2004 Water Use Efficiency Proposal

Project Information Form

Applying for: ❑ Urban **X Agricultural**

1. (Section A) **Urban or Agricultural Water Use Efficiency Implementation Project**

❑ (a) implementation of Urban Best Management Practice, #_____

❑ (b) implementation of Agricultural Efficient Water Management Practice, #_____

❑ (c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit # or Quantifiable Objective #, if applicable _____

❑ (d) Specify other: _____

2. (Section B) **Urban or Agricultural Research and Development; Feasibility Studies, Pilot, or Demonstration Projects; Training, Education or Public Information; Technical Assistance**

X (e) research and development, feasibility studies, pilot, or demonstration projects

❑ (f) training, education or public information programs with statewide application

❑ (g) technical assistance

❑ (h) other

3. Principal applicant (Organization or affiliation): **Sutter Mutual Water Company**

4. Project Title: **Tisdale Variable Frequency Drive and SCADA Demonstration Project**

5. Person authorized to sign and submit proposal and contract:

Name, title	**Max Sakato** Sutter Mutual Water Company/ RD1500
Mailing address	P.O. Box 128
	Robbins, CA 95676
Telephone	(530) 738-4423
Fax.	(530) 738-4327
E-mail	**Xminusmax@aol.com**

6. Contact person (if different): Name, title

Mailing address

Telephone
Fax.
E-mail

7. Grant funds requested (dollar amount): **$200,000**
(from Table C-1, column VI)

8. Applicant funds pledged (dollar amount): **$50,000**

9. Total project costs (dollar amount): **$250,000**
(from Table C-1, column IV, row n)

10. Percent of State share requested (%) **80%**
(from Table C-1)

11. Percent of local share as match (%) **20%**
(from Table C-1)

12. Is your project locally cost effective?
Locally cost effective means that the benefits to an entity (in dollar terms) of implementing a program exceed the costs of that program within the boundaries of that entity.
(If yes, provide information that the project in addition to Bay-Delta benefit meets one of the following conditions: broad transferable benefits, overcome implementation barriers, or accelerate implementation.)

❑ (a) yes
X (b) no

11. Is your project required by regulation, law or contract?
If no, your project is eligible.
If yes, your project may be eligible only if there will be accelerated implementation to fulfill a future requirement and is not currently required.
Provide a description of the regulation, law or contract and an explanation of why the project is not currently required.

❑ (a) yes
X (b) no

12. Duration of project (month/year to month/year): **12/05 to 12/06**

13. State Assembly District where the project is to be conducted:	**2nd**
14. State Senate District where the project is to be conducted:	**4th**
15. Congressional district(s) where the project is to be conducted:	**2nd**
16. County where the project is to be conducted:	**Sutter**
17. Location of project (longitude and latitude)	**Longitude -121.72 W** **Latitude 38.88 N**
18. How many service connections in your service area (urban)?	**n/a**
19. How many acre-feet of water per year does your agency serve?	**226,000 AF contract** **200,000 AF average diverted**

20. Type of applicant (select one):

- ❑ (a) City
- ❑ (b) County
- ❑ (c) City and County
- ❑ (d) Joint Powers Authority
- **X** (e) Public Water District
- ❑ (f) Tribe
- ❑ (g) Non Profit Organization
- ❑ (h) University, College
- ❑ (i) State Agency
- ❑ (j) Federal Agency
- ❑ (k) Other
  - ❑ (i) Investor-Owned Utility
  - **X** (ii) Incorporated Mutual Water Co.
  - ❑ (iii) Specify _____

21. Is applicant a disadvantaged community? If 'yes' include annual median household income. (Provide supporting documentation.)

- ❑ (a) yes, _____ median household income
- **X (b) no**

2004 Water Use Efficiency Proposal Solicitation Package
Signature Page

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form has the legal authority to submit the proposal on behalf of the applicant;

There is no pending litigation that may impact the financial condition of the applicant or its ability to complete the proposed project;

The individual signing the form read and understood the conflict of interest and confidentiality section and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant;

The applicant will comply with all terms and conditions identified in this PSP if selected for funding; and

The applicant has legal authority to enter into a contract with the State.

_____	_____	_____
Signature	Name and title	Date

Tisdale Variable Frequency Drive and SCADA Demonstration Project

Statement of Work

Section One: Relevance and Importance

This proposal is for the Sutter Mutual Water Company (SMWC)/ Reclamation District 1500 (RD1500) to expand its successful modernization program to include upgrades to its main pumping plant (Tisdale) on the Sacramento River. There are two agencies headed by Max Sakato (General Manager) that are responsible for the operation and maintenance activities of a large private mutual water (irrigation) company and reclamation (drainage) district that cover the same area. RD1500 is a public agency. The remainder of this proposal will refer to the district as SMWC/RD1500.

A new Variable Frequency Drive (VFD) and SCADA system will be installed to automate the pumping plant resulting in substantial energy savings and water conservation through a reduction in diversions from the Sacramento River and increased pumping efficiencies. Direct canal spill will be targeted through better coordination of diversions and deliveries in the system. In addition, growers will benefit from the better water service SMWC/RD1500 (increased flexibility) is able to provide.

