ZONE 7 WATER AGENCY
Delivering Quality, Reliability and Safety

100 North Canyons Parkway
Livermore, CA 94551
(925) 454-5000

ZONE 7 BOARD OF DIRECTORS
WATER RESOURCES COMMITTEE

DATE: January 23, 2024

TIME: 3:00 p.m.

LOCATION: Boardroom
Zone 7 Administration Building
100 North Canyons Parkway
Livermore, California

Director Figuers
Director Green
Director Palmer

A G E N D A

1. Call Meeting to Order
2. Public Comment on Items Not on the Agenda
3. Desktop Groundwater Contaminant Mobilization Study
4. Verbal Reports
5. Adjournment

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DATE: January 23, 2024

TO: Water Resources Committee

FROM: Lillian Xie, Integrated Planning

SUBJECT: Desktop Groundwater Contaminant Mobilization Study

SUMMARY:

This action is in support of Zone 7 Water Agency's Strategic Goal A – Reliable Water Supply and Infrastructure, and to implement Strategic Plan Initiative #2 – Evaluate and develop appropriate new water supply and reliability opportunities.

Overview of Results of Desktop Contaminant Mobilization Study for Potable Reuse:

In 2018, Zone 7 and its four retailer agencies completed the Joint Tri-Valley Potable Reuse Technical Feasibility Study (Potable Reuse Study). The primary goals of the study were: 1) to evaluate the feasibility of a wide range of potable reuse options for the Tri-Valley based on technical, financial, and regulatory considerations and 2) assuming that potable reuse is found to be technically feasible, to recommend next steps for the agencies.

The study evaluated groundwater augmentation or recharge as well as raw water augmentation. More specifically, the study investigated three potential end uses for purified water: 1) groundwater augmentation or recharge via injection wells at two locations – one in the eastern side of the basin in Livermore and one in the western side in Pleasanton near the Mocho Demineralization facility, 2) groundwater recharge via Lake I (Chain of Lakes) surface water spreading recharge, and 3) raw water augmentation via Chain of Lakes to DVWTP (or directly to DVWTP). The first two options involve the groundwater basin. The third option would be a direct potable reuse option. For all three potential end uses, the study found that potable reuse for the Tri Valley is technically feasible and there were no fatal flaws identified by this technical evaluation.

The study then recommended next steps, one of which was to characterize the potential for contaminant mobilization in the groundwater basin using models. Staff will provide an overview of the results of the desktop contaminant mobilization study as it relates to groundwater augmentation or recharge.

Objectives:

The Desktop Groundwater Contaminant Mobilization Study was conducted to:

1. Evaluate potential water quality impacts from the recharge of purified water.
2. Identify potential mitigation strategies.
3. Identify potential issues stemming from recharging groundwater with purified water.

Approach:

This study uses the U.S. Geological Survey's PHAST reactive transport model and the PHREEQC geochemical simulator module.

This study simulates two scenarios with surface water spreading using Lake I and two scenarios with direct injection through two hypothetical injection wells. The results from these four scenarios are compared with a baseline condition of average hydrology without purified water recharge.

Findings:

Groundwater Recharge of Purified Water with Surface Spreading in Lake I

Two scenarios simulate recharging different volumes of purified water by surface spreading into Lake I. The effect on constituents in the groundwater from the two scenarios is summarized below.

- **Nitrate, Chloride, and Boron (Decreased):** In general, purified water recharge in Lake I dilutes the existing nitrate, chloride, and boron in groundwater.
- **pH (Increased):** There are increases in pH around Lake I and on the southwestern side of the basin.
- **Arsenic (Increased):** The higher pH in purified water can cause pre-existing arsenic in the soil to leach into the groundwater. A higher volume of purified water recharge generally causes greater increases in arsenic. There are scattered areas where the arsenic maximum contaminant level (MCL) of 10 µg/L is exceeded by 1-2 µg/L.
- **Hexavalent Chromium (Increased):** The higher pH in purified water can cause pre-existing hexavalent chromium in the soil to leach into the groundwater. Like arsenic, a higher volume of purified water recharge causes greater increases in hexavalent chromium. A new hexavalent chromium MCL is anticipated to be set at 10 µg/L. This MCL is exceeded southwest of Lake I by 2 µg/L with a smaller volume of purified water recharge and by 2-8 µg/L with a larger volume of purified water recharge.

Groundwater Recharge of Purified Water with Injection Wells

Two scenarios simulate recharging different volumes of purified water through two hypothetical injection wells. One scenario recharges a smaller volume of purified water at an injection well sited in Livermore. The other scenario recharges a larger volume of purified water at an injection well sited in Pleasanton. The effect on constituents in the groundwater from the two scenarios is summarized below.

- **Nitrate, Chloride, and Boron (Decreased):** In general, purified water recharge via injection wells dilutes the pre-existing nitrate, chloride, and boron in groundwater, causing decreases around the injection site.
- **pH (Increased):** A larger volume of purified water recharge can cause a greater increase in pH and a larger area of impact.
- **Arsenic (Increased):** Injection of the higher pH purified water can cause pre-existing arsenic in the soil to leach into the groundwater. Increases in arsenic around the injection site exceed the MCL (10 µg/L) by 1-2 µg/L with injecting a smaller volume of purified water in the Livermore site and by 2-5 µg/L in a small area with injecting a larger volume of purified water in the Pleasanton site.
- **Hexavalent Chromium (Increased):** The higher pH in purified water causes pre-existing hexavalent chromium in the soil to leach into the groundwater. Increases in hexavalent chromium around the injection site and areas exceed the anticipated MCL (10 µg/L) by 1-8 µg/L with injecting a smaller volume of purified water in the Livermore site and by 1-10 µg/L with injecting a larger volume of purified water in the Pleasanton site.

Potential Next Steps

The modeling results are based on Zone 7's current groundwater model which is eight years old. Zone 7 is developing a new groundwater model that will further refine the basin's hydrogeology and provide more sophisticated modeling capabilities. This model is anticipated to be available in nine months. At that time, the new groundwater model could be used to refine the results and understanding from the Desktop Contaminant Mobilization Study. Other studies could include laboratory and/or field-scale pilot tests to better define potential water quality responses to purified water recharge.

FUNDING:

No funding is requested at this time.

RECOMMENDED ACTION:

Information Only