MokeWISE Program Scope of Work:
Project 2a: Municipal Recycled Wastewater Recharge Program

April 2015

Problem Statement and MokeWISE Stakeholder Interests

Water suppliers are charged with the timely delivery and affordable supply of high quality surface water for our agricultural and municipal clients, and are committed to maintaining that responsibility for their consumers. Water agencies are also interested in protecting their water rights. Some agencies are not in favor of using recycled water for agriculture purposes due to concerns about quality, cost, and transmission of recycled water resources, for primary users as well as any possible secondary and tertiary effects experienced by anyone in the district as a result of using recycled water. However, these agencies understand and are respectful that other entities may not share this view towards recycled water and do not have an official position either in favor or in opposition to other entities that may be interested in the funding and building of particular infrastructure for recycled water, and including general exploration of opportunities to use recycled water.

Other water agencies are interested in developing cost effective recycled water projects as a way to improve water supply reliability for their customers. If recycled water development results in water that is excess to these agencies needs' and downstream needs, then that water could be made available by these agencies in exchange for equivalent financial or other benefit.

The environmental stakeholders in the MokeWISE process are interested in encouraging the recycling and reuse of water of every kind (graywater, process water, blackwater) when and where ever possible. Recycled water is the single largest source of additional water in California. In 2012, about 670,000 acre feet of treated wastewater was put to beneficial use in California, but this is still only a small part of the 5 million acre feet of treated wastewater produced annually in the state.

Recycled water provides a reliable and plentiful supply, and its use can enable the recharge of overdrawn aquifers and preserve the vitality of California's rivers and the Sacramento-San Joaquin Delta. State-of-the-art recycling facilities such as the Edward C. Little West Basin plant in Los Angeles currently produce recycled water types tailored to specific end uses. The state is preparing standards for potable reuse of recycled water. Santa Clara Valley's recently completed Advanced Water Purification Center expects to supply drinking water at some point.

Environmental stakeholders want to ensure that the potential role of recycled water as a present and future water source for the Mokelumne Watershed is not overlooked due to insufficient information or inaccurate assumptions. They would like to see a comprehensive survey of wastewater and graywater availability, and water end uses in the MokeWISE area, including the EBMUD service area, including what water qualities are needed for those purposes. The study would seek to match available sources of wastewater and treatment levels to potential users.

Other entities see that when municipal wastewater is recycled for irrigation and groundwater recharge, it broadens the spectrum of beneficial uses that the water serves. For instance, spreading ponds may also meet year-round and seasonal wildlife habitat needs for resident and migrating birds, and other wildlife. If the pond area has walking and bird watching trails for the public, it could meet recreational needs. Recycled water can also offset Mokelumne River supplies, which can be left in the river to perform in-stream functions or put towards other beneficial uses. Using recycled water for groundwater recharge conserves the natural resource that is the aquifer, while forgoing Mokelumne River water. The recycling project promotes economic benefits by avoiding the costs imposed upon others from alternative water supply projects, like additional dams. If the water recycling project hires local contractors, it can help to improve the economy in the district. The recycling project can help to avoid the divisiveness caused by water supply projects that are geographically inequitable. That is, projects that impose costs in one area (e.g. dams upcountry), while providing benefits to another area (San Joaquin County, Alameda County, etc.)

The Municipal Recycled Wastewater Recharge Program will investigate the potential for using treated, disinfected wastewater to recharge groundwater aquifers in the valley, either directly or indirectly through in-lieu use of the recycled water. This project includes a feasibility study and implementation of the recommendations outlined in the feasibility study. The feasibility study will include completing a groundwater flow analysis, determining the potential for direct recharge, and developing a recycled water demand analysis. This information will inform the development of project alternatives. The recommended project will be further developed through design work. Implementation will include permitting, site preparation, construction, and testing. Costs for this project are estimated to be $15.15 million, with $150,000 for the feasibility study and $15 million for implementation. Implementation costs could be significantly less is the project is completed in phases.

Background Information

Water Supply

The City of Lodi has three sources of water for both potable and non-potable uses: groundwater, recycled water, and surface water purchased from the Woodbridge Irrigation District (WID). As shown in **Table 1**, groundwater is the city's primary supply, comprising between 49 and 67 percent of total supplies.

