

Westside Regional Drainage Plan

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Westside Regional Drainage Plan

A N O V E R V I E W

B a c k g r o u n d :

The U.S. Bureau of Reclamation recently completed a San Luis Drain Feature Re-Evaluation Plan Formulation Report for the area located in the western San Joaquin Valley. The area consists of Westlands, Broadview, Panoche, Firebaugh, and Pacheco water districts and portions of San Luis Water District and Central California Irrigation District.

Long-established drainage practices for farmers in the north portion of the drainage service area are at immediate risk. Impending discharge standards will cut off vital drainage to the San Joaquin River by 2009. The Westside Regional Drainage Plan (Plan) is developed by the stakeholders and is designed primarily to quick-start identified drainage elements in time to meet standards. The initial projects in the Plan are the first steps needed for implementation of the USBR's San Luis Drain Feature Re-Evaluation Plan Formulation Report.

P l a n E l e m e n t s :

- The Plan identifies scientifically sound projects, develops an aggressive implementation plan, curtails discharge to the San Joaquin River in accordance with regulatory constraints.
- Accelerates Plan schedule by using existing adopted environmental documentation. The schedule provides for immediate drainage service implementation.
- Is fully supported by the local stakeholders including Westlands, Panoche and Broadview water districts, Central California Irrigation District, Firebaugh Canal Water District, and the San Joaquin River Exchange Contractors Water Authority.
- The local stakeholders are dedicated to working cooperatively with the USBR to achieve immediate implementation.
- Is consistent with the USBR's San Luis Drain Feature Re-Evaluation Plan Formulation Report. The main difference is the accelerated schedule for the provision of drainage.
- A key element is adaptive management combining investigation, construction of proven drainage components, and operational experience to perfect the final drainage strategy.
- The chief components include land retirement, groundwater management, source control, regional re-use, treatment, and salt disposal.

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Executive Summary

Drainage on the westside of the San Joaquin Valley has been studied for decades. Enormous investments of time and money have been spent developing theoretical drainage reduction strategies. Although many strategies are known to be effective, few projects have been implemented. For over 50 years, both State and Federal planners have recognized the need for a special drainage plan for the region. However, little has been done to actually implement such a plan.

Drainage for farmers in and adjacent to the Central Valley Project's San Luis Unit service area is at a crisis point. Present regulatory requirements for discharge from these lands to the San Joaquin River are nearly impossible to meet. Impending discharge standards will cut off current vital drainage to the San Joaquin River by 2009.

The Westside Regional Drainage Plan (Plan) is intended to: 1) identify scientifically sound projects proven to be effective by the government, local agencies and private consultants; 2) develop an aggressive implementation plan initially utilizing existing projects documented to be environmentally sound; and 3) curtail discharges to the San Joaquin River in accordance with impending regulatory constraints while maintaining the ability to farm.

Local stakeholders have formulated this Plan by integrating all consistent elements developed by government, local agencies, and private partnerships. Local stakeholders are dedicated to working cooperatively with the U.S. Bureau of Reclamation (USBR) to achieve immediate implementation.

The Plan focuses on regional drainage projects implemented on a short timeline. The initial projects of this Plan are the first steps needed for any of the Drainage Service Alternatives identified by USBR in their San Luis Drain Feature Re-Evaluation (Re-Evaluation) Plan Formulation Report, December

2002. Once these regional projects are in place, final disposal projects will be implemented. We concur with USBR that in-valley disposal appears to be the preferred alternative when considering cost, time to implement, implementation complexity, and environmental concerns. The Drainage Service Area is presented on Exhibit A. Identically to the Re-Evaluation, components include drain water reduction measures, irrigation drainage management, drainage collection, and drainage reuse. The Plan coordinates all strategies to meet regulatory requirements on time, to protect the environment and to sustain agriculture.

Adaptive management and implementation of drainage projects are essential. An educated landowners' group, working cooperatively with Federal, State and local agencies, and environmental interests, is the key for successful management. Local knowledge and cooperation, together with the resources of the State and Federal governments will ensure viable projects.

Drainage on the westside must be addressed on a regional basis. However, local districts and entities within each sub-area have specific needs and resources. The Plan for each sub-area must allow for implementation of the most efficient and effective specific drainage management while integrating these practices into one comprehensive program.

Drainage cannot be effectively managed without equitably addressing each sub-area.

The Plan's key management components are: (1) Land Retirement, (2) Groundwater Management, (3) Source Control, (4) Regional Reuse Projects, (5) Drain Water Treatment, and (6) Salt Disposal. Each sub-area will implement a different suite of management practices that will be coordinated to alleviate drainage impacts throughout the region. By implementing management practices in the most effective areas, past, present and future drainage impacts will be mitigated.

Executive Summary Continued

As this coordinated drainage program is implemented, stakeholders will evaluate the long-term sustainability of the complete solution. The first phase of the Plan will be to implement the projects consistent with any ultimate disposal option. We concur with USBR that the preferred alternative is in-Valley treatment and disposal.

The implementation schedule for Phase I projects provides the time needed to perfect and implement the in-Valley option. If treatment proves ineffective, then the Plan provides the necessary immediate drainage relief and time to implement other disposal alternatives.

USBR has analyzed the proposed plan to retire up to 200,000 acres of land within the Westlands Water District. The San Luis Drain Feature Re-Evaluation identifies the remaining quality and quantity of drain water disposal required. The Re-Evaluation recalculates the costs of collection, conveyance, reuse, treatment and disposal. The cost savings to provide drainage by retiring 200,000 acres is on average 33% less expensive than without land retirement.

Background

The United States understood the need for drainage service for the San Luis Unit even before its initial authorization. The San Luis Drain was originally designed to transport drainage flows to the Sacramento-San Joaquin Delta for disposal to the ocean. The upper reaches of the San Luis Drain and Kesterson Regulating Reservoir were constructed, but due to political and environmental concerns, construction was never completed to the Delta. The drain was ordered closed during the mid-1980s creating the drainage dilemma we face today. In order to develop a long-term plan to provide drainage service to the westside, the State and Federal governments initiated the interagency San Joaquin Valley Drainage Program.

