Patterson Irrigation District

Water Management Plan/Agricultural Water Management Plan

2008 Criteria

January 15, 2014

Revised June 15, 2016

Date of first draft – November 23, 2011

Index

		Page
Section 1:	Description of the District	3-3
Section 2:	Inventory of Water Resources	3-16
Section 3:	Best Management Practices (BMPs) for Agricultural Contractors	3-26
Section 4:	Best Management Practices for Urban Contractors	NA
Section 5:	District Water Inventory Tables	3-43

Attachment A District Facilities Map

Attachment B District Soils Map

Attachment C District Rules and Regulations

Attachment D District Sample Bills

Attachment E Groundwater Management Plan

Attachment F Notices of District Education Programs and Services Available to Customers

Attachment G District Agricultural Water Order form

Appendix A Agricultural Water Mangement Plan Addendum

Section 1: Description of the District

District Name: Patterson Irrigation District

Contact Name: Peter Rietkerk

Title: General Manager

Telephone: (209) 892-6233

E-mail: prietkerk@PattersonID.org

Web Address: www.pattersonID.org (website under development)

A. History

1. *Date district formed:* November 1955
   Date of first Reclamation contract: December 18, 1967 *(Contract No. 14-06-200-3598A)*
   Original size (acres): 15,000+
   Current year (last complete calendar year): 2010

2. *Current size, population, and irrigated acres*

	2010
Size (acres)	12,841.11
Population served	N/A
Irrigated acres(est.)	12,791.7 acres (estimated)

3. *Water supplies received in current year*

Water Source	*AF*
Federal urban water (Tbl 1)	
Federal agricultural water (Tbl 1)	2,441
State water (Tbl 1)	
Other Wholesaler (define) (Tbl 1)	
Local surface water (Tbl 1)	34,327
Upslope drain water (Tbl 1)	
District ground water (Tbl 2)	5,040
Banked water (Tbl 1)	
Transferred water (Tbl 6)	
Recycled water (Tbl 3)	
Other (define) (Tbl 1)	
Total	41,809

4. Annual entitlement under each right and/or contract

	AF	*Source*	*Contract #*	*Availability period(s)*
Reclamation Urban AF/Y				
Reclamation Agriculture AF/Y	6,000[1]	CVP-DMC	14-06-200-3598A-LTR1	Mar-Feb
Reclamation Agriculture AF/Y	16,500[2]	CVP-DMC	14-06-200-3598A-LTR1	Mar-Feb
Other AF/Y	50,000+	San Joaquin River	Pre-1914 Rights	

Notes:

1. Replacement Water
2. Project Water Contract Total

5. Anticipated land-use changes

Patterson Irrigation District's service area has reduced by approximately 687 acres over the past 5 years, and will shrink by another 181 acres in 2011, largely due to planned municipal development and urban encroachment. The District does not foresee additional development and subsequent reduction in acres over the next 5 year planning period, largely due to the recent recession and the depressed local real estate market.

6. Cropping patterns (Agricultural only)

The District continues to see a conversion to higher valued, permanent crops such as almonds and walnuts, replacing apricots. In fact, almonds now account for nearly ten percent of the total crops grown in the District. Crops such as alfalfa and corn also continue to be a staple crop in the area, largely due to the local dairy economy.

List of current crops (crops with 5% or less of total acreage) can be combined in the 'Other' category.

Original Plan (2000)		*Previous Plan (2004)*		*Current Plan (2010)*	
Crop Name	*Acres*	*Crop Name*	*Acres*	*Crop Name*	*Acres*
		Alfalfa	3,275.14	Alfalfa	3,510.63
		Corn, Silage	2,236.32	Corn	2,066.78
		Tomatoes	1,517.63	Oats/Wheat	1,855.87
		Apricots	1,388.63	Beans	1,531.15
		Beans	1,116.65	Almonds	1,219.99
		Walnuts	807.80	Tomatoes	982.27
				Walnuts	911.45
Other (<5%)		*Other (<5%)*	2,262.77	*Other (<5%)*	2,198.29
Total		*Total*	10,342.17	*Total*	14,275.80[1]

Notes:

1. In 2010, a significant amount of acreage was double-cropped in oats and wheat, although most of the crop demands for these crops were satisfied by precipitation.

7. Major irrigation methods (by acreage) (Agricultural only)

Low volume irrigation methods are being deployed on more fields throughout the District. Since 2004, the total acreage receiving water by low volume irrigation methods has increased approximately 67-percent, and is mostly due to the planting of higher value permanent orchards in the area.

Original Plan (enter date)		*Previous Plan (2004)*		*Current Plan*	
Irrigation Method	*Acres*	*Irrigation Method*	*Acres*	*Irrigation Method*	*Acres*
		Furrow/Border	12,254.07	Furrow/Level Basin	11,042.84
		Sprinkler	732.95	Sprinkler	885.31
		Drip/Trickle	544.29	Low Volume	912.96
Other		*Other*		*Other*	
Total		*Total*	13,531.31	*Total*	12,841.11

B. Location and Facilities

See Attachment A for points of delivery, turnouts (internal flow), and outflow (spill) points, measurement locations, conveyance system, storage facilities, operational loss recovery system, wells, and water quality monitoring locations

1. Incoming flow locations and measurement methods

Location Name	*Physical Location*	*Type of Measurement Device*	*Accuracy*
San Joaquin River (SJR)	SJR Rivermile 98.5, approximately 3.5 miles east of the City of Patterson	Sub-critical contracted flume section w/h SonTek-SW Doppler Device	+/- 2%
Delta Mendota Canal	DMC Milepost 42.51L	Propeller Meter	+/- 2%
Groundwater Wells	Various Locations in District	Propeller Meters	+/- 2%

2. Current year Agricultural Conveyance System

Miles Unlined - Canal	*Miles Lined - Canal*	*Miles Piped*	*Miles - Other*
3.75	51.75	86	

3 Current year Urban Distribution System

Miles AC Pipe	*Miles Steel Pipe*	*Miles Cast Iron Pipe*	*Miles - Other*

4. Storage facilities (tanks, reservoirs, regulating reservoirs)

Name	*Type*	*Capacity (AF)*	*Distribution or Spill*
Northside Reservoir	Recycled Water Reuse, Spill/Tailwater Recovery, Regulatory Reservoir	45	Both
Marshall Reservoir	Recycled Water Reuse, Spill/Tailwater Recovery, Regulatory Reservoir	45	Both
Main Canal Reservoirs (4)	Small, settling basins to remove silt and reduce maintenance	Negligible	Distribution
Lateral Reservoirs (2)	Small, settling basins to remove silt and reduce maintenance	Negligible	Distribution

The District has four –(4) reservoirs on its main canal and two smaller reservoirs – one each on Laterals 5-South and "M" prior to lift pumps stations. These reservoirs were originally designed a settling basins to settle out silt from the San Joaquin River source water; thereby reducing wear on pump impellors and improving the turbidity of the water delivered to the farms. These reservoirs have negligible storage capacity.

The District also has a 14 surface acre reservoir, the Marshall Reservoir, on a 20 acre parcel on the Districts south side. The reservoir collects surface runoff and operational spill from the District's upper south side. The Marshall Reservoir storage has a maximum capacity of about 45 ac-ft at maximum. The water is impounded and re-used on approximately 850 acres on the Districts lower south side.

The Northside Reservoir, completed in 2009, is a 45-acre-ft capacity reservoir for the collection of tailwater and operational spill water from approximately 4,800 acres for redistribution on 1,300 acres on the District's north side.

5. Outflow locations and measurement methods (Agricultural only)

The District has eight active outflow locations around the District. These locations are described in more detail under Section 2F. These outflow locations include ends of laterals that flow into Del Puerto Creek to the north or Marshall Road drain to the south, subsurface drainage outflow, or into Ramona Lake, where it is comingled with surface supply for reuse by a local irrigation company.

The District has implemented two tailwater and operational spill recovery/regulatory reservoirs, as well as main-canal modernization to limit operational spills. With these projects, the District has focused efforts on collection and redistribution of tailwater/operational spill outflow, rather than measurement. As a result of these projects, the District has reduced by approximately 90-percent, the amount of tailwater and/or operational spill that historically left the District through outfall points and redistributes much of this as irrigation supply in the District.

The District is a founding member of the Westside San Joaquin River Watershed Coalition, formed in response to and as a tool to comply with, the State Water Resources Control Board Irrigated Lands Conditional Waiver Program, and likely the pending Irrigated Lands Regulatory Program. As such, the

Westside Coalition has an approved Monitoring and Reporting Plan which includes sites in which the District and its farms discharge operational spills and on-farm surface drain water. Drain water is tested for many constituents including salinity, sediment toxicity, pesticides, and dissolved oxygen. These sites include Marshall Road drain, and Del Puerto Creek. Additionally, Marshall Road Drain is monitored for flow by the Coalition.

6. Description of the agricultural spill recovery system

Tailwater is returned to the lower irrigation laterals either directly or through sub-laterals for reuse. The main canal flows from east-to-west and the main laterals deliver water off the main canal to the north and south. The fall of the land is from west-to-east, from the coastal range to the San Joaquin River. The District collects operational spill and tailwater on three (3) laterals on the south-side of the District and impounds the spill water in the Marshall Reservoir for reuse. Similarly, the District collects operational spill and tailwater from the five (5) laterals on the north-side of the District and impounds this water in the Northside Reservoir for reuse as irrigation supply.

7. Agricultural delivery system operation (check all that apply)

On-demand	*Scheduled*	*Rotation*	*Other (describe)*
X	X		X

The District generally requires 24-hour advanced notice for water deliveries and two-three hours for water shut-offs. In most cases however, water orders can be accommodated immediately and shut-offs can be accommodated within 1-2 hours advanced notice. Full automation of main canal facilities and major lateral turnout facilities with an integrated SCADA system for remote monitoring and control, construction of two recycled water/tailwater recirculation/regulatory reservoir projects, as well as labor management, has allowed for this type of system flexibility for irrigation water deliveries.

8. Restrictions on water source(s)

Source	*Restriction*	*Cause of Restriction*	*Effect on Operations*
San Joaquin River	Water Quality	Naturally Occurring	Reliance on lower TDS CVP Water
Groundwater	Water Quality	Naturally Occurring	Reliance on lower TDS CVP Water
Delta Mendota Canal (CVP)	Quantity	Reclamation	CVP water limited by annual allocation of total

9. Proposed changes or additions to facilities and operations for the next 5 years

The District has aggressively pursued an automation and modernization plan since 1997 and will continue to do so well into the future. Modernization efforts have included the following:

- Repair and replacement of older, less efficient pumps, motors and electrical panels
- Automation and Remote Control/Monitoring (SCADA) of major delivery facilities
- Construction of Replogle flumes for accurate flow rate measurement
- Construction of long-crested weirs for water level control
- Cell-phone, radio and paging systems to enhance personnel and farmer communications
- Installation of flow meters at farm turnouts and delivery points for accurate flow rate and volumetric measurement, and increased delivery efficiency
- Design/construction of two drainage reuse/operational spill/regulatory reservoirs, Marshall and Northside reservoirs, for increased delivery efficiency and flexibility.

A SCADA system has been developed during the modernization and automation process for the District which provides the following:

- Real-time flow rate, water level, and pump status monitoring
- Site specific alarm generation with output to cell phones and printers
- Implementation of a CanalCAD derived downstream control algorithm (using a VFD) which controls pumps and maintains a consistent water level on all reaches of the District's main canal, and also similar control installed at the Marshall Road Reservoir.
- Control Microsystems Software which allows for remote, manual control of pumps, wells and key delivery facilities when needed
- Implementation of the Northside Reservoir project, which includes sophisticated automation to control VFD pumps and automated gates for water level control in adjacent laterals, flow control in downstream laterals, and conveyance of operational spill and tailwater into the Northside Reservoir from all five northern laterals.

The District completed construction of the 2008 pipeline project by early summer 2010, which included installation of 3 new 100-hp VFD driven pumps at existing pumping facilities along the main canal, expansion and concrete lining of 3,500 feet of main canal, installation of 4 turnout flow meters and 5 magnetic flow meters to measure conveyance/delivery flow rates and volume, and installation of a new pump station and 11,500 feet of 36-inch pipeline from the terminus of the District main canal to the Delta Mendota Canal. This project restores District conveyance from the San Joaquin River to lands historically served with local surface supplies, but through degradation of facilities, has relied on water provided thorough the Delta-Mendota Canal to irrigate these lands. This project also intertie's the District's Main Canal with the Delta Mendota Canal to providing a conduit by which water supplies can be conveyed to aid in drought conditions.

The District is currently in construction of the Fish Screen Intake Project, which includes a 195 cfs flat-plate, positive-barrier fish screen on its San Joaquin River diversion. This project also includes 7 new pumps and motors which will provide for efficient conveyance of diversions from the San Joaquin River to the District's main canal system. This facility will utilize the same downstream control algorithm and automation derived for the District's main canal.

The District is in the planning stages of the East-West Conveyance Project aimed at improvements on the main canal to convey water from the San Joaquin River to the Delta-Mendota Canal. This project will conserve additional supplies by piping main canal facilities, improve overall pumping efficiency by replacing old pumping systems, and provide a conduit available for other San Joaquin River rights holders, Reclamation, and upstream tributary agencies to convey water from the San Joaquin River to other places of need on the Westside of the San Joaquin Valley.

The District is also projecting another major surface drainage and operational spill recovery project on the south-eastern end of the District that will include another regulatory reservoir, new pipelines, VFD pumps, long-crested weirs, and automated flow structures. This project is estimated to conserve approximately 5,000 acre-feet per year that could be put to use regionally within the jurisdictions of the District and a local irrigation company.

Additionally, the District will be formulating a long-term capital-improvement program to plan and implement system-wide improvements to existing facilities. This project is aimed at focusing on canal

lining replacements, piping of sub-laterals, pump facility replacement, and system capacity improvements.

The District will also continue its commitment to improving irrigation delivery flow measurement. The District has been proactively installing propeller and Doppler flow measurement technologies in existing turnouts, depending on turnout configuration and water quality considerations. This implementation will occur well into the future, allowing PID to accurately measure grower flow and volumetric deliveries.

C. Topography and Soils

1. Topography of the district and its impact on water operations and management

The upper portion of the District has a downward slope of 30 ft. per mile and the lower portion has a downward slope of 15 ft. per mile. Due to the steep slope and soil textures within the District, irrigation induced sediments are carried in surface tailwater and are discharged into the San Joaquin River. Various studies conducted by the Soil Conservation Service[1] have identified the West Stanislaus Study Area as a contributor of non-point source sediment pollution in the San Joaquin River. In 2004 the District was a founding member of the Westside Watershed Coalition to address surface drainage issues and respond to the criteria required by the State Water Resources Control Board and its Conditional Ag Waiver Program. The need to reduce sediment transport has been and will continue to be addressed by the implementation of numerous water conservation projects in the District, including the Marshall Road Reservoir, the Northside drainage project, and additional planned projects.

[1] USDA Soil Conservation Service, 1992, West Stanislaus Sediment Reduction Plan, Water Resources Planning Staff, Davis, California.

2. District soil association map (Agricultural only)

See Attachment B, District Soils Map

3. Agricultural limitations resulting from soil problems (Agricultural only)

Soil Problem	*Estimated Acres*	*Effect on Water Operations and Management*
Salinity		
High-water table		
High or low infiltration rates		
Other (define)		

No agricultural limitations resulting from soil problems or irrigation in the local region have been identified.

D. Climate

1. General climate of the district service area

The climate is characterized by long, warm to hot, dry summers for ripening of crops without mildew. The summers are characterized by little to no precipitation, requiring irrigation water to meet the demands of seasonal and permanent crops. The mild, wet winters provide some moisture for winter crops and leaching of salts that can accumulate during dry periods.

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
Avg Prcp. (in)[1]	2.55	2.18	2.00	0.63	0.39	0.04	0.02	0.02	0.27	0.61	1.23	1.51	11.45
Avg Temp. (°F)[1]	45.60	50.90	54.80	59.80	66.80	73.20	77.10	75.80	72.30	64.50	53.00	45.30	61.60
Max. Temp. (°F)[1]	54.20	61.80	67.00	74.50	82.70	90.50	94.60	92.60	88.60	79.80	65.10	55.10	75.50
Min. Temp. (°F)[1]	37.00	40.00	42.60	45.10	50.80	55.90	59.60	58.90	55.90	49.20	40.90	35.50	47.60
ETo. (in)[2]	1.59	2.20	3.66	5.08	6.83	7.80	8.67	7.81	5.67	4.03	2.13	1.59	57.06

Weather station ID NOAA Newman Station *Data period: Year* 1971 *to Year* 2000

Average wind velocity 7.0 mph[3] *Average annual frost-free days:* 262

References:

1. National Oceanic and Atmospheric Administration, Newman, CA COOP Station. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6168. Accessed on June, 28, 2011.
2. California Irrigation Management Information System (CIMIS), Patterson Station (161). http://wwwcimis.water.ca.gov/cimis/monthlyEToReport.do. Accessed on June 28, 2011. Note period of record is from August 1999 to Current.
3. National Oceanic and Atmospheric Administration, Modesto Airport ASOS Station. http://www.wrcc.dri.edu/htmlfiles/westwind.final.html#CALIFORNIA. Accessed on June, 28, 2011.

2. Impact of microclimates on water management within the service area
None identified or studied

E. Natural and Cultural Resources

1. Natural resource areas within the service area

Name	*Estimated Acres*	*Description*
Del Puerto Creek		Creek bordering north end of the District and flows to the San Joaquin River
Salado Creek		Enters District from the west and is pipelined to the San Joaquin River through the District

2. Description of district management of these resources in the past or present
The District has constructed the Northside Reservoir project which recovers operational spills and on-farm surface drainage that historically reached Del Puerto Creek, resulting in less on-farm surface drainage/tailwater flowing into the creek and eventually, into the San Joaquin River. The District is not actively involved in the management of Salado Creek.

3. Recreational and/or cultural resources areas within the service area

Name	*Estimated Acres*	*Description*
None		

F. Operating Rules and Regulations

1. Operating rules and regulations
See Attachment C, District Rules and Regulations (water related)

2. Water allocation policy (Agricultural only)
See Attachment C, Section 6
Water is allocated equally (ac-ft per acre) to all landowners on a yearly basis. The allocation is determined in February of each year and any additional water made available by the District during the water year is made available to all customers.

3. Official and actual lead times necessary for water orders and shut-off (Agricultural only)
See Attachment C, Article 6.3.3
With the implementation of automation and SCADA in key distribution system facilities, labor management, and distribution system modernization the district can generally provide water within a 2-4 hours of an order and allow for shut-offs with the same lead-time. There is no official District policy on lead-time for shut-offs. There is an official policy requiring 24-hour advance notice of water orders, but that rule is generally waived unless the District has operational problems or water supply constraints.

4. Policies regarding return flows (surface and subsurface drainage from farms) and outflow
See Attachment C, Section 7

The District allows continuing surface drainage into its laterals. This return surface drain water is comingled with the District's source waters and delivered to customers. The return surface water not delivered to customers leaves the District as operational spill water. The Marshall Road Reservoir on the Districts south side recovers operational spill water from Laterals 3-North, 4-North and 5-North. This water is impounded in a reservoir and recycled for on-farm use and delivery to customers. Similarly, the District recovers operational spill and tailwater from the five (5) laterals on the north-side of the District and impounds this water in the Northside Reservoir for reuse.

5. Policies on water transfers by the district and its customers
See Attachment C, Article 6.8

The District allows landowners or water users to transfer water allocations from one owned or leased property to another within the District. All water belongs to the District and users are not allowed to transfer water to other districts. The District staff and Board evaluate water supply conditions throughout the year and make decisions regarding transferring water in/out of the District as allowed by state, federal, and local laws, regulations, and contracts.

G. Water Measurement, Pricing, and Billing

1. *Agricultural Customers*

a. *Number of farms* 446 Irrigated Farms

b. *Number of active delivery points (turnouts and connections)* 283

c. *Number of delivery points serving more than one farm* 170

d. *Number of measured delivery points (meters and measurement devices)* *160*

e. *Percentage of delivered water that was measured at a delivery point (based on volumetric deliveries)* 67%

f. *Delivery point measurement device table (Agricultural only)*

Measurement Type	*Number*	*Accuracy (+/- %)*	*Reading Frequency (Days)*	*Calibration Frequency (Months)*	*Maintenance Frequency (Months)*
Orifices	1	+/- 6%	1	12-24	As needed
Propeller meter	18	+/- 3%	1	12	12
Weirs	34	+/- 6%	Twice-daily when in use	12	As needed
Flumes	4	+/- 5%	Twice-daily when in use	0	As needed
Venturi					
Metered gates	94	+/- 6%	Twice-daily when in use	24	As needed
Acoustic Doppler	7	+/- 3%	1	12	18-24 Months
Magnetic Meter	2	+/- 2%	1	24-36	18-24 Months
Total	160				

2. Urban Customers

a. *Total number of connections* _____

*b. Total number of metered connections*_____

c. Total number of connections not billed by quantity _____

d. Percentage of water that was measured at delivery point _____

e. Percentage of delivered water that was billed by quantity _____

f. Measurement device table

Meter Size and Type	*Number*	*Accuracy (+/-percentage)*	*Reading Frequency (Days)*	*Calibration Frequency (Months)*	*Maintenance Frequency (Months)*
5/8-3/4"					
1"					
1 ½"					
2"					
3"					
4"					
6"					
8"					
10"					
Compound					
Turbo					
Other (define)					
Total					

3. Agriculture and Urban Customers

a. Current year agriculture and /or urban water charges - including rate structures and billing frequency

See Attachment C, Water Rate Schedule

b. Annual charges collected from customers (current year data)

Fixed Charges			
Charges ($ unit)	*Charge units .*	*Units billed during year (acres, customer) etc.*	*$ collected ($ times units)*
$12.00	Landholdings under one acre under ($/parcel)	42 parcels	$504
$15.00	Landholdings over one acre and less than two acres ($/parcel)	50 parcels	$750
$60.00	Landholdings greater than 2 acres ($/acre)	12,740.94 acres	$764,456.40

Volumetric charges			
Charges ($ unit)	*Charge units ($/AF), ($/HCF), etc.*	*Units billed during year (AF, HCF) etc.*	*$ collected ($ times units)*
$30	Tier 2 Water ($/AF)	12,234.43 AF	$367,032.90

See Attachment D, District Sample Bills

c. Water-use data accounting procedures

Currently, the District monitors water use daily by lots grouped as individual fields. The average individual irrigated field size (grouped lots) is 23.0 ± acres. Water tags are kept as a record of each irrigation on each field. Included on the tag are the lateral number, the gate number, the crop, the number of acres, the owner, the lot number, the time of irrigation started and stopped, and the flow rate of the delivery on each day the field is irrigated. The tag also shows the amount of water allocated to the lot(s), the amount used during the irrigation, and the balance of water allocation remaining after the irrigation event. The records for the past 10 years are on file at the District.

H. Water Shortage Allocation Policies

1. Current year water shortage policies or shortage response plan - specifying how reduced water supplies are allocated

The District does not have an official policy for water shortages. Each year, the Board of Directors determines Tier I and Tier II water availability and water rates for growers, based on budgetary considerations, and hydrologic conditions prior to the beginning of the irrigation season. During drought conditions, the District implements a Landowner Groundwater Plan which involves groundwater well pump testing for private well owners, a determination of costs to run these wells, and payment of an administrative fee to the well owners if supplies were needed to augment District supply. The District intends on revisiting this policy on an as-needed basis during periods of drought.

2. Current year policies that address wasteful use of water and enforcement methods

The District does have a policy that addresses the wasteful use of water, in order to minimize water shortages.

See Attachment C, Article 4.2

Section 2: Inventory of Water Resources

A. Surface Water Supply

1. Acre-foot amounts of surface water delivered to the water purveyor by each of the purveyor's sources
See Water Inventory Tables, Table 1

2. Amount of water delivered to the district by each of the district sources for the last 10 years
See Water Inventory Tables, Table 8

B. Ground Water Supply

1. Acre-foot amounts of ground water pumped and delivered by the district
See Water Inventory Tables, Table 2

2. Ground water basin(s) that underlies the service area

Name	*Size (Square Miles)*	*Usable Capacity (AF)*	*Safe Yield (AF/Y)*
San Joaquin Basin	13,500	80,000,000	

3. Map of district-operated wells and managed ground water recharge areas
See Attachment A, District Facilities Map

4. Description of conjunctive use of surface and ground water
Water applied to the ground within the District, both at the farm level and as distribution system seepage/deep percolation, enters the groundwater aquifer and is either stored there or continues to flow underground into the San Joaquin River. In both cases, this seepage is made available to the District as supplies through indirect recharge. Such indirect recharge has historically been important to the District to maintain the groundwater basin, which is used by the District, as well as to provide water available to be pumped from the San Joaquin River.

5. Ground Water Management Plan
See Attachment E, Ground Water Management Plan

6. Ground Water Banking Plan
N/A

C. Other Water Supplies

1. "Other" water used as part of the water supply
See the Water Inventory Tables, Table 1

D. Source Water Quality Monitoring Practices

1. *Potable Water Quality (Urban only)*

2. *Agricultural water quality concerns*: *Yes* ____xx____ *No* _____

The District's San Joaquin River and groundwater sources have high salt concentrations. These water quality conditions affect and limit cropping patterns and have effects on yield reductions. Problems with San Joaquin River water quality are well documented by the Regional Water Quality Control Board and USGS.

3. *Description of the agricultural water quality testing program and the role of each participant, including the district, in the program*

The District has installed a water quality monitoring device in the Main Canal, as well as the new Fish Screen Intake Structure to measure constituents such as electro conductivity, temperature, and pH real-time. This information is stored directly into servers for record keeping and historical data tracking. This information is made available to landowners and growers upon request. Because of the relatively new installation, this information is not readily available yet for prior years of monitoring.

Groundwater wells are tested every one or two years to determine similar water quality parameters for regular monitoring. Groundwater quality and depth information is stored at the District office and are available to growers upon request. Additionally, regional groundwater information is regularly monitored through the District's AB 3030 Groundwater Management Plan administration and is provided to the State of California for inclusion in the California State Groundwater Elevation Monitoring (CASGEM) database.

4. *Current water quality monitoring programs for surface water by source (Agricultural only)*

Analyses Performed	*Frequency*	*Concentration Range* (ppm soluble salts)	*Average* (ppm soluble salts)
Complete Analysis including pH, EC, soluble salts, nitrogen, calcium, magnesium, potassium boron chloride	2 times/year	150-2,260[1]	1,100[1]
EC	Real-time	262-1,500[2]	960

1. Range and average data from California Region 5 Water Quality Control. Board data gathered from 1985-2004 at the Patterson Bridge, ¼ mile upstream of Patterson ID'
2. Data retrieved for 2010 from SJR site at Patterson Bridge, ¼ mile upstream of Patterson ID. www.cdec.water.ca.gov

Current water quality monitoring programs for groundwater by source (Agricultural only)

Analyses Performed	*Frequency*	*Concentration Range*	*Average*
pH	2-3 years	7.3-7.8	7.7
EC (mmhos/cm)	2-3 years	1.2-3.01	1.73

Soluble Salts (ppm)	2-3 years	700-1,930	1,121
Boron (ppm)	2-3 years	0.34-1.53	0.69
Nitrate (ppm)	2-3 years	1.3-131.6	32.6

E. Water Uses within the District

1. Agricultural
See Water Inventory Tables, Table 5 - Crop Water Needs

2. Types of irrigation systems used for each crop in current year

Crop name	*Total Acres*	*Level Basin - acres*	*Furrow - acres*	*Sprinkler - acres*	*Low Volume - acres*	*Multiple methods - acres*
ALFALFA	3,510	3,510				
ALMONDS	1,220	596		120	504	
APPLES	20	10	10			
APRICOTS	611	563		24	24	
ASPARAGUS	23			23		
BEANS	1,531	1,514		17		
CACTUS	10	10				
CANTALOUPE	127	127				
CHERRIES	175	58		32	85	
CORN	2,067		2,067			
GRAPES	21	21				
NURSERY	37	37				
OATS/WHEAT	1,856	1,856				
OTHER SEED	40	40				
PASTURE	679	679				
PEACHES	37			37		
PECANS	15	15				
PISTACHIO	15	15				
SPINACH	20	20				
SQUASH	6		6			
SUDAN	131	131				
TOMATOES	982		880	49	53	
TURF	152			152		
WALNUTS	911	544		152	216	
WATERMELON	27		27			

3. Urban use by customer type in current year

Customer Type	*Number of Connections*	*AF*
Single-family		
Multi-family		
Commercial		
Industrial		
Institutional		
Landscape irrigation		
Wholesale		
Recycled		
Other (specify)		
Other (specify)		
Other (specify)		
Unaccounted for		
Total		

4. Urban Wastewater Collection/Treatment Systems serving the service area – current year

Treatment Plant	*Treatment Level (1, 2, 3)*	*AF*	*Disposal to / uses*
	Total		
Total discharged to ocean and/or saline sink			

5. Ground water recharge/management in current year (Table 6)

Recharge Area	*Method of Recharge*	*AF*	*Method of Retrieval*
	Total		

6. Transfers and exchanges into or out of the service area in current year (Table 6)

From Whom	*To Whom*	*AF*	*Use*
Patterson ID	Westlands Water District	4,125	Agricultural
Patterson ID	Westlands Water District	650	Agricultural
Patterson ID	Santa Clara Valley Water District	5,200	Agricultural
Del Puerto Water District[1]	Patterson ID	916	Agricultural
Patterson ID	Del Puerto Water District	142	Agricultural

Notes:

1. Administrative transfer, delivered to Del Puerto lands through PID turnout.

7. Trades, wheeling, wet/dry year exchanges, banking or other transactions in current year (Table 6)

From Whom	*To Whom*	*AF*	*Use*

8. Other uses of water in current year

Other Uses	*AF*

F. Outflow from the District (Agricultural only)

See Facilities Map, Attachment A, for the location of surface and subsurface outflow points, outflow measurement points, outflow water-quality testing locations

1. *Surface and subsurface drain/outflow in current year*

The District currently does not have a defined flow measurement or water quality program for outflow points. Approximately 90-percent of farm surface drains return to district delivery systems and are co-mingled with source supplies and delivered to other customers as agricultural supplies. The district maintains a district delivery percentage of approximately 84 percent, largely due to the fact that the District can collect and redistribute this drain water through the Northside and Marshall Reservoir projects. These reservoirs were planned and installed with coordination and funding from the State Water Resources Control Board.

Considering estimates for seepage and evaporation, operational spills are estimated to total approximately 8-10% of total imported supplies.

Outflow point	*Location description*	*AF*	*Type of measurement*	*Accuracy (%)*	*% of total outflow*	*Acres drained*

Outflow point	*Where the outflow goes (drain, river or other location)*	*Type Reuse (if known)*
Laterals 2N, 3N, 4N, M	Northside Reservoir, Del Puerto Creek	2,300 AF Agricultural reuse in District
Laterals 5S, 4S, 3S	Marshall Reservoir, Marshall Road Drain	2,000 AF Agricultural Reuse in District
Laterals 2S	Marshall Road Drain	
Lateral 1S	Drain	Agricultural
Apricot Avenue Drain	Drain	Agricultural

2. *Description of the Outflow (surface and subsurface) water quality testing program and the role of each participant in the program*

The District currently does not have a defined flow measurement or water quality program for water draining from outflow points. Most surface drains are recycled and mixed with source water supplies from the San Joaquin River, CVP supplies, and groundwater. As a majority of the source water is of generally high salt content from the SJ river source, salinity testing of drain water has not been a testing priority.

The District is a founding member of the Westside San Joaquin River Watershed Coalition, formed in response to and as a tool to comply with, the State Water Resources Control Board Irrigated Lands Conditional Waver Program. As such, the Westside Coalition has an approved Monitoring and

Reporting Plan which includes sites in which the District and its farms discharge operational spills and on-farm surface drain water. These sites include Del Puerto Creek and Marshall Road Drain. This information is provided to the State Regional Board to fulfill monitoring requirements on an annual basis. These reports are also uploaded to the San Luis & Delta Mendota Water Authority website at http://sldmwa.org/sjv_drainage_auth_.htm.

3. Outflow (surface drainage & spill) Quality Testing Program

Analyses Performed	*Frequency*	*Concentration Range*	*Average*	*Reuse limitation?*

Outflow (subsurface drainage) Quality Testing Program

Analyses Performed	*Frequency*	*Concentration Range*	*Average*	*Reuse limitation?*

4. Provide a brief discussion of the District's involvement in Central Valley Regional Water Quality Control Board programs or requirements for remediating or monitoring any contaminants that would significantly degrade water quality in the receiving surface waters.

The District is a founding member of the Westside San Joaquin River Watershed Coalition, formed in response to and as a tool to comply with, the State Water Resources Control Board Irrigated Lands Conditional Waiver Program, and the pending Irrigated Lands Regulatory Program. As such, the Westside Coalition has an approved Monitoring and Reporting Plan which includes sites in which the District and its farms discharge operational spills and on-farm surface drain water. Drain water is tested for many constituents including salinity, sediment toxicity, pesticides, and dissolved oxygen.

G. Water Accounting (Inventory)

1. Water Supplies Quantified

a. Surface water supplies, imported and originating within the service area, by month (Table 1)
b. Ground water extracted by the district, by month (Table 2)
c. Effective precipitation by crop (Table 5)
d. Estimated annual ground water extracted by non-district parties (Table 2)
e. Recycled urban wastewater, by month (Table 3)
f. Other supplies, by month (Table 1)

2. Water Used Quantified

a. Agricultural conveyance losses, including seepage, evaporation, and operational spills in canal systems (Table 4) or

Urban leaks, breaks and flushing/fire uses in piped systems (Table 4)

b. *Consumptive use by riparian vegetation or environmental use (Table 6)*
c. *Applied irrigation water - crop ET, water used for leaching/cultural practices (e.g., frost protection, soil reclamation, etc.) (Table 5)*
d. *Urban water use (Table 6)*
e. *Ground water recharge (Table 6)*
f. *Water exchanges and transfers and out-of-district banking (Table 6)*
g. *Estimated deep percolation within the service area (Table 6)*
h. *Flows to perched water table or saline sink (Table 7)*
i. *Outflow water leaving the district (Table 6)*
j. *Other*

3. *Overall Water Inventory*
   a. *Table 6*

H. Assess Quantifiable Objectives:

Identify the Quantifiable Objectives that apply to the District (Planner, chapter 10) and provide a short narrative describing past, present and future plans that address the CALFED Water Use Efficiency Program goals identified for the District.

QO #s	*QO Description*	*Past, Present & Future Plans*
96, 98,	Reduce native constituents (selenium, boron, molybdenum, organic carbon) to enhance and maintain beneficial uses of water in San Joaquin River and other Water Bodies	The District has installed two Recycled Water Reuse, Spill/Tailwater Recovery, Regulatory, Reservoirs, capable of capturing an estimated 90-percent of pesticide, sediment, and metals laden drainage for agricultural irrigation reuse within the district. The removal of this historical agricultural drainage from the San Joaquin River enhances the overall river quality for this and other tributary water bodies. These reservoirs continue to remain in operation and are regularly maintained by the District. These reservoirs have significantly enhanced the District's overall irrigation efficiency, and has allowed the District to conserve crucial supplies that may be put to beneficial use. The District continues to look for opportunities to reduce agricultural drainage to the San Joaquin River and is planning another recapture and recirculation project capable of recapturing and recirculating approximately 5,000 acre-feet per year.
97, 100, 99, 101, 138, 102, 103, 104, 142, 143	Reduce pesticides to enhance and maintain beneficial uses of water.	Same as Above

Section 3: Best Management Practices (BMPs) for Agricultural Contractors

A. Critical Agricultural BMPs

1. *Measure the volume of water delivered by the district to each turnout with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 6%*

Number of turnouts that are unmeasured or do not meet the standards listed above: 70

Number of measurement devices installed last year: 0

Number of measurement devices installed this year: 5

Number of measurement devices to be installed next year: 3-5

Types of Measurement Devices Being Installed	*Accuracy (Factory)*	*Total Installed During Current Year*
Propeller, Doppler, and Magnetic Meters	+/- 6%	5

In 2010, Patterson Irrigation District had 446 irrigated fields, with an average field size of 27 acres. This large amount of small acreage fields amounts to a relatively dense number of individual fields in comparison to other local irrigation districts. Patterson Irrigation District was originally developed around a colony concept with original parcels ranging from 40-80 acres, for the production of a diverse range of agricultural endeavors. Because of this level of parcel subdivision, most of the parcels do not have direct access to a lateral canal, making ancillary conveyance facilities necessary to irrigate fields. Currently, in locations where PID does not have a device or structure to measure flow, volumes are estimated using in-lateral weirs. This method of measurement is still relatively accurate as automation to prevent level fluctuation in the main canal keeps flows into the laterals constant, and the weirs provide relatively constant water surface elevations for deliveries into fields or sub-laterals.

Patterson Irrigation District also measures deliveries through its conveyance system at a number of locations, some relatively close to customer turnouts, to maintain proper deliveries and diversions into system laterals. All diversions into the District main canal, including river, groundwater, and DMC diversions are measured. All diversions from the main canal into laterals are measured via designed and rated flumes, and distribution system operators use these devices to determine the proper deliveries into laterals to meter deliveries and limit operational spills.

According to PID records, approximately 65-70 percent of customer field deliveries are made from short-sublaterals. In almost all of these cases, the flow rates and volumes are estimated or measured with information from the heads of these short sub-laterals, rather than with flow measurement devices at each field. Because of the small size of these ancillary sub-lateral delivery facilities, nearly all deliveries on sub-laterals are made with only one or two fields irrigating at once.