Table 1: Water Supplies for the City of Lodi

Supply	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)	2035 (AFY)
Woodbridge Irrigation District (Surface Water)	0	6,000	6,000	6,000	6,000	6,000
Groundwater	15,005	15,000	15,000	15,000	15,000	15,000
Recycled Water	7,095	7,861	8,262	8,683	9,126	9,592
Total	**22,100**	**28,861**	**29,262**	**29,683**	**30,126**	**30,592**

Source: City of Lodi, 2011

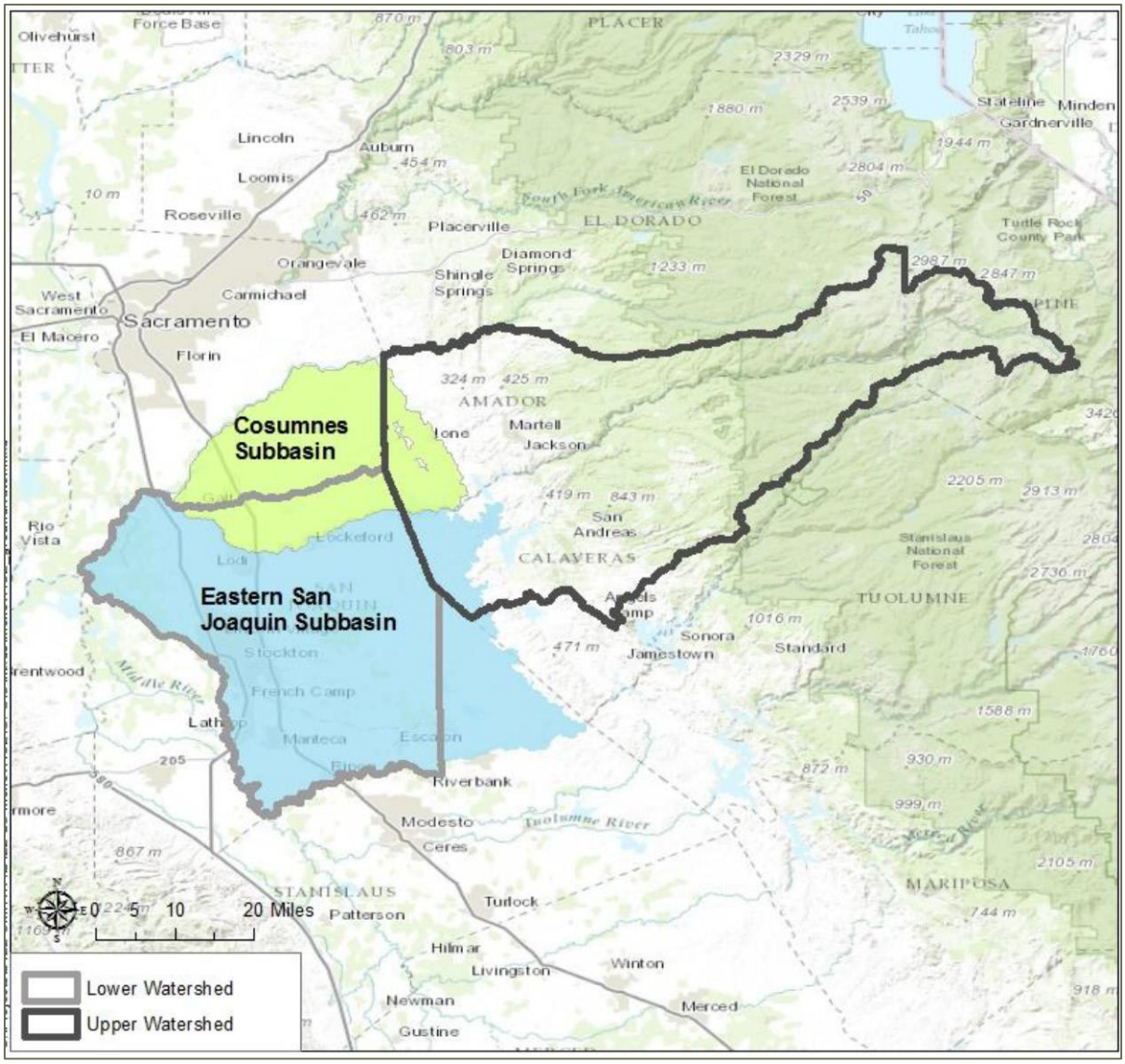
Surface Water

The City of Lodi currently purchases up to 6,000 acre-feet per year (AFY) surface water from WID, which is pumped from the Mokelumne River. The City treats this water at its new surface water treatment facility, which has a capacity of 10 million gallons per day (mgd), or 11,200 AFY (City of Lodi, 2011).

