City of Woodland

REPORT TO MAYOR AND CITY COUNCIL

AGENDA ITEM

TO: THE HONORABLE MAYOR
AND CITY COUNCIL

DATE: September, 30 2008

SUBJECT: New Wastewater Discharge Permit, Related Surface Water Project, And Cost Implications

Report in Brief

The Regional Water Quality Control Board (RWQCB) issued the City of Woodland Water Pollution Control Facility a tentative National Pollution Discharge Elimination System (NPDES) discharge permit for review and public comment on August 25, 2008. **It is important to note that anyone desiring to submit written comment must do so during the public comment period that closes on September 30th, 2008 at 5 pm.** A public hearing for our new NPDES permit is scheduled for October 24th at the RWQCB's office in Rancho Cordova. Upon the expected approval of the State Regional Board, the permit will become active on that date.

The new NPDES permit contains a number of interim discharge limits that includes Electrical Conductivity (EC - an indicator of salt concentration), Boron, and Selenium. Staff believes that these limits are reasonable and were issued with the understanding that the City will commit to the Davis-Woodland Water Supply Project to improve its source water quality which will enable future more restrictive limits to be imposed. This project is also needed to offset problems with aging wells and declining groundwater quality, to secure the City's water right to the Sacramento River, have diversified water supplies, and for all water users to be able to enjoy higher quality water.

Staff recommends that the City Council affirm support for the Davis-Woodland Water Supply Project as the most feasible means to comply with the new NPDES permit effluent limits for EC, Boron, and Selenium and direct the development of a fiscal plan for complying with the new NPDES permit to include an update to the City of Woodland Water Pollution Control Facility Master Plan, water and sewer rate studies, and an evaluation of impacts to development and other fees.

Background

During the last several years the City of Woodland has experienced continual and significant decline in groundwater quality. City wells have increasing levels of nitrate and some are at or nearing state limits for domestic water use. Many wells are also in need of replacement.

The City of Woodland also has problems relating to meeting wastewater effluent quality requirements. The three constituents that are of particular concern to the state, Electrical Conductivity (EC - an indicator of salt concentration), Boron, and Selenium, are very elevated in Woodland's groundwater. On March 13, 2008, the City received a letter from RWQCB indicating that the potential limits would be 700 umhos/cm for EC and 700 mg/l Boron. Given the current very high levels of these constituents in the water, the City cannot expect to meet these limits without finding a new water source with significantly lower levels of these constituents or providing for extremely expensive treatment processes at the Water Pollution Control Facility prior to discharge.

In January 2006, LTD Engineering completed a report showing the use of Sacramento River water as a primary water source was advisable and feasible for Woodland. This conclusion was similar to the 2002 study done for the City of Davis. In 2004, West/Yost Associates did a study that showed the enhanced benefits to both cities and UCD by partnering for a regional solution. Multiple partners result in improved feasibility for all involved. This regional project is now known as the Davis-Woodland Water Supply Project. These reports indicated that surface water as our primary supply is feasible and warranted for improved water quality.

About every five years or when the rated capacity of the City of Woodland Water Pollution Control Facility (WPCF) is increased a new National Pollution Discharge Elimination System (NPDES) discharge permit is issued. Both of the above conditions now exist, thereby triggering the requirement for a new NPDES discharge permit. Based on the policy statements and permits issued to other entities by the RWQCB, the staff fully expected to have new, stricter, requirements in the new permit. For several years the RWQCB has indicated that dischargers would have to comply with the valley basin requirements for salt reduction.

The City of Woodland's water supply has a direct affect on the quality of the wastewater discharge. Electrical Conductivity, Boron and Selenium are already naturally elevated in the City's potable water supply (groundwater) and further concentrated by the time the water is used, conveyed and treated at the WPCF. The WPCF is not designed to remove these dissolved pollutants and significantly exceeds the new discharge limits on a daily basis.

The Regional Water Board understands that Woodland has been working towards a surface water supply project for several years now and this improved source-water quality will result in lower EC, Boron, and Selenium levels in water treated at the WPCF. This long-term plan for an improved water source is the basis for the RWQCB allowing the City of Woodland to receive interim limits in place of the much more restrictive planned limits for the above constituents in the new NPDES permit.

With the issuance of the new NPDES permit, the importance and feasibility of the Davis-Woodland Water Supply Project's is greatly increased. This new water supply project will also provide huge cost savings in complying with the NPDES requirements. An alternative project to construct and operate reverse osmosis treatment will not be needed as long as the City continues progress towards and ultimately completes the Davis-Woodland Water Supply Project. Previous studies have concluded that reverse osmosis is a significantly more expensive project.

Discussion

The new NPDES Permit limits:

- The interim Electrical Conductivity discharge limit of 1835 µmhos/cm is a provisional annual average. Historical EC levels discharged at the WPCF average around 1550µmhos/cm.
- The interim Boron Levels are set at 3,100 µg/L. The WPCF average discharge levels are approximately 2800 µg/L.
- The NPDES interim discharge limit of Selenium is 31 µg/L and the average selenium level discharged from the WPCF is 4.6 µg/L. However the selenium levels do range from 4.1 µg/L up to 7.1 µg/L.

It is important to note that the City will receive interim limits only as long as there is a commitment to and progress towards new source water with improved water quality. The City will be required to demonstrate this in annual reports to the RWQCB. If this does not occur the permit would be reopened and it is expected that the Basin Plan limits that are currently unattainable would be imposed along with applicable fines. The City's inability to comply could then lead to more fines and a potential Cease and Desist Order including a building moratorium for the City of Woodland.

Summary Chart:

	Woodland's Groundwater Domestic Supply From Wells	RWQCB New Interim Limits	Basin Plan limits (Long-term RWQCB limits)	Current WPCF Discharge levels	Sacramento River Water
EC	700-1200 umhos/cm	1835	700	1550	73-127
Boron	1700-2200 Ug/L	3,100 Ug/L	700 Ug/L	2800 Ug/L	0
Selenium	0-23 Ug/L	31Ug/L	3.2 Ug/L	4.6 Ug/L	<0.005 Ug/L

The above summary chart illustrates the levels of EC, Boron, and Selenium in the groundwater supply, new interim limits, Sacramento River water supply, WPCF effluent discharge, and the Basin Plan limits. As noted in the summary chart, the Basin Plan limits are the permanent limits that Woodland will have to comply with. The limits are: EC 700 µmhos/cm, Boron 700 µg/L, and Selenium 3.2 µg/L. At the Basin Plan limits (our longer term limits), the WPCF would not be able to discharge water in compliance with the NPDES permit limits. The City's groundwater supply is the primary source of contamination as it relates to EC, Boron, and Selenium.

The Sacramento River water will be the means for the WPCF to comply with these lower limits. After the Davis-Woodland Water Supply Project is completed and brought online around 2016, the interim EC, Boron, and Selenium NPDES limits will be rescinded and the more stringent Basin Plan limits will be initiated for compliance.

The City of Davis has similar water quality and NPDES permit issues. They too are facing very significant capital implementation costs. The City of Davis recently had an independent outside review done of its need to proceed with the Davis-Woodland Water Supply Project. City of Woodland staff participated in this process. The National Water Research Institute (NWRI) was asked to conduct this outside review. NWRI put together a panel of experts in various areas relating to water resources. The "Independent Advisory Panel - Final Report, dated 7/18/08", for the Davis-Woodland Water Supply Project is very important as it (1) confirms the results of separate studies completed by separate engineering firms and (2) it further clarifies that the Davis-Woodland Water Supply Project is needed to meet the requirements of Woodland's wastewater treatment plant permit.

The NWRI's independent study also looked into if the Davis-Woodland Water Supply Project could be avoided or delayed. They clearly indicated that the project is needed to meet water quality requirements and for numerous reasons should not be delayed. Also, other alternatives were looked at and determined not feasible. These alternatives include:

1. Provide Reverse Osmosis treatment of the wastewater and/or groundwater wells. Several studies have shown this to be excessively costly with no feasible way to dispose of millions of gallons of brine generated each day. The cost to implement this alternative at the WPCF has been determined to be significantly more expensive than the surface water alternative.

2. Provide centralized wellhead treatment. This has the same type of problems as noted above plus the costs of connecting all the wells to one location and then redistributing the water throughout the City is not feasible.

3. Utilize deep aquifer water for an improved water supply. Sampling from deeper water does not solve the problem. Deeper water supplies have additional mineral problems.

Collectively these studies and the independent report provides confidence in the need to move forward with providing improved water quality to the City of Woodland even though it will come at a significant cost.

City staff will provide a discussion on the above actions and related water resource projects at the September 30, 2008 water study session. In addition, staff has attached to this report information that was provided to the Infrastructure Committee on September 16. This information includes the discussion herein regarding the Wastewater Discharge Permit as well as other update and informational items staff has periodically reviewed with the Committee.

Fiscal Impact

The most efficient and cost effective solution to meet the new NPDES permit limits is to have the City commit to the Davis-Woodland Water Supply Project, with an estimated cost to Woodland of $200 million dollars. Much of this cost will be offset by reduced homeowner costs by using much softer water and also by reducing the need for groundwater well treatment and replacement costs. The recommended action includes factoring the project into the water and sewer rate studies.

As stated previously, an alternative option to the surface water supply project that has been studied would be to build a Reverse Osmosis (RO) facility at the WPCF to remove the EC, Boron, and Selenium, after the tertiary treatment system. The RO facility is an expensive project with an estimated construction cost of $350 million dollars ($150 million dollars more than the surface water supply project) and it would cost up to $10 million dollars per year to operate.

Public Contact

Posting of the City Council agenda.

The public had opportunity to comment on the 10.4 MG WPCF expansion project and the Davis-Woodland Water Supply Project during those CEQA processes. The Davis-Woodland Water Supply Project has also been discussed at CEQA scoping meetings and at prior City Council meetings.

Council Committee Recommendation

The attached report was discussed at the September 16, 2008 Infrastructure Committee. The Committee recommended acknowledging and abiding by the terms of the new NPDES permit. This includes committing to obtain improved source water, i.e. proceeding with the Davis-Woodland Water Supply Project Davis-Woodland Water Supply Project.

Alternative Courses of Action

1. Affirm support for the Davis-Woodland Water Supply Project as the most feasible means to comply with the new NPDES permit effluent limits for EC, Boron, and Selenium and direct the development of a fiscal plan for complying with the new NPDES permit to include an update to the City of Woodland Water Pollution Control Facility Master Plan, water and sewer rate studies, and an evaluation of impacts to development and other fees.

2. Direct further study of the Reverse Osmosis alternative.

3. Direct further study of the centralized wellhead treatment alternative.

4. Direct further study of the utilization of the deep aquifer water alternative.

Recommendation for Action

Staff recommends that the City Council approve Alternative No. 1.

Prepared by: Mark Hierholzer
WPCF Superintendent

Prepared by: Doug Baxter
Senior Civil Engineer

Reviewed by: Greg Meyer
Public Works Director

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Mark G. Deven
City Manager

Enclosure, exhibits & attachments required to support the report

Infrastructure Committee Packet

Agenda

Infrastructure Committee Meeting

9/16/2008
5:00 PM to 5:55 PM
Public Works Conference Room

Meeting called by:
PW Department

Time	Agenda topics	
10 minutes	1. Water Conservation Funding ▪ State Funding for high efficiency toilets ▪ Options and City cost impacts	Roberta Childers and Doug Baxter
Remainder	2. Wastewater Treatment Plant ▪ History of upgrades ▪ Concerns over salts, boron and selenium ▪ Wastewater discharge permit renewal status ▪ Interim limits connected to improved supply source, i.e. surface water project ▪ Attached Independent Advisory Panel - Final Report, 7/18/08, by the National Water Research Institute for the Davis-Woodland Water Supply Project	Mark Hierholzer and Doug Baxter
Additional/Future Item		Doug Baxter/Akin Okupe
Narrative Update Attached	3. Water Rate Study Is Underway	
Narrative Update Attached	4. Elevated Water Tank Replacement o Armory Demolition – by early October o Time delays result in rapidly escalating costs	
Narrative Update Attached	5. Water meter update	
Narrative Update Attached	6. Attached Independent Advisory Panel - Final Report, 7/18/08, by the National Water Research Institute for the Davis-Woodland Water Supply Project	
Future Discussion Needed	o Ground storage tanks sites in SW area	
Future Discussion Needed	o CIP update to handle urgent projects	
Future Discussion Needed	o Groundwater Supply Update o Well 25 & Monitoring Well o Well 24 o Wells 15 and 22	

1. City of Woodland Residential Toilet Replacement Program:

Staff is recommending that the City of Woodland accept a grant offer and implement a Residential Toilet Replacement Program. We request that the Infrastructure Committee concur in supporting this program and submittal of a specific proposal, such as noted below, to the City Council for approval.

The City of Woodland has been offered an opportunity to receive a portion of Proposition 50 grant funds awarded by the California Department of Water Resources (DWR) to the Regional Water Authority (RWA) to assist with the financial burden of a residential toilet replacement program, resulting in water savings for the region. Woodland was suggested as a participant by the City of Davis, which is collaborating with the RWA on this program.

RWA is a joint powers authority of about 22 water agencies in the greater Sacramento area and El Dorado, Placer, and Yolo Counties. More information about RWA can be found at its website www.rwah2o.org. RWA has a Regional Water Efficiency Program (RWEP) specifically designed to help water agencies with their water conservation programs. Very recently, DWR awarded RWA with a grant to support implementation of the RWEP by helping regional agencies provide incentives for the replacement of existing toilets with models that substantially reduce water use. An agency does not have to be a member of RWA to participate; however, non-members are required to pay a surcharge of 20% of RWA's grant management costs. Woodland's portion of these administrative costs is anticipated to be $1,000 or less. The program currently runs through December 31, 2009.

