

RECLAMATION

Managing Water in the West

2015 Sediment Monitoring Plan

Grassland Bypass Project



Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

2015 Sediment Monitoring Plan

Grassland Bypass Project

July 30, 2015 – December 31, 2019

Monitoring Program Prepared by:

U.S. Bureau of Reclamation

San Luis Delta-Mendota Water Authority

Abbreviations and Acronyms

Participating Organizations

GAF	Grassland Area Farmers
CDFW	California Department of Fish and Wildlife
Regional Board	California Regional Water Quality Control Board, Central Valley Region
NMFS	National Marine Fisheries Service
Authority	San Luis & Delta-Mendota Water Authority
Reclamation	U.S. Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Grassland Bypass Project Organization

GBP	Grassland Bypass Project
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Features

GDA	Grasslands Drainage Area
SJR	San Joaquin River
SLD	San Luis Drain
SJRIP	San Joaquin River Improvement Program

Administrative Documents

EIS/EIR	2009 GBP Environmental Impact Statement / Environmental Impact Report
QAPP	Quality Assurance Project Plan
ROD	2009 Record of Decision
2009 Use Agreement	Agreement for Continued Use of the San Luis Drain for the Period January 1, 2010 through December 31, 2019. Agreement No. 10-WC-20-3975
WDR	Waste Discharge Requirements Order R5-2015-0094, issued 31 July 2015
MRP	Monitoring and Reporting Program Attachment B to Order R5-2015 - 0094

Abbreviations

WY	Water-Year, October 1 through September 30
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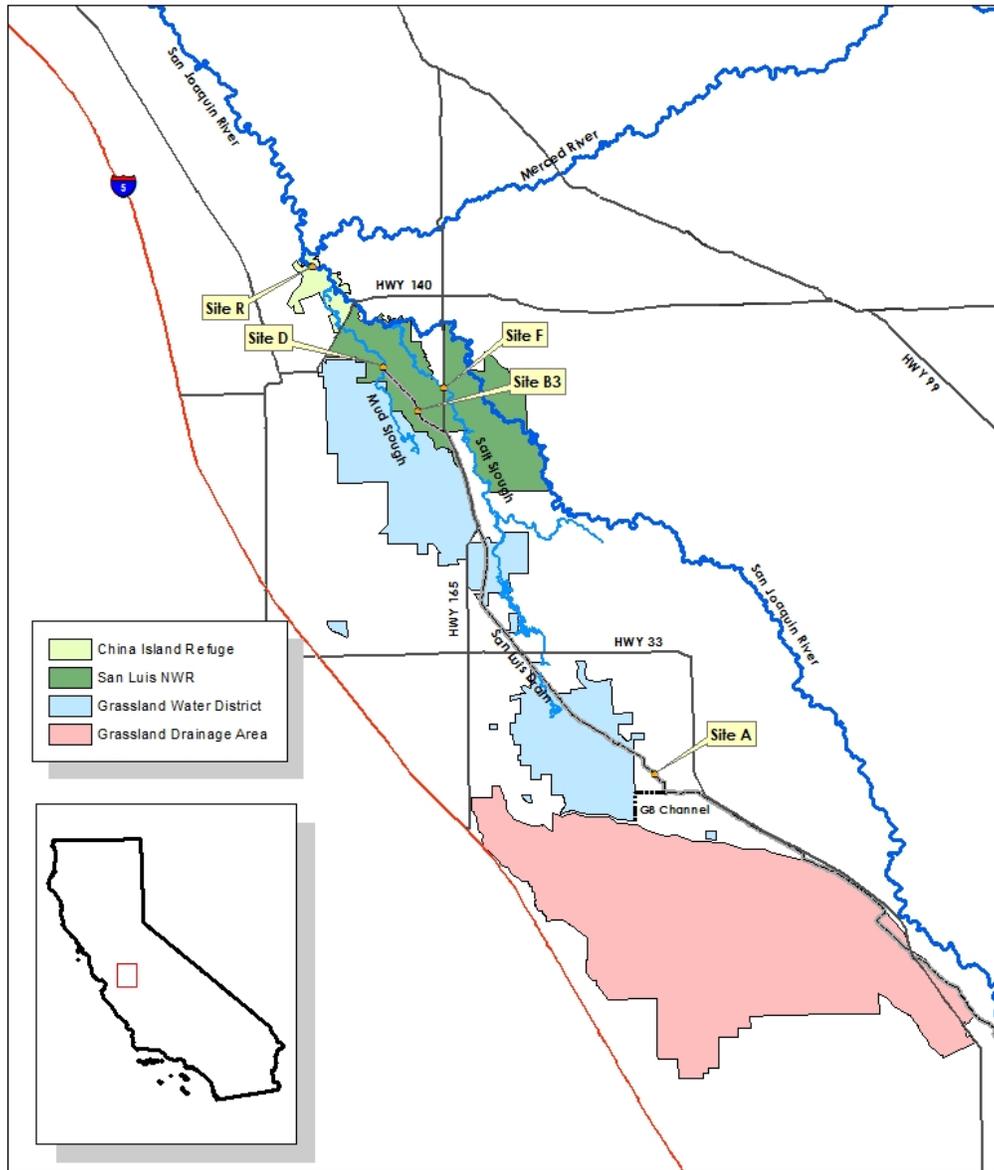
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Grassland Bypass Project