This project will utilize the same technical and control setup as the one already being used effectively at another SMWC/RD1500 facility (Portuguese Bend). The company has worked cooperatively with the Irrigation Training and Research Center (ITRC) in developing the concepts used at Portuguese Bend and to implement an innovative control strategy, including extensive quality control and field verification. The ITRC will provide technical expertise for the implementation of this proposal including comprehensive project performance specifications. The modeling and development of the control algorithms used for VFD automation will be done by the ITRC.

Background

For over 80 years Sutter Mutual Water Company (SMWC/RD1500) has operated and maintained its irrigation facilities, initially using mostly vintage technology, which has proven to be very reliable but increasingly cost-ineffective. In the 1940-1960s, three new pumping stations were built and more efficient turbine pumps were installed to help reduce power consumption and to increase water diversion efficiency. For economic and operational reasons, in 1999 it was decided to begin installing modern control technology in some of the pumping plants in order to take advantage of the substantial energy and labor savings offered by such technology.

The first equipment chosen by the company was a Variable Frequency Drive (VFD) unit and a Supervisory Control and Data Acquisition (SCADA) system, which were installed in the Portuguese Bend plant during 1999-2001. While this project was being completed a second project was also initiated in order to accurately measure the flows in two different canals.

This proposal is for an expansion of the modernization program that has resulted in verifiable economic savings and proven the concept proposed here is feasible and popular with growers. .

Description of Company

Formed in 1919, SMWC/RD1500 is one of the first water companies to be established in the state of California. The company's location (Figure 1) is approximately 45 miles northwest of Sacramento, California and is bordered in the north by the Tisdale Bypass, in the west by the Sacramento River and in the east by the Sutter Bypass. The southern boundary is located at the southern end of Sutter County near the Fremont Weir where the Sacramento River and Feather River come together. The company's 46,746 irrigable acres (18,917 ha), which are part of the 67,850 acres (27,470 ha) gross service area that is maintained by Reclamation District 1500 flood control and drainage personnel, are served by approximately 400 irrigation turnouts. Approximately 200 miles (322 km) of canals and laterals in the distribution system convey water to the fields.

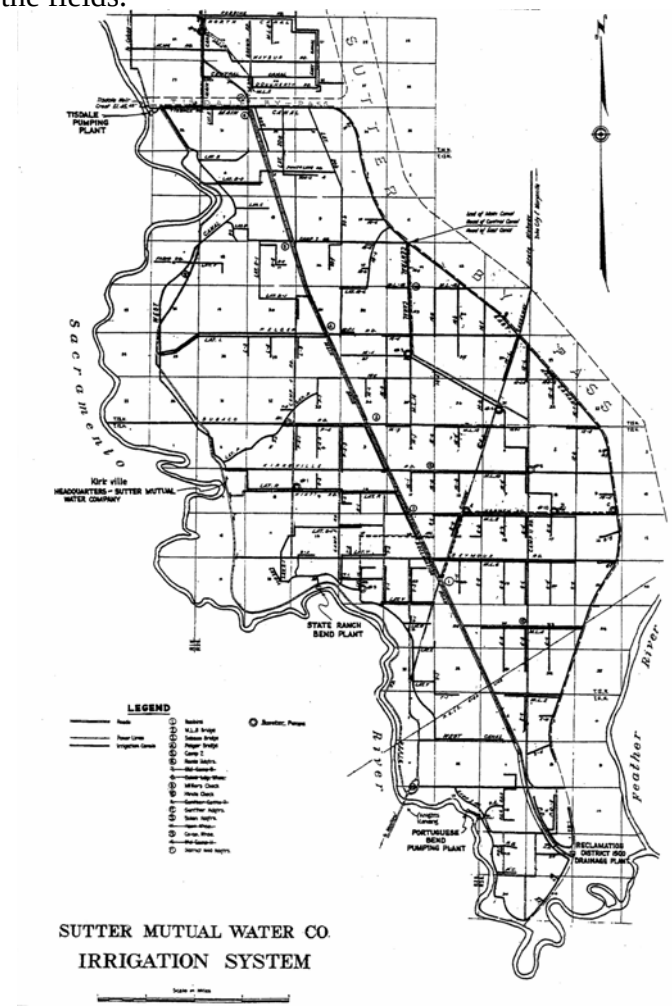


Figure 1. Map of Sutter Mutual Water Company service area

Section Two: Technical/Scientific Merit, Feasibility

Scope of the Project

The scope of the proposed VFD installation and integration of the VFD unit, hydroacoustic flow meter, communications equipment, and related electronic controls and power systems (collectively termed the SCADA system) is described in the following narratives for **Tasks 1 and 2** summarizing the technical phases involved in implementation and verification.

In **Task 1** a VFD unit will be installed as part of upgrades and refurbishments to the Tisdale pumping plant. The advantages of the approach to be followed are highlighted in terms of energy savings and simple operations.

In addition, a list of the specific SCADA tasks planned for the flow measurement site at the Tisdale pumping plant is included in the following section under **Task 2**.

Tasks 1 and 2 will be implemented through a series of four Phases (1-4) that are described in narrative form at the end of this section.

Task 1: Installing a VFD Unit at the Tisdale Pumping Plant

Advantages of Variable Frequency Drive (VFD) Units

Constant-speed AC motors drive many pumps used for water distribution and delivery at the district or grower level. When flow control is needed to accommodate changes in downstream demand, typically two methods are employed to control the flow rate and pressure: (i) a downstream throttling valve is used to alter the system curve, and (ii) some of the output is by-passed back into the intake.