Background

Since 1992, federal law has mandated that all toilets manufactured in the U.S. must use an average of 1.6 gallons per flush (gpf) or less. These 1.6-gpf toilets are often referred to as Ultra-Low-Flush Toilets or ULFTs. Toilets produced from the early 1980s to 1992 used 3.5 gpf or more. Toilets produced prior to 1980 used 5.0 to 7.0 gpf or more. ULFTs use approximately 20,000 gallons less water annually than older non-ULFT models.

High-Efficiency Toilets (HETs) are defined as fixtures that flush at 20 percent below the 1.6- gpf U.S. maximum or less, equating to a maximum of 1.28 gpf. (The HET category includes dual-flush toilets.) The average water savings for HETs is estimated to be 38 gallons per day (gpd) when replacing a non-ULFT and 7 gpd when replacing a ULFT.

Residential Toilet Replacement Program

Under the program, the participating agencies will provide rebates for replacement of older toilets with more efficient new ULFTs and HETs. The toilets cost as little as approximately $90 to as much as several hundred dollars. The rates set for residential toilet rebates are as follows:

- Up to $125 for ULFT (1.6 gpf)
- Up to $175 for HET (1.28 gpf)

For residential toilets, DWR will reimburse the local agency a maximum of $75 per toilet. For the ULFT, this equates to a 75:50 (or 3:2) cost share between DWR and the local agency with a rebate of $125. For the HET, this equates to a 75:100 (or 3:4) cost share between DWR and the local agency with a rebate of $175. It is expected that the number of ULFTs and HETs in the rebate program will be roughly equal.

If the cost of a toilet is less than the rebate amount, the cost share between the agency and DWR is reduced proportionately. For example, for a ULFT costing $100, the resident would receive a $100 rebate. Only $60 would be requested from DWR, and the local share would be $40, maintaining the 3:2 cost share for ULFTs.

A target of 400 residential rebates is anticipated to be offered to Woodland for DWR funding, subject to RWA participant approval.

A program for Woodland to consider could be structured as follows: Water customers are eligible to receive up to $125 rebate for replacement of a 3.5-gpf or greater toilet with a new ULFT (1.6 gpf) or up to $175 with a new HET (1.28 gpf or less).

To Qualify

- The toilet to be replaced must have been installed prior to 1994. (A policy decision will be required regarding whether to use 1992 or 1994. The recommended date is 1994 because the ULFTs that were manufactured before 1994 were poorly designed and commonly require multiple flushes, leading to excessive water use. Since 1994, the design has been substantially improved.)
- Purchase of material must occur within the program period of September 1, 2008 to December 31, 2009. Rebates are provided on a first-come, first-served basis and will end when funds are exhausted.
- Only Woodland residential single-family and multi-family applicants are eligible.
- Note that the City of Woodland or a representative is **NOT** required to send IRS form 1099 to the customer and the IRS when rebates total $600 or more.
- Replacement of one ULFT with another ULFT is not eligible for rebate under this program.
- Replacement of one ULFT with an HET is based on a case-by-case basis generally requiring the replaced toilet to have been manufactured between 1992 and 1994.
- New construction is not eligible under this program.

To Receive a Rebate, Residents Must:

- Replace a toilet that functions at 2.0 gpf or greater (non-ULFT or non-HET), except as noted above.
- Install the toilet(s) themselves or hire a licensed contractor.
- Return the original dated receipt and/or plumber's invoice with the price, model, and brand of each toilet listed individually.
- Submit a signed application that represents agreement to have Woodland verify the type of existing toilet and installation of the specified toilet(s) accompanied by resident. A pre- and/or post-installation inspection may be conducted.
- Eligible expenses can include 1.6-gpf or less tank, bowl, seat, supply line, wax ring, caulking, bolts, bolt covers, tax, and cost of professional installation up to the rebate amount. Some water agencies do not rebate installation. This is a policy decision for Woodland to make. In many cases, having the customer pay a portion of the total cost for a new toilet shows a valuable commitment.
- Woodland would issue rebate checks within eight to ten weeks of receipt of completed application materials. Rebates will vary depending on the toilet (ULFT or HET). Total rebate amounts will not exceed the money spent by a resident.

The toilet replacement program can be a residential customer rebate program or even a direct install program where the resident brings their old toilet to a designated bulk toilet storage location and switches it out for a ULFT on site. Either way, Woodland would be paying a certain amount per toilet and then submitting the data to RWA. RWA would then submit the data to DWR for reimbursement, and the DWR funds will be dispersed to the agencies.

As noted above, DWR would reimburse up to $75 per toilet and Woodland would pay up to $50 per ULFT and $100 per HET. A rebate amount discrepancy between ULFT and HET is suggested to promote more efficient technology and discourage free-ridership. It is important for a water utility to carefully evaluate the benefits and costs when determining the rebate value. The financial incentive value must be high enough to encourage the residents to buy a product they would not normally purchase. When consumers accept the financial incentive for a purchase they would have made without the incentive, they are categorized as free-riders. Free-ridership is a cost to a program without netting any benefits to the local

agency. On the other hand, many consumers purchase products intending to apply for the rebate, but fail to ever submit rebate applications – this allows the local agency to get a "free-ride" – obtaining benefits of conservation without expending funds.

Again, 400 rebates are expected to be available to Woodland. If 200 ULFTs and 200 HETs are distributed, as much as $60,000 would be distributed in toilet rebates, $30,000 from Woodland and $30,000 from DWR. Note that the RWA program participation fee of approximately $1,000 is NOT included in this estimate. Also note that Woodland would be responsible for providing the rebates to residents and then obtaining reimbursement from DWR after each quarterly reporting period.

Benefits to City of Woodland

- Providing a program for those customers receiving a meter and metered rates and a means to save money in the transition
- Positive publicity for Woodland
- Demonstration of a proactive program
- Woodland will save water, which will help defer any new water purchases, well development, and additional storage.
- The burden of costs is not only on Woodland; grant funding will stretch Woodland's dollars further, resulting in more rebates and more water savings.
- Woodland can mimic other current programs (like the clothes washer rebate program) that have been already established, and therefore does not have to redesign a program and can benefit from lessons learned.
- Woodland did not have to submit the grant application; all of that work has been done. Woodland can reap the benefits of RWA's efforts.
- Future DWR grant funding will rely upon compliance with the CUWCC BMPs; the implementation of this program is one step closer to BMP compliance.
- This program will generate significant savings without requiring behavioral changes.

Benefits to Residents

- The fear of increased water bills when switched to a metered rate can be lessened with a water saving program.
- No behavioral changes are necessary to generate the water savings.
- The majority of the costs are covered up front and within the program.
- ULFT selections are readily available, and more HETs are also becoming more accessible.
- Lower monthly bills.
- The ability to say they are helping the environment and are doing the right thing.

Woodland can take advantage of this program in several ways:

1. Join the region and participate in the grant through RWA as a non-member with payment of a surcharge for grant administration costs. Under this scenario, RWA will need to amend the DWR grant to include Woodland. To be eligible, Woodland must have an approved Urban Water Management Plan, which we do.
2. Coordinate an agreement through the City of Davis. To be eligible, Woodland must have an approved Urban Water Management Plan.
3. Join RWA and participate in the grant. Under this scenario, RWA will need to amend the DWR grant to include Woodland. To be eligible, Woodland must have an approved Urban Water Management Plan.

The City of Davis intends to participate in the commercial toilet rebate portion of the program. It is important to note that with Woodland's participation in the residential rebate portion, the Davis is looked on more positively for program participation, i.e. we are helping the City of Davis.

There is a cost share for the DWR grant funding, and documented staff time, marketing, inspections, and other costs of program implementation are all eligible for the cost share. RWA has budgeted $30,000 in

funds for this program (400 residential toilet rebates). There may be opportunities to fund more rebates, and to request a program extension if participation isn't as robust as anticipated. The City of Woodland already has a funded Water Conservation Coordinator position that would administer this program.

Potential partnership funding might be available to assist with either the rebate amounts or increasing rebate amounts. Also, where provision of water supply is energy intensive, such as groundwater pumping, energy utilities are sometimes willing to help fund programs of this type to reduce the energy impact of water pumping or processing.

2. New WPCF NPDES Permit 2008-2013

The Regional Water Quality Control Board (RWQCB) recently issued the City of Woodland's tentative National Pollution Discharge Elimination System (NPDES) discharge permit for review and public comment. The public hearing is scheduled for October 24th at the RWQCB's office in Rancho Cordova and if approved, pending public comment, the new permit will become active and enforceable on that date.

The NPDES permit is required by the Environmental Protection Agency, to discharge treated effluent from a wastewater treatment facility. NPDES permits must be periodically renewed and is also a requirement for the City of Woodland to utilize the expanded 10.4 million gallons per day capacity of our new treatment facilities.

The new NPDES permit for Woodland contains a number of new requirements for how the City treats and disposes its wastewater. Of particular importance are new permit limits for Electrical Conductivity (EC), Boron, and Selenium within the discharged effluent. These constituents are already naturally elevated in the City's potable water (groundwater) and for a number of reasons, further concentrated by the time the water is used, conveyed, and treated at the City's Water Pollution Control Facility (WPCF). The WPCF is not designed to remove these dissolved pollutants and generally exceeds the new discharge limits on a daily basis. The City has completed several studies that indicate the best means to reduce the levels of these dissolved pollutants is to improve the quality of Woodland's potable water supply.

The RWQCB is required to set NPDES effluent limits so that the effluent remains at or below established water quality objectives. Since 2001, the RWQCB is also required by law to levy mandatory minimum penalties (MMPs) of $3,000 per violation of an effluent limit per day. These fines have become a significant financial burden to many communities. As a means to minimize the City's exposure to MMPs, the RWQCB allowed the City to have "interim" limits for EC, boron, and selenium that are based on historical performance of the WPCF – on the premise that the City continues to make progress on improving its potable water quality.

Impacts of EC, Boron, and Selenium

The RWQCB set EC, Boron, and Selenium limits back in 2000 as part of the Basin Plan for the Central Valley.

EC has been shown to interfere with water absorption in the soil as the Salts (EC) plug the porosity of the soil, which then requires more water to be used for irrigation purposes.

Many crops have a high sensitivity to boron and in some cases cannot be grown in soils that contain high levels of Boron. In other cases crop yields are reduced, when irrigated by water sources that contain boron levels higher than 700 µg/L.

Selenium has a direct impact on wildlife, chick deaths in Kesterson Reservoir and deformed waterfowl in the 1980's, were attributed to selenium in agricultural drainage waters.

NPDES Permit Limits

- Electrical Conductivity (EC): The NPDES permit contains an interim discharge limit of 1835 µmhos/cm as a provisional annual average. Historical EC levels discharged from the WPCF average around 1550 µmhos/cm.
- Boron: Interim Boron levels are set at 3,100 µg/l. The WPCF average discharge levels are approximately 2800 µg/L. The Basin Plan calls for Boron levels to be 700 µg/l.
- Selenium: The NPDES discharge limits for selenium are; 3.2 µg/L Monthly Average, and 9.2 µg/L Daily Maximum. The WPCF average discharge level for Selenium is 4.6 µg/L. However, the selenium can range anywhere from 4.1 µg/L up to 7.1 µg/L through out the year.
- The improved Sacramento River water will be the means for the WPCF to comply with the lower limits of EC, boron, and selenium. After the surface water project is brought online, the interim EC, Boron, and Selenium, NPDES limits will be rescinded and the more stringent Basin Plan limits will be the initiated for compliance.

Summary Chart:

	Woodland's Groundwater Domestic Supply Water	Interim Limits	Basin Plan limits (Long-term limits)	Current WPCF Discharge levels	Sacramento River Water
EC	700-2100 umhos/cm	1835	700	1550	73-127
Boron	1700-2200 Ug/L	3,100 Ug/L	700 Ug/L	2800 Ug/L	0
Selenium	0-23 Ug/L	31Ug/L	3.2 Ug/L	4.6 Ug/L	<0.005 Ug/L

Implications for Woodland

Woodland is not the only community facing these stringent discharge limits. The RWQCB has implemented these limits to several communities in the Central Valley Region and all of these communities are facing very difficult decisions as to how they can comply with their respective NPDES permits. Recently, these communities through the Central Valley Clean Water Association (CVCWA) drafted a letter to the RWQCB addressing the restrictive EC limits. The letter states that many communities are receiving effluent limits for salt (expressed as EC) parameters that are not feasible with currently used treatment technologies. These technologies include advanced or tertiary treatment methods. Most NPDES effluent limits are based on protecting the most salt sensitive crops. For most Publicly Owned Treatment Plants, salt levels in the effluent are pre-determined by the salt levels in the influent, or drinking water (as is the case for Woodland).

Additionally CVCWA continues to be troubled by the Regional Board's interpretation of the narrative chemical objective for the salinity parameters with the most conservative recommended goals developed by the Food and Agricultural Organization of the United Nations in 1985. CVCWA agrees that the solution to meeting the RWQCB EC levels has to be a holistic approach that considers water quality standards with an interrelationship of water supply and water quality.

Woodland has studied the feasibility of going to a surface water supply as a means of obtaining a more reliable water source and better drinking water for the community. In turn, this study has taken on more importance as a means of compliance of the new NPDES permit limits.

The RWQCB understands that Woodland is working towards a surface water supply project. This improved source water quality will result in lower EC, boron, and selenium levels and is the basis for the State allowing Woodland to have temporary interim limits until the surface water project can be implemented. To assure Woodland will actively move towards an improved source water quality the new NPDES permit requires Woodland to submit annual update reports on the status of the surface water supply

project. In the meantime, the RWQCB issued interim limits for EC, Boron, and Selenium. Once Woodland has had time to implement the surface water supply project the more restrictive discharge limits will likely be required.

What happens if Woodland does not develop a surface water supply?