Groundwater

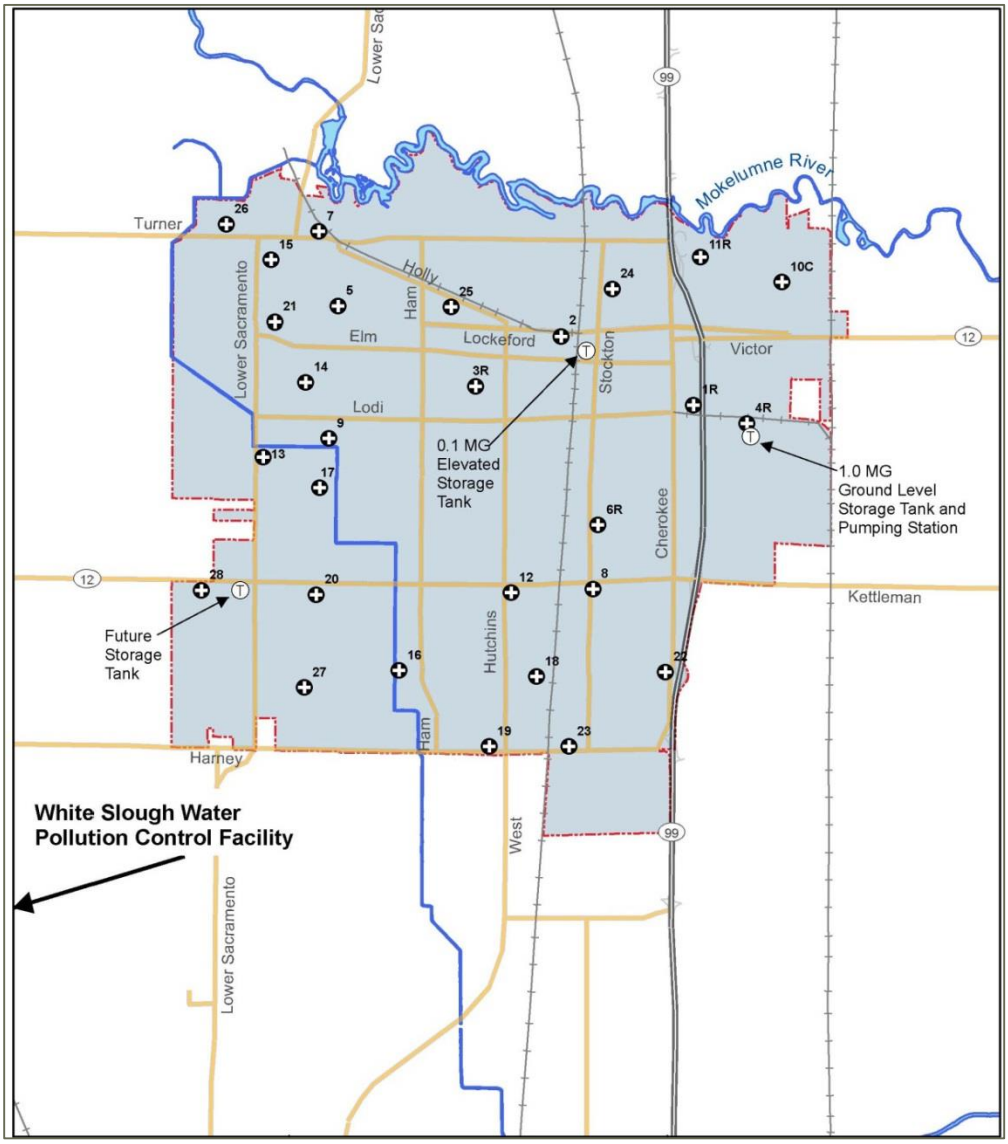
The City of Lodi overlies the Eastern San Joaquin Subbasin of the San Joaquin Valley Groundwater Basin (**Figure 1**). As shown in **Table 1**, groundwater is the primary water supply source for the city, which pumps approximately 15,000 AFY from 26 wells located throughout the city. Up until 2006, when the city entered into an agreement with WID, groundwater was the sole supply of potable water. The City has estimated a safe yield of the aquifer serving Lodi to be approximately 15,000 AFY, with projected pumping to remain within this limit (City of Lodi, 2011). **Figure 2** shows the location of the City's groundwater wells.

