Attachment 3 – Project Justification

Introduction

The Upper Kings Basin IRWM Authority (Authority) has developed a priority list of projects as described in Attachment 1. This grant application proposal includes five projects from the Upper Kings IRWM region that serve to meet the needs created by the drought. The project proponents include Consolidated Irrigation District (CID), the City of Fresno (Fresno), Fresno Metropolitan Flood Control District (FMFCD), East Orosi Community Service District (EOCSD) and Sultana Community Service District (SCSD). The projects included in this application provide many benefits including increasing water supply and reliability, improving water quality, water conservation, helping meet the critical water needs of multiple disadvantaged communities and addressing the Human Right to Water.

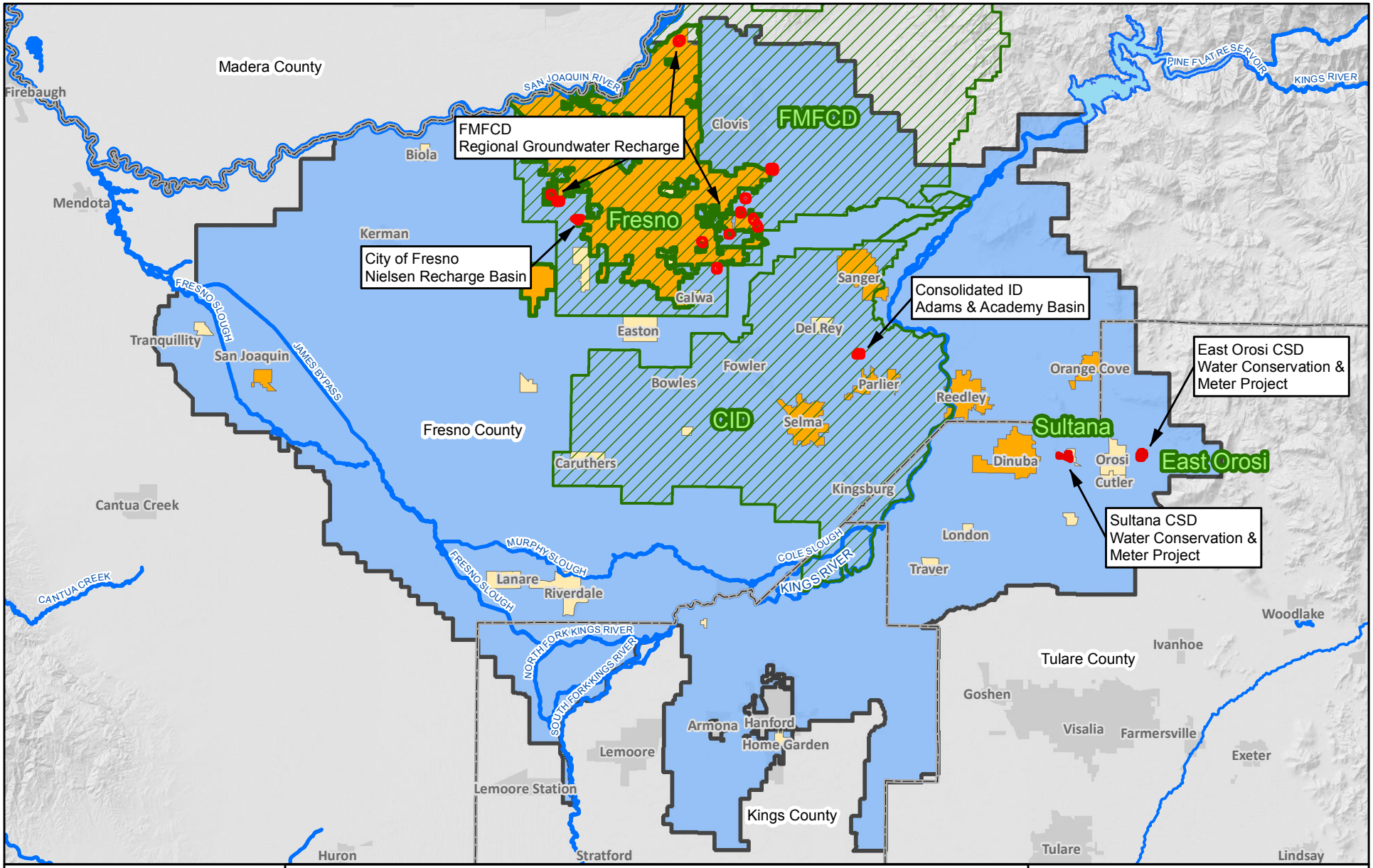
Project Summary Table

Table 3-1 identifies the Drought Project Element and IRWM Project Element that is applicable to each project. Drought Project Element No. 1 is addressed by all five projects included in the grant application and all remaining elements are addressed by at least one project.

Regional Map

The regional map included below identifies the IRWM boundary and includes a marker identifying all five projects contained in the Proposal.

Table 3-1: Project Summary Table (DWR Table 4)						
Drought Project Element		**CID: Adams and Academy Basin**	**Fresno: Nielsen Recharge Basin**	**FMFCD: Regional Groundwater Recharge Project**	**EOCSD: Water Conservation and Meter Project**	**SCSD: Water Conservation and Meter Project**
D.1	Provide immediate regional drought preparedness (as defined in Table 1 of the 2014 IRWM Guidelines)	X	X	X	X	X
D.2	Increase local water supply reliability and the delivery of safe drinking water	X	X	X	X	X
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective				X	X
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	X	X	X		
IRWM Project Element						
IR.1	Water supply reliability, water conservation, and water use efficiency	X	X	X	X	X
IR.2	Stormwater capture, storage, clean-up, treatment, and management	X	X	X		
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands					
IR.4	Non-point source pollution reduction, management, and monitoring					
IR.5	Groundwater recharge and management projects	X	X	X		
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users					
IR.7	Water banking, exchange, reclamation, and improvement of water quality	X	X	X		
IR.8	Planning and implementation of multipurpose flood management programs	X	X	X		
IR.9	Watershed protection and management					
IR.10	Drinking water treatment and distribution				X	X
IR.11	Ecosystem and fisheries restoration and protection	X				



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- Kings Basin IRWMP Boundary
- Proposed Projects
- DAC Incorporated City (Source CA DWR)
- DAC Unincorporated Area (Source CA DWR)
- County Boundary

Project Proponents:

City of Fresno
Consolidated ID
East Orosi
Fresno Metropolitan FCD
Sultana

Kings Basin Water Authority

Region Map

2014 Dought Solicitation

7/15/2014 : G:\Clients\Upper Kings Basin IRWMA - 2048\2014 IRWM Drought Solicitation\GIS\Map\Regional_Map.mxd

Project A: CID – Adams and Academy Basin

Project Description

The project, implemented by CID, is a 50-acre groundwater banking and recharge facility that will yield 1,320 acre-feet/year and recharge the aquifer.

Addressing Drought Impacts

As indicated in Attachment 2, CID's project addresses five of the listed Drought Impacts including,

- At risk of not meeting existing drinking water demands: The project will provide up to 2,268 AF/yr of recharge to replenish the aquifer that serves as the primary source of drinking water supply.
- At risk of not meeting existing agricultural water demands: The project will provide needed recharge in an area of declining groundwater levels, and will make approximately 1,320AF/yr available to the District should it choose to deliver to its growers. In years when CID has limited surface water supply (drought years) and the banked water is marketed, the banking operation will provide water to the growers immediately downstream of the project.
- At risk of not meeting ecosystem water demands: The project will provide habitat for a variety of animals such as red tail hawk, redwing blackbird, grackles, northern flicker, American coot, great white egret, great blue heron, American avocet, grey foxes, bullfrogs and western pond turtles. The Project will increase pooled surface water area and shoreline habitat, which will further establish and enhance existing wildlife ecosystems.
- Groundwater basin overdraft: The project will provide up to 2,268 AF/yr of groundwater recharge, which directly improves the condition of overdraft and will also make 1,320 AF/yr available to market for delivery within Kings service area, even in drought years, helping to reduce the groundwater pumping.
- Other drought related adverse impacts*:*
    - Delay of Potential Rate Increases: The marketing of water from the project will generate revenue for the District, helping to delay potential rate increases.