1. The new NPDES permit states: "*If no discernable progress is being made by the City of Woodland* [towards surface water], *the Regional Water Board may reopen the permit, as necessary, to include appropriate effluent limitations for these constituents*." If the Regional Board does open the permit for lack of progress, then the EC, Boron and Selenium limits will be set at the current Basin Plan limits and become enforceable at those limits.
2. The RWQCB will levy Mandatory Minimum Penalties (MMPs). These penalties are required by law to be at least $3,000 for each constituent violated and are cumulative, meaning each time the WPCF exceeds an effluent limit, the City will be fined cumulatively for each constituent exceeded. Many local communities are already assessed MMP's that total up to hundreds of thousands of dollars. UC Davis was just issued MMP's for $240,000 of which, $150,000 of fines were due to EC violations of their NPDES permit.
3. If Woodland does not initiate corrective actions to comply with the Basin Plan limits, then a Cease and Desist Order (CDO) will be issued by the RWQCB. The CDO would put the City on a timetable for compliance. The RWQCB could levy additional fines or impose additional capacity limits on the NPDES permit- essentially triggering a building moratorium.
4. The City also has some exposure to third party lawsuits which can sue under the Federal Clean Water Act.

Actions Woodland has taken:

The City staff has been aware of the looming financial impacts the EC, Boron and Selenium, will cause to the local community. In as much as the City of Woodland has lead efforts with the City of Davis in concert with Larry Walker and Associates, and UC Davis experts, to revise the EC limits imposed by the RWQCB. These entities joined forces in drafting a letter with supporting analysis commissioned by Woodland then submitted this letter to the RWQCB. The letter uses conservative and scientifically proven data that illustrates an EC limit of 1,100 µmhos/cm can be used and still meet the agriculture objective of the Basin Plan, instead of the presently used limit of 700 µmhos/cm. Although this new limit would still not be met with regards to the current EC levels discharged from the WPCF, it does help in regards to design capacity of the surface water plant. The higher EC limits would allow blending of the surface water with city wells during the summer months, in turn reducing the size of the surface water plant that would need to be built to serve our community.

Another study done by National Water Research Institute, commissioned by the City of Davis, studied all aspects of meeting the future water supply needs and future wastewater discharge limits expected from the RWQCB up to the year 2040. The study addressed using deep water wells with centralized treatment, demineralization, well head water treatment, or RO filters at the wastewater treatment plants. The alternative of using deep groundwater wells is not feasible due to the high costs of treatment and brine disposal, and the lack of space at many well sites to build treatment.

Below are costs estimates for each alternative.

- Surface Water – No Grant $200 million dollars
- RO filters at the WPCF $350 million dollars.

The conclusions of the National Water Research institute were;

- Postponement of the surface water project could result in the failure to meet future wastewater discharge requirements resulting in expensive fines levied by the RWQCB.
- It would be cheaper to meet the water quality objective of the RWQCB by going with a surface water supply.

Conclusion

In conclusion, the new NPDES permit contains numerical limits for Electrical Conductivity, Boron and Selenium which are unachievable with the current treatment process used at the WPCF. The only way the WPCF will be able to economically meet these new limits is by changing the majority of its water supplies from groundwater to surface water, which is significantly lower in many dissolved constituents. This option will require a considerable investment by our community, but this investment brings a two fold benefit; a higher quality and more reliable water supply, and the ability to meet future NPDES requirements.

Future or Additional Items as time allows

3. Update on Water Rate Study:

Water rate study is underway. The Finance Department and Utility Engineering staff have met with the rate study consultant and we are all very impressed with their experience and competency to provide a highly professional rate study that is tailored to the needs and desires of our community. The following information was provided to the City of Woodland by the water rate study consultant, HDR. This information is provided to the Infrastructure Committee so they are aware that the process is under way and to understand the general approach that will be taken in preparing the water rate study. The Infrastructure Committee will be involved in the review process as the study is developed.

For the Davis-Woodland Water Supply Project (Sacramento River water) it is important to determine the appropriate cost allocation to the development fund and enterprise fund. Without appropriate cost allocation to development the rate increase will be significantly higher than previously projected and presented to Council. A study should be done to accurate determine this cost allocation. Likewise, since a significant reason for going to surface water is to be able to comply with our NPDES permit for our Water Pollution Control Facility a significant amount of the cost, perhaps half could be put on the sewer bill instead of putting it all on the water bill. The Regional Board staff looks at the sewer charges when it determines feasibility of State required permit items so there could be advantages to put some of the cost on the sewer bill to show that we have already incurred significant economic impact from the 2008 permit.

HDR is aware that:

1. We are seeking equity in 12 month billing totals between those who will be on meters and those who will be on a flat rate,
2. We want to be sensitive to impacting low-income users and have options submitted for considerations such as:
    a. having a life line tier to help low-income customers and/or
    b. a limited amount of general funds used to subsidize low-income customers
3. We need to be able to position ourselves to a allow for surface water as it appears regulatory limits will mandate this requirement.

HDR's most recent update message on the rate study was,

"I am going to be somewhat general in my statements as I am not sure how things will end up, I have a general feel, but there are three distinct analyses that will be conducted during the rate study update. The review of each analysis will allow for HDR to provide policy and general recommendations, staff to agree or refine those recommendations, and then our final recommendation to the committee and City Council. So here goes…

The rate study will be comprised of three interrelated analyses. These are a revenue requirement analysis, a cost of service analysis, and a rate design analysis. The revenue requirement analysis will provide an overall review of rates and the adjustments necessary to adequately and prudently fund the water utility. The abbreviated version of this is the annual rate revenues of the utility along with any miscellaneous revenues (i.e., rents, interest income, etc.) are compared to the operating and maintenance and capital expenses of the utility. Any balance or deficiency of funds is divided by the rate revenues to determine the appropriate adjustment to rates for each of the years of the analysis. Typically this is a five to ten year review to allow for any "bumps" in the road to be taken into consideration prior to them actually occurring. Typically, these are related to major capital projects on the horizon, such as the surface water treatment plant. One of the analyses we will be completing will be to determine the most cost effective method to fund these projects. This will most likely be a mix between rates and outside borrowing. Once the five year rate impacts are known, a rate transition plan can be developed to help smooth any needed rate adjustments. At the end of the revenue requirement analysis HDR, along with City staff, will provide a rate implementation plan that will meet the operating and capital needs over the time period reviewed. This will allow us to determine the best strategy to start ramping rates prior to any major rate increases needed to avoid rate shock, or to minimize rates in the short term and allow for future rate increases to be implemented.

Once the revenue requirement is known, the next step is to equitably allocate the revenue requirement to the various customer classes of service. This is accomplished through a cost of service analysis. The first step in this analysis will be the determination of the customer classes of service. The customer information will be reviewed and HDR will work with City staff in finalizing the actual customer classes of service to utilize in the cost of service analysis. At this point it would appear that developing the classes of service for residential, commercial, and large use will be the most appropriate. However, after a final review of the data changes may be suggested. Once the classes have been determined the revenue requirement for the test period, or one year most likely 2010, will be allocated to the

different customer classes of service to determine if any interclass adjustments should be made. That is, is one customer class subsidizing another through the current rates? If that is the case, a recommendation will be developed and presented to the committee and City Council for approval. At this point in the analysis a determination can be made as to how we approach the rate design component and a final determination of classes of service can be made. In other words, we may have more detail in the cost of service analysis, but may combine the specific customers into larger groups for rate making purposes.

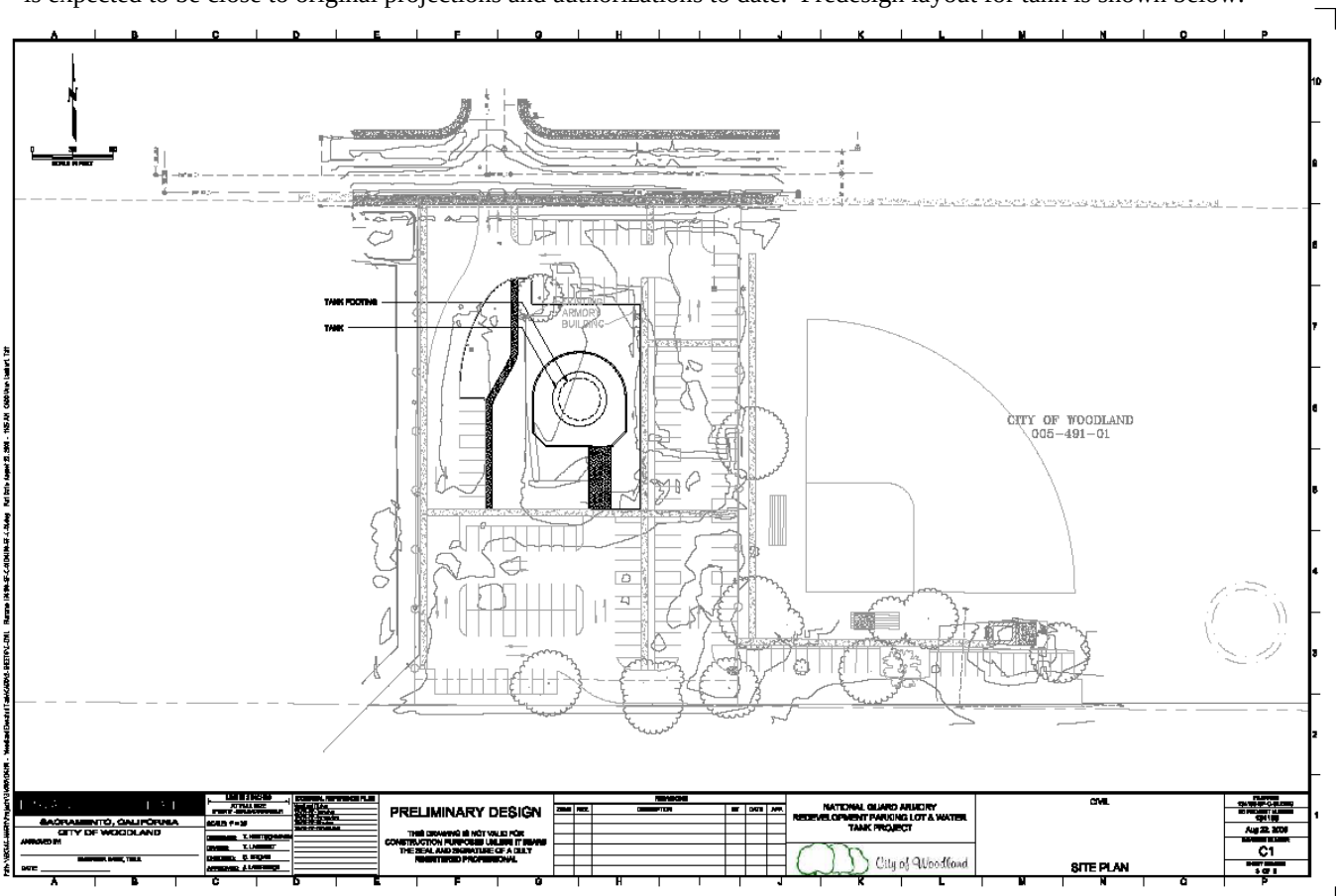
Once the revenue requirement and cost of service is complete and the final rate adjustments are known the rates can be designed. The revenue requirement will provide the overall revenue changes for the utility. The cost of service analysis will provide the rate adjustment by class of service. The rate designs will take into consideration both. In any case, the rate designs will review alternative rates that will meet the overall goals of the study. The key to the rate design is the transition of un-metered customers to metered rates. Given the significant number of customers transitioning, care must be taken to allow customers to understand the impacts of moving to a metered rate. Given that, the rate will be developed so that the average residential customer would pay the same per month under metered or un-metered rates. Given that residential usage characteristics are unknown, estimates will need to be made as to the level of assumed consumption over the year. As a result, the rate structure may need to be phased in over a multi-year period to achieve the final goals of the utility. A consideration that some utilities are making is developing a rate structure that allows for minimal use at base costs, that is lower consumption at the lowest cost. This provides a "lifeline" rate for those customers on a fixed income or those that use minimal water on a monthly basis. In addition, other alternative rate structures may be reviewed as the results are developed to meet the specific needs of the City.

I hope this helps, let me know if you have any questions. Thanks Shawn"

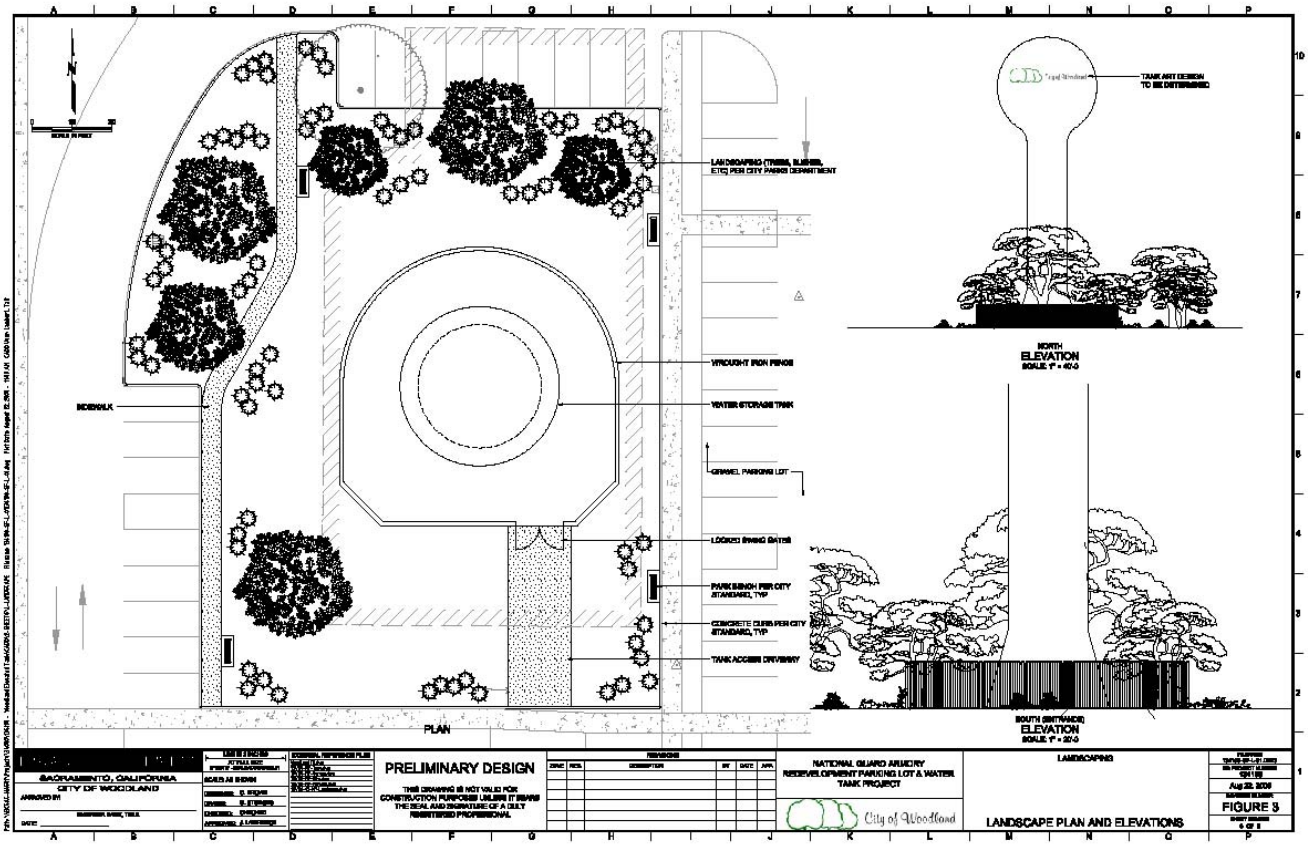
SHAWN KOORN
HDR Engineering Inc.