The District has technical challenges with excellent volumetric measurement for a number of reasons including:

- There is a very high silt load in its canals. The soil texture coupled with the natural slopes cause a high silt load that originates from tail water return flows into downhill laterals and from sediments pumped from the San Joaquin River. Silt from tailwater is expected to decrease over time as many acreages are being converted to permanent orchards and high efficiency irrigation systems that limit drainage.
- During the summer, the District routinely maintains canals to reduce aquatic weeds and algae growth in canals. This biological growth limits the capacity of canals, and when dislodged, can plug or inhibit flow measurement devices.
- Because many of the lateral canals follow natural contour lines, many delivery points off of laterals have minimal head loss available.
- Many of the field level turnouts are not easily accessible because there is no direct PID easement to the turnouts. In addition, the hydraulic conditions at these field turnouts are not conducive to efficient and accurate flow measurement. Flow measurement at the top of the sub-laterals (at the delivery point from the lateral canal) has historically been selected by the district as the most accurate and efficient method of measuring water deliveries to those fields.

According to the current District database information, approximately 21-percent of the District's irrigated fields do not have adequate flow measurement meeting Reclamation criteria. If the District were to meet the criteria established by Reclamation at the field level, this would require construction and installation of approximately 154 structures and/or flow measurement devices throughout the District. This quantity of flow structures would be very costly, and as described above, would prove difficult because of limited easement for access, existing topographic conditions, and maintenance.

If the District were to provide modifications or improvements to accurately measure volumetric deliveries at a multiple user delivery point, then the District would be required to construct improvements for approximately 70 flow measurement sites. This is approximately 45-percent of the necessary modifications required to provide at flow measurement at the field level. Not only would this provide an economic benefit for the District, the new installations at the head of a multiple user delivery point would allow the District to have better access to these sites for maintenance, monitoring, and operations during the irrigation season.

In order to achieve compliance with Reclamation's Critical Agricultural BMP A1, the District will implement the following flow measurement plan:

1. Volumetric measurement can be made at the PID lateral turnout delivery structures that supply multiple fields, if the following conditions are documented and practiced by PID:

   a. No more than two deliveries will be made simultaneously from any single lateral delivery measurement point – unless any additional deliveries have their own individual flow meters. For example, down a sub-lateral one farmer may have a flow meter on a drip system. Two other deliveries could therefore be made simultaneously from the same sub-lateral.

   b. PID must establish a written protocol regarding complaints from individual farmers regarding billing. This protocol must include:

      i. Documentation of all such complaints.

      ii. Documentation of what was done to resolve each complaint.

2. PID will require farmers to install PID-approved flow meters (which also totalize volumes) on new pressurized irrigation systems. The PID approval process will consist of:

a. A list of specific devices or technologies that will be approved.
b. A written understanding of the obligations of the farmer/district regarding maintenance and access.
c. Written requirements related to proper installation of the flow meters.

3. PID will develop a database of the types and conditions of all of its turnouts by December of 2013, depending on weather conditions.

4. PID will field test a new orifice plate measurement device in the summer of 2013 on one of its larger turnouts.

5. PID will begin to improve its measurement devices/procedures, starting with its larger turnouts and progressing down the list, in order of the annual volume delivered. This improvement program will consist of:

a. Modifying the structures as needed, including replacement of old gates or adding new instrumentation or components, if necessary.
b. Monitoring and cleaning the structures as needed.
c. Developing proper rating tables/equations – using properly defined measurements as required by each type of structure.

6. PID will plan to complete its improvement program by 2019.

2. *Designate a water conservation coordinator to develop and implement the Plan and develop progress reports*

Name: Peter Rietkerk *Title:* General Manager/Water Conservation Coordinator

Address: *PO Box 685, Patterson, CA 95363*

Telephone: (209) 892-6233 *E-mail:* prietkerk@PattersonID.org

3. Provide or support the availability of water management services to water users
See Attachment F, Notices of District Education Programs and Services Available to Customers.

a. On-Farm Evaluations

1) On farm irrigation and drainage system evaluations using a mobile lab type assessment

	Total in district	*# surveyed last year*	*# surveyed in current year*	*# projected for next year*	*# projected 2nd yr in future*
Irrigated acres	12,791.7	0	0	0	0
Number of farms	446	0	0	0	0

The District has supported Mobile Labs in our area in varying ways since 1990. There has been a low level of interest to date within the District. Some years the District has paid for irrigation evaluations on a demand basis, other years in has funded the Mobile lab directly and recently the District provided the availability of irrigation evaluations through its membership in the San Luis and Delta Mendota Water Authority.

The District plans to provide for on-farm irrigation evaluations on a demand basis to ensure funding of this BMP occurs within the District. The local mobile lab has been very well established in the Northern San Joaquin Valley. The District has determined there is no need to sponsor the Mobile Lab when its services can be hired out for direct benefit for water users within the District. District staff is also readily available to landowners to questions regarding irrigation efficiency and provide recommendations for most efficient irrigation practices on a case by case basis.

Although the interest has been low to-date, the growers receiving irrigation evaluations have implemented recommendations generated from the evaluations including management of tailwater sedimentation ponds, tailwater return systems and proper systems operation, management and scheduling of irrigation with drip/micro systems, including filtration system management which increase system efficiencies.

The District will sponsor on-farm irrigation evaluations, offering this service to fields greater than 100 acres, on a 50-50 cost share basis between the District and the grower, if funding is not made available. Targeting larger fields will provide the best chance for water conservation and efficiency improvements. In the event that sponsored farm evaluations are provided free to growers, the District will notice growers of this opportunity.

2) Timely field and crop-specific water delivery information to the water user

The Districts water database produces reports giving growers a wide array of water use and crop water use information, including their field water use by crop and comparison to district averages. The District sends out statements monthly and includes copies of irrigation tags which are used to record single field irrigation events. This way the farmer has monthly up to date information on where his crops and fields stand on water usage. The District plans on implementing a new water accounting database within the next three years and providing annual reporting of individual grower's crop water usage in comparison to the District averages for the similar crops. *A copy of a statement and associated irrigation tags is attached.*

b. Real-time and normal irrigation scheduling and crop ET information

The District has notified the water users of the availability of CIMIS information and data for using CIMIS for irrigation scheduling. The booklets and ET data are provided on a request basis. The West

Stanislaus Resource Conservation District installed a CIMIS weather station in the Patterson Area in 2000.

In order to make this information more readily available to growers, the District intends on advertising CIMIS website, and Cal Poly Irrigation Training and Research Center resources regarding irrigation scheduling. The District will also review and pursue the use of WateRight, (http://www.wateright.org/) to assist growers in irrigation scheduling. Using live ETo data from the local Patterson CIMIS station, as well as additional Kc information based on crop and stage of production, this will allow the growers to anticipate actual ET for irrigation scheduling. This data, in conjunction with grower input for crop rooting depth and type, will give growers an effective tool to estimate irrigation frequency and volumetric quantities. The District will disseminate this data via newsletter and/or website. If growers are interested in more information regarding crop scheduling, the District will provide additional resources and training through workshops or individual meetings, depending on the level of interest.

c. Surface, ground, and drainage water quantity and quality data provided to water users

The District has and will continue to implement an aggressive modernization program to allow for real-time flow rate measurement of all district in-flows. This information, coupled with delivery records and estimates on evaporation and seepage provide the data to perform a water balance and estimate operational tailwater spills. The District has installed devices to measure real-time water quality at the Northside Reservoir, and plans on using this data to track drainage water quality on the northern portion of the District. If successful, this strategy will also be deployed on the Marshall reservoir. Furthermore, the District has installed a water quality sondes at the San Joaquin River diversion and main canal to track real-time water quality through our SCADA system. The District will notify growers of the availability of this data through newsletter. All of this data is made available to landowners on a demand basis.

As stated in prior sections of this report the District monitors quantity and quality of District owned groundwater facilities and is working with other agencies to implement an AB 3030 groundwater management plan that also meets the newer SBx7-6 requirements in our area.

The District does not measure drainage water quantity. A large percentage of District surface drain water is re-circulated within the Districts water distribution system and recaptured through the Northside and Marshall reservoirs and reused by water users.

d. Agricultural water management educational programs and materials for farmers, staff, and the public

Program	*Co-Funders (If Any)*	*Yearly Targets*

See Attachment F for samples of provided materials and notices

Patterson Irrigation District is a member of the San Luis & Delta Mendota Water Authority, Association of California Water Agencies, California Farm Water Coalition, the California Water Awareness Campaign, and the Stanislaus County Farm Bureau, which provide education on water-

related issues from local to state levels. PID staff have also expressed interest to local educators to facilitate classroom discussions on water related-issues including hydrology, water resources, canal safety, and irrigation. The District has also partnered with Turlock Irrigation District in the past to educate local school children on canal safety.

e. other

The District has extensive materials on-hand in its water conservation library. These materials include books on and videos on water management, water measurements, soil-plant-water relationships, engineering, fertigation, etc. This information is available to staff, farmers and the public.

The District also provides an update letter on a regular basis, to all water users and landowners in the District. This newsletter outlines the Districts modernization and conservation programs and provides relevant information for water users in areas relating to water conservation, water management, water conservation projects, and water quality components on the San Joaquin River.

4. Pricing structure - based at least in part on quantity delivered

Adopted in 2010, the District charged a minimum of $60 per acre for which the customer is entitled to 2 acre-feet or less of water per acre. Annual assessments for purchase of irrigation water are paid in two equal installments due on March 31st and June 30th. All deliveries are measured volumetrically. Any volume of water used above the 2 acre-feet Tier I allocation are billed monthly. In 2010, this second Tier rate was also $30/acre foot. In the Districts experience this pricing structure encourages conservation and to a degree, deficit irrigation. Landowners do not like additional bills for Tier II Water and a majority of the water users track use to avoid and/or minimize Tier II use and subsequent billing. This pricing structure encourages farming with 2 ac-ft/acre of water in many cases.

The District has also adopted a Tiered-Water Pricing structure. The policy adopted by the District Board is as follows:

When 80% of the annual 16,500 Ac-ft contractual CVP allotment has been utilized in the District, cost per acre-foot will increase an additional $1/Ac-ft. When 90% of the annual 16,500 Ac-ft contractual CVP allotment has been utilized, cost per acre-foot will increase another additional $1/Ac-ft.

5. Evaluate and describe the need for changes in policies of the institutions to which the district is subject

The Board of Directors regularly review and suggest development of policies for issues that become pervading concerns for the District, or are relevant in the current regulatory climate. The Directors also evaluate current contracts and relationship with other agencies on a daily basis. All policy development, contract creation, and issues are forwarded through General Counsel.

6. Evaluate and improve efficiencies of district pumps

The District has made much progress in this area over the years. The District has completed automating all its pumping plants on its main canal and installing downstream control automation using a VFD at each pumping plant. The pumps which are most efficient operate the most hours and the least efficient units operate the least hours. As older, less efficient pumps wear out they are replaced with new higher efficiency pumps and motors. Every two years, the District performs pump tests on all pumping plants on the main canal, testing each pump for flow and power consumption using data readily available through the Allen-Bradley motor control centers, and through installation of a temporary weir

in the main canal lifts. This allows the District to utilize flow and power consumption data to determine overall pump performance, and track changes in pump performance over time.

In 2008, when the threat of drought was apparent, the District developed a Landowner Groundwater Plan which involved groundwater well testing for private well owners, a determination of costs to run these wells, and payment of a fee to these the well owners if supplies were needed to augment District supply. These wells tests were subsidized by the District. The District will continue to implement this program on a regular basis to prepare for the possibility of drought.

B. Exemptible BMPs for Agricultural Contractors
(See Planner, Chapter 2, Appendix C for examples of exemptible conditions)

1. Facilitate alternative land use

Drainage Characteristic	*Acreage*	*Potential Alternate Uses*
High water table (<5 feet)		
Poor drainage		
Ground water Selenium concentration > 50 ppb		
Poor productivity		

N/A. No major problems or issues have been identified to be caused by irrigation service.

Patterson Irrigation District's boundaries have reduced by approximately 687 acres over the past 5 years, and are anticipated to shrink by another 181 acres in 2011, largely due to planned municipal development and urban encroachment.

2. Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to crops or soils

Sources of Recycled Urban Waste Water	*AF/Y Available*	*AF/Y Currently Used in District*

The availability to incorporate local wastewater that is treated for recycling has not been studied with the local city municipality at this time. Initial discussions though with the City of Patterson have indicated that the City is relying on the incorporation of recycled water use for landscape irrigation as part of its water supply to support future growth and development, and would likely not seek an agricultural recycled water project with the District The District operates open channel delivery facilities for much of its system, providing water to forage crops and crops grown for human consumption, which may prove problematic for recycled water supplies. The District does recycle agricultural drain for reuse within the District, reducing District outflow by nearly 90 percent.

The District has participated in discussions recently regarding the North Valley Regional Recycled Water Program. The goal of this project is to provide recycled water from the Cities of Modesto and Turlock to Del Puerto Water District. Patterson Irrigation District has provided input regarding conveyance and/or exchange of recycled water to Del Puerto Water District, and is listed in various project alternatives. The District will be continuing these discussions, and staff will be looking for Board input to gauge the District's participation in this project. The Project intends on utilizing an agronomist to address long-term agricultural water quality concerns.

3. Facilitate the financing of capital improvements for on-farm irrigation systems

Funding source Programs	*How provide assistance*
District/Landowner Cost Share[1]	Cost share 40%/60% (District/Landowner)
On-Farm Efficiency/Drainage Reduction Programs through NRCS, CURES[2]	District informs landowners of opportunities, facilitates contacts between Landowner and District, provides assistance on forms

Notes

1. The District has a cost-share program for conservation projects, which involve facilities that wholly or in part, serve as distribution facilities. Approved projects are cost shared 40% by the District and 60% by the Landowner. An example would be an open sub-lateral serving as a delivery to a farm, which a landowner would request to be piped.

2. The District also stays informed on programs, such as those administered by NRCS and CURES and informs landowner/growers of funding opportunities to improve irrigation efficiency and/or reduce agricultural drainage.

In recent years, the District has seen conversion from apricots and other traditionally surface irrigated crops to more permanent crops such as almonds and walnuts. These new permanent crop plantings are almost exclusively implementing drip, micro or sprinkler irrigated systems.

As part of the Northside Reservoir project, the District funded construction of a two-stage tailwater collection reservoir, return pump station, and pipeline which services approximately 550 acres. This system conveys tailwater into a sedimentation pond to settle out silt, then return the system back to the top of the field where it is blended with irrigation water. This project was constructed to conserve water by reducing tailwater flow into local tributary streams, and to compare operations and maintenance/benefit costs between local grower-based tail-water return systems, and more regional drainage solutions such as the District's Northside Reservoir Project. This landowner based project cost approximately $138,000 and is estimated to save approximately 400 acre-feet per year.

The Districts irrigation evaluation program is also used as a tool to help water users better manages their water; thereby providing financial incentive for improved on-farm management. This program is provided on an on-demand basis.

In 1993, the District notified their water users of the availability of a low interest loan program under the State of California's water conservation loan program. Notification was by direct mailing and by public notice published in the Patterson Irrigator. The loan money was to be used to purchase irrigation equipment to improve on-farm irrigation efficiency. There was interest from 25 water users in purchasing around $700,000 worth of equipment to alter irrigation techniques on around 1,000 acres of land. The project with the most favorable return on investment was installation of solid set under tree sprinklers in orchards to replace border and furrow irrigation. Gated pipe did not show enough water savings to justify the investment, and the useful lives of drip systems were not long enough to justify the loan. When the interested parties were advised that under the state program they would have no control over who would be installing the systems on their farms, interest in the program was lost.

4. Incentive pricing

Structure of incentive pricing	*Related goal*

Adopted in 2010, the District charged a minimum of $60 per acre for which the customer is entitled to 2 acre-feet or less of water per acre. Annual assessments for purchase of irrigation water are paid in two equal installments due on March 31st and June 30th. All water usage is billed volumetrically. The charges for the volume of water used above the 2 acre-feet are billed monthly. In 2010, this second Tier rate was also $30/acre foot. In the Districts experience, this pricing structure encourages conservation and to a degree - deficit irrigation. Landowners do not like additional bills for Tier II Water and a majority of the water users track use to avoid and/or minimize Tier II use and subsequent billing. This pricing structure encourages farming with 2 ac-ft/acre of water in many cases.

Depending on the year and hydrology, the Board may reduce the amount of water allocated each year with the District assessment. Especially during years of drought, this provides a greater incentive to conserve water as less water is made available to growers through the first allocation, causing Tier II water costs to be much greater than usual for growers.

The District has adopted a Tiered-Water Pricing structure. The policy adopted by the District Board is as follows:

When 80% of the annual 16,500 Ac-ft contractual CVP allotment has been utilized in the District, cost per acre-foot will increase an additional $1/Ac-ft. When 90% of the annual 16,500 Ac-ft contractual CVP allotment has been utilized, cost per acre-foot will increase another additional $1/Ac-ft.

5. a) Line or pipe ditches and canals

Canal/Lateral (Reach)	*Type of Improvement*	*Number of Miles in Reach*	*Estimated Seepage (AF/Y)*	*Accomplished/ Planned Date*
Main Canal Lift 5	Expansion/Lining	3,500 feet		April 2010
Pipeline Extension of Main Canal Lateral 5 to DMC	Expansion/Piping	11,500 feet	0 (Nominal, Rubber Gasketed PVC Pipe)	April 2010

The piping and lining noted above were part of the District's 2008 Pipeline Project, which involved expansion and lining of an existing canal from a lateral into the main canal stem, as well as construction of a pump station and pipeline to convey water from the District's Main Canal to the DMC.

The District is in such close proximity to its Main Source, the San Joaquin River, and also pumps groundwater on an as needed basis, the District considers its water management practices to be consistent with a conjunctive use-type district. As such the District has focused its efforts on improving delivery efficiency and pumping efficiency by recycling surface drainage as opposed to preventing seepage, which makes its way into the aquifer from which the District pumps and also as groundwater seepage into the San Joaquin River.

b) Construct regulatory reservoirs

Reservoir Name	*Annual Spill in Section (AF/Y)*	*Estimated Spill Recovery (AF/Y)*	*Accomplished/ Planned Date*
Northside Reservoir	2,600	2,400	Construction Completed in 2008
Marshall Reservoir	2,800	2,000	July 2003
Two-Drains Reservoir	5,000	3,000	July 2015

Please see descriptions of Marshall and Northside Reservoirs in other sections of this plan.

6. Increase flexibility in water ordering by, and delivery to, water users
See Attachment G, contractor 'agricultural water order' form

Also see Comments under Section B.9.

7. Construct and operate district spill and tailwater recovery systems

Distribution System Lateral[1]	*Annual Spill (AF/Y)*	*Quantity Recovered and reused (AF/Y)*
"M" Lateral[1]	320	300
Lateral 4-North[1]	330	300
Lateral 3-North[1]	650	600
Lateral 2-North[1]	650	600
Lateral 1-North[1]	650	600
Lateral 5-South[2]	650	650
Lateral 4-South[2]	680	680
Lateral 3-South[2]	680	680
Total	4,610	4,410

Notes:
1. All recovered and reused operational spill/tailwater resulting from the Northside Reservoir Project.
2. All recovered and reused operational spill/tailwater resulting from the Marshall Reservoir.

Drainage System Lateral	*Annual Drainage Outflow (AF/Y)*	*Quantity Recovered and reused (AF/Y)*
Total		

The District generally slopes from West to East and drains toward the San Joaquin River. Most surface irrigated fields are delivered water from an upslope canal normally to the west and drain into a down slope canal normally to the east either by gravity drain or pumped drain. This surface drain water enters the lateral below and is mixed with other source and drain water in the delivery lateral. This water then makes its way downstream and is either delivered to another customer or makes its way to the end of the lateral and becomes operational spill. Most of the District's canals are small with minimal storage capabilities so efficient recycling of surface drain water is difficult. As a result of the comingling of surface deliveries and drainage, it is difficult to assess how many acres and how much associated

tailwater is currently lost. Project such as the Northside Reservoir Project and Marshall Reservoir allow the District to measure and document how much water operational spill/tailwater could be recovered in aggregate, instead of assessing or estimating tailwater losses or recovery.

The Northside Reservoir Project incorporated a reservoir and interceptor lines with pumping stations to collect drain water from the northern District laterals and deliver it within the district to customers, virtually eliminating operational spill. Magnetic flow meters and automated canal structures allow PID to accurately meter deliveries from Fruit Avenue to the end of the system, nearly eliminating spills here. The District has the ability to compare actual deliveries with what was metered into the delivery laterals past the reservoir and closely estimate the outflow from that portion of the system.

8. Plan to measure outflow.

Total # of outflow (surface) locations/points 7
Total # of outflow (subsurface) locations/points 0
Total # of measured outflow points _____
Percentage of total outflow (volume) measured during report year 50%

Identify locations, prioritize, determine best measurement method/cost, submit funding proposal

Location & Priority	*Estimated cost (in $1,000s)*				
	2009	*2010*	*2011*	*2012*	*2013*
Lateral 4-North at Del Puerto Creek (Low)					
Lateral 3-North at Del Puerto Creek (Low)					
Lateral 2-North at Del Puerto Creek (Low)					
Lateral M at Del Puerto Creek (Low)					
Apricot Avenue (Medium)				10	
Almond Avenue (Medium)					10
Marshall Road Drain (Low)					

Marshall Road Drain is currently under observation for flow and water quality measurement through the Westside San Joaquin Valley Coalition

9. Optimize conjunctive use of surface and ground water

The District relies on its surface supplies and only resorts to groundwater supplies when there is a need such as facility or distribution system constraints such as lack of pumping capacity due to down pump units, low-river, and/or distribution system bottlenecks.

10. Automate canal structures

The District has over the years reported on its main canal automation program and the completion of the Marshall Road Reservoir Project. The District has also automated wells for remote operation and installed long-crested weirs in key locations. Completion of the Northside Reservoir project facilities included construction of automated canal structures for flow control from Fruit Avenue downstream on Laterals 1-North, 2-North, 3-North, 4-North, and M Lateral. This allows PID to operate the end of these laterals like new canal segments, turning accurate flow into these canals to meet grower demands at the end of the system, and limiting operational spill into the downstream Del Puerto Creek.

Also, PID completed construction of the 2008 Pipeline Project in 2010 which included construction of 3,500 feet of expanded and concrete-lined main canal for the fifth pool, five new and efficient VFD driven pumps, 11,500 feet of 36-inch PVC pipeline, and installation of two automated flow control structures at the headworks of Laterals 5-South and M-Lateral. These automated flow control structures utilize orifice flow equations, level transducers, and SCADA for remote control and operation to achieve accurate flow deliveries to downstream growers. Additionally, automation and control on four of the five pump stations and lifts on the District's main canal were calibrated and improved to incorporate a new 35 cfs pump station, and five new pumps operating with a variable frequency drive. This project cost approximately $3.9M, with approximately $92,800 invested in flow measurement devices.

The District will also complete construction of the Fish Screen Intake Project in 2010, an approximately $13.8 M effort to construct a replacement diversion facility on the San Joaquin River, complete with a National Marine Fisheries Service and California Department of Fish and Game approved fish screen to prevent entrainment and impingement of migrating salmon and steelhead in the San Joaquin River. This facility will include a sediment suspension system, fish screen brush cleaner, and Cathodic protection, and pumping systems that will be completely automated. The pumping system will utilize algorithms, similar to the other main canal pumping plants, to achieve level control in the first reach of the main canal.

11. Facilitate or promote water customer pump testing and evaluation
See Attachment F, Notices of District Education Programs and Services Available to Customers

In 2008, when the threat of drought was apparent, the District developed a Landowner Groundwater Plan which involved groundwater well testing for private well owners, a determination of costs to run these wells, and payment of a fee to these the well owners if supplies were needed to augment District supply. These wells tests were subsidized by the District. The District will continue to update policies for this program on a regular basis to prepare for the possibility of drought.

In addition, the District will continue to provide information available to growers regarding pump efficiency testing available through university sponsored programs, or individuals locally who specialize in pump testing through its newsletter. The Patterson Irrigation District's electrical service provider is Turlock Irrigation District and growers are not eligible for pump testing through Pacific Gas and Electric's program with Fresno State.

12. Mapping

GIS maps	*Estimated cost (in $1,000s)*				
	2009	*2010*	*2011*	*2012*	*2013*
Layer 1 – Distribution system			4	20	10
Layer 2 – Drainage system			4		
Suggested layers:					
Layer 3 – Ground water information					
Layer 4 – Soils map					
Layer 5 – Natural & cultural resources					
Layer 6 – Problem areas					

In 2011, The District plans on using a hand-held Trimble GIS unit to map and document all of the District's facilities, turnouts, flow measurement devices, and other notable facilities. This will be the first step toward developing a robust GIS database to store geo-spatial data. This will eventually allow the District to generate user maps, answer landowner questions, and allow District staff to create maps for projects or other routine maintenance issues.

Following the ground GIS survey, the District will be scoping and estimating efforts to develop a functional GIS database that will complement activities such as creating maps, assessing capital improvement planning efforts, water resource management, filing, and documentation efforts. One goal of the GIS database is to also incorporate or integrate this information with water accounting software and SCADA in the future.

C. Provide a 3-Year Budget for Implementing BMPs

1. Amount actually spent during current year.

BMP #		BMP Name	Actual Expenditure (not including staff time)	Staff Hours
A	1	Measurement [1]	$9,400	320
	2	Conservation staff	$24,600	570
	3	On-farm evaluation /water delivery info	$1,000	15
		Irrigation Scheduling	$1,000	24
		Water quality	$500	10
		Agricultural Education Program	$42,000	40
	4	Quantity pricing	$0	40
	5	Policy changes	$0	30
	6	Contractor's pumps	$1,750	40
B	1	Alternative land use	$4,000	40
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$0	8
	4	Incentive pricing	$4,500	40
	5	Line or pipe canals/install reservoirs [1]	$3,900,000	4,000
	6	Increase delivery flexibility [1]	$0	0
	7	District spill/tailwater recovery systems	$8,600	10
	8	Measure outflow	$0	10
	9	Optimize conjunctive use	$15,000	25
	10	Automate canal structures [1]	$0	0
	11	Customer pump testing	$0	0
	12	Mapping	$0	20
		Total	$4,012,350	5,242

Notes

1. Flow measurement devices, lining or piping canals, and increased delivery flexibility and canal structure automation were all part of the 2008 Pipeline Project, and costs are incorporated under item B.5. Line or pipe canals/install reservoirs.

2. Projected budget summary for the next year.

BMP #		BMP Name	Budget (not including staff time)	Staff Hours
A	1	Measurement	$210,000	1600
	2	Conservation staff	$40,000	600
	3	On-farm evaluation /water delivery info	$1,000	15
		Irrigation Scheduling	$1,000	24
		Water quality	$500	10
		Agricultural Education Program	$50,000	40
	4	Quantity pricing	$0	40
	5	Policy changes	$0	30
	6	Contractor's pumps	$80,000	153
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements [1]	$30,000	320
	4	Incentive pricing	$5,000	50
	5	Line or pipe canals/install reservoirs	$0	0
	6	Increase delivery flexibility	$0	0
	7	District spill/tailwater recovery systems[2]	$750,000	800
	8	Measure outflow	$10,000	50
	9	Optimize conjunctive use	$7,500	25
	10	Automate canal structures	$0	0
	11	Customer pump testing	$0	0
	12	Mapping	$8,000	600
		Total	$1,193,000	4,357

Notes
1. On-farm improvement project to pipe sublateral 3N-27.
2. Construction of Two-Drains tailwater recovery project.

3. Projected budget summary for 3rd year.

BMP #		BMP Name	Budget (not including staff time)	Staff Hours
A	1	Measurement	$210,000	1600
	2	Conservation staff	$40,000	600
	3	On-farm evaluation /water delivery info	$1,000	15
		Irrigation Scheduling	$1,000	24
		Water quality	$500	10
		Agricultural Education Program	$50,000	40
	4	Quantity pricing	$0	40
	5	Policy changes	$0	30
	6	Contractor's pumps	$80,000	153
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$0	20
	4	Incentive pricing	$5,000	50
	5	Line or pipe canals/install reservoirs	$0	0
	6	Increase delivery flexibility	$0	0
	7	District spill/tailwater recovery systems(1)	$750,000	800
	8	Measure outflow	$10,000	50
	9	Optimize conjunctive use	$7,500	25
	10	Automate canal structures	$0	0
	11	Customer pump testing	$0	0
	12	Mapping	$8,000	600
		Total	$1,163,000	4,057

Notes

1. Construction of Two-Drains tailwater recovery project.

Table 1

Surface Water Supply

2010 Month	Federal Ag Water (acre-feet)	Federal non-Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	Other Water () (acre-feet)	Upslope Drain Water (acre-feet)	Total (acre-feet)
Method	M1	M1		M1			
January	0	0	0	0	0	0	0
February	420	0	0	0	0	0	420
March	0	0	0	0	0	0	0
April	0	0	0	660	0	0	660
May	269	0	0	5,957	0	0	6,226
June	532	0	0	7,096	0	0	7,628
July	359	0	0	8,504	0	0	8,863
August	25	0	0	6,895	0	0	6,920
September	16	0	0	5,216	0	0	5,232
October	780	0	0	0	0	0	780
November	40	0	0	0	0	0	40
December	0	0	0	0	0	0	0
TOTAL	2,441	0	0	34,327	0	0	36,768

Table 2

Ground Water Supply

2010 Month	**District Groundwater** (acre-feet)	**Private Groundwater** *(acre-feet)
Method	M1	E3
January	0	0
February	0	0
March	140	10
April	112	40
May	223	380
June	713	700
July	1,025	800
August	1,285	750
September	340	400
October	624	70
November	578	0
December	0	0
TOTAL	5,040	3,150

*normally estimated

Table 3

Total Water Supply

2010 Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Recycled M&I Wastewater (acre-feet)	Total District Water Supply (acre-feet)
Method				
January	0	0	0	0
February	420	0	0	420
March	0	140	0	140
April	660	112	0	772
May	6,226	223	0	6,449
June	7,628	713	0	8,341
July	8,863	1,025	0	9,888
August	6,920	1,285	0	8,205
September	5,232	340	0	5,572
October	780	624	0	1,404
November	40	578	0	618
December	0	0	0	0
TOTAL	36,768	5,040	0	41,809

*Recycled M&I Wastewater is treated urban wastewater that is used for agriculture.

Table 4

Distribution System

2010

Canal, Pipeline, Lateral, Reservoir	**Length** (feet)	**Width** (feet)	**Surface Area** (square feet)	**Precipitation** (acre-feet)	**Evaporation** (acre-feet)	**Spillage** (acre-feet)	**Seepage** (acre-feet)	**Total** (acre-feet)
Canal-Lined	22,400	20	448,000	11	40	100	62	(190)
Lateral-Line	205,920	11	2,265,120	57	200	941	311	(1,395)
Lateral-Earth	21,120	11	232,320	6	20	96	565	(677)
Lateral-Old Lining	47,520	11	522,720	13	46	217	180	(430)
Northside Reservoir	699	699	487,902	12	43	0	123	(154)
Marshall Reservoir	1,540	385	592,900	15	52	0	150	(187)
Sub-Earth	52,800	6	316,800	8	28	100	771	(891)
Sub-Lined	443,520	0	0	0	0	100	0	(100)
Spills	0	0	0	0	0		0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL			4,865,762	121	429	1,554	2,162	3,409

Table 5

Crop Water Needs

2010 Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requirement (AF/Ac)	Cultural Practices (AF/Ac)	Effective Precipitation (AF/Ac)	Appl. Crop Water Use (acre-feet)
Alfalfa hay	3,511	4.27	0.56	0.00	0.59	14,871
Corn	2,067	2.21	0.35	0.00	0.00	5,296
Oats/Wheat	1,856	1.34	0.14	0.00	1.09	720
Beans	1,531	1.38	0.43	0.00	0.00	2,777
Almonds	1,220	3.62	0.64	0.00	0.59	4,483
Tomatoes	982	2.52	0.25	0.00	0.00	2,722
Walnuts	911	3.63	0.64	0.00	0.59	3,352
Other	2,198	2.84	0.31	0.00	0.59	5,637
Crop Acres	14,276					39,857

Total Irrig. Acres 10,941 (If this number is larger than your known total, it may be due to double cropping)

Notes:

1. Crop Evapotranspiration estimated using crop coefficients from ITRC, Cal Poly, San Luis Obispo, CA developed for the local region, multiplied by the actual annual ET_o for CIMIS.
2. 2. Leaching Requirement = $EC_w/(5EC_e-EC_w)$, where EC_w is EC of irrigation water and EC_e is EC of saturated soil extract. The Threshold values of EC_e for various crops were obtained from Tanji, K. Kenneth, 1990, Agricultural Salinity Assessment a& Management, American Society of Civil Engineers, Manuals and Reports on Engineering Practices, No. 7 pp. 271-285.
3. Estimated using actual rainfall as measured by local CIMIS station in Patterson, CA for 2010.
4. Numerous acres of double-cropping for oats and wheat occurred in 2010. Only a minimal amount of this was irrigated though, with the remaining crop ET met by precipitation.