With these two methods a considerable amount of energy could be wasted in doing work that is not needed just to achieve the desired flow rate. VFD units provide an effective way of reducing the speed of the pump drive motor, thereby allowing the flow rate or pressure to be adjusted to the desired level without the additional energy from throttling or by-passing. Basically the VFD is an electronic device that is used in conjunction with a constant-speed AC motor. The VFD accepts the standard line voltage and frequency then converts the signal into a variable frequency and voltage output that allows the standard constant-speed AC motor to be varied in speed.

VFDs provide the potential for system automation of pumping stations such as Tisdale Pumping Plant. In this case, water level sensors can be used as feedback into the controller to continuously adjust the VFD speed for varying downstream conditions. In general, this permits the ability to provide water deliveries to growers practically on-demand. In turn, growers are able to precisely schedule irrigations to match the crop water requirements rather

than district operational limitations. This type of VFD operation also offers the potential for labor savings over manual adjustment.

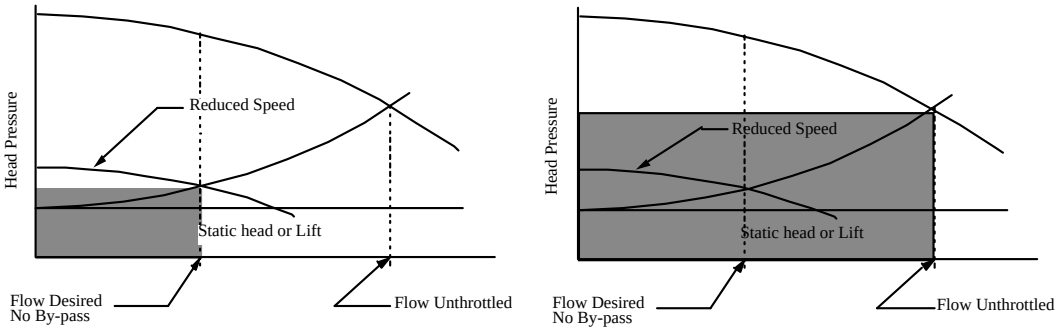
The further advantages of VFD systems include the following:

- Softer starting: the device limits the current inrush to the motor providing for a smooth non-shocking acceleration of the pump shaft speed up to its operational RPM
- Elimination of pressure surge: bringing the system up to operating speed slowly removes the pressure surge caused by an almost instantaneous acceleration of the water to its operational flow rate
- Reduction of operating costs: by reducing the energy input over previous control methods (by-pass) operating costs can be reduced
- Reduction of motor stress: reduces mechanical stress on motor windings
- Reduction of peak demand charges: by reducing the energy loads the overall peak demand of the facility can be reduced

Energy Savings

VFD units usually reduce pumping costs by reducing the pump drive motor speed to match the desired operating conditions thereby reducing energy input. Without a VFD device this is typically accomplished by using either a by-pass set-up or a downstream throttling valve. The system layout for a typical by-pass installation consists of a pump and by-pass piped into a standtank. With this arrangement the by-pass maintains a constant head in the standtank regardless of flow, as there is less downstream demand. The excess flow is by-passed to the pump intake to maintain a constant head in the standtank or canal. Determining how a pump will operate in a given situation requires an understanding of the pump and system curve. The pump characteristic curve for a standard centrifugal pump shows that the pump, at a fixed speed, has a flow rate associated with a particular pressure; high flow, lower pressure vs. low flow, higher pressure. The intersection of the pump curve and the system curve shows the point of system operation.

If, instead, the pump speed is modified using a VFD device to control head just below the by-pass, flow and head are reduced together along the system curve. A comparison of the relative pump water horsepower with (i) VFD, and (ii) by-pass installations are shown by the shaded areas in Figure 3.



Water horsepower (shaded area) for pumping plant with (i) VFD and (ii) by-pass

However, the water horsepower differences above are only some of several factors to consider. To properly compare the actual cost savings of a VFD system, the overall plant pumping efficiencies with and without the VFD device also need to be considered. The major additional losses that must also be considered in determining the overall pumping plant efficiency are as follows:

- As the system curve changes or the pump speed is reduced, the operating efficiency of the pump changes. Therefore, for each operating point the pump efficiency must be checked.
- VFD units have some losses associated with the conversion process to the new operating frequencies. In general the units are relatively efficient, 95%. But, as the frequency is lowered, some units do become less efficient.
- Electric motors if sized properly near maximum loading, can be very efficient. With VFD units used in pumping, the motor loading is reduced as the speed is reduced. This reduction in motor loading can reduce its efficiency and drive motor losses will result.
- Drive friction losses can be reduced with VFD applications. As the speed is reduced the mechanical friction on drive shaft components is reduced.

Cost Savings Analysis on the previous VFD Installation at Portuguese Bend: To determine the total savings due to the Portuguese Bend VFD unit, a detailed cost savings analysis was begun on the VFD installation on pump #1 (100 hp motor) at the Portuguese Bend pumping plant.

Initial savings were realized in the first year with the reduction of one employee who was needed to constantly monitor and reset the plant's three pumps as dictated by flow requirements out of the plant's main canal. The main costs now under continual evaluation involve two other components as follows: (1) energy savings as a result of eliminating the by-pass practice (before meter) to control delivery flow, and (2) reduction of spilled water out of the canal, which reduces metered pumping of a purchased volume, plus the additional energy savings associated with the reduction in pumped volume. Both portions of the savings analysis as presented here do not take into consideration the specific time of use

rates; they are based on the total monthly values. The reduction in canal spill and the associated energy savings have only been achievable with the new SCADA system.