4. Update on Elevated Water Tank Replacement

Final design is underway for the pedesphere style tank to be located at the site of the existing Armory building. The Armory building demolition should be complete by early October. The cost of steel has escalated but cost of project is expected to be close to original projections and authorizations to date. Predesign layout for tank is shown below.



Concept of Landscaping Layout around new tank is shown below.



5. Meter Implementation Update:

We expect the meter project to go out for bids within the next 5 weeks. A staff report will be prepared to summarized the project, ask for authorization to go to bid, approve plans and specifications and present a budget update. Mailers have gone out to the public with their billing statements in an effort to keep the public informed of water needs, upcoming capital projects and meter implementation. At the County Fair we presented to following information to the public.

WOODLAND

Basics of Water Metering

City of Woodland

1. **Who** is going to be metered? All customers with water connections in the City.

2. **Why** use meters? State Assembly Bill 2572, signed into law September 2004, requires water customers with buildings built after January 1, 1992 be billed based on their consumption by January 1, 2010, and that by 2025 all water users located within the City's service area be billed based on consumption. Water metering results in conservation with related environmental benefits.

3. Besides Woodland, **which other Cities** have to be metered? By law, all cities, statewide, have to be metered. However, most other cities in the state, and throughout the country, have already been metering water customers for years.

4. **When** will metering occur? All homes and businesses built in 1992 or after will be part of Phase 1 and are required to be metered by 2010. All water connections that have a water meter will also be on a metered rate. Phase 2 will include the remaining water customers in the City who will be metered before 2025.

5. **Who pays** for the meter installations? The City will pay the direct cost of water meter installations.

6. **Where** will the meters be located? Your meter/meter box will be (or already is) located on your property's public utility easement either in the front yard, driveway, park strip, or walkway. The meter is inside the meter box below ground level.

7. **How will** meter installations affect my landscaping? If you already have a meter box and your landscaping is not covering or obstructing the meter box your landscape should remain in the same condition as found. However, any landscape covering and/or obstructing access to the meter box will need to be removed by the property owner.

If you do not have a meter box, or your service line to the street needs to be replaced, some disturbance may occur. All reasonable efforts will be made to restore the site to its previous condition.

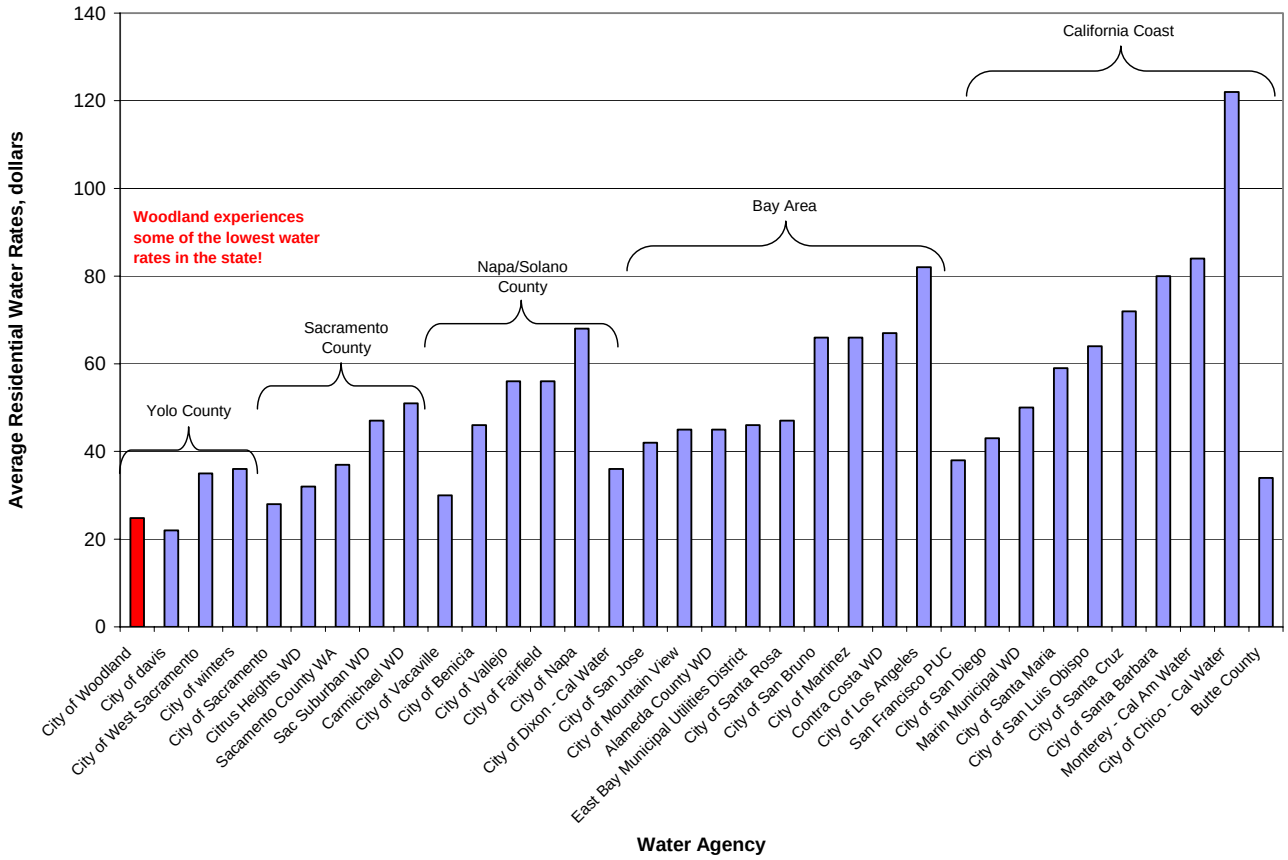
8. **How long** does a meter installation take? Usually less than 4 hours.

9. **How will** my meter be read? The City will use an automatic radio-read technology which allows all meters in the city to be read within a day. In order for the automatic reading to work, all existing meters in the City will be upgraded with a meter transceiver unit which will send a radio signal from the meter to the receiving tower. All new meter installations will be compatible with this technology.

10. What is the difference between **flat-rate and metered-rates**? Flat rates depend only on lot size and are independent of the amount of water used. Flat rates cover both the service charge and water usage. Metered rates include the service charge plus a charge based on the amount of water used, as recorded by the water meter. Currently a residential meter rate does not exist. The new residential meter rate will be structured so that the annual costs for both the flat rate and meter rate payers will be similar to the extent possible.

11. How much do residents pay for water on average? About 4 cents buys you 10 gallons of water.

12. How does Woodland's water rates compare to other water agency's rates? The average water bill in Woodland is lower than most other areas in California. See graph below.



6. Independent Advisory Panel - Final Report, 7/18/08, by the National Water Research Institute for the Davis-Woodland Water Supply Project:

The City of Davis requested and independent review of the proposal to utilize Sacramento River water as a significant water supply for the future. National Water Research Institute (NWRI) conducted this review by putting a panel of experts in various areas relating to water resources. The Independent Advisory Panel - Final Report, dated 7/18/08, for the Davis-Woodland Water Supply Project is included below. (Some formatting problems occurred in trying to convert the pdf file to a work document so please forgive the less professional looking appearance than the original document).

The City of Woodland and the City of Davis each previously did studies that showed that it was feasible and advisable to pursue the use of higher quality water from the Sacramento River. For Woodland it was feasible to do a Woodland only user but subsequently we decided to improve the feasibility to do a joint project with Davis and UCD. This NWRI independent study is a very important as it (1) confirms the results of the separate studies (2) and it further clarifies that the Davis-Woodland Water Supply Project is needed to meet the requirements of our wastewater treatment plant permit.

The NWRI independent study looked in to if the Sacramento River water supply project could be avoided or delayed. They clearly indicated that the project is needed to meet our water quality requirements and for numerous reasons should not be delayed. Also, other alternatives were looked at and determined to be not feasible. They looked at alternatives such as:

- Deep groundwater without demineralization.
- Groundwater with centralized treatment.
- Groundwater with well-head treatment.

NATIONAL WATER RESEARCH INSTITUTE

Final Report
Independent Advisory Panel

Review of the
Davis-Woodland Water Supply Project

July 18, 2008

Fountain Valley, California

1. PURPOSE OF THE PANEL

In October 2007, the City of Davis City Council: (1) adopted the Environmental Impact Report for the Davis-Woodland Water Supply Project (DWWSP); and (2) ordered an independent review of the recommended project. Subsequently, the City requested the National Water Research Institute (NWRI) of Fountain Valley, California, to appoint an Independent Advisory Panel (Panel) to provide independent peer review of the project. A short biographical sketch of the individual members on the NWRI Panel is presented in Appendix A. Key elements that the Panel was to specifically address include:

1. Overall assessment of the project, such as:
    - Evaluation of alternative options.
    - Groundwater uses, limitations, and potential conflicts.
    - Timing of improvements.
    - Area-of-origin and summer water purchases.

2. Effectiveness of public outreach efforts.

3. Future needs and long-term challenges.

The Panel participated in a conference call on March 20, 2008, with staff from the Cities of Davis and Woodland (referred to as "Project Partners") and their consultants to review the project. The Panel also attended a meeting in Davis, California, on June 3-4, 2008, with those same participants to further discuss the project, review appropriate reports, and participate in a field trip to become more familiar with the proposed project. On June 4, the Panel deliberated in closed session, reviewed various reports (see Appendix B), and was further briefed by staff from the City of Davis. Subsequently, after exchanging various e-mails, the Panel reached the findings and conclusions presented in this report.

2. OVERALL ASSESSMENT OF THE DWWSP

The first question the Panel debated was whether the objectives of the DWWSP were met by the alternative selected. Those objectives included:

1. Provide a reliable water supply to meet existing and future needs.

2. Improve water quality for drinking water purposes.

3. Improve the quality of treated wastewater effluent discharged by the Project Partners through 2040.

The Panel unanimously concluded that the selected DWWSP project, which will develop a surface water supply for use by the City of Davis, the City of Woodland, and the University of California at Davis, in conjunction with the continued use of their groundwater supplies, will fully meet all three of the above objectives. Furthermore, the Panel was impressed by the regional approach exemplified by Yolo County's Integrated Regional Water Management Plans (IRWMP) and by the foresight shown in 1994 by the Yolo County Flood Control and Water Conservation District in submitting an application to the State Water Resources Control Board (SWRCB) for water rights to withdraw water from the Sacramento River to meet the long-term water supply needs of the County. Without this foresight, the Project Partners would have had a

much more difficult time in developing the DWWSP, which fully meets all three of the above objectives.

In reaching this overall assessment, the areas discussed by the Panel – and the findings reached – are briefly summarized below.

3. WHY NOW? WHY NOT WAIT TO IMPLEMENT THE PROJECT?

The second major question the Panel debated was whether the project could be postponed and implemented at a later date. The Panel concluded that there are several potential consequences of postponing the project, which are summarized below.

3.1 Loss of Water Rights. The Panel concluded that the most serious consequence of postponing the project is the probability of losing the pending appropriative right to withdraw up to 46,100 acre-feet of water per year from the Sacramento River. The application to secure these rights was submitted to the SWRCB by Yolo County Flood Control and Water Conservation District in 1994 in response to a county-wide water supply study. That application has been reassigned to the Project Partners. The SWRCB, however, requires due diligence on the part of the applicant to pursue and implement water rights. Therefore, if the Project Partners are not able to show timely progress, the SWRCB is likely to cancel the application. The net result of this action would be that the Project Partners would have to start the process anew, thereby losing their "place in line." The money expended thus far in pursuing this application has exceeded $3 million. If the effort to secure these water rights is postponed to a later date, much of the work would have to be redone. Furthermore, whereas only 11 protests were filed when the original application was filed in 1994, nine of which have been resolved, it is probable that a new application would trigger far more protests and concomitantly reduce the chances of obtaining the rights to appropriate the surface water needed for the project. The Panel found the Technical Memorandum dated October 17, 2007, from Jim Yost et al. to Gary Wegener on this subject persuasive.