2015 Sediment Monitoring Sites

0 2.5 5 10
Miles



Grassland Bypass Project
NAD 1983 California Zone 10
US: Bureau of Reclamation

Figure 1. Sediment Monitoring Sites

2015 Sediment Monitoring Plan

Grassland Bypass Project

Section 1 - Introduction

This document describes the plan to monitor sediment to meet the environmental commitments agreed upon in the Agreement for Continued Use of the San Luis Drain¹ (2009 Use Agreement) between the Authority and U.S. Bureau of Reclamation (Reclamation) and the 2015 Waste Discharge Requirements (WDR)², issued by the California Regional Water Quality Control Board, Central Valley Region (Regional Board). The 2009 Use Agreement and 2015 WDR direct the Grassland Bypass Project (GBP).

Section 2 – Background

The project is located within the Grasslands Sub-area as defined in the Basin Plan for the San Joaquin Valley³. The Grasslands Sub-area is approximately 370,000 acres and is generally bounded on the north by the alluvial fan of Orestimba Creek and by the Westlands Sub-area to the south. The San Joaquin River forms the eastern boundary and Interstate Highway 5 forms the approximate western boundary. See Figure 1 for a map of the monitoring sites.

The purposes of the GBP are to:

1. Continue the separation of unusable agricultural drainwater discharged from the Grasslands Drainage Area (GDA) from Grassland wetland supply conveyance channels through December 31, 2019, and to
2. Facilitate drainage management that maintains the viability of agriculture in the GDA and promotes improvement in water quality in the San Joaquin River.

Features of the GBP include:

1. Management and consolidation of unusable agricultural drainwater from the GDA, which is comprised of Camp 13 Drainage District, Charleston

¹ San Luis & Delta-Mendota Water Authority and the United States, Department of the Interior, Bureau of Reclamation, December 22, 2009. Agreement for Continued Use of the San Luis Drain. Agreement No. 10-WC-20-3975

² California Regional Water Quality Control Board, Central Valley Region July 31, 2015. Order R5-2015-0094.

Waste Discharge Requirements for the San Luis & Delta-Mendota Water Authority and the United States Department of the Interior, Bureau of Reclamation. Surface Water Discharges from the Grassland Bypass Project

³ California Regional Water Quality Control Board, 1998, revised 2011. The Water Quality Control Plan for the Sacramento River and San Joaquin River Basin, Appendix 41.

Drainage District, Firebaugh Canal Water District, Panoche Drainage District, Pacheco Water District, Widren Water District, and unincorporated adjacent farmland,

2. Continuation of the Grassland Basin Drainers Activity Agreement, a regional drainage entity,
3. Continued separation of GDA drain water from 93 miles of channels that supply clean water to private wetlands and State and Federal wildlife refuges,
4. Use of the Grassland Bypass Channel, a 4-mile-long earthen constructed ditch, to convey drainwater from the GDA to the San Luis Drain,
5. Continued use of approximately 28 miles of the San Luis Drain to convey unusable agricultural drain water to its terminus,
6. Discharge of unusable agricultural drain water into Mud Slough (North), a tributary of the San Joaquin River,
7. Execution of the 2009 Use Agreement,
8. Development of the San Joaquin River Water Quality Improvement Project (SJRIP) within the GDA, and
9. Implementation of this Monitoring Program to evaluate the effects of the GBP on water, sediment, and biota in the San Luis Drain, Mud Slough (North), Grassland wetland supply channels, and the San Joaquin River.