Table 1 shows the expected estimated annual energy savings based on the reduced pumping costs associated with a VFD unit. The cost savings analysis is based on an estimate of the average pumping costs before and after the installation of a VFD unit. In addition, an estimate of the average pumping cost with a VFD using a simple control algorithm is included to illustrate the expected additional cost savings during the first year operating with the new SCADA system. Table 2 shows the anticipated annual savings of approximately $2,000 to SMWC/RD1500 on Portuguese Bend's main canal due to the reduction in spilled water along the canal. Total cost savings from reducing both canal spill and from overall energy cost savings should be between $14,000 and $18,000 per year and will increase even more in the future as energy costs continue to increase.

Table 1. Average annual energy savings expected from VFD operations

Item	Pumping Cost $/AF	Annual Energy Savings based on 6,000 AF/ Season	Annual Energy Savings based on 8,000 AF/ Season
without VFD	4.7	---	---
with VFD	3.0	$10,200	$13,600
with VFD and simple algorithm	2.7	$12,100	$16,200

Table 2. Average annual savings anticipated from a reduction in Portuguese Bend canal spill with the new VFD and SCADA system

Description	Amount
Approximate annual spill at end of canal (acre-feet)	200
Possible reduction in spill with VFD (acre-feet)	120
Water value as missed opportunity to sell ($/acre-feet)	$12.00
Possible revenue from missed sales annually ($)	$1,440
Approximate pumping cost $/acre-feet (from pump test data)	$4.18
Energy savings from reduced pumped volume ($)	$502
Total Anticipated Canal Spill Savings	**$1,942**

VFD Specifications

The ITRC has developed VFD performance specifications for irrigation applications that will be followed as part of the selection, installation, and testing for this project. The updated version of the ITRC VFD specifications provide a benchmark for the equipment used at the

Tisdale pumping plant. Reference is made to the ITRC online specifications at http://www.itrc.org/reports/vfd/vfdspecs.html.

The VFD unit supplied and installed in this project will be specified as follows:

- Control schematics and connection diagrams
- Interconnection wiring schematics and diagrams
- Configuration software specifications
- Data sheets on major components including electronic devices
- Complete O&M Manuals for maintenance, troubleshooting and repair procedures

Task 2: Expanding the SMWC/RD1500 SCADA System to include Tisdale Pumping Plant

The SMWC/RD1500 performs real-time control and monitoring of flows, canal water levels, and pumping plants over a large, complex water distribution and drainage system. The company has an existing SCADA system set up as part of the modernization of the Portuguese Bend pumping plant. SCADA is a tool that allows SMWC/RD1500 to acquire real-time information and control operations at Portuguese Bend from the headquarters office. By having this real-time information available at the office, the pumping plant can be managed on a real-time basis, thereby providing the ability to achieve maximum water conservation and operational flexibility.

The basic objective of the proposed SCADA system at Tisdale would be to monitor and control the VFD unit as well as providing alarming and reporting functions. The additional SCADA component proposed for the Tisdale pumping plant are complementary to the existing SCADA system and all the specified equipment is compatible.

The basic objective of the automation at Tisdale pumping plant will be vary the pump flow rates from the pumping plant in order to maintain a target water level in the main canal. This will require the integration of a VFD unit at the pumping plant and an expansion of the existing SCADA system. Specifically, this will involve the ability to remotely monitor the system (water levels, flow rates, pumps on/off, etc.), manually control operations from SMWC/RD1500's administration office, and to eventually control the system fully automatically using the new VFD unit. This requires the integration of data acquisition components (sensors for water level, electronic flow meters, etc.) with computerized controllers for implementing supervised commands. Monitoring and controlling operations at this site will also require establishing radio communications between the pumping plant and office.

Current SCADA systems are now being designed under a term called "open architecture". This new approach uses off-the-shelf industrially hardened components, which can be linked together using common communication protocols. One such protocol currently adopted by the industry is Modbus. The current systems configuration assembles individual components, called Remote Terminal Units (RTU's), to control or monitor at each site independently. These standard components are then configured (programmed) for the

specific task. The site RTU information is then linked back to the central location via radio communication. The open architecture and industrially hardened components have allowed increased scalability and reliability.

The configuration of the Tisdale SCADA system would be similar to the one already in use at Portuguese Bend, thus ensuring easy adoption by the operators and reducing implementation risks.

Specific Tasks for Implementing a SCADA Flow Measurement Site at Tisdale Pumping Station

A new flow measurement device will be installed as part of this proposal for both monitoring and control purposes. Besides being used for day to day operations, the upgraded accuracy of flows in the main canal will provide data for future monitoring and evaluation activities also envisioned as part of this proposal.

The project engineering and performance specifications for this proposal were done cooperatively by SMWC/RD1500 and the ITRC. The specific SCADA tasks for the Tisdale pumping plant include:

- Install cross-section in main canal for stable reference dimensions and better maintenance
- Install SonTek/YSI sensor, trash deflector, and bracket
    - Manufacture ITRC trash deflector
    - Manufacture bracket assembly
- Install buried conduit
- Install electrical cabinets with back-up power systems
- Install radio, cables and antenna. Troubleshoot operations.
- Connect power system and check communications with headquarters office
- Connect sensor inputs and deploy PLC. Troubleshoot operations.
- Velocity indexing procedure and develop constants
- Program SonTek/YSI sensor with index constants
- Prepare documentation
- Program PLC
- Field Verification
- Configure LookOut HMI screen at district base station

Project Phases

The VFD unit and SCADA system will be implemented in Phases 1-4 as described below.