Eligible Drought Project Type

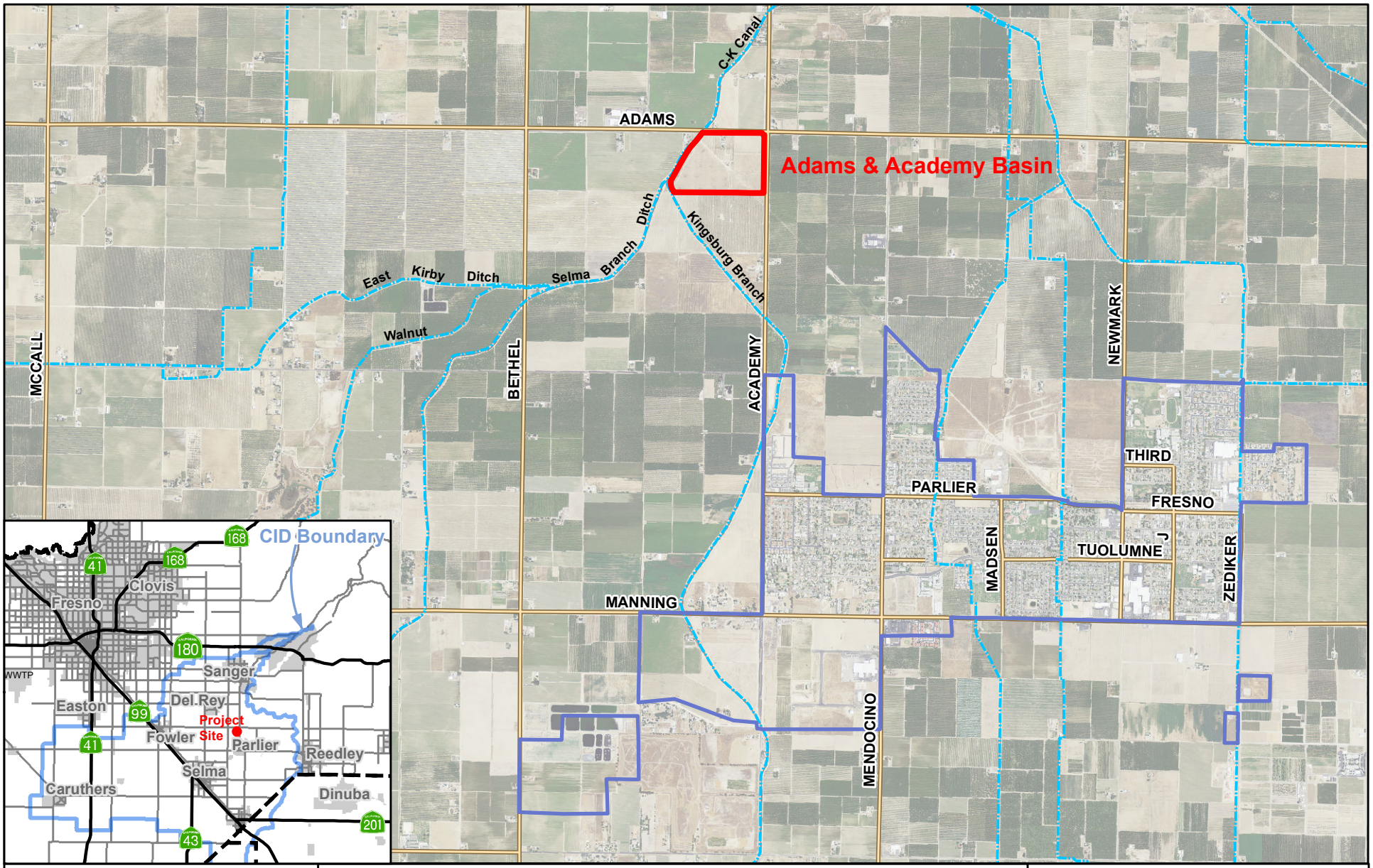
The project qualifies under the following eligible drought project types (from Section C of the 2014 Drought Solicitation PSP):

- Provide immediate regional drought preparedness (from Table 1 of the 2014 IRWM Drought Guidelines):
    - Promote water conservation, conjunctive use, reuse and recycling, improve landscape and agricultural irrigation efficiencies, and efficient groundwater basin management
- Increases local water supply reliability and the delivery of safe drinking water.
- Reduce water quality conflicts or ecosystem conflicts created by the drought

The project promotes water conservation and conjunctive use and improves irrigation efficiencies by raising groundwater levels, in turn reducing the amount of lift for nearby wells. The project also shows efficient groundwater basin management by capturing surface water lost to the District and the region, and using it to benefit groundwater replenishment and converting a portion to dry year supply available during drought conditions. Decreasing the quantity of water pumped increases local water supply reliability and aids in ensuring the delivery of safe drinking water. The project also provides habitat areas, which allow more opportunity for various species to seek shelter and satisfy their basic survival needs, and will help sustain the Kings River Fisheries Management Program.

Expedited Funding Needs

Expedited funding is important for this project so that design and construction of the facility can be developed to capture available surface water supplies as soon as possible. Each year that the project is delayed, the potential to capture and recharge an average of 2,268AF/yr (or as much as 6,300 AF in a year) at the site is missed. More importantly, with the addition of wells to recover groundwater, once water deliveries can be made to the basin for recharge, the project can generate approximately 1,320AF/yr for delivery and exchange.



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Legend

- Adams & Academy Basin Project Site
- City of Parlier
- Consolidated ID Facilities

Kings Basin Water Authority

CID: Adams & Academy Basin

Project Map

2014 Dought Solicitation

G:\Clients\Upper Kings Basin IRWMA - 2048\2014 IRWM Drought Solicitation\GIS\Map\Academy_Adams.mxd

Project Physical Benefits

Table 3-2: CID Annual Project Physical Benefits (DWR Table 5)				
Year	Benefit	Without Project	With Project	Change Resulting from Project
2015-2065	Banked Water / Dry Year Supply	0	up to 1,320 acre-ft/yr	up to 1,320 acre-ft/yr
2015-2065	Groundwater Recharge	0	up to 2,268 acre-ft/yr	up to 2,268 acre-ft/yr
2015-2065	Flood Diversion	0	40 cfs	40 cfs
2015-2065	Average water in bank (storage)	0	5,365 acre-ft	5,365 acre-ft
2015-2065	Surface Storage Capacity/ Regulation Reservoir	0	113 acre-ft	113 acre-ft
2015-2065	Sustaining the Fisheries Management Program	0	40 cfs	40 cfs
2015-2065	Habitat Creation	0	50 acres	50 acres
2015-2065	Energy Conservation	0	20,700 KWh/yr ($3,000)	20,700 KWh/yr ($3,000)
2015-2065	Greenhouse Gas Reduction	0	15metric tons/yr CO_2	15metric tons/yr CO_2

Technical Analysis of Physical Benefits Claimed

Technical Basis

A project feasibility study was completed in May 2014 for the project and is included as **Attachment 4b**. The feasibility study included site specific investigations and includes operational analysis based on surface water supply availability, site infiltration rate expectations, and recovery well capacity. The operational analysis is based on based historic hydrologic conditions and includes prior drought periods. The project recharge and operations analysis tables from the feasibility study are included as **Attachments 3a and 3b**, showing recharge, recovery and banked water supplies.

Preliminary basin layout plans have been prepared and are included as Attachment 9 of the project Feasibility Study (see **Attachment 4b)**. The District and the landowner have initiated negotiations for the sale of the property; the option language has been finalized and will be approved at CID's August Board meeting (see **Attachment 4a)**.

The workplan will include Monitoring, Assessment, and Performance Measures (MAPM) to ensure the project benefits are obtained. As part of the groundwater banking operations an annual report will be prepared including groundwater level and water quality data from a monitoring network surrounding the basin and a report of the measured flows into the basin, extracted from recovery wells and the resulting recharge and storage volumes.

Recent and Historical Conditions

Groundwater levels in Consolidated Irrigation District are declining. Data on CID groundwater levels are provided in **Attachment 3c**. This condition will be exacerbated by the drought as agricultural users in the area are required to rely more heavily on groundwater. This project will allow the local users to utilize banked groundwater and will support replenishing the aquifer.

Without Project Conditions

Without the project, none of the benefits would be realized. The water supply would flow out of the Kings Basin and be lost to local water users and lost to the region.

Methods to Estimate Physical Benefits

Primary Project Physical Benefit – Banked Water/Dry Year Supply

The project includes one recovery well that will provide up to 1,320AF/yr of banked groundwater recovery capacity. Additional yield could be achieved by extended pumping or constructing additional extraction wells at a later date. The estimation of the groundwater pumping and operations is presented in the Feasibility Study; the relevant pages have been extracted and are included as **Attachment 3b** (the Feasibility Study is included in **Attachment 4b**).

Primary Project Physical Benefit – Groundwater Recharge

A description and monthly simulation of the available surface water supplies that can be used for groundwater recharge/banking at the project shows that an average of 2,268 AF/year could be recharged by the project. The simulation is provided as **Attachment 3a**. The simulation is based on an assumed recharge rate of 0.5 feet/day, which is consistent with observed rates at other nearby District ponds. According to the Project Feasibility Study, this rate, or an even higher rate, could be maintained at the basin with proper maintenance. Over the 50-year life of the basin recharge would be over 113,000 AF. In very wet years, with long periods of floodwater, recharge could be as high as 6,375 AF in one year. The recharged water will help to raise groundwater levels, lower groundwater pumping costs, and provide a more reliable dry-year water supply. The project analysis includes a recharge leave behind of 10% or approximately 230 AF/yr (**Attachment 3b**) as a net benefit to the aquifer.

Secondary Project Physical Benefit – Flood Diversion

The project will have the capacity to divert up to 40 cfs of floodwater (see **Attachment 3a**). Average annual floodwater diversions to the project site are estimated to be approximately 2,268 AF. In very wet years, such as 1968-1969, 1979-1980 and 1982-1983, flood water was available for over 180 days each year. With six months of floodwater, diversions could be as high as 6,375 AF/year. This will reduce water levels and peak flows on the Kings River during flood periods, and thereby potentially reduce flood damage.

Secondary Project Physical Benefit – Average Water in Bank

As discussed above, the project will recharge up to 2,268 AF/yr and extract 1,320 AF/yr, depending on the water and weather conditions in the year. This practice will allow some amount of water to remain in the aquifer each year, which will also vary. **Attachment 3b** shows the anticipated quantity of water to remain in the groundwater bank for future use; the average amount in the bank is approximately 5,365 AF of supply that could be available for extraction.

Secondary Project Physical Benefit – Surface Storage Capacity/Regulation Reservoir

The project will have the capacity to divert floodwater, creating additional options for the routing of Kings River flood water and local stormwater that is routed into CID's system. Floodwater diversions will reduce water levels and peak flows on the Kings River during flood periods, and thereby potentially reduce flood damage. The water will be diverted on the east end of the San Joaquin Valley, and the flood reduction benefits will be realized along a significant reach of the Kings River. These flood flows ultimately reach the San Joaquin River and Delta, so some flood damage reduction will also be seen in those areas. The basin will provide additional 113 AF of surface storage. By providing additional floodwater routing capacity, the project has potential to help reduce flood-related damage to sensitive habitat in the Kings River and local streams.

Secondary Project Physical Benefit – Sustaining the Fisheries Management Program

This project will have the capacity to divert up to 40 cfs (see **Attachment 3a**) and will help sustain the fisheries management program on the Kings River while allowing the District not to lose their portion of the committed flows. This project will allow CID to divert water down the river for the fishery to CID's headgates, then ultimately route and store the water at the project's recharge locations. CID will then be able to pump groundwater for delivery to its growers and exchange or sell surface water supplies in Pine Flat Reservoir.