Table 6

2010 District Water Inventory

Water Supply	Table 3		41,809
Riparian ET	(Distribution and Drain)	minus	0
Groundwater recharge	(intentional - ponds, injection)	minus	0
Seepage	Table 4	minus	2,162
Evaporation - Precipitation	Table 4	minus	308
Spillage	Table 4	minus	1,554
Transfers/exchanges/trades/wheeling	(into or out of the district)	plus/minus	0
Non-Agri deliveries	(delivered to non-ag customers)	minus	0
Water Available for sale to agricultural customers			37,785
Compare the above line with the next line to help find data gaps			
2005 Actual Agricultural Water Sales		From District Sales Records	34,217
Private Groundwater	Table 2	plus	3,150
Crop Water Needs	Table 5	minus	39,857
Drainwater outflow	(tail and tile not recycled)	minus	
Percolation from Agricultural Land	(calculated)		(2,490)

Table 7

Influence on Groundwater and Saline Sink

2010

Agric Land Deep Perc + Seepage + Recharge - Groundwater Pumping = District Influence on Groundwater Storage	(2,878)
Estimated actual change in ground water storage, including natural recharge)	0
Irrigated Acres (from Table 5)	14,276
Irrigated acres over a perched water table	0
Irrigated acres draining to a saline sink	0
Portion of percolation from agri seeping to a perched water table	0
Portion of percolation from agri seeping to a saline sink	0
Portion of On-Farm Drain water flowing to a perched water table/saline sink	0
Portion of Dist. Sys. seep/leaks/spills to perched water table/saline sink	0
Total (AF) flowing to a perched water table and saline sink	0

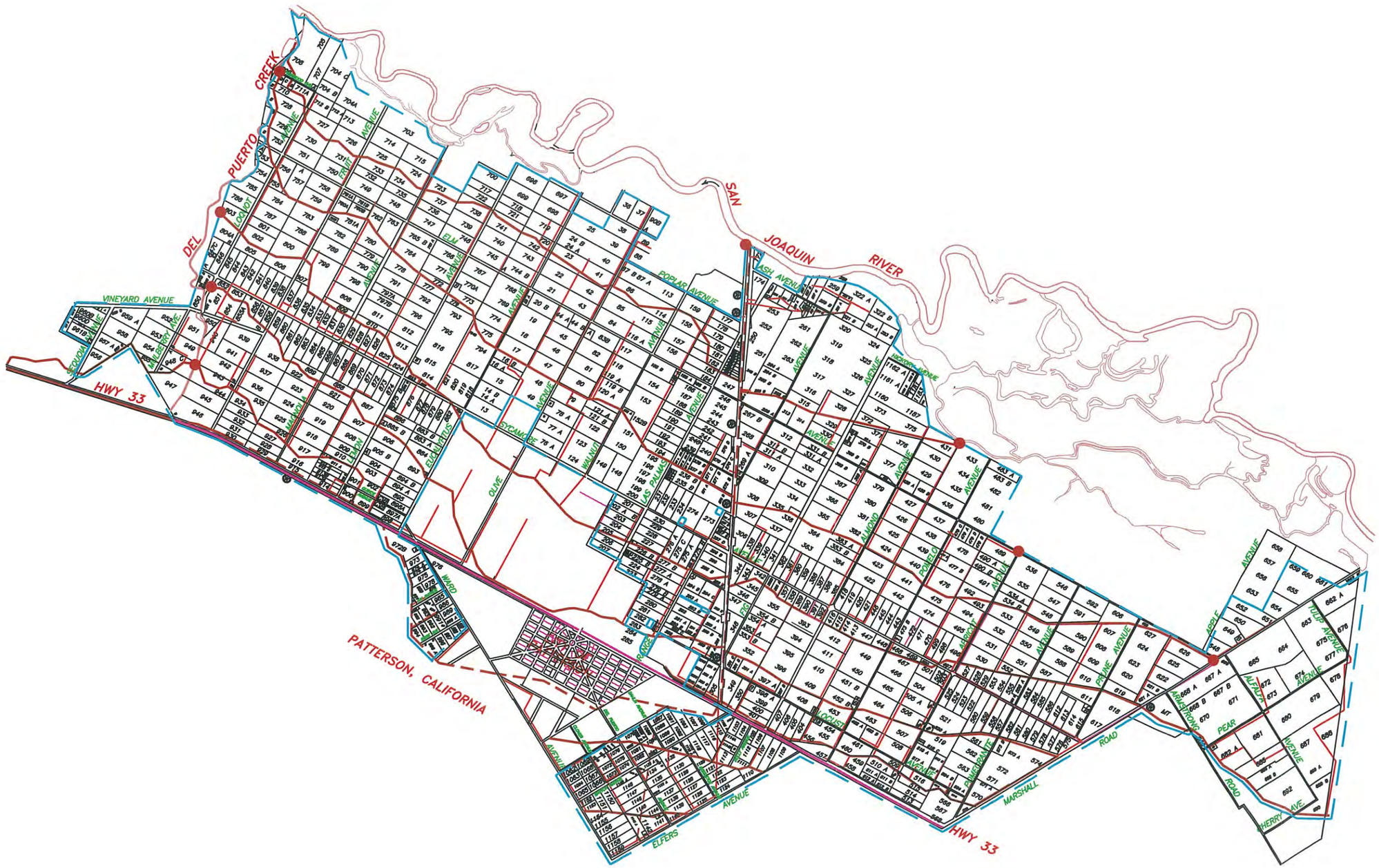
Table 8

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Ag Water (acre-feet)	Federal non-Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	Other Water (Replacement Water Rights) (acre-feet)	Upslope Drain Water (acre-feet)	Total (acre-feet)
2001	6,368	0	0	45,831	0	0	52,199
2002	6,000	0	0	45,931	0	0	51,931
2003	6,000	0	0	38,051	0	0	44,051
2004	6,000	0	0	38,754	0	0	44,754
2005	6,098	0	0	34,685	0	0	40,783
2006	6,027	0	0	32,668	0	0	38,695
2007	4,804	0	0	44,118	0	0	48,922
2008	5,225	0	0	38,729	0	0	43,954
2009	5,444	0	0	43,427	0	0	48,871
2010	2,441	0	0	34,327	0	0	36,768
Total	54,407	0	0	396,521	0	0	450,928
Average	5,441	0	0	39,652	0	0	45,093

ATTACHMENT A

DISTRICT FACILITIES MAP



ATTACHMENT A
Patterson Irrigation District

FACILITIES MAP

LEGEND

- DISTRICT BOUNDARY
- MAIN CANAL
- LATERALS
- SUB-LATERALS
- DISTRICT WELLS
- OUTFLOW POINTS

SCALE:
1-INCH=4,000 FEET

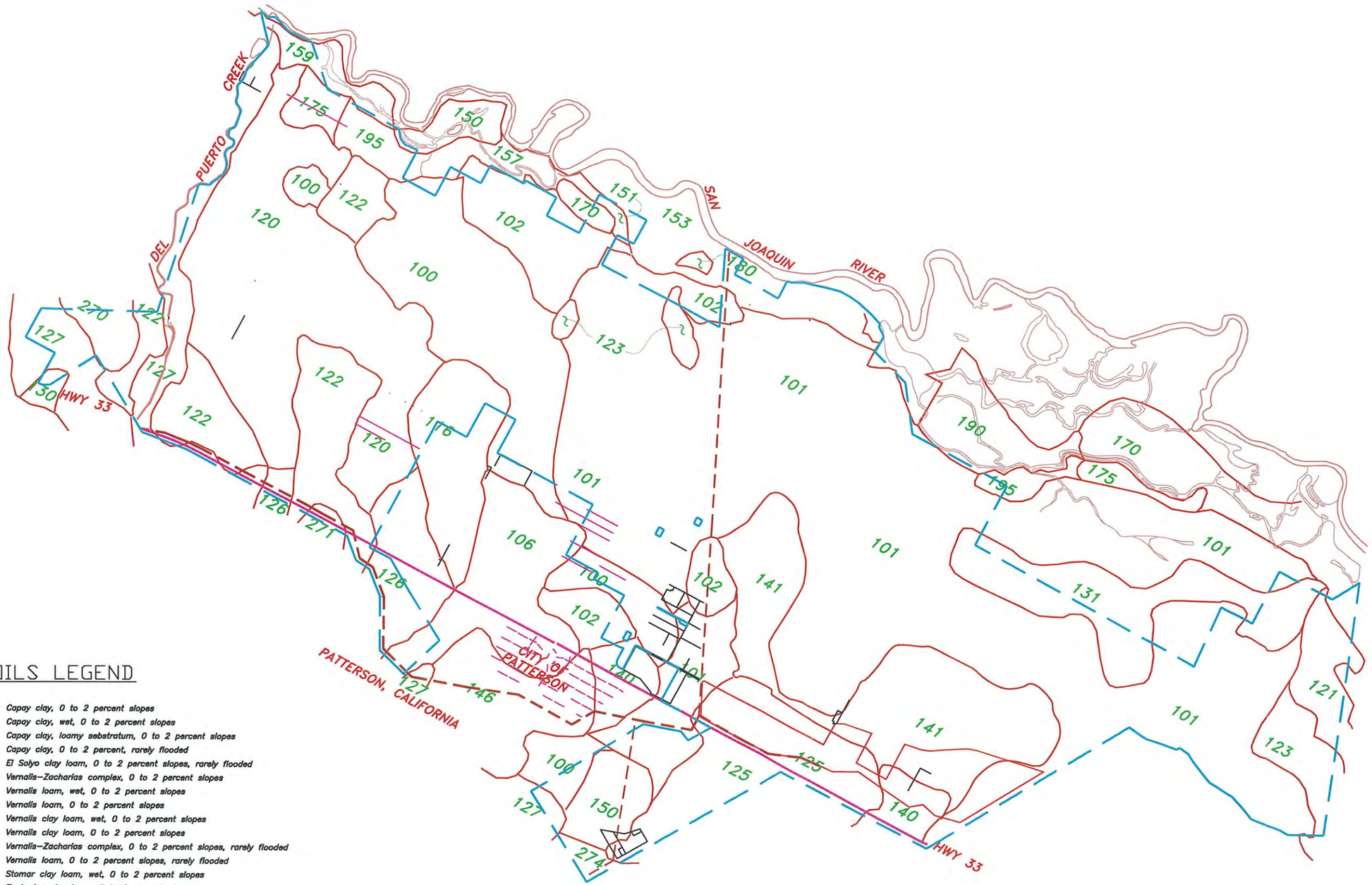
PATTERSON IRRIGATION DISTRICT 1910

ATTACHMENT B

DISTRICT SOILS MAP

ATTACHMENT B
Patterson
Irrigation District

SOILS MAP



LEGEND

- DISTRICT BOUNDARY
- MAIN CANAL
- LATERALS
- LINES OF SOIL DIVISION

SOILS LEGEND

100 Capay clay, 0 to 2 percent slopes
101 Capay clay, wet, 0 to 2 percent slopes
102 Capay clay, loamy sebstratum, 0 to 2 percent slopes
106 Capay clay, 0 to 2 percent, rarely flooded
116 El Solyo clay loam, 0 to 2 percent slopes, rarely flooded
120 Vernalis–Zacharias complex, 0 to 2 percent slopes
121 Vernalis loam, wet, 0 to 2 percent slopes
122 Vernalis loam, 0 to 2 percent slopes
123 Vernalis clay loam, wet, 0 to 2 percent slopes
125 Vernalis clay loam, 0 to 2 percent slopes
126 Vernalis–Zacharias complex, 0 to 2 percent slopes, rarely flooded
127 Vernalis loam, 0 to 2 percent slopes, rarely flooded
131 Stomar clay loam, wet, 0 to 2 percent slopes
140 Zacharias clay loam, 0 to 2 percent slopes
141 Zacharias clay loam, wet, 0 to 2 percent slopes
150 Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded
157 Columbia complex, partially drained, 0 to 2 percent slopes, rarely flooded
159 Columbia complex, partially drained, 0 to 2 percent slopes, frequently flooded
170 Dospalos–Bolfar complex, partially drained, 0 to 2 percent slopes, occasionally flooded
180 Dello fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequintly flooded
190 Clear Lake clay, partially drained, 0 to 2 percent slopes, occasionally flooded
195 Clear Lake clay, partially drained, 0 to 2 percent slopes, rarely flooded
270 Salado fine sandy loam, 0 to 2 percent slopes, rarely flooded
271 Salado loam, 0 to 2 percent slopes, rarely flooded
274 Salado loam, 0 to 2 percent slopes

SCALE:
1–INCH=4,000 FEET

PATTERSON IRRIGATION DISTRICT 1910

ATTACHMENT C

DISTRICT RULES AND REGULATIONS

Rules For the Distribution and Use of Water Within the Patterson Irrigation District

Preamble

1 Definitions
2 Facilities
3 Operation of Irrigation System Facilities
4 Duties of Irrigator
5 Distribution System Operator Duties
6 Delivery of Irrigation Water
7 Drainage to District Facilities
8 Water Quality
9 Irrigation Regulations
10 Enforcement of Irrigation Rules and Regulations

REVISED AND ADOPTED BY THE BOARD OF DIRECTORS SEPTEMBER 25, 2003.

RULES FOR THE DISTRIBUTION AND USE OF WATER WITHIN THE PATTERSON IRRIGATION DISTRICT

PREAMBLE

These rules are established pursuant to Water Code Section 22257 to ensure the orderly, efficient, and equitable distribution, use and conservation of the water resources of the District. The District will endeavor to deliver irrigation water in a flexible, timely manner consistent with the physical, operational and safety limits of the delivery system facilities.

Section 1: Definitions

As used herein, the following words, whether or not initially capitalized, shall have the following meanings:

1.1 "Board" means the Board of Directors of the District.

1.2 "Conduits" includes canals, laterals, ditches, drains, pipes, measurement,

control and monitoring devices, and all related operational facilities.

1.3 "Distribution System Operator" means those employees of the District responsible for the daily operation of the district facilities; otherwise referred to as ditchtenders.

1.4 "District" means the PATTERSON IRRIGATION DISTRICT functioning under Irrigation District Laws of the California Water Code.

1.5 "District Conduits" mean conduit owned or leased by the District.

1.6 "District Facilities" includes dams, structures, wells, conduits, pumps, motors, pumping plants, reservoirs, and all other facilities of the District.

1.7 "District Office" means the main office of the District currently located at 948 Orange Avenue, Patterson, Ca.

1.8 "Irrigable" means all parcels that irrigate and all those parcels with or without on farm irrigation facilities that could be irrigated by either District supplies or from private wells.

1.9 "Distribution System Supervisor" means the Distribution System Supervisor and/or his/her authorized representative.

1.10 "Irrigator" means the landowner or tenant of a parcel of land who has the primary responsibility for irrigating the parcel. The term includes the irrigator's officers, employees and agents.

1.11 "Landowner" means holder of title or evidence of title to land.

1.12 "Manager" means the General Manager of the District.

1.13 "Pollutant" means any foreign or deleterious substance or material including, but not limited to, garbage, rubbish, refuse, animal carcasses, matter from any barnyard, stable, dairy or hog pen, herbicides, pesticides, or any other material which is offensive to the senses or injurious to health, or which pollutes or degrades the quality of the receiving water as defined by federal, state or local law.

1.14 "Assessment" means a charge for facilities, maintenance and operations, etc., assessed against all parcels that irrigate and those parcels within District boundaries that are irrigable.

1.15 "Tenant" means a person or entity who leases, rents, or sharecrops land from a landowner.

1.16 "Vehicle" means any motor vehicle, self propelled vehicle, motorcycle, motorized bicycle, or all terrain vehicle.

1.17 "Tier I Water" means the base quantity of water which is set annually by

the Board of Directors for each acre of land within the District which can receive District water from District facilities directly or from private facilities which comply with these rules.

1.18 "Additional Tiered Water" means the quantity of water above the Tier I Water which is made available to each acre of land within the District that can receive District water, and billed separately by volume on a monthly basis.

1.19 The masculine, feminine, or neuter gender and the singular or plural number shall each include the others whenever the context so indicates.

Section 2: Facilities

2.1 CONTROL OF THE SYSTEM:

District facilities are under the exclusive control and management of the Board of Directors and its authorized agents, the General Manager and the Distribution System Supervisor and no other persons shall have any right to operate or interfere with said system in any manner.

2.2 ACCESS TO LANDS:

Every District director, employee, or authorized agent or representative shall have free access at all times (including weekends and holidays) to enter any land irrigated with District water for any of the following purposes: (1) inspecting District, or private irrigation facilities, the flow of water within the facilities (including measurement), and the use of water on the land; (2) determining the acreage of crops irrigated or to be irrigated; and (3) maintaining, constructing, demolishing, altering, improving, verifying, surveying or operating District facilities.

2.3 ENCROACHMENTS:

2.3.1 No trees, vines, shrubs, corrals, fences, or any other type of encroachment shall be planted, or placed in, on, over, or across any District conduit or any District right-of-way unless the District has given specific written approval for such encroachment.

2.3.2 Any unauthorized encroachment may be removed by the District at the expense of the encroacher.

2.3.3 Encroachments on an improvement District right-of-way that interferes with the operation or maintenance of that facility may be removed by the District at the expense of the encroacher.

2.4 CONSTRUCTION OF IRRIGATION FACILITIES:

2.4.1 No diverting gates, weirs, structures, or pump intakes shall be constructed or placed in any District conduit until an application in writing has

been made to the Board of Directors and permission granted therefore.

2.4.2 All such permitted gates, weirs, structures, or pump intakes shall be at the irrigator's expense, built to current District Construction and Engineering Design Standards as adopted by the Board, and shall become the property of the District upon completion.

2.5 CONSTRUCTION OF NON-IRRIGATION FACILITIES:

2.5.1 No improvements such as buildings, bridges, gates, cross canal pipes, or facilities, etc., shall be constructed or placed in, on, over or across any District conduit until an application for a Revocable License Agreement or Encroachment Permit has been made to the District and Board authorization is granted therefore. The applicant does not acquire any rights in the District's right-of-way other than those set forth in the Revocable License Agreement or Encroachment Permit.

2.5.2 All such permitted bridges, gates, or other cross canal facilities shall be constructed, erected, installed, and maintained at the irrigator's expense and built to District Construction and Engineering Design Standards.

Section 3: Operation of Irrigation System Facilities

3.1 LIMITS OF LIABILITY:

3.1.1 The District will not be liable for damage of any kind or nature resulting directly or indirectly from any private ditch or conduit or the water flowing therein, or for negligent, wasteful, or other use or handling of water by the users thereof.

3.1.2 The District's responsibility shall absolutely cease when the water leaves the sidegate from a District conduit onto the irrigator's land or into a private conduit or improvement District facility.

3.2 CONTROL OF GATES:

3.2.1 The District's employees have sole right and responsibility to open any sidegate from a District conduit, and they have the exclusive responsibility to close such gate. The Distribution System Operator may make arrangements with an irrigator allowing the irrigator to operate a sidegate during the period the irrigator is scheduled to receive water.

3.2.2 Any irrigator or group of irrigators may lock their sidegate(s) from the District facilities with prior written permission of the District.

3.2.3 The District may lock or require an irrigator to seal or remove, at their sole expense, a sidegate, turnout gate, or other valve where service from that facility is no longer desired, required by the irrigator, or subject to vandalism.

3.2.4 All turnouts from District facilities shall be gated or have another positive shut-off system easily accessible to the Distribution System Operator

within the District right-of-way.

3.3 USE OF CANAL BANK ROADS:

3.3.1 Use of District canal bank roads and rights-of-way is at the sole risk of the user.

3.3.2 No person shall drive any vehicle upon any District canal bank road or right-of-way unless such person has received permission from the District to drive upon such road or right-of-way.

3.3.3 The following persons have permission to drive a vehicle upon a District canal bank road or right-of-way:

3.3.3.1 Any District director, officer, employee, or agent in the discharge of their duties.

3.3.3.2 Private parties actively involved with farming a parcel of land adjacent to the specific District canal bank road or right-of-way, or which require the use of a specific District canal bank road or right-of-way for access to irrigation facilities serving that parcel of land.

3.3.3.3 Any sheriff, police, fire, or public safety personnel on official business.

3.3.3.4 Any District contractor who needs to use a specific District canal bank road or right-of-way to perform work under their contract with the District.

3.3.4 The General Manager is authorized to adopt regulations setting forth the procedure for other persons to obtain permission to drive a vehicle on specific District canal bank roads or rights-of-way.

3.4 INTERFERENCE WITH DISTRICT FACILITIES:

3.4.1 Any interference with or damage to any District or improvement District facility, or the banks of any District or improvement District conduit is prohibited.

3.4.2 Except for authorized District employees, agents and representatives, and persons authorized under these rules, no person shall be permitted to do any of the following:

3.4.2.1 To attach or place any boards, ropes, or any other object to, on or upon any District or improvement District facility;

3.4.2.2 To place or remove a weir board in a weir or drop;

3.4.2.3 To be on any counter weight, cable, or any parts of an automatic gate;

3.4.2.4 To remove any chain, board, post, or gate placed on or across any

canal bank road of the District.

3.4.3 Any interference with or damage to District facilities by pedestrians, livestock, vehicles, parking of vehicles, or obstructions placed thereon is forbidden. Costs for repair of damages to District facilities shall be borne by the party causing said damage or obstruction.

3.5 PUBLIC USE OF CONDUITS:

District conduits shall be used solely for the authorized purposes of the District, including conveying irrigation water for use on land and for conveying drainage water away from the land. The use of District conduits for any other purpose shall be at the sole risk of the user.

3.6 PUMPING FROM CONDUITS:

3.6.1 All landowners or irrigators who pump from District conduits for the purpose of irrigating lands shall be governed in all respects by the rules and regulations applicable to landowners under gravity service, except system design flows.

3.6.2 The District shall not be responsible for any trash or debris that may flow or accumulate in the water, or for any interference with or decrease in the operation or capacity of any private pump installations or pipelines.

3.6.3 All landowners or irrigators who pump from District conduits for the purpose of irrigating lands shall be required to install District approved flow meters and maintain them to ensure proper operating conditions at all times.

3.6.4 Pumping directly from open conduits is prohibited.

3.7 DISTRICT DRAINAGE WELLS AND PUMPS:

3.7.1 The water pumped from any District well shall be subject to all the rules and regulations governing the use of gravity water.

3.7.2 During the non-irrigation season, District pumps are to be operated only with prior authorization of the District.

Section 4: Duties of Irrigator

4.1 IRRIGATOR RESPONSIBILITIES:

4.1.1 When water is made available to an irrigator by the District's Distribution System Operator, the irrigator must have a responsible person present, and the land to be irrigated must be properly prepared to efficiently take the water.

4.1.2 From the time delivery of water is commenced to the completion of

irrigation, the irrigator shall, day and night, attend and control the water.

4.1.3 When water is delivered to the irrigator, the irrigator shall be responsible for the water at all times after it leaves the District conduit.

4.1.4 The irrigator is responsible and liable for any damage caused by the irrigator's negligence or careless use of water, or the result of failure of the irrigator to properly operate or maintain any ditch, pipeline, or other facility for which the irrigator is wholly or partially responsible.

4.1.5 It is the irrigator's responsibility to close all of the irrigator's private valves at the end of each irrigation.

4.1.6 It is the irrigator's responsibility to clear the common facilities by opening stopgates and closing sidegates, unless directed otherwise by rules of that distribution system.

4.1.7 It is also the irrigators responsibility to call their Distribution System Operator immediately after the irrigation to report irrigation times on and off. Irrigation time may be estimated by the Distribution System Operator, if the irrigator does not call in a timely manner.

4.2 WASTE OF WATER:

4.2.1 All water must be applied efficiently and used in a reasonable and beneficial manner.

4.2.2 Any irrigator who wastes water on roads, vacant land, or land previously irrigated, either willfully, carelessly, or on account of defective or inadequate conduits or facilities, or inadequately prepared land, or who floods a portion of the land to an unreasonable depth or amount in order to irrigate other portions, or floods across one parcel to irrigate another parcel, may be refused District water until such conditions are remedied.

4.3 MAINTENANCE OF FACILITIES:

4.3.1 All private or improvement District conduits must be kept free from weeds and other obstructions, be of sufficient capacity, and be properly constructed and maintained to carry the flow of water applied for, without the danger of breaks, overflow, or undue seepage.

4.3.2 The District may shut off the delivery of water to any private or improvement District facility not meeting the above requirements and require them to be cleaned, repaired, or reconstructed before water is turned into them.

4.4 CAPACITY OF PRIVATE OR IMPROVEMENT DISTRICT FACILITIES:

4.4.1 All new private or improvement District facilities for irrigation purposes shall provide for a gravity flow of not less than five (5) cubic feet per second. A variance from this minimum flow size shall be evaluated by the General

Manager on a case-by-case basis considering the impacts on the operation of the delivery system.

4.4.2 The irrigator will be required to install and operate lift pumps to receive water where the District is unable to deliver gravity water.

4.4.3 The location and tie-in of gravity or pump facilities to District facilities must meet District Construction and Engineering Design Standards and be approved of in writing by the District.

Section 5: Distribution System Operator Duties

5.1 MEASUREMENT OF WATER:

All measurements of water delivered by the District to irrigators shall be made by the District at the District sidegate. The District shall maintain records of the names of each irrigator, the parcel that each irrigator has irrigated, the number of acre feet of water used by each parcel, and other such irrigation and operations information as required by the General Manager.

5.2 INFORMATION TO WATER USERS:

The Distribution System Operator will provide a service to water users by informing and advising each irrigator of the anticipated time of water delivery to his parcel of land and the persons water is to be received from and passed on to. The Distribution System Operator will confirm information on flows, sidegate operation, and any special instructions related to the delivery.

Section 6: Delivery of Irrigation Water

6.1 WATER ALLOTMENT AND CHARGES:

6.1.1 Each year the Board of Directors shall establish the quantities of water and the charges for each quantity of water, assessments and standby charges, and the beginning and ending dates for the irrigation season.

6.1.2 Pursuant to Water Code Section 22259, the Board of Directors may determine that surplus water is available and can be sold for irrigation of lands outside the District boundaries. These above normal water supplies are intermittent and should not be counted on as a firm supply to be delivered every year.

6.1.3 All water charges and other irrigation or drainage related charges shall be due and payable as stated by Board Resolution and notices in billing statements.

6.2 FAILURE TO PAY CHARGES:

6.2.1 The District may refuse to furnish water to any parcel if outstanding charges for water or services already furnished or rendered such parcel

(including any accrued interest and penalties) have not been paid in full by the Districts prescribed payment date.

6.2.2 All charges shall be made for individual parcels and are the responsibility of the recorded owners of record for each parcel even if the irrigator is only a tenant and not the landowner. All delinquent charges and assessments, together with any accrued interest and penalties, may be collected in accordance with the procedures specified in Water Code Section 25806.

6.2.3 The District may refuse to furnish water to any parcel to which the District holds title by virtue of a collector's deed, lien or on which the District has an outstanding unredeemed certificate of sale for the nonpayment of an assessment.

6.3 IRRIGATION SERVICE:

6.3.1 Irrigation water will be provided to the irrigator on the basis of an arranged demand delivery, "call system", whereby the rate of gravity water delivered, the frequency and the duration of use is requested by the irrigator.

6.3.2 The Distribution System Operator will endeavor to meet the scheduled time of delivery within the capacity and safety limitations of the District facilities while maintaining efficient and equitable water distribution between irrigators. A time limit may be applied to each delivery of water to prevent unreasonable use or waste of water. Delivery of water to parcels not in the original water order may be curtailed to meet previously scheduled deliveries.

6.3.3 To schedule an irrigation, the irrigator must place an order with the District Office. In the water order, the irrigator should give a reasonably close estimate for the length of irrigation time the water will be used for each individual parcel intended to be irrigated. The irrigator will confirm the delivery flow for each parcel with the District Office and Distribution System Operator. The Distribution System Operator, within twenty-four (24) hours of receiving the irrigation request will give the irrigator an estimate of the date when water will be available, and will later attempt to give the irrigator at least twelve (12) hours notice of any change in time of delivery. The irrigator must have his land ready to receive water when the water request is made. Water will be made available on requested specific dates, if it does not jeopardize service to another customer or operation of the canal system.

6.4 REFUSAL OF WATER BY IRRIGATOR:

6.4.1 If an irrigator fails or refuses to continuously use the entire head of water normally delivered to him, then the following shall apply:

6.4.1.1 The full amount will be charged to the irrigator;

6.4.1.2 The irrigator shall not be entitled to use the unused portion of water at any other time;

6.4.1.3 The irrigator will be required to reschedule for delivery of water;

6.4.1.4 The irrigator may not be allowed to reschedule water for a five (5) day period because of repeated refusals of previously scheduled water.

6.4.2 The District will endeavor to utilize canceled water to the benefit of other irrigators and that portion so utilized will not be charged to the irrigator described in Section 6.4.1.

6.5 INTERRUPTIONS OF SERVICE:

When a break occurs in any private or District facility necessitating an interruption of irrigation service, the irrigator whose irrigation was interrupted, shall be allowed, when service is restored, to finish irrigating before water is taken from the irrigator.

6.6 UNAUTHORIZED USE OF WATER:

6.6.1 Any person who uses the District water without the District's permission may become subject to criminal prosecution and civil liability.

6.6.2 First time use of the District's water without the District's permission shall result in an additional charge, for the water taken, at the rate set by the Board for the unauthorized use of water.

6.6.3 Subsequent taking of water without permission shall result in forfeiture of irrigation water for the remainder of the season and an additional charge, for the water taken, at the rate set by the Board for the unauthorized use of water.

6.6.4 If the District cannot make a reasonable estimation of the water taken, the average irrigation in acre-feet of the parcel irrigated without the District's permission shall be used for assessing the additional charge.

6.7 SERVICE TO PRIVATE OR IMPROVEMENT DISTRICT SYSTEMS:

Water entitlements of irrigators who utilize private or improvement District conduits shall be delivered to the head of these facilities by the Distribution System Operator. It shall be incumbent on the irrigators to control the actions of individuals taking water from private or improvement District conduits.

6.8 TRANSFER OF WATER:

6.8.1 A Landowner may transfer water from an owned or rented parcel to another parcel which the landowner owns or rents provided all of the following conditions are met:

6.8.1.1 Both parcels are entitled to receive water;

6.8.1.2 The rented parcel from which water is transferred shows on the

District records to have been rented to the same landowner or irrigator during the prior year's irrigation season;

6.8.2 All transfers must be approved by the General Manager and must be completed by September 1st.

6.8.3 The landowner may request that the District Office link parcels described in Section 6.8.1 together for the purpose of water transfers. It is the landowners responsibility to designate which parcels are to be linked and to inform the District Office of any additions or deletions in the parcels to be linked together.

6.8.4 No individual or entity may transfer water into or out of the District.

6.8.5 Sales of water from private wells between well owners or operators and District water users which involve the use of District facilities shall not be permitted.

6.9 IRRIGATION OF GARDEN SERVICE AREAS:

6.9.1 Garden service areas, which are ordinarily parcels each less than two acres in size that are separate or distinct from farm service areas, will be irrigated as a group, where possible, with a standardized rotation irrigation flow consistent with the capacity of the garden service area irrigation facilities.

6.9.2 Deliveries of water to ditches or pipelines for irrigation of garden service areas will be scheduled by the District and may be subject to interruption when it is necessary to minimize waste of water.

6.10 USE OF PRIVATE IRRIGATION WELLS

6.10.1 Well owners/operators shall always have priority in the use of their well for their farming operations. When well owners are not using a well for their purposes, the District will pay the power and/or fuel cost(s), plus a predetermined per acre-foot premium, adopted and approved by the Board. The Distribution System Operator shall read the electric meter or hour meter at the beginning and the end of each usage, and the owners/operators shall be reimbursed monthly following the submittal of a copy of their electric use invoice or fuel bill for the prior month.

6.10.2 The operation, maintenance and repair of the well will be the responsibility of the owners/operators.

6.10.3 The quality of the well water shall be checked by the District, and shall meet District standards for salinity.

6.10.4 Transfers of well water for irrigation water in which said water shall move through District facilities to other parcels of land owned and operated by the private well owners/operators shall be subject to the following criteria:

6.10.4.1 A predetermined per acre-foot wheeling charge, adopted and

approved by the Board, will apply.

6.10.4.2 The district shall be notified a minimum of 24 hours in advance of any intended discharge of a private well into District facilities.

6.10.4.3 Failure to notify the District of any intended discharge of a private well into District facilities will result in a one time warning, and subsequent predetermined fines for repeated occurrences. The right to discharge private wells into District facilities may also be permanently revoked at the discretion of the General Manager.

6.10.5 Private well water exchanges, in which an owner/operator supplies well water for irrigation into District facilities at one location in exchange for District water in another location owned or operated by the owner/operator of the well, shall be provided only as follows:

6.10.5.1 Only if the District cannot provide District water to the target location.

6.10.5.2 Only if there is a shortage of District water.

6.10.5.3 A shortage of District water shall be a determination of the District Manager, and the private well shall be subject to a predetermined per acre-foot wheeling charge, adopted and approved by the Board.

6.11 Sales of water from private wells between well owners or operators and District water users which involve the use of District facilities shall not be permitted. (See Rule 6.8.5)

Section 7: Drainage to District Facilities

7.1 DISCHARGE TO DISTRICT FACILITIES:

7.1.1 No discharge is allowed to enter into any District facility without the prior express written approval of the District.

7.1.2 Use of District facilities for transportation of animal wastewater is strictly prohibited.

7.1.3 Any person who willfully or negligently allows any discharge to enter any District facility without the prior express written approval of the General Manager shall be liable for all damages caused by the discharge and the costs of the cleanup of all affected facilities and of all property adversely affected by the discharge.

7.1.4 The District will not deliver water to the land from which the discharge originated until the facilities by which the discharge entered the District facilities are removed or permanently sealed and all costs associated with the cleanup and damages have been paid.

7.2 DRAINAGE PERMIT:

7.2.1 A Revocable License Agreement for drainage or discharge, approved by the District, is required to pump, siphon, or drain surplus irrigation water, storm water, waste water, subsurface drainage, or any other water into any District conduit, facility or property.

7.2.2 The rate and quantity of drainage into the District facility is subject to limitations based on the capacity of the facility and the quality of the drainage water. Connections to District facilities shall be made to District Construction and Engineering Design Standards at the permittee's expense.

7.2.3 If the General Manager determines that it is in the best interest of the District, existing field drainage facilities not currently covered by a Revocable License Agreement shall become subject to the same limitations on rate, quantity, or quality as the then current standards for new installations under a permit. The General Manager determination shall be on a case-by-case basis unless federal, state or local law requires that all such facilities or discharges be regulated.

7.3 DRAINAGE OF WATER:

Where excessive runoff from lands receiving District water are entering District facilities, the District may reduce the quantity of water delivered in an effort to reduce the drainage flows, or require the landowner to install special drainage facilities to regulate the flow back into the District facilities. The District may also require a landowner to cease all such runoff into District facilities whenever necessary for the District's, or the public's interest, including, but not limited to, ensuring water quality standards, preventing injury or damage, performing repair or maintenance, or adhering to any and all applicable local, state or federal laws and regulations.

Section 8: Water Quality

8. 1 WATER QUALITY REQUIREMENTS:

8.1.1 In addition to any other legally required standard, any discharge of water into District facilities must meet District water quality standards for discharge to canal system.

8. 1.2 Dischargers are solely liable and responsible for meeting and complying with all local, state, and federal regulation of water quality for both subsurface and surface drainage and pumping. Dischargers agree to indemnify, defend and hold harmless the District, its Board of Directors, officers, employees and agents against all liability, claims, damages and costs (including reasonable attorneys fees) relating to the quality of water discharged by a discharger.

8.1.3 New Drainage Systems: Prior to the first discharge of drainage into District facilities, the District will perform a water quality test on the water to be discharged. All water quality tests performed under this section will be at

the expense of the discharger.

8.1.3.1 Drainage systems found to be non-compliant will be required to obtain a Variance per section 8.3 prior to commencing discharge into District facilities.

8.1.4 Existing Drainage Systems: the District will perform water quality tests quarterly or at other intervals at the District's discretion. All water quality tests performed under this section will be at the expense of the discharger.

8.1.4.1 Within 1 month of water quality test, the District will notify the discharger of non-compliance. The discharger will be given 30 days to apply for a variance.

8.1.4.2 Failure to apply for a variance within the 30 day period will result in immediate suspension of discharge privileges.

8.2 VARIANCE PROCESS:

8.2.1 Discharger must prepare and provide, along with the variance application, a District approved plan of operation. If land being drained is used for dairy operations or nutrient water is applied to the soil on land subject to subsurface drainage, the grower must also successfully complete the California Dairy Quality Assurance Program including certification. The District will make staff available to assist growers in these processes.

8.2.2 The objective of the operational plan is to identify all facility modifications or best management practices necessary to improve the water quality such that the discharges will meet water quality standards within 12 months.

8.2.3 Discharger will be allowed up to a 12 month variance to bring a non compliant facility into compliance with water quality standards for discharges. The 12 month period may be reduced as a result of new requirements imposed upon the District by any local, state, or federal agency.

8.2.4 Discharger shall physically implement operational changes according to the schedule detailed in the plan of operation for the variance to remain in effect.

8.2.5 The District will conduct an annual review to verify compliance with the plan of operation and assess the effectiveness of operational changes. Modifications to the original plan of operation may be necessary as a result of the annual inspection. Failure to comply with the provisions contained within the operational plan will result in the suspension of discharge to the District's system until such time that the plan is brought into compliance.

8.2.6 Through normal irrigation operations, the District will accept non-compliant drainage discharges provided that flows within the canal are sufficient to provide adequate dilution to meet all water quality standards in

effect at the time of discharge.

8.2.7 The District may, at its discretion, accept non-compliant drainage discharges during the variance period provided they do not adversely impact water quality standards or cause other potential injury. The District will not re-operate its system to ensure non-compliant discharges meet water quality standards. However, the District can, at its sole discretion, identify methodologies to aid non-compliant discharges in meeting water quality standards, including but not limited to, establishing a rotating block system to cycle available drainage operating times.

8.2.8 In the event that the District concludes that facility modifications, or suitable best management practices are not available to improve the water quality of the discharges, the discharger will not be allowed to discharge into the District's system.

8.2.9 If after 12 months the water does not meet standards the discharge must cease immediately

Section 9: Irrigation Regulations

9.1 AUTHORITY OF GENERAL MANAGER TO ADOPT REGULATIONS:

The General Manager is authorized to adopt regulations to implement or supplement these rules.

9.2 VIOLATION OF A REGULATION CONSTITUTES A VIOLATION OF THESE RULES:

A violation of a regulation duly adopted pursuant to Section 9.1 shall constitute a violation of these rules.

Section 10: Enforcement of Irrigation Rules and Regulations

10.1 TERMINATION OF DISTRICT WATER DELIVERY FOR FAILURE TO COMPLY WITH RULES OR REGULATIONS:

Failure or refusal of any landowner or irrigator to comply with any of these rules or applicable regulations ("rules and regulations") shall be sufficient grounds for terminating delivery of District water to the lands of such landowner or irrigator, and water shall not again be furnished until full compliance with all rules and regulations.

10.2 NOTICE AND ORDERS:

10.2.1 The General Manager is authorized to issue a Notice and Order to any landowner or irrigator the District Manager determines is in violation of any rule or regulation. An oral or written warning may be issued in lieu of a Notice and Order.

10.2.2 The Notice and Order shall contain a brief description of the alleged violation, a statement of the action to be taken by the landowner or irrigator, and an explanation that a written appeal must be filed within ten (10) calendar days of the date of service of such Notice and Order or the person waives all rights to a hearing on the matter.

10.3 RED TAGS:

10.3.1 The General Manager and his/her duly appointed and authorized District personnel are authorized to immediately terminate the delivery of District water to a parcel under any one of the following circumstances:

10.3.1.1 If the land or irrigation facility in question is in such a condition so as to make it immediately dangerous to any person, to the public, or to any property, including but not limited to the flooding of property;

10.3.1.2 If the landowner or irrigator has failed to comply with a prior District Notice and Order or warnings pertaining to the same or similar problem;

10.3.1.3 Such other circumstances as are described in regulations adopted by the General Manager pursuant to Section 9.1.

10.3.2 Notice of an immediate termination of the delivery of District water shall be by service of a Notice and Order with a Red Tag.

10.3.3 When a Red Tag is issued, the Board will be notified at the next Board meeting.

10.4 SERVICE OF NOTICE AND ORDERS AND RED TAGS:

Each Notice and Order and Red Tag shall be served upon the landowner or irrigator either personally or by regular mail to each such landowner or irrigator at the address indicated in the District's records. Service by mail shall be effective on the date of mailing. The Red Tag may also be posted on the affected land or irrigation facility.

10.5 COMPLIANCE WITH NOTICE AND ORDERS AND DECISIONS:

10.5.1 A Notice and Order becomes final if a written appeal is not filed within ten (10) calendar days of the date of service of such Notice and Order. The General Manager decision becomes final if a written appeal to the Board is not filed within the (10) calendar days of the date of service of the decision. The Board's decision becomes final on the day the decision is issued.

10.5.2 After a Notice and Order or a decision of the General Manager or of the Board has become final, no person to whom any such order or decision is directed shall fail, neglect, or refuse to obey any such order or decision.

10.5.3 If, after an order or decision has become final, the person whom such order or decision is directed fails, neglects, or refuses to comply with such order or decision, the District may refuse to furnish water to the land in

question and the District may institute any other appropriate action under these rules or applicable law.

10.5.4 Whenever any order action or repair is not commenced within seven (7) calendar days after any order or decision has become final or is not pursued with sufficient diligence to enable the order action or repair to be completed within the time established for compliance, the Water Distribution Department Manager may issue a Red Tag if a Red Tag has not already been issued.