Due to the complex nature of installing a SCADA system into an irrigated area, successful implementation is best accomplished in phases. Initiating change in the routine operation of key facilities and altering the day-to-day activities of company or district personnel can create significant uncertainty. It is therefore necessary that this uncertainty is addressed

during each step of the process and a level of confidence is gradually built-up in the participants. Achieving this critical "buy-in" from the people who will actually use the system is essential for the success of modernization projects. This phased approach has the important benefits including maximizing reliability while allowing an irrigation company or district to prioritize critical modernization needs and implement components on a site-by-site basis.

The Project Phases used for installing a SCADA system for SMWC/RD1500 will be as follows:

Phase 1 (12-1-05 to 3-1-06): The first phase of the SCADA part of the project will be to install, test and calibrate a new water level sensor in the head of the main canal at Tisdale. A new RTU/PLC will also be evaluated for installation at the Tisdale pumping plant. One issue to be resolved with this evaluation is the use of a VFD on the existing pumping units. It may be required that the district replace one of the pumps in order to use the VFD.

The new sensor will be connected to the new RTU/PLC at the Tisdale pumping plant. The new sensor installation will be setup so that water levels in the canal are measured once per second and transmitted via radio to the RTU/PLC, where it will be stored in a data table and averaged over a one-minute time interval. Upon completion of the RTU installation, the HMI (human machine interface- in this case Lookout®) screens at the office will include information on the canal water levels at two locations, the river stage, the status of each pump (on/off and speed) and target depth (water level setpoint). In addition, the Lookout® screens will be configured so that the target depth can be remotely changed from the office (for future automatic control), and so that coefficients used for the distributed automatic control can be remotely changed from the office.

Phase 2 (3-1-06 to 4-1-06): The VFD unit will be installed in this phase. The VFD will be tested to begin with in a manual mode, while continuing to operate the sensor system in the main canal. Manual VFD operation means the operator sets the motor speed control using the percent speed control located in the pumping plant control panels. Remote manual operation will be made possible in this phase by setting up the radio system. The new communications equipment and integration with the office HMI will be tested and verified during this phase.

Phase 3 (4-1-06 to 5-1-06): In this phase a hydroacoustic flow meter (SonTek/YSI acoustic flow meter) will be deployed in the Tisdale main canal. This will allow operators to have on-site accurate flow rate measurements. The device will be installed in a new concrete lined cross-section using a mounting assembly especially developed for deployments in irrigation canals. The sensor will be calibrated through data collection using a reference measurement device and the proper coefficients determined with multiple linear regression. The ITRC has developed a procedure for field calibrating hydroacoustic meters, along with comprehensive specifications for O&M and site conditions, which will be used to ensure long-term accuracy of the site.

Phase 4 (5-1-06 to 12-1-06): This final phase will be to fully automate the VFD at Tisdale pumping plant.. A Proportional-Integral-Filtered (PIF) algorithm for control of the site will be programmed into the RTU/PLC and implemented. The control algorithm will be a PIF algorithm supplied by the ITRC and not the internal Proportional-Integral (PI) equation supplied by the VFD's manufacturer.

The Lookout® screens in the office necessary to support this automation will have been already put in-place as part of Phase 2. The ladder logic and additional site programming were completed during this stage. A significant part of this task will be the determination of the optimum control scheme for the new VFD unit. ITRC is the only entity in California with an established procedure to tune sophisticated canal control algorithms (and to select the appropriate algorithms), and then to follow up with field verification.

The results from the similar project done at Portuguese Bend showed that this task could be successfully implemented at Tisdale pumping plant.

Section Three: Monitoring and Assessment

SMWC/RD1500 is very confident that the objectives outlined in this proposal can be achieved based on its proven track record with a similar modernization project at the Portuguese Bend pumping plant. The implementation of previous modernization efforts has been closely monitored by SMWC/RD1500. In this case, the primary benefits derived from water conservation and energy savings will be monitored and reported by SMWC/RD1500 based on a comparative analysis of historical records from the pumping plant.

In particular as part of the monitoring component of this project, a new flow measurement site will be incorporated into the design of the SCADA system. An advanced hydroacoustic flow meter will be installed in the Tisdale Main Canal to accurately measure the diverted flow. This type of device has proven to be very accurate and reliable and many agricultural water agencies are installing them as part of efforts to upgrade monitoring capabilities.

The cost of the new flow rate measurement includes the cost for the following components:

- appropriate support arm for the electronic flow measurement equipment
- communications link to the SCADA system
- calibration of the unit

In addition, electrical energy usage at the Tisdale Pumping Plant will be monitored after the installation of the VFD system. Implementing this system will lay the groundwork for being able to take advantage of time-of-use rates in the future.

Qualifications of the Applicants and Cooperators

Resumes *(of the project manager(s))*

The resume for Max Sakato (General Manager) is attached. This project will be managed by Fred Schantz (Operations Manager for SMWC).

External Cooperators

Others who will be participating in the demonstration project will be staff from the Irrigation Training and Research Center.