In 1990, the San Joaquin Valley Drainage Program published A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley, Final Report of the San Joaquin Valley Drainage Program (The “Rainbow Report”). The Rainbow Report outlined a management plan that included all of the key management practices contained in this Plan. In January 2000, the San Joaquin Valley Drainage Implementation Program issued a report titled Final Report, Evaluation of the 1990 Drainage Management Plan for the Westside San Joaquin Valley, California (2000 SJVDIP Report). The 2000 SJVDIP Report also identified the key management practices included in this Regional Drainage Plan. Currently, USBR has just completed the San Luis Drainage Feature Re-Evaluation to once again identify alternatives to provide drainage service to the Westside of the San Joaquin Valley. The key components of the USBR’s current Re-evaluation effort are included in this Plan. The main difference between the USBR’s

efforts and this Plan are the inclusion of an adaptive management approach, shorter implementation timeline, and reduced cost of design, construction, and operation.

The adaptive management component of this Plan will allow the local interests to work with the USBR and other State and Federal agencies to adapt to practical experience gained through the continued implementation of on-the-ground projects. The local interests understand from experience with operating drainage projects that a successful effort must adapt to new information gained through constant evaluation of in-progress projects. The short implementation timeline of this Plan is essential in order to provide meaningful drainage service to the region. The regulatory constraints being imposed by various State and Federal agencies do not allow the region to wait while the USBR completes its study and begins design of a drainage alternative; drainage service is needed immediately. The Grassland Drainage Area must reduce its selenium discharges by 42% within the next three years and 55% percent within the next six years to meet regulatory requirements. Additional water quality regulations are being imposed on the region that further necessitates immediate action.

These regulatory constraints on drainage discharges further exacerbate the impacts to local growers. Shallow groundwater levels continue to rise causing serious impacts to crop production. Groundwater levels must be managed in order to prevent further hardships to family farmers and crop productivity. Large-scale drainage projects are needed immediately to provide meaningful relief from drainage-related impacts.

Background

- **No Valley-wide master drain**
- **Focus on in-Valley drainage management**

- **WRDP vs. USBR Re-evaluation:**
 - Timely implementation
 - Adaptive management approach
 - Reduced design, construction and operation costs

- **Immediate need:**
 - Impending water quality regulations
 - Groundwater levels pose threat to crop productivity

Current Drainage Management Activities

Significant drainage control efforts are ongoing within the Drainage Service Area. (See Exhibit B.) The efforts have been implemented to respond to the specific needs of the different sub-areas. The

Drainage Service Area has been subdivided into five sub-areas; 1) the San Luis Unit Sub-area; 2) the Exchange Contractors Sub-area 3) the Northern Westlands Sub-area, 4) the Central Westlands Sub-area, and; 5) the Southern Westlands Sub-area.

Drainage Service Area:

Five sub-areas:

- San Luis Unit Sub-area
- Exchange Contractors Sub-area
- Northern Westlands Sub-area
- Central Westlands Sub-area
- Southern Westlands Sub-area

Grassland Drainage Area

The Grassland Drainage Area is comprised of the San Luis Unit and Exchange Contractors sub-areas. The Grassland Drainage Area formed a regional drainage entity in March 1996 under the umbrella of the San Luis and Delta-Mendota Water Authority to implement the Grassland Bypass Project. Participants include the Broadview Water District, Charleston Drainage District, Firebaugh Canal Water District, Pacheco Water District, Panoche Drainage District, Widren Water District, and the Camp 13 Drainage District, located in part of Central California Irrigation District. The area comprises approximately 97,000 gross acres of irrigated farmland on the westside of the San Joaquin Valley. The area is highly productive, producing an estimated \$113 million annually in agricultural crop market value, with an



Photo Credit: Gary Zahm, USFWS

additional estimated \$126 million generated for the local and regional economies, for a total estimated annual economic value of \$239 million.

The Grassland Drainage Area farmers have implemented several activities aimed at reducing discharge of subsurface drainage waters to the San Joaquin River. These activities include the Grassland Bypass Project, the San Joaquin River Water Quality Improvement Project, formation of a regional drainage entity, distribution of newsletters and other farmer-oriented education series, development of a monitoring program, use of State Revolving Fund loans for improved irrigation systems, development and implementation of drainage recycling systems to mix subsurface drainage water with irrigation supplies under strict limits, tiered water pricing and tradable loads programs.

Grassland Drainage Area

- Includes San Luis Unit and Exchange Contractors Sub-areas
- 97,000 gross acres; total annual economic value of \$239-million
- Programs already in place:
 - Grassland Bypass Project
 - SJR Water Quality Improvement Project
 - Regional Drainage entity
 - Communication, education and monitoring programs
 - Irrigation improvements
 - Drainage recycling
 - Tiered pricing

Current Drainage Management Activities Continued

Grassland Bypass Project

The entities within the Grassland Drainage Area have implemented the Grassland Bypass Project, an innovative program designed to improve water quality in drainage channels now used to deliver water to wetland areas. Prior to the project, subsurface drainage water was conveyed through these channels to the San Joaquin River and limited their availability to deliver habitat supplies. The Project consolidates subsurface drainage flows regionally and utilizes a portion of the federal San Luis Drain to convey the flows around the habitat areas to the San Joaquin River downstream of the Merced River confluence.

Negotiations between the San Luis and Delta-Mendota Water Authority and the USBR to utilize a portion of the San Luis Drain for the Project commenced in 1988. Stakeholders included in the process were the U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service, California Department of Fish and Game, the Central Valley Regional Water Quality Control Board, Environmental Defense, Contra Costa County, and Contra Costa Water District.

In late 1995, environmental documentation for the first five years of the project was completed and an agreement was signed. Discharge through the project began in September 1996. In September 2001, the agreement was extended for another 8 years and 3 months through December 2009. An Environmental Impact Report/Environmental Impact Statement (EIR/EIS) was completed. On September 7, 2001, the Central Valley Regional Water Quality Control Board issued new Waste Discharge Requirements for the project. In addition, a Biological Assessment/Biological Opinion was completed as

well as Total Maximum Monthly Load (TMML) reports submitted to the Regional Board and EPA. The agreement requires continued reductions in selenium discharge until ultimately TMML limits are achieved in 2005 for above-normal and wet years, and continued progress is made to meet water quality objectives in 2010 for below-normal, dry and critically dry years.

