December 17, 2015

Pamela Creedon
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, CA 95670-6114

Subject: Waste Discharge Requirement Order No. 5-01-234, Update of Long Term Drainage Management Plan and submittal of Monitoring Results

Dear Pamela,

The above Waste Discharge Requirements (WDR) require submission of an update of the long-term drainage management plan for the Grassland Bypass Project and monitoring data. The WDR's were issued to the San Luis & Delta-Mendota Water Authority (Water Authority) and the U. S. Bureau of Reclamation. The Water Authority members that participate in the Grassland Bypass Project are hereafter referred to as the Grassland Area Farmers.

The long-term drainage management plan was submitted on September 30, 1998 in compliance with WDR No. 98-171. Following is an update to the plan.

On July 31, 2015, WDR Order No. R5-2015-0094 (2015 Order) was adopted by the Central Valley Regional Water Quality Control Board. This 2015 Order updated the 2001 WDRs and monitoring requirements to make the Grassland Bypass Project consistent with the Irrigated Lands Regulatory Program (IRLP). Monitoring under the 2015 Order began in September of 2015 and will be reported in the Annual Monitoring Report that will be submitted on April 30, 2016. This annual December report under WDR 5-01-234 will be discontinued after this letter.

Milestones since Last Update

The milestones that have occurred for the Grassland Bypass Channel Project since the 2010 update are as follows:

- During 2015 there was zero discharge from the San Luis Drain from April 26, 2015 thorough October 17, 2015.
- The Grassland Area Farmers have reduced the discharge of selenium from the Grassland Drainage Area by 97% since the beginning of the project as measured at the end of Water Year 2015. A December 2014 storm event caused the selenium

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load allocation for December 2014 to be exceeded by 21 pounds. Incentive fee credits allocated under the 2010 Use Agreement negate any incentive fees under the 2010 Use Agreement for this exceedence.

- The Grassland Area Farmers have continued to develop funding for the Westside Regional Drainage Plan as described in previous reports. Panoche Drainage District received $30.3 million in funding assistance through the U.S. Bureau of Reclamation's San Joaquin River Salinity Management Program including $3.75 million awarded in 2015. These funds continue to be used to implement a number of activities outlined in the Westside Regional Drainage Plan including projects for groundwater management, development of the reuse area, source control projects and environmental mitigation.

- The Grassland Area Farmers continue to utilize and expand the San Joaquin River Water Quality Improvement Project (SJRIP). The total acreage of the SJRIP has been increased to more than 6,000 acres, with approximately 5,200 developed to salt tolerant crops for drainage reuse. More than 33,000 acre feet of drain water were reused on the SJRIP in Water Year 2015.

- The Grassland Area Farmers are continuing to work closely with the U.S. Bureau of Reclamation to develop an in-valley drainage solution for the Grassland Drainage Area. The In-Valley Solution Plan includes irrigation improvements, seepage reduction, land retirement, recirculation, drainage reuse, and drainage treatment. Reclamation is in the process of developing a demonstration level treatment plant on land in the SJRIP to test treatment methods utilizing subsurface agricultural drainage. Construction on this plant began in December 2012, which was completed in the Spring of 2014. The plant is currently undergoing calibration and start-up testing.

- The discharge from the Grassland Bypass Project in Calendar Year 2014 (critical year type) was 458 pounds of selenium with a load limit of 1,075 pounds. The selenium load discharge during Calendar Year 2015 (critical year type) is projected to be 228 pounds of selenium, approximately 74% below the annual load limit of 884 pounds. The actual pounds discharged are not available pending receipt of monitoring reports and will be included in the next update report.

Statement of Goals

The principal goal of the Grassland Area Farmers remains is described in the September 30, 1998 long term drainage management plan. This goal is summarized as providing for the achievement of the water quality objectives fixed by the Regional Board and their Basin Plan related to subsurface drainage discharges from the drainage area while maintaining viable agricultural production in the area.

Inflows Not Within the Control of Grassland Area Farmers

The issue of high drainage flows caused by major storm events continues to be a concern. The 2010-2019 Use Agreement provides for mechanisms to deal with rain

induced drainage through the high-rainfall and upper watershed exemptions. It also describes a planning process that may evaluate the utilization of a portion of the San Luis Drain to bypass storm water flows around some wetland areas after 2019, in order to minimize the impact of such flows. Under the Use Agreement, development of a formal plan must begin no later than 2016. Another source of inflows to agricultural drainage systems of the Grassland Drainage Area that continues to be of interest is the contribution from seepage out of the San Luis Canal/California Aqueduct. This issue was described in the 2004 annual report and estimated impacts are being updated. The zero flow from the San Luis Drain ended on October 17, 2015 due to a storm event.

Future Regulation and Milestones

The Regional Board has adopted a TMDL for salt and boron and one for dissolved oxygen. These TMDLs have subsequently been approved by the State Board and the State Office of Administrative Law. These regulations encompass discharges from a much larger area than the Grassland Drainage Area. The Grassland Area Farmers assisted in the development of a real-time program to comply with the salt and boron TMDL. Part of the real-time program was the development of a Memorandum of Understanding (MOU) to allow for participation in the real time program. The San Luis & Delta-Mendota Water Authority (on behalf of the Grassland Basin Drainage Management Activity Agreement) is a signatory to the MOU. The real-time program was approved by the Central Valley Region Board on December 4, 2014. The Grassland Area Farmers are also contributing to the operation of the aerator at the Port of Stockton to maintain high dissolved oxygen levels. The operation of the aerator has been very successful and there are adequate funds to continue operation during 2015.

Discharge during Water Year 2015

Table 1 sets forth discharges from the Grassland Drainage Area for the period Water Year 1995 (October 1994 through September 1995) through Water Year 2015. The Grassland Bypass Project began in Water Year 1997. The volume of drainage has been reduced significantly compared to pre-project (1995) discharges:

- Discharge volume (acre feet) has been reduced by 89%
- Selenium load has been reduced by 97%
- Salt load has been reduced by 83%
- Boron load has been reduced by 76%

Figure 1 shows this historic discharge (acre feet) and selenium concentration from the Grassland Drainage Area since 1995. As expected, the discharged volume has reduced significantly since the project implementation. However, the concentration of selenium has also reduced – by almost 72% since the beginning of the project. The cause of this selenium concentration reduction is likely the combined result of water delivery infrastructure improvements, irrigation system modernization, and reuse activities on the San Joaquin River Improvement Project.

Selenium load discharged from the Grassland Drainage Area compared with 2015 monthly targets in WDR 5-01-234 are shown in Figure 2. Figure 3 shows the 2015 discharged load along with historic discharges and the "glidepath" in the Use Agreement incorporating the load values from the August 4, 2005 request for revision of the TMML for selenium. Figure 4 shows an estimate of the impact of control activities that occurred during Water Year 2015. Conservation, which includes improved irrigation application, tiered water pricing, tailwater controls, the tradable loads program, and seasonal land fallowing accounted for a reduction of approximately 6,800 pounds of selenium from historic loads. Reuse and treatment, which includes recycling, use of subsurface drainage water on salt tolerant crops and displacement of subsurface drainage water such as for wetting of roadways for dust control, resulted in a 5,600 pound reduction in discharge in Water Year 2015. The remaining 354 pounds was discharged to the San Joaquin River through the Grassland Bypass Project.

The water quality objective for the San Joaquin River at Crows Landing is a 5-ppb 4-day average selenium concentration. This objective was not exceeded in all months through September 19, 2015 and is not expected to have been exceeded the remainder of the year.

Meeting Water Quality Objectives within Grassland Area Channels

The Regional Board has established a two parts per billion monthly average selenium objective for water delivery channels within the wetland areas. Previous long term drainage management plans discussed the activities within the Grassland Drainage Area to keep their agricultural subsurface drainage out of those channels to meet this water quality objective. The Grassland Area Farmers have caused the objective to be exceeded on a few occasions. During 1997 and 1998 storm water discharges caused by surface runoff from heavy rainfall and discharge from coastal streams overwhelmed the agricultural drainage system and flowed into wetland channels, violating the objectives. In February of 2005, significant storm events required the Grassland Area Farmers to divert water through the Agatha Canal in accordance with their Storm Water Management Plan, exceeding the objective for several days. No storm-related diversions into wetland channels by the Grassland Area Farmers have been made since that time.