Outreach, Community Involvement and Acceptance

Outreach and Information Dissemination

District modernization such as implementing VFDs have served as a catalyst for other water conservation programs in districts. A successful strategy starts by targeting a visible problem in the district. Newsletters and presentation meetings open to general audiences or for board members allow for promoting win-win modernization solutions and the role of modern engineering techniques. Once the system has been established as working with all of the bugs worked out, the new installation will be a model for other irrigation districts.

Innovation

The proposed project features several innovative applications of modern water control technologies. In fact, SMWC/RD1500 was a pioneer in the development and verification of the combination of VFD units configured to respond to changes in conditions downstream in a canal such as the one at Tisdale. Considerable fieldwork and modeling validation has shown this is a feasible system with significant benefits but there are still only a few successful applications of this type in the western U.S.

Benefits and Costs

Project Implementation Costs (Budget)

Table C-1: Project Costs (Budget) in Dollars)

	Category (I)	Project Costs $ (II)	Contingency % (ex. 5 or 10)[2] (III)	Project Cost + Contingency $ (IV)	Applicant Share $ (V)	State Share Grant $ (VI)	Life of investment (years) (VII	Capital Recovery Factor (VIII)	Annualized Costs $ (IX)
	Administration[1]								
	Salaries, wages	$21,545	0	$21,545	$0	$21,545	0	0.0000	$0
	Fringe benefits	$8,241	0	$8,241	$0	$8,241	0	0.0000	$0
	Supplies	$30,018	0	$30,018	$50,000	-$19,982	0	0.0000	$0
	Equipment	$165,196	0	$165,196		$165,196	0	0.0000	$0
	Consulting services	$25,000	0	$25,000	$0	$25,000	0	0.0000	$0
	Travel	$0	0	$0	$0	$0	0	0.0000	$0
	Costs)	$0	0	$0	$0	$0	0	0.0000	$0
(a)	Total Administration Costs	$250,000		$250,000	$50,000	$200,000			$0
(b)	Planning/Design/ Engineering		0	$0	$0	$0	0	0.0000	$0
(c)	Equipment Purchases/Rentals/ Rebates/Vouchers		0	$0	$0	$0	20	0.0872	$0
(d)	Materials/Installation/ Implementation		0	$0	$0	$0	0	0.0000	$0
(e)	Implementation Verification		0	$0	$0	$0	0	0.0000	$0
(f)	Project Legal/License Fees		0	$0	$0	$0	0	0.0000	$0
(g)	Structures		0	$0	$0	$0	0	0.0000	$0
(h)	Land Purchase/Easement		0	$0	$0	$0	0	0.0000	$0
(i)	Environmental Compliance/Mitigation/ Enhancement		0	$0	$0	$0	0	0.0000	$0
(j)	Construction		0	$0	$0	$0	0	0.0000	$0
(k)	Other (Specify)		0	$0	$0	$0	0	0.0000	$0
(l)	Assessment		0	$0	$0	$0	0	0.0000	$0
(m)	Report Preparation		0	$0	$0	$0	0	0.0000	$0
(n)	**TOTAL**	$250,000		$250,000	$50,000	$200,000			$0
(o)	Cost Share -Percentage				20	80			

1- excludes administration O&M.

Provide a brief explanation for the labor costs (including consultants), equipment, supplies, and travel included in the budget

A detailed breakdown of the cost estimates is included as Attachment B.

SALARIES AND WAGES: The salary rates are based on the SMWC/RD1500 established salary rates paid during the 2004-2005 year (July 1 – June 30). The rates shown are for budgetary purposes; the actual rates in effect at the time the work is performed will be charged to the project.

FRINGE BENEFITS: Fringe benefits include a benefit package consisting of FICA, State Unemployment Insurance (SUI), Worker's Compensation, non-industrial leave, medical,

dental, and life insurance benefits, and retirement benefits. Rates vary with the number of dependents and type of coverage. An historic average of 34% - 57% is used for budgetary purposes and is determined by the work the employees are doing and the environment in which they do their work. Only actual rates in effect for each individual at the time the work is performed will be charged to the sponsor.

OPERATING EXPENSES: Materials and supplies in support of this project include but are not limited to various VFD equipment such as vandalism enclosures, water level sensors, cables, software, alarm management dialer, and spare parts. Other materials and supplies in support of this project include general office supplies and site visit supplies and materials. Printing, photocopying and color copying expenses in support of this project include copies of existing reports and copies of the final report.

EQUIPMENT: Equipment for this project include a field RTU with PLC, an acoustic flow rate measurement device, and a vfd pump and motor.

CONSULTING SERVICES: The Irrigation Training and Research Center will provide technical support on this project.

COST SHARE: The amount of cost share that will be received during the performance period of this proposal is $50,000. This is through a contract with the U.S. Bureau of Reclamation.

Potential benefits and information to be gained in terms of water use efficiency

A study for SMWC/RD1500 involves an expansion of the existing SCADA system and the installation of a VFD at the Tisdale Pumping Plant in the northern portion of the district. Both tasks will improve operation at the districts largest pumping plant. The district will be able to increase the flexibility to water users downstream of Tisdale Pumping Plant allowing them to utilize alternative irrigation methods and properly schedule irrigations. The tasked outlined for Tisdale pumping plant directly and indirectly effect targeted benefits 30, 33, and 35 listed above through reduction in district operational spill and potential improvement in on-farm irrigation management resulting from the tasks.