On July 31, 2015, the Regional Board issued a WDR and corresponding Monitoring and Reporting Program (MRP) that specified conditions to allow Reclamation and the Authority to transport agricultural subsurface drainwater from the San Luis Drain into Mud Slough (North), which included allowable maximum monthly and annual loads of selenium. The MRP also provides sediment monitoring requirements. These requirements can be found in **Table 3** of the 2015 MRP. Only sediment toxicity, grain size, and total organic carbon at Site D on an annual basis is required under this order.

The 2009 Use Agreement establishes the terms and conditions for using the SLD and operation of the GBP through December 31, 2019. This document also requires the monitoring of sediment levels, distribution, and selenium content within the San Luis Drain.

Section 3 – Data Collection/Reporting and Project Oversight

Sediment monitoring efforts for the GBP will be performed primarily by Reclamation and the Authority. Reporting of monitoring results as required by the 2015 WDR will be submitted to the Regional Board by the Authority. The frequency of reporting will be on an annual and semi-annual basis. Data will be submitted to Regional Board staff on the appropriate templates and in an electronic format.

Additional data that is being collected under this project, but it not required by the WDR, will be compiled by Reclamation and published in an Annual Report. This report can be found on the GBP website with is maintained by the San Francisco Estuary Institute (<http://www.sfei.org/projects/grassland-bypass-project>).

Oversight of the Grassland Bypass Project as a whole (including sediment monitoring) will provided by various state and federal agencies. These agencies include the Grassland Water District, the Authority, the Regional Board, the California Department of Fish and Wildlife (CDFW), Reclamation, U.S. Fish and Wildlife Service (USFWS), and U.S. Geological Survey (USGS). Technical and environmental guidance will be provided the U.S. Environmental Protection Agency (US EPA), USGS, and the National Marine Fisheries Service (NMFS). For More information on the structure of the project oversight committees please see the 2015 Revised Monitoring Plan for the Grassland Bypass Project Draft.

Section 4 - Monitoring Plan Approach

This plan will cover three main aspects of sediment monitoring as it relates to the Grassland Bypass Project. The monitoring will satisfy the requirements in the 2015 WDR and the 2009 Use Agreement. Each of the following aspects will be monitored.

1. Sediment Quality
2. Sediment Toxicity (Toxicity at Site D Required under the 2015 WDR)
3. Sediment Quantity

This plan will outline the locations to be sampled, constituents to be collected, sampling techniques and schedule for each aspect of the sediment monitoring listed above. **Table 1** provides detailed information about the sediment Monitoring Plan in the sloughs and the SLD. **Table 2** provides the lab methods and reporting limits for the constituents that are being monitored.

Section 5 - Sediment Quality

Sediment quality will be measured in the SLD, Mud Slough, Salt Slough, and San Joaquin River. The purpose of the measurements within the SLD provides

selenium concentration estimates for comparison with California Department of Health Services' hazardous waste criterion of 100 mg Se/kg (wet weight). The measurements in Mud and Salt Sloughs and the river will provide selenium concentrations for comparison with USFWS thresholds for ecological risk. The data/analysis will be provided in the GBP Annual Reports which are published on SFEI's website. Any sampling not required in the 2015 WDR or 2009 Use Agreement is subject to change based on sampling results and/or DCRT findings.

Sampling Locations

Samples will be collected at the sites listed below. Please see **Figure 1** for a map of the locations.

In Drain Sampling:

SLD Ten places within the San Luis Drain (includes Site A and B3)

Sediment Sampling Sites:

Station D Mud Slough (North) downstream of SLD discharge

Station I2 Mud Slough (North) backwater

Station F Salt Slough at Highway 165

Station R San Joaquin River between Mud Slough and Merced River
(CDFW China Island Refuge)

For the in-drain sampling selenium in sediment will be measured at ten places in the San Luis Drain (this total includes Site A and Site B3). The locations in the drain were selected based on a probability sampling scheme associated with the amount of sediment estimated within each check. The estimated cubic yards for each check come from the annual survey made each November by the San Luis & Delta Mendota Water Authority. See Section 7 of this plan for more information on the sediment accumulation survey.