The Grassland Area Farmers continue to work with the Regional Board to identify and manage discharges to wetland water delivery channels from outside of the Grassland Drainage Area that may cause exceedances of the selenium water quality objective within the wetland areas. Figure 5 shows the monthly average selenium concentrations for two sites within the wetland area. There have been 2 exceedances within the last 111 months, showing marked improvements and low exceedance rates (see Table 2).

Tools to be used For Long Term Drainage Management

Conservation, reuse and treatment, and river discharge will continue to be the main tools available to the Grassland Area Farmers during the next several years.

During Water Year 2001, Panoche Drainage District on behalf of the other Grassland Area Farmers implemented the San Joaquin River Water Quality Improvement Project

(SJRIP). Table 3 shows the usage of subsurface drainage water within the SJRIP area in Water Year 2015, including drain water reused on the newly expanded area. The project resulted in a displacement of 2,670 pounds of selenium. The SJRIP is a multi-phase project, which was initiated with the purchase of 4,000 acres of land in the year 2000 within the Grassland Drainage Area by Panoche Drainage District. During 2008, an additional 2,000 acres were purchased, of which 480 acres were developed for reuse. Currently the total developed reuse area is approximately 5,500 acres. Future phases call for installing subsurface tile drainage systems in the remainder of the SJRIP area to maintain a salt balance within the soil and for disposal of the collected water through treatment and salt disposal options. A portion of these future phases are budgeted in federal grants awarded to Panoche Drainage District. Other funds within this grant will be used to investigate drainage treatment options for final salt disposal.

Future Needs

In order to maintain the drainage control strategy for the Grassland Area Farmers, there are several needs. They are as follows:

- The completion of the SJRIP Project including planting of salt tolerant crops and construction of subsurface drainage systems.

- Purchase of additional SJRIP lands of up to 2,500 acres for planting of additional cropping to be irrigated with subsurface drainage water. This will allow field rotation to ensure long-term sustainability and additional capacity to manage storm-induced drainage flows.

- Implementation of treatment and disposal of salt from the SJRIP lands. The U.S. Bureau of Reclamation has constructed a demonstration-scale treatment plant within the SJRIP that receives its source water from tile systems within the SJRIP. The plant is currently undergoing calibration and start-up testing.

- Additional pilot treatment testing occurred in this time period. These included several reverse osmosis pilots and a solar evaporator from Water FX. The Water FX project is looking to expand to a full size plant. Environmental documents are being prepared for this project.

- Retirement of land could be part of the ultimate solution to the problem within the Grassland Drainage Area. The Grassland Area Farmers have developed a land retirement policy that was identified and described in the September 30, 1998 Long Term Drainage Management Plan. In addition to this plan, Broadview Water District has been purchased and has been fallowed. Other lands within the Grassland Drainage Area are also being considered for fallowing.

- The Grassland Area Farmers and other local interests have been participating with the USBR in their San Luis Drainage Feature Re-Evaluation Program. The goal of the Grassland Area Farmers is to develop local projects that can be implemented to provide drainage service that meets regulatory requirements, including the selenium load reduction targets, while still maintaining a viable agricultural economy.

- The Grassland Area Farmers continue to work with the USBR, other local stakeholders and interested parties to resolve long standing drainage issues. The main component would be full implementation of the Westside Regional Drainage Plan.

Recent Developments

There are four recent and on-going developments related to efforts of the Grassland Area Farmers to meet the regulatory requirements of the Waste Discharge Permit and the Use Agreement. The first two were indicated in the 2004 annual report.

- The Westside Regional Drainage Plan has been developed by the San Joaquin River Exchange Contractors Water Authority, the Broadview Water District, Panoche Water District and Westlands Water District. This process is meant to complement the USBR San Luis Drain Feature Re-evaluation process and to help resolve longstanding drainage issues within the area. The Grassland Area Farmers are aggressively pursuing funding opportunities to implement the Westside Regional Drainage Plan, and have met on a number of occasions with the USBR to move this plan forward. A number of state and federal grants have help significantly in funding portions of this plan.

- The San Joaquin River Water Quality Management Group was formed out of the "UOP Discussions" between statewide water interests and Delta interests to develop a plan to meet Vernalis salinity objectives. There are many components to this plan that is being developed, one of the major ones being the future reductions of discharge from the Grassland Drainage Area.

- In December, 2006 the Grassland Area Farmers complied with the requirement in the Use Agreement that a Mud Slough Compliance Plan be developed by 2006 to meet Mud Slough water quality objectives. This letter also outlined a process to continue discharges to the San Joaquin River beyond the term of the then-current Use Agreement, which expired in December, 2009.

- In the summer of 2007 the Grassland Area Farmers initiated discussions with stakeholders regarding a time extension of the Grassland Bypass Project. The discharge of selenium and salinity has significantly reduced since the initiation of the Grassland Bypass Project. The Westside Regional Drainage Plan has been developed and significant funding has been obtained to implement parts of the plan. However, the final funding and technical steps are not yet in place and therefore the Grassland Area Farmers have requested up to a 10 year extension of the Use Agreement. The EIR for this extension was approved by the San Luis & Delta-Mendota Water Authority on October 8, 2009 and the Record of Decision by the US Bureau of Reclamation was issued on December 21, 2009 with a subsequent signing of the new 2010-2019 Use Agreement. This action required a Basin Plan Amendment. The Basin Plan Amendment was approved by the Central Valley Regional Board on May 27, 2010 and by the State Water Resources Control Board on October 5, 2010. The Central Valley Water Board had developed and adopted

revised Waste Discharge Requirements for the Project which were approved in July, 2015.

- The six interceptor sumps along the Delta-Mendota Canal have been rerouted so that their discharge is reused on the SJRIP rather than discharged to the Delta-Mendota Canal. This work was completed in the Spring of 2015.

Water Quality Data

In compliance with Order No. 5-01-234, water quality data for tributary and receiving water sites is shown in the attached tables and figures. Table 4 summarizes the monthly water quality data for the San Luis Drain at Site B (discharge into Mud Slough North). Tables 5 through 8 summarize the monthly water quality data for Sites C, D, G, and N (respectively). Table 9 summarizes the aquatic toxicity results for all three species for Sites B, C, and D.

Conclusion

The Grassland Area Farmers have demonstrated their commitment to the project as evidenced by the accomplishments as detailed in this report. They are also committed to the goals and milestones in the new 2010-2019 Use Agreement. This will include maintaining efforts to meet monthly and annual selenium targets while at the same time aggressively pursuing the long term solutions and funding that will be necessary to meet these future requirements.

If you should have any questions please feel free to call. I can be reached at (559) 582-9237.

Very Truly Yours,

Joseph C. McGahan
Drainage Coordinator
Grassland Area Farmers

JCM/jcl

Cc: David Murillo, USBR Sacramento
Michael Jackson, USBR Fresno
Dan Nelson, SL&DMWA
Grassland Basin Drainage Steering Committee
Sue McConnell, RWQCB, Rancho Cordova

Table 1
Discharge Comparison from Grassland Drainage Area
Values October thru September

	WY 95	WY 96	WY 97	WY 98	WY 99	WY 00	WY 01	WY 02	WY 03	WY 04	WY 05
Volume (AF)	57,574	52,978	39,856	49,289	32,317	31,342	28,235	28,358	27,345	27,640	29,957
Se (lbs)	11,875	10,034	7,096	9,118	5,124	4,603	4,377	3,939	4,032	3,860	4,305
Salt (tons)	237,530	197,526	172,602	213,533	149,081	139,303	142,415	128,411	126,500	121,138	138,908
B (1,000 lbs)	868	723	753	983	630	619	423	544	554	530	585
Se (ppm)	0.076	0.070	0.066	0.068	0.058	0.054	0.057	0.051	0.054	0.051	0.053
Salt (µmhos/cm)	4,102	3,707	4,306	4,308	4,587	4,420	5,016	4,503	4,600	4,358	4,611
Boron (ppm)	5.5	5.0	7.0	7.3	7.2	7.3	5.5	7.1	7.5	7.1	7.2

	WY 06	WY 07	WY 08	WY 09	WY 10	WY 11	WY 12	WY 13	WY 14	WY 15	Reduction from WY 95 to WY 14
Volume (AF)	25,995	18,531	15,665	13,166	14,529	18,513	10,486	10,258	7,125	6,079	89%
Se (lbs)	3,563	2,554	1,736	1,264	1,577	2,067	733	638	317	354	97%
Salt (tons)	119,646	79,094	66,254	55,556	67,661	87,537	38,398	54,663	44,834	40,779	83%
B (1,000 lbs)	539	278	269	233	315	440	245	309	244	212	76%
Se (ppm)	0.050	0.051	0.041	0.035	0.040	0.041	0.026	0.023	0.016	0.021	
Salt (µmhos/cm)	4,577	4,244	4,206	4,196	4,631	4,702	3,641	5,299	6,257	6,670	
Boron (ppm)	7.6	5.5	6.3	6.5	8.0	8.7	8.6	11.1	12.6	12.8	

Note: WY 97, 98, & 05 include discharges through Grasslands
Note: GAF quality data used where RWQCB data was missing or pending.