10.6 APPEALS OF NOTICE AND ORDERS AND RED TAGS:

10.6.1 Any landowner or irrigator affected by the Notice and Order and or Red Tag may file an appeal.

10.6.2 When a Notice and Order is issued without a Red Tag, a written appeal must be filed with the General Manager within ten (10) calendar days of the date of service of such Notice and Order or the person waives all rights to a hearing on the matter by the Administrator and the Board. The Administrator's decision may be appealed to the Board.

10.6.3 When a Notice and Order is issued with a Red Tag and water delivery is terminated, a written appeal must be filed directly with the Board within ten (10) calendar days of the date of service of such Notice and Order or the person waives all rights to a hearing on the matter.

10.6.4 If the final decision requires compliance with the Notice and Order or any portion thereof and delivery of water is terminated to the land in question for failure to comply with the Notice and Order, no further appeal is allowed and the landowner or irrigator must fully comply with the Notice and Order and with all rules and regulations before water will be delivered.

ATTACHMENT D

DISTRICT SAMPLE BILLS

3/2/2011

PATTERSON IRRIGATION DISTRICT
P.O. BOX 685
PATTERSON, CA 95363

Account No: 08113

Phone (209)892-6233
Fax (209)892-4013

Invoice No.: 8255

First installment Regular Assessment Tier 1
$30.00 per acre-foot; Delinquent March 31, 2011

Second installment Regular Assessment Tier 1
$30.00 per acre-foot; Delinquent June 30, 2011

10% PENALTY WILL BE ASSESSED ON ALL DELINQUENT CHARGES

Tier 1 allocation is Two-(2) acre-ft per acre

Parcel#	Lot#	Owner	Acres
047-0729	760A		7.54
047-0729	761A		4.74
047-1017	766		20.00
			32.28

Charges: 32.28 Acres @ $60.00 per Acre = $1,936.80

1st Installment is Due: March 31, 2011 = $968.40
2nd Installment is Due: June 30, 2011 = $968.40

PLEASE MAKE PAYMENT FROM THIS INVOICE
PLEASE REFER TO THE ACCOUNT NUMBER WHEN MAKING PAYMENTS
PLEASE NOTIFY US IF YOU SELL YOUR PROPERTY

All combined parcels containing one acre or less will be charged $12.00. All combined parcels containing one acre and less then two acres will be charged $15.00

8/31/2011

PATTERSON IRRIGATION DISTRICT

P.O. BOX 685
PATTERSON, CA 95363
(209)892-6233

Account No. 08113

Invoice No. 9144

Please refer to the Account Number when making payments

Please notify us if you sell your Property

Group No.	Lateral	Tag Number	Crop	Start Date	End Date	Acre Ft
760A	2 NORTH	2758	WALNUTS	8/5/2011	8/5/2011	3.00
766	2 NORTH	2985	ALFALFA	8/16/2011	8/19/2011	11.00
766	2 NORTH	3262	ALFALFA	8/29/2011	8/29/2011	0.70
						14.70

Assessed 64.56 Acre Ft

	Acre Ft
Prior Water Used	33.70
Water Used This Invoice	14.70
TOTAL WATER USED	48.40
Prior Water Billed	64.56
Water Billed This Invoice	0.00

Tier	Ac Ft	Rate	Charge

AMOUNT DUE THIS INVOICE **$0.00**

This Invoice Due and Payable Upon Receipt
This account must be cleared prior to additional water deliveries

Please Remit To: PATTERSON IRRIGATION DISTRICT
P.O. BOX 685
PATTERSON, CA 95363

9/1/2011

PATTERSON IRRIGATION

Daily Water Use Report

Lateral	Group ID	Crop	Tag No.	Date	Started	Stopped	Hours	CFS	AcreFt
User ID: 08113						**Daily Use For Invoice: 9144**			
2 NORTH	760A	WALNUTS	2758	8/5/2011	0700	1300	6.00	6.00	3.00
								Tag Total:	**3.00**
								Group Total:	**3.00**
2 NORTH	766	ALFALFA	2985	8/16/2011	0930	2400	14.50	4.00	4.80
2 NORTH	766	ALFALFA	2985	8/17/2011	0000	1400	14.00	2.00	2.30
2 NORTH	766	ALFALFA	2985	8/17/2011	1400	2400	10.00	1.00	0.80
2 NORTH	766	ALFALFA	2985	8/18/2011	0000	2400	24.00	1.00	2.00
2 NORTH	766	ALFALFA	2985	8/19/2011	0000	1300	13.00	1.00	1.10
								Tag Total:	**11.00**
2 NORTH	766	ALFALFA	3262	8/29/2011	1730	2130	4.00	2.00	0.70
								Tag Total:	**0.70**
								Group Total:	**11.70**
								User Total:	**14.70**

ATTACHMENT E

GROUNDWATER MANAGEMENT PLAN

Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area

Groundwater Management Plan Update

San Luis & Delta-Mendota Water Authority

July 2011

Revised November 7, 2011

AECOM 1120 West "I" Street, Suite C Los Banos, CA 93635

Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area

San Luis & Delta-Mendota Water Authority

Client Representative — Frances Mizuno

AECOM Technology Corporation

Project Engineer — Robert M. Stoddard, PE

REGISTERED PROFESSIONAL ENGINEER
ROBERT M. STODDARD
No. 26407
EXP. 3/31/12
CIVIL
STATE OF CALIFORNIA

60185608.0001

July 2011
Revised November 7, 2011

AECOM 1120 West "I" Street, Suite C Los Banos, CA 93635

Table of Contents

Section 1 Introduction 1
1.1 Regulatory Basis 2
1.2 Setting 5
Section 2 The Groundwater Management Area 7
Section 3 Characteristics of the GMA 9
3.1 Land Use and Groundwater Beneficial Use 9
3.2 Topography and Structure 9
3.3 Climate 10
3.4 Geology 11
3.4.1Confined Aquifer 12
3.4.2Corcoran Clay Layer 12
3.4.3Semiconfined Aquifer 12
3.5 Hydrology 13
3.5.1Surface Hydrology 14
3.5.2Subsurface Hydrology 15
3.6 Groundwater Quality 16
3.6.1Hydrochemical Facies 18
3.6.2Dissolved Solids 18
3.6.3Sulfate 18
3.6.4Boron 19
3.6.5Arsenic 19
3.6.6Selenium 19
3.6.7Nitrate 20
3.6.8Trace Elements 20
Section 4 Management Objectives 21
Section 5 Program Components Relating to Management 22
5.1 Components Relating to Groundwater Level Management 22
5.1.1Reduction of Groundwater Use by Development of New Surface Water Supplies 22
5.1.2Increase Use of Available Surface Water Supplies 22
5.1.3Development of Overdraft Mitigation Programs 22
5.1.4Development of Conjunctive Use Programs and Projects 23
5.1.5Development of Agricultural and Urban Incentive Based Conservation and Demand Management Programs 25
5.1.6Replenishment of Groundwater Extracted by Water Producers 27
5.2 Components Relating to Groundwater Quality Management 27
5.2.1Regulation of the Migration of Contaminated Groundwater 28

5.2.2Development of Saline Water Intrusion Control Programs 29
5.2.3Identification and Management of Wellhead Protection Areas and Recharge Areas 29
5.2.4Administration of Well Abandonment and Well Destruction Program 30
5.2.5Well Construction 31
5.2.6Review of Land Use Plans to Assess Risk of Groundwater Contamination 31
5.2.7Construction and Operation of Groundwater Management Facilities 32
5.3 Components Relating to Inelastic Land Surface Subsidence 33
5.4 Components Relating to Surface Water Quality and Flow 33
Section 6 Groundwater Monitoring Programs and Plans 34
6.1 Groundwater Monitoring Programs 34
6.2 Monitoring Plans 39
Section 7 Implementation of the Groundwater Management Plan 42
Section 8 References 44

List of Tables

Table 1 List of Agencies Participating in the Groundwater Management Plan

Table 2 Summary of Climatic Data for Los Banos, and Tracy

Table 3 Chemical Analysis of Selected Constituents in Groundwater

List of Figures

Figure 1 Hydrologic Regions, California

Figure 2 Sub-Basins of the San Joaquin River Hydrologic Region

Figure 3 Boundary of the Groundwater Management Plan

Figure 4 Water Table Elevation, Spring 2004

Figure 5 Water Table Elevation, Spring 2008

Figure 6 Change in Water Table Elevation Spring 1993 to Spring 1998

Figure 7 Change in Water Table Elevation Spring 1998 to Spring 2004

Figure 8 Change in Water Table Elevation Spring 2004 to Spring 2008

Figure 9 Change in Water Table Elevation Spring 1993 to Spring 2008

Figure 10 Change in Water Table Elevation Spring 1998 to Spring 2008

Appendix A

USBR GAMA Water Quality Data for Tracy Subbasin Area

Section 1
Introduction

In 1995, the San Luis & Delta-Mendota Water Authority (SLDMWA) entered into an activity agreement with its member agencies; City of Tracy, Plainview Water District, Del Puerto Water District, Banta-Carbona Irrigation District, West Stanislaus Irrigation District, Patterson Water District and the Westside Irrigation District to provide an umbrella organizational structure for managing groundwater resources. Those members adopted a Groundwater Management Plan for the NA-DMC service area (GMP-NA) based upon the requirements of AB 3030, which GMP-NA characterizes the groundwater basin; reviews factors of the water resources balance, including groundwater; estimates basin-wide groundwater pumping and sustainable yield; summarizes groundwater quality and reviews potential management elements to be considered by the individual participating agencies. Since that time, the SLDMWA has entered into memoranda of understanding with the City of Patterson and the San Joaquin County Flood Control and Water Conservation District, expanding the coordinated effort. The Plain View Water District has been merged with Byron-Bethany Irrigation District, which participates in the plan for the Plain View service area.

Groundwater management plans need to be living documents that evolve to address legislative and regulatory changes and changing conditions. The GMP-NA is being updated in the present document to reflect the understanding of current conditions in the GMA, summarize the existing groundwater management activities in the Groundwater Management Area (GMA), develop the relative elements of the GMP, identifies management objectives, and provides project recommendations for implementation. and incorporate the appropriate management goals and components necessary to address recent changes that have occurred in regulations, participating agencies' (PAs) policies, and groundwater conditions since the last update. It is intended to establish the framework for collecting the necessary groundwater monitoring data needed to assess the impacts of the various activities that affect the groundwater basin and manage the resource such that sustained use of groundwater can be optimized without adverse impacts to the water quality and yield. Under this plan the PAs, will assume a more active role managing regional groundwater resources within the basin. While PA's will continue to individually adopt the GMP-NA and to develop their own priorities, funding and projects, the Plan provides for additional mechanisms for coordination and cooperation on a regional basis under the umbrella of the SLDMWA. As part of this plan, the SLDMWA will assume the role as the entity responsible for the groundwater monitoring function within the GMA on behalf of the PAs. The groundwater monitoring function will be a cooperative effort of the PAs and the SLDMWA under the SLDMWA's administration.

The water resources utilized in the Northern Agencies (NA) in the Delta-Mendota Canal (DMC) service area of the San Luis & Delta Mendota Water Authority (SLDMWA) support a variety of uses, including industrial, municipal and agricultural application. To supply the various users'

demands, several water sources are utilized within the NA-DMC service area. Water supplies within the NA-DMC service area are obtained from three main sources:

1. Imported surface water diverted from the Sacramento River-San Joaquin River Delta (Delta) and conveyed through the DMC under the Central Valley Project (CVP), and the California Aqueduct (CA) under the State Water Project (SWP). The DMC and CA provide water for urban use in communities, such as the City of Tracy, and for agricultural production. Additionally, treated surface water is imported by the City of Tracy from the South San Joaquin Irrigation District located east of the San Joaquin River.
2. Local surface water supplies diverted from the San Joaquin River for agricultural use.
3. Groundwater for municipal and industrial purposes, rural domestic needs, and agricultural production where the surface water supplies are either not readily available or are insufficient to meet the demand.

Other sources of water supplies occur within the GMA, such as direct precipitation and local stream flows, but these meet a relatively small portion of agricultural water demand and a minor recharge source for groundwater.

As political and environmental conditions change, so does the availability of supplies from these various sources. During drought, the water supply available from the CVP can be limited, which then forces many users to pump groundwater to meet water demand. In addition, CVP water supplies delivered south of the Delta can be limited in an effort to protect endangered species that depend on adequate water conditions within the Delta. During periods when CVP surface water supplies are limited, many water users have had to increase groundwater pumping to augment their supplies to meet demands.

Communities that rely on groundwater have experienced water quality deterioration over time, while regulations governing domestic water quality have become stricter. This combination has made it increasingly difficult for these communities to find groundwater supplies meeting the domestic water quality standards (CCR Title 22, Div. 4, Ch. 15) and has raised serious concerns about the sustainability of groundwater resources to meet domestic demands without treatment. As an example, the City of Tracy uses treated surface water to blend with higher salinity groundwater to provide sufficient potable domestic water to meet the community's water needs.

The growing demand for cost-effective water resources in an ever-changing environment compels the responsible agencies resources to enhance management and to promote long-term stability of this water resource to meet the water needs of the users without depleting the resource. The proper management of groundwater resources requires knowledge of the storage, distribution, depletion, and replenishment of the resource as well as the various local and regional geologic and hydrologic factors. Without such knowledge, the effect of current and future activities on the groundwater resources cannot be adequately predicted.

1.1 Regulatory Basis

In 1992, Assembly Bill 3030 (AB 3030), the Groundwater Management Act, was enacted to amend the California (State) Water Code, Sections 10750 through 10756. It established provisions to allow local water agencies to develop and implement a groundwater management

plan (AB3030 GMP) in groundwater basins defined in the California Department of Water Resources (DWR) Bulletin 118. AB 3030 provided a systematic procedure for existing local agencies to develop AB3030 GMP. Twelve technical components are identified in the Water Code that may be included in an AB3030 GMP. The twelve components consist of the following:

1. The control of saline water intrusion;
2. Identification and management of wellhead protection areas and recharge areas;
3. Regulation of the migration of contaminated groundwater ;
4. The administration of a well abandonment and well destruction program;
5. Mitigation of conditions of overdraft;
6. Replenishment of groundwater extracted by water producers;
7. Monitoring of groundwater levels and storage;
8. Facilitating conjunctive use operations;
9. Identification of well construction policies;
10. The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling and extraction projects;
11. The development of relationships with state and federal regulatory agencies; and
12. The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

An AB3030 GMP can be developed only after a public hearing and adoption of a resolution of intention to adopt a groundwater management plan. The procedures for Adopting an AB 3030 GMP are clearly defined in the Water Code. Once adopted, rules and regulations must be enacted to implement the AB3030 GMP programs. Because there are no explicit provisions regarding amendment or updating GMP programs, it is assumed that updated or amended plans must undergo the same procedural process as the original adoption.

In 2002, Senate Bill SB 1938 was enacted to amend the Water Code Section 10750 *et. seq.* to require that AB 3030 GMPs contain specific elements in order to receive state funding for water projects (DWR, 2010a). This mandates the development of a AB3030 GMP with specific elements, and documented public review if local agencies desire to remain eligible for water grants or loans administered by the State (Water Funds). It also allows for additional elements to be considered in an AB3030 GMP. In order to remain eligible for Water Funds, an agency preparing the AB3030 GMP must include the following:

a. Documentation that a written statement was provided to the public: “describing the manner in which interested parties may participate in developing the groundwater management plan”, Section 10753.4;

b. A plan to: “involve other agencies that enables the local agency to work cooperatively with other public entities whose service areas or boundaries overlies the groundwater basin”;

c. A map showing the area of the groundwater basin, as defined by Bulletin 118, with the area of the local agency subject to the plan as well as the boundaries of the other local entities that overlie the basin in which the agency is developing the AB3030 GMP;

d. Management Objectives for the groundwater basin subject to the AB3030 GMP;

e. Components relating to the monitoring and management of the groundwater levels, groundwater quality, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping; and

f. Monitoring protocols for the components for those components described above (Water code 10753.7 (a)(4)).

In 2008, a draft updated GMP for the NA-DMC service area was prepared as part of the ongoing efforts by the SLDMWA and their PAs to assist in managing the limited water resources in conformance with SB1938 and AB3030. The 2008 draft GMP-NA provided a mechanism to bridge gaps and interface between local PAs' programs to support comprehensive regional water resources management in the GMA. The PA’s and the City of Patterson used the SLDMWA umbrella to jointly fund the preparation of a coordinated regional plan. In addition to the NA, portions of San Joaquin County west of the San Joaquin River and outside the boundaries of a local water agency or municipality were included into the GMA. These western outlying portions of San Joaquin County are represented by the San Joaquin County Flood Control and Water Conservation District (SJCFCWCD), which entered into a memorandum of understanding with the SLDMWA such that the GMP-NA could cover this portion of the County. However, the draft plan has not been formally adopted.

Now recent amendments to the Water Code Section 10920 et seq., enacted in 2009 through the passage of Senate Bill SBx7-6, have established further requirements related to groundwater management that have led to this current update to the GMP-NA. SBx7-6 mandates that prescribed entities with authority to assume groundwater monitoring functions (entities) do so, coordinate monitoring efforts with DWR, and convey the information regularly to DWR if they seek to remain eligible for Water Funds (California, 2009). SBX7-6 mandates that (DWR, 2010b):

- Local entities may assume responsibility for monitoring and reporting groundwater elevations;
- DWR work cooperatively with local monitoring entities to achieve monitoring programs that demonstrate seasonal and long-term trends in groundwater elevations;

- DWR accept and review prospective monitoring entity submittals, then determine the designated monitoring entity, notify the monitoring entity and make that information available to the public;
- DWR perform groundwater elevation monitoring in basins where no local party has agreed to perform the monitoring functions; and
- If local entities do not volunteer to perform the groundwater monitoring functions, and DWR assumes those functions, then those entities become ineligible for water grants or loans from the state.

This current update of the GMP-NA addresses these new regulatory requirements set forth in SBx7-6. The GMP-NA designates the local entity that assumes responsibility for groundwater monitoring, and sets forth the framework that will form the basis for a groundwater monitoring program.

1.2 Setting

In general, this GMP-NA is meant to promote groundwater sustainability within the GMA. However, as the individual PAs may have different ambitions they may seek to attain through groundwater management, it would be very difficult to develop or implement highly-specific or locally-specialized groundwater management programs that suit all of the needs of the individual PAs. Rather, at this regional scale, it is more efficient and specific programs would be better focused if they were undertaken by each individual PA or group of PAs depending on their specific local needs. The GMP-NA has been prepared to facilitate coordinated regional management of groundwater resources within the GMA and may not address all of the more specialized or localized groundwater resources management needs that could occur. It is intended that the GMP-NA afford the PAs the operational flexibility to address their own individual or local group needs without being bound by specific programs that are irrelevant to their operations, counterproductive to the cost-effective implementation of local good groundwater management practices or not mandatory for the regional program. Thus, it is anticipated that in some cases the individual PAs may also seek to prepare their own local GMP to augment this regional plan and address specific local needs beyond the more general scope of the GMP-NA. (For example the City of Tracy prepared their own GMP in 2007 that expands on the GMP-NA for a management area encompassing their municipality.) The GMP-NA provides the regional framework for:

- Gathering the groundwater data needed to assess the regional impacts of activities that affect the groundwater resources within the GMA;
- Establishing standards amongst the PAs that promote consistency in management and monitoring practices that provide regional benefits throughout the GMA;
- Interaction of the PAs for regular, early collaborations to discuss and resolve concerns that may arise from groundwater monitoring assessments and projections; and
- Providing general guidance for programs to promote focused groundwater management practices and resource sustainability throughout the GMA for the benefit of the PAs.

Since this is a regional plan, each PA would need to independently adopt the whole plan or portions thereof. Through the appropriate execution of this GMP-NA and sincere efforts of the

PAs, it is anticipated that the sustained use of groundwater within the GMA will be better optimized without adverse impacts to the water quality and yield through the implementation of this GMP. Regional sustainability of the groundwater resources throughout the GMA is the basic goal of this program.

In the past, the PAs within the GMA have engaged in transfers of water supplies to qualified recipients. Under this plan, the PAs will continue to reserve their operational flexibility to engage in such water transfers. However, prior to undertaking any water transfer program, the PAs will evaluate any adverse economic or environmental impacts of the program. The evaluation may include, but is not be limited to, an assessment of management practices, groundwater storage capacity, and conjunctive use with surface water supplies. These programs may be undertaken to assist other areas in need of water, in addition to consumers within the PAs' service areas, and to benefit PAs and their consumers, as long as such programs do not:

- Exceed the safe annual yield of the aquifer;
- Result in conditions of overdraft or otherwise fail to comply with provisions of California Water Code Section 1745.10;
- Result in uncompensated adverse impacts upon landowners affected by the program.

Section 2
The Groundwater Management Area

The DWR divides California into 10 hydrologic regions (HRs), which generally correspond to the State's major drainage areas (DWR, 2003). The HR and the GMA are shown in Figure 1. The San Joaquin River HR was further divided into separate subbasins largely based on political considerations for groundwater management purposes (Figure 2). Figure 2 depicts the groundwater subbasins as described in the DWR Bulletin 118 Update 2003, and the relative location of the GMA boundaries within the subbasins. The GMA lies within the Tracy (5.22-15) and Delta-Mendota (5.22-07) Basins of the San Joaquin River HR, and covers western portions of Merced, Stanislaus and San Joaquin Counties. The GMA is generally bounded:

- on the North by Old River;
- on the west by the Coast Range Mountains, Alamedas County, and those portions of Byron Bethany Irrigation District that lie outside the CVP Service Area;
- on the south by San Luis Water District and Santa Nella Village; and
- on the east by the San Joaquin River and Central California Irrigation District.

The GMA encompasses 173,000 acres. Figure 3 shows the boundaries of the GMA.

The GMA encompasses the following agricultural water supply districts: Banta-Carbona Irrigation District, Westside Irrigation District, West Stanislaus Irrigation District, Patterson Irrigation District, Del Puerto Water District, and the Central Valley Project Service Area (CVPSA) within the Byron-Bethany Irrigation District. Del PuertoWater District includes the former Davis, Foothill, Mustang, Orestimba, Hospital, Kern Canon, Quinto, Romero, Salado, and Sunflower Water Districts. The CVPSA within the Byron-Bethany Irrigation District is the former Plainview Water District. In addition, the GMA encompasses: the City of Tracy (Tracy), the City of Patterson (Patterson), several unincorporated communities, and unincorporated and non-district lands within San Joaquin County represented by the SJFCWCD. A list of the current PAs involved in the GMP-NA is given in Table 1.

Table 1
List of Agencies Participating in the Groundwater Management Plan

- San Luis & Delta-Mendota Water Authority (SLDMWA)

Water or Irrigation District:

- Banta-Carbona Irrigation District (BCID)
- Byron-Bethany Irrigation District (only the CVPSA) (BBID)
- Del Puerto Water District (DPWD)
- Patterson Irrigation District (PID)
- West Stanislaus Irrigation District (WSID)
- Westside Irrigation District (WID)

Cities:

- City of Tracy (Tracy)
- City of Patterson (Patterson)

Non-District Lands:

- San Joaquin County Flood Control and Water Conservation District (SJFCWCD)

Section 3
Characteristics of the GMA

3.1 Land Use and Groundwater Beneficial Use

Most of the land in the San Joaquin Valley is utilized for agricultural crop production. Major agricultural activities include the operation of dairies, and the production of cotton, tomatoes, beans, alfalfa, corn, grapes, walnuts, almonds and oranges. A number of small rural communities, as well as some large municipalities exist within the San Joaquin Valley. The largest of these communities, Fresno, has a population of nearly a half of a million people. The majority of communities have populations of less than 100,000 people, and many have less than 10,000. Other notable large municipalities in the San Joaquin Valley include Stockton, Modesto, and Bakersfield. The southern end of the San Joaquin Valley also has a large oil production industry, and numerous oil/gas fields are located throughout the San Joaquin Valley.

Within the GMA, the majority of the current land use is agricultural, with irrigated crops, dairies and rangeland. There are two municipalities within the GMA, the cities of Tracy and Patterson, both of which are PAs. Tracy is a municipality with a population of about 80,000 people, and Patterson has a population of about 21,000 people. There are also some smaller unincorporated communities within the GMA.

The beneficial uses of groundwater in the GMA are predominantly for agriculture and related industry, domestic potable water, and other municipal uses. For agricultural applications within the GMA, groundwater is used conjunctively to supplement surface water supplies that support the water needs in the GMA. However, groundwater is the primary source of domestic and municipal water supplies within the GMA. In the case of Tracy, groundwater is supplemented by imported surface water.

3.2 Topography and Structure

The San Joaquin Valley is the southern portion of the Great Valley Geomorphic Province in central California. The San Joaquin Valley is a structural trough up to 200 miles long and 45 to 70 miles wide. It conjoins the northern portion of the Great Valley Geomorphic Province, the Sacramento Valley, at the confluence of the Sacramento and San Joaquin Rivers ("the Delta"). The Great Valley opens to the San Francisco Bay west of the Delta.

The San Joaquin Valley is bounded by the Sierra Nevada Mountains to the east, the Coast Range Mountains to the west, and the Tehachapi Mountains to the south. It is a broad, fault bounded, northwest trending, asymmetric topographic and structural trough, with axis of the valley offset nearer the western margin. The topographic slope along the axis declines gently, generally towards the north-northwest.

Within the GMA, the land surface generally slopes easterly to northeasterly from the base of the Coast Range Mountains, near the western boundary, towards the trough of the valley and the San Joaquin River, along the eastern boundary. Small ephemeral streams drain from the Coast Range

Mountains typically trending northeasterly toward the trough of the valley. The natural land surface is relatively flat to slightly undulating. However, agricultural practices have modified many topographic features to provide suitable conditions for crop production. The land surface elevation in the GMA ranges from about 60-feet above mean sea level in the southwest to about sea level in the north. Major man-made features include Interstate Highway 5, the California Aqueduct, the DMC, and a number of smaller canals used for water supply distribution and drainage.

3.3 **Climate**

The San Joaquin Valley has a more continental climate than much of the more populous coastal areas, with relatively warm summers and cooler winters. The mean annual high temperatures in the valley range from about 73° Fahrenheit (°F) to 79°F, and the mean annual lows range from about 48°F to 50°F.

Due to some rain shadow effects from the Coast Range Mountains and the lower elevations of the valley floor, the valley experiences relatively little rainfall, typically less than 12 inches. Some areas of the southern San Joaquin Valley experience desert conditions due to the very low seasonal precipitation. Rainfall occurs typically between late fall and early spring, with dry summers. Mean annual rainfall amounts range from 5 to 13 inches per year on the valley floor.

The range of typical climatic conditions experienced within the GMA can vary. Two representative weather stations, with long documented histories, have been chosen to demonstrate the range of climatic conditions within the GMA. The City of Los Banos (Los Banos) lies within 10 miles of the southern boundary of the GMA, and Tracy lies within the GMA near the northern boundary. The recent climatic history recorded for each location is presented below:

- Los Banos:

  Between 1906 and 2010, the average annual temperature was 62.2^{o}F, the average monthly high temperature of 96.5^{o}F was in July, and the average monthly low temperature of 36.3^{o}F was in December (WRCC, 2010). Los Banos averages about 97 days per year above 90°F, and 29 days below 32°F. The hottest day on record was 116°F on July 30, 1931, and the coldest was 14°F occurring twice on January 11, 1949 and December 22, 1990.

  Between 1906 and 2010, the average annual rainfall was 9.21 inches. The highest annual rainfall was 21.08 inches in 1998, and the lowest annual rainfall was 4.61 inches in 1947. The maximum-recorded rainfall over a 24-hour period was 2.25 inches on September 30, 1983. Annually, Los Banos experiences, on average, about 46 days with precipitation greater than 0.01 inches, 25 days with precipitation greater than 0.10 inches, 5 days with precipitation greater than 0.50 inches, and 1 day with precipitation greater than 1.0 inch.

- Tracy:

  Between 1955 and 2010, the average annual temperature was 62.1^{o}F, the average monthly high temperature of 92.7^{o}F was in July, and the average monthly low temperature of 38.3^{o}F was in January (WRCC, 2010). Tracy averages about 75 days per

year above 90°F, and 17 days below 32°F. The hottest day on record was 112°F on June 15, 1961, and the coldest was 17°F on December 26, 1990.

Between 1955 and 2010, the average annual rainfall was 12.07 inches. The highest annual rainfall was 27.48 inches in 1983, and the lowest annual rainfall was 5.44 inches in 1976. The maximum recorded rainfall over a 24-hour period was 2.80 inches on January 4, 1982. On average, annually, Tracy experiences about 55 days with precipitation greater than 0.01 inches, 31 days with precipitation greater than 0.10 inches, 7 days with precipitation greater than 0.50 inches, and 1 day with precipitation greater than 1.0 inch.

Table 2
Summary of Climatic Data for Los Banos and Tracy

		Los Banos	Tracy
Average Monthly High Temperature	°F	96.5	92.7
Average Monthly Low Temperature	°F	36.3	38.3
Hottest Recorded High Temperature	°F	116	112
Coldest Recorded Low Temperature	°F	14	17
Average Number of Days Above 90°F	Day	97	75
Average number of Days Below 32°F	Day	29	17
Average Annual Rainfall	Inch	9.21	12.07
Highest Annual Rainfall	Inch	21.08	27.48
Lowest Annual Rainfall	Inch	4.61	5.44
Maximum 24-hour Rainfall	Inch	2.25	2.80

Based on the climatic data, both Tracy and Los Banos lie within Semi-arid hot climate regimes. While the conditions in Los Banos lie in the middle of the Semi-arid climate regime, Tracy has milder conditions and greater rainfall approaching a more Mediterranean climate regime typical of the Delta. The northern end of the GMA receives on average about 30 percent more rainfall annually than the southern end.

3.4 **Geology**

The geologic materials that fill the San Joaquin Valley are comprised of mostly unconsolidated alluvial and lacustrine sediments, Holocene to Jurassic in age, derived from parent materials of the Coast Ranges and the Sierra Nevada Mountains. These sediments overlie older marine sediments. The Valley fill reaches a thickness of about 28,000 feet in the southwestern corner (Page, 1986). Continental deposits shed from the surrounding mountains form an alluvial wedge

that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes, which mark the current and historic axis of surface drainage in the San Joaquin Valley (DWR, 2003). Major faults run parallel to the western boundary of the GMA, along the east side of the Coast Range Mountains. In particular, the Greenville and Ortigalita faults lie within about 10 to 20 kilometers of the western boundary.

The water bearing geologic formations within the GMA typically are comprised of continental deposits of Late Tertiary to Quaternary age. These deposits include the Tulare Formation, older alluvium, flood basin deposits, terrace deposits, and younger alluvium. The cumulative thickness of these deposits ranges from a few hundred feet near the Coast Range foothills west of the GMA to about 3,000 feet along the trough of the valley east of the GMA (DWR, 2003).

The Tulare Formation is composed of beds, lenses, and tongues of clay, sand, and gravel that have been alternately deposited in oxidizing and reducing environments (Hotchkiss, 1972). The Tulare Formation dips eastward from the Coast Ranges in the west towards the trough of the valley east of the GMA. The total thickness of the Tulare Formation is about 1,400 feet (DWR, 2006). The Corcoran Clay occurs near the top of the Tulare Formation and confines the underlying fresh water deposits.

3.4.1 Confined Aquifer

The confined aquifer zone underlying the Corcoran clay stratum extends downward from the base of the clay to the base of fresh water (Page, 1971). Sierran Sand and Coast Ranges alluvium interfinger in a similar fashion as those of the semi-confined zone above, except that Sierran sediments extend further to the west in the confined zone (Dubrovsky et al., 1991).

3.4.2 Corcoran Clay Layer

Much of the central and northern portions of the valley, which includes the GMA, is underlain by a continuous aquitard layer of Pleistocene age, known as the Corcoran Clay layer or E-clay. This layer is comprised of fine-grained lacustrine and marsh deposits that divide the aquifer system vertically into an upper semiconfined zone and a lower confined zone (Davis and DeWiest, 1966). Because of this, the underlying aquifer is typically designated the confined aquifer or zone in the regions where the Corcoran Clay occurs. The Corcoran Clay member of the formation underlies the basin at depths ranging from about 100 to 500 feet and acts as a confining bed (DWR 1981). The unconsolidated sediments of the valley floor taper toward the Coast Ranges, and the Corcoran Clay becomes discontinuous along the west margin of the valley, near the western limits of the GMA.

3.4.3 Semiconfined Aquifer

Overlying the Corcoran Clay is the semiconfined zone. It is comprised of sediments derived from the Coast Ranges on the west interfingered to the east with sediments derived from the Sierra Nevada. These sediments comprise the older alluvium, younger alluvium and terrace deposit layers. The Coast Range and Sierran sediments differ in their hydrogeologic characteristics. The Coast Range sediments consist of beds, lenses, and tongues of clay, sand,

and gravel, and form most of the sedimentary material deposited west of the San Joaquin River (Hotchkiss, 1972). Although there are no distinct continuous aquifers or aquitards within the Coast Range alluvium, the term "semiconfined" is used to emphasize the cumulative effect of the vertically distributed fine-grained materials. The Sierran sediment that interfingers with the Coast Range alluvium is well sorted, medium to coarse-grained micaceous sand derived from the Sierra Nevada. The uppermost expression of the interface between the Coast Ranges and Sierran deposits is close to the eastern boundary of the GMA.

Across much of the San Joaquin Basin, a layer of older alluvium consisting of loosely to moderately compacted sand, silt and gravel deposited in alluvial fans during the Pliocene and Pleistocene ages overlies the Tulare Formation. The older alluvium is widely exposed between the Coast Range foothills and the Delta. The thickness of the older alluvium is up to about 150 feet. It is moderately to locally highly permeable.

A layer of younger alluvium overlies the layer of older alluvium. This layer includes sediments deposited in the channels of active streams as well as overbank deposits and terraces of those streams. They consist of unconsolidated silt, fine to medium grained sand, and gravel. Sand and gravel zones in the younger alluvium are highly permeable and, where saturated, yield significant quantities of water to wells. The thickness of the younger alluvium near Tracy is less than 100 feet (DWR, 2006). Further south, terrace deposits of Pleistocene age are up to several feet higher than present streambeds. They are composed of yellow, tan, and light-to-dark brown silt, sand, and gravel with a matrix that varies from sand to clay (Hotchkiss 1971). The water table generally lies below the bottom of the terrace deposits.

In the northern portion of the GMA, flood basin deposits occur (DWR, 2006). They are the distal equivalents of the Tulare Formation and older and younger alluvial units and consist primarily of silts and clays. Occasional interbeds of gravel occur along the present waterways. Because of their fine-grained nature, the flood basin deposits have low permeability and generally yield low quantities of water to wells. The flood basin deposits are generally composed of light-to-dark brown and gray clay, silt, sand, and organic materials with locally high concentrations of salts and alkali. Occasional zones of fresh water are found in the basin deposits, but they generally contain poor quality groundwater. The maximum thickness of the flood basin deposits is about 1,400 feet.

3.5 **Hydrology**

The following sections discuss the surface and groundwater hydrology of the area. Hydrologically, the GMA has inflow from outside bringing water supplies into the area.

Sources of inflow into the GMA include:

- diversions into the GMA from the San Joaquin River,
- the streams and channels conveying storm runoff from the east side of the Coast Range Mountains,
- the network of canals conveying surface water south from the Delta,
- subsurface groundwater flowing in from the southwest,
- and precipitation.

Sources of outflow from the GMA include:

- surface runoff to the San Joaquin River,
- groundwater flow moving towards the trough of the valley and exiting the GMA,
- groundwater discharged to the San Joaquin River system, directly or through subsurface drainage systems in some areas,
- evaporation,
- Surface waters conveyed out of the GMA by canals and drainage ways,
- and crop and phreatophyte evapotranspiration.

3.5.1 Surface Hydrology

Streams that drain into the northern two-thirds of the San Joaquin Valley, flowing from the Sierra Nevada and Coast Range mountains, empty into the San Joaquin River and flow northward to join the Delta. Historically, the rivers and streams in the southern one-third of the San Joaquin Valley had no natural drainage connecting to the ocean, but rather drained into Tulare and Buena Vista Lakes. Seasonal flooding would occur along these rivers and streams in spring as rainfall and snowmelt from the mountains drained to the valley floor. A number of dams placed along the major watercourses, particularly in the Sierra Nevada Mountains, have alleviated the flooding. The majority of the runoff that drains into the San Joaquin River is derived from the rainfall and snowmelt from the western side of the Sierra Nevada Mountains. These rivers typically drain southwest to west out of the Sierra Nevada Mountains, turning north at the trough of the valley floor, where the San Joaquin River is located.

The ephemeral streams of the eastern side of the Coast Range Mountains typically drain east to northeast out of the mountains towards the trough of the valley floor. Many of these streams only flow during torrential winter storms and for very short periods following. In the past, many of these ephemeral streams would drain out onto the valley into wetlands and infiltrate before reaching the San Joaquin River. This infiltrated water would supply base flow for the San Joaquin River and recharge groundwater. Many of these ephemeral streams have been transected by canals and highways, their drainage courses diverted, and agriculture reclaimed and drained much of the wetlands and lakes. Much of the surface hydrology of the San Joaquin Valley is controlled by man-made structures and practices. Surface waters in the San Joaquin Valley are frequently conveyed into and out of the valley by a network of large canals that supply users' needs in areas far from the natural source. Large man-made reservoirs are used to retain and store runoff from the mountains and temporary surface water being conveyed to other locations.