3.2 Loss of Summer Water. The Panel concluded that postponement of the project to a later date would likely result in the loss of upstream water currently available for purchase to supplement the amount of water needed during the summer months. As discussed above, the pending water rights application will allow diversion of 46,100 acre-feet of water per year from the Sacramento River. However, this diversion will be subject to limitations specified in permits issued by the SWRCB (e.g., no withdrawals during the summer months or other dry periods). The Project Partners project a total water demand of 55,600 acre-feet per year by 2040. Because this demand exceeds the 46,100 acre-feet per year of surface water that can be diverted from the Sacramento River under the pending application, the Project Partners are negotiating with upstream water rights holders to purchase the water needed to meet the demand. Initially, this supplemental water will be needed primarily during the summer months when withdrawal under the pending application will be prohibited. Failure to proceed to contract for this "summer water" in a timely fashion will probably result in the inability to do so at a later date. A number of agencies throughout the state are continuously looking to purchase water from upstream water rights holders to

supplement shortages in their supplies. The Panel concluded that these shortages will continue and be exacerbated with time due to population growth, climate change, drought, etc. Thus, the number of agencies with water shortages will increase, as will competition for available water from water rights holders. Consequently, the ability to purchase needed water at a future date will be far more difficult and expensive. Furthermore, the water may not even be available.

3.3 Escalating Cost. The Panel carefully considered the costs of the project and debated whether advances in technology would lower the costs if the project were to be postponed. The Panel was unanimous in concluding that any reduction in cost due to changes in technology would have minimal impact on the big picture and that delaying the project would result in much higher total costs. As shown in Figure 1, the cost indices for construction are increasing at very fast rates. By extrapolating these data, it is reasonable to conclude that these costs will continue to increase. Furthermore, engineering costs will increase as well, but at a slower rate.

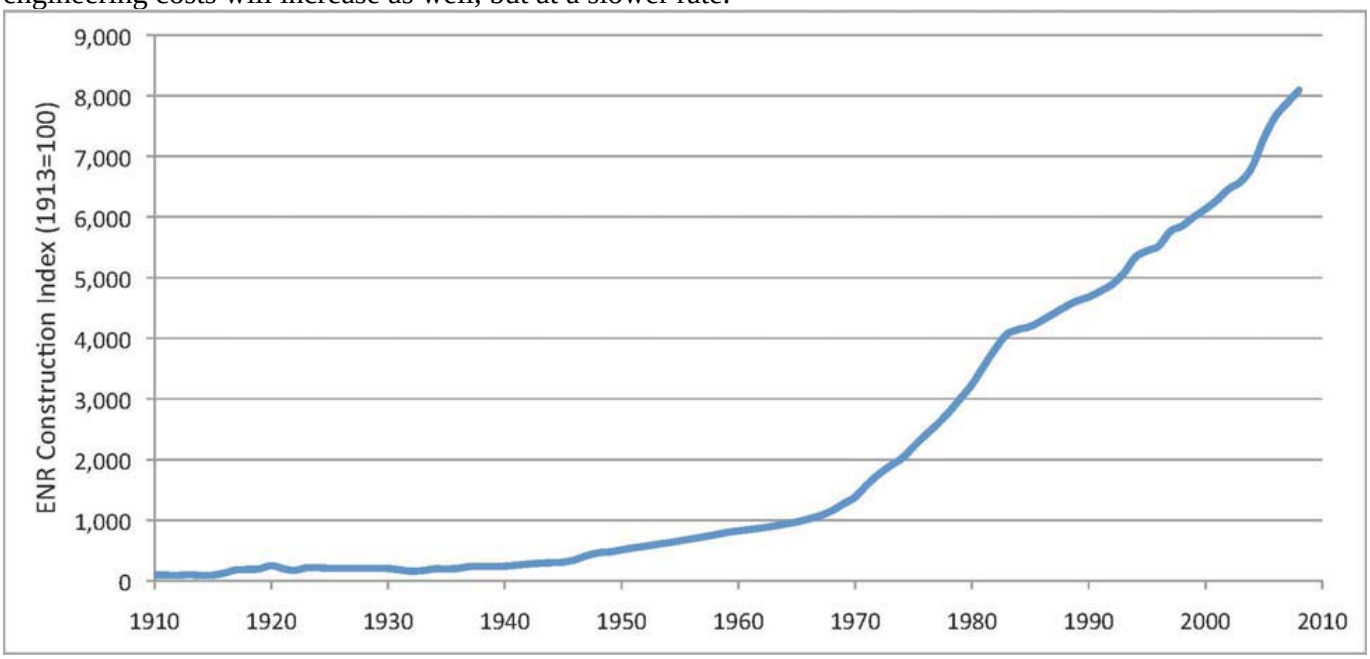


Figure 1. The history of the Engineering News Record Construction Cost Index from 1910 to the present time shows a steady increase.

As pointed out in the Technical Memorandum dated October 17, 2007, from Jim Yost et al. to Gary Wegener, “Most all construction materials increased by at least 100 percent between 2003 and 2006 … Since 2003, the rate of inflation has increased by a total of 10 percent.” The Panel agrees with these statistics. Therefore, the only way to avoid these rapidly escalating costs is to continue with the project as planned instead of hoping to save money by postponing the project to a later date. Furthermore, Proposition 84 approved by the voters in 2006 included $1 billion for implementation of integrated regional water management programs included in the IRWMP that were funded by the earlier Proposition 50. The DWWSP is a key element of the Yolo County IRWMP and is in a good position to

compete for Proposition 84 funding ($73 million of the $1 billion is allocated to the Sacramento Valley region). Thus, postponement of the project would take the DWWSP out of competition for these funds and could result in the City of Davis having "to go it alone" at a later date.

3.4 Probable Failure to Meet Wastewater Discharge Requirements. The Panel unanimously concluded that postponement of the project could result in the failure to comply with future wastewater discharge requirements. Such a failure would be serious and could result in fines and litigation. The Panel is well aware that one of the key objectives of the project is to improve the quality of treated wastewater effluent discharged by the Project Partners through 2040. The City of Woodland completed a site-specific investigation of appropriate EC and boron levels to protect beneficial uses and submitted its results to the RWQCB-CVR in 2005. The City of Davis will perform a similar investigation as a requirement of their October 2007 permit and, subsequently, will be issued a National Pollutant Discharge Elimination System (NPDES) permit limiting EC and boron. In a letter dated March 13, 2008, to Mr. Greg Meyer, Deputy Public Works Director of the City of Woodland, the California Regional Water Quality Control Board, Central Valley Region (RWQCB-CVR), under the heading *Protection of Salt Sensitive Beneficial Uses*, stated: "Per U.S. Code of Federal Regulation, Title 40 … and as required in the Water Quality Control Plan for the Sacramento/San Joaquin River Basins (Basin Plan), water quality objectives must provide reasonable protection of beneficial uses, including consideration of past, present, and probable future beneficial uses."

The Project Partners are thus required to plan ahead and anticipate what future requirements they will likely be required to meet. The March 13 letter from the RWQCB-CVR further states: "In the absence of an approved site-specific study, Regional Water Board staff would consult published accepted studies (such as the 1985 Ayers and Wescot Study) to establish EC and Boron effluent limitations that are protective of the most sensitive beneficial uses." The RWQCB-CVR letter then states that the Ayers -Wescot Study recommends an agricultural water quality goal for electrical conductivity (EC) [1] of 700 micromhos per centimeter (µmhos/cm) and a boron concentration of 700 micrograms per liter (µg/L) as long-term averages. The Basin Plan referenced in the above letter contains the following water quality objectives: (1) a maximum EC of 900 µmhos/cm for drinking water supplies; and (2) an EC of 700 µmhos/cm or less for agricultural uses for the most salt-sensitive crops.

Many agricultural crops are very sensitive to boron, which is quite prevalent in area groundwater and, concomitantly, in wastewater effluent. As stated above, the Ayers-Wescot Study recommends an agricultural water quality goal of 700 µg/L for boron. Current boron concentrations in the wastewater treatment plant effluent from the City of Davis ranges between 1,300-1,800 µg/L. The boron concentration in City of Woodland wastewater effluent ranges between 2,100 and 3,000 µg/L.

Selenium is another trace element that has received much attention in recent years. Deformed waterfowl and chick deaths in Kesterson Reservoir during the 1980s were

[1] Electrical conductivity and total dissolved solids are both used as a measure of the salinity of water.

attributed to selenium in agricultural drainage waters. Based on a review of tentative and existing waste discharge requirements, project staff anticipate that the RWQCB-CVR will set an effluent limit for selenium of 4.4 µg/L for the City of Davis effluent. Very limited data exist for selenium concentrations in the effluents from the wastewater treatment plants. The available data, however, indicate that neither the City of Davis nor the City of Woodland could meet a selenium requirement of 4.4 µg/L.

As stated above, the Project Partners are required to plan ahead and anticipate what future wastewater discharge requirements they will likely be required to meet. After reviewing the Basin Plan and discharge requirements already established for other jurisdictions in the Sacramento/San Joaquin River Basins, they have determined that it is likely that the RWQCB-CVR will set requirements for the City of Woodland as follows: (1) an EC of 700 mhos/cm; (2) a boron concentration of 700 µg/L; and (3) a selenium concentration of 4.4 µg/L as long-term averages. The Panel concluded that the RWQCB-CVR is indeed likely to include these requirements in the NPDES permit for the City of Woodland and for the City of Davis.

In summary, the Panel concluded that the Project Partners will be unable to meet wastewater discharge requirements likely to be established by the RWQCB-CVR without implementing one of the following options: (1) continuing with the proposed project; (2) installing reverse osmosis treatment processes to treat existing groundwater supplies; or (3) installing reverse osmosis treatment processes to treat the wastewater effluents to remove salinity, boron, and selenium. Furthermore, although option #3 would enable the Project Partners to comply with NPDES permits likely to be established, it would not result in meeting either project objective #1 of providing a reliable water supply to meet existing and future needs or project objective #2 of improving water quality for drinking water purposes specified in the DWWSP. The Project Partners determined that if membranes (e.g., reverse osmosis) were used to remove the salts from existing groundwater supplies, a pipeline would have to be constructed to the Carquinez Strait near Benicia just to dispose of the salts. The Panel concluded that the costs for such a pipeline essentially rule out option # 2 (installing reverse osmosis processes to treat existing groundwater supplies) and option #3 (installing reverse osmosis processes to treat the wastewater effluents to remove salinity, boron, and selenium). Therefore, as stated above, the Panel unanimously concluded that postponement of the project could result in the failure to comply with future wastewater discharge requirements.

3.5 Drinking Water Quality Will Continue to Be Marginal and Threatened. If the project is postponed, the citizens will continue to receive drinking water of marginal quality. Moreover, there is the ongoing potential for shallow, poor-quality groundwater to continue migrating into intermediate and deep aquifer intervals tapped by the drinking water purveyors. As discussed above, the groundwater tapped by drinking water wells is somewhat high in EC. Put another way, it is elevated in total dissolved solids (TDS), including constituents that cause hardness (primarily the divalent ions of calcium and magnesium). Hard water results in increased costs to the consumer. For example, homeowners will have increased costs due to the precipitate formed inside water pipes and other plumbing fixtures, water heaters, etc., thereby decreasing their usable lifespan. Furthermore, many consumers have installed self-regenerating water softeners to treat their

existing supply. Brines from the regenerating process add an appreciable amount of salt to the sewer system, thereby exacerbating the problem of salinity in the effluents from the wastewater treatment plants.

In addition to the problems associated with high TDS in the groundwater, some wells produce groundwater relatively high in iron and manganese. These two constituents result in the staining of bathroom fixtures and washed clothing. The California Department of Public Health has set secondary maximum contaminant levels (MCLs) for iron and manganese at 0.3 and 0.05 mg/L, respectively. City of Davis staff informed the Panel that, in order to reduce consumer complaints, they have to periodically flush areas of the distribution system to flush-out the precipitated iron and manganese. This practice is expensive and results in a waste of groundwater due to its poor quality. However, changing to a surface water supply may not eliminate this practice entirely in that some flushing may be required to maintain water of suitable bacteriological quality.

The Panel considered all of the above factors, and unanimously concluded that postponement of the project will not meet the objective of improving water quality and its sustainability for drinking water purposes.

3.6 California Environmental Quality Act (CEQA) Documents. If the project is postponed to a future date, the CEQA documents will likely need to be rewritten. Therefore, much if not all of the costs incurred in preparing these documents will be lost. Proposed water supply projects face far more stringent scrutiny now than they have in the past. Therefore, if the Project Partners have to re-issue these CEQA documents in the future, it may be much more difficult to obtain the necessary approvals and the costs will increase accordingly. Also, as pointed out above, the costs already incurred in preparing these documents may be lost.

4. Other Alternatives that the Panel Evaluated

The third major question the Panel debated was whether the objectives of the DWWSP could be met by other alternatives than the one selected by the Project Partners. The Panel could only identify the three alternatives shown below that might possibly meet these objectives.

- Deep groundwater without demineralization.
- Groundwater with centralized treatment.
- Groundwater with well-head treatment.

However, as discussed in Section 3.4 above, the alternative of installing reverse osmosis treatment processes to remove excess minerals from existing groundwater supplies was quickly ruled out due to the cost of brine disposal.

4.1 Deep Groundwater without Demineralization. Early in its deliberations, the Panel concluded that the alternative of using deep groundwater without treatment to remove excess minerals had the best possibility of meeting the objectives of the DWWSP. However, after further deliberations, the Panel concluded that even this alternative appears infeasible, primarily because it is unlikely that the Project Partners can: (1) successfully negotiate a less

stringent EC requirement for their wastewater effluents; and (2) eliminate essentially all self-regenerating water softeners. Even if those two obstacles could be overcome, the capital cost savings would be moderate, while risks and other costs are numerous and collectively substantial. Therefore, the Panel concluded that this alternative is probably infeasible and is far less attractive than the DWWSP, which fully meets all three of the project objectives (See Appendix C for a more thorough discussion of this alternative).