Table 2

Exceedance of 2 ppb Monthly Mean Water Quality Objective

	Site	
	J	K
% months exceeding 2 ppb monthly mean selenium objective Oct 1996 through Aug 2006	19%	13%
% months exceeding 2 ppb monthly mean selenium objective Sept 2006 through November 2015	2%	2%

Months exceeding 2 ppb but with no flow were excluded from calculations

Table 3
San Joaquin River Improvement Project
Water Year 2015

MONTH	WATER APPLIED (AF) DRAIN	OTHER	TOTAL	SELENIUM LBS	SALT TONS	BORON LBS
OCT 14	2,912	292	3,204	241	18,953	103,246
NOV	2,576	363	2,939	170	20,293	89,050
DEC	3,323	175	3,498	273	22,442	120,127
JAN 15	3,578	230	3,808	201	24,070	129,516
FEB	2,576	0	2,576	248	19,081	105,264
MAR	2,950	36	2,986	228	18,442	101,889
APR	2,000	103	2,103	124	13,369	75,600
MAY	2,594	439	3,033	262	8,462	80,862
JUN	2,504	691	3,195	219	15,742	86,773
JUL	2,525	616	3,141	228	12,225	59,759
AUG	3,198	473	3,671	266	14,499	69,589
SEP	2,307	237	2,544	207	12,600	62,808
TOTAL	**33,043**	**3,655**	**36,698**	**2,667**	**200,178**	**1,084,483**

Figure 1
Grassland Bypass Project - Site B
Annual Average Selenium Concentration

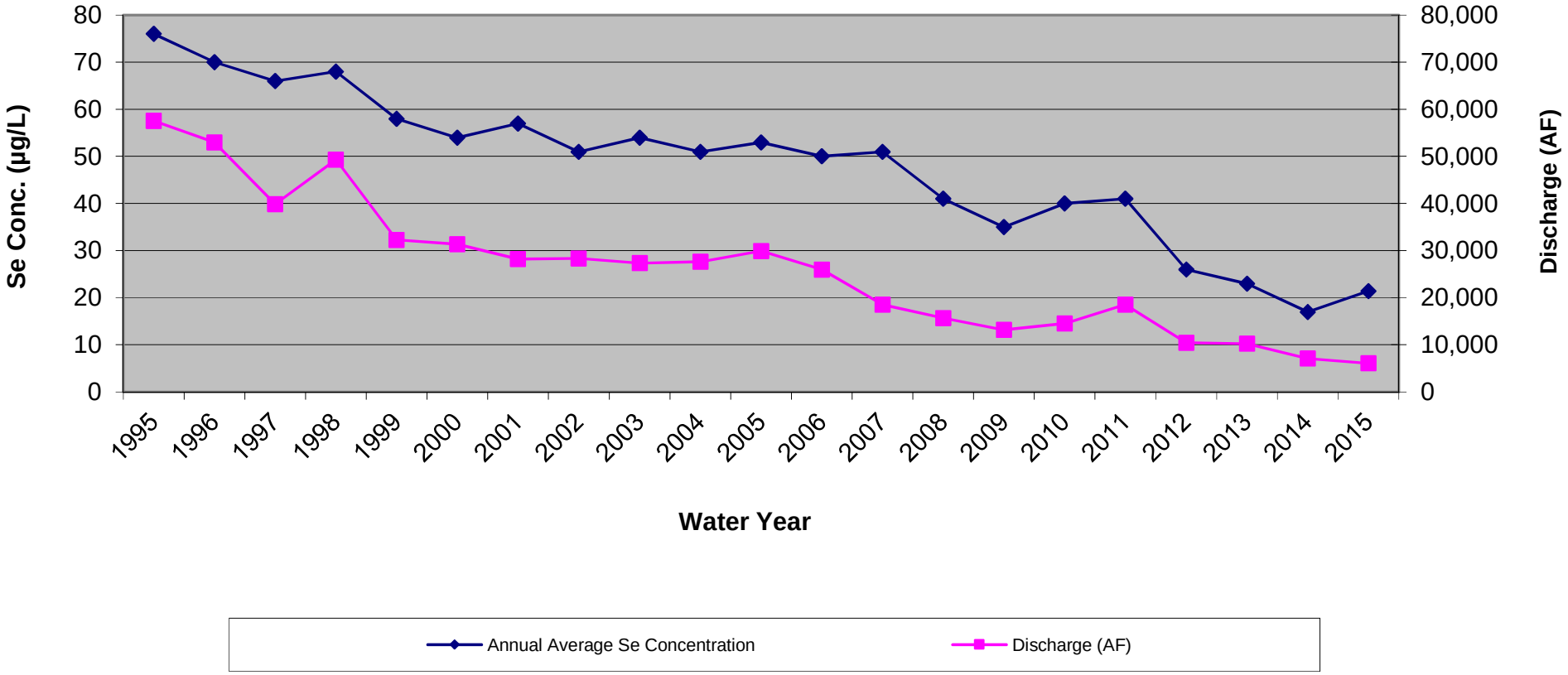


Figure 2
Discharge from the Grassland Drainage Area
October 2014 through September 2015