Secondary Project Physical Benefit – Habitat Creation

The project site will be converted from agricultural land to a 50-acre recharge basin that is periodically flooded. This will provide the following benefits to local wildlife:

- Water supply for terrestrial wildlife
- Creation of waterfowl, upland, wetland and aquatic habitat
- Resting, roosting, nesting, drinking, and foraging habitat for waterfowl, shorebirds, resident and migratory birds and a variety of other wildlife
- Waterfowl habitat for bird species on the Pacific flyway
- Reduction in fugitive dust and pesticide applications from changing the land use from agriculture to recharge basins

The project will also include the following features that will improve wildlife habitat:

- Flat Levee Slopes. Interior levee slopes will be 5H:1V, which will promote the growth of native wetland and upland vegetation to provide wildlife habitat.
- Varying Water Depths. Water depths in the basin will frequently vary, providing a variety of habitat environments for different species, including foraging areas for waterfowl, shorebirds, and other wildlife.
- Interior Levees. The interior levee for the settling channel will provide semi-isolated habitat and safer conditions from predation.

These features will significantly improve habitat for local wildlife, which has been highly disturbed for many years due to agricultural activity.

Secondary Project Physical Benefit – Energy Conservation & Greenhouse Gas Reduction

Energy will be saved by raising groundwater levels and reducing pumping lifts. If it is assumed that the recharged water spreads out over six square miles then water levels will rise several feet each year. It is assumed that this water is available on average for two years before it is pumped out and used. Using these criteria energy savings will be about 20,700 KWH/year which has a value of about $3,000. This also equates to a reduction in greenhouse gasses of 14.6 metric tons/year of carbon dioxide (see **Attachment 3i**).

Secondary Project Physical Benefit – Water Quality Improvement

While not easily quantifiable, the project will have a positive impact on local groundwater quality by mixing high quality surface water with lower quality groundwater. This will also aid with slowing movement of any groundwater contamination plumes in the area.

Facilities, Policies, and Actions Required

The project would require a turnout structure to divert water from the Centerville Kingsburg Canal, into a settlement channel that will settle out fines that could potentially plug the basin floors, into a distribution structure that would distribute water from the settlement channel and into the basins. Monitoring wells would be established to gage impacts from the project and determine if changes need to be made during operations of the project. A recovery well will provide for a way to extract water that has been stored and deliver water to downstream users.

Potential Adverse Physical Effects

No potential adverse effects are anticipated from the project. Recharge basins sometimes cause groundwater mounding and high groundwater levels on adjacent lands. This is a low concern for this project since the basin is depressed and below the surrounding ground surface and the sandy soils should quickly absorb water delivered to the site. The facility will also include a monitoring network using existing wells around the basin to track monitor water level and provide information to reduce or stop recharge if water levels are raised too high.

Cost Effectiveness Analysis

<table>
<tr><th colspan="2">Table 3-3: Cost Effective Analysis (DWR Table 6)</th></tr>
<tr><td colspan="2">Project Name: CID – Adams and Academy Basin (Project A)</td></tr>
<tr><td>Question 1</td><td>Types of benefits provided as shown in Table 5 (Annual Project Physical Benefits)

Provide groundwater recharge of approximately 2,268AF/yr, and annual yield of 1,320AF/yr.</td></tr>
<tr><td rowspan="3">Question 2</td><td>Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?

Yes; alternative methods to achieve the same benefits include constructing a recharge basin at an alternate site or purchasing additional surface water supplies as needed.</td></tr>
<tr><td>If no, why? N/A</td></tr>
<tr><td>If yes, list the methods (including the proposed project) and estimated costs.
<table>
<tr><th>Alternatives</th><th>Estimated Cost</th></tr>
<tr><td>Proposed Project</td><td>$4,435,109</td></tr>
<tr><td>Recharge Basin at Different Location</td><td>$5M (likely higher land price, difficulty of finding a willing seller, plus new costs for investigation, technical studies, and engineering work already complete)</td></tr>
<tr><td>Purchase 2,268AF Surface Water Supply</td><td>$22M (2,268AF/yr @$200/AF for 50 years; $200AF considered average price. Dry year prices this year selling for $1000-$1500/AF)</td></tr>
</table></td></tr>
<tr><td>Question 3</td><td>If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.

The proposed project is the least cost alternative.</td></tr>
</table>

Project B: City of Fresno – Nielsen Groundwater Recharge Basin

Project Description

The City of Fresno, Nielsen Recharge Basin Project would include 35 acres of property used for the construction of a groundwater recharge facility.

Addressing Drought Impacts

As indicated in Attachment 2, the City's project addresses three of the listed Drought Impacts including,

- At risk of not meeting existing drinking water demands: The project will provide up to 2,096 AF/yr of recharge to replenish the aquifer that serves as the primary source of drinking water supply.
- At risk of not meeting ecosystem water demands: The project will provide habitat for a variety of animals such as red tail hawk, redwing blackbird, grackles, northern flicker, American coot, great white egret, great blue heron, American avocet, grey foxes, bullfrogs and western pond turtles. The Project will increase pooled surface water area and shoreline habitat, which will further establish and enhance existing wildlife ecosystems.
- Groundwater basin overdraft: The project will provide up to 2,096 AF/yr of groundwater recharge, which directly improves the condition of overdraft.

Eligible Drought Project Type

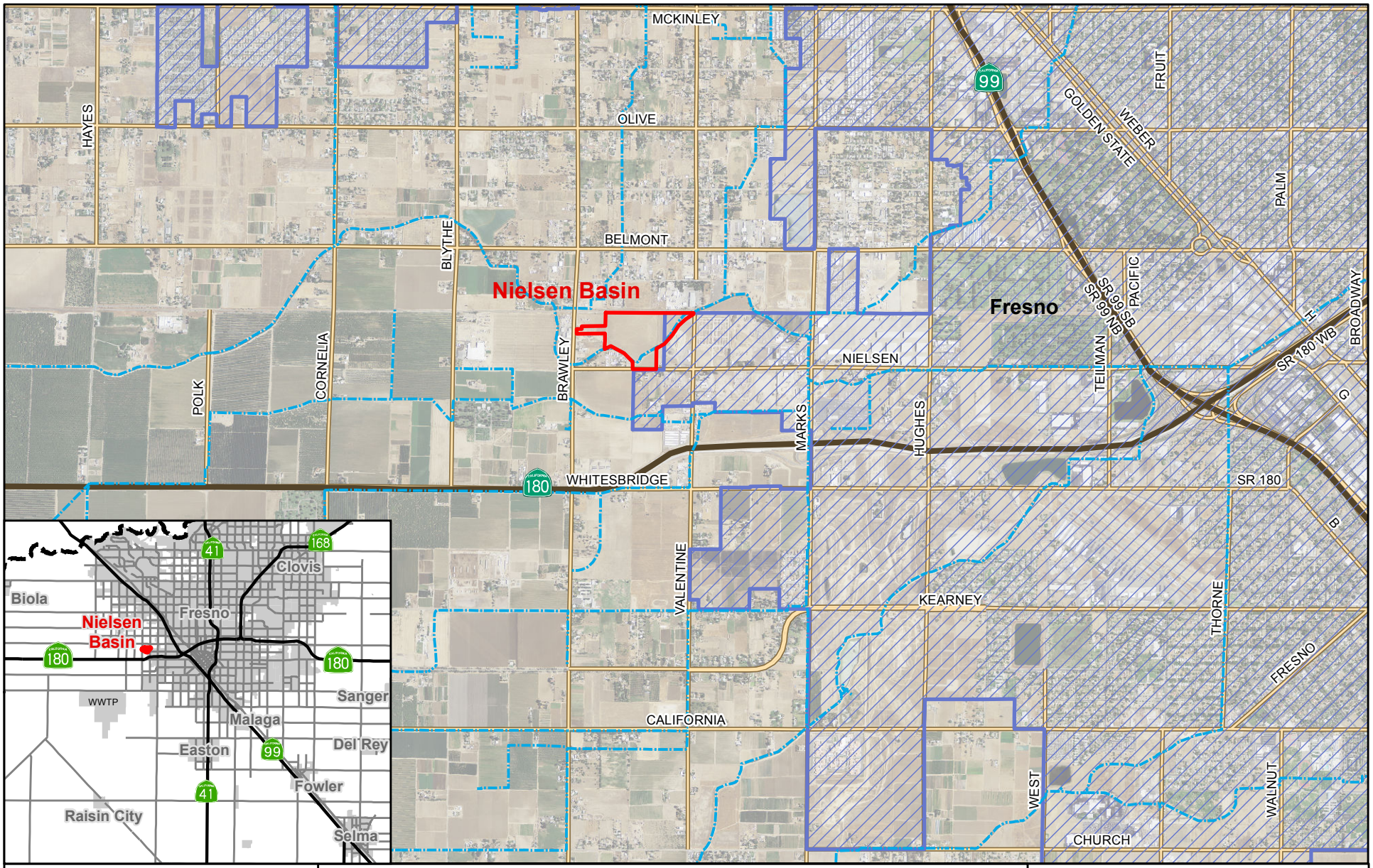
The project qualifies under the following eligible drought project types (from Section C of the 2014 Drought Solicitation PSP):

- Provide immediate regional drought preparedness (from Table 1 of the 2014 IRWM Drought Guidelines):
  - Promote … conjunctive use … and efficient groundwater basin management
- Increases local water supply reliability and the delivery of safe drinking water
- Reduce water quality conflicts or ecosystem conflicts created by the drought

The Project effectively addresses long-term drought preparedness by storing wet year flood water for future use (conjunctive use) and contributes to meeting the City of Fresno's Urban Water Management Plan goals by helping to efficiently manage the groundwater basin in the region. Currently the groundwater basin that supplies that City of Fresno with the majority of their drinking water is in critical overdraft. Conjunctive use also will aid in increasing local water supply reliability. The project will also promote safe drinking water. Increased depth to the water table can create water quality problems requiring additional treatment costs; mixing higher quality surface water supplies with lower quality groundwater supplies positively impacts the quality of the groundwater supply. The project also provides habitat areas, which allow more opportunity for various species to seek shelter and satisfy their basic survival needs.

