

## Attachment 6 – Monitoring, Assessment, and Performance Measures

A description of the proposed Monitoring Assessment and Performance Measures (MAPM) is provided here for each of the projects. The Authority has previously been awarded grants for groundwater banking and meter installation projects. For similar projects included in this application, a similar MAPM is proposed herein.

### Project 1: Consolidated Irrigation District South and Highland Basin

A ground water monitoring program will be put in place that will consist of District staff recording monitoring well levels and flow measurement in order to track recharge and recovery operations, groundwater levels and groundwater quality. A network of monitoring wells, flow measurement at individual turnouts, and recovery wells are proposed and will be monitored so that a complete water balance can be estimated for the project site. A sample table of contents for the annual facility report is included as **Attachment 6a**. This monitoring will help in determining the following parameters:

- 1) Determine long-term recharge rate for the facility;
- 2) Evaluate the effect of groundwater recharge on shallow groundwater levels beneath and adjacent to the facility;
- 3) Determine drawdown during recovery well pumping in zones tapped by nearby water supply wells;
- 4) Evaluate development of operation and maintenance procedures to maintain or enhance recharge rates;
- 5) Evaluate need for measures to increase recharge rates, should long-term rates be found inadequate;
- 6) Evaluate need for measures to reduce groundwater mounding should it be found to adversely affect properties or public facilities adjacent to the facility;
- 7) Determine measures to limit drawdown in water supply wells within the area as needed;
- 8) Evaluate the ability to monitor project operations and to allow controls so that the project accomplishes the goals of developing additional water supplies while not negatively affecting neighboring landowners;
- 9) Evaluate effect of groundwater recharge on local groundwater quality.

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
Expand the available water supply to the Kings River region	Bank water to provide an additional annual water supply average of 2,500 AF	Amount of water pumped and extracted using the banking facility recovery wells	Project completion and evaluation of operations	Meters installed on all recovery wells, annual exchange of water supply based on pumpage amount in accordance water transfers/sales	Create 2,500 AF additional average annual water supply
Make use of the portion of Kings River floodwater and fishery water that is lost to CID and the Kings River region	Utilize surface water supplies during the irrigation season that is usually only available to CID during low demand periods of the year	Completed project. Amount of water diverted and recharged at the site	Measurement of water diverted into project basins	Meters installed at recharge facilities and turnouts, documentation of water supplied to facility	Bank an average of 3,200 AF per year
Increase groundwater storage	Provide recharge capacity to provide additional storage	Completion of recharge facilities	Groundwater levels in the project vicinity	Groundwater monitoring with onsite monitoring wells to identify mounding and available storage.	Up to 10,000 AF of additional extractable groundwater storage

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
Provide a reliable, dry year water supply	Bank water to provide an additional annual water supply average of 2,500 AF	Amount of water pumped and extracted using the banking facility recovery wells	Project completion and evaluation of operations	Meters installed on all recovery wells, annual exchange of water supply based on pumpage amount in accordance water transfers/sales	Create 2,500 AF additional average annual water supply, available during dry years
Reduce local groundwater overdraft	Reduction in groundwater overdraft in CID and project vicinity and maintain groundwater levels	Amount of water recharged, recovered, exchanged	Groundwater levels within CID and project vicinity	Groundwater monitoring using the proposed monitoring well canvass to identify mounding and available storage	10% of banked water will be considered recharged into aquifer, lost from banking operations
Sustain the local agricultural community by providing revenue to CID	Completed project generating revenue by future water sales and transfers, funding to construct additional banking	Quantity of water sold, operational costs	Amount of revenue generated from water sales	Meters installed on all recovery wells, annual exchange of water supply based on pumpage amount in accordance water transfers/sales	Additional operating revenue over and above operational/sales costs

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
	projects and subsidize water costs to CID customers.				
Minimize flooding damage by diverting some floodwaters	New facilities that can divert floodwaters and thereby reduce the potential for flood related damage downstream of the project site	New facilities capable of diverting and recharging water including turnouts, and basin improvements	Volume of floodwater diverted and recharged each year	Water measurement facilities on project turnouts	Divert and bank long term average of 3,200 AF per year, utilizing available Kings River floodwater and fish flows
Increase knowledge of the local geology and hydrogeology	Gain new information of performance of facility and design improvements	Completion of recharge facilities	Monitoring groundwater levels in the project vicinity, infiltration rates	Groundwater monitoring of adjacent wells to identify mounding and available storage	New knowledge of project area, and application for development in other areas

## **Project 2: City of Clovis SWTP Expansion**

Project Performance Measures for the existing Plant have already been developed and implemented for several years. The City will continue the ongoing monitoring efforts at the proposed Expansion that have been used to monitor the project performance at the existing Plant. Project performance measures include monitoring capacity, groundwater well pumping capacities, water sampling constituent monitoring, and cost analysis between plant and well operational costs. A sample Plant monthly monitoring report is included in **Attachment 6b**. The monthly reporting includes "Monthly Summary of Monitoring for Surface water Treatment Regulations", "Monthly Treatment Plant Report Form", "Monthly Summary of Monitoring for Surface Water Treatment Regulations", and "Monthly IT Report".