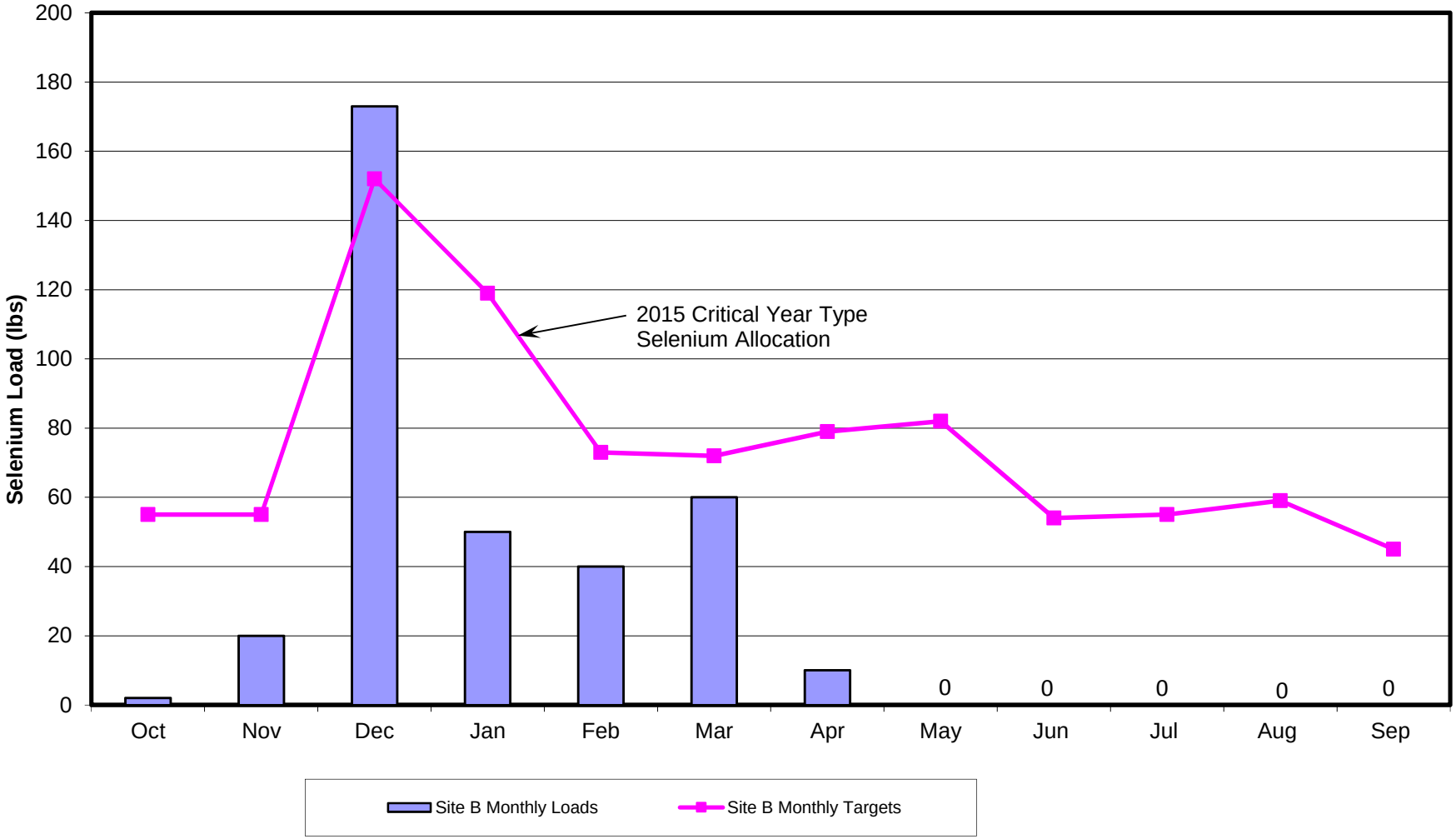
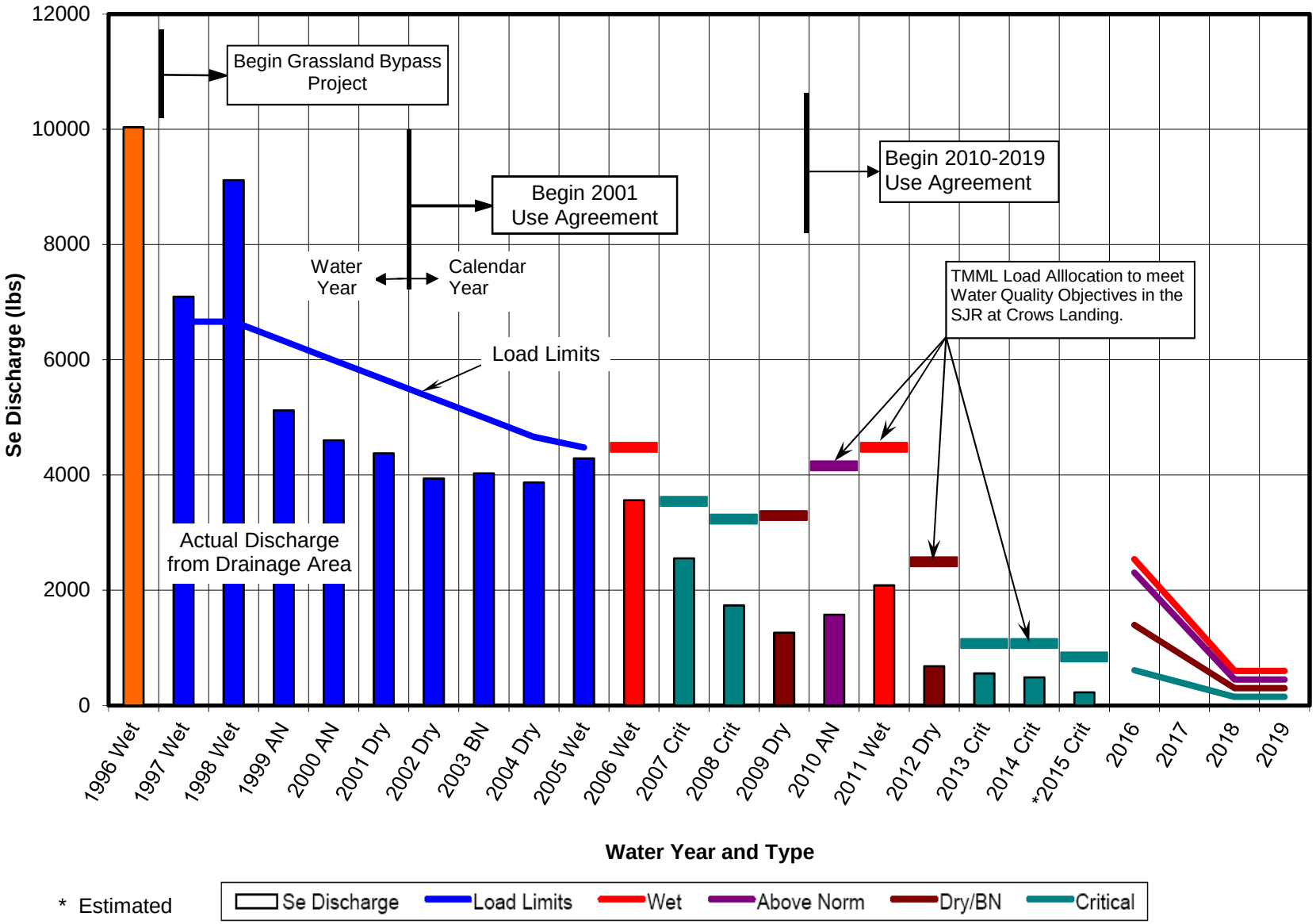