The benefits of the Grassland Bypass Project are well documented. In water year (WY) 2001, drainage volume was reduced by 47%, selenium load was reduced 56%, salt load reduced 28% and boron load reduced 41% compared to the pre-project conditions in WY 1996. In WY 1996, prior to the Grassland Bypass Project, the mean selenium concentration in Salt Slough at Lander Avenue was 16 parts per billion (ppb). Since October 1996, the 2 ppb water quality objective for Salt Slough has been met in all months except in February 1998 when uncontrollable flood flows were mixed with subsurface drainage water and could not be contained within the Grassland Bypass Project (that month the selenium concentration in Salt Slough was 4 ppb). In WY 1996, the mean selenium concentration at Camp 13 Ditch was 55.9 parts per billion (ppb). In WY 1997, the first year of operation of the Grassland Bypass Project, the mean selenium concentration at Camp 13 Ditch was 2.6 ppb. This value was slightly above the wetland selenium objective of 2 ppb. In April 1998, specific actions were taken to eliminate any possible subsurface drainage discharges from the Grassland Drainage Area into the Camp 13 Slough and other discharge points. Since that time, there have been no discharges from the Grassland Drainage Area into wetland channels.

Grassland Bypass Project

- **Consolidates regional subsurface flows**
- **Utilizes San Luis Drain to convey water around habitat areas for strategic SJR discharge**
- **Meets waste discharge requirement**
- **Meets Selenium TMDLs**

- **2001 results:**
 - Water volume down by 47%
 - Selenium load down by 56%
 - Salt load down by 28%
 - Boron load down by 41%

Current Drainage Management Activities Continued

San Joaquin River Water Quality Improvement Project

The San Joaquin River Water Quality Improvement Project (SJRIP) is a major project undertaken by Grassland Drainage Area entities. The project, covered under the 2001 EIR/EIS, used Proposition 13 funds to purchase and improve 4,000 acres of land within the Grassland Drainage Area for the purpose of drainage water treatment and disposal. The initial Phase I projects of the SJRIP were implemented in the winter of 2001 with the planting of salt tolerant crops and construction of distribution facilities, which allowed for 1,821 acres to be irrigated with drainage water and/or blended water.

As a result, 1,025 pounds of selenium, 14,500 tons of salt, and 62,000 pounds of boron were retained and not discharged to the Grassland Bypass Project

and to the San Joaquin River. The SJRIP project is the key component for the Grassland Drainage Area as a whole to meet future selenium load limits.

This project will ultimately allow for planting and irrigation of the entire 4,000 acres with drainage water. Future phases call for acquisition of additional acreage, installation of subsurface drainage systems and implementation of treatment and salt disposal components.



Photo Credit: Gary Zahm, USFWS

A component of this future phase, the Grassland Integrated Drainage Management Project, is being implemented with Proposition 13 funds. Subsurface drains are being installed in 550 acres within the SJRIP area and irrigation systems improvements are underway so drainage water can be applied to this land and associated crops.

San Joaquin River Water Quality Improvement Project

SJR Water Quality Improvement Project:

- Salt-tolerant crops irrigated with drainage water
- Project is key component to help meet any discharge load limit.
- Improve acres in Grassland Drainage Area
- Drainage water treatment and disposal

Groundwater Management Pilot Project

In 2002, the San Joaquin River Exchange Contractors Water Authority (Exchange Contractors) in cooperation with the USBR implemented a pilot project to study the feasibility of using groundwater pumping to mitigate drainage impacts. The project involves pumping two wells above the Corcoran Clay but below the shallow groundwater. Although this water supply does contain elevated levels of salt, it contains no selenium.

This water supply is diverted into a surface supply canal and put to beneficial use on surrounding lands and refuges. In addition to the water supply being made available, the project also included monitoring of the shallow groundwater levels and discharges

of nearby tile sumps. The 2002 project has demonstrated significant lowering of the crop root zone water levels by pumping groundwater from within the sierran sands located above the Corcoran Clay but below shallow selenium laden groundwater.

It has long been identified that the sierran sands reduce selenium and can eliminate the constituent from groundwater discharges. This pilot project also showed reductions in nearby tile sump outputs.

The pilot project indicates that expansion of the groundwater management program is a viable component of the long-term drainage plan. Additionally, extensive modeling has demonstrated significant drain water source reduction benefits

Current Drainage Management Activities Continued

from groundwater pumping. Figure 1 (See Page 21) presents the modeled estimations of drainage discharge from the Exchange Contractors sub-area assuming several land retirement and pumping

combination alternatives. The modeling results show that a carefully crafted and implemented groundwater management program alone can result in significant source reduction.

Groundwater Management Pilot Project:

- Using groundwater pumping to mitigate impacts
- Reduced crop root zone water levels
- Pumped zones are above Corcoran Clay, below shallow groundwater

Westlands Drainage Area

Westlands Water District (Westlands) includes more than 560,000 irrigated acres of diversified crops on some of the most productive soil in the world. Large portions of the westside of the San Joaquin Valley are affected by salinity and drainage problems. This affected area includes approximately 200,000 acres of farmland within Westlands. The U.S. government has long been aware of these problems, and congressional authorization of the facilities to deliver Central Valley Project (CVP) water to Westlands mandated drainage service as part of this project. Accordingly, provisions for drainage service were expressly included in Westlands water service contract with the USBR.

Construction of drainage facilities began in 1968. By 1975, concerns over costs and possible environmental issues led to a suspension in construction. Increased environmental concerns led to the closure of existing drainage facilities in 1986, and Westlands and other districts served by the San Luis Unit of the CVP have been without drainage service since that time.

In 1999, Westlands initiated a process to purchase approximately 14,000 acres of land with shallow groundwater problems and within the area identified by the USBR as needing drainage service.

In addition, 1,443 acres have been retired under

the USBR's Land Retirement Demonstration Project. As the land was purchased, the water supply that was historically applied to that land was reallocated to the remaining lands in the District. The District developed an agricultural lease program for these lands, which allows lessees to dry land farm and maintain it according to District specifications. The USBR has been using its land for habitat restoration.