The Plant's monitoring procedures guides the City's effort to track operations and capacity. The City also tracks groundwater usage by evaluating the pumping quantities from each City owned groundwater well. This report will eventually demonstrate the City's reduced dependence on groundwater and the usage reduction would result in an "in lieu" groundwater recharge. The City also monitors groundwater levels in wells and this information is used to contour groundwater levels each year as part of the Fresno Area Regional GWMP. See the table on the next page for a list of project goals.

<b>Project Goals</b>	<b>Desired Outcomes</b>	<b>Output Indicators</b>	<b>Outcome Indicators</b>	<b>Measurement Tools and Methods</b>	<b>Targets</b>
Increase surface water treatment capacity	Provide water supply services from City Plant	Monthly Treatment Plant Report Forms	Monthly Treatment Plant Report Forms	Monthly Treatment Plant Report Forms	7,711 ac-ft/yr of surface water supply
Reduce City groundwater well usage	“in lieu” groundwater recharge to local groundwater basin	Existing wells have lower pumping rates	Measurement/ reports of City groundwater well usage	Groundwater meters	Reduce pumping totals by 7,711 ac-ft/yr
Reduce Local groundwater overdraft	Reduction of overdraft in vicinity of City wells	Reduced groundwater well usage	Groundwater levels in the project vicinity	Groundwater level monitoring at Well sites	Reduce pumping totals by 7,711 ac-ft/yr
Reduced large truck traffic (if sewer option is built)	Reduced large hauling truck trips to/from Plant.	Lowered City expenses for hauling/ dumping costs.	Lowered City expenses for hauling/ dumping costs.	Truck traffic counts from Plant	

**Project 3: Fresno County Drummond Jensen Ave Sewer Connection Study**

The City of Fresno currently monitors groundwater quality (including nitrate contamination levels) throughout its sphere of influence, including near the Drummond Jensen Avenue neighborhood. Snapshots of nitrate levels in the groundwater in this area for the past several decades are included in the City of Fresno Nitrate Management Plan (**Attachment 3k**). The current groundwater monitoring program will continue after the proposed construction of the new sewer system in this neighborhood, allowing the performance of the sewer system (and subsequent elimination of septic system use) to be evaluated and reviewed. The performance of the sewer system improvements will be monitored using the following parameters:

<b>Project Goals</b>	<b>Desired Outcomes</b>	<b>Output Indicators</b>	<b>Outcome Indicators</b>	<b>Measurement Tools and Methods</b>	<b>Targets</b>
OVERALL PROJECT: REDUCE NITRATE GROUNDWATER CONTAMINATION IN THE DRUMMOND JENSEN AVE AREA OF SOUTHEAST FRESNO	NITRATE GROUNDWATER CONTAMINANT PLUMES IN THE AREA DISSIPATED	REDUCED NITRATE CONTAMINATION LEVELS MEASURED DURING FRESNO'S ON-GOING GROUNDWATER QUALITY MONITORING PROGRAM	REDUCED NITRATE LEVELS IN AQUIFER IN THE DRUMMOND JENSEN NEIGHBORHOOD AREA OF FRESNO	ON-GOING CITY OF FRESNO GROUNDWATER QUALITY MONITORING PROGRAM, WATER SAMPLING AND LAB ANALYSIS FOR NITRATE LEVELS	GROUNDWATER NITRATE LEVELS BELOW EPA MCL OF 45 MG/L
OVERALL PROJECT: PROVIDE A RELIABLE SANITARY SEWER SYSTEM ALTERNATIVE TO SEPTIC TANKS FOR THE RESIDENTS OF THE NEIGHBORHOOD	ALL NEIGHBORHOOD RESIDENTS CONNECTED TO CITY OF FRESNO SEWER SYSTEM AND ALL PRIVATE SEPTIC SYSTEMS REMOVED	A COMPLETE AND FUNCTIONAL SEWER SYSTEM IS CONSTRUCTED IN THE NEIGHBORHOOD AND TIED INTO EXISTING FRESNO SEWER SYSTEM	REDUCED SEPTIC SEWAGE ON GROUND SURFACE, SAFER DRINKING WATER FOR RESIDENCES STILL ON WELLS	RESIDENT SURVEY TO MEASURE PERFORMANCE OF NEW SEWER SYSTEM	PROJECT BECOMES SHOVEL READY