Figure 3
Grassland Drainage Area
Selenium Discharge and Targets

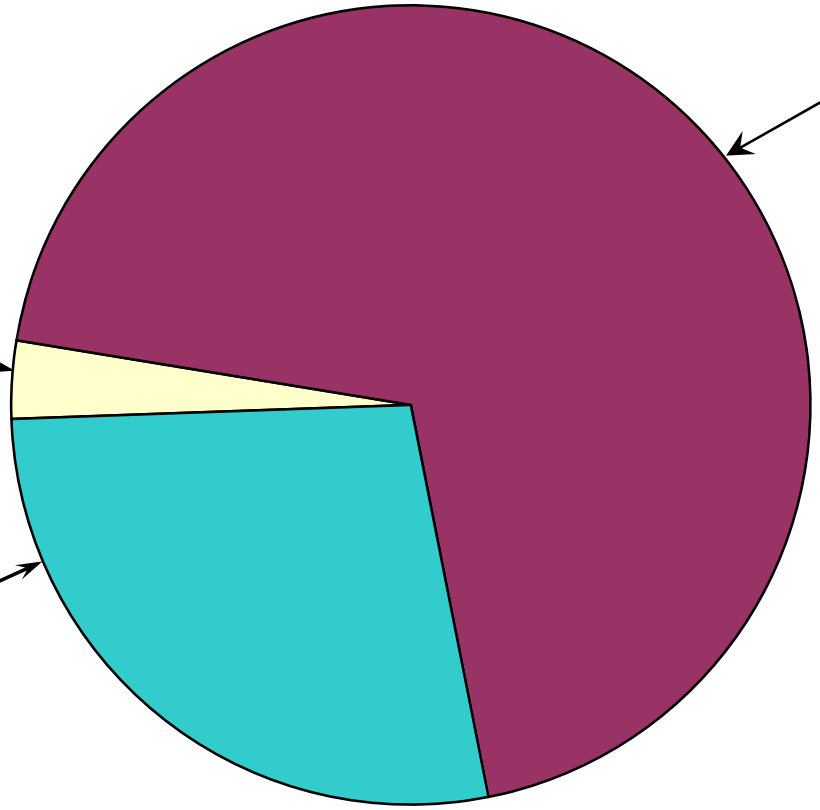


* Estimated

Se Discharge | Load Limits | Wet | Above Norm | Dry/BN | Critical

Figure 4

Historic Drainage Water (lbs selenium)
57,000 AF 12,700 lbs Se 240,000 Tons Salt



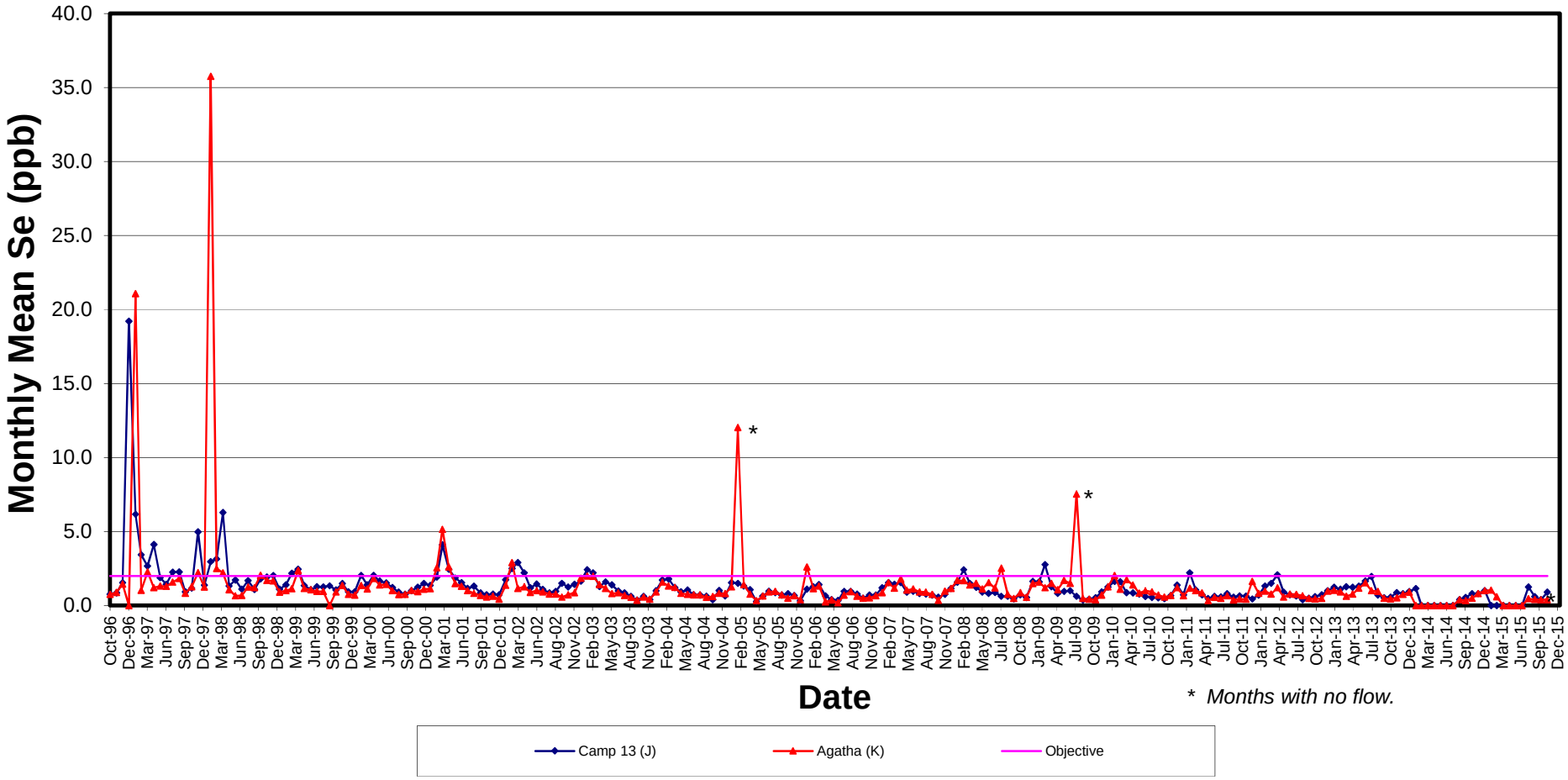
8,800
Conservation
lbs Selenium conserved through GAF activities.
- Improved irrigation applications
- Tiered water pricing
- Tailwater controls
- Tradable Loads

400
River Discharge
lbs Selenium discharged through the GBP

3,500
Reuse & Treatment
lbs Selenium reused, recycled or treated.
- Recycling
- Use on salt tolerant crops
- Displacement
- Pilot Treatment

2015 Drainage Management

Figure 5
Camp 13 (J) and Agatha Canal (K)



* *Months with no flow.*

Table 4: Site B - San Luis Drain at Discharge to Mud Slough (North)

PARAMETER	Total Flow	Average Temperature	Average Specific Conducantce	Average Total Suspended Solids	Average Boron	Average Selenium	Selenium Load	Selenium Load Objective
DATA SOURCE	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	UA3
UNITS	acre-feet	°C	µS/cm	mg/L	mg/L	ug/L	lbs	lbs
Oct-2014	47	20.0	15,300	86	30.5	13.2	2	55
Nov-2014	601	13.3	10,200	74	23.4	11.9	20	55
Dec-2014	2,839	11.7	6,630	49	14.1	22.6	173	152
Jan-15	909	10	6372	56	13	21	50	119
Feb-15	788	13	6914	27	13	21	40	73
Mar-15	757	17	6579	48	13	29	60	72
Apr-15	137	18	6826	40	13	17	10	79
May-15	0	20	7595		17	7	0	82
Jun-15	0	27	9694		19	7		54
Jul-15	0				27	8		55
Aug-15	0							59
Sep-15	0							45
Cumulative Totals	6079						354	840

	Physicals					Total Selenium	Total Boron	Total Molybdenum
PARAMETER	Dissolved Oxygen	pH	Specific Conductance	Temperature	Turbidity			
DATA SOURCE	USBR	USBR	USBR	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	units	µS/cm	°C	NTU	ug/L	mg/L	ug/L
Oct-03-2014	11.8	8.2	12,400	20.1	NA	9	28	NA
Oct-10-2014	9.5	9.5	14,300	22.1	47.0	9	38	NA
Oct-17-2014	NA	8.1	12,100	20.1	135	15	29	NA
Oct-24-2014	9.8	7.9	11,400	16.9	79.6	11	29	NA
Oct-31-2014	9.2	8.4	9,910	18.6	75.7	12	20	9.0
Nov-07-2014	19.0	8.5	7,080	15.6	19.2	21	14	NA
Nov-14-2014	17.2	8.3	11,280	16.2	16.6	15	30	NA
Nov-21-2014	12.1	8.3	10,800	13.2	16.6	10	32	NA
Nov-28-2014	12.8	8.2	6,820	12.1	10.0	12	14	NA
Dec-05-2014	NA	NA	NA	NA	NA	NA	NA	NA
Dec-12-2014	NA	7.9	6,820	13.2	18.6	11	15	NA
Dec-16-2014	8.0	7.7	5,140	11.3	52.5	20	11	13.0
Dec-23-2014	NA	7.6	6,320	13.8	30.7	28	13	NA
Dec-30-2014	14.7	8.1	6,740	8.1	16.8	39	13	NA
Jan-09-2015	11.8	8.3	5783	11.0	4.7	36	11	NA
Jan-13-2015	20.8	8.4	5765	11.4	8.6	23	12	16
Jan-23-2015	19.9	8.3	7608	9.8	11.8	10	18	NA
Jan-30-2015	9.9	8.0	8440	17.5	28.5	21	21	NA
Feb-04-2015	22.3	8.4	7247	12.7	11.7	26	15	NA
Feb-13-2015	19.1	8.3	6854	15.1	13.6	29	15	NA
Feb-19-2015	13.4	8.2	5835	16.1	NA	21	11	17
Feb-27-2015	16.0	8.4	7097	13.6	23.2	10	16	NA
Mar-06-2015	17.2	8.3	4739	14.7	17.7	11	9	NA
Mar-13-2015	13.1	8.2	6430	18.8	7.2	30	14	NA
Mar-20-2015	2.7	3.7	5134	19.2	17.8	19	11	20
Mar-27-2015	16.6	8.5	6850	20.1	15.1	36	13	NA
Apr-01-2015	13.0	8.6	6800	18.8	17.3	29	14	17
Apr-10-2015	20.9	9.1	6907	16.7	17.1	20	14	NA
Apr-16-2015	12.7	9.1	6177	17.0	25.5	13	12	18
Apr-24-2015	10.3	8.7	7603	21.6	16.2	10	16	NA
May-01-2015	6.3	8.3	7654	24.1	20.5	6	16	NA
May-08-2015	7.0	8.3	7606	18.7	28.6	6	17	NA
May-15-2015	4.6	8.2	8372	21.9	75.6	6	18	NA
May-21-2015	3.6	8.1	8262	17.1	70.3	6	19	10
May-27-2015	6.2	8.2	8643	17.5	81.0	7	20	9
Jun-04-2015	NA	8.7	9434	19.7	68.0	9	21	NA
Jun-11-2015	3.4	8.9	10041	26.5	63.8	9	23	NA
Jun-17-2015	7.3	8.4	11091	24.4	33.8	9	26	7
Jun-25-2015	10.0	8.3	13037	28.3	NA	11	33	NA
Jun-29-2015	11.9	8.3	14448	25.5	45.2	15	36	9
Jul-09-2015						21	59	
Jul-15-2015						23	75	
Jul-20-2015						21	84	