In 2002, Westlands approved an agreement to settle that portion of *Sagouspe, et al., v. Westlands Water District, et al.*, concerning how the District will allocate Central Valley Project water to the Area I Lands and Area II Lands after December 31, 2007, or after a long-term renewal contract, which is currently being negotiated with the USBR, is executed and becomes effective. The agreement is the product of lengthy negotiations between Area I and Area II representatives. Under the settlement agreement, the District will acquire additional lands and the water appurtenant to those lands will be allocated as provided in the settlement agreement.

The proposed plan shows acquisition of 100,175 irrigable acres through the issuance of debt. This total includes the 13,978 acres previously taken out of agricultural production and lands to be acquired through the settlement of other litigation. These lands will be temporarily fallowed and managed by the District.

Westlands Drainage Area:

- No natural drainage
- No drainage service since 1986
- District land buy-out program
- Proposed plan shows acquisition of 100,175

Key Management Practices

This Regional Drainage Plan proposes the expansion of the current drainage management practices into a comprehensive sustainable drainage program. In order to implement a sustainable drainage program, all management practices must be integrated to provide long-term salt balance in the region. While the goal of salt balance is the same for each sub-area, the most efficient suite of management practices designed to achieve salt balance may vary among sub-areas. Therefore, each sub-area will emphasize different management practices in their drainage program.

With the goal of maintaining a salt balance in the region, the management plan will implement on-the-ground management practices on an increasingly larger scale. As practices are shown to be effective they will be expanded. The process will build upon past research and evolve into a fully developed integrated in-Valley drainage control effort. The districts will implement drainage control efforts

appropriate for their specific needs. The implementation of the district efforts will be coordinated with input from USBR and will be integrated into one comprehensive program.

The key management practices are: (1) Land Retirement (2) Groundwater Management (3) Source Control (4) Regional Reuse Projects (5) Drain Water Treatment (6) Salt Disposal. These components are described in more detail below.



Photo Credit: Central California Irrigation District

Key Management Practices for a Sustainable Drainage Program:

- Land Retirement
- Groundwater Management
- Source Control
- Regional Reuse Projects
- Drainage Water Treatment
- Salt Disposal

Land Retirement

Land retirement is a key component of the Plan. By retiring drainage impacted land on a voluntary basis the need for future drainage service on these lands will be reduced. The retired lands will no longer be irrigated with surface supplies, which will reduce the impacts of deep percolation from these lands. To the extent possible, groundwater pumping will continue throughout the areas where land retirement occurs. Modeling shows a significant drain water source reduction from such a combination.

The land will become available for other uses such as regional drainage reuse projects, commercial and industrial use, flood control, surface water storage where appropriate, and wildlife habitat. Each project will be strategically located to maximize the benefits

to the region. For example, drainage reuse projects will be located to maximize their ability to mitigate past drainage impacts and eliminate future regional impacts from land that remains in production. Each land use choice will be coordinated into an overall program designed to maintain a viable environment and economy.

The land retirement component of the Plan will be to buy land from willing sellers in areas currently impacted by shallow groundwater. The water supply from this land will remain with the region so long as appropriate drainage mitigation programs are effectively implemented consistent with this Plan. Specific measurable criteria will be developed to document that the drainage management measures are effective at mitigating past, present, and future drainage impacts resulting from irrigation within the region.

Key Management Practices Continued

Westlands Water District Land Retirement Plan

As previously indicated, each area will place different emphasis on each management practice. Westlands Water District plans significant land retirement within their area. At the present time, the general outline of the Westlands Water District land retirement plan is as follows:

- Up to 200,000 acres of drainage-impacted land will be purchased from individual landowners, permanently removing the land from irrigated agricultural production. Title to these lands would be retained by Westlands and/or a nonprofit entity, and put to beneficial uses such as wildlife habitat, dry land farming, or related economic development activities. Westlands would manage the retired lands in ways compatible with continuing agriculture on the remaining farmlands.
- The plan must provide balanced benefits for all affected parties.
- The plan must provide farmers a fair and reasonable price for their land, with values determined as if those lands had drainage services provided.
- The program must be voluntary, involving only willing sellers.
- No harm or loss of water should occur to any other CVP water user.
- Third-party impacts must be identified and addressed.

Land Retirement:

- **Key component of regional plan**
- **Voluntary basis**
- **WWD Retirement Plan**
 - Balanced benefits for all affected
 - No harm to CVP users
 - Third-party impacts addressed

- **Retired land uses:**
 - Regional Drainage Reuse/Treatment Facility
 - Business development
 - Flood management
 - Surface water storage
 - Dry land farming
 - Wildlife corridor
 - Upland habitat

Potential Uses of Retired Land within Westlands

Westlands has begun a preliminary investigation into the potential alternative uses of the retired land, with the objective of administering those lands to achieve broader benefits for the District and region. This land will become available for other uses such as regional drainage reuse projects, commercial and industrial use, flood control, surface water storage where appropriate, and wildlife habitat. Each project will be strategically located

to maximize the benefits to the region.

For example, drainage reuse projects will be located to maximize their ability to mitigate past drainage impacts and eliminate future regional impacts from land that remains in production. Each land use choice will be coordinated into an overall program designed to maintain a viable environment and economy. Title to these lands would be retained by Westlands and/or a nonprofit entity.

Key Management Practices Continued

To date, the following potential uses for the land have been considered:

- Regional Drainage Reuse and Treatment / Disposal
- Highway 180 Business Corridor
- Panoche/Silver Creek Detention Basin
- Arroyo Pasajero Flood Control Project
- Surface Water Storage (where appropriate)
- Dry Land Farming, Hunting Opportunities
- Wildlife Corridor
- Upland Habitat Development

Regional Drainage Reuse and Treatment

Westlands anticipates that lands adjacent to the retired area will still need drainage service with a focus on treatment and reuse. Retired lands can be used as regional reuse projects to provide drainage for lands remaining in production and to mitigate for past drainage impacts. The facilities

would be designed and operated similar to the project identified in the USBR's Plan Formulation Report of the San Luis Drainage. The beneficiaries of this project would include: Westlands, landowners who need drainage service, and the USBR since it will be relieved from providing drainage service at a significant cost to the US.