Expedited Funding Needs

Expedited funding is important for this project so that design and construction of the facility can be developed to capture available surface water supplies as soon as possible. Each year that the project is delayed, the potential to capture and recharge an average of 2,096AF/yr at the site is missed.



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Legend

- Nielsen Recharge Basin Project Site
- City of Fresno - City Limits
- Fresno ID Facilities

Kings Basin Water Authority

Fresno: Nielsen Recharge Basin

Project Map

2014 Dought Solicitation

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Project Physical Benefits

Table 3-4: City of Fresno Annual Project Physical Benefits (DWR Table 5)				
Year	**Benefit**	**Without Project**	**With Project**	**Change Resulting from Project**
2015-2065	Groundwater Recharge	0	1,876 AF/yr	1,876 AF/yr
2015-2065	Flood Diversion	0	220 AF/yr	220 AF/yr
2015-2065	Surface Storage Capacity / Regulation Reservoir	0	200 acre-feet	200 acre-feet
2015-2065	Habitat Creation	0	30 acres	30 acres
2015-2065	Energy Creation	0	188,640 KWh/yr ($25,000)	188,640 KWh/yr ($25,000)
2015-2065	Greenhouse Gas Reduction	0	133.1 metric tons/yr CO_2	133.1 metric tons/yr CO_2

Technical Analysis of Physical Benefits Claimed

Technical Basis

An Initial Study and Mitigated Negative Declaration (IS/MND) was completed for the project in February 2011. The IS/MND included project discussion and analysis based on surface water supply availability and infiltration rates. The operational and recharge analyses are based on historical hydrologic conditions, knowledge of similar recharge basin operations in the area, and geotechnical investigations of the area.

Preliminary project plans have been prepared and are included as **Attachment 4e**. The City owns the property, as evidenced by **Attachment 4c**.

Recent and Historical Conditions

Groundwater levels in the City of Fresno are declining and the aquifer beneath the city has developed a cone of depression due to overdraft in the past. A series of graphics showing the decline of groundwater levels in the area are included in **Attachment 3d**. This project will allow the City to more fully use its surface water supplies and stormwater to replenish the aquifer.

Without Project Conditions

Without the project, none of the benefit would be realized; the water supply would flow out of the Kings Basin as it has done in past years.

Methods to Estimate Physical Benefits

<u>Primary Project Physical Benefit – Groundwater Recharge</u>

The primary focus of the project is to reduce groundwater overdraft in the region. The project will provide up to an average amount of 1,876 AF/yr. The Project will consist of approximately 18.4 acres of recharge area. The estimated recharge capacity for the project is 0.4 AF per acre per day. Estimating 255 days of use in the non-rainy months, during the Fresno Irrigation District's water delivery season, the project will utilize a planned recharge volume of 1,876 AF/year (0.4AF/Ac/day * 18.4Ac * 255 days/yr).

<u>Primary Project Physical Benefit – Flood Diversion</u>

During the rainy season (October through March), the ability for the City to receive surface supply waters is somewhat impaired due to the need for FID to direct stormwater away from the metropolitan area utilizing the canal system. With the construction of this basin, those waters could be captured and directed to the project site. This would offer dual benefit, giving additional flood protection as well as capturing additional water and recharging the aquifer. If this water is not captured in this manner, it will continue out of the area and not offer a

benefit offsetting the City's groundwater degradation. Approximately 220 AF/yr (0.4AF/Ac/day * 18.4Ac * 30 days/yr) could be applied to the recharge, based on the estimated recharge capacity of 0.4 AF per acre per day for a portion of the rainy season (30 days of 111 available days).

Secondary Project Physical Benefit – Surface Storage Capacity/Regulation Reservoir

The project will have the capacity to divert floodwater, creating additional options for the routing of regional flood water and local stormwater that is routed into FID's system. The basin will provide additional 200 AF of surface storage. By providing additional floodwater routing capacity, the project has potential to help reduce flood-related damage to sensitive habitat in the area and along local streams.

Secondary Project Physical Benefit – Habitat Creation

The project site will be converted from vacant land to a 35-acre recharge basin; portions of the site will remained undeveloped, it is anticipated approximately 30-acres will be developed with this project. This will provide the following benefits to local wildlife:

- Water supply for terrestrial wildlife
- Creation of waterfowl, upland, wetland and aquatic habitat
- Resting, roosting, nesting, drinking, and foraging habitat for waterfowl, shorebirds, resident and migratory birds and a variety of other wildlife
- Waterfowl habitat for bird species on the Pacific flyway
- Reduction in fugitive dust and pesticide applications from changing the land use from agriculture to recharge basins

The project will also include the following features that will improve wildlife habitat:

- Flat Levee Slopes. Interior levee slopes will be 5H:1V, which will promote the growth of native wetland and upland vegetation to provide wildlife habitat.
- Varying Water Depths. Water depths in the basin will frequently vary, providing a variety of habitat environments for different species, including foraging areas for waterfowl, shorebirds, and other wildlife.
- Interior Levees. The interior levee for the settling channel will provide semi-isolated habitat and safer conditions from predation.

These features will significantly improve habitat for local wildlife, which has been highly disturbed for many years due to agricultural activity.

Secondary Project Physical Benefit – Energy Conservation & Greenhouse Gas Reduction

Energy will be saved by raising groundwater levels and reducing pumping lifts. If it is assumed that the recharged water spreads out over six square miles then water levels will rise several feet each year. It is assumed that this water is available on average for two years before it is pumped out and used. Using these criteria energy savings will be about 188,640 KWH/year which has a value of about $25,000. This also equates to a reduction in greenhouse gasses of 133.1 metric tons/year of carbon dioxide (see **Attachment 3i**).

Secondary Project Physical Benefit – Water Quality Improvement

While not easily quantifiable, the project will have a positive impact on local groundwater quality by mixing high quality surface water with lower quality groundwater. This will also aid with slowing movement of any groundwater contamination plumes in the area (see **Attachment 3e**).

Facilities, Policies, and Actions Required

The project would require a turnout structure to divert water from the Houghton Canal, into a settlement channel that will settle out fines that could potentially plug the basin floors, into a distribution structure that would distribute water from the settlement channel and into the basins.

Potential Adverse Physical Effects

No potential adverse effects are anticipated from the project. Recharge basins sometimes cause groundwater mounding and high groundwater levels on adjacent lands. This is a low concern for this project since the basin is depressed and below the surrounding ground surface and the sandy soils should quickly absorb water delivered to the site.

Cost Effectiveness Analysis

<table>
<tr><th colspan="2">Table 3-5: Cost Effective Analysis (DWR Table 6)</th></tr>
<tr><td colspan="2">Project Name: City of Fresno – Nielsen Basin Recharge Project (Project B)</td></tr>
<tr><td>Question 1</td><td>Types of benefits provided as shown in Table 5 (Annual Project Physical Benefits)

Provide groundwater recharge of approximately 1,876 AF/yr, and flood diversion of 200 AF/yr; a total of 2,096 AF/yr is anticipated.</td></tr>
<tr><td rowspan="3">Question 2</td><td>Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?

Yes, other properties were considered for possible recharge sites. This site was chosen due to its availability, its proximity to an FID canal, and the location of the site to the critically over drafted groundwater basin.</td></tr>
<tr><td>If no, why?</td></tr>
<tr><td>If yes, list the methods (including the proposed project) and estimated costs.

<table>
<tr><th>Alternatives</th><th>Estimated Cost</th></tr>
<tr><td>Proposed Project</td><td>$4,564,643</td></tr>
<tr><td>Recharge Basin at Different Location</td><td>$6.5M (Currently the City owns the property on which the project is proposed. If the City was to choose another recharge site of similar size and site characteristics it would cost an additional $1,804,900 (value of the property in 2011), plus the cost of all site investigations, to develop the site into a recharge basin.)</td></tr>
</table></td></tr>
<tr><td>Question 3</td><td>If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.

The proposed project is the least cost alternative.</td></tr>
</table>

Project C: FMFCD – Regional Groundwater Recharge Project

Project Description

The FMFCD project consists of interconnecting eleven existing basins with FID canals to increase the groundwater recharge of the basins by 2,390 AF/yr.

Addressing Drought Impacts

As indicated in Attachment 2, FMFCD's project addresses three of the listed Drought Impacts including,

- At risk of not meeting existing drinking water demands: The project will provide up to 2,390 AF/yr of recharge to replenish the aquifer that serves as the primary source of drinking water supply.
- At risk of not meeting ecosystem water demands: The project will provide habitat for a variety of animals such as red tail hawk, redwing blackbird, grackles, northern flicker, American coot, great white egret, great blue heron, American avocet, grey foxes, bullfrogs and western pond turtles. The Project will increase pooled surface water area and shoreline habitat, which will further establish and enhance existing wildlife ecosystems.
- Groundwater basin overdraft: The project will provide up to 2,390 AF/yr of groundwater recharge, which directly improves the condition of overdraft.