Quantifiable Objectives Region #4
Mid-Sacramento Valley, Chico Landing to Knights Landing

30. ERPP: More closely emulate seasonal streamflow patterns in dry and normal year- types by allowing a late winter or early-spring flow event of approximately 8,000 to10,000 cfs in dry years and 15,000 to 20,000 cfs in below normal water-years to occur below Keswick Dam; Maintain base flows of 6,000 to 8,000 cfs during fall.
    QO: 44 - 180 TAF per year
    - Improve farm irrigation management (such as irrigation scheduling) and more uniform irrigation methods (such as shorter furrows, sprinkler, or drip).
    - Reduction in operational spill through improved management, canal automation or regulatory storage.
    - Reduction in canal seepage through canal lining or piping.

31. Quality: Reduce pesticides to enhance and maintain beneficial uses of water
    QO: TBD
    - Cover crop, furrow or field diking and reduction in late season irrigation.

33. Core: Reduce unwanted ET by _____ acre-feet per year.
    QO: 4.6 TAF per year plus additional water generated through reduction in application through improved irrigation systems
    - Improve farm irrigation management (such as irrigation scheduling) and more uniform irrigation methods (such as shorter furrows, sprinkler, or drip).
    - Reduction in operational spill through improved management, canal automation or regulatory storage.
    - Reduction in canal seepage through canal lining or piping.
34. Core: Enhance the effectiveness of potential conjunctive use programs by reducing flows to groundwater to _____ acre feet per year during periods of shortage; and increasing flows to groundwater to _____ acre feet per year during periods of excess.
    QO: TBD
    - TBD

35. ERPP/Core: Cooperatively manage ____ acres of ag lands and restore ____ acres of seasonal, semipermanent, and permanent wetlands consistent with the CV Habitat Jt Venture and N. Am. Waterfowl Mgmt. Plan.
    QO: 4.5 TAF per year
    - Improve farm irrigation management (such as irrigation scheduling) and more uniform irrigation methods (such as shorter furrows, sprinkler, or drip).
    - Reduction in operational spill through improved management, canal automation or regulatory storage.

– Reduction in canal seepage through canal lining or piping.

36. Core: Provide water for the Delevan, Colusa, and Sutter National Wildlife Refuges. The following water quantities are required for the following wetland types: seasonal marsh, 4.1 - 8.5 acre-feet/acre; permanent and semipermanent marsh or brood pond, 7.4 - 13.25 acre-feet/acre; managed riparian, 4.0 - 8.0 acre-feet/acre; upland, 4.25 acre-feet/acre; and reverse-cycle, 5.25 acre-feet/acre
QO: TBD
– TBD

Compare the potential benefits and anticipated information to be gained to the anticipated costs

Based on the experience from the VFD and SCADA installed at the Portuguese Bend Pump Station, it is anticipated that at least 5,000 af of savings could be realized with this $250,000 project.

Table C-5 Project Annual Physical Benefits (Quantitative and Qualitative Description of Benefits)

	Qualitative Description - Required of all applicants[1]				**Quantitative Benefits - where data are available [2]**
	Description of physical benefits (in-stream flow and timing, water quantity and water quality) for:	Time pattern and Location of Benefit	Project Life: Duration of Benefits	State Why Project Bay Delta benefit is Direct[3] Indirect [4] or Both	Quantified Benefits (in-stream flow and timing, water quantity and water quality)
Bay Delta	Less district diversions	Water season	Permanent	Direct - more water left in the river	5,000
Local	More control of diversions	Water Season	Permanent	**Not applicable.**	0

[1] The qualitative benefits should be provided in a narrative description. Use additional sheet.
[2] Direct benefits are project outcomes that contribute to a CALFED objective within the Bay-Delta system during the life of the project.
[3] Indirect benefits are project outcomes that help to reduce dependency on the Bay-Delta system. Indirect benefits may be realized over time.
[4] The project benefits that can be quantified (i.e. volume of water saved or mass of constituents reduced) should be provided.

Attachment A
Max Sakato Resume

MAX S. SAKATO
3349 Spyglass Court
Fairfield, California 94534
(707) 422-3470

Education

* **Master of Science, Agriculture (Specialization in International Agriculture) - California Polytechnic State University (Cal Poly), 1974.**
* **Bachelor of Science, Agricultural Business Management - Honors California Polytechnic State University (Cal Poly), 1971.**
* **Graduate of Agricultural Leadership Program - Ca. Ag Education Foundation, 1980-1981.**

Professional and Civic Affiliations

* **Present Director, California Central Valley Flood Control Association**
* **Past Director, Sacramento River Water Contractors Association**
* **Past Member, ACWA Affiliate Membership Committee and Federal Affairs Committee**
* **Member, California Agricultural Leadership Associates, 1981-present.**
* **Committee Member, California State Chamber of Commerce Water Resources Committee, 1983-1988.**
* **Active Member, Council of California Growers, 1977-1982.**
* **Junior Achievement Business Counselor Oakland and Alameda, 1977-1979.**

Military

* **Served with United States Navy and Marine Corps from 1966-1969 including tours of duty in Japan, Okinawa and Vietnam. Received Honorable Discharge, 1969.**

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*Current Position

General Manager (1990-present)
Sutter Mutual Water Company/Reclamation District No. 1500