Figure 1: Groundwater Basins in the MokeWISE Region



Source: RMC, 2015

Figure 2: Groundwater Wells in the City of Lodi



Source: City of Lodi, 2011

Recycled Water

Wastewater is treated at the City of Lodi's existing White Slough Water Pollution Control Facility (WSWPCF), which currently treats all wastewater to tertiary standards. The WSWPCF currently treats a total of 7,100 AFY wastewater, of which 1,642 AFY is used to meet non-potable demands nearby. The remaining 5,458 AFY is discharged to Dredger Cut, which flows into the Delta. Total capacity of the WSWPCF is 9,592 AFY, with projected recycled water demands of 2,842 AFY for the City (current agricultural use and use at the NCPA power plant).

An additional 3,700 AFY recycled water may be used for an agricultural reuse project included in the City's 2008 Reclaimed Water Master Plan, leaving a potential 3,050 AFY of recycled water available for groundwater recharge or in-lieu use in the long-term (RMC 2015). At present, assuming the 3,700 AFY recycled water project is implemented, 1,758 AFY is available for other recycled water projects. Although the WSWPCF and surrounding lands are part of the City of Lodi, they are located approximately 4 miles west-southwest of the urbanized area of the city.

Recharge

Groundwater recharge through this project would be achieved using either direct recharge or in-lieu groundwater recharge. Direct recharge uses methods frequent referred to as "artificial recharge" because it moves water that would otherwise be elsewhere directly to the groundwater basin. Indirect recharge involves using other supply sources, such as recycled water, in lieu of pumping groundwater, reducing outflow from the basin.

Spreading Basins

Spreading basins hold water over a permeable surface, allowing it to percolate naturally into the aquifer below.

Injection Wells

Injection wells, also called aquifer recharge wells or aquifer storage and recovery (ASR) wells, are active means of moving water into the aquifer. An aquifer recharge well injects water into the aquifer, while an ASR well both injects water into the aquifer and extracts water. Use of an injection well enables artificial aquifer recharge even in areas with impermeable geologic features, or where the use of spreading basins is impractical (USEPA 1999).

In-Lieu

In-lieu groundwater recharge is a passive form of recharge. It occurs when groundwater extraction is reduced, which can be achieved by offsetting groundwater demand with alternate supplies, such as surface water or recycled water. By reducing groundwater pumping, natural inflows to the groundwater basin will recharge the aquifer.