Eligible Drought Project Type

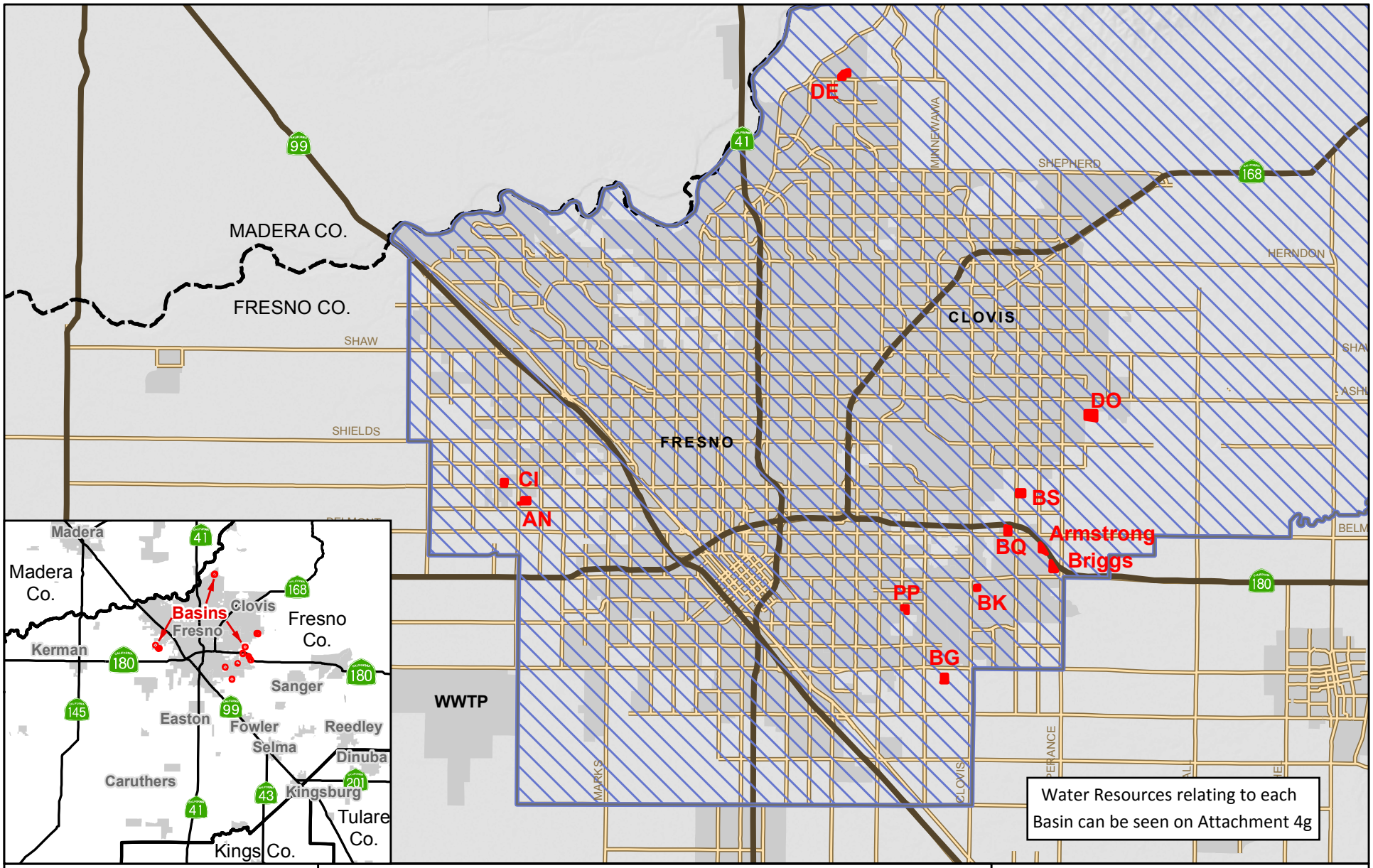
The project qualifies under the following eligible drought project types (from Section C of the 2014 Drought Solicitation PSP):

- Provide immediate regional drought preparedness (from Table 1 of the 2014 IRWM Drought Guidelines):
  - Promote … conjunctive use … and efficient groundwater basin management
- Increases local water supply reliability and the delivery of safe drinking water
- Reduce water quality conflicts or ecosystem conflicts created by the drought

The Project effectively addresses long-term drought preparedness by storing wet year flood water for future use (conjunctive use) and contributes to meeting the City of Fresno's Urban Water Management Plan goals by helping to efficiently manage the groundwater basin in the region. Currently the groundwater basin that supplies that City of Fresno with the majority of their drinking water is in critical overdraft. Conjunctive use also will aid in increasing local water supply reliability. The project will also promote safe drinking water. Increased depth to the water table can create water quality problems requiring additional treatment costs; mixing higher quality surface water supplies with lower quality groundwater supplies positively impacts the quality of the groundwater supply. The project also provides habitat areas, which allow more opportunity for various species to seek shelter and satisfy their basic survival needs.

Expedited Funding Needs

Expedited funding is important for this project so that design and construction of the facility can be developed to capture available surface water supplies as soon as possible. Each year that the project is delayed, the potential to capture and recharge an average of 2,390AF/y at the site is missed.



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- Basins
- FMFCD

Kings Basin Water Authority

FMFCD: Regional Groundwater Recharge

Project Map

2014 Dought Solicitation

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Project Physical Benefits

Table 3-6: City of Fresno Annual Project Physical Benefits (DWR Table 5)				
Year	**Benefit**	**Without Project**	**With Project**	**Change Resulting from Project**
2015-2065	Groundwater Recharge	0	2,390 AF/yr	2,390 AF/yr
2015-2065	Surface Storage Capacity / Regulation Reservoir	0	76.2 acre-feet	76.2 acre-feet
2015-2065	Habitat Creation	0	75 acres	75 acres
2015-2065	Energy Creation	0	263,250 KWh/yr ($34,000)	263,250 KWh/yr ($34,000)
2015-2065	Greenhouse Gas Reduction	0	185.7 metric tons/yr CO_2	185.7 metric tons/yr CO_2

Technical Analysis of Physical Benefits Claimed

Technical Basis

The physical benefits estimated for the sites are based on accomplishing surface water recharge at all sites in the category as well as stormwater recharge at two sites (Briggs and Armstrong Basins). There are two types of recharge that occur in stormwater basins: surface water recharge and stormwater recharge. Surface water recharge is accomplished by diverting surface water, from FID's surface water delivery system, to stormwater basins. Surface water recharge runs parallel with FID's water delivery season. Stormwater recharge is a secondary benefit of FMFCD's system of stormwater basins. By retaining stormwater, it is allowed to percolate and recharge the groundwater aquifer.

To estimate surface water recharge amounts in advance, FMFCD created a recharge model. This model factors in data such as percolation rate, degree of excavation, authorized water level, construction, maintenance, excavation, delivery capability, and delivery season duration. The model calculates surface water on a monthly basis. To estimate stormwater recharge that has occurred, a model, similar to the surface water recharge model was created. This model uses percolation rate and degree of excavation to estimate stormwater recharge based on past water level readings. The basis for the calculations in both models is the percolation rate and the design of the basin. The percolation rate is either measured or estimated based on nearby sites. The design of the basin is used to create an elevation-storage curve. In either model, the water elevation is compared to the elevation-storage curve to determine the volume of water in the basin, which is used to determine how much water a given percolation rate will recharge. These calculations are carried out for the entire month. See **Attachment 3f** for information on the modeling factors, and recharge calculations.

The annual Project physical benefits were estimated using the aforementioned models (based on assumed water elevations). Year-to-year recharge volumes increase because several basins are not completely excavated; therefore, the assumption was made that incomplete basins would have material removed each year and, therefore, provide more surface water recharge capacity. FMFCD desilts its stormwater basins approximately every five years, which accounts for the extreme drop-off of recharge every fifth year. Years when basins are assumed to be desilted are not given zero values because of stormwater recharge estimated for two sites.

Recent and Historical Conditions

Groundwater levels around the Fresno Metropolitan Flood Control District are declining. Data on groundwater levels are provided in **Attachment 3d**. This project will allow the District to more fully use available surface water supplies and stormwater to replenish the aquifer.

Without Project Conditions

Without the project, none of the benefit would be realized; the water supply would flow out of the Kings Basin as it has done in past years.

Methods to Estimate Physical Benefits

Primary Project Physical Benefit – Groundwater Recharge

The primary focus of the project is to reduce groundwater overdraft in the region. The project will provide up to an average amount of 2,390 AF/yr. In future years, Basins "BG", "BS" and "DO" will have increased capacity due to additional excavation (see **Attachment 3f**).

Secondary Physical Project Benefit – Habitat Creation

Two wildlife enhancement metrics were used to illustrate wildlife benefits; pooled surface water area and additional shoreline length. FMFCD Project basins will increase wildlife habitat by increasing the amount of pooled surface water and shoreline habitat during the summer recharge season. Birds, mammals, frogs, fish and turtles spend some or all of their life cycle in or around the water and depend on this habitat for breeding, foraging, hunting, fishing, and other essential uses. The project will provide increased habitat for a variety of song birds, raptors and water fowl like red tail hawks, redwing blackbirds, grackles, northern flicker, American coot, great white egret, great blue heron and the American avocet, grey foxes, bullfrogs and western pond turtles. The Project will increase pooled surface water area by 75 acres and shoreline habitat by 4.2 miles, which will further establish and enhance existing wildlife ecosystems. The following table shows the benefits increasing as the project construction progresses, after 2017, the benefit level will remain constant.

Secondary Project Physical Benefit – Energy Conservation & Greenhouse Gas Reduction

Energy will be saved by raising groundwater levels and reducing pumping lifts. If it is assumed that the recharged water spreads out over six square miles then water levels will rise several feet each year. It is assumed that this water is available on average for two years before it is pumped out and used. Using these criteria energy savings will be about 263,250 KWH/year which has a value of about $34,000. This also equates to a reduction in greenhouse gasses of 185.7 metric tons/year of carbon dioxide (see **Attachment 3i**).

Secondary Project Physical Benefit – Water Quality Improvement

While not easily quantifiable, the project will have a positive impact on local groundwater quality by mixing high quality surface water with lower quality groundwater. This will also aid with slowing movement of any groundwater contamination plumes in the area (see **Attachment 3e**).

Without Project Conditions

Without the project, none of the benefit would be realized. The water supply would flow out of the Kings Basin and be lost to local water users.