Highway 180 Business Corridor

This project allows land along the proposed Highway 180 alignment to be used for commercial and industrial activities. Land could be made available to local communities impacted by land retirement

and land fallowed as a result of decreased water supplies resulting from the implementation of CVP Improvement Act. Beneficiaries from this project would include the City of Mendota, County of Fresno, and Westlands.

Panoche/Silver Creek Detention Basin

This project consists of constructing a detention basin to collect and attenuate flood flows from Panoche/Silver Creek and discharge a constant flow to the Fresno Slough. Historically, flows from Panoche Silver Creek have flowed out from the channel and down to the City of Mendota flooding parts of the city, depositing silt on county and state

roadways, and damaging adjacent crop land. Westlands expects this activity will also be administered by the Panoche Silver Creek Coordinated Resource Management and Planning Program. The beneficiaries would include the City of Mendota, County of Fresno, CALTRANS, landowners, and the U.S. Army Corps of Engineers.

Key Management Practices Continued

Arroyo Pasajero Flood Control Project

Retired lands could be used to construct a detention basin to collect and attenuate flood flows from the Arroyo Pasajero. The Corp of Engineers completed a report to construct a 50,000 acre-foot reservoir to attenuate the flows from the creek; however, the cost-benefit ratio did not support construction of the project. As an alternative, DWR is investigating a proposal to divert Arroyo Pasajero flows into the California Aqueduct, transport them downstream,

and then divert the waters into the Tulare Lake Bed. As an alternative, which is less expensive and easier to implement, Westlands is proposing to divert the Arroyo Pasajero flows onto land retired in the District. The beneficiaries of this project would be the City of Huron, County of Fresno, CALTRANS, U.S. Army Corps of Engineers, California Department of Water Resources, State Water Contractors, and the CVP contractors.

Surface Water Storage

The project consists of constructing a series of storage basins on eight sections (5,120 acres) adjacent to Westlands Laterals 6 and 7 within Township 15 South and Range 15 East. The Project will have an estimated 40,000 to 50,000 acre-feet of storage for rescheduled water, surplus water, and water from other sources including refuges,

San Joaquin River flood flows, and other CVP contractors. In addition to the storage benefit, the project will be near the Mendota Wildlife Area and will provide habitat for migratory birds, and with this benefit, other partners could be willing to contribute to the project. This project will be designed to prevent impacts to shallow ground-water due to seepage.

Dry Land Farming, Hunting Opportunities

Currently, Westlands is leasing out land acquired by the District for lessees to farm. Since these lands do not have a CVP allocation, dry land farming is the best alternative. Typically, lessees will plant

a winter or spring grain on the land, which will be harvested or used for livestock grazing. Retired lands can be dry land farmed with grains and other crops to provide food and habitat for wildlife. Beneficiaries include Westlands, wildlife, and the local economy.

Key Management Practices Continued

Wildlife Corridor

Westlands has been meeting with the USBR, California Department of Fish and Game, and U.S. Fish and Wildlife Service to discuss restoring acquired and retired land for wildlife purposes. Both wildlife agencies are interested in restoring an east-west and north-south corridor to allow species to migrate to different lands and different areas of the District.

In addition to using dedicated retired lands for a wildlife corridor, Westlands would also work with landowners with permanent crops, which could also be used for a corridor. Beneficiaries of this project include the California Department of Fish and Game, U.S. Fish and Wildlife Service, and Valley species.

Upland Habitat Development

Similar to the Wildlife Corridor Project, Westlands has been meeting with the USBR, California Department of Fish and Game, and U.S. Fish and Wildlife Service to discuss restoring acquired and



Photo Credit:
Gary Zahm, USFWS

retired land for upland habitat purposes. Retired lands can be restored to upland habitat similar to the USBR demonstration project for animal and plant species. Beneficiaries include the USBR, the California Department of Fish and Game, U.S. Fish and Wildlife Service, and Valley species.

Groundwater Management

Groundwater management will be used to meet several goals of the drainage management program. These goals include: 1) limiting the advance of sub-surface drainage; 2) maintaining groundwater below the crop root levels; 3) mitigating the impacts from the lack of historical drainage service; 4) providing necessary interim drainage management until disposal options are developed; and 5) developing an additional water supply for beneficial uses, such as Level 2 refuge supplies during the life of the project.

Studies conducted by the Federal government and others have identified that groundwater management is a suitable strategy to provide drainage within the region. The studies conclude that extraction of groundwater above the Corcoran Clay will lower groundwater levels and reduce drainage water production. Also using a groundwater flow model, specifically designed for the region (Belitz) the U.S. Geological Survey estimated the beneficial effects from pumping on levels and flows.

Key Management Practices Continued

The Belitz model demonstrates significant drain water source reduction benefits from groundwater pumping. Figure 1 (see page 21) presents the modeled estimations of drainage discharge reduction from the Exchange Contractors sub-area. The modeling indicates that groundwater management is a key component of any drainage program.

Groundwater pumping also is needed to manage the advance of poor quality groundwater northeasterly towards the City of Firebaugh and the San Joaquin River. The San Joaquin River Exchange Contractors Water Authority AB3030 groundwater monitoring effort has documented this advance and concluded that groundwater pumping is needed to manage the advance.

In addition, groundwater pumping is needed in order to extract the accumulated drainage water from the shallow groundwater. The accumulation is from the many years of irrigation of crop lands without the ability to drain. The resulting imbalance in the water budget within the region has caused the shallow water table to rise. Surface water has been applied at rates that exceed the carrying capacity of the groundwater system resulting in increase groundwater storage in shallow zones. A groundwater pumping program would be designed to extract the accumulation to pre-CVP levels.

The Groundwater Management Plan will develop a usable water supply during the life of the project. It has been shown that water from well below the root zone and above the Corcoran Clay, while generally high in salinity, does not contain selenium. This selenium-free water can be used to augment water supplies for regional re-use projects, wildlife habitat and traditional farming without creating potential problems associated with selenium-laden water.