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
<p>GRANT-SPECIFIC PROJECT: DEVELOP SANITARY SEWER SYSTEM CONSTRUCTION DOCUMENTS FOR A SHOVEL-READY PROJECT</p>	<p>CONSTRUCTION DOCUMENTS FOR A FULLY FUNCTIONAL NEIGHBORHOOD SEWER SYSTEM</p>	<p>PRELIMINARY ENGINEERING REPORT COMPLETE ENVIRONMENTAL DOCUMENTS COMPLETE AND FILED PROJECT DESIGN COMPLETE</p>	<p>RECOMMENDED PROJECT DETERMINED NOTICE OF EXEMPTION OR NOTICE OF DETERMINATION FILED AT COUNTY AND STATE. BID/CONSTRUCTION DOCUMENTS PREPARED.</p>	<p>REVIEW AND FINALIZATION OF BID / CONSTRUCTION DOCUMENTS</p>	<p>SHOVEL-READY CONSTRUCTION DOCUMENTS</p>

### Project 4: East Orosi CSD Water Well Rehabilitation Project

The East Orosi CSD has been monitoring water quality in its wells for the past 30 years. A baseline for the well’s groundwater quality will be used to compare the results of the rehabilitated wells after the improvements are made. Primarily, the monitoring will consist of testing the pumped groundwater for nitrates, with well output capacity (flow and pressure) being a secondary monitoring item. The performance of the well rehabilitation project will be monitored using the following parameters:

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
IMPROVE QUALITY OF WATER DELIVERED TO RESIDENTS OF EAST OROSI	REDUCE NITRATE LEVELS IN COMMUNITY WATER SYSTEM TO LEVELS BELOW THE REQUIRED MCL.	WELL SCREEN PERFORATIONS IN BOTH THE EAST & WEST WELLS WILL BE CLEANED AND PATCHED RESULTING ALLOWING GROUNDWATER EXTRACTION FROM LOWER STRATA.	SAFE DRINKABLE POTABLE WATER FROM BOTH EAST AND WEST WELLS	WATER SAMPLING FOR BACTERIOLOGICAL AND CHEMICAL CONTAMINANTS.	NITRATE LEVELS LESS THAN 45 PPM IN BOTH WELLS
ENSURE RESIDENTS DO NOT EXPERIENCE CONDITIONS OF LOW WATER PRESSURE	INCREASE CAPACITY/OUTPUT PERFORMANCE OF THE TWO WELLS	WELL SCREEN PERFORATIONS IN BOTH THE EAST & WEST WELLS WILL BE CLEANED AND PATCHED RESULTING ALLOWING GROUNDWATER EXTRACTION FROM LOWER STRATA.	STABLE WATER PRESSURE EXPERIENCED THROUGHOUT DISTRIBUTION SYSTEM	PRESSURE SENSORS/GAUGES ON WELL DISCHARGE, MONITORING OF PRESSURE	MAINTAIN A SYSTEM PRESSURE BETWEEN 30 AND 50 PSI

## **Project 5: City of Fresno Residential Water Meter Project (Area IV)**

The monitoring, assessment, and performance measures for work completed within Contract Area IV will be accomplished through acceptance testing of project components prior to, and after installation. Additionally, the contractor will be responsible for system performances through warranties and 'system performance guarantees' after installation (i.e. the AMR system shall be guaranteed to produce meter reads at an overall success rate of 98% during, and up to the point of contract closing) at each location.

Through these contractor requirements, and results obtained through integration of Contract Area IV with the 'overall' project monitoring system, comparative evaluations can be made related to Contract Area IV performance.

Results from residential water meter AMR systems will provide an avenue for assessing original IRWMP and project goals for achieving a net 10% reduction of annual water use across the project's 10,000 newly water metered customers, and reducing local area groundwater overdraft conditions.

These results will quantify anticipated project benefits through additional outcome indicators including: 1) expectations based on similar projects and the per capita water use of nearby communities presently utilizing water meters, 2) comparative analysis of metered quantities to historic monthly and annual groundwater pumping volumes for the overall project and those within Contract Area IV, and 3) address of groundwater overdraft conditions by long-term monitoring well evaluations.