Facilities, Policies, and Actions Required

The project would require interconnection of basins and canals (see **Attachment 4g** for preliminary design of each basin) identified in the project description. Additionally, an agreement with Caltrans would be required to legally transfer the Armstrong and Briggs basins to FMFCD. The District has prepared a MOU with Caltrans outlining the terms of the transfer agreement (see **Attachment 4f**). Both Caltrans and FMFCD will require action to be taken by their governing boards to move forward with the transfer; however, based upon discussions conducted with Caltrans, there are not problems anticipated with moving forward.

Potential Adverse Physical Effects

No potential adverse effects are anticipated from the project.

Cost Effectiveness Analysis

<table>
<tr><th colspan="2">Table 3-7: Cost Effective Analysis (DWR Table 6)</th></tr>
<tr><td colspan="2">Project Name: FMFCD – Regional Groundwater Recharge Project (Project C)</td></tr>
<tr><td>Question 1</td><td>Types of benefits provided as shown in Table 5 (Annual Project Physical Benefits)

Provide groundwater recharge of approximately 2,390AF/yr and habitat creation.</td></tr>
<tr><td rowspan="3">Question 2</td><td>Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?

Yes; alternatives considered include selecting different basins or constructing new basins</td></tr>
<tr><td>If no, why?</td></tr>
<tr><td>If yes, list the methods (including the proposed project) and estimated costs.
<table>
<tr><th>Alternatives</th><th>Estimated Cost</th></tr>
<tr><td>Proposed Project</td><td>$4,678,302</td></tr>
<tr><td>Recharge at Different Basin Locations</td><td>$5.6M (The District evaluated proximity to FID water supplies and level of completeness of excavation at the basin site; basins farther from FID facilities or with more excavation required would incur additional costs in construction.)</td></tr>
<tr><td>Recharge at Additional Basin Locations</td><td>$6M (The District also evaluated recharge efficacy of each the basin site and weighed it against the cost; selecting other basins would necessitate interconnecting additional basins to achieve comparable benefits.)</td></tr>
</table></td></tr>
<tr><td>Question 3</td><td>If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.

The proposed project is the least cost alternative.</td></tr>
</table>

Project D: East Orosi CSD – Water Conservation and Meter Project

Project Description

The EOCSD project consists of installing 115 radio read water meters and ultra-low flush toilets throughout the community, reducing groundwater pumping by 22.1 AF/yr.

Addressing Drought Impacts

As indicated in Attachment 2, EOCSD's project addresses three of the listed Drought Impacts including,

- At risk of not meeting existing drinking water demands: The project will provide conservation of up to 22.1 AF/yr, sustaining the life of their community wells in area of declining groundwater levels and poor water quality.
- Drinking water MCL violations: The project will help reduce demand, which will help sustain the aquifer and lower the risk of their well that periodically exceeds the MCL for nitrate, having to be modified or replaced.
- Groundwater basin overdraft: The project will reduce pumping demand by an approximately 22.1 AF/yr, helping to sustain the groundwater aquifer.

Eligible Drought Project Type

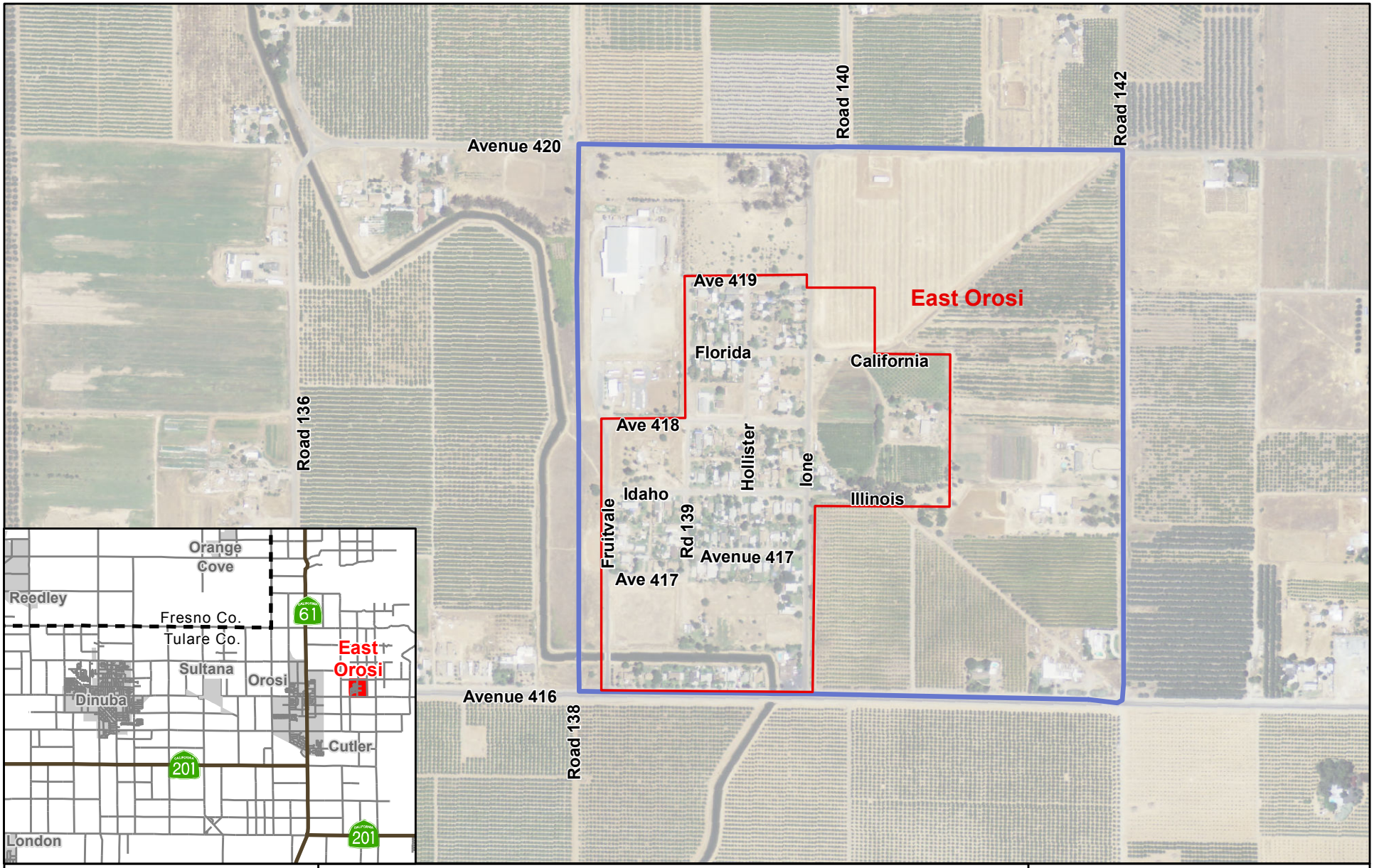
The project qualifies under the following eligible drought project types (from Section C of the 2014 Drought Solicitation PSP):

- Provide immediate regional drought preparedness (from Table 1 of the 2014 IRWM Drought Guidelines):
    - Promote water conservation
    - Achieve long term reduction of water use
    - Efficient groundwater basin management
- Increases local water supply reliability and the delivery of safe drinking water
- Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective

The project promotes water conservation by charging a volumetric rate for water used by each household (water connection), in turn minimizing the amount of groundwater to be extracted. Decreasing the quantity of water pumped increases local water supply reliability and aids in ensuring the delivery of safe drinking water. The project also provides the District assistance to implement a government mandated system improvement (water meter installation) that is not locally cost effective (as discussed in detail in Attachment 1).

Expedited Funding Needs

Expedited funding is important for this project so construction of the improvements can begin in the near-term is beneficial for the region so the meters can be in use as soon as possible and the groundwater pumping reduction can be realized as soon as 2015, potentially.



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- Project Limits
- East Orosi

Kings Basin Water Authority

East Orosi CSD:
Water Conservation & Meter Project

Project Map

2014 Dought Solicitation

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Project Physical Benefits

Table 3-8: EOCSD Annual Project Physical Benefits (DWR Table 5)				
Year	Benefit	Without Project	With Project	Change Resulting from Project
2015-2045	Water Conservation (Meters)	0	18.53 AF/yr	18.53 AF/yr
2015-2035	Water Conservation (ULFTs)	0	3.54 AF/yr	3.54 AF/yr
2015-2045	Energy Conservation	0	$2,470 (12,150 KWh)	$2,470 (12,150 KWh)
2015-2045	Greenhouse Gas Reduction	0	8.6 metric tons/yr CO_2	8.6 metric tons/yr CO_2

Technical Analysis of Physical Benefits Claimed

Technical Basis

The project is necessary for two main reasons, first to promote and realize water conservation with the community and second to comply with legislative requirements from AB 2572:

> *Section 527. (a) An urban water supplier that is not subject to Section 526 shall do both the following: (1) Install water meters on all municipal and industrial service connections located within its service area on or before January 1, 2025.*
> *(2) (A) Charge each customer that has a service connection for which a water meter has been installed, based on the actual volume of deliveries, as measured by the water meter, beginning on or before January 1, 2010.*
> *(B) Notwithstanding subparagraph (A), in order to provide customers with experience in volume-based water service charges, an urban water supplier that is subject to this subdivision may delay, for one annual seasonal cycle of water use, the use of meter-based charges for service connections that are being converted from non-volume based billing to volume-based billing.*

The installation of the residential water meters and ultra-low flush toilets will improve the sustainability of the ground water supply and will be instrumental in conserving water in East Orosi. As shown in Table 3-10, metering with a volumetric pricing structure encourages conservation. The installation of the meters and volumetric pricing will provide an incentive for water conservation. The project will also enable the District to accurately track actual water consumption by customers and accurately identify water loss within the distribution system by making total usage data available, which can be compared to flow meters at wellheads in a water audit. Lost water has a value and an even more valuable commodity in drought conditions.