A Groundwater Management Program is currently in the early stages of deployment through a set of studies and pilot projects focused on immediate drainage relief. Program progress is managed through a monitoring analysis and refinement system designed to maximize benefits and direct project component development. It is expected that the program will include the following steps:

1. Identify the acceptable water quality standards for the various water supply needs in the area. As an example, the Grassland Drainage Area (GDA) 4,000-acre experimental salt removal project has an additional need for water supply in the 2,500 parts per million (ppm) total dissolved solids (tds) range. Additionally, an investigation is being conducted to determine whether a portion of the well water could be blended with better quality Delta-Mendota Canal water and used within the Grassland Water District. On the basis of the required standards, identify potential production areas with acceptable groundwater quality through evaluation of existing data, pilot project data, and additional samples to be collected for this purpose. The results will provide preliminary groundwater volumes and production area estimates for the future pumping strategy.
2. Modify, update and develop analytical tools. The U.S. Geological Survey groundwater-flow model is the primary tool to analyze the proposed pumping strategy. Necessary updates include: a) extension of model boundaries to include all of the area; b) reevaluation of boundary conditions for potential impacts on the pumping assessment and modification as necessary; c) representation of drainage systems in greater detail; d) revise model time-steps to provide seasonal information, review and revise hydraulic conductivity data; and e) revise sub-area boundaries. Portions of these work tasks are currently being accomplished and are in various stages of completion.
3. Utilize analytical tools to identify preferred production areas and develop a preliminary pumping strategy. The groundwater-flow model and an optimization program will be used to estimate the mixture of pumping volumes to optimize water quality. The groundwater-flow model will be utilized to determine pumping amounts and locations to minimize drainage water production, possible subsidence effects, and maximize management of poor groundwater migration. Solute transport modeling updated using recent pilot project data will be used to calculate the expected operation life of the pumping strategy.

Key Management Practices Continued

4. Design and implementation of further field-scale pilot projects to evaluate the pumping in areas most likely to result in successful drainage and/or water level reductions and yield good quality water. Collect water level, drainage and pumping data. Measurement of pumping volumes will be critical for effective evaluation of the project. Implementation of initial field-scale pilot projects is currently under way with results from the monitoring indicating good results towards successful drainage management.

5. Incorporate pilot projects results into the model and reevaluate pumping using the new information. Integrate pumping into the overall drainage management strategy.

6. Conduct necessary environmental and additional legal analysis.

7. Fully integrate pumping into the overall drainage management strategy; install necessary wells and integrate these existing wells into the water supply system.

Groundwater Management:

- **Develop new water supply**
- **Maintain groundwater below crop root zone**
- **Mitigate lack of drainage service**
- **Necessary interim management**
- **Limit advance of subsurface drainage**

Source Control

Source control is the first line of defense in the battle to control subsurface drainage. Farmers in the region have implemented various irrigation improvements by taking advantage of funding through the State Revolving Fund (SRF) and other sources to improve irrigation practices. These practices include conversion to ¼-mile furrows, sprinkler systems and drip irrigation systems. Experimentation has also proceeded with timing of pre-irrigation and shallow drainage management to reduce deep percolation. These practices and new improvements will continue to be implemented to further reduce the production of subsurface drainage water that



Photo Credit: Central California Irrigation District

has to be managed by other means. It is assumed funding will be utilized through various sources including SRF loans or other loan/grant sources.

In addition to on-farm measures, such as improved irrigation practices, there are regional source control measures that likely would be implemented on a regional

level by districts or other regional entities. These would include lining of surface water delivery canals to reduce seepage losses that contribute to subsurface drainage and implementation of uses of drainage water for displacement projects, such as replacing fresh water dust control with permanent systems or water trucks using drainage water.

Source Control (drainage volume reduction):

- **Reduce drainage volume through improved irrigation on-farm**
- **Regional efforts to reduce drainage:**
- **Reduce seepage loss in canals**
- **Use drainage water for dust management**

Key Management Practices Continued

Regional Drainage Reuse

Reuse is the application of subsurface drainage water (either directly or slightly diluted) to salt tolerant crops. The purpose is to reduce the volume of the subsurface drainage water for ease in treatment.

Reuse is different from recycling in that recycled water is minimized for maximum yield on salt sensitive crops. Reuse is maximized for drainage quantity reduction. Crops used for reuse would include salt tolerant alfalfa, pasture or halophytes.

These crops would not necessarily be grown for returns on yield but for drainage volume reduction.

Lands used for reuse would have to be managed to maintain adequate salt levels in the fields for the crops grown. This would likely entail installing of subsurface drains under the reuse fields so an adequate leaching fraction can be maintained. It is assumed that approximately 4 acre-feet per acre could be applied on the reuse crops with leaching fraction of about 27% or 1 acre-foot per acre. So there is a 73% reduction in volume through the reuse projects. The reuse projects are essential to any long-term drainage plan.

These projects will be modeled after the San Joaquin River Water Quality Improvement Project (SJRIP) that has already been partially implemented within the Grassland Drainage Area. Within Westlands Water District, portions of the land purchased under the land retirement program that are best suited to mitigate past and future drainage impacts will be used to implement these regional reuse projects. The land will be used to grow salt tolerant crops as a means to utilize water collected by

shallow agricultural tile sumps as well as water generated by shallow well pumping described above in the groundwater management section. These projects will reuse drainage water in order to reduce the volume of and increase the efficiency of treatment. These types of projects have been proven effective and will be integrated into the entire regional approach to maximize drainage water use and minimize drainage impacts.

Specific locations will be selected to implement large-scale reuse projects to mitigate regional drainage impacts. These sites will be selected based upon the ease of delivering drainage flows to the area, the regional benefits from intercepting drainage flows on the property, and the availability of the property. Preliminary investigations indicate that, in addition to retired lands within Westlands, portions of Broadview Water District and areas on the northern edge of the Grassland Drainage Area are potential candidates for regional reuse projects.

These projects will reuse drainage water in order to minimize flows for more efficient treatment. Drainage water will be applied to salt tolerant crops such as pasture and alfalfa. These crops will be marketed when possible to reduce costs of the project. While the crops will be marketed the primary factor in planting decisions will be drainage reduction not crop production. The agricultural activity will also provide jobs in the region and help maintain retired ground to avoid impacts to surrounding farmland. Subsurface tile lines will be installed on the reuse projects to collect water that percolates from the irrigation. This water will be reused, treated or placed in evaporation ponds.