Project Information

Project Description

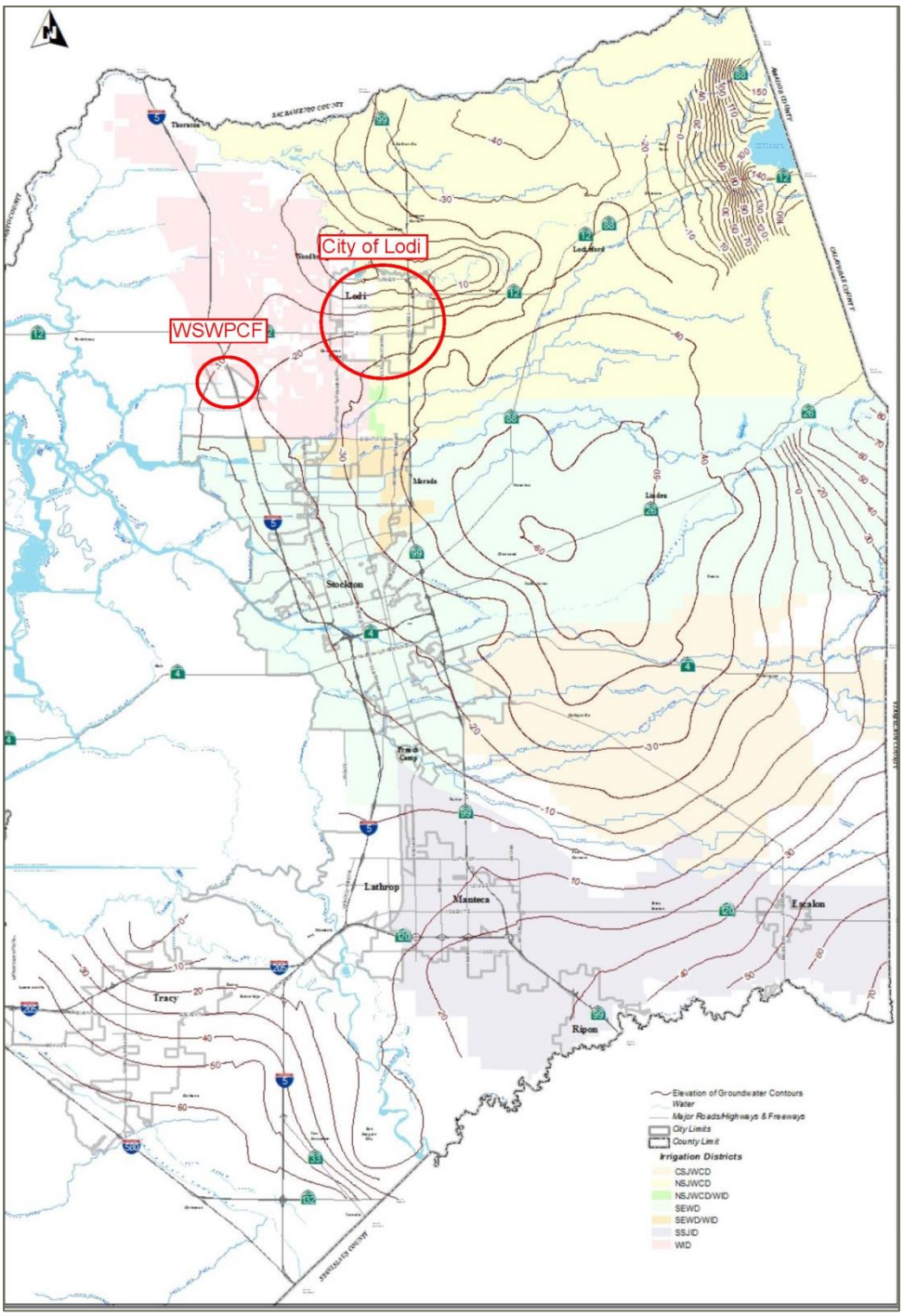
The Municipal Recycled Wastewater Recharge Program will investigate the potential for using treated, disinfected wastewater to recharge groundwater aquifers in the valley, either directly or indirectly through in-lieu use of the recycled water. This project includes two

components: 1) a feasibility study, and 2) implementation of feasibility study recommendations.

Project Location

The *Municipal Recycled Wastewater Recharge Program* would be located within the city of Lodi, with water recycling provided by the existing Lodi White Slough Water Pollution Control Facility, which currently treats to tertiary. Figure 1 shows the location of the proposed project, while **Figure 3** shows the location of the WSWPCF in relation to the City of Lodi.

Figure 3: Project Location



Source: RMC, 2015

Project Sponsor

City of Lodi is the project sponsor for the *Municipal Recycled Wastewater Recharge Program*. To-date, no additional project sponsors have been identified. Potential project partners include North San Joaquin Water Conservation District (NSJWCD) or Woodbridge Irrigation District (WID).

Scope of Work

Task 1. Develop Feasibility Study

A Feasibility Study will be developed to consider the potential for recycled water use to either direct groundwater recharge or indirect recharge through in-lieu use, in which recycled water offsets groundwater pumping, allowing for natural recharge of the groundwater basin to occur.

Task 1.1 Complete Groundwater Flow Analysis

A thorough understanding of the groundwater basin is required to determine the potential for groundwater recharge as a supply option. This analysis would identify and evaluate the inflows and outflows of the basin, both natural and engineered. The purpose of this analysis will be to provide the basis for developing potential project alternatives and determining the feasibility of direct recharge versus indirect recharge.