	Nutrients				
PARAMETER	Nitrates as N (Dissolved)	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorous as P	Ortho-phosphate as P
DATA SOURCE	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L
Oct-31-2014	< 0.80	< 0.5	6.7 U	0.350 U	< 2.00
Nov-30-2014	NA	NA	NA	NA	NA
Dec-16-2014	6.0	0.5	2.5	0.2	0.052
Jan-13-2015	2.60	0.12	1.70	0.08	< 0.010
Feb-19-2015	1.1 T	0.14 L	1.70	0.09	< 0.010 T
Apr-01-2015	3.30	0.10	2.20	0.09	< 0.010
Apr-16-2015	<0.010	0.33	2.80	0.07	0.01
May-21-2015	<0.010	<0.050	3.90	0.19	< 0.010 L
May-27-2015	<0.010	<0.050	6.1 U	0.34 U	< 0.010
Jun-17-2015	<0.010	<0.050	4.80	0.22	0.01
Jun-29-2015	<0.010	<0.050	1.40	0.27	0.02

NA	= no data available
P	= pending
H	= Result may have high bias
L	= Result may have low bias
V	= Result may vary excessively
T	= Result obtained past holding time
U	= Result determined to be outlier at the time of data validation

Table 5: Site C - Mud Slough (North) above San Luis Drain discharge

	Nutrients				
PARAMETER	**Nitrates as N (Dissolved)**	**Ammonia as N**	**Total Kjeldahl Nitrogen**	**Total Phosphorous as P**	**Ortho-phosphate as P**
DATA SOURCE	**USBR**	**USBR**	**USBR**	**USBR**	**USBR**
UNITS	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Jan-13-2015	0.96	0.27	1.90	0.17	0.09
Feb-19-2015	0.35 T	0.23	1.60	0.40	0.33 T
Apr-01-2015	0.12	0.17	2.60	0.51	0.41 U
Apr-16-2015	<0.010	0.17	2.30	0.30	0.024 T
May-21-2015	NA	NA	NA	NA	NA
May-27-2015	NA	NA	NA	NA	NA
Jun-17-2015	<0.010	0.06	0.92	0.54	0.49
Jun-29-2015	<0.010	<0.050	0.75	0.86	0.44

NA	= no data available
P	= pending
H	= Result may have high bias
L	= Result may have low bias
V	= Result may vary excessively
T	= Result obtained past holding time
U	= Result determined to be outlier at the time of data validation

	Physicals							
PARAMETER	**Dissolved Oxygen**	**pH**	**Specific Conductance**	**Temperature**	**Turbidity**	**Total Selenium**	**Total Boron**	**Total Molybdenum**
DATA SOURCE	**USBR**	**USBR**	**USBR**	**USBR**	**USBR**	**USBR**	**USBR**	**USBR**
UNITS	**mg/L**	**units**	**µS/cm**	**°C**	**NTU**	**ug/L**	**mg/L**	**ug/L**
Oct-03-2014	NA	NA	NA	NA	NA	NA	NA	NA
Oct-10-2014	12.3	7.9	1,360	NA	11	0.4	0.9	NA
Oct-17-2014	NA	7.9	1,670	NA	37	< 0.4	1.1	NA
Oct-24-2014	NA	NA	NA	NA	NA	NA	NA	NA
Oct-31-2014	9.8	7.9	2,130	NA	11	< 0.4	1.6	25 U
Nov-07-2014	8.2	7.9	1,746	NA	20	0.4	1.2	NA
Nov-14-2014	NA	NA	NA	NA	NA	NA	NA	NA
Nov-21-2014	10.7	7.6	2,150	NA	10	< 0.4	1.4	NA
Nov-28-2014	62.0	7.4	1,120	NA	12	0.4	1.6	NA
Dec-05-2014	NA	NA	NA	NA	NA	NA	NA	NA
Dec-12-2014	NA	NA	NA	NA	NA	NA	NA	NA
Dec-16-2014	6.2	7.4	1,120	NA	12	0.5	0.9	6.0
Dec-23-2014	NA	7.5	1,510	NA	6	0.7	1.4	NA
Dec-30-2014	9.9	8.0	1,750	NA	12	0.7	1.6	NA
Jan-09-2015	11.6	7.7	3001	11.5	16.6	6.4	3.2	NA
Jan-13-2015	9.5	7.7	3325	12.1	22.3	5.6	3.9	16
Jan-23-2015	11.1	7.7	3825	10.0	18.6	2.4	5.6	NA
Jan-30-2015	9.9	8.0	6597	12.3	25.1	10.3	13	NA
Feb-04-2015	8.4	7.8	3664	14.0	25.2	4.4	5.1	NA
Feb-13-2015	7.5	7.7	3390	15.6	31.0	3.5	3.8	NA
Feb-19-2015	7.0	7.7	3178	15.1	NA	2.2	3.2	14
Feb-27-2015	9.8	8.0	4205	14.2	35.1	3.2	6.3	NA
Mar-06-2015	9.4	8.1	4242	15.0	25.1	10.6	6.6	NA
Mar-13-2015	8.4	8.0	2922	17.8	22.9	3.0	3.1	NA
Mar-20-2015	NA	NA	NA	20.5	NA	3.2	3.7	12
Mar-27-2015	9.1	8.1	4361	20.2	42.2	10.8	6.8	NA
Apr-01-2015	14.7	8.0	3730	16.3	58.6	0.7	3.4	20
Apr-10-2015	15.1	8.2	3975	18.1	48.0	1.2	3.8	NA
Apr-16-2015	10.2	8.2	4400	17.8	20.4	3.5	5.4	20
Apr-24-2015	9.2	8.0	3754	19.5	40.0	0.4	3.4	NA
May-01-2015	7.9	8.2	2739	22.7	17.6	0.8	2.6	NA
May-08-2015	9.8	8.1	4082	17.8	34.4	0.4	3.7	NA
May-15-2015	NA	NA	NA	NA	NA	NA	NA	NA
May-21-2015	NA	NA	NA	NA	NA	NA	NA	NA
May-27-2015	NA	NA	NA	NA	NA	NA	NA	NA
Jun-04-2015	NA	NA	NA	NA	NA	NA	NA	NA
Jun-11-2015	3.7	7.9	8911	29.2	22.7	0.4	7.6	NA
Jun-17-2015	8.2	8.1	9565	25.3	15.6	0.6	7.6	22
Jun-25-2015	10.1	8.2	10456	27.2	NA	0.6	9.3	NA
Jun-29-2015	8.8	8.2	10989	25.8	10.5	0.6	9.6	22
Jul-09-2015						0.7	11.0	
Aug-17-2015						0.4	1.3	
Aug-24-2015						0.4	1.3	