Consistent with most of the San Joaquin Valley, within the GMA, much of the surface hydrology is governed by the man-made structures, agricultural practices, and urbanization. A notable few ephemeral streams convey water into the GMA from the east side of the Coast Range Mountains.

These streams include:

- Corral Hollow Creek,
- Lone Tree Creek,
- Hospital Creek,

- Ingram Creek,
- Del Puerto Creek,
- Crow Creek,
- Salado Creek,
- Orestimba Creek,
- and Garzas Creek.

North of Tracy, a network of sloughs and river channels, including the Old River and Middle River, intertwine as the San Joaquin River system and nearby streams forming a part of the Delta. Some areas within the GMA are relatively flat, and groundwater can be seasonally shallow. The San Joaquin River flows along the eastern boundary of the GMA and is a major source of water to the GMA.

Besides the natural water conveyance systems, major canals convey water from the Delta, to and through the GMA. These canals include the California Aqueduct and the DMC. Other smaller canals in the network convey surface water from the San Joaquin River and the CVP to the users, and drain runoff from areas within the GMA. The DMC is a major water supply source to the GMA.

3.5.2 Subsurface Hydrology

Groundwater in the region occurs in three water-bearing zones (DWR, 2006). These include the lower zone, which contains confined fresh water in the lower section of the Tulare Formation, an upper zone which contains confined, semi-confined, and unconfined water in the upper section of the Tulare Formation and younger deposits, and a shallow zone which contains semi-confined and unconfined water to within about 25 feet of the land surface.

Agricultural irrigation in the GMA provides most of the recharge water of the upper semiconfined zone through seepage losses occurring in irrigation water conveyance channels and by deep percolation of applied water. Other sources of recharge include seepage from creeks and rainfall. Occasional recharge from the creeks that enter the GMA from the Coast Ranges to the west is relatively small compared to the other sources (KJC, 1990). Recharge to the lower confined zone occurs primarily by infiltration downward from the unconfined zone through the Corcoran Clay. Groundwater pumping from below the Corcoran Clay in the GMA is likely to increase percolation through the clay layer.

Historically, groundwater flow was northwestward parallel to the San Joaquin River (Hotchkiss and Balding, 1971). The groundwater flow direction towards the San Joaquin River typically causes subsurface outflow laterally along the eastern boundary of the GMA. The hydraulic gradients west of the San Joaquin River are generally steeper than gradients east of the river (Phillips, et al., 1991). Typically, notwithstanding local influences, the water table west of the San Joaquin River can be thought of as a subdued replica of the ground surface topography, sloping gently toward the river from the Coast Ranges. More recent data shows flow tending northeastward, toward the San Joaquin River (DWR 2003). Potentiometric surface maps, developed from DWR water surface elevation measurements for wells screened in the unconfined aquifer, for the Spring of 2004 and Spring of 2008 show the general subsurface flow direction and gradients throughout the GMA during these periods (Figure 4 and Figure 5). The

flow directions appear to continue to be generally consistent with the northeasterly trend towards the San Joaquin River, as noted above, with some localized variations for well pumping depressions and various minor physiographic features that effect drainage and recharge.

The previous GMP (Stoddard & Associates, 1996) indicated that the average groundwater levels from 1986 through 1993 have declined in the subbasins, but from 1993 through 1994, water levels rose throughout the study area, demonstrating recovery in the groundwater storage system. That report concluded that the study area was in a hydrologically balanced condition over the study period.

As a part of this planning effort, changes in groundwater levels in the upper zone were examined over the 1993 to 2008 period. From Spring 1993 through Spring 1998, the groundwater levels continued to rise throughout most of the GMA (Figure 6). This pattern reversed during the Spring 1998 to Spring 2004 period (Figure 7). From Spring 2004 through Spring 2008, the groundwater levels recovered slightly throughout most of the GMA, with localized areas where water levels continued to decline west of the City of Newman, and northeast of Tracy (Figure 8). Longer-term trends in the groundwater levels can be observed in the figures showing change in groundwater levels from 1993 through 2008, and 1998 through 2008 (Figure 9 and Figure 10). Over these longer time frames the groundwater levels appeared to be generally hydrologically balanced across much of the GMA throughout the study period, with local areas of consistent decline persisting west of Newman and in the area of Tracy. The change in groundwater levels in the northern part of the subbasin (Tracy to Westley) appears to show a consistent decline in groundwater levels. This decline could be indicative of a developing overdraft condition in that area.

The groundwater levels underlying the vicinity of Patterson appeared to have minimal net change and appeared generally hydrologically balanced through the study period. The DWR groundwater database utilized a number of different wells for groundwater level measurements between 1993 and 2008 for the central part of the GMA (West Stanislaus ID and Patterson ID). Data from close-by monitoring wells was used to calculate groundwater level elevation changes when there was no other information available. For this reason, some actual local elevation changes may differ slightly from those depicted on the groundwater elevation change maps. The minimal apparent net change in groundwater level elevation seems to indicate equilibrium within the GMA between recharge and use during the study period. The change in groundwater levels in the southern part of the subbasin (West of Newman) also appears to show a consistent decline in groundwater levels. This decline could also be indicative of a developing overdraft condition in that area. However, further south in the Merced County portions of the GMA (West of Ingomar), the long-term change in groundwater levels appears to indicate this area is generally hydrologically balanced.

3.6 **Groundwater Quality**

Between March and July 1985, the United States Geologic Society (USGS) analyzed water samples from 44 wells in the northern part of western San Joaquin Valley (Dubrovsky, et al., 1991). The objective was to assess the geochemical relations and distribution of major ions and selected trace element concentrations in groundwater of the area. Their results indicate a relatively better quality of water in the confined zone than in the semiconfined zone. These results were supportive of those of Hotchkiss and Balding (1971). Concentrations of selected

constituents reported by USGS (Dubrovsky, et al., 1991) in both zones are provided in Table 3. It was concluded that the areal and vertical distributions of groundwater of varying quality has been affected by different agricultural and natural sources of recharge, and the sources and geochemical nature of the sediments are products of a depositional environment.

Table 3
Chemical Analysis of Selected Constituents in Groundwater

State Well No.	Sampling Date	Sulfate	TDS	N	Boron	As	Se
		Upper Zone					
		(mg/L)				(μg/L)	
2S/5E-13P1	3/28/85	320	1400	9.1	2.20	<1	4
3S/6E-07E1	3/11/85	230	1100	6.4	1.60	1	2
4S/7E-33B1	3/12/85	370	1400	0.1	0.90	3	10
5S/7E-01M2	5/01/85	120	750	18.0	0.58	<1	2
5S/8E-22C1	4/30/85	1200	2400	0.9	2.20	3	13
6S/8E-04P1	5/16/85	540	1300	15.0	0.51	<1	4
7S/8E-13N1	3/26/85	300	1900	11.0	0.64	<1	<1
8S/8E-01H1	3/27/85	120	750	11.0	0.48	<1	2

State Well No.	Sampling Date	Sulfate	TDS	N	Boron	As	Se
		Lower Zone					
		(mg/L)				(μg/L)	
2S/5E-21D1	3/27/85	220	650	2.3	1.30	1	3
2S/6E-20L2	5/21/85	140	510	<0.1	0.57	5	<1
3S/5E-20A2	3/28/85	330	920	1.4	3.00	<1	2
3S/6E-26Q1	3/12/85	120	710	5.6	0.79	<1	1
4S/6E-09M1	3/13/85	44	340	9.1	0.43	<1	2
4S/7E-36Q3	3/13/85	120	690	8.3	0.59	<1	1
5S/7E-27B1	5/16/85	190	760	16.0	1.20	1	5
5S/8E-32K3	4/30/85	530	1000	4.0	0.67	1	11
6S/7E-01R1	5/16/85	630	1300	9.6	0.86	1	6
6S/8E-03R2	5/16/85	360	820	6.4	0.41	2	8
7S/8E-27Q1	5/13/85	56	650	10.0	0.47	<1	<1

More recently USGS, in cooperation with DWR, has undertaken a comprehensive study of the groundwater resources within California called the Groundwater Ambient Monitoring and Assessment (GAMA) Program. The GAMA program collects groundwater data for numerous chemical constituents of the water from numerous wells throughout the various groundwater basins within the State. Currently, within the GMA only the initial study of the Northern San Joaquin Study Unit has been published (Faunt, C.C., ed., 2009). This Study Unit consists of four subbasins defined in Bulletin 118 including the Tracy subbasin in western San Joaquin County. The results of that study are presented in the attached Appendix A. The remainder of the GMA lies within the Western San Joaquin Valley Study Unit, which consist of the Delta Mendota subbasin and the Westside subbasin. Publication of initial study of the Western San Joaquin Valley Study Unit is pending and should be available later in 2011.

3.6.1 Hydrochemical Facies

Chemical analyses of groundwater from the semiconfined zone show considerable variation in water type and concentration of dissolved solids (Hotchkiss and Balding, 1971). In general, the chemical character of the water in the upper water bearing zone (except near Patterson and Crows Landing) is a transitional type, i.e., groundwater in which no single anion or cation reacting value amounts to 50 percent or more of the total reacting values. The transitional type groundwater in the GMA occurs in many combinations.

Groundwater near Tracy is very hard. Northwest of Tracy, in the vicinity of the Jones Pumping Plant, groundwater is a chloride type. The sodium chloride type groundwater in the area northwest of Tracy is probably due to infiltration of water from Old River. Old River water varies from transitional chloride bicarbonate to sodium chloride type (Hotchkiss and Balding, 1971).

Sulfate type groundwater occurs in areas located west of Patterson and Crows Landing. Near Patterson, groundwater is sodium magnesium sulfate type to the west and sodium calcium sulfate type to the east. Waring (1915) mentioned some small sulfur springs on Crow and Orestimba Creeks, indicative of sulfate bearing deposits that are probably responsible for the sulfate groundwater type in the area near Patterson (Hotchkiss and Balding, 1971).

3.6.2 Dissolved Solids

Results of the USGS sampling study showed that in the semi-confined zone the total dissolved solids (TDS) concentration ranges from 750 to 2,400 mg/L. Areal distribution of the data shows a high TDS concentration (>1,500 mg/L) in groundwater in the semiconfined zone measured near Patterson and west of Newman, and low concentration (<1,000 mg/L) is reported near the community of Westley. The TDS concentration in water in the confined zone generally ranged between 500 and 1,000 mg/L. Although high TDS concentrations (>1,000 mg/L) in water in the confined zone have been reported southwest of Patterson by the USGS, Patterson has reported TDS concentrations between 600 and 1,000 mg/L (Patterson, 2004). The distribution of TDS in groundwater in the two zones shows little similarity, with the deeper zone showing relatively low TDS, and shallower zone showing almost consistently high TDS.

3.6.3 Sulfate

Sulfate concentrations vary greatly in both water-bearing zones, but areal distribution is similar in both zones. Highest sulfate concentration in groundwater (>500 mg/L) is measured in an area centered near Crows Landing and Patterson. A similar area of high sulfate concentration was also reported by Hotchkiss and Balding (1971) and is likely related to the Coast Range streams that recharge this area (Hotchkiss and Balding, 1971). Smaller sulfate concentrations were reported in 2004 by Patterson, which detected concentrations in a range between 190 and 380 mg/L (Patterson, 2004). In 2004, Tracy reported groundwater sulfate concentrations between 160 and 330 mg/L (Tracy, 2004). The lowest concentrations of sulfate in groundwater (<100 mg/L) were measured in an area south of Vernalis. The similarity of sulfate concentrations in the GMA could result from the presence of similar sulfate concentrations in the streams that were the major source of recharge under natural conditions over a long period of time.

3.6.4 Boron

Concentrations of boron in groundwater range from 0.48 to 2.2 mg/L in the semiconfined zone and from 0.41 to 3.0 mg/L in the confined zone. Areal distribution of boron in the semiconfined zone shows high concentrations (>0.75 mg/L) near Tracy and northeast of Crows Landing near Patterson. The areal distribution of boron in the confined zone shows high boron concentrations (>0.75 mg/L) near Tracy, Vernalis and west of Patterson. This agrees with the results presented by Tracy (Tracy, 2004). The U.S. Environmental Protection Agency (EPA) suggested criterion for boron concentration in water used for long-term irrigation of sensitive crops is 0.75 mg/L. This limit was exceeded in four samples in the semiconfined zone and five samples in the confined zone (Table 3).

3.6.5 Arsenic

Recently, the federal primary drinking water standard maximum contaminant level (MCL) for arsenic was lowered from 50 µg/L to 10 µg/L. This change became effective for all states as of January 23, 2006, and California's revised arsenic MCL of 0.010 mg/L (equivalent to 10 micrograms per liter, µg/L) became effective on November 28, 2008 (DPH, 2008). Currently, the California standard is consistent with the federal standard. Arsenic is typically derived by dissolution of igneous parent materials, and released from iron and manganese oxides when pH declines. Based on the USGS study, arsenic concentrations in the groundwater samples from the semi-confined aquifer in the GMA vicinity ranged between 1 and 38 µg/L, which at that time were below the MCL (Dubrovsky, et al, 1991). Based on the USGS study, arsenic concentrations in the groundwater samples from the confined aquifer in the region ranged between 1 and 18 µg/L. Within the GMA the highest reported arsenic concentrations were 3 µg/L and 5 µg/L, respectively. In both aquifers, arsenic concentrations were reported that exceeded the current MCL in the vicinity of the GMA, but none within the GMA. The arsenic distribution between the groundwater in the semi-confined and confined aquifers showed little difference. However, the areal distribution showed an increase in arsenic concentrations in the GMA toward the southeast. The concentrations increased in the Sierran sediments. The increase is probably related to the higher proportion of Sierra sediments in the profile towards the southeast. In their respective water quality reports, Tracy reported arsenic concentrations as high as 3 µg/L, and Patterson reported arsenic concentrations as high as 6 µg/L, which are below the current MCL (Tracy, 2004; Patterson, 2004).

3.6.6 Selenium

Selenium concentrations in the GMA groundwater range from a less than detectable limit of 1 µg/L to 13 µg/L (Table 3). The current MCL for selenium in drinking water is 50 µg/L. The selenium MCL concentration was equaled or exceeded in two samples from the unconfined zone and in one sample from the confined zone. The concentration and areal distribution of selenium were similar in both zones. Selenium concentrations are relatively high (10 µg/L) in a narrow area of both zones between Patterson and Crows Landing. Lower concentrations (between 3 and 8 µg/L) were reported in 2004 by Patterson (Patterson, 2004). However, higher concentrations (non-detect to 10 µg/l) were reported in 2009, consistent with the range shown in Table 3 (Patterson, 2009). In the Tracy and Vernalis area, the selenium concentrations range between 1

μg/L to 5 μg/L. The USGS (Dubrovsky, et al., 1991) study concluded that selenium was transported to the area under natural conditions by runoff from the Coast Range.

3.6.7 Nitrate

The MCL for nitrate in drinking water is 45 mg/L. The USGS (Dubrovsky, et al., 1991) sampling study indicated that no well water in the GMA exceeds the MCL for nitrate. This agrees with the results presented by Tracy (Tracy, 2009). However, Dubrovsky et al (1991) mentioned that there were reports of nitrate MCL exceedance in shallow domestic wells. In general, higher nitrate concentrations in groundwater exist along the west side of the GMA and in the Westley area. The areas along the San Joaquin River have lower nitrate concentrations (Hotchkiss and Balding, 1971).

Within both the Tracy and Patterson areas, the quality of the municipal potable water supply is routinely monitored as required by State law. Historical data provided by Patterson for municipal supply wells shows a possible long term trend of increasing nitrate concentrations in some wells, Wells 4, 6 and 8, (Patterson, 2010). These wells tend to be located in the western portion of the distribution network for the City. Well No. 4 had to be removed from operation recently, in 2007, due to continued exceedance of the primary MCL. Upon entering service, nitrate concentrations in Well No. 4 were near the MCL and had remained marginal with water quality frequently at or near the MCL and a few occurrences where sample results had exceeded the MCL during this period of operation. All other wells in operation in Patterson remain viable and show no signs of an increasing trend in nitrate concentrations.

3.6.8 Trace Elements

The Deverel et al. (1984) study (reported by Dubrovsky, et al., 1991) states that the shallow groundwater, near the top of the semiconfined zone and less than 30-feet below the land surface, generally has higher trace element concentrations than the deeper zones. This study indicates that the higher trace element concentrations in the shallow groundwater might correlate with the generally higher TDS concentrations in the shallow groundwater. The higher concentrations probably result from leaching of soil salts and evaporative concentration of shallow groundwater near the land surface.

Because of the high variability of groundwater quality in the GMA, focused groundwater supply investigations are necessary to determine if groundwater is suitable for an intended use. Additionally, management practices must be designed and implemented to maintain or improve groundwater quality to meet the differing needs of the users within the GMA.

Section 4
Management Objectives

As it was stated before, typically, this regional program will rely on the PAs to develop the specific program components to meet management objectives that address local groundwater concerns while considering regional interests.

There are general objectives that should be considered for management of groundwater resources within the GMA:

- Assure an affordable groundwater supply for the long term needs of the users.
- Prevent long-term depletion of groundwater resources and maintain adequate groundwater supplies for all users.
- Maintain groundwater quality to meet the long-term needs of users.
- Attempt to reduce or prevent inelastic land subsidence due to groundwater overdraft.
- Maintain general continuity between groundwater management practices and activities undertaken by the PAs.

Section 5
Program Components Relating to Management

5.1 Components Relating to Groundwater Level Management

Groundwater level management is becoming more critical to protect against future problems related to groundwater overdraft. Overdraft is the condition of a groundwater basin in which the amount of water withdrawn by pumping over the long term exceeds the amount of water that recharges the basin (DWR, 2003). Overdraft can lead to shortages in supplies, increased extraction costs, land subsidence, water quality degradation, and environmental impacts. With increasing demands for water supply, the ability to accurately quantify and manage groundwater resources is imperative to maintaining a sustainable resource.

5.1.1 Reduction of Groundwater Use by Development of New Surface Water Supplies

Agencies buy water from out-of-basin sellers to supplement their supplies.

Activities within the GMA: Tracy is participating with the cities of Manteca, Lathrop, Escalon and the South San Joaquin Irrigation District in the South County Surface Water Supply Project (SCSWSP), which brings high quality Sierra Nevada water from the Stanislaus River to cities for their urban use. The project reduces the reliance on groundwater while satisfying urban demands. A water treatment plant on the Stanislaus River uses water that the irrigation district has conserved from improvements in irrigation practices and water use efficiencies. Water from South San Joaquin Irrigation District is conveyed through Woodward Reservoir, treated to drinking standards, and conveyed to Tracy. Water deliveries commenced in July 2005, and Tracy has been importing approximately 10,000 acre-feet of water a year through this source. During those years where CVP allocations are significantly lower than normal, the PAs purchase surface water from water suppliers north of the Delta in addition to using more of the local groundwater resource.

5.1.2 Increase Use of Available Surface Water Supplies

There are some in-basin water transfers and purchases from agencies to others with limited surface water rights and groundwater resources.

Activities within the GMA: Surface water is purchased by Tracy from West Side Irrigation District and Banta Carbona Irrigation District. Tracy has developed agreements with Byron-Bethany Irrigation District to purchase additional water in the future from their CVP water supply for Tracy's municipal and industrial uses.

5.1.3 Development of Overdraft Mitigation Programs

According to the DWR definition, overdraft occurs when continuation of present water management practices would probably result in significant adverse overdraft related impact upon

environmental, social, or economic conditions at a local, regional, or state level. Long-term depletion of storage can cause several problems, including land subsidence, degradation of groundwater quality, and increased pumping costs.

Although overdraft of the entire basin is not occurring, conditions of localized overdraft could happen, since areas of extraction do not typically coincide with areas of recharge. One portion of the GMA can experience an increase in groundwater storage while another shows a continual decrease. Such localized overdraft can cause the same adverse impact as basin-wide overdraft, except on a smaller scale. Monitoring of groundwater levels and water quality is necessary to identify areas where localized overdraft is occurring, and to evaluate its effect. The monitoring will allow the overdraft to be quantified, which is needed to evaluate means to control or reverse the overdraft. Curtailing local overdraft usually requires increasing or redistribution of basin surface water supplies or reducing the amount of groundwater pumped.

The prerequisite to implementation of an overdraft mitigation program is to monitor groundwater levels. Once groundwater trends are known, a responsive overdraft investigation program should be developed around the following components:

- Identify areas of overdraft.
- Determine the potential for significant adverse impact due to the overdraft.
- Formulate a plan to mitigate the impact and a strategy for plan implementation.

<u>Activities within the GMA</u>:

a. Activities in the GMA to address overdraft mitigation programs include those programs described in 5.1.1 and 5.1.2 above.

b. Del Puerto Water District has implemented policies to restrict the pumping and transfer of groundwater outside the area where the pumping occurs, and to restrict pumping for transfer where such groundwater extraction may damage adjacent land owners or cause overdraft conditions to develop.

c. SLDMWA through USBR has contracted the USGS to modify the USGS Central Valley Hydrologic Model (CVHM) to provide a potential for increased resolution in the model within the GMA, as well as other areas serviced by SLDMWA. It is intended that this higher resolution CVHM will be accessible to PAs to employ in evaluating the potential for changing groundwater conditions under selected potential water management schemes.

d. Increased groundwater monitoring within the GMA

5.1.4 Development of Conjunctive Use Programs and Projects

Conjunctive use of groundwater and surface water typically occurs when the surface water supply varies from year to year and is insufficient at times to meet an area's demand. In some years, the surface water supply is greater than the water demand; and in other years, the surface water supply cannot meet the entire water demand. In the years when water is plentiful, water available above the demand is utilized to recharge the groundwater aquifer. Recharge can occur

either directly by operation of recharge facilities or injection wells, or indirectly, by applying surface water where available to areas to avoid the pumping and use of groundwater. In effect, the groundwater basin is utilized as a storage reservoir, and water is placed in the reservoir during wet periods and withdrawn from the reservoir during dry periods.

There are opportunities for conjunctive use in the study area that could increase overall water supply yield; however, each must be evaluated in terms of available water supply, basin geology, available storage capacity, pumping zones, and recharge potential to determine yield, costs, and potential adverse impacts. In the GMA, pumping takes place primarily from the confined zone, while unoccupied aquifer storage is currently available only in the unconfined zone. Based on the basin characteristics, water supply sources, and current groundwater usage, potential conjunctive use opportunities should focus on the following:

- Identifying areas of local overdraft and evaluating the viability of a recharge program using direct recharge.
- Evaluating the availability of additional surface water supplies, which could be utilized in conjunctive use programs either directly or via exchange of CVP supplies.
- Optimizing the overall groundwater yields during dry periods through sound basin management.

In recent history in the GMA, conjunctive use has been practiced in an unmanaged fashion. When full CVP water supplies are being received, relatively little pumping occurs and recharge occurs through seepage and deep percolation of surface water. During water short periods, water is withdrawn from the aquifer to make up for the deficits in surface water supply. Increased pumping due to chronic surface water shortages are causing more emphasis to be placed on locating water supplies for groundwater recharge.

Activities within the GMA: Patterson Irrigation District pumps groundwater on an as needed basis. The District has focused its efforts on improving surface water delivery and pumping efficiencies by recycling surface drainage as opposed to limiting canal seepage. Deep percolation of irrigation water and distribution system seepage losses, recharge the groundwater. The stored groundwater supply is available to the District and others during drought conditions. Such recharge is an important component to the District's water management strategy (Patterson ID, 2005).DWR has implemented, through its Conjunctive Water Management Program (CWMP), several integrated programs to improve the management of groundwater resources in California. The program emphasis is on forming partnerships with local agencies and stakeholders to share technical data and costs for planning and developing locally controlled and managed conjunctive water use projects. DWR and SJCFCWCD entered into a Memorandum of Understanding to cooperatively develop a CWMP, establish an advisory committee representative of all water stakeholders, and complete a basin management evaluation (DWR, 2006).

Tracy has acquired permits from the Central Valley Regional Water Quality Control Board (RWQCB) to proceed with an Aquifer Storage and Recovery (ASR) program. The ASR program will utilize the local groundwater aquifer for long term water storage of available surface water, as a way to increase the reliability of Tracy's water supply. They have received authorization to proceed with pilot testing and have proceeded through the 3rd cycle of a 4-cycle

pilot testing program. The proposed project would consist of injecting surface water treated to drinking water standards into the aquifer via deep wells during times of surplus water and recovery of the water from the aquifer to optimize delivered water quality and meet demands during droughts or when emergency or disaster scenarios preclude the use of imported water supplies. Tracy anticipates that the ASR program will be capable of storing approximately 9,000 af of high-quality surface water allowing for on average 3,000 af of stored water to be available in drought years, thereby increasing the reliability of Tracy's water supply and closing the potential future gap between supply and demand during drought or emergency conditions through 2025 (EKI, 2005).

Tracy is also studying the possibility of procuring surface water storage to increase water supply reliability. Tracy is evaluating the potential to buy water storage capacity in the Semitropic Water Banking Project (Semitropic) in Kern County. To store water in Semitropic, Tracy would transfer a portion of its CVP water from the DMC through the California Aqueduct for delivery to Semitropic. During a drought, Semitropic would pump the stored water into the California Aqueduct and a like amount of water would be made available to Tracy to pump from the DMC. Tracy negotiated with Semitropic to purchase up to 10,500 af of storage volume. If this storage were filled, it would provide Tracy with up to 3,500 af of water annually for three years during water short periods (EKI, 2005).

Patterson is in the process of updating its General Plan and has prepared a Final Environmental Impact Report (FEIR) on the update (Patterson, 2010). This FEIR includes new policies oriented towards implementing conjunctive use of recycled water and imported surface water supplies to augment the City's supplies through application to landscape irrigation and other non-potable municipal uses providing "in-lieu" groundwater recharge.

5.1.5 Development of Agricultural and Urban Incentive Based Conservation

Increasing water use efficiency, either urban or agricultural, should be an important component of the long-term planning and management of water resources. It makes prudent use of the available supplies, helps compensate chronic reductions in supply from competing demands and in some cases may reduce the need for developing new water supplies.

The experience of active urban water conservation programs in California is that the potential for water savings are initially about 10 to 20 percent of the volume of water used. Such programs typically include distribution system leak-reduction programs, household metering, tiered pricing to discourage inefficient use, education of the public on water savings measures and market-enforced transition to water-saving household plumbing devices.

The greatest potential for agricultural water conservation relies mainly on the use of more efficient irrigation technologies and irrigation scheduling based on crop water needs. Increasing irrigation efficiency decreases the amount of water that is lost to the system or leaves the site through surface water runoff or deep percolation to groundwater.

In November 2009, SBx7-7 was enacted. It requires all water suppliers to increase water use efficiency and utilize a single standardized water use reporting form, which would be used by both urban and agricultural water agencies. It sets a goal for urban water users of reducing per capita urban water use by 20% by December 31, 2020. Agricultural water suppliers must

prepare and adopt agricultural water management plans by December 31, 2012, updating those plans by December 31, 2015 and every 5 years thereafter. In addition, On or before July 31, 2012, agricultural water suppliers shall:

- Measure the volume of water delivered to customers. The Department of Water Resources shall adopt regulations that provide for a range of options that agricultural water suppliers may use to comply with the measurement requirement.
- Adopt a pricing structure for water customers based at least in part on quantity delivered.
- Implement additional efficient management practices.

CVP contractors that maintain and regularly update the water management plans required by federal law and regulations comply with these requirements. Agencies that fail to comply with SBx7-7 would be ineligible for State Water funds.

Activities within the GMA:

a. Tracy developed a Water Conservation Plan in 2000. This plan was subsequently updated in 2009 and is currently under review by the United States Bureau of Reclamation for approval. The conservation efforts include implementation of the California Urban Water Conservation Council's (CUWCC) 14 Best Management Practices (BMPs). The BMPs include residential water surveys, system water audits and leak detection, water pricing to encourage conservation, waste prohibitions, public information, landscape guidelines, etc.

An update of the Urban Water Management Plan (UWMP) for Tracy was prepared in 2005 to fulfill the UWMP Act requirements. This UWMP describes how Tracy intends to manage its current and future water resources and demands to continue to provide its customers with an adequate and reliable water supply. This updated UWMP reflects changes to the Tracy's water supply portfolio and water demands since 2000 (EKI, 2005). Currently, a new update of the UWMP is scheduled for 2011.

The PAs that utilize agricultural water supplies of CVP water have completed agricultural water management plans and periodically update the plans pursuant to the Reclamation Reform Act of 1982 and the Central Valley Project Improvement Act (CVPIA). In these plans, water conservation practices have been identified and instituted to maximize beneficial use of the water supply. Practices include better irrigation management, physical improvements, and institutional adjustments. Irrigation management practices include on-farm water management and district water accounting, use of efficient irrigation methods, and on-farm irrigation system evaluations. Physical improvements include lining of canals, replacement of unlined ditches with pipeline conveyance systems, and improvement of on-farm irrigation and drainage technology. Institutional adjustments include improvements in communication and cooperative work among districts, water users, and state and federal agencies, increased conjunctive use of groundwater and surface water, and facilitating the financing of on-farm capital improvements. Other practices that have been instituted include installation of flow measuring devices, modification of distribution facilities to increase the flexibility of water deliveries, and changes in the water fee structure to provide incentive for more efficient use of water. The water management plans have helped the districts identify and implement policies and projects for better irrigation water

utilization. Compliance with CVPIA water management plans will also be compliant with SBx7-7 requirements.

PAs with discharges from irrigation are also subject to the Irrigated Lands Regulatory Program. While the original Program focused on surface water supplies, and implementation of best management practices to address surface runoff may have positive or negative implications for groundwater quality. Also, the ILRP long-term program requirements will include monitoring and BMP's for discharges to groundwater as well.

5.1.6 Replenishment of Groundwater Extracted by Water Producers

The hydrologic balance included in the previous GMP, suggests that lowering the groundwater levels increases sustainable yield, since subsurface outflow is reduced which counteracts the water extracted. More data and analysis is needed to confirm this finding and to determine the level of pumping that can be sustained without overdraft. As urban areas develop and there is a corresponding shift from surface water use to groundwater use, groundwater use increases and aquifer recharge decreases. Judging by the water resources balance, the GMA should be able to absorb the increased extraction due to increasing urban demand and maintain a balance. However, localized overdraft conditions could develop due to changes in surface water delivery, concentrated groundwater pumping, and water quality changes. The natural response of the aquifer to limited increases in pumping can provide for some replenishment.

Activities within the GMA:

a. The Patterson General Plan update FEIR includes proposed policies to identify and locate opportunities for proposed groundwater recharge facilities in a joint effort with other local agencies, and to import or otherwise supply surface water to recharge local groundwater supplies.

b. The Tracy ASR program will be injecting surface water into the groundwater aquifer to replenish storage depleted during drought periods, as discussed above in section 5.1.4.

5.2 Components Relating to Groundwater Quality Management

Groundwater quality management is critical to protect against the degradation that could adversely impact beneficial uses of available groundwater resources. Municipal, agricultural, and industrial activities can all increase the risk of polluting groundwater resources. Pollutants from these activities can find their way into the local aquifers degrading the water quality such that it becomes unusable for some beneficial uses without substantial treatment and cost. Some sources of pollution are natural. Through disruption in the existing barriers these low quality resources can intrude into higher quality groundwater resources, degrading the groundwater quality. Other sources are derived from anthropogenic applications and byproducts of human activities and waste. Degradation of groundwater resources can lead to expensive water treatment or loss of beneficial uses. The beneficial uses of groundwater resources may be sustained through proper monitoring and management of the resources and potential sources of degradation.

5.2.1 Regulation of the Migration of Contaminated Groundwater

Contaminants addressed in this section are those that result from improper application, storage or disposal of petroleum products, solvents, pesticides, fertilizers and other chemicals used by industry, and are distinguished from salinity degradation.

Activities within the GMA:

a. The RWQCB has primary responsibility in enforcing water quality regulations, in the respective counties.

b. By acting as the regional monitoring coordinator the SLDMWA will help develop a better understanding of the regional hydrogeology of the GMA, the vertical and lateral groundwater flow directions, and groundwater quality based on the various groundwater monitoring activities supporting this program. By distributing information and through coordination sessions, the SLDMWA will be able to make the PAs aware of changes in groundwater quality, which may indicate that new sources of contamination or changes in existing plumes of contamination are occurring.

c. The San Joaquin County Environmental Health Department (SJCEHD) carries out different management programs. The purpose of the "Underground Injection Control" program is to protect public health and the environment from exposure to contaminants that may exist in shallow underground injection wells, such as dry wells, seepage pits, sumps, etc. These injection wells can transport contaminants to soil and groundwater. The primary focus is the protection of groundwater from contamination. Activities include identifying, mapping, inspecting and remediating potential or existing contaminant sources. The SJCEHD also permits and inspects well installation and destruction to minimize the potential for the wells to adversely impact groundwater.

The Underground Storage Tanks (UST) program was developed by SJCEHD to protect public health and the environment from exposure to hazardous materials stored in USTs. The primary focus is the protection of groundwater from contamination. Activities include inspection, permitting, monitoring, repair, installation and removal of USTs. UST sites with identified contamination are referred to the SJCEHD Site Mitigation Unit for cleanup oversight.

SJCEHD is also responsible for a Site Mitigation Database, which contains information about all the known hazardous material contamination sites within San Joaquin County. The database was established in 1993, although it includes information as far back as 1985. It is available to the public.

The Stanislaus County Department of Environmental Resources, Hazardous Material Division has an UST program. The goal of the program is to protect public health, the environment and groundwater. UST inspectors make certain that businesses and facilities with ongoing UST operations are properly permitted and meet the monitoring requirements applicable to their type of equipment. The UST Program and the Site Assessment and Mitigation Program oversee UST removal and soil clean-up activities. The primary function of the Site Assessment and Mitigation Program in UST removal activities is to provide regulatory oversight for the site assessment and mitigation of properties where unauthorized releases from UST systems have occurred.

The SWRCB developed a UST program which purpose is to protect public health and safety and the environment from releases of petroleum and other hazardous substances from tanks. By 2005, there were approximately 2,650 open UST cases in the Central Valley Region. There are four program elements: leak prevention program (requirements for tank installation, construction, testing, leak detection, spill containment and overfill protection), cleanup of leaking tanks, enforcement, and tank tester licensing. In addition, there is a database and geographic information system (GIS), Geo Tracker, which provides online access to environmental data (http://www.geotracker.waterboards.ca.gov/). It tracks regulatory data about underground fuel tanks and public drinking water wells, as well as other types of sites, such as above ground storage tanks and site cleanup cases (SWRCB, 2006).

Under the Pesticide Contamination Prevention act of 1985, the California Department of Pesticide Regulation (DPR) maintains a Ground Water Protection Program (DPR, 2011). Through the Ground Water Protection Program DPR evaluates risk and monitors for pesticide contamination in groundwater, identifies sensitive areas, and develops mitigation measures to prevent further contamination. DPR adopts regulations to protect groundwater as part of the Ground Water Protection Program.

The agricultural PA's are also subject to the RWQCB's Irrigated Lands Regulatory Program which is expected to require a groundwater monitoring program for specified constituents under general orders for waste discharge requirements. To the extent the PA's participate in the ILRP through a watershed coalition, the watershed coalition will be the primary venue for regional coordination, and PA's will need to coordinate their participation in both programs.

5.2.2 Development of Saline Water Intrusion Control Programs

Groundwater quality within an aquifer can be permanently degraded if saline groundwater migrates into the aquifer. Such degradation has the potential to render the groundwater unsuitable for some uses, particularly potable water use, if not treated. Desalination treatment systems are very expensive. In the GMA, saline water intrusion does not occur from an ocean or saltwater body.

5.2.3 Identification and Management of Wellhead Protection Areas and Recharge Areas

The Federal Wellhead Protection Program established by Section 1428 of the Safe Drinking Water Act (SDWA) Amendments of 1986 was designed to protect groundwater resources of public drinking water from contamination and to minimize the need for costly treatment to meet drinking water standards. A Wellhead Protection Area, as defined by the 1986 Amendments, is *"the surface and subsurface area surrounding a water well or well field supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water or well field."* In 1996, Congress reauthorized SDWA and amended it to require each state to develop and implement a Source Water Assessment Program.

In response to the 1996 re-authorization of the SDWA, Section 11672.60 amended to the California Health and Safety Code. Section 11672.60 requires the Department of Public Health Services (DHS, the precursor to DPH) to develop and implement a program to protect sources of drinking water, specifying that the program must include both a source water assessment

program and a wellhead protection program. In conformance with the legal mandate, the California's Drinking Water Source Assessment and Protection (DWSAP) Program was developed (DPH, 1999). The DWSAP Program addresses both groundwater and surface water sources.

In November 1999, the United States Environmental Protection Agency (USEPA) gave final approval of the DWSAP Program as California's Source Water Assessment and Protection program. The Department of Public Health (DPH) Division of Drinking Water and Environmental Management is the lead agency for development of the DWSAP Program and its implementation. California did not developed a separate Wellhead Protection program, thus the groundwater portion of the DWSAP serves as the State's Wellhead Protection program. In January 1999, USEPA approved the DWSAP as California's wellhead protection program.

According to the California Water Plan Update 2009 (DWR, 2009), recharge area protection includes keeping groundwater recharge areas from being paved over or otherwise developed and guarding the recharge areas so they do not become contaminated. Protection of recharge areas, whether natural or man-made, is necessary if the quantity and quality of groundwater in the aquifer are to be maintained. Existing and potential recharge areas must be protected so that they remain functional and they are not contaminated with chemical or microbial constituents. Zoning can play a major role in recharge area protection by regulating land-use practices so that existing recharge sites are retained as recharge areas.