Regional Drainage Reuse:

- Reuse subsurface water on salt-tolerant crops
- Maximized for drainage volume reduction
- Crops grown mostly for drainage, not commercial purposes

Key Management Practices Continued

Drainage Water Treatment

Drainage water treatment is another essential component of a regional drainage solution. Drainage water collected from the regional drainage projects described above will require treatment to further reduce its volume, remove salt and allow for more cost-effective disposal of the residue.

This treatment will consist of reverse osmosis and other membrane systems, chemical reduction systems as well as flow-through wetland systems. Pilot projects exist for all of these treatment systems. The region will expand these pilot programs to find the most effective system to treat the drainage water.

It is anticipated that irrigation efficiency, source control, groundwater management and regional reuse projects can reduce the amount of drainage water by 82%. However, to eliminate discharge to the San Joaquin River the remaining water needs to be managed. Pilot treatment plants are being implemented within the Grassland Drainage Area.

These investigations include membrane treatment for removal of salt, selenium, and boron as well as flow-through selenium removal systems. The membrane systems for pretreatment and salt removal are showing water recovery of up to 92% and salt removal of up to 98%. The system also is showing promise on accomplishing this with reduced power requirements. These pilot projects will continue for the next five years. Selenium treatment systems are showing a high percentage of selenium removal. Investigations are continuing on the removal of selenium through cropping in reuse areas.

The products of these treatment systems will be improved quality water and concentrated brine. The water will be made available to augment regional water supplies. Some of this water may be of such high quality to be used for municipal and industrial supplies. This water will be marketed to help offset the costs of the treatment process. After treatment the resulting brine solution must be disposed of or utilized.

Drainage Water Treatment:

- **Treatment to reduce volume, remove salts, allow for cost-effective disposal.**
- **Reverse Osmosis, membrane systems**
- **Pretreatment and salt removal shows water recovery at 92%; salt removal at 98%**

Salt Disposal

Salt disposal is the final stage of the drainage solution. Initially, the brine solution could be stored in waste containment facilities, including evaporation ponds, built on retired land. Ultimately, it may be possible to market some of this product for uses ranging from construction materials to dying textiles. An aggressive investigation into potential markets

for reclaimed salts should be implemented. If successful, this investigation could result in the most economical and environmentally favored alternative for salt disposal. If a viable market for reclaimed salt is not developed then, as an alternative, salts could be collected in waste containment facilities and stored indefinitely. Evaporation ponds and solar evaporators will be used to concentrate the

Key Management Practices Continued

brine into sludge or dry crystals for ultimate utilization and disposal. Final disposal also could be into permitted disposal sites. Recent legislation has acknowledged the need for on-site disposal of salt.

While the need for ultimate salt disposal is obvious, the best method for this disposal is unclear. Any final salt disposal option must be economically

viable and environmentally sound. In an effort to find the best disposal option, the parties will explore a wide variety of disposal methods. The ultimate disposal option will be selected based upon economic, environmental and practical considerations. Determination of the best disposal method will require significant efforts by all parties, but these efforts will result in a comprehensive drainage program.

Salt Disposal:

- Preferred alternative in current analysis
- Final stage of drainage solution
- Possible market for salt products
- Permitted disposal sites

Adaptive Management Approach

This Plan will utilize adaptive management to find the most effective and efficient drainage solutions. Districts in the region will coordinate their activities with input from USBR. Each of the districts will participate in a group to manage the regional activities and document the program's progress. The members will work with the USBR, and other State and Federal agencies to ensure the most effective program possible. This Plan establishes a three-phased approach to establishing drainage service. The phased approach will allow the districts to modify their activities according to the most recent developments in drainage control.

The group will analyze specific management efforts and refine them as needed to meet the goal of sustaining agriculture while addressing regulatory

issues. When particular practices are shown to be viable they will be expanded. When the analysis indicates that other practices are deficient they will be refined or abandoned. This process will serve as a practical test of the drainage reduction concepts developed over the last several decades.

Each of the districts supporting this approach has specific resources and expertise that can be used to find long-term in-Valley solutions. If after the region has made a focused effort to reduce drainage impacts through in-Valley solutions and these practices do not prove to be the total drainage solution, then an out-of-Valley solution can be more thoroughly explored. The projects, expertise and knowledge the region develops through this process will greatly benefit regional drainage control in both the short- and long-term.

Adaptive Management Approach:

- **To find and perfect most effective and efficient solutions**
- **Local district coordinate with USBR**
- **Three-phased approach allows for modifications and flexibility**
- **Reacts to changes and advancements made in drainage management**