Sample Analysis

Laboratory analysis of sediment samples collected from Mud Slough, Salt Slough, and the river will be tested for the following constituents:

- total selenium
- percent moisture
- total organic carbon (TOC)
- Grain Size

The laboratory methods and reporting limits used to analyze these constituents are listed in **Table 2**.

Sampling Techniques

Samples will be collected by Reclamation staff according to 2012 Standard Operating Procedures for Environmental Monitoring. Sediment samples will be collected with an acrylic coring device (42 cm diameter, 38 cm internal length). After collecting up to 15 cm (6 inches) of sediment, sections of the core are

slowly extruded using a non-metallic internal pushing device and placed in a stainless steel bowl. The process will be continued until three samples are collected along a transect across the Drain or slough. Material from the 2nd and 3rd samples is placed in the mixing bowl containing the 1st samples. The samples are then mixed well in their mixing bowls in a manner similar to kneading bread. The mixing objective is to get one homogeneous sample in each of the bowls. Compositated samples are then placed in a wide-mouth polyethylene container and stored in an ice chest at 4°C.

Schedule for Sampling

The measurement of selenium in sediment will occur annually, usually in September. See **Table 1** for a list of sampling parameters and the collection frequency.

Section 6 – Sediment Toxicity

As stated in the 2015 WDR the purpose of the toxicity monitoring is to:

1. Evaluate compliance with the Basin Plan narrative toxicity water quality objective
2. Identify the causes of toxicity when and where it is observed (e.g. metals, pesticides, ammonia, etc.)
3. Evaluate any additive toxicity or synergistic effects due to the presence of multiple constituents

Sediment toxicity monitoring will be used in conjunction with water quality toxicity monitoring to determine the objectives listed above.

Sampling Locations

Toxicity samples will be collected at Site D in Mud Slough. This location is downstream of the SLD discharge.

Sample Analysis

Sediment toxicity testing will consist of chronic toxicity of *Hyalella Azteca* (survival only). Sediment samples that measure toxicity $\geq 20\%$ difference from the control will also be tested for sediment pesticides. The following analysis will be performed (list subject to change based on findings) to help determine the probable cause of toxicity:

- Percent Solids
- Chlorpyrifos
- Bifenthrin
- Cyfluthrin
- Cypermethrin
- Deltamethrin

- Esfenvalerate/Fenvalerate
- Fenopprathrin
- Lambda cyhalothrin
- Permethrin
- Piperonyl butoxide (PBO)

Sediment samples will also be analyzed for Total Organic Carbon (TOC) and grain size. TOC analysis is necessary to evaluate the magnitude of toxicity to the species.

Sampling Techniques

Samples will be collected by the Grassland Drainage Area Coalition according to the Pacific EcoRisk SOP for 10-Day *Hyalloa azteca* Survival and Growth Sediment Toxicity Test. Grab or composite samples of sediment will be collected in appropriately decontaminated glass or plastic containers. Samples will be placed on ice immediately after collection to bring the temperature to $\leq 6^{\circ}\text{C}$. The sample will then be transported to the testing laboratory.

Schedule for Sampling

Toxicity samples will be collected on a biannual basis. Samples will be collected between March 1st and April 30th and August 15th and October 31st, provided safe access to the site. If site conditions require a shift in the sample window the Regional Board staff will be contacted.

Section 7 - Sediment Accumulation

Sediment accumulation will be monitored primarily in the San Luis Drain. The purpose of this monitoring is to determine the changes in quantity and movement of the sediment. This will help to accomplish the provision set forth in the 2009 Use Agreement for complete removal of sediment from the drain. As stated in Section 5 the concentration of selenium and other parameters in sediment and accumulation data will be used to determine if the sediments can be spread locally or must be treated as hazardous waste. This is accomplished by conducting an annual survey measuring the sediment and using total suspended solids measurements at the inlet and outlet of the SLD to determine sediment volumes.

