STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

STAFF REPORT FOR REGULAR MEETING OF JULY 13-14, 2017
Prepared on June 21, 2017

ITEM NUMBER: **11**

SUBJECT: **Managed Aquifer Recharge in the Central Coast Region**

STAFF CONTACT: Harvey Packard, 805/542-4636, Harvey.packard@waterboards.ca.gov

THIS ACTION: **Informational**

SUMMARY

Managed aquifer recharge is an important strategy to improve groundwater sustainability. The Water Board can encourage and facilitate aquifer recharge in the Central Coast Region.

DISCUSSION

Managed aquifer recharge captures available water (during wet or high flow periods, during periods of low demand, or water that would be potentially discharged to the ocean or otherwise lost) and moves this water under controlled, engineered conditions into aquifers.[1] The strategic goals of managed aquifer recharge for this groundwater dependent region are straightforward and include:

- Increasing the volume and speed of groundwater infiltration,
- Diluting the effects of regional salt and nitrate concentration increases in groundwater,
- Working towards sustainability for basins in overdraft, and
- To some degree, managed aquifer recharge can also be used as a counterstrategy against the effects of drought and climate change.

This staff report discusses some of the various types of managed aquifer recharge projects that exist in the Central Coast Region.

Aquifer Storage and Recovery (ASR) Wells

In ASR systems, water is injected into aquifers using specifically screened aquifer intervals and engineered wells, for storage and later recovered for use. Two ASR systems are located in the Central Coast Region:

- Goleta Water District operates nine wells using water from Cachuma reservoir.
- Monterey Peninsula Water Management District operates one well. High winter flows of the Carmel River are injected and then recovered later in the year.

[1] National Ground Water Association, Retrieved June 5, 2017, at http://www.ngwa.org/Media-Center/briefs/Documents/Managed%20Aquifer%20Recharge.pdf

Benefits: In addition to being an effective water banking system, the ASR strategy allows discrete injection and delivery to deeper aquifer zones, which can help offset sea-water intrusion or achieve dilution benefits in high salt or pollution scenarios.

Challenges: ASR works best in aquifers with controlled and regulated pumping, because the objective is to completely recover the injected water. Both Seaside and Goleta are adjudicated aquifers, which makes ASR more feasible. ASR may not work as well in aquifers with many individual, unregulated users.

Percolation Ponds

Several agencies use percolation ponds for aquifer recharge, where water is recharged to shallow aquifer zones through surface percolation. Some examples in the Region include:

- Santa Clara Valley Water District operates a system of reservoirs to capture winter runoff and moves this water to percolation ponds to recharge aquifers. Recharge ponds and channels include Llagas Creek, Madrone Channel, San Pedro pond, and Main Avenue pond. Water is supplied from Anderson, Coyote, Chesbro, and Uvas reservoirs and by federal Central Valley Project (CVP) imported water. From 2002-2011, the district percolated an average of 24,000 acre feet annually. Forty-two percent was from the CVP and remainder from local reservoirs.
- Pajaro Valley Water Management Agency operates the Harkins Slough recharge facility near Watsonville, Santa Cruz County. The facility seasonally stores wet weather flows from Harkins Slough in the shallow aquifers of the San Andreas Terrace, located near the coast. Stored water is pumped from a series of wells and delivered to coastal farms through a pipeline delivery system. In its first 12 years of operation, between 2002 and 2013, the facility recharged 7,000 acre feet (about 580 acre feet per year, on average) of diverted Harkins Slough water, roughly 2,200 acre feet of which was recovered for delivery and use by coastal farms; the balance was left in storage. In 2013, the facilities delivered approximately 220 acre-feet of water to the ag irrigation delivery system.[2]
- Until recently, the City of Salinas operated an industrial wastewater treatment plant and used ponds nears the Salinas River to dispose of the wastewater. That untreated wastewater is now treated and recycled by the Pure Water Monterey project. Salinas repurposed the percolation ponds to collect stormwater. Excess stormwater not percolated will be used by the Pure Water Monterey project. In addition, the Pure Water Monterey project will also use stormwater collected from the Salinas River, the Reclamation Ditch, and Blanco Drain.

Other agencies that operate significant recharge pond facilities include Santa Maria, Santa Barbara County, Grover Beach, Hollister, Greenfield, Gonzales, and San Luis Obispo County.

Benefits: Percolation ponds can dilute salts and pollutants in uppermost groundwater and recharge underlying zones.

Challenges: High property values can make this strategy difficult to implement, potentially taking property out of use or production.