Task 1.2 Determine Potential for Direct Recharge

This task will assess the feasibility of implementing direct recharge. Direct recharge can be achieved through percolation, such as with the use of spreading ponds, or injection, in which recycled water is injected into the groundwater basin via injection wells. This task will evaluate the potential for each of these methods, based on the suitability for each method of the local geologic formations. Areas suitable for both of these methods, if applicable, will be identified, and further refined under Task 1.4 Develop Project Alternatives.

Task 1.3 Develop Recycled Water Demand Analysis

This task will assess alternatives for implementing in-lieu recharge. With this method, groundwater pumping is reduced and groundwater is recharged naturally because of the associated offset of demand for groundwater. For the City of Lodi, this could be achieved by increasing recycled water use within its service area. The City currently provides recycled water for users in the immediate vicinity of the WSWPCF, but does not have a recycled water distribution system in place for the urbanized area of the City.

This task will identify potential recycled water customers within the City and evaluate their demand. Due to the distance between the WSWPCF and the urban center of the City of Lodi, this task will also identify potential recycled water demands within the WID and NSJWCD service areas that could potentially be served by the project.

Task 1.4 Stakeholder Coordination

Potential recycled water project opportunities will be discussed with local stakeholders prior to making any implementation decisions. Concerns regarding the use of recycled water for agricultural irrigation in the region must be addressed with the potentially impacted parties in order to make beneficial decisions for all stakeholders involved. This task will include coordination with local stakeholders and potential major users to address concerns that exist or may arise as projects opportunities are explored.

Task 1.5 Develop Project Alternatives

The potential for direct recharge and in-lieu recharge will be used to develop project alternatives for both methods. For direct recharge, injection well and spreading pond sites will be identified, using the geologically-appropriate areas identified in Task 1.2, along with land uses (e.g., spreading ponds would not be located on a lot that currently houses an office building). Direct recharge alternatives shall attempt to locate recharge sites such that they maximize the benefits received by the City. Should recharge sites be best suited downgradient of groundwater wells, the feasibility analysis will consider the potential for water trading with nearby agencies that could benefit from this recharge. For in-lieu groundwater use, project alternatives will include grouping potential recycled water users to maximize demands while minimizing costs. Due to the distance between the WSWPCF and the urbanized areas of the city, the primary cost driver is anticipated to be the length of pipeline necessary to extend service to the users.

Project alternatives will also include preliminary identification of recycled water pipeline routes and sizes to serve each alternative, and consider the potential for connecting to existing recycled water distribution systems that may be owned by neighboring agencies.

Task 1.6 Conduct Cultural Resources Analysis

A cultural resources analysis will be performed to identify areas of high sensitivity that may be affected by construction of any required project element. Existing data records and information will be reviewed and both federally recognized and currently unrecognized Native American tribes within the region will be consulted.

The results of previous cultural resource studies and recorded cultural resources in the records search area will be plotted on 7.5-minute topographic quadrangles. Based on this analysis, an assessment will be prepared to address the sensitivity of the project elements with respect to cultural resources.

Task 1.7 Develop Recommended Project

The Feasibility Study will recommend a preferred project based on criteria such as potential demand served, potential recharge volume, costs, ease of implementation (e.g., level of difficulty to obtain applicable regulatory approval), the need for agreements with other entities, and potential for acquiring outside funding (e.g., grants and low-interest loans). The preferred alternative should aim to maximize the use of available recycled water, or up to 1,700 AFY in the near-term, and up to 3,050 AFY in the long-term. Once a preferred project is identified, the Feasibility Study will develop a more detailed project description, including a refined preliminary pipeline alignment, identification of the estimated facilities required for the preferred projects, and a more refined list of potential customers, should in-lieu recharge be the preferred project. Potential funding sources for the Recommended Project should also be identified.

Task 2. Implementation of Recommended Project

The Feasibility Study completed under Task 1 will form the basis for the implementation project to be completed under Task 2.

Task 2.1 Design

If direct groundwater recharge is selected under the Recommended Project in the Feasibility Study (Task 1), the primary design components would be the recharge site (spreading basins or injection wells), and the conveyance pipeline from the WSWPCF to the recharge area. Depending on the location of the recharge area, pump stations may also be required, along with any additional appurtenances necessary to convey the recycled water to the recharge area. An injection well generally includes the following components (USEPA, 1999):

- Well casing
- Well screen
- Sand/gravel (filter) pack around the screen
- Grout/cement around the casing
- Pump

If in-lieu groundwater recharge is selected as the Recommended Project, primary design components would include conveyance pipelines, and any necessary pump stations or appurtenances to convey recycled water to potential users. During this task, recycled water user agreements should be finalized.