In the GMA, an important source of groundwater recharge is derived from percolation of surface water as well as a small component of rainfall. In some cases pollutants associated with the percolating water can be transported from the surface into the underlying aquifer. The discharge of wastewater to land or surface water conveyance systems could, if improperly managed, pose a risk of polluting groundwater resources. The RWQCB has jurisdiction to regulate such discharges.

Activities within the GMA: Through programs administered by a variety of State agencies, the State of California regulates waste disposal. The PAs will rely on continued regulation by the State; however, currently, both Tracy and Patterson routinely monitor water quality from local groundwater productions wells that supply potable water. Furthermore, to the extent parties subject to such permits request information from the PA's, require permission from a PA or are otherwise called to the PA's attention, PA's may advise the dischargers of the importance of protecting the groundwater resource and/or request notice and participate in the public comment opportunities of the agency with permit jurisdiction.

5.2.4 Administration of Well Abandonment and Well Destruction Program

State regulations require that all unused wells be properly abandoned or destroyed so that they do not act as conduits for mixing of groundwater of differing quality. Non-pumped wells are a much greater threat than pumped wells, since pumping normally quickly removes contaminants that may have migrated during idle periods. In gravel packed wells, the gravel pack as well as the casing itself can act as a conduit for mixing and potential contamination.

Permits are required from the local responsible jurisdiction, county or city, for abandonment of wells within their jurisdiction.

Activities within the GMA: The cities within the GMA defer this responsibility within their jurisdiction to the county health departments for well abandonment and destruction permitting. For public water supply wells, additional requirements may be prescribed by the DPH. Permit fees are normally required. The agricultural PAs rely on continued administration of the well abandonment and destruction program by the permitting agencies. The PAs' role in well abandonment and destruction is to provide available groundwater data, assist in identifying locations of operating and abandoned wells, and advise well owners why proper well destruction is important for protection of water quality.

5.2.5 Well Construction

Improperly constructed wells can establish pathways for pollutants to enter from surface drainage and can cause mixing of water between aquifers of differing quality. Sections 13700 through 13806 of the California Water Code require proper construction of wells. The standards of well construction are specified in DWR Bulletins 74-81 and 74-90 (DWR, 1981 and DWR, 1991).

The local jurisdictions, counties and cities, within the GMA have the fiduciary responsibility to enforce well construction standards within their jurisdictions. Well construction permits are required to drill a new well or to modify an existing well. Well Driller's Reports must be filed with the DWR and the respective counties.

Typically, it is the responsibility of the respective environmental health divisions of San Joaquin, Stanislaus and Merced Counties to permit and enforce standards for construction and abandonment of wells within their respective jurisdictions. The counties maintain records on these permitted wells as well as DWR. These data are publicly available and should be collected to incorporate into regional studies and monitoring programs, and may be supplemented with data on water levels and groundwater quality collected by other agencies to identify locations susceptible to intermixing of aquifer zones of varying water quality.

A better understanding of the subsurface geology and water quality is needed to define the confining beds between aquifer zones of differing water quality. Site-specific hydrogeologic investigations should be conducted to support well designs and should be submitted with the proposed well designs to obtain the well drilling permit.

Activities within the GMA: The cities within the GMA defer this responsibility within their jurisdiction to the county health departments for well construction permitting. Merced and Stanislaus Counties have adopted the DWR California Well Standards. San Joaquin County has developed its own standards that are slightly more rigorous than the DWR standards. The authority over well construction remains with the respective counties. The PAs may obtain information from the counties, such as copies of well permits, logs, and studies to assist in their groundwater management activities

5.2.6 Review of Land Use Plans to Assess Risk of Groundwater Contamination

Land use planning is used by counties and cities for regulation of land uses within their boundary or sphere of influence to create a quality of life and to achieve compatibility between man's

activities and the environment. It is a very effective method to mitigate impacts of changes in land use on groundwater quantity and quality.

Policies set forth in county general plans, city general plans, and community specific plans that affect groundwater may include:

- Regulating growth in groundwater recharge areas to protect water quality;
- Regulating development to improve water quality from storm water runoff and improve groundwater recharge opportunities;
- Monitoring water quality and groundwater levels;
- Providing planning for proper disposal of solid waste, sanitary waste, storm runoff, and hazardous wastes generated by the community;
- Restrictions to projected growth based on water consumption relative to available water supplies; and
- Mitigating the impacts of reduction in surface water supply resulting from conversion of land from agricultural use to urban use.

To achieve the common goals between the various land use plans and this GMP, close coordination between agencies is needed. During periodic land use plan preparation and updates, cities or counties should consult with the appropriate PAs to avail themselves of the latest information on hydrogeologic conditions that may be affected by proposed activities, so that appropriate mitigation measures can be included in the plans to avoid significant adverse impacts to local water resources. Proposed land use plans and supporting environmental documentation should be reviewed and commented upon by the PAs.

Activities within the GMA: Currently, The City of Patterson has proposed Low Impact Development policies as part of their General Plan update that should be followed during the planning process of development.

5.2.7 Construction and Operation of Groundwater Management Facilities

Groundwater management plans can include projects that protect the quality of groundwater and assure that the quantity of groundwater in storage is managed to meet long-term demand. The facilities that can aid in efficient management of groundwater resources include groundwater contamination clean-up projects, groundwater recharge projects, water recycling projects, and groundwater extraction projects. As knowledge is gained through implementation of the GMP components, specific projects may be identified and evaluated. The individual PAs are responsible for the development and implementation of those projects.

Activities within the GMA:

a. Tracy developed a regional groundwater management plan to refine and address their specific needs and define projects to sustain the groundwater resources beyond those identified in this Basin-wide GMP.

b. SLDMWA is in the process of developing a basin-wide groundwater monitoring plan that will include a groundwater monitoring network that will be developed following approval by DWR. This monitoring will assist the PAs in identifying projects to manage the groundwater resources.

c. The City of Patterson has included programs in their water supply planning and policy documents to increase local groundwater recharge and protect groundwater quality.

5.3 Components Relating to Inelastic Land Surface Subsidence

Reducing the amount of groundwater in storage by pumping can cause the dewatering of fine-grained geological formations, potentially resulting in land subsidence and a reduction in the storage capacity of the aquifer.

The management of the land subsidence would include monitoring and prevention programs. Management of land surface subsidence should contain the following elements:

- Establish a subsidence monitoring program. Benchmarks should be established at well locations, so it would be possible to relate the subsidence to groundwater levels and extractions.
- Identify areas where monitoring suggests land subsidence.
- Identify groundwater management strategies that may be employed to minimize the subsidence.

Activities within the GMA: Tracy established a subsidence-monitoring program in 2003. Benchmarks were established near each of the City's monitoring wells. A benchmark level survey is performed in the spring periodically by using a Global Positioning System (GPS) initially calibrated with precise differential level surveys. The results of the Monitoring Program are presented in semiannual reports.

5.4 Components Relating to Surface Water Quality and Flow

SB 1938 requires the inclusion of components relating to the management of changes in surface flow and water quality that directly affect groundwater levels or quality or are caused by groundwater pumping. Specific actions may include:

- Use of surface water supplies when available in a recharge program or conjunctive use program that is sensitive to downstream users and the environment;
- Avoidance or mitigation of projects that detrimentally affect surface water quality and flow;
- Increase understanding of the interaction between surface water quality and groundwater quality through the GMA monitoring programs.

Activities within the GMA: The current and planned actions within the GMA related to recharge and conjunctive use are detailed in previous sections. Monitoring programs are being expanded through the SLDMWA basin-wide monitoring plan and network and also through the collection of information required under the ILRP.

Section 6
Groundwater Monitoring Programs and Plans

6.1 Groundwater Monitoring Programs

The purposes of a groundwater monitoring program are to identify areas of overdraft, provide information that will allow computation of changes in groundwater storage to evaluate net recharge or depletion, and identify the areas and extent of water quality degradation for potential mitigation. Groundwater level monitoring is essential to understand the impact on aquifer storage due to changes in water inflow and outflow components and in pumping activities. Mapping of groundwater levels depicts the direction of groundwater movement and the hydraulic gradient necessary for quantifying groundwater inflow and outflow to the GMA. Monitoring and mapping should be done independently in the unconfined and confined zones.

On behalf of the PAs, SLDMWA plans to take on the role as the groundwater Monitoring Entity within the GMA, in accordance with the requirements set forth in SBx7-6. As of January 2011, SLDMWA notified DWR that they are planning to assume the responsibility for the groundwater Monitoring Function within the GMA. Additionally, SLDMWA is preparing a groundwater monitoring plan, assuming this role as an Umbrella Monitoring Entity in a collaborative effort with USBR and the PAs. This plan will describe the proposed groundwater monitoring program in detail. It is anticipated that this plan will be submitted to DWR by the summer of 2011 for review and approval, and Monitoring Functions within the GMA undertaken by the PAs with SLDMWA as the lead entity on or before January 2012. The proposed monitoring program would rely on the collaboration with the PAs to perform any necessary measurements and collect groundwater elevation data for regular submittals to DWR, at a minimum annually. As an Umbrella Monitoring Entity, SLDMWA will collect and compile the water level data gathered by the PAs for submittal to DWR. The proposed groundwater monitoring plan will describe:

- A program for collaborating with and coordinating the efforts amongst the PAs to monitor groundwater levels within the GMA;
- Standard procedures and methods for the measurement and collection, quality assurance, and documentation of field data;
- A DWR approved monitoring network comprised of monitoring wells selected to be representative of the groundwater conditions throughout the GMA, including a map of the proposed monitoring locations;
- A monitoring schedule that is coordinated amongst the PAs and approved by DWR that facilitates evaluation of seasonal and long-term trends in groundwater levels;
- Standard protocols for the gathering and coordination of data from the PAs and other agencies, as applicable, like DWR, USGS, DPH, San Joaquin County, Stanislaus County, and Merced County;
- Standard procedures for reporting results and findings to the PAs for evaluation; and,
- Standard protocols for data transmittal from the SLDMWA to DWR.

As part of this groundwater monitoring plan, groundwater levels will be reviewed by the PAs. An annual report will be prepared that describes the groundwater monitoring results, and evaluates developing trends and the condition of the aquifer. Based on the information presented in the annual report, the PAs, through a steering committee, will determine if additional activities are warranted. Some details regarding the sources of groundwater data from within the GMA are identified below.

DWR

In the past, DWR measured groundwater levels in wells and maintained a database of the groundwater measurements statewide. Currently, DWR maintains publicly available statewide groundwater level data at the Department's Groundwater Level Database website (http://www.water.ca.gov/waterdatalibrary/). This site provides a graphical interface that allows selection of individual wells from a local area map. Data can also be retrieved by specifying the groundwater basin or township of interest. A selected well will return a groundwater level hydrograph and data table including the depth to water below reference point, elevation of water surface and depth to water below land surface. This site currently maintains groundwater level information for nearly 18,000 wells within the San Joaquin District boundary and about 60,000 wells statewide.

With the passage of SBx7-6, DWR will be relying on local entities to take on the responsibility of measuring groundwater levels within basins in conformance with a DWR approved monitoring plan and schedule, and submitting the data to DWR. The data will be uploaded to a DWR database in conformance with DWR protocols. Therefore, the number of groundwater monitoring locations, and continuity with previous locations may change as the monitoring responsibility transitions from DWR to local monitoring entities, and new monitoring networks and schedules are established. Information regarding the SBx7-6 requirements may be obtained through the DWR at the California Statewide Groundwater Elevation Monitoring (CASGEM) website (http://www.water.ca.gov/groundwater/casgem/).

USGS

USGS maintains the Ground-Water Data for the Nation database, which contains groundwater site inventory, groundwater level data, and water quality data (http://waterdata.usgs.gov/nwis/gw). The groundwater site inventory consists of more than 850,000 records of wells, springs, test holes, tunnels, drains, and excavations in the United States. Available site descriptive information includes well location information such as latitude and longitude, well depth, and aquifer. The USGS annually monitors groundwater levels in thousands of wells in the United States. Groundwater level data are collected and stored either as discrete groundwater level measurements or as continuous record. The data available for this GMA has not been updated.

USGS, in concert with other State and Federal agencies, developed and maintains a hydrologic model of the Central Valley of California. The CVHM is a MODFLOW model developed from a comprehensive geospatial database of numerous features of the heterogeneous Central Valley aquifer system. According to USGS, CVHM will be operated by USGS and made available for use by water managers and other agencies. It was designed to help resource agencies assess, understand and address the many issues affecting the use of surface water and groundwater supplies in the Central Valley. It is intended to aid water managers by simulating a number of

water-management scenarios and assess possible changes in both groundwater and surface water supplies on a regional scale. CVHM generally has a resolution of about 1 mile spacing between nodes. However, at the request of SLDMWA through USBR, CVHM resolution is being increased by USGS to approximately ¼ mile spacing between nodes within the areas serviced by SLDMWA, including the GMA. This improvement to the CVHM, within the SLDMWA Service Area, was requested to aid in modeling of potential subsidence from water withdrawal and to assist PAs with alternatives impact analyses for local project decision-making through groundwater modeling. The model can take into account a number of hydrologic factors including the conversion of farmland to urban use, groundwater recharge and extractions, and the effects of climate change. Limitations on the application of CVHM due to the scale used in calibration may be encountered in some smaller applications by water managers. Upon request, USGS can incorporate additional data into the CVHM to refine the input parameters and calibration, thus providing improved accuracy and precision, within a specified region. Information regarding the CHVM may be obtained through USGS (Contact: Claudia Faunt, Phone: 619-225-6142; ccfaunt@usgs.gov).

SWRCB – USGS – Lawrence Livermore National Laboratory (LLNL)

The SWRCB is collaborating with the USGS and the LLNL to implement the GAMA Program. The GAMA Program is a statewide comprehensive groundwater quality monitoring program, developed in response to the Groundwater Quality Monitoring Act of 2001 (Water Code sec.10780-10782.3). The goals are to improve statewide groundwater monitoring, and facilitate the availability of information about groundwater quality to the public. The data collected will provide an indication of potential water quality problems. It will also be used to identify the natural and human factors affecting groundwater quality. Prior to 2003, the GAMA Program conducted the California Aquifer Susceptibility (CAS) Assessment. The CAS Assessment addressed the relative susceptibility to contamination of public wells. This effort was the foundation for the GAMA Program. The GAMA Program also addresses the quality of private/domestic drinking water wells through the Voluntary Domestic Well Assessment Project.

As part of the GAMA Program, the groundwater basins in California were ranked in groups of sampling priority on the basis of the number of public wells, groundwater usage, and potential sources of groundwater contamination in each basin. Three types of water quality assessments were conducted for each unit:

1. The assessment of current groundwater quality.
2. The detection of changes in water quality.
3. The assessment of natural and human factors that affect groundwater quality.

To efficiently facilitate a statewide, comprehensive program most efficiently, uniform and consistent study-design and data-collection protocols were applied to the entire state.

There are four currently active components of the GAMA Project:

1. GeoTracker GAMA: GeoTracker GAMA is a program to develop and implement a user-friendly internet accessible to georeferenced groundwater database. Data are searchable by text or through an interactive map for groundwater constituents, location and other parameters. The database includes over 150,000 sampling locations. GeoTracker

GAMA provides tools to integrate, standardize, and analyze data from several datasets, including data from:

- California State Water Resources Control Board (SWRCB)
- California Regional Water Quality Control Boards (RWQCB)
- California Department of Public Health (DPH)
- California Department of Pesticide Regulation (DPR)
- California Department of Water Resources (DWR)
- United States Geological Survey (USGS)
- Lawrence Livermore National Laboratory (LLNL)

More information about this program is available through SWRCB (http://www.waterboards.ca.gov/gama/geotracker_gama.shtml#).

2. Priority Basin Project: The GAMA Priority Basin Project assesses groundwater quality in key groundwater basins in the State. Groundwater is monitored for hundreds of chemicals at low detection limits, including emerging contaminants such as pharmaceuticals and personal care products. The GAMA Priority Basins consist of 116 of the 472 DWR defined groundwater basins in the State. The GAMA Priority Basin Project is grouped into 36 groundwater basin groups called "study units". Each study unit is sampled for common contaminants regulated by the DPH, and also for unregulated chemicals. Some of the chemical constituents that are sampled by the GAMA Priority Basin Project include: volatile organic compounds (VOCs); pesticides; Stable isotopes of oxygen, hydrogen, and carbon; emerging contaminants; trace metals; radioactivity; general ions; nutrients; and bacteria. Monitoring and assessments for priority groundwater basins is on-going and will be completed every ten years, with trend monitoring every 3 years. Initial testing of and reporting on the groundwater quality is being conducted currently. More information about this program is available through SWRCB (http://www.waterboards.ca.gov/gama/priority_basin_projects.shtml).

3. Domestic Well Project: The GAMA Domestic Well Project collects and tests samples from private domestic water supply wells, whose owners have volunteered for the program, for commonly detected chemicals. Domestic well water is for private use and consumption. Its quality is not regulated by the State. The results of the testing for each well are shared with the well owner, and used to evaluate the quality of groundwater used by private well owners. The Domestic Well Project has sampled five County Focus Areas in California as of 2009: Yuba, El Dorado, Tehama, Tulare, and San Diego. None of which lie within the GMA. In general, the Domestic Well Project tests for constituents that are a common concern in potable water: bacteria, general minerals, general chemical parameters, inorganic chemicals and nutrients, and organic chemicals. The results are compared to CDPH drinking water standards. More information about this program is available through SWRCB (http://www.waterboards.ca.gov/gama/domestic_well.shtml).

4. Special Studies Project: The GAMA Special Studies Project consist of a number of studies undertaken by LLNL, to look at various relationships between land uses, management practices, and other activities and the effects these activities have on local groundwater resources. LLNL has conducted several groundwater special studies. Of which, Seven projects have been completed; five reports have been published with

numerous scientific papers and presentation. The studies completed consist of the following:

- The fate & transport of nitrate sources from dairies
- Nitrate management plan studies for the Llagas Basin (Gilroy), and Chico Basins
- The fate and transport of nitrate sources and occurrence, and its relation to land usage (fertilizer, wastewater, and/or agricultural)
- Nitrate sources and occurrence in Orange County
- Nitrate sources and occurrence in Livermore
- Wastewater indicator study
- A wastewater indicator study on how septic systems affect shallow groundwater
- A wastewater indicator study of areas irrigated by recycled water in Gilroy and Livermore.

The Special Studies still in progress address groundwater recharge, changes in chemistry of groundwater recharged by surface waters, and development of a field deployable apparatus for extraction and collection of dissolved gasses from groundwater samples. More information about this program is available through SWRCB (http://www.waterboards.ca.gov/gama/special_studies.shtml).

Findings from the initial studies conducted as part of the Priority Basin Project for the Northern San Joaquin Study Unit have been completed and published by USGS, and are available at the GAMA Program website (http://ca.water.usgs.gov/gama/SU/nsjv.htm). The northern portions of the GMA within San Joaquin County lie within the Tracy Subbasin, which in turn lies within the western portion of the Northern San Joaquin Study Area (Bennett, G.L., *et.al*., 2006). The remainder of the GMA lies within the Delta Mendota Subbasin, which lies within the Western San Joaquin Valley Study Unit. The initial sampling and testing of groundwater from wells located in the Western San Joaquin Valley Study Unit is currently being completed and the findings are scheduled to be published in early 2011 (Contact: jshelton@usgs.gov). More information about this program is available through SWRCB or USGS (http://www.waterboards.ca.gov/gama/ or http://ca.water.usgs.gov/gama/).

DPH - Division of Drinking Water and Environmental Management

Every public water system in the State has to have the analyzing laboratory enter the results of all chemical monitoring to the Drinking Water Program, a water quality monitoring database. A CD containing the database can be purchased from the Monitoring and Evaluation Unit (Contact: Steve Book, Phone: 916-449-5566; sbook@dhs.ca.gov). For security reasons, DPH does not provide the coordinates of each well included in the database. However, general location information is easy to deduce from names of the water systems.

SLDMWA

The PAs cooperatively developed a comprehensive groundwater level and quality monitoring plan for the GMA (Stoddard & Associates, 1999). Currently, only the groundwater levels are monitored twice a year at a portion of the wells identified in the plan. Other elements of the plan have not yet been implemented, though implementation of additional elements will occur in the

future as the groundwater monitoring plan is prepared and approved by DWR. (Contact: Joe Martin, Phone: 209-832-6241; joe.martin@sldmwa.org.)

San Joaquin County

The San Joaquin County Groundwater Data Center (GDC) is a countywide centralized groundwater information medium that provides access to groundwater data collected and shared by agencies throughout San Joaquin County. The county groundwater level monitoring program includes semi-annual measurements of over 550 wells, of which approximately 300 are measured by county staff. The data collected is stored electronically in a database for further analysis. Historic groundwater data are accessible through the internet at the GDC website (http://www.sjmap.org/groundwater/).

Stanislaus County

The County has groundwater quality information available from the Public Water System database. An appointment is necessary to gather that information. At this time, there is no groundwater level information available. (Contact: Tom Wolf, Phone: 209-525-6756)

City of Tracy

Tracy developed a Mitigation Monitoring Program in 2001. The monitoring network consists of eight active production wells, four nested monitoring wells, and 18 clustered monitoring wells. Because of the design of the monitoring wells, data from those wells are considered representative of individual aquifer conditions and are generally of higher quality than the data obtained from production wells. Groundwater levels are obtained monthly, and water quality is collected quarterly. This program also includes a subsidence survey. The annual benchmark survey is performed in the spring periodically. The results of the monitoring program are presented in semiannual reports (GEI Consultants, 2005). (Contact: Steve Bayley, Phone: 209-831-4420; steve.bayley@ci.tracy.ca.us.)

6.2 Monitoring Plans

SB 1938 requires the adoption of monitoring protocols designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management.

For this GMP, monitoring protocols will be defined based on goals of particular programs. As part of the requirements of SB 1938, the PAs must adopt monitoring protocols to measure changes in water levels and quality, subsidence where subsidence has been identified as a potential problem, and flow and quality of surface water directly influenced by groundwater.

Under the requirements of SBx7-6, the SLDMWA has notified DWR as the monitoring entity for the GMA on behalf of the PAs. As the Umbrella Monitoring Entity in the GMA, SLDMWA is responsible for coordinating the activities of the PAs with regard to groundwater monitoring, including development of schedules, approved monitoring network, and standardized collection

techniques for groundwater level monitoring, groundwater quality sample collection, preparation, documentation, laboratory procedures and methods, and data validation and transfer procedures. All of these elements are described in the recent Groundwater Monitoring Plan prepared by SLDMWA. The Groundwater Monitoring Plan should be adopted by the PAs, and then approved by DWR by the summer of 2011, and implemented before the end of 2011. SLDMWA, through consultation with the PAs, will describe in the Groundwater Monitoring Plan the framework for analysis of data and dissemination of the results in conformance with DWR data transfer protocols. There are currently 6 proposed elements, or plans, considered for the Groundwater Monitoring Program.

Data Collection

This proposed element will describe a data collection plan to ensure that data is collected in a consistent manner that produces meaningful data for reporting. To this end, this element will include procedures associated with the data collection process, such as the protocol for sampling and/or measuring point location, frequency of sampling/measuring, what entity performs the sampling/measuring, quality assurance, quality control, documentation requirements, well owner notification procedures and parameters to be monitored. This element will also include a description of procedures for obtaining access permission from well and/or land owners, for documenting special access requirements, for marking and identifying monitoring points, and for obtaining and documenting site conditions and survey information regarding the monitoring points.

Groundwater Elevation Monitoring

This proposed element will describe a groundwater elevation monitoring plan to provide accurate and dependable groundwater well depth-to-water field measurements that are the basis for evaluating the long-term trends in the change in groundwater levels and quantity within the GMA. This element will include procedures and schedules for conducting groundwater level measurements to determine groundwater elevations. A schedule for conducting measurements will be included and will be based on sampling periods most likely to be representative of long-term groundwater conditions, anticipated to likely occur in spring and fall of each year based on current understanding of regional conditions. In addition, groundwater level information will also be regularly collected from continuously monitoring instrumentation affixed to a number of groundwater monitoring points throughout the GMA. Groundwater level data will be incorporated into the SLDMWA database in accordance with data collection protocol and uploaded to the DWR web-based database at least once a year in accordance with DWR protocol.

Groundwater Quality Monitoring

This proposed element will describe a groundwater quality monitoring plan to track various groundwater constituents of concern that may demonstrate long-term trends in water quality that may adversely impact the beneficial uses of groundwater within the GMA and to allow early detection of potential trends as they develop so that timely remedial actions may be undertaken. Water quality testing will be conducted routinely on wells within the GMA discharging to the Delta Mendota Canal. Additionally, water quality testing will be conducted on some USGS wells. Groundwater quality data will be incorporated into the SLDMWA database in accordance

with data collection protocol and uploaded to the DWR web-based database at least once a year in accordance with DWR protocol.

Groundwater Extraction Monitoring

This proposed element will describe a plan for documenting the amount and location of groundwater extracted from within the GMA to aid in evaluating of groundwater conditions. Groundwater pumping will be measured at a number of wells within the GMA affixed with meters, many of which are currently measured for discharge to DMC under Warren Act Contract. Groundwater extraction data will be incorporated into the SLDMWA database in accordance with data collection protocol and may be uploaded to the DWR web-based database at least once a year in accordance with any applicable DWR protocol.

Land Subsidence Monitoring

This proposed element describes a plan to measure land subsidence and to predict the potential for further subsidence. Continuously operating subsidence monitoring stations have previously been installed within the GMA, which will be utilized to measure subsidence. Tentatively, it has been proposed that data will be collected monthly. Subsidence monitoring data will be incorporated into the SLDMWA database in accordance with data collection protocol and may be uploaded to the DWR web-based database at least once a year in accordance with any applicable DWR protocol.

Reporting

This proposed element describes a plan for reporting the results of the monitoring program. As the Umbrella Monitoring Entity representing the PAs, SLDMWA will take undertake the responsibility of coordinating the collection and compilation of all applicable groundwater well data within the GMA, and regularly submit the data, at a minimum annually, to the DWR in conformance with the CASGEM protocol. Additionally, it is anticipated that as part of the program, an annual Groundwater Monitoring Report will be prepared that summarizes the water quality, water level, water extraction and subsidence data collected throughout the year. It is anticipated that this report will provide summary information including maps, figures, charts, and tables to characterize water quality, water level and subsidence trends occurring within the GMA. Finally, in accordance with agreements with USGS, SLDMWA will submit data reports on a regular basis to USGS for incorporation into the USGS Central Valley Groundwater Study, and the groundwater flow and land-subsidence model that is currently being developed within the SLDMWA boundaries.

Section 7
Implementation of the Groundwater Management Plan

The GMP implementation involves development of programs through cooperative efforts of the PAs. Implementation of some aspects of the plan may require considerable expenditures and formulas must be developed to allocate costs amongst the PAs. Implementation of regional groundwater management plans is ultimately less costly than implementation of plans by individual agencies, but the implementation strategy is complicated since the PAs have varied reliance on the groundwater resource. The priorities for implementation of the various elements of the GMP will vary from PA to PA. The potential benefits of regional planning within a common groundwater basin or subbasin far outweigh the difficulties of plan implementation. The cooperation of agencies increases the opportunities for water resource management.

In the GMA, the PAs can be generally separated into four categories:

1. Urban water users that currently rely exclusively or primarily on groundwater.
2. Agricultural water users who rely solely on groundwater for water supply.
3. Agricultural water users that rely on surface water and use groundwater for supplemental supply.
4. Agricultural water users with sufficient surface water supply, with groundwater used only for incidental purposes.

Depending on the category, a PA will be willing to invest an appropriate amount of time, effort, and financial resources into groundwater management and make the investment in those management elements that affect it the most. It cannot be expected that all agencies will invest equally in all the elements of the GMP. Hence, an implementation strategy must provide flexibility in the level of agency participation in each element of the plan. For instance, urban agencies and agricultural agencies that rely solely on groundwater supplies may be much more prone to invest in controlling saline water intrusion and localized overdraft; whereas, urban agencies may be more interested in wellhead protection or controlling migration of contaminated groundwater. Participating in conjunctive use operations is obviously desirable for those PAs with water supply deficits, but may also be attractive to those with surplus surface supplies that can be used for recharge purposes.

With consideration given to the reliance upon groundwater by the PAs and the varying importance of the groundwater management elements, the recommended implementation strategy is as follows:

- After public review and consideration of comments received, the final plan should be adopted by each agency.
- The SLDMWA will facilitate coordinating plan implementation among the PAs.
- Groundwater monitoring data collected annually will be provided to a consultant with expertise in hydrogeology and local groundwater conditions for review and preparation

of an annual report that will include a summary of the groundwater data, discussion of developing trends and recommendations for groundwater management strategies.

- Under the SLDMWA Activity Agreement, the Steering Committee made up of representatives of the PAs will meet at least twice a year to:
  1) Review findings of the groundwater monitoring program and developing trends,
  2) Based on the annual findings, consider and recommend that the PA's adopt new regional groundwater policies as necessary,
  3) Review particular projects being implemented or proposed by the Pas and their potential impacts, and
  4) Assist the PA's to coordinate policies and projects under the regional GMP.
- With consideration given to the identified problem areas, the committee shall establish a recommended priority list for management actions.
- Management activity groups will be formed, as needed, of those participating agencies interested in implementing certain elements of the groundwater management plan to identify specific management actions, develop budgets, and apportion costs.
- Once a year, each PA will provide a summary of the status of their ongoing programs and any proposed programs to be implemented within the following year for consideration by the PAs and for coordination purposes.
- An annual summary would be prepared to report the current state of the basin and describe the management activity that has taken place for each plan element. It would be used to keep PAs and the SLDMWA abreast of the group's activities.
- At least once a year the PAs will meet to discuss budgets and cost allocations for SLDMWA activities in facilitating and coordinating the regional monitoring program and any other SLDMWA expenditures needed to facilitate and coordinate implementing agreed upon groundwater management programs within the GMA.

This GMP is a living document and as such is expected to adapt as more information becomes available through the various programs instituted within the GMA, as conditions change, and as the needs of the PAs evolve. Thus, this implementation strategy is expected to be refined as necessary by the management committee.

Section 8
References

Bennett V, G.L., K. Belitz, B.J. Milby-Dawson. 2006. California GAMA Program: Ground-Water Quality Data in the Northern San Joaquin Basin Study Unit, 2005. Unite States Geologic Survey, Data Series 196, Sacramento, California, 2006. http://pubs.usgs.gov/ds/2006/196/

California. 2009. Official California Legislative Information website, publications. http://www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx7_6_bill_20091106_chaptered.html

Camp, Dresser & McKee. 2001. "Water Management Plan. Phase 1- Planning, Analysis and Strategy". Report submitted to San Joaquin County, Flood Control and Water Conservation District, California.

Davis, S. N. and R. J. M. DeWiest. 1966. "Hydrogeology". New York, John Wiley.

DPH. 1999. "Drinking Water Source Assessment and Protection (DWSAP) Program". California Department of Public Health. http://www.cdph.ca.gov/certlic/drinkingwater/Documents/DWSAPGuidance/DWSAP_document.pdf

DPH. 2008. "Arsenic in Drinking Water: MCL Status". California Department of Public Health. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Arsenic.aspx

DPR. 2011. Ground Water Protection Program. California Department of Pesticide Regulation. http://www.cdpr.ca.gov/docs/emon/grndwtr/index.htm

DWR. 1981. "Water Well Standards: State of California, Bulletin 74-81." December, 1981. Department of Water Resources, California. http://www.dpla2.water.ca.gov/publications/groundwater/CA_Well_Standards_Bulletin74-81_1981.pdf

DWR. 1991. "California Well Standards, Bulletin 74-90 (Supplement to Bulletin 74-81)." June 1991. Department of Water Resources, California. http://www.dpla2.water.ca.gov/publications/groundwater/CA_Well_Standards_Bulletin74-90_1991.pdf

DWR. 2003. "California's Groundwater, Bulletin 118-Update 2003". California Department of Water Resources, Sacramento, California. http://www.water.ca.gov/groundwater/bulletin118/bulletin118update2003.cfm

DWR. 2006. "Conjunctive Water Management Branch Partners - San Joaquin County". California Department of Water Resources. http://www.groundwater.water.ca.gov/cwm/conjuse/sanjoaq_index.cfm

DWR. 2009. "California Water Plan Update 2005". California Department of Water Resources, Sacramento, California. http://www.waterplan.water.ca.gov/cwpu2009/index.cfm

DWR. 2010a. "Senate Bill 1938 (SB 1938)". California Department of Water Resources, Sacramento, California. http://www.water.ca.gov/groundwater/gwmanagement/sb_1938.cfm

DWR. 2010b. "California Groundwater Elevation Monitoring, authorized by SBX7 6". California Department of Water Resources, Sacramento, California. http://www.water.ca.gov/groundwater/pdfs/SBX7%206%20flier.pdf

Dubrovsky, N. M., J. M. Neil, M. C. Welker, and K. D. Evenson. 1991. "Geotechnical Relation and Distribution of Selected Trace Elements in Groundwater of Northern Part of the Western San Joaquin Valley, California". United States Geological Survey Open File Report 90-108.

Erler & Kalinowski. 2005. "City of Tracy Urban Water Management Plan". Report submitted to the City of Tracy, California.

Faunt, C.C., ed.. 2009. "Groundwater Availability of the Central Valley Aquifer, California": Professional Paper 1766, 225 p., United States Geological Survey.

GEI Consultants. 2005. "Mitigation Monitoring Report – November 2004 Through April 2005". Report submitted to City of Tracy, California.

Hotchkiss, W. R. and G. O. Balding. 1971. "Geology, Hydrology and Water Quality of the Tracy-Dos Palos Area". Open File Report, United States Geological Survey, Menlo Park, California.

Hotchkiss, W. R. 1972. "Generalized Subsurface Geology of the Water-Bearing Deposits, Northern San Joaquin Valley, California". Open File Report, United States Geological Survey, Menlo Park, California.

Kennedy/Jenks/Chelton. 1990. "Tracy Area Groundwater Yield Evaluation". Report submitted to City of Tracy, California.

Page. 1971. "Base of Fresh Groundwater in the San Joaquin Valley, California". United States Geological Survey Open File Report.

Page, R. W. 1986. "Geology of the Fresh Groundwater Basin of the Central Valley, California, with Texture Maps and Sections." United States Geologic survey Professional Papers 1401C

Patterson. 2010. "2010 General Plan Update". City of Patterson, California

Patterson. 2009. "Consumer Confidence Report 2009". City of Patterson, California. http://www.ci.patterson.ca.us/Default.aspx?pi=20&ni=29

Patterson. 2004. "Consumer Confidence Report 2004." City of Patterson, California.

PID. 2005. "Water Conservation Plan – 5 Years Update". Patterson Irrigation District, Patterson, California.

Phillips, S. P., Sherrill Beard and R. J. Gilliom. 1991. "Quantity and Quality of Groundwater Inflow to the San Joaquin River, California". United States Geological Survey Water Resources Investigative Report 91-4019.

Stoddard & Associates. 1996. "Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area and a Portion of San Joaquin County". Report submitted to San Luis & Delta-Mendota Water Authority, Los Banos, California.

Stoddard & Associates. 1999. "Regional Groundwater Monitoring Program for the Northern Subbasin Groundwater Management Area". Report submitted to San Luis & Delta-Mendota Water Authority, Los Banos, California.