As concurrent General Manager of the above, I am responsible to two separate Boards of Directors and plan, direct, manage and oversee all operation and maintenance activities of a large private mutual water (irrigation) company and flood control and drainage district. I am responsible for policy implementation, project management, finance, accounting, and budgeting and serve as Secretary/Treasurer to the respective Boards of Directors and Trustees. I coordinate and collaborate with local, State and federal agencies and provide highly responsible and complex administrative support to the Boards. I direct the development and implementation of the Company's and District's goals and objectives. I represent the Company and District to outside agencies and coordinate activities with those of other irrigation and flood protection agencies and outside organizations. I collaborate with local, State and federal agencies on regulatory and political affairs affecting the Company and District. I review legislation, reports and correspondence that relate to water and flood control/drainage issues and prepare responses. I attend and participate in professional group meetings and stay abreast of

new trends and innovations in the field of water law and water sciences. I respond to Board concerns and issues and media inquiries. I establish, within Company and District policy, appropriate service and staffing levels; monitor and evaluate the efficiency and effectiveness of water service delivery and flood protection and drainage methods and procedures and allocate resources accordingly. I perform related duties and responsibilities as required.

General Manager (1990-present)
Sutter Mutual Water Company/Reclamation District No. 1500

As concurrent General Manager of the above, I am responsible to two separate Boards of Directors and plan, direct, manage and oversee all operation and maintenance activities of a large private mutual water (irrigation) company and flood control and drainage district. I am responsible for policy implementation, project management, finance, accounting, and budgeting and serve as Secretary/Treasurer to the respective Boards of Directors and Trustees. I coordinate and collaborate with local, State and federal agencies and provide highly responsible and complex administrative support to the Boards. My specific duties include:

* Assume full management responsibility for all operation and maintenance services and activities, and administer policies and procedures.
* Direct the development an implementation of the Company's and District's goals and objectives.
* Establish, within Company and District policy, appropriate service and staffing levels; monitor and evaluate the efficiency and effectiveness of water service delivery and flood protection and drainage methods and procedures; allocate resources accordingly.
* Plan, direct and coordinate the work plan for the Company and District; assign projects and programmatic areas of responsibility; review and evaluate work methods and procedures; meet with management and supervisory staff to identify and resolve problems.
* Assess and monitor workload, administrative and support systems, and internal reporting relationships; identify opportunities for improvement.
* Oversee the development and administration of the Company and District budgets; approve the forecast of funds needed for staffing, equipment, materials and supplies; approve expenditures and implement budgetary adjustment as appropriate and necessary.
* Represent the Company and District to outside agencies; coordinate activities with those of other irrigation and flood protection agencies and other outside organizations; collaborate with local, State and federal agencies.
* Confer with landowners, water users and the general public; explain Company and District policies and procedures; resolve difficult and sensitive inquiries and complaints.
* Provide staff assistance to the Board of Directors and Trustees, prepare and present staff reports and other necessary correspondence; serve as Secretary/Treasurer to the Boards.

* Review legislation, reports and correspondence that relate to water and flood control/drainage issues and prepare responses, as appropriate.
* Provide staff support to assigned boards and commissions.
* Attend and participate in professional group meeting; stay abreast of new trends and innovations in the field of water law and water science engineering.
* Respond to Board of Trustees' concerns and issues and media inquiries.
* Perform related duties and responsibilities as required.

Other Positions:

Agricultural Business Consultant (1988 to 1990) - Independent
Director of Agriculture (1984 to 1988) - Santa Fe Pacific Realty Corporation
San Francisco, California U.S.A.
Senior Assistant General Manager (1983) - Southern Pacific Land Company
Natural Resources Division, San Francisco, California U.S.A.
Assistant General Manager (1981 to 1982) - Southern Pacific Land Company
Natural Resources Division, San Francisco, California U.S.A.
Agricultural Supervisor (1976 to 1980) - Southern Pacific Land Company
Natural Resources Division, San Francisco, California U.S.A.

Attachment B
Detailed Cost Estimate

Cost Estimate Worksheet for SCADA System

Irrigation Training and Research Center
California Polytechnic State University

		Field RTU with PLC	Radio Repeater Station	Vandalism Enclosure	Antenna, mast, cable, and lightning arrestor	Water Level Sensor(s) for Pools	Water Level Sensor(s) for FlumeWeir	Redundant Water Level Sensor	Acoustic Flow Rate Measurement Device	Stilling Well	Buried Cables in Conduit (per foot)	VFD and Pumping Unit	HMI Software - 300 OPC Tags	Office Computer System	Alarm Management (Dialer)	WebHMI - Server	System Documentation	Training	Spare Parts
	Unit Price	**$12,112**	**$5,152**	**$1,640**	**$1,108**	**$1,671**	**$1,779**	**$1,671**	**$15,496**	**$1,000**	**$7.5**	**$138,368**	**$5,600**	**$3,526**	**$3,000**	**$5,538**	**$10,000**	**$6,000**	**$7,523**
No.	**Location**																		
1	Tisdale Pumping Plant	1			1	2		2	1	4	1,000	1							1
2	District Office												1		1		1	1	

No.	Location																			Total
1	Tisdale Pumping Plant	$12,112			$1,108	$3,343		$3,343	$15,496	$4,000	$7,500	$138,368							$7,523	**$192,791**
2	District Office												$5,600		$3,000		$10,000	$6,000		**$24,600**

Estimated Site Total **$217,391**

+ Design and Contingencies @ 15% $32,609

Total Estimated Cost **$250,000**