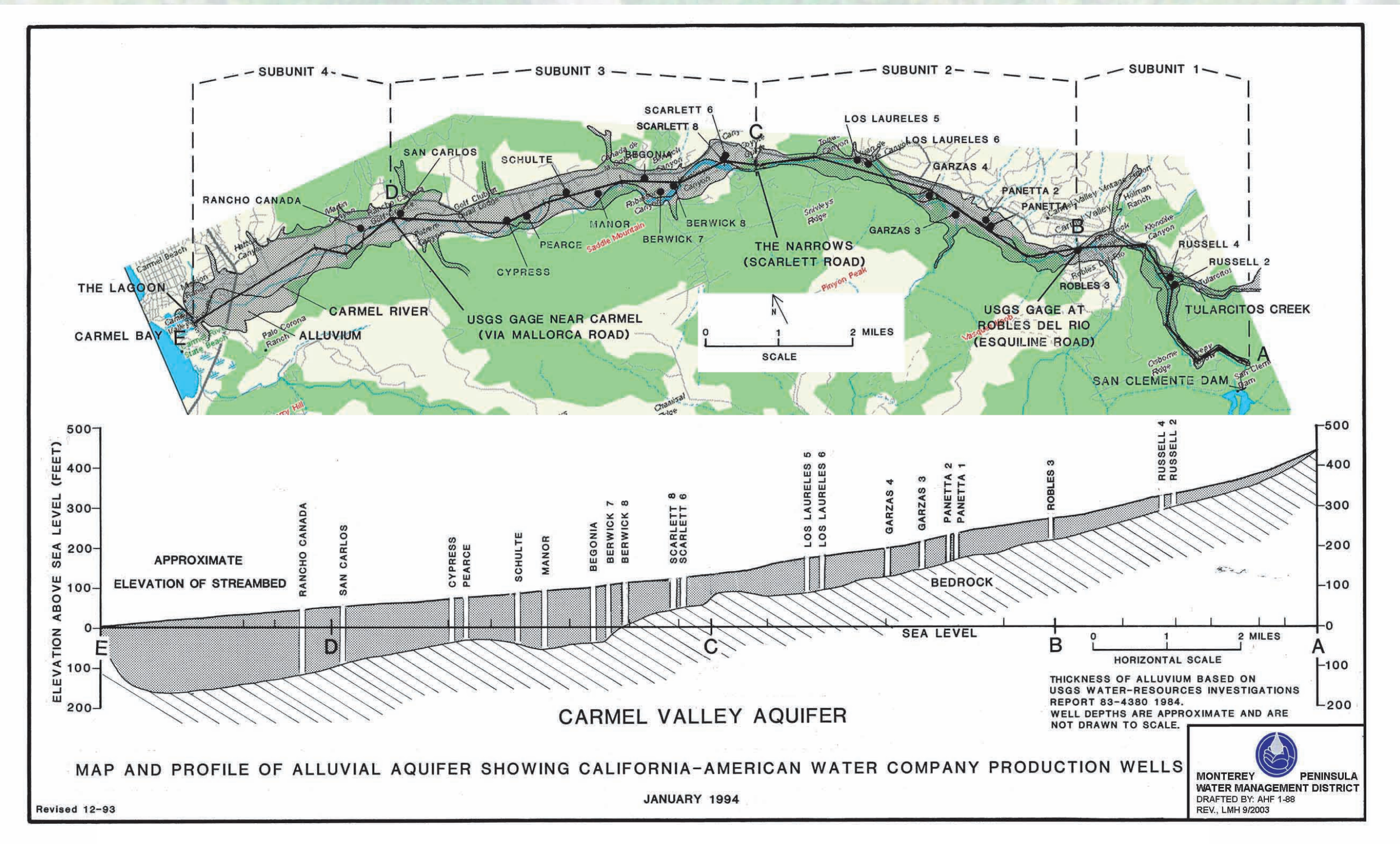


#### MPWMD ASR Test Injection Well

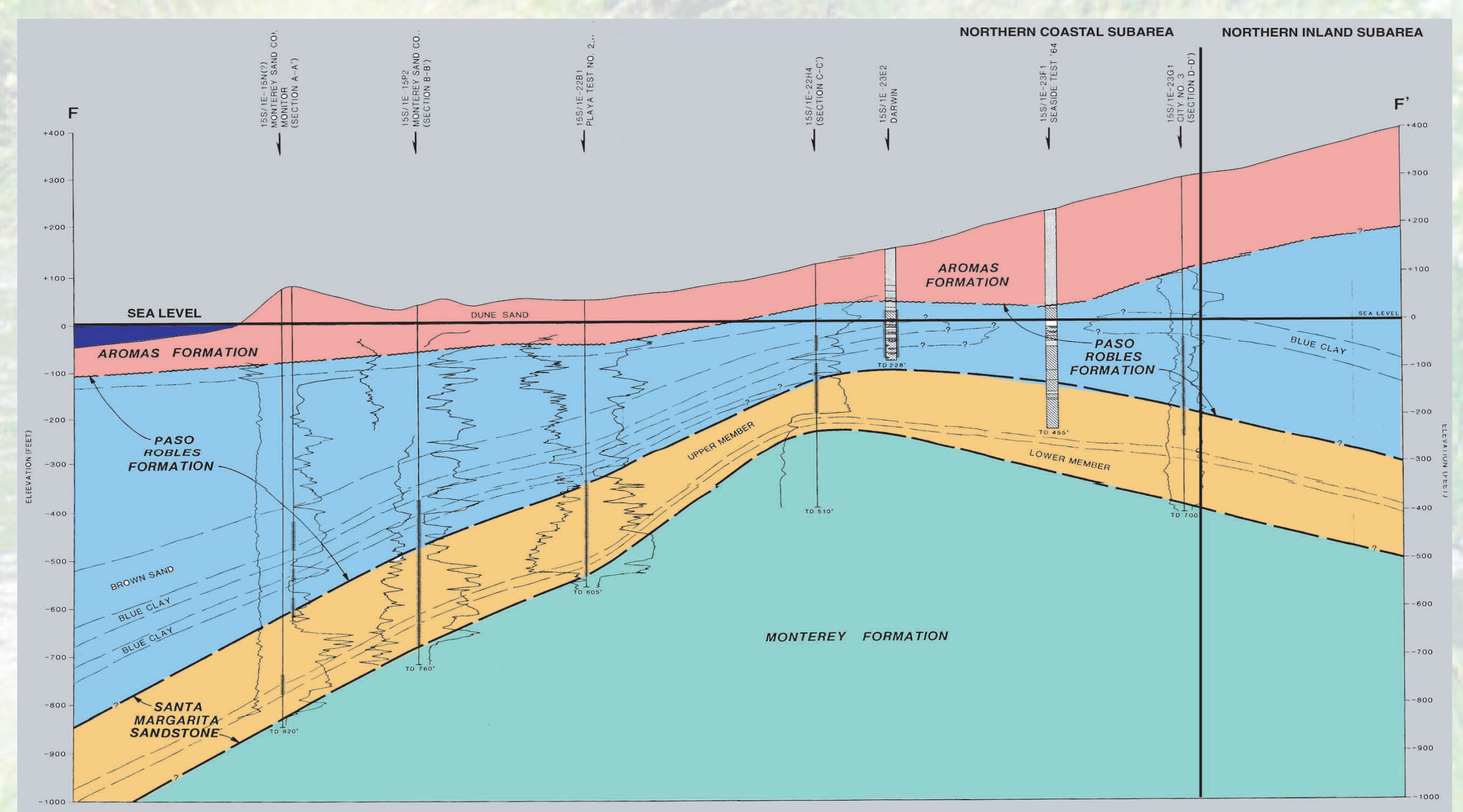
Routine backflush pumping is conducted between injection periods at the District's Santa Margarita Test Injection Well. The 16-inch diameter, 720-foot deep well is equipped with a downhole control valve. Water is injected at an average rate of 1,000 gpm and backflushed at rates up to 2,500 gpm.



Oblique view of the Monterey Peninsula area showing Carmel Valley and Seaside Groundwater Basins



Map and profile of Carmel Valley Alluvial Groundwater Basin showing California American Water production wells



West-East profile through the coastal area of the Seaside Groundwater Basin



Aerial view of Monterey Peninsula area showing proposed Phase 1 ASR Project facilities

### Panel 1 of 2

Prepared for the 25th Biennial Groundwater Conference and 14th Annual Groundwater Resources Association of California, Sacramento, CA October 25-26, 2005

Authors: Darby Fuerst, Joe Oliver, and Dave Dettman