SWRCB. 2009. Geotracker Website, State Water Resources Control Board, California. http://www.geotracker.waterboards.ca.gov/

SWRCB. 2006. "Underground Storage Tank Program". State Water Resources Control Board, California. http://www.swrcb.ca.gov/cwphome/ust/

Tracy. 2009. "2009 Consumer Confidence Report". Tracy, California. http://www.ci.tracy.ca.us/modules/dms/file_retrieve.php?function=view&obj_id=1162

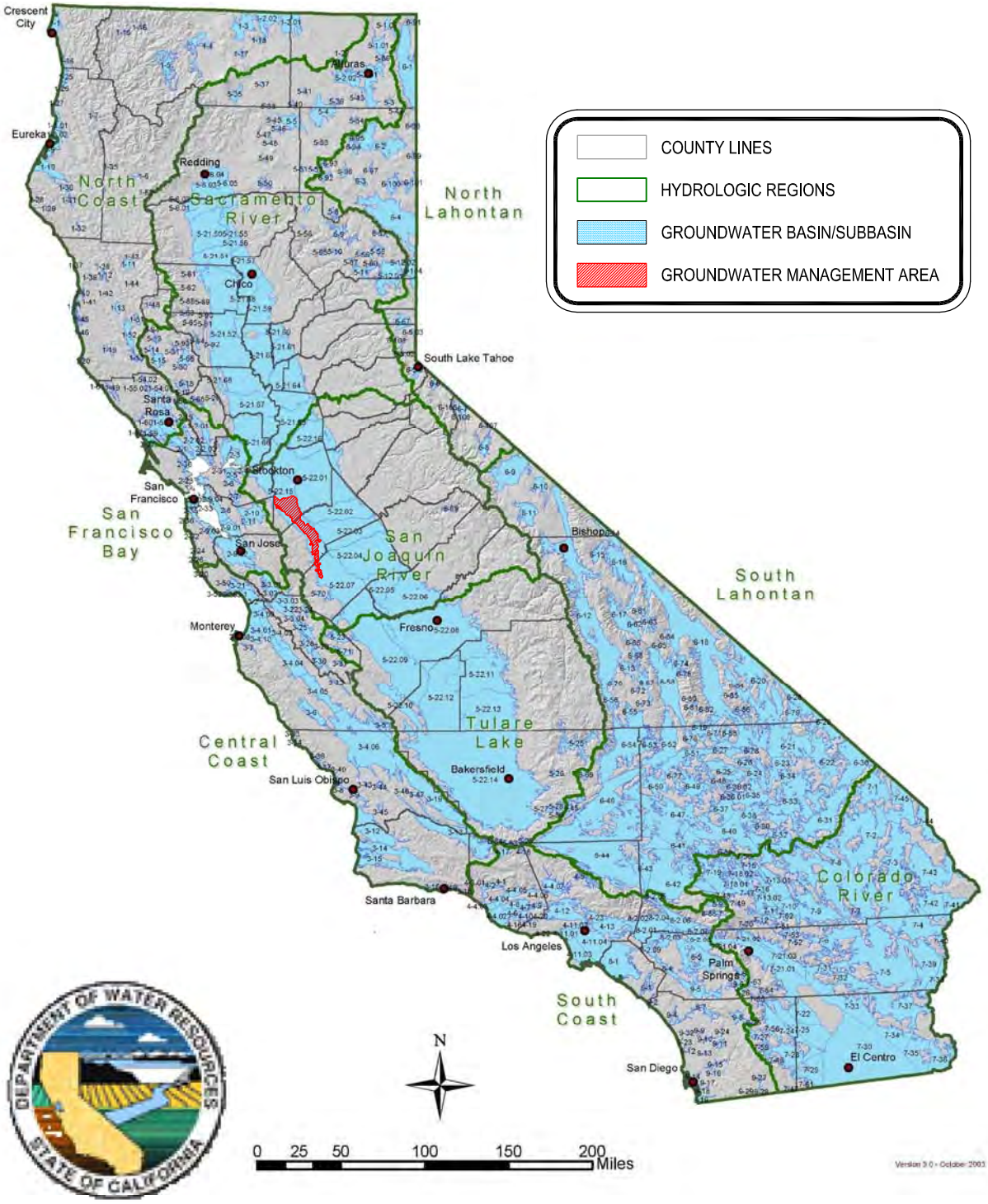
USGS. 2007. "USGS Ground-Water Data for the Nation". United States Geological Survey. http://waterdata.usgs.gov/nwis/gw

Waring, G.A. 1915. "Springs of California". United States Geological Survey, Water Supply Paper 338.

WRCC. 2010. "Historical Climate Information". Western Regional Climate Center. http://www.wrcc.dri.edu/CLIMATEDATA.html

FIGURES

Groundwater Basins in California

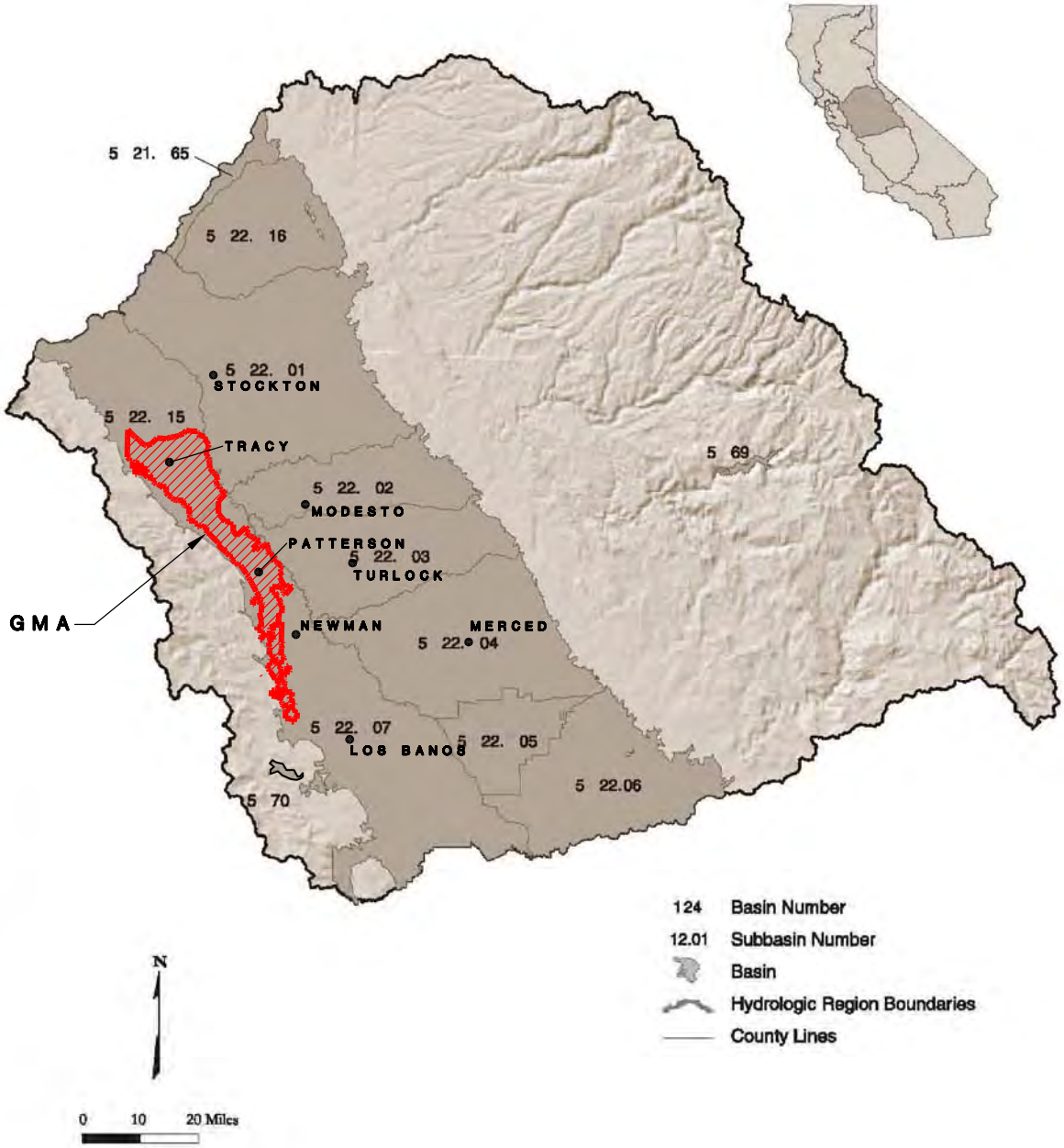


AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

SAN LUIS DELTA MENDOTA WATER AUTHORITY	AECOM PROJECT NO.	FIGURE
HYDROLOGIC REGIONS, CALIFORNIA	60185608	1

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_01.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:03 AM
XREFS: C-8x11-TITLE IMAGES: AERIAL.jpg - correct_statewide_basin_map_V3_subbas.jpg -



DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_02.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:02 AM
XREFS: C-8x11-TITLE IMAGES: Bulletin118_6-SJ_Page_2.jpg -

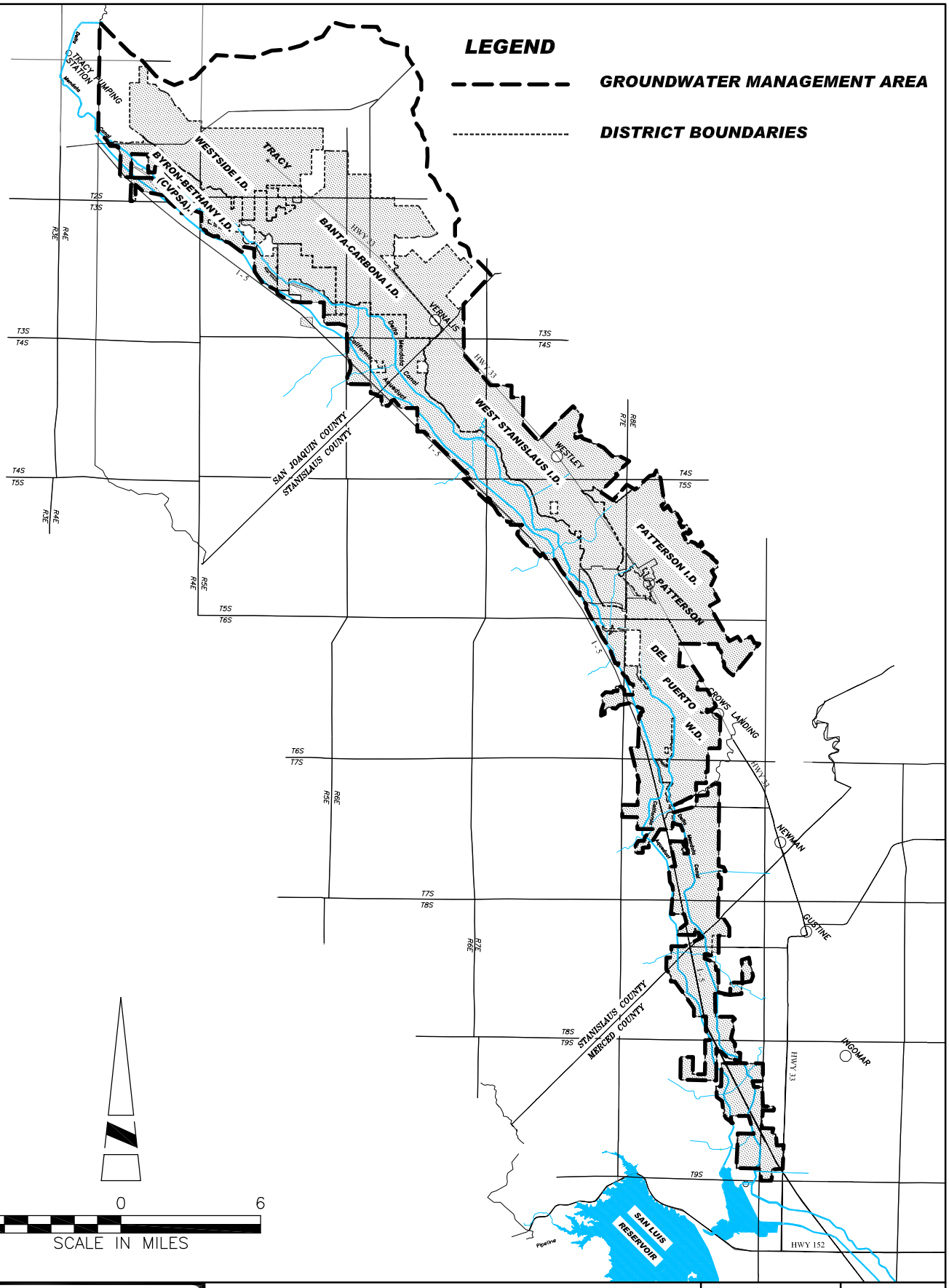
AECOM
AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

SAN LUIS DELTA MENDOTA WATER AUTHORITY

SUB-BASINS OF THE SAN JOAQUIN RIVER HYDROLOGIC REGION

AECOM PROJECT NO. 60185608

FIGURE 2



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

SAN LUIS DELTA MENDOTA WATER AUTHORITY

BOUNDARY OF THE GROUNDWATER MANAGEMENT PLAN

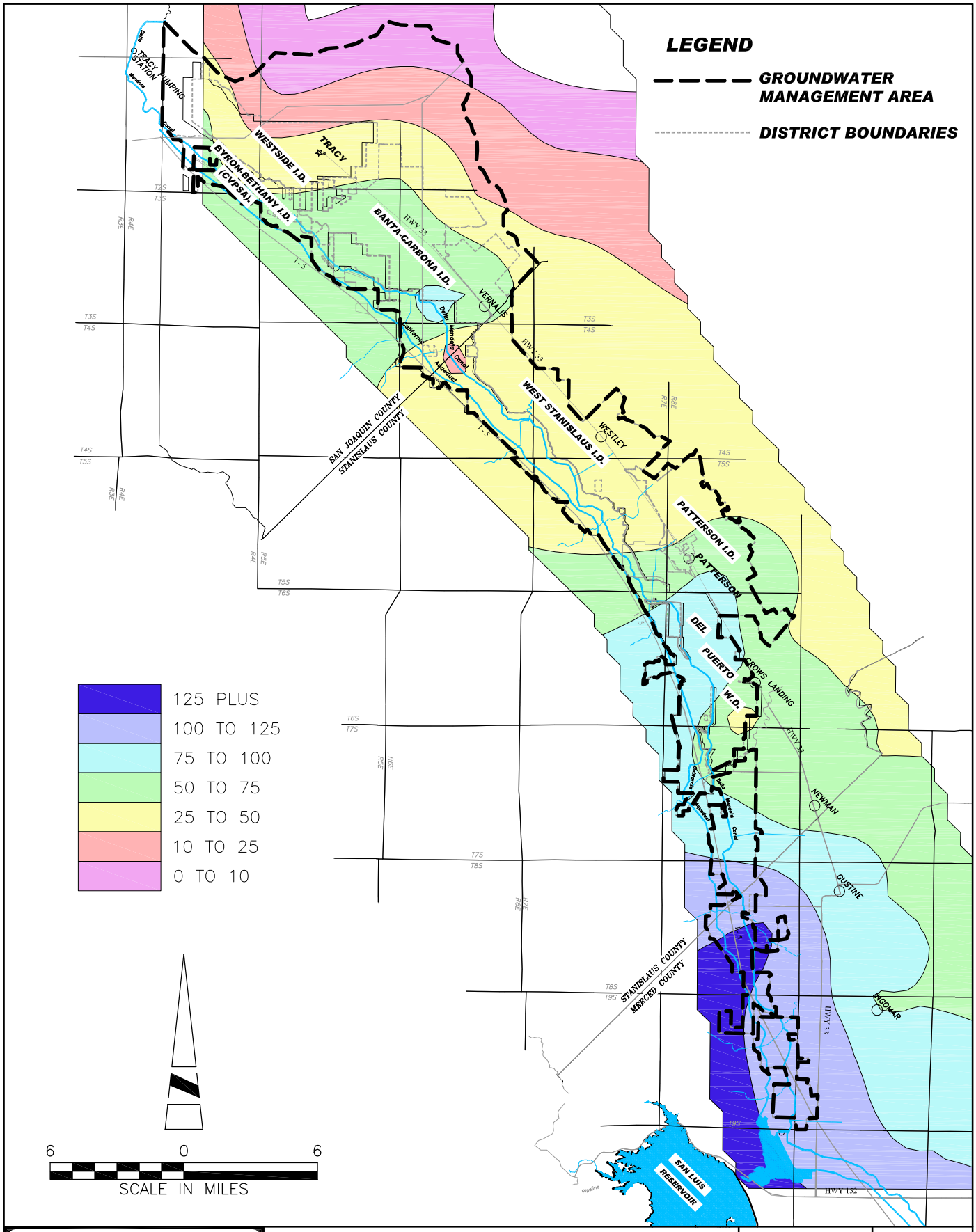
AECOM PROJECT NO.

60185608

FIGURE

3

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_03.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:02 AM
XREFS: C-8x11-TITLE IMAGES:



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

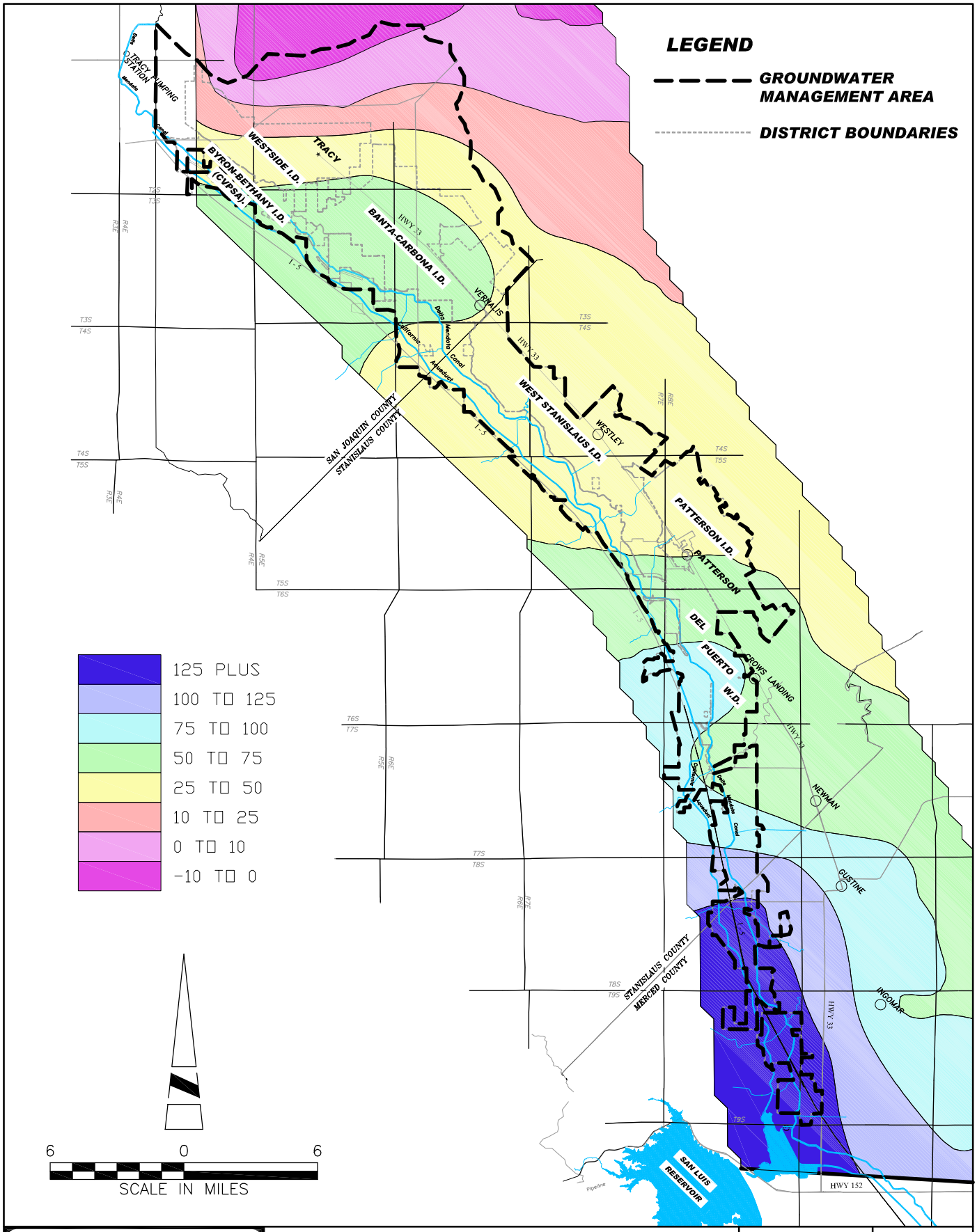
SAN LUIS DELTA MENDOTA WATER AUTHORITY

WATER TABLE ELEVATION
SPRING 2004

AECOM PROJECT NO.
60185608

FIGURE
4

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_04.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:01 AM
XREFS: C-8x11-TITLE - SPRING_2004-XREF IMAGES:



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

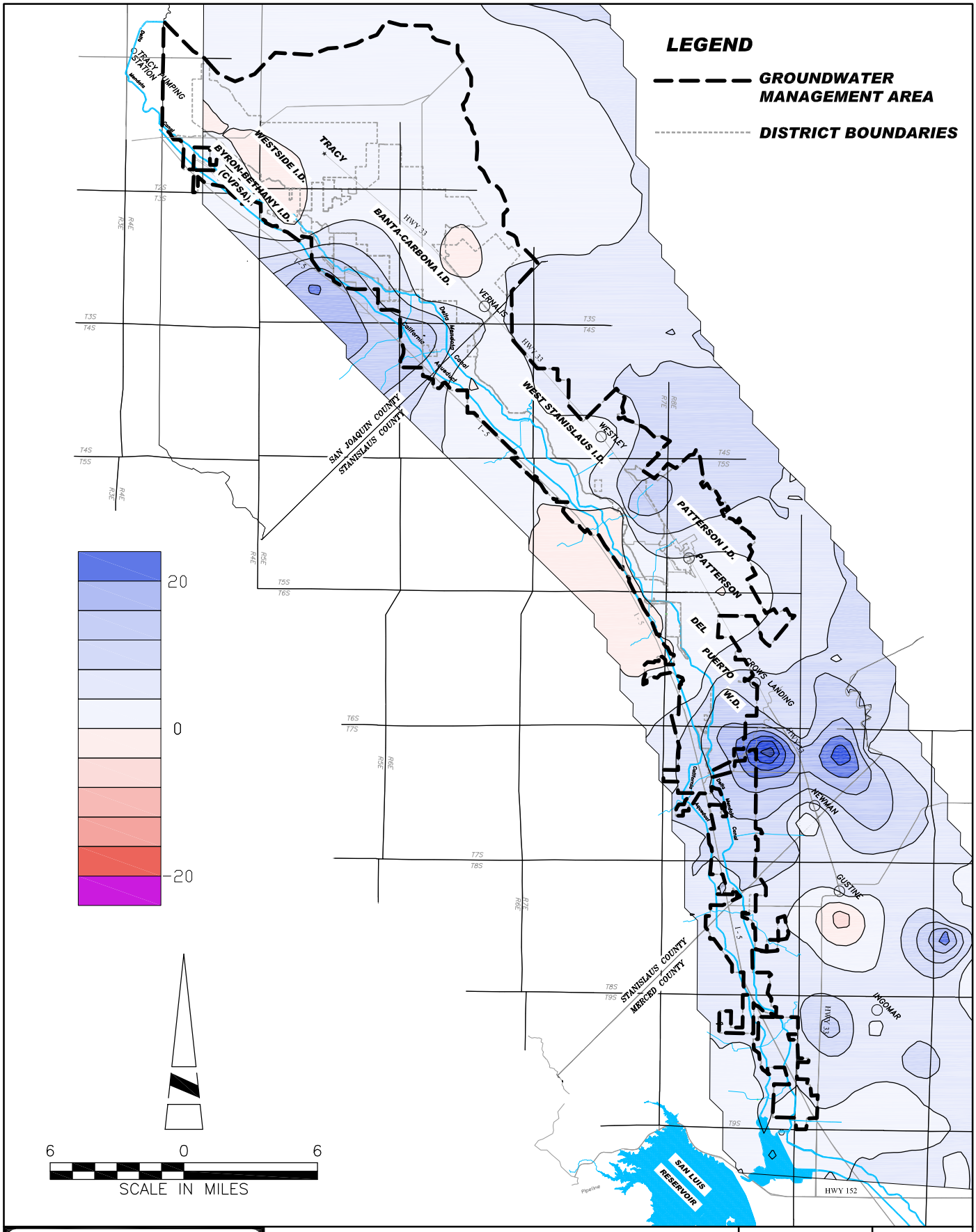
SAN LUIS DELTA MENDOTA WATER AUTHORITY

WATER TABLE ELEVATION
SPRING 2008

AECOM PROJECT NO.
60185608

FIGURE
5

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_05.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:01 AM
XREFS: C-8x11-TITLE - WSE 2008 IMAGES:



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

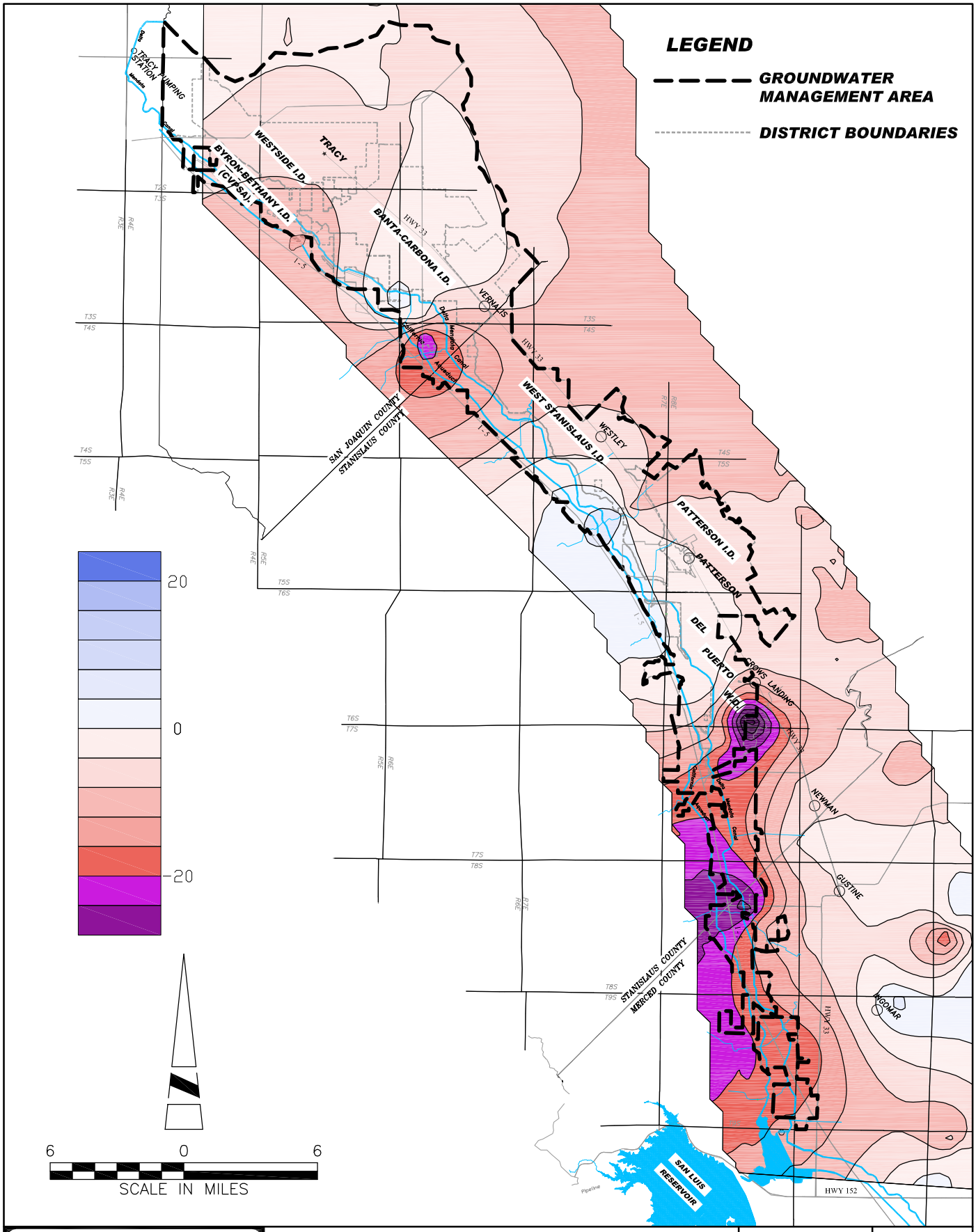
SAN LUIS DELTA MENDOTA WATER AUTHORITY

CHANGE IN WATER TABLE ELEVATION
SPRING 1993 TO SPRING 1998

AECOM PROJECT NO.
60185608

FIGURE
6

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_06.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 7:58 AM
XREFS: C-8x11-TITLE IMAGES:



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

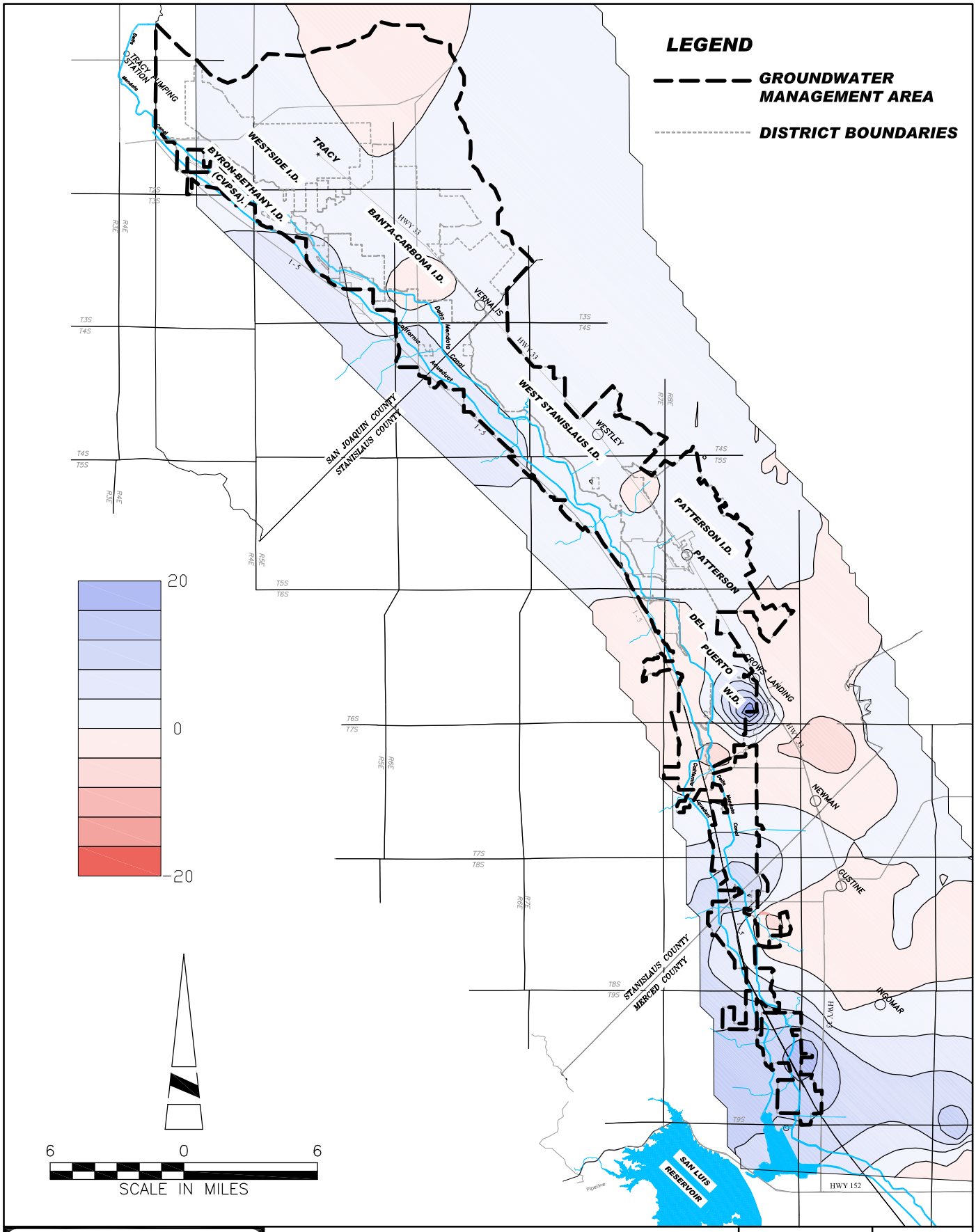
SAN LUIS DELTA MENDOTA WATER AUTHORITY

CHANGE IN WATER TABLE ELEVATION
SPRING 1998 TO SPRING 2004

AECOM PROJECT NO.
60185608

FIGURE
7

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_07.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:07 AM
XREFS: C-8x11-TITLE IMAGES:



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

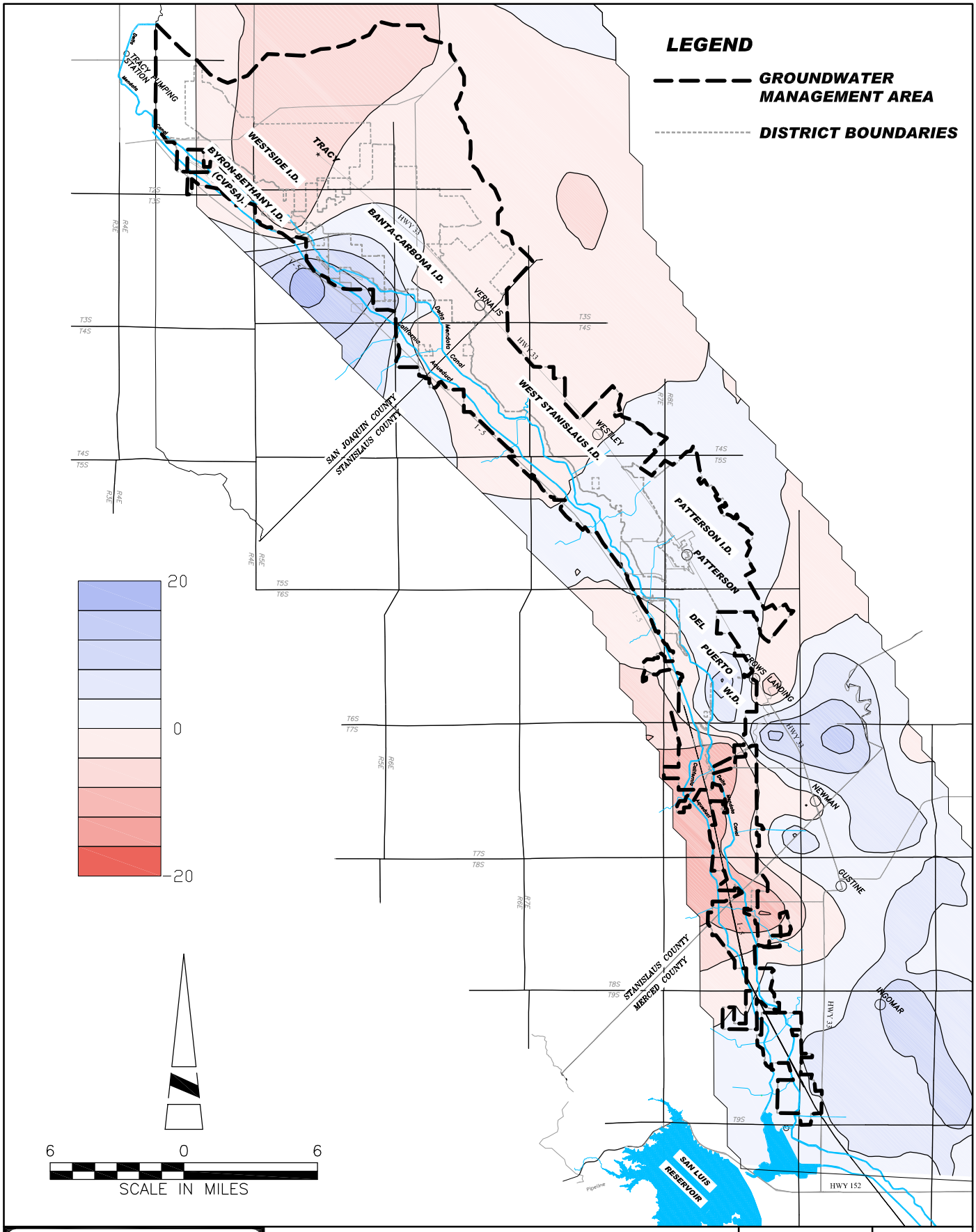
SAN LUIS DELTA MENDOTA WATER AUTHORITY

CHANGE IN WATER TABLE ELEVATION
SPRING 2004 TO SPRING 2008

AECOM PROJECT NO.
60185608

FIGURE
8

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_08.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:07 AM
XREFS: C-8x11-TITLE IMAGES:



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

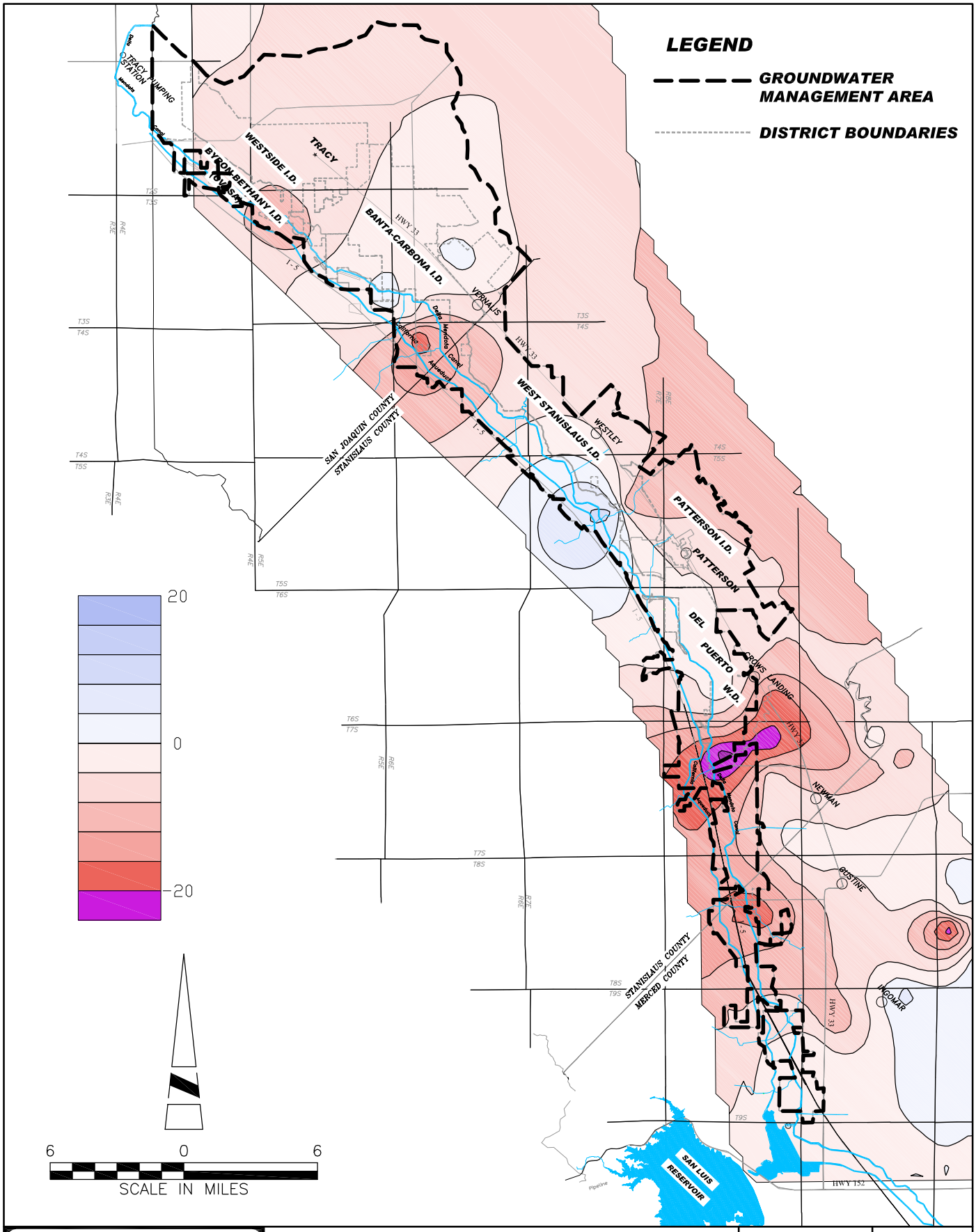
SAN LUIS DELTA MENDOTA WATER AUTHORITY

CHANGE IN WATER TABLE ELEVATION
SPRING 1993 TO SPRING 2008

AECOM PROJECT NO.
60185608

FIGURE
9

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_09.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:07 AM
XREFS: C-8x11-TITLE IMAGES:



AECOM

AECOM USA, Inc.
1120 W. I St.
LOS BANOS, CA. 93635, SUITE "C"
T 209-826-5155 F 209-826-3307
www.aecom.com

SAN LUIS DELTA MENDOTA WATER AUTHORITY

CHANGE IN WATER TABLE ELEVATION
SPRING 1998 TO SPRING 2008

AECOM PROJECT NO.
60185608

FIGURE
10

DWG: \\USLBS1FP001\data\Projects\SLDMWA\North GWMP Update 2010\400-Technical\403-Mapping\CADD\FIGURES-2010\Figure_10.dwg Layout Name: Layout1 - Plotted by: Moreno, David Date: 9/1/2011 - 8:03 AM
XREFS: C-8x11-TITLE IMAGES:

APPENDIX A

USBR GAMA Water Quality Data for Tracy Subbasin Area

Table 4
Findings from GAMA Priority Basins Program for Tracy Subbasin Area of the Northern San Joaquin Study Area

	GAMA well identification number	Units	Threshold type	Threshold level	TRCY-01	TRCY-03	TRCY-08	TRCY-11	TRCYFP-02	TRCYFP-03	TRCYFP-04	TRCYFP-05
	Sample Date	(mm/dd/yy)	n/a	n/a	1/5/2005	1/6/2005	2/8/2005	2/17/2005	1/4/2005	1/5/2005	1/5/2005	1/5/2005
	Well head altitude	(ft above LSD)	n/a	n/a	16	207	105	26	29	22	199	45
	Year of construction		n/a	n/a	1953	1989	1997	1985	1961	n/a	1988	1989
	Well depth	(ft below LSD)	n/a	n/a	502	900	340	400	1148	400	870	990
	Top perforation	(ft below LSD)	n/a	n/a	384	420	320	310	337	n/a	420	490
	Bottom perforation	(ft below LSD)	n/a	n/a	480	890	340	400	561	n/a	850	980
	Total open length	(ft)	n/a	n/a	96	470	20	90	224	n/a	430	490
	Number of openings		n/a	n/a	1	1	1	2	5	n/a	1	1
Field Parameters	Turbidity(61028)	(NTU, field)	n/a	n/a	nc	0.2	nc	nc	0.1	nc	0.2	nc
	pH (00400)	(standard units, field)	n/a	n/a	nc	7.5	nc	nc	7.7	nc	7.5	nc
	pH (00403)	(standard units, laboratory)	n/a	n/a	nc	E6.6	nc	7.9	E7.2	7.5	7.3	7.5
	Specific conductance (00095)	(µS/cm at 25°C, field)	n/a	n/a	1880	1000	699	938	999	1060	1250	1290
	Total hardness, as CaCO3 (00900)	(mg/L, laboratory)	n/a	n/a	nc	310	nc	160	290	210	370	250
	Alkalinity, dissolved, as CaCO3 (29802)	(mg/L, field)	n/a	n/a	nc	A194	nc	nc	A122	nc	A184	nc
	Bicarbonate, dissolved, as HCO3 (63786)	(mg/L, field)	n/a	n/a	nc	A235	nc	nc	A149	nc	A224	nc
	Carbonate, dissolved, as CO3 (63788)	(mg/L, field)	n/a	n/a	nc	<1	nc	nc	<1	nc	<1	nc
	Chloroform (Trichloromethane) (32106)	(µg/L)	MCL-US	80	nc	E0.02	nc	nc	1.82	2.39	E0.02	E0.03
	Bromoform (Tribromomethane) (32104)	(µg/L)	MCL-US	80	nc	ND	nc	nc	1.2	3.8	ND	ND
Trihalomethanes	Bromodichloromethane (32101)	(µg/L)	MCL-US	80	nc	ND	nc	nc	3.06	5.91	E0.03	ND
	Dibromochloromethane (32105)	(µg/L)	MCL-US	80	nc	ND	nc	nc	2.9	6.8	ND	ND
	Tetrachloroethylene (PCE) (34475)	(µg/L)	MCL-US	5	nc	ND	nc	nc	ND	ND	ND	ND
	1,2-Dichloropropane (34541)	(µg/L)	MCL-US	5	nc	ND	nc	nc	ND	ND	ND	ND
	Trichloroethylene (TCE) (39180)	(µg/L)	MCL-US	5	nc	ND	nc	nc	ND	ND	ND	ND
	1,1-Dichloroethene (34501)	(µg/L)	MCL-CA	6	nc	ND	nc	nc	ND	ND	ND	ND
	cis-1,2-Dichloroethene (77093)	(µg/L)	MCL-CA	6	nc	ND	nc	nc	ND	ND	ND	ND
Solvents	Tetrahydrofuran (81607)	(µg/L)	n/a	n/a	nc	ND	nc	nc	ND	ND	ND	ND
	Dichloromethane (34423)	(µg/L)	MCL-US	5	nc	ND	nc	nc	ND	E0.03	ND	ND
	Dibromomethane (30217)	(µg/L)	n/a	n/a	nc	ND	nc	nc	0.14	0.38	ND	ND
	trans-1,2-Dichloroethene (34546)	(µg/L)	MCL-CA	10	nc	ND	nc	nc	ND	0	ND	ND
	Tetrachloromethane (Carbon tetrachloride) (32102)	(µg/L)	MCL-CA	0.5	nc	ND	nc	nc	E0.02	0	ND	ND

	GAMA well identification number	Units	Threshold type	Threshold level	TRCY-01	TRCY-03	TRCY-08	TRCY-11	TRCYFP-02	TRCYFP-03	TRCYFP-04	TRCYFP-05
Gasoline	Ethylbenzene (34371)	(µg/L)	MCL-CA	300	nc	ND	nc	nc	ND	0	ND	ND
	Methyl tertbutyl ether (MTBE) (78032)	(µg/L)	MCL-US	13	nc	ND	nc	nc	ND	0	ND	ND
	Benzene (34030)	(µg/L)	MCL-CA	1	nc	ND	nc	nc	ND	0	ND	ND
	Methyl tertpentyl ether (50005)	(µg/L)	n/a	n/a	nc	ND	nc	nc	ND	0	ND	ND
	Toluene (34010)	(µg/L)	MCL-CA	150	nc	ND	nc	nc	ND	V0.01	ND	V0.01
	m-and p- Xylene (85795)	(µg/L)	MCL-CA	1750	nc	ND	nc	nc	ND	0	ND	ND
	o-Xylene (77135)	(µg/L)	MCL-CA	1750	nc	ND	nc	nc	ND	ND	ND	ND
Organic synthesis	1,1-Dichloroethane (34496)	(µg/L)	MCL-US	5	nc	ND	nc	nc	ND	ND	ND	ND
	1,2,4-Trimethylbenzene (77222)	(µg/L)	NL	330	nc	E0.08	nc	nc	ND	ND	E0.09	ND
	Carbon disulfide (77041)	(µg/L)	NL	160	nc	ND	nc	nc	ND	ND	ND	ND
	Styrene (77128)	(µg/L)	MCL-US	100	nc	ND	nc	nc	ND	ND	ND	ND
Refrigerants	Bromochloromethane (77297)	(µg/L)	HA-L	9	nc	ND	nc	nc	ND	0.24	ND	ND
	Trichlorofluoromethane (CFC-11) (34488)	(µg/L)	MCL-CA	100	nc	ND	nc	nc	ND	ND	ND	ND
	Dichlorodifluoromethane (CFC-12) (34668)	(µg/L)	NL	1000	nc	ND	nc	nc	ND	ND	ND	ND
	Chloromethane (34418)	(µg/L)	HA-L	30	nc	ND	nc	nc	ND	ND	ND	ND
Tentatively identified compounds with CAS numbers1	Cyclopentane (287-92-3)	(µg/L)	n/a	n/a	nc	0.1	nc	nc	nc	nc	nc	nc
	Methane chlorodifluoro (75-45-6)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Methane dichlorofluoro (75-43-4)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	C5-Alkene (109-67-1)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	C2-cyclopropane (1191-96-4)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Sulfur dioxide (7446-09-5)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Hexafluoropropene (116-15-40)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Pentafluoropropene (690-27-7)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Hexafluoropropene and CO2	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Pentafluoropropene and CO2	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Unknown (a)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	C1-Cyclobutane (598-61-8)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc
	Unknown (b)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nc	nc	nc	nc

	GAMA well identification number	Units	Threshold type	Threshold level	TRCY-01	TRCY-03	TRCY-08	TRCY-11	TRCYFP-02	TRCYFP-03	TRCYFP-04	TRCYFP-05
Herbicides	Simazine (04035)	(µg/L)	MCL-US	4	nc	nc	nc	nc	ND	nc	nc	nc
	Atrazine (39632)	(µg/L)	MCL-CA	1	nc	nc	nc	nc	ND	nc	nc	nc
	11,2-Dibromo-3-chloropropane (DBCP) (82625)	(µg/L)	MCL-US	0.2	nc	nc	nc	nc	ND	nc	nc	nc
	2Diphenamid (04033)	(µg/L)	HA-L	200	nc	nc	nc	nc	ND	nc	nc	nc
	Hexazinone (04025)	(µg/L)	HA-L	400	nc	nc	nc	nc	E0.008	nc	nc	nc
	Metolachlor (39415)	(µg/L)	HA-L	100	nc	nc	nc	nc	0.006	nc	nc	nc
	Tebuthiuron (82670)	(µg/L)	HA-L	500	nc	nc	nc	nc	ND	nc	nc	nc
	Trifluralin (82661)	(µg/L)	HA-L	5	nc	nc	nc	nc	ND	nc	nc	nc
	11,2-Dibromoethane (EDB) (77651)	(µg/L)	MCL-US	0.05	nc	nc	nc	nc	ND	nc	nc	nc
	2Imazaquin (50356)	(µg/L)	n/a	n/a	nc	nc	nc	nc	ND	nc	nc	nc
	Phorate (82664)	(µg/L)	n/a	n/a	nc	nc	nc	nc	ND	nc	nc	nc
Pesticide degradates	2-Chloro-4-isopropylamino- 6-aminos-triazine (deethylatrazine) (04040)	(µg/L)	n/a	n/a	nc	nc	nc	nc	ND	nc	nc	nc
	22-Chloro-6-ethylamino-4-amino-striazine (deisopropylatrazine) (04038)	(µg/L)	n/a	n/a	nc	nc	nc	nc	ND	nc	nc	nc
	2,6-Diethylaniline (82660)	(µg/L)	n/a	n/a	nc	nc	nc	nc	ND	nc	nc	nc
	3,4-Dichloroaniline (61625)	(µg/L)	n/a	n/a	nc	nc	nc	nc	ND	nc	nc	nc
Wastewater-indicator Constituents	Isophorone (34409)	(µg/L)	HA-L	100	nc	E0.1	nc	nc	nq	nc	nq	nc
	Benzophenone (62067)	(µg/L)	n/a	n/a	nc	ND	nc	nc	ND	nc	ND	nc
	4-Nonylphenol (62085)	(µg/L)	n/a	n/a	nc	ND	nc	nc	ND	nc	ND	nc
	1Caffeine (50305)	(µg/L)	n/a	n/a	nc	ND	nc	nc	ND	nc	ND	nc
	Bisphenol A (62069)	(µg/L)	n/a	n/a	nc	ND	nc	nc	ND	nc	ND	nc
	Tris (dichloroisopropyl) phosphate (62088)	(µg/L)	n/a	n/a	nc	ND	nc	nc	nq	nc	ND	nc
	2Phenol (34466)	(µg/L)	HA-L	2000	nc	V0.7	nc	nc	ND	nc	ND	nc

	GAMA well identification number	Units	Threshold type	Threshold level	TRCY-01	TRCY-03	TRCY-08	TRCY-11	TRCYFP-02	TRCYFP-03	TRCYFP-04	TRCYFP-05
	Bromide, dissolved (71870)	(mg/L)	n/a	n/a	nc	0.39	nc	0.51	0.44	0.46	0.5	0.71
	Calcium, dissolved (00915)	(mg/L)	n/a	n/a	nc	80.9	nc	38.5	66.5	49	94	57.9
	Chloride, dissolved (00940)	(mg/L)	SMCL-US	250	nc	102	nc	82.1	114	126	124	168
	Fluoride, dissolved (00950)	(mg/L)	MCL-US	2	nc	0.2	nc	E0.1	0.2	0.1	0.2	0.1
	Iodide, dissolved (71865)	(mg/L)	n/a	n/a	nc	0.015	nc	0.12	0.017	0.044	0.016	0.032
	Magnesium, dissolved (00925)	(mg/L)	n/a	n/a	nc	26.8	nc	16.2	30.6	21.9	33.2	24.7
	Potassium, dissolved (00935)	(mg/L)	n/a	n/a	nc	3.17	nc	3.39	4	3.67	3.41	4.49
	Silica, dissolved (00955)	(mg/L)	n/a	n/a	nc	23.4	nc	34.3	21.3	24	24.8	20.1
	Sodium, dissolved (00930)	(mg/L)	n/a	n/a	nc	138	nc	134	120	145	156	170
	Sulfate, dissolved (00945)	(mg/L)	SMCL-US	250	nc	248	nc	191	252	223	309	244
	Total dissolved solids (residue on evaporation) (70300)	(mg/L)	SMCL-US	500	nc	751	nc	604	721	675	889	778
Inorganic Constituents	Aluminum, dissolved (01106)	(µg/L)	MCL-US	1000	nc	ND	nc	3	ND	E3	E1	ND
	Antimony, dissolved (01095)	(µg/L)	MCL-US	6	nc	ND	nc	ND	ND	ND	ND	ND
	Arsenic, dissolved (01000)	(µg/L)	MCL-US	10	nc	0.8	nc	7.2	1.3	2.5	0.8	1.7
	Barium, dissolved (01005)	(µg/L)	MCL-CA	1000	nc	25	nc	44	30	28	26	26
	Beryllium, dissolved (01010)	(µg/L)	MCL-US	4	nc	ND	nc	ND	ND	ND	ND	ND
	Boron, dissolved (01020)	(µg/L)	NL	1000	nc	2190	nc	916	1340	1180	2310	1180
	Cadmium, dissolved (01025)	(µg/L)	MCL-US	5	nc	ND	nc	ND	ND	ND	ND	ND
	Chromium, dissolved (01030)	(µg/L)	MCL-CA	50	nc	7.2	nc	ND	6.7	1.2	7.1	1.9
	Cobalt, dissolved (01035)	(µg/L)	n/a	n/a	nc	0.247	nc	0.107	0.211	0.142	0.29	0.163
	Copper, dissolved (01040)	(µg/L)	MCL-US	11300	nc	3	nc	1.1	3	1.2	3.8	1.1
	Iron, dissolved (01046)	(µg/L)	SMCL-US	300	nc	E4	nc	8	E3	9	15	ND
	Lead, dissolved (01049)	(µg/L)	MCL-US	115	nc	0.89	nc	0.27	1.15	0.44	1	0.65
	Lithium, dissolved (01130)	(µg/L)	n/a	n/a	nc	32.3	nc	5.4	20.8	16.6	35.3	18.8
	Manganese, dissolved (01056)	(µg/L)	NL	500	nc	VE0.2	nc	194	ND	1.9	1.5	2.1
	Mercury, dissolved (71890)	(µg/L)	MCL-US	2	nc	ND	nc	nc	E0.01	nc	ND	nc
	Molybdenum, dissolved (01060)	(µg/L)	HA-L	40	nc	1.9	nc	4.5	1.5	2.3	1.8	1.5
	Nickel, dissolved (01065)	(µg/L)	MCL-CA	100	nc	0.77	nc	1.11	0.8	1.7	1.05	1.44
	Selenium, dissolved (01145)	(µg/L)	MCL-US	50	nc	1.2	nc	0.7	1.3	1.7	1.6	3.2
	Strontium, dissolved (01080)	(µg/L)	HA-L	4000	nc	1060	nc	664	1630	1190	1310	1590
	Thallium, dissolved (01057)	(µg/L)	MCL-US	2	nc	ND	nc	ND	ND	ND	ND	ND
	Tungsten, dissolved (01155)	(µg/L)	n/a	n/a	nc	ND	nc	0.6	ND	ND	ND	ND

GAMA well identification number	Units	Threshold type	Threshold level	TRCY-01	TRCY-03	TRCY-08	TRCY-11	TRCYFP-02	TRCYFP-03	TRCYFP-04	TRCYFP-05
Uranium, dissolved (22703)	(µg/L)	MCL-US	30	nc	3.37	nc	0.21	1.69	1.05	3.68	0.97
Vanadium, dissolved (01085)	(µg/L)	NL	50	nc	2.7	nc	0.3	4.6	8.3	3.1	6.3
Zinc, dissolved (01090)	(µg/L)	HA-L	2000	nc	VE2.0	nc	10.3	12.4	17.2	2.8	3.1

Notes:

TRCY, Tracy Basin; TRCYFP, Tracy Basin flowpath

The five digit number below the constituent name is the USGS parameter code used to uniquely identify a specific constituent or property.

ft, feet; LSD, land surface datum; mm/dd/yy, month/day/year; °C, degrees Celsius; mg/L, milligram per liter; µg/L, microgram per liter; mm, millimeter; NTU, nephelometric turbidity units; µS/cm, microsiemens per centimeter

The threshold type identifies the source of the comparison threshold. The threshold level is the level with which ground-water detections are compared.

HA-L, lifetime health advisory (U.S. Environmental Protection Agency, 2004b); MCL-CA, California Department of Health Services Maximum Contaminant Level (California Department of Health Services, 2005a); MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level (U.S. Environmental Protection Agency, 2005); NL, notification level (California Department of Health Services, 2005d).

USGS, U.S. Geological Survey.

Concentrations preceded by "V" indicate detections potentially biased by contamination; A indicate averaged value; E, indicate estimated value.

n/a, not applicable or not available; nc, sample not collected, not analyzed; ND, analyzed but not detected;

ATTACHMENT F

NOTICE OF DISTRICT EDUCATION PROGRAMS AND SERVICES AVAILABLE TO CUSTOMERS

PID NEWS

July 2013

Patterson Irrigation District Update

2013 Water Outlook is Dry
Do Your Part to Conserve

The 2012-2013 water year has shaped up to be the driest on record even as the period from October to December was wetter than average. The San Joaquin 5-Station Index indicated approximately 148% of average rainfall through December 2012. As of May 29, 2013, after dry weather had persisted through much of 2013, the index now falls at 67% of average to date and 25.8-inches of precipitation. The period between January to May has resulted in the driest period in a record of over 80 years.

The results of this dry hydrology are being felt across the San Joaquin Valley. PID, along with other Bureau of Reclamation, Central Valley Project Contractors which receive water from the Delta Mendota Canal, are only receiving 20-percent of their contract values, which was reduced from a 25-percent initial allocation.

Moving forward, the situation does not appear to be getting any better. In a recent meeting with contractors, Reclamation staff indicated that even with average rainfall this winter, there is a possibility that the initial allocation next year will be zero percent (0%). Reservoir levels are projected to be at or near all-time lows at the end of the growing season in order to meet this year's contract allocation.

On the San Joaquin River, the hydrologic index this year is critically dry, which means that river base flows will be very low. These low levels have historically inhibited PID's ability to pump from the river. PID is taking necessary steps to prepare for this season as well as future years. Some of these measures include engaging landowners with groundwater well facilities, and reserving CVP contract supply for the peak irrigation season demands.

As growers and landowners, do your part this summer to make sure water is delivered throughout the District as equitably and efficiently as possible. **District delivery efficiency begins at the farm level.** Measures you can take to reduce burden due to drought include:

- **Water conservation**
- **Increasing on-farm irrigation efficiency**
- **Reducing surface tailwater runoff**
- **Careful coordination of irrigation orders and deliveries including advance notice to District when you expect to end your irrigation event.**

Your efforts to efficiently use water this irrigation season will reduce the effects of drought impacts to landowners and growers within the District.

Ditchtenders with iPads? New Technology Implemented for District Operations

Beginning in 2013, District Distribution System Operators will be using tablet computers (iPads) to manage water deliveries. In 2012, the Board of Directors approved improvements to the District's Supervisory Control and Data Acquisition (SCADA) System which now allow District staff to remotely access and operate pump and delivery facilities via iPad. In addition, the Board also approved implementation of a new water accounting system, which will allow the Distribution System Operators to take orders and record delivery information via iPad, rather than paper record. These improvements are all expected to provide greater flexibility in operating the District's distribution system, as well as cost savings through reductions in fuel and paper consumption.

PID Awarded Engineering Project of the Year for Fish Screen

Patterson Irrigation District's Fish Screen Intake Project was recently awarded the American Society of Civil Engineers Water Region 9 Outstanding Water Project Award. ASCE's Region encompasses the State of California. The District's project was one of 24 category specific project awards from a pool of almost 50 eligible nominations. The award was presented by ASCE Society President Greg DiLoreto at a banquet on March 6, 2013 at Los Angeles Union Station. The District submitted the award in conjunction with MWH Americas, the Engineer of Record for the $13.8M fish screen and pumping plant project completed in 2011. The District is now eligible to compete for the national ASCE Outstanding Civil Engineering Achievement Award.

The Patterson Irrigation District Fish Screen Intake Project was funded in cooperation with the Bureau of Reclamation and the California Department of Fish and Wildlife (formerly Fish and Game).

District Receives $1.5 M Grant from Reclamation for Drainage Project

The District was recently awarded a $1.5M WaterSMART Water and Energy Efficiency Grant from the Bureau of Reclamation for its Marshall and Spanish Land Grant Drain Return System Project. This project includes the installation of three new pump stations and approximately 3.7 miles of new pipeline so that water from these drains can be recovered and pumped back in to the delivery system for agricultural use. The project is expected to result in approximately 5,000 acre-feet of water savings annually, and will improve water quality in the San Joaquin River by reducing sediment and salt loads carried into the San Joaquin River. The overall project costs are estimated at $3.2M.

East-West Conveyance Project- Main Canal Improvement Feasibility Study Nears Completion

In 2012, the Board of Directors approved a study to evaluate alternatives to improve and replace the District's main canal delivery facilities. The current pumping plants were constructed in the 1950's and 1960's and are showing serious signs of age including structural degradation. Because the main facilities including the pumping plants are truly the "life-blood" of agriculture within PID, it is vitally important that these facilities maintain a high level of reliability for landowners and growers within the District.

Existing District Main Canal Pump Station

In addition to replacement, the District is also evaluating alternatives for expanding the main canal's capacity, not only for improved delivery flexibility to lands within PID, but to also take advantage of potential opportunities to participate in regional water supply solutions through wheeling opportunities. Some of these opportunities include recirculation and recapture of San Joaquin River Restoration Program flows, and east-to-west water transfers, where excess capacity in District facilities is used to facilitate transfers between other water agencies in the region.

District staff delivered project alternatives to the Board in June 2013. Next steps include selecting an alternative, and vetting various financing options and construction schedules for the project.

Irrigation Evaluations

Cal Poly Irrigation Training and Research Center (ITRC), in conjunction with Department of Water Resources, will be offering **FREE** on-farm irrigation evaluations in the San Joaquin Valley this summer. The Irrigation Evaluations provide a measure of distribution uniformity, non-uniformity, and recommendations to improve overall system performance.

Irrigation systems cost money to operate, and their performance has a huge impact on yield and yield quality. This evaluation lets growers know if a tune-up is needed for an old system, and what types of things can be done to improve performance. The evaluations also allow growers to verify the performance and quality of new irrigation systems. This service has helped farmers reduce crop water stress, increase crop yields, increase irrigation water application efficiencies and reduce pumping costs.

The number of evaluations offered are limited and on a first-come, first-served basis. In order sign up for an evaluation, landowners and growers should contact Dr. Charles Burt or Coral Norris at Cal Poly ITRC by phone at (805) 756-2434 or email at cburt@calpoly.edu or clnorris@calpoly.edu.

Public Workshop to Review Long-Term Irrigated Lands Program Regulations Set for July 30th

A workshop to review the proposed Long-Term Irrigated Lands Regulatory Program requirements for drainage and groundwater in this region will be held on July 30, 2013 starting at 9:00 a.m. at the Los Banos Fair Grounds, O'Banion Building, 403 F Street in Los Banos.

The workshop will include presentations by the Regional Board and a public comment period to hear comments from landowners and growers regarding the pending regulations. The meeting is sponsored in part by the Westside San Joaquin River Watershed Coalition. All landowners and growers are urged to attend this important meeting to learn how these regulations will affect your agricultural practices into the future.

Water Conservation & Management Assistance Available

The District offers and promotes many programs available to assist water users with water and energy conservation and management including pump testing, irrigation system evaluations, irrigation scheduling, and cost-sharing on water conserving pipeline projects. Please contact the District office for information and assistance on these programs.

ATTACHMENT G

DISTRICT AGRICULTURAL

WATER ORDER FORM

Water Order Form: **Ditchtender:**

for office use

Tag# _____

User Name: _____

User ID# _____ Group ID# _____ Lateral: _____

Gate: _____

Requested Start Date: _____ Requested Start Time: _____ Crop: _____

Date Ordered: _____ CFS: _____

Ordered By: _____ Comments: _____

for office use

Tag# _____

User Name: _____

User ID# _____ Group ID# _____ Lateral: _____

Gate: _____

Requested Start Date: _____ Requested Start Time: _____ Crop: _____

Date Ordered: _____ CFS: _____

Ordered By: _____ Comments: _____

for office use

Tag# _____

User Name: _____

User ID# _____ Group ID# _____ Lateral: _____

Gate: _____

Requested Start Date: _____ Requested Start Time: _____ Crop: _____

Date Ordered: _____ CFS: _____

Ordered By: _____ Comments: _____

for office use

Tag# _____

User Name: _____

User ID# _____ Group ID# _____ Lateral: _____

Gate: _____

Requested Start Date: _____ Requested Start Time: _____ Crop: _____

Date Ordered: _____ CFS: _____

Ordered By: _____ Comments: _____

for office use

Tag# _____

User Name: _____

User ID# _____ Group ID# _____ Lateral: _____

Gate: _____

Requested Start Date: _____ Requested Start Time: _____ Crop: _____

Date Ordered: _____ CFS: _____

Ordered By: _____ Comments: _____

Appendix A

Agricultural Water Management Plan Addendum

Patterson Irrigation District

Agricultural Water Management Plan Addendum

A. Drought Management Plan.

Patterson Irrigation District adopted a Drought Mitigation Policy on January 31, 2014. The policy is included below.

The Patterson Irrigation District (District) shall apportion water to each District delivery facility in a manner to assure fair and equitable distribution of water to the entire District.

Factors affecting the distribution of water to lateral systems include wateruser demand, available water supplies, and effective reuse of return flows. The Distribution System Operators (DSOs), under the supervision of the Watermaster, shall distribute water within the District in a fair and equitable manner.

<u>Rationing</u>
During times of drought, available water supplies can be very uncertain. Tier I allocations may be lower than historically provided. During times of water shortages caused either by a short water supply in the San Joaquin River, emergency, or a situation where demand exceeds the available capacity of District distribution facilities and supplies, the DSO shall, under the supervision of the District Watermaster and the General Manager, implement a water rationing plan within the District according to the following conditions:

a. District landowners/waterusers have first priority for delivery of available water supplies. Delivery to waterusers through Out-Of-District Contracts to Priority Area I and II lands shall be curtailed and/or cease depending on available supplies in order to meet in-District demands.

b. Whenever demands within the District exceed the supply of water available to the District, rationing shall be conducted so as to distribute the supply of water evenly throughout the acreage demanding water service, both by available capacity and by volume.

c. When it is projected that demands will exceed available supplies for an extended period of time, Tier II water supplies available beyond the Tier I allocation will be made on a monthly basis and will be subject to many factors including hydrology, available water supplies including the San Joaquin River, facilities capacity, State Water Resources Control Board (SWRCB) regulatory actions, etc. These allocations will vary, but could range from three (3) to nine (9) acre-inches per acre, per month (0.25 to 0.75 acre-feet per acre, per month) or less.

d. Landowners/water users are reminded that they may leave ground fallow, or abandon a crop and transfer that supply to other fields owned and/or operated by the same landowner/water user. All requests for transfer of water allocation shall be made in advance of irrigation

e. A wateruser shall be allowed a ration comparable to the total number of acres he/she operates. The District Assessment Roll shall be used in determining the operator of each field or parcel.

f. A wateruser shall be allowed to combine and distribute his/her ration amongst fields he/she operates except where lateral capacity is exceeded and fair distribution of water to others is jeopardized.

g. Waterusers may mutually agree to combine and reciprocate his/her ration with another water user if approved by the DSO.

h. Waterusers who operate fields in more than one lateral system will receive computed rations in each respective system if necessary.

i. Water quality cannot be guaranteed any District conveyance facility.

j. Individual situations may be subject to the discretion of the General Manager and District staff, and will be handled on a case by case basis**. It is the District's intention to work with all landowners and water users with flexibility to distribute water as fairly and equitably as possible with minimal disruption**.

k. Winter water availability will be subject to hydrology and a determination made at a later date.

<u>Landowner Groundwater Program</u>

In addition to rationing, the District will be implementing a formal Landowner Groundwater Program. The District will sign well lease agreements with landowners who own groundwater facilities which can be discharged into the District distribution system. Summary of the well lease agreements include the following provisions:

a. The District will have the ability to call on and operate the well during the irrigation season, when the well is not being used for the irrigation benefit of the well owner's property. PID will provide regular maintenance of the well facilities during this time.

b. The District will compensate the landowner per acre-foot for water pumped in for the District at a fee to be determined by the Board of Directors. This fee shall be inclusive of all costs related to energy, capital, and operations and maintenance for time of district operation.

c. PID may install a propeller-type flow meter for the purposes of accounting for the water pumped into the District facilities.

The use of private well water involving District facilities will be subject to the Rules and Regulations for the Distribution of Water within Patterson Irrigation District.

Surface Water Transfers into the District

At the Board's discretion during drought periods, the District may allow transfers involving the Bureau of Reclamation (Reclamation) Delta Mendota Canal (DMC) facilities to occur into the District. These transfers must involve the same landowner/water user. All charges related to the transfer including charges levied by Reclamation, the San Luis & Delta Mendota Water Authority, and PID administrative costs, shall be paid by the landowner. Transfers must conform to Reclamation Law. Transfer water from the DMC that cannot be delivered directly to landowners will be blended in District facilities and be subjected to a 5-percent loss. Schedules for transfers including quantity must be submitted upon request.

B. Quantification of Water Supplies and Demands for 2013 through 2015.

Table 1 shows the District water supplies in terms of Central Valley Project (CVP) supplies, San Joaquin River supplies and groundwater, as well as the water delivered to District growers.

Table 1: Quantification of Water Supplies and Demands

	2013	2014	2015
CVP Supplies	4,125	0	0
SJR Supplies	70,528	48,415	39,498
Groundwater	5,360	5,764	9,592
Total Supplies	80,013	54,179	49,090
District Demand	68,418	42,086	42,447

Notification Documents

Notification letters were sent to the following agencies:

Central California Irrigation District

Del Puerto Water District

The City of Patterson

West Stanislaus Irrigation District

A copy of the notification letter is attached.

Board of Directors

John Azevedo
President
David Reichmuth
Vice President
David Fantozzi
Richard Barbaste
Steve Prevostini

Marc N. Vanden
General Manager

Toni Russell
Secretary/Treasurer

948 Orange Avenue - P.O. Box 685 - Patterson, Ca. 95363
Office (209) 892-6233 - Fax (209) 892-4013

May 10, 2016

Del Puerto Water District
Attn: Anthea Hansen, General Manager
PO Box 1596
Patterson, CA 95363

SUBJECT: NOTICE OF PREPARATION OF AN AGRICULTURAL WATER MANAGEMENT PLAN BY PATTERSON IRRIGATION DISTRICT.

Dear Mrs. Hansen,

This letter is being sent to inform you that Patterson Irrigation District is preparing an Agricultural Water Management Plan (AWMP) in accordance with California Water Code and Governor Brown's Executive Order B-29-15. Should you have any concerns or wish to provide input, please submit those in writing to the District by Wednesday June 1, 2016. A public hearing for comments on the AWMP will be held on June 8, 2016, at 1:00 PM at the Patterson Irrigation District Office, located at 948 Orange Ave, Patterson, CA.

If you have any questions or need any further information, please let us know.

Thank you,

Marc N. Vanden
General Manager

PROOF OF PUBLICATION
(2015.5 C.C.P)

STATE OF CALIFORNIA
County of Stanislaus

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of the Patterson Irrigator, a newspaper of general circulation, printed and published once a week on Thursdays, in the city of Patterson, California, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court, of the County of Stanislaus, State of California, under the date of June 23, 1952, Case Number 47304; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to –wit:

5/12, 19, 26

all in the year 2016

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Patterson, California, this 26
day of May, 2016

Signature

This space is for the County Clerk's Filing stamp

Proof of Publication of

PUBLIC NOTICE

This publication serves as Gov. Code Section 6066 notice that the Patterson Irrigation District intend's to prepare an Agricultural Water Management Plan Addendum, per Governor Brown's Executive Order B-29-15. The Patterson Irrigation District will be holding a public hearing in Stanislaus County at 948 Orange Ave, Patterson, CA 95363, on June 8, 2016, at 1:00 PM.

5/12,19,26

Adoption Documents

THE PATTERSON IRRIGATION DISTRICT
RESOLUTION NO. 03 – 2016

RESOLUTION OF THE BOARD OF DIRECTORS OF PATTERSON IRRIGATION DISTRICT ADOPTING ITS AMENDMENT TO THE 2010 WATER MANAGEMENT PLAN.

WHEREAS, Section 210 of the Reclamation Reform Act of 1982 (Public Law 97-293; 43 US §390jj) requires districts with repayment or water supply contracts to develop and maintain water conservation plans containing definite goals, appropriate water conservation measures, and time schedules for meeting conservation objectives; and

WHEREAS, the purpose of the Water Conservation Criteria are to promote the highest level of water-use efficiency reasonably achievable by Contractors using best available cost-effective technology and Best Management Practices; and

WHEREAS, agricultural water suppliers that supply water to 10,000 to 25,000 acres of irrigated lands (mid-sized agricultural water suppliers) must comply with the requirements of Governor Brown's Executive Order (EO) B-29-15 Directive 13; and

WHEREAS, the District has developed an amendment to the water conservation plan to comply with EO B-29-15 Directive 13, creating an Agricultural Water Management Plan; and

WHEREAS, on May 12, May 19, and May 26, 2016, notice of public hearing to consider adoption of the Agricultural Water Management Plan was duly published in the Patterson Irrigator; and

WHEREAS, on June 8, 2016, the Board of Directors of the District held a public hearing for the purposed as described in the aforementioned published notice; and

WHEREAS, after hearing the staff report of the Agricultural Management Plan and holding the public hearing regarding the same, the Board of Directors of the District found it to be in the best interest of the District to have the Agricultural Water Management Plan comply with the statutory requirements and to guide and direct its activities; and

WHEREAS, PID has revised its 2006 Water Management Plan in accordance with the requirements contained in the 2008 Criteria for evaluating Water Management Plans developed by the United States Department of the Interior, Bureau of Reclamation, Mid-Pacific Region. Said plan was updated in 2014; and

WHEREAS, PID submitted its updated Water Management Plan to the United States Department of the Interior, Bureau of Reclamation, Mid-Pacific Region on January 15, 2014; and

NOW, THEREFORE, based upon the evidence presented, the Board of Directors of the Patterson Irrigation District FINDS, DETERMINES, DECLARES AND RESOLVES each of the following:

1. The attached Water Management Plan is adopted.

2. Staff is directed to forward the Plan and this Resolution to the California Department of Water Resources.

PASSED AND ADOPTED this 15th day of June, 2015, by the following vote:

AYES: AZEVEDO, REICHMUTH, FANTOZZI, BARBASTE, PREVOSTINI

NOES:

ABSENT:

John M. Azevedo, Board President

ATTEST:

Toni Russell, Secretary