**Project Performance Measures Table:**

<b>Project Goals</b>	<b>Desired Outcomes</b>	<b>Output Indicators</b>	<b>Outcome Indicators</b>	<b>Measurement Tools and Methods</b>	<b>Targets</b>
<p>PROMOTE WATER CONSERVATION</p> <p>EXPAND AVAILABLE GROUNDWATER SUPPLY</p> <p>PROVIDE RELIABLE DRY-YEAR WATER SUPPLY</p> <p>SUSTAIN LOCAL AGRICULTURAL COMMUNITY BY REDUCING OVERDRAFT</p> <p>IMPROVE LOCAL GROUNDWATER LEVELS</p> <p>INCREASE OVERALL WATER SUPPLY RELIABILITY</p>	<p>SAVE 10% OF CURRENT RESIDENTIAL WATER USEAGE (1,008 ACRE FEET/YEAR).</p> <p>IN ACCORDANCE WITH AB 514, MAINTAIN THE CITY’S WATER CONTRACT WITH THE USBR</p>	<p>AMR system integration and monitoring</p>	<p>Comparative analysis of historic monthly and annual groundwater pumping volumes</p> <p>Long-term monitoring well evaluation</p>	<p>Record comparison and analysis</p> <p>SCADA program system output</p>	<p>Comparative analysis of past similar projects utilizing water meters.</p> <p>Meter and AMR accuracy related to similar projects, project expectations and manufacturer recommendations.</p>

## **Project 6: Bakman Water Company Water Meter Installation Project**

Project Performance Measures for the proposed project will include ongoing monitoring efforts that will be used to demonstrate the project performance.

The objectives of the Monitoring, Assessment, and Performance Measures are to provide Bakman with documented information that will allow Bakman to evaluate the effect of installing water meters on the water usage within the water service area.

### **Meter Reading Program**

The meter reading program will monitor water usage throughout the service area. Bakman will use existing data of water consumption to compare with the consumption after meters are installed to determine how much water is being conserved. They will also analyze daily meter readings to examine daily, weekly, and annual fluctuations in consumption rates in order to more efficiently manage the water system.

### **Other**

One of the project goals is to slow the movement of contaminant plumes in the project area. While this is a real concern, it is not measureable. Several of Bakman's wells have already been affected by contaminants such as Dibromo-Chloropropane (DBCP) and nitrates, and there are additional contaminant plumes in the area that could eventually affect Bakman's groundwater supply quality. Routine water quality monitoring will continue in accordance with requirements of the California Department of Public Health.

Additionally, by conserving water through reducing usage, this project will help halt overdraft in the region. The impact on overdraft of the groundwater will be directly related to the decrease in consumption, and therefore will be measured through the meter reading program. Additional groundwater level monitoring will not be necessary.

<b>Project Goals</b>	<b>Desired Outcomes</b>	<b>Output Indicators</b>	<b>Outcome Indicators</b>	<b>Measurement Tools and Methods</b>	<b>Targets</b>
<p>Bakman Water Company will conserve the potable water supply by reducing water usage by 10% by installing 2,453 new water meters by June 2013.</p>	<p>10% of current water usage will be conserved.</p>	<p>10% of water conserved The meters will determine the amount of water consumed by the residents.</p>	<p>Bakman’s consumers will be encouraged to change the way they use water when they are charged for it on a volumetric basis. Bakman’s consumers will also be educated on ways to reduce water usage by fixing leaks in their homes and more efficiently using water in and around their homes.</p>	<p>Bakman will use the installed water meters to measure the amount of water consumed after the meters are installed. Bakman will use existing data of water consumption to compare with the current consumption to determine how much water is conserved.</p>	<p>With the installation of the 2,453 water meter, Bakman is hoping to reach the 10%, or approximately 420 acre feet per year decrease in water consumption.</p>

<b>Project Goals</b>	<b>Desired Outcomes</b>	<b>Output Indicators</b>	<b>Outcome Indicators</b>	<b>Measurement Tools and Methods</b>	<b>Targets</b>
Reduce local groundwater overdraft.	Reduction in groundwater overdraft in project vicinity.	Amount of water conserved.	Groundwater levels within project vicinity.	Bakman will use existing data of water consumption to compare with the current consumption to determine how much water is conserved, and therefore the resulting reduction in overdraft.	Reduction of overdraft by 420 AF per year.