4.2 Groundwater with Centralized Treatment. This alternative would require conveying the water from existing or new groundwater wells into a centralized treatment plant. The plant would have to be designed to remove contaminants of concern (e.g., arsenic, selenium, boron, hardness, TDS, etc.). This alternative would allow a consistency of water quality to be delivered to the customers, and also might result in less maintenance than the individualized wellhead treatment alternative. Another advantage of this alternative is that it would provide the ability to change the treatment processes at one central location to meet future regulations. However, as discussed above, the Panel concluded that this alternative would not be feasible, primarily due to the cost of brine disposal. Furthermore, as discussed in Appendix C, there are numerous risks in attempting to use groundwater to meet the long-term objectives of the DWWSP (e.g., potential litigation, land subsidence, deterioration in water quality, and reduction in aquifer yield).

4.3 Groundwater with Well-Head Treatment. This alternative would probably require the installation of water treatment processes at each well (well-head treatment). One advantage of this alternative is that the treatment processes could be tailored to the water quality characteristics of the well. The disadvantages include: (1) the maintenance requirements associated with individual treatment units; and (2) space constraints associated with each well site. More importantly, however, this alternative would also have the same disadvantages as the centralized treatment alternative discussed in Section 4.2. The Panel, therefore, concluded that this alternative would not be feasible.

4.4 Alternative of Choice. The Panel concluded that the alternative selected by the Project Partners will meet all objectives of the DWWSP. The only other alternative that the Panel considered worthy of careful evaluation was the use of deep groundwater without demineralization. However, even that alternative appears to be infeasible, while risks and costs are numerous and collectively substantial, as discussed in Section 4.1 above and in Appendix C.

5. OTHER RECOMMENDATIONS TO CONSIDER

The Panel's overall assessment of the DWWSP was presented in Section 2, and the problems that the Project Partners would probably encounter if the project was postponed were presented in Section 3. Additionally, the Panel discussed several issues that the Project Partners might encounter if the decision is made to proceed with the DWWSP. These issues and recommendations are presented below.

5.1 Water Rights and Water Transfers in the DWWSP

The Panel was presented with four inter-related programs within the DWWSP, three of which involve water transfers and, therefore, water rights issues. The four programs include:

- The Sacramento River surface water supply program.
- The summer agricultural-urban water transfer program.
- The program to produce and sell urban reclaimed water to nearby farms.
- The Woodland metering program (no regional water rights issues).

This section discusses risks and strategies to minimize the risks associated with all but the last of these programs.

5.1.1 Sacramento River Surface Supply Program

Permit Acquisition Risk

This program relies on "area of origin" statutes (Water Code Sec. 11460) to secure high-priority water withdrawal permits from the SWRCB. Yolo County acted with foresight in applying to the SWRCB for such rights to up to either 45,000 acre feet per year (af/yr) (from the presentation materials) or 46,100 af/yr (from the Community Report), and maximum diversion of 80 cubic feet per second (cfs) in 1994. Although not a certainty, due to the lack of extensive opposition and the Project Partners' continuing effort to reach accommodation with remaining opposition, it is likely that the permit will be issued by the SWRCB if the Project Partners pursue it.
Risk-minimizing strategies: (1) Maintain diligent pursuit of permits and project so as not to compromise the permitting process; and (2) identify a satisfactory threshold of assurance that the permit will be issued before proceeding with financial commitments to build surface-water infrastructure. The Panel recognizes that these strategies are already being pursued.

Standard Permit Term 91 Risk

Standard Permit Term 91 (also called Standard Water Right Term 91) provides a means by which the SWRCB can curtail water deliveries to permit holders to achieve Sacramento-San Joaquin Delta water quality objectives and other in-basin goals. The general validity of Term 91 has been affirmed judicially.[2] Term 91 provides the SWRCB authority to curtail water withdrawals on a real-time basis.[3] Project plans anticipate that no "area of origin" permit water will be available during the summer months as a result of Term 91. The risk associated with Term 91 involves potential future increased degradation of the Delta and expansion of the periods in which no water withdrawals are

[2] *El Dorado Irrigation District v. State Water Resources Control Board (2006) 142 Cal. App. 4th 937 (48 Cal.Rptr.3d 468).*
[3] *See "Implementing Standard Terms 91 and 93 for the Sacramento-San Joaquin River Delta Watershed" http://www.waterrights.ca.gov/HTML/license_progam.html#lic4 accessed June 13, 2008.*

permitted. The risks manifest themselves as the possibility of stranding surface-water diversion infrastructure assets (intake, treatment, and pipelines), as well as reduced and/or less reliable regional water supply.
Risk-minimizing strategies: (1) Study the historical implementation of Term 91 and project alternative water-loss scenarios (compare historical precedents to Delta degradation scenarios, including climate change impacts and increasing water withdrawals from the Delta); (2) Negotiate cost-sharing with Conaway Ranch of the Sacramento River joint intake facility that accounts for reduced- and no-supply scenarios (this could take the form of dividing some of the capital costs on a fixed percentage basis with the rest of the capital costs divided on a variable [relative use] basis); (3) Expand the capacity of the project's surface-water transmission, storage, and treatment to increase the program's capacity to acquire surface supplies as opportunities arise; and (4) Expand the proposed summer agriculture-urban water transfer program through option agreements to water during other seasons (discussed below).

5.1.2 Summer Agricultural-Urban Water Transfer Program

<u>"Wet Water" Accounting Risk</u>

This risk encompasses whether substitute groundwater utilized by the farms that transfer water to DWWSP will be considered new water to the basin. It is possible that groundwater used by transferors will be considered subsurface flows of the basin and that farms transitioning from surface to groundwater will not be seen as producing new "wet" water (instead of "paper" water, which when withdrawn is in reality a net loss to the basin). This determination would result in DWWSP not being allowed to withdraw summer water as planned.

Risk-minimizing strategies: (1) Secure transfer agreements and options from Yuba County Water Agency or
similar agencies and farms with either proven hydrologically-distinct groundwater supplies or otherwise-demonstrated capacity to supply summer water; (2) Structure water transfers on the Devil's Den-Castaic Lake Water Agency model in which farmers' financial compensation was a function of agricultural water availability (the less water applied to the farm, the higher the compensation paid by the urban district); (3) Agree to summer land fallowing on transferring farms, or facilitate/help pay for ecological restoration efforts in exchange for rights to a portion of the saved water; and (4) Secure option contracts for water supply needs consistent with the risk analysis performed related to Term 91 limitations.

5.1.3 The Program to Produce and Sell Urban Reclaimed Water to Nearby Farms

<u>Loss of Willing Buyer Risk</u>

Today's interested buyers may choose not to actually conclude and implement agreements to purchase reclaimed water. The Panel considers this to be a low-probability

risk since other potential users will be identified when the project starts generating usable water.

Risk-minimizing strategy: Reduce the linkage of sale of reclaimed water from other aspects of the DWWSP by
minimizing expected freshwater offsets in planning scenarios.

Requirement to Maintain Existing Wetlands Risk

The existing wetlands are a popular habitat for birds and other wildlife. The Panel is unaware of whether or not the wetlands are a habitat for threatened or endangered species, but they may be. Therefore, the Project Partners should carefully consider the impact of planned activities that might impact the wetlands.

Risk-minimizing strategy: (1) Investigate the impacts of reclaimed water transfers on the wetlands and endangered species; and (2) Commence discussions with regulators on the legal status of the wetlands as critical habitat.

5.2 Public Outreach

As documented in the materials provided to the Panel, the Project Partners have expended a significant effort in educating the public about the DWWSP. The EIR process was completed without substantial controversy and was not challenged in court. The DWWSP Community Report issued in December 2007 provides an outstanding summary of the project history and vision for its implementation, and is a useful tool in the public outreach efforts.

Nonetheless, and as expressed by project staff, support for the DWWSP in the local community remains mixed. Decision-makers and the general public alike continue to question the need for the project, and are concerned about the substantial increase in consumer rates to pay for the project, along with the anticipated debt financing that will require repayment over a long period of time. If the Project Partners decide to move forward with the project, more funds will be expended and agreements will be negotiated. However, it is not certain that when the elected decision-makers are asked to finally approve and commit to long-term financing of the project, the votes will be there. Therefore, the Project Partners must also commit to continuing their public education campaign from this point forward to ensure the necessary support from the community. Education must remain a key element of the implementation efforts. The Panel concluded that the DWWSP will provide numerous benefits to the public, including: (1) a high-quality drinking water supply; (2) improving the reliability of their water supply; (3) lower costs to consumers who currently treat their water supply; (4) water reuse opportunities thereby preserving limited surface and groundwater; and (5) improving the quality of wastewater discharges thereby reducing the potential for fines and litigation. These benefits should be clearly stated and presented to the public as part of the education process.

The following are several public outreach suggestions and ideas the Project Partners might want to consider as the DWWSP moves forward:

***5.2.1 Address the Rates Issue Head-On*:** Project staff need to help the public and decision-makers understand the "true cost" of water. Davis and Woodland have been the beneficiaries of some of the lowest water rates in California, primarily due to a modest scale of investment in the water supply infrastructure over time. The Panel appreciates that the rate increases for the project will generate controversy; nevertheless, even after the increases, the Panel believes that the new rates will be reasonable compared to rates throughout the State. Therefore, the rate issue should be viewed as an educational challenge. *Water rates will go up anyway.* The Panel recommends that the costs of various water supply options be presented using a cost per acre foot metric; this is a common metric used in water supply projects and is readily understood by decision-makers and the general public.

***5.2.2 Convey the Project's Importance as One Part of an Overall Sustainable Water Supply Portfolio*:** The Project Partners must convey the message that the surface water supply project is an important, but not the only, piece of the community's overall water supply picture. If one thinks of the water supply portfolio as a stool (see Figure 2), the community currently has a two-legged stool: groundwater and conservation. Both are important, but the community cannot be sustained using this unbalanced approach. The surface water project and water reuse provide the other two legs of the stool to balance out the portfolio. Conservation should continue to be an important part of the education campaign; therefore, water conservation successes in the community should continue to be reported and emphasized.

Figure 2: Sustainable water supply portfolio.

Furthermore, the Project Partners should look for ways to increase conservation. Governor Arnold Schwarzenegger recently proclaimed that California is in a drought, the first such proclamation in 17 years. The *San Jose Mercury News* in an editorial of June 6, 2008, stated that the Governor's proclamation "…could help drive home the urgency of conservation. If calls for voluntary cuts don't work – and they tend not to – then water agencies need to offer more incentives or levy penalties to change behavior." The editorial continued: "It's the second straight year of below-normal precipitation, and this spring was the driest on record for the Sierra Nevada." Assembly Bill 2175, which recently passed the Assembly, would require a 20 percent decrease in urban water use by 2021. The Panel is aware of court decisions to further cut pumping from the Sacramento Delta to protect fish. All of these facts point out the importance of maximizing conservation. By doing so, the Project Partners will be helping to ensure that they have an ample water supply during years of drought. And, as pointed out above, water reuse, which is further discussed below, is an important part of the overall water supply picture.

***5.2.3 Use Media Appropriate to the Message*:** Single-page question and answer (Q&A) fact sheets are very useful tools in conveying targeted messages and simplifying highly technical information for a non-technical reader. The October 17, 2007 Technical Memorandum titled *"Why Surface Water & Why Now"* (provided in the Panel's binder) contains highly relevant material to the public's understanding of the project and provides good answers to the "why this, why now" question. The *2007 Community Report* also contains good information. Much of this material could be translated to one-page fact sheets covering individual topics; use more graphics than text to convey meaning. The fact sheets should be posted on the project's website and placed in water bills. The Project Partners should be perceived as the reliable and credible source of information about the project. This kind of material can help in that perception. It is important to be as transparent as possible.

***5.2.4 Public Outreach Does Not End with the CEQA Process*:** Many communities appropriately use the CEQA process as the framework for public outreach because it has predictable milestones and has a beginning-middle-end. However, just because the DWWSP EIR was certified without much controversy does not mean that the public is "okay" with the project and their interest has diminished. If anything, the public needs to be kept more informed *after* the CEQA process because now the project is moving into design, financing, and construction. This is when the project finally becomes "real" to people, and designing outreach and education materials for this phase of implementation is critical.

5.3 Project Costs

The Panel would like to compliment the Project Partners for thoroughly investigating the costs of the various alternatives to improve the reliability and enhance the quality of their drinking water supply. Following are some additional considerations regarding project costs.

*5**.3.1 Mitigating Costs**:* Regarding the documentation of costs and mitigation of costs for the various water supply alternatives, the Panel made the following findings:

- The costs of the water supply alternatives were thoroughly examined.
- The cost of doing nothing is important to document, including the impact on water rights, summer water purchasing, meeting discharge requirements, risk of relying upon aging infrastructure, and others.

If the decision is made to proceed, the Panel recommends that the Project Partners examine all viable means to cost-effectively design and implement the DWWSP using strategies including incorporating public-private partnerships that do not sacrifice reliability, stability, and public health.
In particular, the Panel supports and encourages the Project Partners to pursue grants, loans, and bonds to help offset the costs of funding the DWWSP and to keep increases to water rates at a minimum.

5.3.2 Alternative Water Supply Options: The Panel agreed that they could not identify any other lower cost water supply alternatives that could achieve objectives similar to those proposed by the DWWSP (see Appendix D for summaries of cost by alternatives). The Panel discussed the idea of a deep groundwater without demineralization alternative, which shows a lower cost per acre-foot, but concluded that it was probably not a viable option (See Section 4.1 and Appendix C).

5.4 Surface Water Treatment

5.4.1 Conventional Surface Water Treatment

5.4.1.1 As the Project Partners move away from groundwater supplies and begin planning and designing their surface water treatment plant, there may be reliability issues that should be considered, some of which might be too detailed for consideration at this time. For example, at present, the Project Partners rely on a network of wells to provide water to their customers. As the wells are closed and they move toward a surface supply, there will only be one primary conduit from the water treatment plant to the City of Davis and one to the City of Woodland. The Project Partners may want to explore the option of placing multiple lines from the water treatment plant and intake to their distribution network to ensure that supply can be maintained during short pipeline outages (repair or maintenance). This redundancy would improve the operational reliability and flexibility of the water supply systems of both cities.