Task 2.2 Environmental Documentation

Upon completion of design, environmental documentation must be completed for the project. It is anticipated that this project would need to undergo analysis under CEQA and NEPA given that federal permitting or funding would likely be part of the project. Should federal funding,

and not federal permitting, be part of the project, CEQA-Plus analysis should be sufficient. Given the size of this project, the potential for substantial pipeline construction, and reduction of flows to Dredger Cut (and subsequently the Delta), it is likely that an Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) would be required.

Task 2.3 Construction

Construction of the Project can be divided into the following subtasks:

- Subtask 2.3.1 Permitting
- Subtask 2.3.2 Site Preparation
- Subtask 2.3.3 Construction
- Subtask 2.3.4 Testing

Subtask 2.3.1 Permitting

Permits would be required for the Recommended Project from a variety of entities for construction, water reuse, and changes to discharges. Potential permits that may be necessary for the project are listed in **Table 2**. This list is a preliminary list and should not be considered exhaustive. Formal agreements should be obtained under this subtask should the Recommended Project identify a need for any. Additional permits or agreements should be identified in the Feasibility Study completed under Task 1.

Table 2: Potential Permits for Recommended Project

Agency	Permit
Regional Water Quality Control Board	Waste Discharge Requirements NPDES Permit Recycled Water Master Permit
California Department of Water Resources	Well Drilling
California Department of Public Health	Water Supply Permit
City of Lodi	Conditional Use Construction Permit Encroachment Permit Tree Removal Permit
Local Municipalities and San Joaquin County	Conditional Use Construction Permit Encroachment Permit Tree Removal Permit

Subtask 2.3.2 Site Preparation

Site preparation activities include setting up staging areas, assembling materials and equipment, and clearing ground for construction activities.

Subtask 2.3.3 Construction

Construction activities for any Recommended Project would include excavation for pipelines, pump stations and other conveyance appurtenances. If spreading ponds are included in the Recommended Project, additional excavation would be required at the spreading pond site. Construction of the spreading ponds would require appropriate reinforcement and installation of materials and equipment as required by the design and any applicable regulations and permits. Construction of injection wells would involve drilling the well(s), installing the well(s), and any other equipment necessary for well operation. Should the Recommended Project be in-lieu groundwater recharge from the conversion of non-potable uses from groundwater/potable water to recycled water, construction would primarily involve the conveyance pipelines and any necessary pump stations. It is assumed that pipelines would be constructed within roadway right-of-ways to the extent feasible, and that any disturbance from excavation activities would be restored to before-project conditions following installation of the pipeline.

Subtask 2.3.4 Testing

Prior to delivery of recycled water to customers or direct groundwater recharge activities, all facilities and project components will be tested. Following completion of successful testing and demobilization of equipment and construction sites, construction would be complete and recycled water deliveries or groundwater recharge could commence.

Budget

The estimated budget for the project is $15.15 million. Costs associated with the project are as follows:

- Feasibility Study: $150,000
    - These costs are based on the costs for similar Feasibility Studies, and on the total amount of water that could be used by the project.
- Implementation: $15,000,000
    - Implementation costs could be significantly less if the project is completed in phases.
- **Total Project Costs: $15,150,000**

These costs are based on the costs for similar Feasibility Studies, and on the total amount of water that could be used by the project. It was assumed that implementation costs would average $10,000 per AFY, although these costs could vary depending on the groundwater

recharge method selected, size of the final project, pipeline length, location, and any special considerations. Costs for implementation will be developed and refined under Task 1 Feasibility Study.

References

City of Lodi. 2011. 2010 Urban Water Management Plan. August. Available at: http://www.water.ca.gov/urbanwatermanagement/2010uwmps/Lodi,%20City%20of/Lodi%202010%20UWMP_Complete.pdf

RMC Water and Environment (RMC). 2015. MokeWISE Program Final Memorandum: Water Availability Analysis. January 9. Available at: http://mokewise.org/documents

United States Environmental Protection Agency (USEPA). 1999. The Class V Underground Injection Control Study. Volume 21. Aquifer Recharge and Aquifer Storage and Recovery Wells. September.