Phase I Drainage Plan from 2003 to 2009

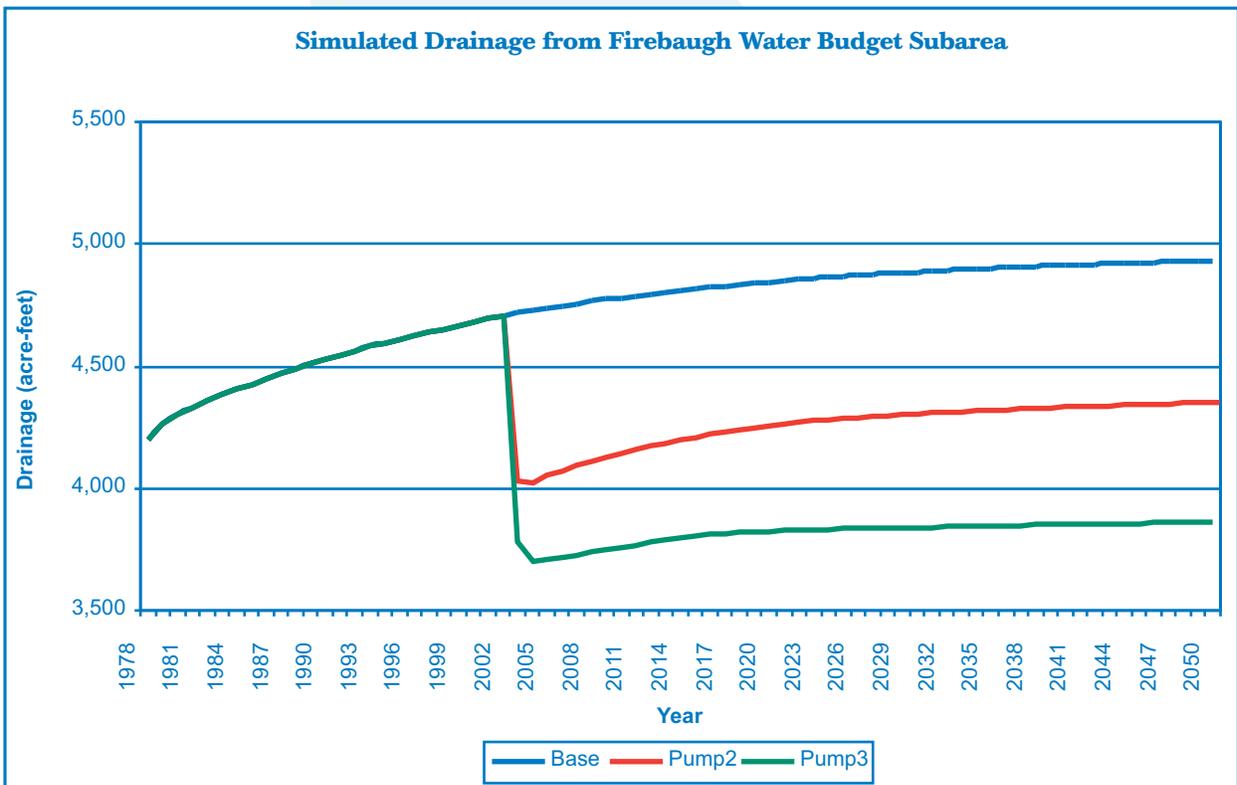
The region will implement the drainage management projects, which are generally located on Exhibit C.

Figure 2 presents the proposed timeline and cost estimates for implementation for Phase I.

All Sub-areas

- Adaptive management of SJRIP and Groundwater Management Programs.
- Expand and develop reuse areas.
- Continue implementation of proven treatment programs,
- Implement other viable land use options evaluated in Phase I,
- Finalize in-Valley treatment and disposal, or select and implement other disposal alternative,
- Implement salt disposal program,
- Evaluate success of the Drainage Management Program,

Figure 1



- Base Continue existing conditions.
- Pump 2 Retire , 25,000 AF/yr pumpage from beneath Firebaugh Subarea (95% above corcoran).
- Pump 3 Retire , 50,000 AF/yr pumpage from beneath Firebaugh, Broadview, Panoche, and WWD.

Firebaugh subarea includes CCID and FCWD.

Phase II Drainage Plan

Figure 2

Westside Regional Drainage Plan Project Funding and Implementation for Phase I

Year	Item	Estimated Cost	Sub-Area	Comment
2003	Land Retirement Monitoring	\$200,000	3	Calfed & Local
	Groundwater Management	\$900,000	1,2,3	5 wells Total - 4500af Water Supply & Calfed
	SJRIP Phase I Completion	\$2,000,000	1,2	SJRIP, USBR Plan, Prop 50, Prop 13 and Local
		<u>\$3,100,000</u>		
2004	Land Retirement	\$100,000,000	3,4,5	"Up to" amount based on Implementation
	Groundwater Management	\$600,000	1,2,3	8 Wells Total - 6500 af Water Supply & Calfed
	GW Conveyance Legal & Engineering	\$3,000,000	1,2,3	Long Term Water Supply
	SJRIP Phase I Completion	\$3,000,000	1,2	SJRIP, USBR Plan, Prop 50, Prop 13 and Local
	Treatment Legal & Engineering	\$2,000,000	1,2,3	USBR Plan
	<u>\$108,600,000</u>			
2005	Land Retirement	\$100,000,000	3	"Up to" amount based on Implementation
	Groundwater Management	700,000	1,2,3	11 Wells Total - 9500af Water Supply
	GW Conveyance Construction	\$10,000,000	1,2,3	Long Term Water Supply
	SJRIP Plumbing	\$950,000	1,2	SJRIP & USBR Plan
	SJRIP Phase 2 Expansion	\$8,100,000	1,2	SJRIP & USBR Plan
	SJRIP Phase 2 Development	\$2,300,000	1,2	SJRIP & USBR Plan
	Treatment Legal & Engineering	\$2,000,000	1,2,3	SJRIP & USBR Plan
	<u>\$124,050,000</u>			
2006	Land Retirement	\$100,000,000	3,4,5	"Up to" amount based on Implementation
	Groundwater Management	\$800,000	1,2,3	14 Total Wells - 12500af Water Supply
	GW Conveyance Construction	\$10,000,000	1,2,3	Long Term Water Supply
	SJRIP Phase 2 Development	\$5,000,000	1,2	SJRIP & USBR Plan
	SJRIP Phase 3 Expansion	\$5,000,000	1,2	SJRIP & USBR Plan
	Treatment Legal & Engineering	\$4,000,000	1,2,3	SJRIP & USBR Plan
	<u>\$124,800,000</u>			
2007	Land Retirement	\$100,000,000	3,4,5	"Up to" amount based on Implementation
	Groundwater Management	\$850,000	1,2,3	17 Total Wells - 15500af Water Supply
	SJRIP Phase 3 Expansion	\$7,100,000	1,2	SJRIP & USBR Plan
	SJRIP Phase 3 Development	\$7,300,000	1,2	SJRIP & USBR Plan
	Treatment Construction	\$21,000,000	1,2	SJRIP & USBR Plan
	<u>\$136,250,000</u>			
2008	Land Retirement	\$100,000,000	3,4,5	"Up to" amount based on Implementation
	Groundwater Management	\$1,000,000	1,2,3	20 Total Wells - 19500af Water Supply
	Treatment Construction	\$21,000,000	1,2	USBR Plan
	<u>\$122,000,000</u>			

NOTE: The Land Retirement includes development of the key management practices such as regional reuse and treatment, dry land farming, etc.

Sub Area

- 1 San Luis Unit Sub-Area
- 2 Exchange Contractors Sub-Area
- 3 Northern Westlands Sub-Area
- 4 Central Westlands Sub-Area
- 5 Southern Westlands Sub-Area

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