[2] Pajaro Valley Water Management Agency, Accessed June 8, 2017, http://www.pvwma.dst.ca.us/about-pvwma/assets/bmp_update_eir_final_2014/BMP_Update_Final_February_2014_(screen).pdf

In-Channel Percolation

This strategy uses reservoir storage releases to high permeability or more course grained channel bottoms to facilitate percolation. Examples of reservoir storage and in-channel percolation include:

- Monterey County Water Resource Agency stores water in the Nacimiento and San Antonio reservoirs for summer groundwater recharge. The agency also operates a temporary dam on the lower Salinas to enhance percolation and provide water that is treated and recycled on agricultural operations.
- The Santa Ynez River bed is used to percolate water stored in Cachuma reservoir.
- Santa Maria Valley Water Conservation District operates Twitchell reservoir for groundwater recharge through the Santa Maria River bed.
- San Luis Obispo County Flood Control and Water Conservation District operates Lopez reservoir in a similar fashion.
- San Benito County Water District stores water in Hernandez and Paicines reservoirs and releases water to the San Benito River and Tres Pinos Creek. The district formerly percolated imported Central Valley Project Water but no longer does.

Benefits: In channel percolation is effective and can benefit large numbers of downstream groundwater users. Using existing channels does not require acquiring property and constructing improvements.

Challenges: Not effective in droughts. For example, Monterey County was unable to operate the rubber dam on the lower Salinas for several years during the recent drought. Flows can also be lost to riparian vegetation, which could expand beyond native levels.

Title 22 Groundwater Recharge

Recycled water projects undergo extensive analysis and review. Two Central Coast projects are permitted to recharge groundwater with recycled wastewater: Cambria CSD and Pure Water Monterey. Several others are proposed, including in Soquel, Morro Bay, Arroyo Grande, and Carpinteria. A staff report for the May 2017 Board Meeting contained additional information on recycling projects.

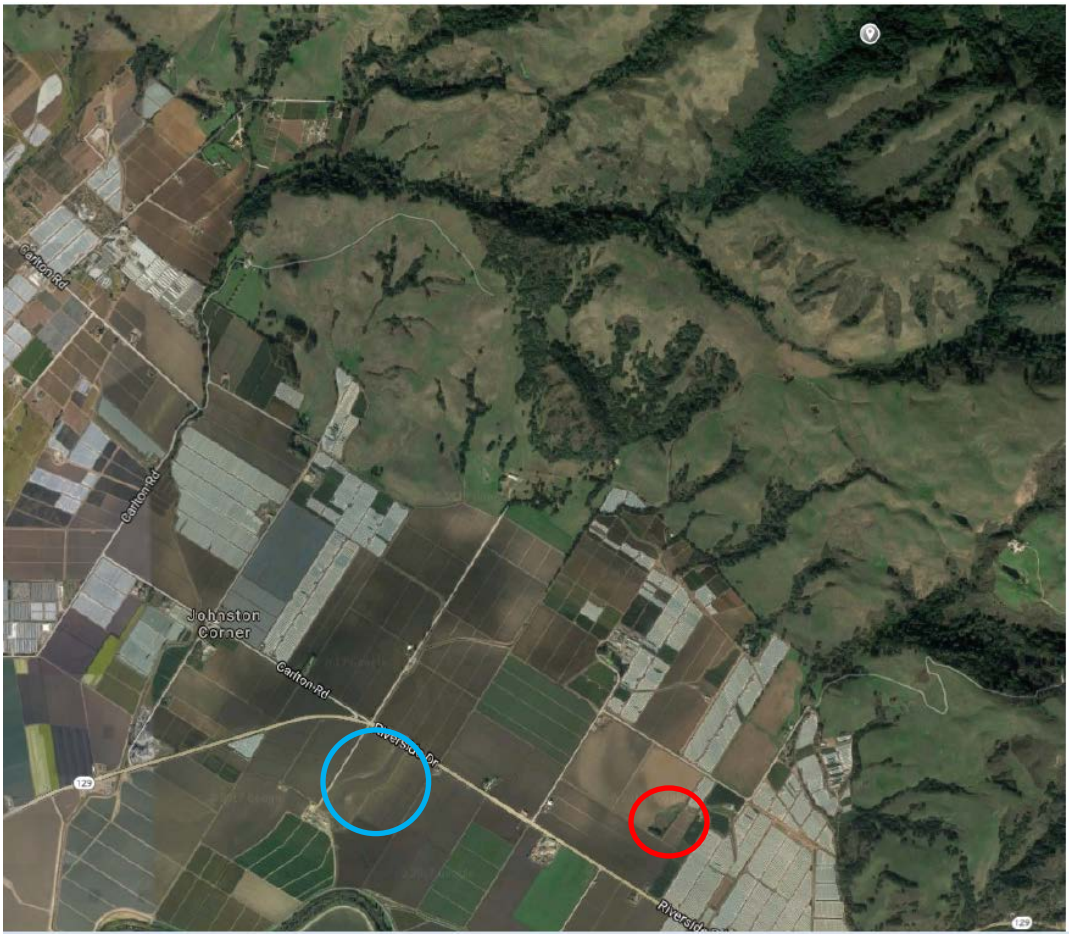
Distributed Storm Water Collection

Dr. Andrew Fisher, of University of California, Santa Cruz (UCSC), is working with Pajaro Valley Water Management Agency and the Resource Conservation District of Santa Cruz County on a concept he calls distributed stormwater collection managed aquifer recharge. The concept relies on three bases:

- Mapping locations where enhanced recharge might be best accomplished, based on, among other things, geology.
- Modeling availability of stormwater.
- Monetizing activities and policies that incentivize stakeholders and strengthen partnerships.