5.4.1.2 While conventional treatment is proposed for the DWWSP, alternative treatment technologies should be evaluated for potential cost savings. If the project moves forward, the Project Partners should consider forming and convening a technical advisory panel to review and evaluate treatment process options. Simply dismissing treatment alternatives due to the turbidity of surface water sources or due to the fact that neighboring utilities use conventional treatment processes is insufficient given the advancements and operational configurations of treatment technologies, such as membranes. Submerged membranes (Carmichael) and ballasted sedimentation (Placer County Water Agency) may be treatment processes worth evaluating.

5.4.2 Other Concerns

5.4.2.1 The commingling or blending of treated surface water and groundwater presents water quality challenges. The Project Partners need to carefully plan how the waters are to be blended, as well as the location of the blending point(s). That is, the blending process must be carefully planned, designed, operated, and managed to ensure that stable water quality is maintained in the distribution system and delivered to the customers.

5.4.2.2 Operation of a surface water treatment plant will be very different from the operation of a groundwater-only water system. The Project Partners have anticipated and appear to be prepared for the hiring and/or retraining needed treatment plant operators.

5.4.2.3 Simply meeting primary and secondary drinking water standards should not be sufficient operating or production objectives for the final product. Given that the source water quality for the DWWSP will be much improved over the current supply, water quality objectives that are lower than the primary and secondary drinking water standards should be the norm.

5.4.2.4 Operators of the Project Partner's distribution systems need to be cognizant of water chemistry challenges, flow patterns, changes in water quality due to biofilm formation, corrosion of pipes, etc.

5.4.2.5 If localized blending of groundwater and treated surface water within the distribution system does not meet water quality objectives, it may be necessary to consider pumping groundwater to the treatment plant for blending prior to distribution.

5.5 Water Reuse

As pointed out above, the Panel recommends that the Project Partners increase the use of reclaimed water to achieve a balanced water portfolio. The Panel recognizes, however, that the quality of effluent currently produced by the Project Partners prevents them from maximizing reuse within their service areas and adjacent lands. If the Project Partners proceed with the DWWSP, the effluent produced will be of better quality (e.g., low concentrations of TDS, selenium, and boron), which will be an encouragement to agricultural and other users to consider reuse in lieu of using ground or surface water.

There are numerous resources that can be used to identify potential recycled water uses and applications such as the Department of Water Resources website at www.owue.water.ca.gov/recycle, the University of California's library and information resources, and the California section of WateReuse Association (www.watereuse.org/ca/index.html).

Reclaimed water has been used in California as a non-potable water supply for more than a century, primarily for agricultural and landscape irrigation. Early recycling projects were initiated primarily to help control water pollution. However, as wastewater treatment has improved and as water supplies have become scarcer, the beneficial uses of reclaimed water have

increased appreciably. Furthermore, California law (Water Code Sections 461-465) requires the maximum use of treated wastewater. In 1991, California Water Code 13577 set recycling goals of 700,000 acre-feet annually by year 2000 and 1 million acre-feet annually by 2010. Currently, recycled water is used for the following beneficial uses: (1) agricultural irrigation; (2) landscape irrigation; (3) industrial use; (4) groundwater recharge; (5) seawater barriers; (6) recreational impoundments; and (7) wildlife habitat. The degree of treatment required for these different uses will vary. Where such use may result in a potential threat to health, the treatment required and restrictions on use are governed by regulations promulgated by the California Department of Public Health. However, the water quality required for agricultural use is plant- or crop-specific. Furthermore, there may not be regulations governing such use, but there may be guidelines of good practice to ensure that the use will not result in damage to the crop being grown.

5.5.1 The Panel is aware that the largest market for recycled water in the project area will be agriculture. The Panel also realizes that rice is one of the predominant crops grown in the area, but knows of no research regarding the quality of water required for its successful irrigation with recycled water. The Project Partners may need to either identify such research and/or farm advisers to determine the quality of water required, and then conduct tenant education to encourage use of the resource. Such use, of course, will depend on the completion of the DWWSP and the ability to produce a reclaimed water of suitable quality.

6. Conclusions

Based on review of the technical information provided by the Project Partners and on the knowledge and experience of the individual Panel members, the Panel unanimously concluded that the alternative of using Sacramento River water and groundwater in the proposed DWWSP will fully meet all three of the following project objectives:

1. Provide a reliable water supply to meet existing and future needs.
2. Improve water quality for drinking water purposes.
3. Improve the quality of treated wastewater effluent discharged by the Project Partners through 2040.

In addition, the Panel also came to the following conclusions:

- The most serious consequence of postponing the project is the probability of losing the pending appropriative right to withdraw up to 46,100 acre-feet of water per year from the Sacramento River. Furthermore, postponing the project most likely will result in other serious negative consequences, such as the loss of summer water purchases, funding opportunities, partnerships, increased costs due to inflation, increased costs to rewrite the CEQA documents, and the failure to comply with future wastewater discharge requirements, which could result in penalties and litigation.

- The Panel was unable to identify any other alternative that could potentially meet the project objectives other than the alternatives evaluated by the Project Partners (using deep

groundwater without demineralization, groundwater with centralized treatment, and groundwater with well-head treatment).

- The alternatives of using groundwater with either centralized or well-head treatment are not feasible due to the high costs of brine disposal.

- The use of deep groundwater without demineralization is probably infeasible and fraught with obstacles. Furthermore, even if these obstacles could be overcome, the capital cost savings would be moderate, while risks and other costs are numerous and collectively substantial. Therefore, the Panel concluded that this alternative is far less attractive than the alternative selected by the Project Partners of using Sacramento River water and groundwater to comply with the objectives of the DWWSP.

- The Project Partners thoroughly investigated the costs of the various alternatives that had the potential of meeting the project objectives. Project staff need to help the public and decision-makers understand the "true cost" of water. Davis and Woodland have been the beneficiaries of some of the lowest water rates in California, primarily due to a modest scale of investment in the water supply infrastructure over time. The Panel appreciates that the rate increases for the project will generate controversy; nevertheless, even after the increases, the Panel believes that the new rates will be reasonable compared to rates throughout the State.

- The Panel identified a number of strategies to minimize the risks associated with water rights issues associated with the proposed DWWSP project. These strategies are outlined in the report.

- The Project Partners are strongly encouraged to develop an effective public outreach program to ensure the necessary support from the community. A key element of this public outreach effort will be to directly address the projected increase in water rates with the general public and to clearly identify the benefits that the DWWSP will provide to the public. Suggestions on how best to accomplish this are contained in the report.

- The Panel identified additional concerns that the Project Partners will need to address as they move forward, including issues associated with: (1) conventional surface water treatment (such as alternative surface water treatment options); (2) challenges associated with blending treated surface water and groundwater; and (3) maximizing water conservation and reuse.

- Finally, the Panel was impressed by the regional approach exemplified by Yolo County's Integrated Regional Water Management Plans and by the foresight shown in 1994 by the Yolo County Flood Control and Water Conservation District in submitting an application to the State Water Resources Control Board for water rights to withdraw water from the Sacramento River to meet the long-term water supply needs of the County. Without this foresight, the Project Partners would have had a much more difficult time in developing the DWWSP, which fully meets all three of the project objectives.

APPENDIX A: PANEL BIOGRAPHIES

HARVEY F. COLLINS, PH.D., P.E. (Chair)

Environmental Engineer Consultant (Sacramento, California)

Harvey Collins has over 30 years of experience in California state government, working in all fields of sanitary/environmental engineering and environmental health. He served as Deputy Director of Public Health at the California Department of Health Services, and was Chief of the Division of Drinking Water and Environmental Management when he retired in 1995. Since then, he has consulted on various water and wastewater engineering projects and has served on several blue ribbon panels. He also has received numerous awards, including a Rudolf Hering Medal of the American Society of Civil Engineers, Walter F. Synder Award from the National Environmental Health Association and NSF International, and Special Recognition Award from the California Department of Health Services. Collins received a B.S. in Civil Engineering from Oregon State University, an M.S. in Sanitary Engineering from the University of Missouri, Columbia, and a Ph.D. in Sanitary Engineering from the University of California, Berkeley. He is a licensed Civil Engineer in the State of California.

ROBERT C. CHENG, PH.D., P.E.

Deputy General Manager, Operations (Long Beach, California)

Robert Cheng is the Deputy General Manager of Operations for the Long Beach Water Department. There, he oversees the operations of the potable water system (including 30 wells, 62.5 MGD Groundwater Treatment Plant, and associated distribution system), reclaimed water system, sanitary sewer collection system, and all Department research activities, including a $20 million, 10-year seawater desalination research program. Before becoming Deputy General Manager of Operations in 2005, Cheng served the Department as Director of Operations. He had also performed numerous bench-, pilot-, and full-scale water treatment studies as a process engineer with the Metropolitan Water District of Southern California prior to joining the Department and, in addition, worked as a Senior Process Engineer for Black & Veatch Consulting Engineers in Kansas City, Missouri. Cheng has also taught Water and Wastewater Treatment classes within the Civil Engineering Department at the California State Polytechnic University, Pomona. Cheng received a B.E. and M.S. in Chemical Engineering from Vanderbilt University, and Ph.D. in Civil Engineering from UCLA. Cheng is active in the water industry, where he serves on several AWWA Councils and also on the AwwaRF Research Advisory Council.

GRAHAM E. FOGG, PH.D.

Professor of Hydrogeology and Hydrogeologist
University of California, Davis (Davis, California)

Graham Fogg has had over 30 years experience characterizing and analyzing groundwater under a variety of conditions in the southwest and western United States. He is currently a professor of

Hydrogeology in the Department of Land, Air and Water Resources (LAWR) at the University of California, Davis where he teaches undergraduate and graduate courses such as Hydrogeology and Contaminant Transport and Numerical Modeling of Groundwater Systems. His research has also made important contributions to UC Davis' Center for Watershed Sciences. His area of expertise includes groundwater contaminant transport, groundwater basin characterization and management, and the role of molecular diffusion in contaminant transport and remediation. Fogg received a B.S. in Hydrology from the University of New Hampshire, an M.S. in Hydrology at the University of Arizona, and Ph.D. in Geology at the University of Texas at Austin.

BRENT M. HADDAD, PH.D.
Director, Center for Integrated Water Research
Professor of Environmental Studies Department
University of California, Santa Cruz (Santa Cruz, California)

Brent Haddad has taught courses in Environmental Studies at the University of California, Santa Cruz (UCSC) for the past 10 years, including UCSC's most highly enrolled course, *Introduction to Environmental Policy and Economics*. In 2007, he founded and became Director of the UCSC Center for Integrated Water Research. The Center undertakes research to work towards refocusing and resolving major debates on water quality and supply in the U.S. and abroad. Major projects of the Center include developing a tool to guide state and local desalination planning and an economic analysis of the development of a major desalination plant in Monterey Bay known as the Coastal Water Project. Haddad received his B.A. in International Relations from Stanford University, an M.A. in International Relations from Georgetown University, and an MBA in Business and Public Policy as well as a Ph.D. in Energy and Resources from the University of California, Berkeley.

RICHARD H. SAKAJI, PH.D., P.E.
Manager of Planning and Analysis for Water Quality
East Bay Municipal Utility District

Dr. Richard Sakaji is the Manager of Planning and Analysis for Water Quality with the East Bay Municipal Utility District (EBMUD). Prior working for EBMUD he was with the California Department of Public Health (for close to 15 years) as the water treatment specialist for the Drinking Water Program (providing regulatory oversight in the arena of new and emerging treatment technologies for California’s public drinking water systems and enforcement of the Federal and State Safe Drinking Water Acts). Dr. Sakaji’s unique background in research and regulatory affairs has allowed him to bring a public-health perspective to advisory committees and workshops on public health, water quality, and water-treatment issues surrounding drinking water and wastewater reclamation. Currently, he has served on several project advisory committees for the American Water Works Association Research Foundation and the Water Environment Research Foundation and is a member of the U.S. Environmental Protection Agency’s Science Advisory Board Drinking Water Committee. He was also among the co-authors of NWRI’s Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse. Dr.

Sakaji received an A.B. in Marine Biological Studies and both an M.S. and Ph.D. in Environmental Engineering from the University of California, Berkeley.

R. RHODES TRUSSELL, PH.D., P.E., DEE
President
Trussell Technologies, Inc. (Pasadena, California)

R. Rhodes Trussell, Ph.D., P.E., DEE, is recognized worldwide as an authority in methods and criteria for water quality and in the development of advanced processes for treating water or wastewater to achieve the highest standards. A Civil and Corrosion Engineer with 35 years of experience, he has worked on the process design for dozens of treatment plants ranging in size from 1 to 900 million gallons per day in capacity. At present, he is President of Trussell Technologies, Inc., an environmental engineering firm that focuses on the quality and treatment of water and wastewater. He is also active on numerous boards and committees, such as serving as Chair of the Water Science and Technology Board for the National Academies. Just recently, he retired from the U.S. Environmental Protection Agency's Science Advisory Board after 17 years of service. Trussell received a B.S. in Civil Engineering and both an M.S. and Ph.D. in Sanitary Engineering from the University of California, Berkeley.

GUS YATES, PG, CHg
Independent Consulting Hydrologist (Berkeley, California)

Gus Yates is an independent consulting hydrologist with 24 years experience in technical analysis, water resources planning, and project management for investigations involving surface water, groundwater, water quality and habitat restoration. His particular expertise is in modeling. However, water-related projects are inherently interdisciplinary and Mr. Yates has developed competence in hydrology, hydraulics, water quality, riparian and aquatic ecology, fluvial geomorphology, water system operations, stakeholder facilitation, and regulatory compliance. His professional experience includes 8 years each at the U. S. Geological Survey and Jones & Stokes, a leading natural resource management consulting firm in Sacramento. The past 8 years he has been an independent consultant, working mainly for cities, counties and water districts in northern and central California. He lived in Davis from 1982 to 2002, where he led or participated in technical studies and stakeholder processes related to Putah Creek (flow regime, Solano Project operations, and channel substrate), Willow Slough (watershed management plan), Cache Creek (stream-aquifer study, gravel mining impacts), Yolo Bypass (management plan and fish habitat enhancement), and the entire county (Integrated Water Resources Management Plan).