Recent and Historical Conditions

Groundwater levels in the East Orosi CSD service area are declining (see **Attachment 3g**) and the community's wells have, on occasions experienced MCL exceedances of nitrate. This project will allow the District to reduce its groundwater pumping and allow the aquifer to recover.

Without Project Conditions

Without the project, none of the benefit would be realized. It is anticipated that continuing the status quo of using a flat rate billing system will further continue water use practices in the community that contribute to the current over drafted conditions.

Methods to Estimate Physical Benefits

Primary Project Physical Benefit – Water Conservation

Water Meter Component

East Orosi delivered 92.7 AF of water in 2013-2014. It is estimated that the use of water meters will save approximately 20 percent of current water usage or approximately 18.53 AF/yr. Water savings from meters is predicated upon the implementation of a volumetric rate structure, which the District is in the process of establishing and will be in place prior to start of construction in April 2015. The 20 percent savings estimate is based on several sources, detailed in the following table.

Table 3-9: Consumption Reduction Estimates

Source	Description	Reduction Estimate
Alliance for Water Efficiency	http://allianceforwaterefficiency.org/metering.aspx	15-30%
City of Fresno, Water Division	Initial stages of City-wide metering project. Per capita usage reduced from 301 to 239 gallons per day from 2008 to 2012	21%
City of Clovis	Comparison of metered community in Clovis (249 gpd, Clovis 2010 UWMP) to unmetered community in adjacent Fresno (313 gpd, 2010 Fresno UWMP)	20%
City of Kerman	City of Kerman water records from 2008 to 2010 after meters were installed in part of City (249 gpcpd to 184 gpcpd).	26%

Ultra Low Flow Toilet Component

As detailed in Exhibit 6 of the Memorandum of Understanding Regarding Urban Water Conservation in California (see **Attachment 1q**, page 79) and based on one toilet per household and a household size of 3.0[1], the estimated conservation per toilet is 27.5 gallons per day per toilet. The program will be available to all households in the community; at full implementation, this component of the project will conserve 3.54 AF/yr.

Table 3-10: East Orosi CSD - ULFT Water Savings Calculations

ULFT Units	Water Savings Per ULFT Per Day (gal)*	Daily Savings (gal)	Annual Savings (AF)
115	27.5	3,163	3.54

Between both components, the entire project is estimated to save 22.1 AF/yr, approximately 23.8% of the total water deliveries of the community. This analysis will utilize data collected one-year prior and one year post project to determine the actual water savings.

Secondary Project Physical Benefit – Energy Conservation

With an overall water conservation savings of 22.1 AF/yr or 23.8% of the total water deliveries, the related costs to pump the water will decrease proportionally. In 2013, the District used 51,000 KWh for pumping, relating to a cost of $10,367 in pumping costs; the anticipated savings in pumping $2,470 (23.8% of $10,367). This benefit will

[1] The average household size of homes within East Orosi is 4.42 persons per house hold (2008-2012 American Community Survey, Table QT-P11); however, conservatively, the estimated water savings for a household size of 3.0 was used (see **Attachment 3k**).

directly apply to the residents within East Orosi, enabling the District to avoid raising rates due to the decreases annual costs to the District.

Secondary Project Physical Benefit –Greenhouse Gas Reduction

Related to the reduced amount of groundwater pumping costs and electrical uses, the project would require less electricity and therefore would reduce greenhouse gas emissions used to generate electricity. Based on an estimated 7.0555×10^{-4} tons of CO_2 per KWh (see **Attachment 3j**), it is anticipated the project will save 8.6 metric tons of CO_2 annually.

Table 3-11: East Orosi CSD – Energy Conservation & Greenhouse Gas Reduction		
Annual Energy Usage (for Pumping)	51,006	KWh
Energy Conservation (23.8%)	12,150	KWh
Greenhouse Gas Equivalencies	0.0007	CO_2 tons/KWh
Greenhouse Gas Reduction	8.6	metric tons of CO_2

Facilities, Policies, and Actions Required

East Orosi CSD will conduct a rate study and Proposition 218 election to establish the volumetric pricing structure; this process is discussed in Attachment 4 and 6 and is anticipated to be complete prior to April 2015 so the project construction may begin on schedule. Once complete and adopted, the construction of meters will begin. Concurrent with the rate establishment, the Board and community advocates (Community Water Center and Self Help Enterprises) will assist with outreach to community members to promote the installation of ULFTs in all homes; it is anticipated, based on preliminary discussions with residents, the program will be well received.

Potential Adverse Physical Effects

No potential adverse effects are anticipated from the project.

Cost Effectiveness Analysis

Table 3-12: Cost Effective Analysis (DWR Table 6)

Project Name: East Orosi CSD – Water Conservation and Meter Project (Project D)

Question 1	*Types of benefits provided as shown in Table 5 (Annual Project Physical Benefits)* Water conservation of approximately 22.1 AF/yr, energy savings of approximately 12,150 KWh/yr, and reduction of greenhouse gases (8.6 tons of CO_2) is anticipated.
Question 2	*Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?* Yes; alternatives considered include constructing a recharge facility, constructing a new well, or installing direct read meters.
	If no, why?
	If yes, list the methods (including the proposed project) and estimated costs.

Alternatives	Estimated Cost
Proposed Project	$288,770
Construct Recharge Facility	$600,000 (The District would have to locate property to purchase and an available surface water supply, plus conduct studies and engineering work.)
Construct a New Well	$500,000 (This solution would increase the reliability of the system but would not provide the conservation benefit to the aquifer.)
Utilize Direct Read Meters	$450,000 (These meters are initially less costly to install, but much more time is involved in reading the meters, transcribing readings to billing programs with the potential of errors that can lead to inaccurate customer billings. The annualized costs of utilizing the direct read meter alternative were calculated and found to be significantly more than radio read meters.)

Question 3	*If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.* The proposed project is the least cost alternative.

Project E: Sultana CSD – Water Conservation and Meter Project

Project Description

The SCSD project consists of installing 242 radio read water meters and ultra-low flush toilets throughout the community, reducing groundwater pumping by 43.1 AF/yr.

Addressing Drought Impacts

As indicated in Attachment 2, SCSD's project addresses three of the listed Drought Impacts including,

- At risk of not meeting existing drinking water demands: The project will provide conservation of up to 43.1 AF/yf, sustaining the life of their community wells in area of declining groundwater levels and poor water quality.
- Drinking water MCL violations: The project will help reduce demand, which will help sustain the aquifer and lower the likelihood of needing to utilize their backup well, which exceeds the MCL for DBCP.
- Groundwater basin overdraft: The project will reduce pumping demand by an approximately 43.1 AF/yr, helping to sustain the groundwater aquifer.

Eligible Drought Project Type

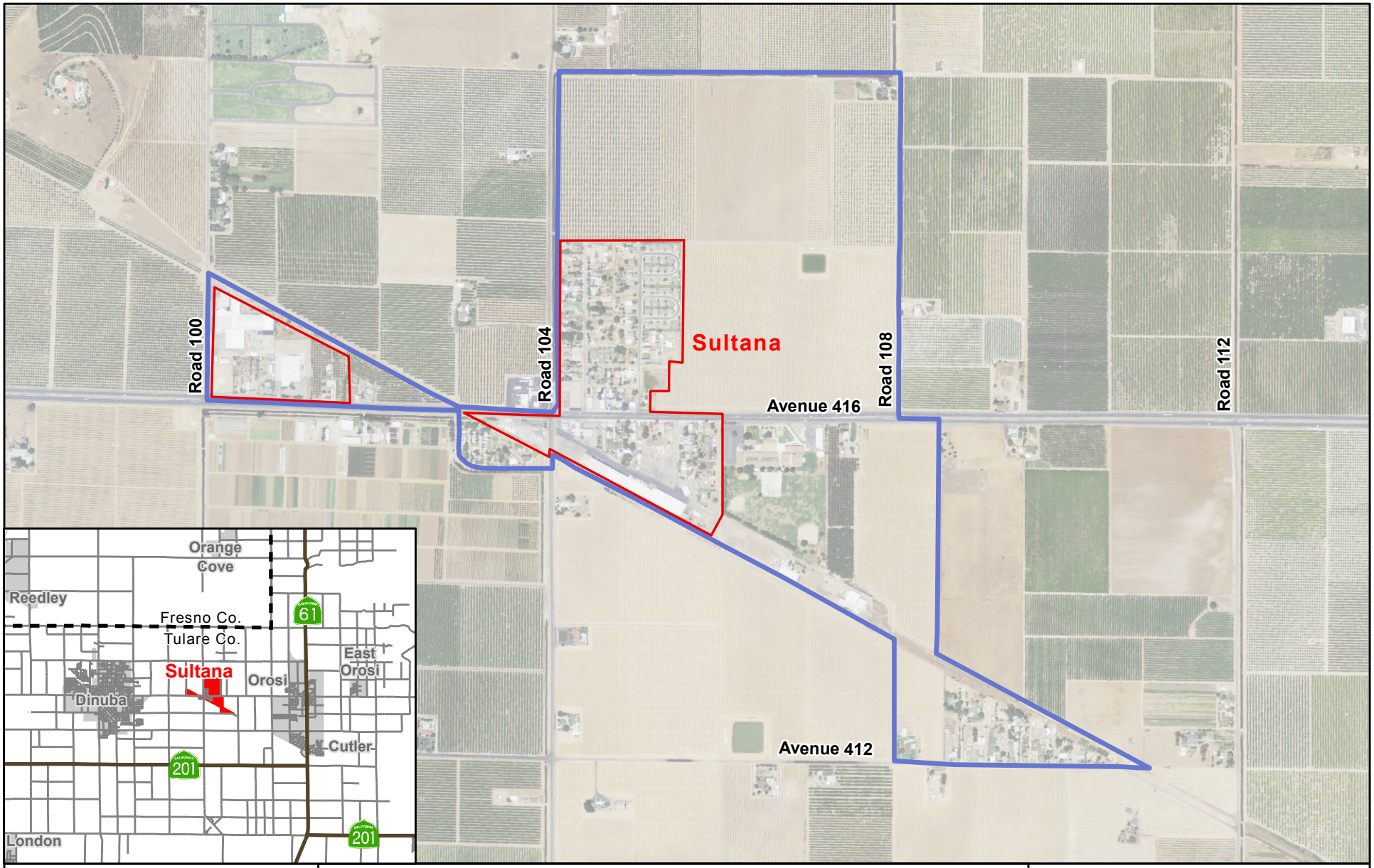
The project qualifies under the following eligible drought project types (from Section C of the 2014 Drought Solicitation PSP):

- Provide immediate regional drought preparedness (from Table 1 of the 2014 IRWM Drought Guidelines):
  - Promote water conservation
  - Achieve long term reduction of water use
  - Efficient groundwater basin management
- Increases local water supply reliability and the delivery of safe drinking water
- Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective

The project promotes water conservation by charging a volumetric rate for water used by each household (water connection), in turn minimizing the amount of groundwater to be extracted. Decreasing the quantity of water pumped increases local water supply reliability and aids in ensuring the delivery of safe drinking water. The project also provides the District assistance to implement a government mandated system improvement (water meter installation) that is not locally cost effective (as discussed in detail in Attachment 1).