Table 6: Site D - Mud Slough (North) below San Luis Drain discharge

	Nutrients				
PARAMETER	Nitrates as N (Dissolved)	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorous as P	Ortho-phosphate as P
DATA SOURCE	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L
Oct-31-2014	<0.40	<0.5	1.6	0.46	<1.000
Nov-30-2014	NA	NA	NA	NA	NA
Dec-16-2014	1.80	0.5 U	2.5	0.44	0.280 U
Jan-13-2015	0.96	0.27	1.90	0.17	0.09
Feb-19-2015	0.35 T	0.23	1.60	0.40	0.33 T
Apr-01-2015	0.12	0.17	2.60	0.51	0.41 U
Apr-16-2015	<0.010	0.17	2.30	0.30	0.024 T
May-21-2015	NA	NA	NA	NA	NA
May-27-2015	NA	NA	NA	NA	NA
Jun-17-2015	<0.010	0.06	0.92	0.54	0.49
Jun-29-2015	<0.010	<0.050	0.75	0.86	0.44

NA	= no data available
P	= pending
H	= Result may have high bias
L	= Result may have low bias
V	= Result may vary excessively
T	= Result obtained past holding time
U	= Result determined to be outlier at the time of data validation

	Physicals							
PARAMETER	Dissolved Oxygen	pH	Specific Conductance	Temperature	Turbidity	Total Selenium	Total Boron	Total Molybdenum
DATA SOURCE	USBR	USBR	USBR	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	units	µS/cm	°C	NTU	ug/L	mg/L	ug/L
Oct-03-2014	11.7	8.2	1,650	21.6	NA	< 0.4	1.6	NA
Oct-10-2014	10.9	8.0	1,600	21.5	13.1	0.5	1.4	NA
Oct-17-2014	NA	7.9	1,750	20.6	9.8	0.5	1.6	NA
Oct-24-2014	10.1	7.8	4,000	17.4	16.3	1.5	6.6	NA
Oct-31-2014	8.5	7.9	4,010	17.5	20.6	2.2	6.2	22
Nov-07-2014	10.6	8.3	4,770	16.1	20.9	12.4	8.2	NA
Nov-14-2014	8.9	8.1	5,510	16.5	23.3	5.4	10.0	NA
Nov-21-2014	7.7	7.9	3,950	13.6	13.8	2.5	6.5	NA
Nov-28-2014	9.1	7.8	3,780	12.1	9.2	1.9	6.0	NA
Dec-05-2014	NA	NA	NA	NA	NA	NA	NA	NA
Dec-12-2014	NA	7.6	2,980	13.0	20.7	3.5	4.7	NA
Dec-16-2014	9.1	7.4	2,200	11.3	25.0	5.4	3.2	8
Dec-23-2014	NA	7.5	2,660	13.6	15.0	6.5	4.0	NA
Dec-30-2014	9.6	7.6	2,320	8.8	15.2	3.7	2.6	NA
Jan-09-2015	11.6	7.7	3001	11.5	16.6	6.4	3.2	NA
Jan-13-2015	9.5	7.7	3325	12.1	22.3	5.6	3.9	16
Jan-23-2015	11.1	7.7	3825	10.0	18.6	2.4	5.6	NA
Jan-30-2015	9.9	8.0	6597	12.3	25.1	10.3	13	NA
Feb-04-2015	8.4	7.8	3664	14.0	25.2	4.4	5.1	NA
Feb-13-2015	7.5	7.7	3390	15.6	31.0	3.5	3.8	NA
Feb-19-2015	7.0	7.7	3178	15.1	NA	2.2	3.2	14
Feb-27-2015	9.8	8.0	4205	14.2	35.1	3.2	6.3	NA
Mar-06-2015	9.4	8.1	4242	15.0	25.1	10.6	6.6	NA
Mar-13-2015	8.4	8.0	2922	17.8	22.9	3.0	3.1	NA
Mar-20-2015	NA	NA	NA	20.5	NA	3.2	3.7	12
Mar-27-2015	9.1	8.1	4361	20.2	42.2	10.8	6.8	NA
Apr-01-2015	14.7	8.0	3730	16.3	58.6	0.7	3.4	20
Apr-10-2015	15.1	8.2	3975	18.1	48.0	1.2	3.8	NA
Apr-16-2015	10.2	8.2	4400	17.8	20.4	3.5	5.4	20
Apr-24-2015	9.2	8.0	3754	19.5	40.0	0.4	3.4	NA
May-01-2015	7.9	8.2	2739	22.7	17.6	0.8	2.6	NA
May-08-2015	9.8	8.1	4082	17.8	34.4	0.4	3.7	NA
May-15-2015	NA	NA	NA	NA	NA	NA	NA	NA
May-21-2015	NA	NA	NA	NA	NA	NA	NA	NA
May-27-2015	NA	NA	NA	NA	NA	NA	NA	NA
Jun-04-2015	NA	NA	NA	NA	NA	NA	NA	NA
Jun-11-2015	3.7	7.9	8911	29.2	22.7	0.4	7.6	NA
Jun-17-2015	8.2	8.1	9565	25.3	15.6	0.6	7.6	22
Jun-25-2015	10.1	8.2	10456	27.2	NA	0.6	9.3	NA
Jun-29-2015	8.8	8.2	10989	25.8	10.5	0.6	9.6	22
Jul-09-2015						0.7	11.0	
Aug-17-2015						0.4	1.3	
Aug-24-2015						0.4	1.3	

Table 7: Site G - San Joaquin River at Freemont Ford

	Nutrients				
PARAMETER	Nitrates as N (Dissolved)	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorous as P	Ortho-phosphate as P
DATA SOURCE	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L
Jan-13-2015	0.24	0.14	1.10	0.09	0.03
Feb-19-2015	0.93 T	0.14	1.10	0.15	0.042 T
Apr-01-2015	0.15	0.10	0.79	0.13	0.05
Apr-16-2015	0.23	0.14	0.96	0.14	0.063 T
May-21-2015	0.02	<0.050	0.85	0.12	0.030 L
May-27-2015	<0.010	<0.050	0.93	0.18	0.02
Jun-17-2015	<0.010	0.09	0.98	0.17	0.02
Jun-29-2015	<0.010	0.08	0.43	0.16	0.02

NA	= no data available
P	= pending
H	= Result may have high bias
L	= Result may have low bias
V	= Result may vary excessively
T	= Result obtained past holding time
U	= Result determined to be outlier at the time of data validation

	Physicals							
PARAMETER	Dissolved Oxygen	pH	Specific Conductance	Temperature	Turbidity	Total Selenium	Total Boron	Total Molybdenum
DATA SOURCE	USBR	USBR	USBR	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	units	µS/cm	°C	NTU	ug/L	mg/L	ug/L
Jan-09-2015	11.8	7.8	2357	10.5	22.9	< 0.4	1.00	NA
Jan-13-2015	12.7	7.9	2288	12.0	39.8	< 0.4	0.94	9
Jan-23-2015	13.7	7.7	2524	10.4	25.6	< 0.4	1.20	NA
Jan-30-2015	10.6	7.8	2452	12.8	23.7	< 0.4	1.00	NA
Feb-04-2015	12.3	8.1	2314	14.1	25.4	< 0.4	1.10	NA
Feb-13-2015	10.4	7.8	2237	15.7	40.9	< 0.4	1.10	NA
Feb-19-2015	10.9	7.8	1962	15.2	NA	< 0.4	0.86	9
Feb-27-2015	9.3	7.8	2061	14.7	30.9	< 0.4	1.00	NA
Mar-06-2015	11.0	7.8	2423	15.4	63.3	< 0.4	1.10	NA
Mar-13-2015	8.2	7.7	2154	16.5	54.1	< 0.4	1.20	NA
Mar-20-2015	NA	NA	NA	45.8	NA	< 0.4	1.20	12
Mar-27-2015	9.6	7.9	2206	19.5	27.9	< 0.4	0.94	NA
Apr-01-2015	14.6	7.9	2636	15.7	26.3	< 0.4	0.99	13
Apr-10-2015	9.6	8.0	1900	16.9	29.6	< 0.4	0.79	NA
Apr-16-2015	9.2	7.9	2358	15.7	26.3	< 0.4	0.93	12
Apr-24-2015	9.2	8.0	2470	19.3	27.3	< 0.4	1.10	NA
May-01-2015	7.1	7.9	2436	21.6	38.0	< 0.4	0.84	NA
May-08-2015	9.2	7.9	2355	17.4	30.2	< 0.4	0.75	NA
May-15-2015	8.0	7.8	2147	19.7	32.6	< 0.4	0.65	NA
May-21-2015	9.8	7.8	1536	18.2	23.5	< 0.4	0.74	11
May-27-2015	13.6	7.8	2533	20.6	30.0	< 0.4	0.92	13
Jun-04-2015	NA	7.5	3249	20.1	38.1	< 0.4	1.10	NA
Jun-11-2015	7.9	7.9	2065	27.0	37.1	< 0.4	0.72	NA
Jun-17-2015	7.5	7.5	2659	22.9	24.1	< 0.4	0.98	11
Jun-25-2015	13.2	7.6	3999	25.6	22.8	< 0.4	1.40	NA
Jun-29-2015	12.3	7.6	3548	25.1	12.6	< 0.4	1.20	11
Jul-09-2015						< 0.4	0.61	
Jul-15-2015						< 0.4	0.48	
Jul-20-2015						< 0.4	0.38	
Jul-27-2015						< 0.4	0.48	
Aug-06-2015						< 0.4	0.52	
Aug-11-2015						< 0.4	0.38	
Aug-17-2015						< 0.4	0.35	
Aug-24-2015						< 0.4	0.25	