VALERIE J. YOUNG, AICP
Senior Environmental Planner
Winzler & Kelly (San Francisco, California)

Valerie Young is a senior environmental planner and water reuse specialist with over 28 years of professional planning experience. Since 1993, she has focused her environmental planning work (CEQA/NEPA) on recycled water and water-related projects in California. She has been a contributor to the success of California recycled water programs in Redwood City, San Jose, and the San Ramon and Upper San Gabriel Valleys. Her primary role has been to shepherd these projects through the environmental review process, preparing environmental documents and addressing community and agency concerns, and supporting engineering teams to bring water projects to fruition. She has served on two National Water Research Institute advisory panels (San Francisco Recycled Water Alternatives and Los Osos Wastewater Management Plan) and is currently serving on a WateReuse Foundation Project Advisory Committee researching the relationship between recycled water supply and growth inducement. She is an active member of the WateReuse Association and Association of Environmental Professionals, and a member of the American Institute of Certified Planners since 1986. Young received a B.A. in History from the University of California, Santa Barbara, and an M.A. in Geography from Arizona State University.

APPENDIX B: DOCUMENTS REVIEWED

Binder provided to the Panel for the June 3-4, 2008, meeting on the Davis-Woodland Water Supply Project, which contained the following items:

1. Meeting Agenda
2. Panel Contact List
3. Panel Biographies
4. Tour Route Map
5. Power Point Presentation
6. Davis-Woodland Regional Water Supply Project Figures
    Figure 1 – Major Existing or Planned Sacramento River Intakes in Vicinity of DWWSP
    Figure 2 - Regional Re-Use Potential
    Figure 3 – Davis Local Facilities
7. Background Groundwater Information
    Summary of Groundwater Work
    Water Quality Concentrations for Constituents of Concern
    Figure 4.1 – Wells with Information in the Yolo County WRID by Entity
    Figure 4.2 – Groundwater Sub-basin and Wells by Entity with Water Level or Water Quality Measurement

8. Davis-Woodland Water Supply Community Report
9. DWWSP Information and Analysis Related to the City of Woodland's Question "Why Surface Water & Why Now" Technical Memorandum
10. Power Point Presentation to Woodland City Council on October 23, 2007 "Workshop on Water Issues"
11. California Regional Water Quality Control Board Letter dated March 13, 2008
12. Groundwater Only Alternative
    Reverse Osmosis – Brine Pipeline Route
    California Energy Commission Water Energy Use in California
13. Community Outreach
    Davis-Woodland Water Supply Project and Wastewater Treatment Improvement Project
    Incorporating Sustainability at Davis' WWTP
    City of Davis Wastewater Treatment
    Davis-Woodland Water Supply Project Draft Environmental Impact Report Available for Public Review
    Davis-Woodland Water Supply Project Surface Water Supply Project Begins Environmental Process
    City of Davis/UC Davis Water Feasibility Study
14. Davis-Woodland Water Supply Project Water Treatment Plant Design Concept Technical Memorandum
    Davis-Woodland Regional Water Supply Project Water Treatment Plant Figure
    Davis-Woodland Water Supply Project Water Treatment Plant Design Concept Technical Memorandum
15. Davis-Woodland Water Supply Project Environmental Impact Report

DWWSP Final EIR Cover Page
DWWSP Draft EIR Cover Page

16. Permits
    Master Permit Schedule
    Anticipated Regulatory Requirements and Permits for Project Implementation
17. Joint Powers Agreement
18. Integrated Regional Water Management Plan Executive Summary
19. California-Nevada Section, American Water Works Association 2007 Water Rate Survey
20. Davis WWTP/Re-Use Presentation

City of Davis & University of California Davis Joint Water Supply Feasibility Study. Prepared by West Yost and Associates. September 2002. 011-00-23.99

City of Davis & University of California Davis Hydrogeologic Investigation Deep Aquifer Study. Prepared by West Yost and Associates in conjunction with Montgomery Watson. March 24, 1999.

City of Davis in Conjunction with UC Davis and City of Woodland Executive Summary: Phase II Deep Aquifer Study. Prepared by Brown and Caldwell in conjunction with West Yost and Associates. July 2005

City of Davis in Conjunction with UC Davis and City of Woodland Phase II Deep Aquifer Study. Prepared by Brown and Caldwell in conjunction with West Yost and Associates. July 2005

Davis-Woodland Water Supply Project Draft Environmental Impact Report. Prepared by City of Davis, Public Works Department in association with UC Davis and City of Woodland, Vol. 1. April 2007. State Clearinghouse No. 2006042175.

Technical Memorandum dated May 9, 2003, from Mr. Jacques DeBra, City of Davis, to Mark Soldati, Soldati Engineering Services, on *Groundwater System Implementation Plan Final Report*.

Hydrogeologic Conceptualization of the Deep Aquifer. Prepared by Luhdorff and Scalmanini Consulting Engineers. May 2003. File No. 02-1-091.

The Yolo County GPS Subsidence Network Recommendations and Continued Monitoring. Prepared by Don D'Onofrio, Geodetic Consultant, and Jim Frame, Frame Surveying & Mapping. February 2003.

The Yolo County GPS Subsidence Project 2002 Project Report. Prepared by Jim Frame, Frame Surveying & Mapping, and Don D'Onofrio, Geodetic Consultant. September 10, 2002.

The Yolo County GPS Subsidence Project 2005 Project Report. Prepared by Jim Frame, Frame Surveying & Mapping, and Don D'Onofrio, Geodetic Consultant. October 1, 2005.

The Yolo County GPS Subsidence Network: Recommendations for Future Monitoring. Prepared by Don D'Onofrio, Geodetic Consultant, and Jim Frame, Frame Surveying & Mapping. September 1999.

APPENDIX C: DEEP GROUNDWATER WITHOUT DEMINERALIZATION ALTERNATIVE

As discussed in Section 4.1, early in its deliberations, the Panel concluded that the alternative of using deep groundwater without treatment to remove excess minerals had the best possibility of meeting the objectives of the DWWSP. The assumptions used by the Panel in considering this option and the conclusions reached are presented below. The costs presented are rough approximations, which were deemed "close enough" for general comparisons between the various alternatives examined by the Panel.

1. Project Description

- All 15 intermediate wells are replaced by deep wells over 10-15 years (to meet expected compliance timeline for wastewater discharge).
- New deep wells are selectively screened to avoid high boron zones. Assume 25-percent loss of potential yield, so assume 19 new wells needed. This equates to a new well every 15-23 months.
- Wellhead treatment is installed at about half of the wells for Fe-Mn.
- Desirable option: Some new well sites are outside City limits to spread out pumping stress (to minimize well interference and impacts on University of California, Davis, wells).
- Self-regenerating water softeners are completely eliminated (existing users have the option to switch to "exchange tank" type softeners, which are regenerated centrally, or simply forego softening).
- Municipal salt pickup in wastewater in the absence of self-regenerating water softeners is 200 mg/L.
- Expected water quality of key constituents is as follows:

Constituent	Water Supply[a]	Wastewater	Expected Discharge Requirement
EC (µmho/cm)	540	848[b]	700
B (mg/l)	0.8-0.9	0.7[c]	0.7
As (µg/l)	3-5	3-5[e]	<10[d]
Se (µg/l)	2-4	2-4[e]	4.4
Fe (µg/l)	100		None
Mn (µg/l)	36		None
Hardness	100-130		None

[a] Median values from existing deep wells.
[b] 200 mg/L salt pickup /0.65 = 308 µmho/cm.
[c] Assuming selective screening of new wells avoids highest boron zones.
[d] The waste discharge requirements might not include an arsenic limit, but if it does, there is a good chance it would be lower than the drinking water MCL of 10 µg/L (per Keith Smith).
[e] Assuming no pick-up of this constituent during municipal use and no evaporative concentration during wastewater treatment.

- A new water supply plan and EIR are needed.
- Half of the new deep wells are drilled on existing intermediate-depth well sites.
- Approximate cost:

Cost	
Well design and construction (19 wells at $2.5 million)	$47.5 million
Wellhead Fe-Mn treatment (10 wells at $1.5 million)	$15 million
Land costs (10 sites at $500,000)	$ 5 million
Pipelines for wells outside city limits (5 mi at $2 million??)	$10 million
EIR, permitting, litigation	$ 2 million
Total	$79.5 million

2. Advantages, Disadvantages, and Risks

Cost. Based on the above assumptions, the only advantage to this alternative is lower capital cost, which is approximately 60 percent as large as the cost of the DWWSP.

Stranded Assets. If the purpose of the alternative is to delay rather than avoid the surface water project, then the large number of new deep wells that would have to be constructed in the next decade under this alternative would become largely superfluous when the surface water project subsequently comes online.

Waste Discharge Permit. Based on the City of Woodland's experience with the RWQCB-CVR, it is unlikely that the City of Davis will succeed in arguing for a salinity discharge limit of 900 µmho/cm rather than 700 µmho/cm. This may be a fatal flaw.

Water Softener Elimination. It is highly unlikely that the City will be able to convince all customers to forego water softening or switch to exchange tank-type softening equipment. Participation in the conversion effort would have to approach 100 percent for this alternative to succeed. The hardness of the deep zone groundwater (100-125 mg/L as $CaCO_3$) is sufficiently high that customers might not immediately conclude that softening is unnecessary. The Panel knows of no precedent for such a comprehensive and rapid decommissioning of private water softeners. As we understand the current law, the City can ban the installation of new softeners, but does not have the power to directly require that existing softeners be removed.

Deep Aquifer Yield. There is a risk of overdraft in the deep zone. The increase in production from that zone from about 2,800 to 7,700 af/yr during the past 15 years has not resulted in chronic declining water levels. However, the increase to 27,600 af/yr would probably cause water levels to decline. The decline might stabilize when the "pumping trough" has reached a size large enough to induce leakage from the intermediate aquifer zone equal in magnitude to the well production. Several studies of the deep aquifer completed to date have not been able to estimate its sustainable yield based on available data. Additional studies, including comprehensive groundwater modeling, would likely reduce the uncertainty regarding sustainable yield, but there is also substantial risk that the sustainable yield will not be adequately quantified until the deep aquifer production increases and adverse impacts commence. The potential adverse impacts are degradation in groundwater quality, subsidence, and increased energy costs.

Subsidence. There is a moderate risk of subsidence in the deep zone. Water-level declines (seasonal, long-term and drought-year) would all be larger than the

corresponding declines in the intermediate zone. Therefore, the head stresses that induce compaction of clay layers would be greater than the stresses that have historically caused subsidence in the intermediate zone. However, clays in the deep zone are probably less compressible than clays in the intermediate zone because of their greater age and depth of burial.

• ***Deep Aquifer Quality.*** Even if pumping from the deep aquifer does not exceed its sustainable yield, it is likely that the quality of water produced by deep wells will gradually deteriorate over a period of decades (possibly more than a century). Three processes could contribute to the deterioration: (1) pumping will induce downward leakage of intermediate-zone groundwater into the deep zone; (2) decreased head in deep aquifers will cause water to seep out of adjacent aquitards into the aquifers; and (3) decreased head in deep aquifers will cause upward flow of still deeper, brackish, or saline water. The water quality in clay aquitards is typically worse than in aquifers. This effect was noticeable in the intermediate zone wells when water-levels declined during the 1987-1992 drought. Therefore, the deep aquifer alternative is not considered indefinitely sustainable from a water quality standpoint.

• ***Interference with UC Davis Wells.*** Well testing and water level monitoring have shown that pumping of City of Davis deep aquifer wells would cause additional drawdowns in water levels of UC Davis wells. While the ultimate seriousness of future interference between City and University wells is unclear, there is the risk that the two parties would end up competing for the same, limited source of water. Because the University developed the deep aquifer resources before the City did, the University's rights to the deep aquifer would likely be considered superior.

• ***Carbon Footprint.*** The energy cost per acre-foot for the deep aquifer alternative would be substantially greater than for the DWWSP. The DWWSP FEIR estimated that greenhouse gas emissions for the No Project alternative would be 30-percent greater than for the DWWSP at production levels in 2040.

• ***Restricted or Foregone Future Water Supply Alternatives.*** Pursuing the deep aquifer alternatives could restrict or eliminate the feasibility of implementing the DWWSP at a future date. Briefly, the risk and cost considerations are:

- The SWRCB would very likely cancel the existing 1994 application for lack of due diligence.
- The City of Woodland would probably seek an independent solution to its water supply problems and might not be available as a partner in the future.
- Climate change will likely change the yield of Lake Shasta and could decrease the availability of unappropriated water.
- Competition for purchases of summer water from willing sellers will almost certainly be much greater. It is unlikely that most of the current identified potential sellers would have as much water available to sell in 25-30 years.
- The cost to date of the water rights application, protest negotiations, and CEQA documentation is approximately $3 million; most of this money would be lost because these documents would have to be updated in the future, thereby incurring additional costs.
- RD 2035 (Conaway Ranch) almost certainly needs to replace its intake in the near future anyway and, without the DWWSP, the Ranch would probably not construct the full 400 cfs capacity, thus increasing the cost of any future project.

- Construction costs have been increasing far faster than inflation, so the rate impact in the future would be higher.

3. Conclusion

The deep groundwater without demineralization alternative appears to be infeasible, primarily because the likelihood is slim of: (1) successfully negotiating a less stringent EC discharge requirement at the wastewater plant; and (2) eliminating essentially all self-regenerating water softeners. Even if those two obstacles could be overcome, the capital cost savings would be moderate, while risks and other costs are numerous and collectively substantial. Therefore, the Panel concludes that this alternative is probably infeasible and is, in any event, less attractive than the DWWSP.