Expedited Funding Needs

Expedited funding is important for this project so construction of the improvements can begin in the near-term is beneficial for the region so the meters can be in use as soon as possible and the groundwater pumping reduction can be realized as soon as 2015, potentially.



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- Project Limits
- Sultana CSD

Kings Basin Water Authority

Sultana CSD:
Water Conservation & Meter Project

Project Map

2014 Dought Solicitation

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Project Physical Benefits

Table 3-13: EOCSD Annual Project Physical Benefits (DWR Table 5)				
Year	**Benefit**	**Without Project**	**With Project**	**Change Resulting from Project**
2015-2045	Water Conservation (Meters)	0	35.62 AF/yr	35.62 AF/yr
2015-2035	Water Conservation (ULFTs)	0	7.45 AF/yr	7.45 AF/yr
2015-2045	Energy Conservation	0	$3,535 (17,620 KWh)	$3,535 (17,620 KWh)
2015-2045	Greenhouse Gas Reduction	0	12.4 metric tons/yr CO_2	12.4 metric tons/yr CO_2

Technical Analysis of Physical Benefits Claimed

Technical Basis

The project is necessary for two main reasons, first to promote and realize water conservation with the community and second to comply with legislative requirements from AB 2572:

> *Section 527. (a) An urban water supplier that is not subject to Section 526 shall do both the following: (1) Install water meters on all municipal and industrial service connections located within its service area on or before January 1, 2025.*
> *(2) (A) Charge each customer that has a service connection for which a water meter has been installed, based on the actual volume of deliveries, as measured by the water meter, beginning on or before January 1, 2010.*
> *(B) Notwithstanding subparagraph (A), in order to provide customers with experience in volume-based water service charges, an urban water supplier that is subject to this subdivision may delay, for one annual seasonal cycle of water use, the use of meter-based charges for service connections that are being converted from non-volume based billing to volume-based billing.*

The installation of the residential water meters and ultra-low flush toilets will improve the sustainability of the ground water supply and will be instrumental in conserving water in Sultana CSD. As shown in Table 3-15, metering with a volumetric pricing structure encourages conservation. The installation of the meters and volumetric pricing will provide an incentive for water conservation. The project will also enable the District to accurately track actual water consumption by customers and accurately identify water loss within the distribution system by making total usage data available, which can be compared to flow meters at wellheads in a water audit. Lost water has a value and an even more valuable commodity in drought conditions.

Recent and Historical Conditions

Groundwater levels in the Sultana CSD service area are declining (see **Attachment 3h**) and the community's wells have, on occasions experienced MCL exceedances of nitrate. This project will allow the District to reduce its groundwater pumping and allow the aquifer to recover.

Without Project Conditions

Without the project, none of the benefit would be realized. It is anticipated that continuing the status quo of using a flat rate billing system will further continue water use practices in the community that contribute to the current over drafted conditions.

Methods to Estimate Physical Benefits

Primary Project Physical Benefit – Water Conservation

Water Meter Component

Sultana delivered 178.1 AF of water in 2013. It is estimated that the use of water meters will save approximately 20 percent of current water usage or approximately 35.62 AF/yr. Water savings from meters is predicated upon the implementation of a volumetric rate structure, which the District is in the process of establishing and will be in place prior to start of construction in April 2015. The 20 percent savings estimate is based on several sources, detailed in the following table.

Table 3-14: Consumption Reduction Estimates

Source	Description	Reduction Estimate
Alliance for Water Efficiency	http://allianceforwaterefficiency.org/metering.aspx	15-30%
City of Fresno, Water Division	Initial stages of City-wide metering project. Per capita usage reduced from 301 to 239 gallons per day from 2008 to 2012	21%
City of Clovis	Comparison of metered community in Clovis (249 gpd, Clovis 2010 UWMP) to unmetered community in adjacent Fresno (313 gpd, 2010 Fresno UWMP)	20%
City of Kerman	City of Kerman water records from 2008 to 2010 after meters were installed in part of City (249 gpcpd to 184 gpcpd).	26%

Ultra Low Flow Toilet Component

As detailed in Exhibit 6 of the Memorandum of Understanding Regarding Urban Water Conservation in California (see **Attachment 1q**, page 79) and based on one toilet per household and a household size of 3.0[2], the estimated conservation per toilet is 27.5 gallons per day per toilet. The program will be available to all households in the community; at full implementation, this component of the project will conserve 7.45 AF/yr.

Table 3-15: East Orosi CSD - ULFT Water Savings Calculations

ULFT Units	Water Savings Per ULFT Per Day (gal)*	Daily Savings (gal)	Annual Savings (AF)
242	27.5	6,655	7.45

Between both components, the entire project is estimated to save 43.1 AF/yr, approximately 24.2% of the total water deliveries of the community. This analysis will utilize data collected one-year prior and one year post project to determine the actual water savings.

Secondary Project Physical Benefit – Energy Conservation

With an overall water conservation savings of 43.1 AF/yr or 24.2% of the total water deliveries, the related costs to pump the water will decrease proportionally. In 2013, the District used 72,840 KWh for pumping, relating to a cost of $14,614 in pumping costs; the anticipated savings in pumping $3,535 (24.2% of $14,614). This benefit will

[2] The average household size of homes within Sultana is 3.52 persons per house hold (2008-2012 American Community Survey, Table QT-P11); however, conservatively, the estimated water savings for a household size of 3.0 was used (see **Attachment 3l**).

directly apply to the residents within Sultana, enabling the District to avoid raising rates due to the decreases annual costs to the District.

Secondary Project Physical Benefit –Greenhouse Gas Reduction

Related to the reduced amount of groundwater pumping costs and electrical uses, the project would require less electricity and therefore would reduce greenhouse gas emissions used to generate electricity. Based on an estimated 7.0555×10^{-4} tons of CO_2 per KWh (see **Attachment 3j**), it is anticipated the project will save 8.6 metric tons of CO_2 annually.

Table 3-16: East Orosi CSD – Energy Conservation & Greenhouse Gas Reduction		
Annual Energy Usage (for Pumping)	72,840	KWh
Energy Conservation (23.8%)	17,617	KWh
Greenhouse Gas Equivalencies	0.0007	CO_2 tons/KWh
Greenhouse Gas Reduction	12.4	metric tons of CO_2

Facilities, Policies, and Actions Required

Sultana CSD will conduct a rate study and Proposition 218 election to establish the volumetric pricing structure; this process is discussed in Attachment 4 and 6 and is anticipated to be complete prior to April 2015 so the project construction may begin on schedule. Once complete and adopted, the construction of meters will begin. Concurrent with the rate establishment, the Board and community advocates will assist with outreach to community members to promote the installation of ULFTs in all homes; it is anticipated, based on preliminary discussions with residents, the program will be well received.

Potential Adverse Physical Effects

No potential adverse effects are anticipated from the project.

Cost Effectiveness Analysis

<table>
<tr><th colspan="2">Table 3-17: Cost Effective Analysis (DWR Table 6)</th></tr>
<tr><td colspan="2">Project Name: East Orosi CSD – Water Conservation and Meter Project (Project D)</td></tr>
<tr><td>Question 1</td><td>Types of benefits provided as shown in Table 5 (Annual Project Physical Benefits)

Water conservation of approximately 43.1 AF/yr, energy savings of approximately 17,617 KWh/yr, and reduction of greenhouse gases (12.4 tons of CO_2) is anticipated.</td></tr>
<tr><td rowspan="3">Question 2</td><td>Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?

Yes; alternatives considered include constructing a recharge facility, constructing a new well, or installing direct read meters.</td></tr>
<tr><td>If no, why?</td></tr>
<tr><td>If yes, list the methods (including the proposed project) and estimated costs.
<table>
<tr><th>Alternatives</th><th>Estimated Cost</th></tr>
<tr><td>Proposed Project</td><td>$520,474</td></tr>
<tr><td>Construct Recharge Facility</td><td>$800,000 (The District would have to locate property to purchase and an available surface water supply, plus conduct studies and engineering work.)</td></tr>
<tr><td>Construct a New Well</td><td>$500,000 (This solution would increase the reliability of the system but would not provide the conservation benefit to the aquifer.)</td></tr>
<tr><td>Utilize Direct Read Meters</td><td>$750,000 (These meters are initially less costly to install, but much more time is involved in reading the meters, transcribing readings to billing programs with the potential of errors that can lead to inaccurate customer billings. The annualized costs of utilizing the direct read meter alternative were calculated and found to be significantly more than radio read meters.)</td></tr>
</table></td></tr>
<tr><td>Question 3</td><td>If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.

The proposed project is the least cost alternative.</td></tr>
</table>