Table 8: Site N - San Joaquin River at Crows Landing

	Nutrients				
PARAMETER	Nitrates as N (Dissolved)	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorous as P	Ortho-phosphate as P
DATA SOURCE	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L
Jan-13-2015	2.20	0.13	0.77	0.12	0.12
Feb-19-2015	1.3 T	0.09	0.89	0.15	0.073 T
Apr-01-2015	1.00	0.17	1.10	0.18	0.12
Apr-16-2015	1.50	0.07	1.30	0.15	0.092 T
May-21-2015	2.20	< 0.050	0.91	0.16	0.080 L
May-27-2015	0.59	< 0.050	0.80	0.20	0.06
Jun-17-2015	1.70	0.21	0.90	0.12	0.05
Jun-29-2015	1.80	0.33	0.86	0.14	0.08

NA	= no data available
P	= pending
H	= Result may have high bias
L	= Result may have low bias
V	= Result may vary excessively
T	= Result obtained past holding time
U	= Result determined to be outlier at the time of data validation

	Physicals					Total Selenium	Total Boron	Total Molybdenum
PARAMETER	Dissolved Oxygen	pH	Specific Conductance	Temperature	Turbidity			
DATA SOURCE	USBR	USBR	USBR	USBR	USBR	USBR	USBR	USBR
UNITS	mg/L	units	µS/cm	°C	NTU	ug/L	mg/L	ug/L
Oct-03-2014	12.2	7.8	1,360	20.7	NA	< 0.4	0.5	NA
Oct-10-2014	13.7	7.8	1,110	21.7	17.6	< 0.4	0.4	NA
Oct-17-2014	NA	8.0	1,540	19.4	13.5	< 0.4	0.5	NA
Nov-07-2014	10.5	8.5	818	16.3	12.0	0.7	0.8	NA
Nov-14-2014	9.0	7.8	796	16.4	8.8	0.6	0.5	NA
Nov-21-2014	9.3	7.8	859	13.7	7.5	< 0.4	0.6	NA
Nov-28-2014	10.9	7.8	926	12.1	4.9	< 0.4	0.7	NA
Dec-05-2014	7.8	7.7	1,060	14.6	13.7	0.5	0.9	NA
Dec-12-2014	NA	7.6	833	13.1	159	< 0.4	0.5	NA
Dec-23-2014	NA	7.7	1,660	13.3	23.8	1.9	1.8	NA
Dec-30-2014	10.9	7.8	1,710	9.0	12.8	2.0	2.7	NA
Jan-09-2015	12.0	7.8	1528	10.5	9.4	0.67	1.1	NA
Jan-13-2015	12.7	7.8	1557	12.0	9.9	0.72	1.1	8
Jan-23-2015	13.5	7.8	1657	10.5	8.2	0.52	1.4	NA
Jan-30-2015	10.3	7.8	1812	12.5	13.2	0.97	1.6	NA
Feb-04-2015	11.4	7.9	1752	13.9	12.9	0.66	1.4	NA
Feb-13-2015	11.2	7.9	1924	16.1	25.7	0.88	1.4	NA
Feb-19-2015	9.4	7.8	1815	15.8	NA	0.63	1.2	8
Feb-27-2015	9.9	7.9	1861	14.3	28.9	0.71	1.4	NA
Mar-06-2015	11.8	8.0	2332	15.6	25.0	1.51	1.8	NA
Mar-13-2015	8.0	7.8	2241	16.6	20.4	0.95	1.6	NA
Mar-20-2015	NA	NA	NA	NA	NA	0.81	1.6	10
Mar-27-2015	10.1	8.1	2610	19.2	20.7	2.96 U	2.1	NA
Apr-01-2015	11.9	8.0	2201	15.8	20.8	0.66	1.3	9
Apr-10-2015	8.9	7.9	1999	16.6	25.9	< 0.4	1.1	NA
Apr-16-2015	9.4	7.9	2289	15.0	17.7	0.66	1.4	9
Apr-24-2015	9.2	8.0	2184	19.8	23.1	< 0.4	1.2	NA
May-01-2015	7.8	7.8	1980	20.7	26.8	0.51	1.0	NA
May-08-2015	13.1	8.1	2070	16.2	30.8	0.41	0.94	NA
May-15-2015	10.9	7.9	1784	17.7	22.7	0.47	0.72	NA
May-21-2015	9.9	7.9	1529	18.4	21.7	0.53	0.59	6
May-27-2015	13.5	8.0	1745	19.7	20.8	0.55	0.66	7
Jun-04-2015	NA	7.5	1907	19.9	24.1	< 0.4	0.8	NA
Jun-11-2015	12.1	8.3	1674	24.5	22.9	< 0.4	0.6	NA
Jun-17-2015	5.0	7.6	2360	21.1	15.7	0.51	1.0	8
Jun-25-2015	6.5	7.5	2011	22.5	15.3	0.43	0.8	NA
Jun-29-2015	4.3	7.5	1935	22.3	22.3	0.77	0.8	5
Jul-09-2015						0.72	0.7	
Jul-15-2015						0.51	0.5	
Jul-20-2015						0.74	0.6	
Jul-27-2015						0.55	0.6	
Aug-06-2015						0.54	0.7	
Aug-11-2015						0.46	0.7	
Aug-17-2015						0.42	0.6	
Aug-24-2015						<0.4	0.6	

Table 9: Summary of Toxicity Results

Summary of fathead minnow (*Pimephales promelas*) larvae survival

LOCATION	Station B	Station C	Station D	Station F	Delta Mendota Canal	Laboratory Control
DATA SOURCE	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**
UNITS	**%**	**%**	**%**	**%**	**%**	**%**
September-14	5*	95	98	88*	100	93
December-14	NA	NA	NA	NA	NA	NA
March-15	100.0	92.5	92.5	95.0	100.0	97.5
June-15	0.0	57.5	77.5	97.5	90.0	97.5
September-15	0.0	NA	100.0	100.0	NA	100.0

Summary of fathead minnow (Pimephales promelas) larvae growth in 7-day tests

LOCATION	Station B	Station C	Station D	Station F	Delta Mendota Canal	Laboratory Control
DATA SOURCE	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**
UNITS	**mg**	**mg**	**mg**	**mg**	**mg**	**mg**
September-14	0.01*	0.65	0.58	0.63	0.61	0.58
December-14	NA	NA	NA	NA	NA	NA
March-15	0.54	0.53	0.51	0.46	0.49	0.53
June-15	0.00	0.36	0.45	0.52	0.46	0.53
September-15	NA	NA	NA	NA	NA	NA

Summary of Daphnia magna survival in 7-day tests

LOCATION	Station B	Station C	Station D	Station F	Delta Mendota Canal	Laboratory Control
DATA SOURCE	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**	**SLDMWA**
UNITS	**%**	**%**	**%**	**%**	**%**	**%**
September-14	0*	100.00	100.00	100.00	100.00	100.00
December-14	NA	NA	NA	NA	NA	NA
March-15	70.00	80.00	100.00	90.00	90.00	90.00
June-15	80.00	50.00	80.00	90.00	100.00	70.00
September-15	0*	NA	100.0	100.0	NA	100.0