Note: Monitoring required for the removal of sediment from the San Luis Drain is not part of this Monitoring Program.

Sampling Locations

The sediment is not uniformly deposited along the length of the SLD. In general, sediment tends to build up near the check structures. To obtain an accurate determination of sediment deposition, it is necessary to take additional readings near these structures. Sediment thickness measurements are taken at the locations

that were used in the March 1987 Summers Engineering survey. The distances from the structures and locations at which measurements were taken are documented, and the sites can reliably be re-sampled. Chapter 10 of the GBP Annual Reports contains historic sediment accumulation data.

Sample Analysis

No laboratory analysis will be necessary for the sediment accumulation monitoring.

Sampling Techniques

Sediment accumulations will be determined using the following field techniques and calculations.

Field Techniques:

Cross-sections of the SLD from Check 18 (west of Russell Ave) to the terminus will be used for volume estimates. There will be water flowing in the SLD during the sediment surveys. In order to obtain an accurate thickness measurement at any given location, a measurement will be taken along the length of the slope of the lining from the top of the lining to the water surface on each side of the drain, and then, a probe be used to take the measurement from the water surface to the sediment at the intersection of the sediment and the canal lining on each side of the SLD. This cross-sectioning method should help account for variations in the sediment thickness across the width of the SLD. The thickness of sediment is measured and determined arithmetically.

Calculations for Volume Estimation:

a. Water Level Calculations

The level of the water is determined by measuring along the lining above the water level on the left (Xlt) and right bank (Xrt) of the SLD. The actual water level (h) is determined by subtracting the average of the Xlt and Xrt (Xavg) from the total length of lining (X1) and converting it into a vertical distance, $h = 0.55 * (X1 - X_{avg})$.

b. Depth of Sediment

The depth of sediment (d) is determined by taking the average of the difference between the two readings (y1 and y2) obtained from the sediment probe and the water level (h), $d = h - y_{avg}$.

c. Cross-Sectional Area of Sediment

The cross-sectional area of the sediment is determined by assuming that the upper surface of the sediment is flat and that it occupies a trapezoidal area. The formula for finding the area of sediment is as follows: $Area = 2 * (8 + (8 + 2 * d * 1.5)) * d$.

d. Volume of Sediment

The volume of sediment in the SLD is calculated by averaging the cross sectional area between readings and multiplying by the length. The formula for the sediment volume is as follows: $\text{Volume} = (\text{Average Area}) * \text{Length} * 0.037$, where length is the distance between probe readings and 0.037 is the factor by which cubic feet are converted to cubic yards.

Frequency of Sampling

The sediment volume survey will be done annually, typically in September at the end of the irrigation season.

2015 Sediment Monitoring Program

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Table 1a. Monitoring Stations, Parameters, and Frequencies

Sampling Site Information			USBR			Summers Engineering			
Feature	Station	Location	Selenium	Percent moisture	Total organic carbon	Total Organic Carbon	Grain size	Toxicity (Hyaella azteca (Survival))	Accumulation
San Luis Drain	A	Check 17	A	A	A				
		Checks 1 - 18 (10 places)	A	A	A				A
	B3	Gun Club Road	A	A	A				
Mud Slough (north)	D	downstream of SLD discharge	A	A		B*	B*	B*	
Wetlands channels	F	Salt Slough at Hwy 165	A	A	A				
San Joaquin River	R	China Island Unit	A	A	A				

A: Annual (September)

B: Biannual (between 15 Aug - 15 Oct and 1 Mar and 30 Apr)

* Required under the 2015 WDR

Sampling not required under the WDR subject to change based on sampling results/analysis

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Table 2. Monitoring Laboratory Methods and Reporting Limits

Parameter	Method	Reporting Limit	Units
Selenium	EPA 6020	2630	ppb
Percent Moisture	SM 2540G	0.06	%
Total Organic Carbon	Walkley-Black	200	mg/kg
Grain Size	ASTM D4464M	0.01	%
Toxicity (<i>Hyallolella azteca</i> (Survival))	EPA 100.1	NA	% Survival
Accumulation	NA	NA	NA

Modified or alternate methods (e.g., USGS lab method) may be used as long as EPA requirements are met