Dr. Fisher, working with UCSC students and resources agencies, has installed a pilot project near Watsonville. The drainage area is 172 acres, which flows to a 4.3-acre infiltration basin. The goal is to infiltrate 100 acre feet per year. Since its installation in 2011, they have met the goal except in two drought years.

Another basin in the Watsonville area is planned, has been approved, and will be installed soon. Staff is planning a field trip in conjunction with the July 2017 Board meeting (see Item No. 22) for the Water Board to visit these two basins and the Harkins Slough project. The following aerial photograph shows the locations of the two infiltration basins east of Watsonville.



Dr. Fisher's results also indicate improved water quality as the stormwater is infiltrated. He is augmenting his research with a water quality component by lining infiltration basins with wood-chip bioreactors to remove nitrate prior to percolation.

Benefits: Dr. Fisher estimates the widespread implementation of this strategy can be a significant part of solving the overdraft problem in the Pajaro basin. Successfully monetizing the program is key to success.

Challenges: Since the infiltration basins are relatively small, it will take many basins to have an appreciable effect. Effective sites are limited by hydrology and stormwater availability.

Regulatory Issues

Groundwater recharge has clear water-quality benefits. Dr. Fisher describes these benefits as follows:

- When aquifers are overdrafted, they lose connection to surface water and become terminal sinks for salts, nutrients, etc., leading to elevated concentrations.

Evapotranspiration (ET) leaves salts and nutrients behind, and these are washed into underlying aquifers. Seawater intrusion also occurs in overdrafted coastal basins.

- Similar considerations potentially apply to pesticides and other chemicals of concern.
- Without hydrologic outflows from aquifers (to surface water and/or the ocean) the solutes build up over time. This is not how these aquifers functioned prior to development. Prior to development, each gallon of recharge to an aquifer was balanced by a gallon of discharge (to rivers, to the ocean, etc.)—this is steady state for a full aquifer. A fully restored aquifer recharges and discharges in equal amounts; all recharge becomes discharge, and water quality is stable on this basis.
- Not enhancing recharge is not just a risk to water quality—it guarantees poorer water quality. By enhancing high quality recharge, we can improve water quality by dilution, but also by processing of solutes during infiltration, and by reconnection of aquifers to surface water and reestablishing outflow of water (and solutes). We can also limit export of sediments and associated impacts on downstream aquatic systems and habitat (streams, wetlands, estuaries).[3]

The Central Coast Water Board can encourage recharge projects in various ways, including:

- Permit Facilitation: Some projects will require various permits, such as 401 water quality certifications, Department of Fish and Wildlife agreements, and water rights. Even when the Central Coast Water Board is not the permitting agency, we can help project proponents navigate the process and provide agency support.

  For example, several recharge or treatment basins have been installed within ditch and watercourses in the Santa Maria area. Water Board staff has developed a permitting strategy and worked closely with project proponents.

- Planning Processes: Recharge projects are affected by many planning requirements, including sustainable groundwater plans developed pursuant to the Sustainable Groundwater Management Act, salt and nutrient management plans, and integrated regional water management plans. The Water Board can influence these processes and help harmonize or find opportunities to combine efforts, and thereby reduce individual project costs.
- Funding: Many recycling and recharge projects are funded at least partially through the State Water Board's Clean Water State Revolving Fund. The Central Coast Water Board has some ability to influence the funding process.

Except for those involving recycled wastewater (Cambria emergency water supply and Pure Water Monterey), the Central Coast Water Board regulates only one aquifer recharge project: the Monterey Peninsula Water Management District's Seaside aquifer storage and recovery (ASR) well. The primary water-quality concern with this project is added chlorine and its associated byproducts. So far, monitoring has not detected any degradation of the aquifer.

<u>Actions and Recommendations</u>

- Continue to facilitate permitting, both internally and externally, as much as possible.
- Encourage farmers to work with Dr. Fisher, the resource conservation district, and Pajaro Valley Water Management Agency to install more infiltration basins in the Pajaro groundwater basin.

[3] Personal communication to Harvey Packard by email, June 9, 2017.

- Remain engaged in assisting State Water Board staff in reviewing grant and loan applications for proposed projects.

CONCLUSION

Managed aquifer recharge will become increasingly necessary to meet groundwater sustainability in the future, especially in areas that rely heavily on groundwater, such as the Central Coast Region. Staff will continue to look for opportunities to facilitate and influence the growth of these projects, including integration of board members in this influencing process.

ATTACHMENTS

1. NGWA Information Brief: Managed Aquifer Recharge: A Water Supply Management Tool

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