

Project 184
Preferred Canal Drainage
Structure and Release Point
Plan

September 2011

Version 5.0

REVISION HISTORY

Page	Description	Date
7	Added Section 5.1 – Plan Modifications	09/08/11
9	Modified Table 2 to reflect SW 47C Improvements	09/08/11

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1.0 Background

This plan is the result of a collaborative effort between the El Dorado Irrigation District (EID), Project 184 Ecological Resources Committee (ERC), USDA Forest Service (Forest Service), and the State Water Resources Control Board (SWRCB). This plan is designed in accordance with the Federal Energy Regulatory Commission (FERC) Order Issuing New License October 18, 2006, Appendix A – Section 4(e) Condition No. 41 (Condition 41) and Appendix B – Condition No. 10 and the Project 184 Settlement Agreement (EID 2003).

Condition 41 states:

“Condition No. 41 – Preferred Canal Drainage Structure and Release Point Plan

The licensee shall, within 1 year after license issuance, file with FERC a plan approved by the FS and SWRCB after consultation with the ERC, to designate preferred canal drainage structures and release points to be used in the event of an emergency and for maintenance, that will minimize adverse impacts to water quality. The licensee shall implement the plan upon approval.”

2.0 Introduction

The El Dorado Canal spillways serve a critical role in protecting the integrity of the canal, promoting water supply reliability, and providing environmental protection.

Water is conveyed from the El Dorado Diversion Dam (Diversion Dam) to the Powerhouse through the approximately 22 mile long El Dorado Canal (Canal), which traverses steep slopes on the south side of the South Fork American River (SFAR). The Diversion Dam is located about 1.5 miles downstream of the town of Kyburz at an elevation of about 3,911 feet above msl. The Canal discharges at the El Dorado Forebay, located just north of Pollock Pines, at an elevation of about 3,791 feet above msl. Water diverted at the El Dorado Diversion Dam takes approximately 14 hours to reach the Forebay Reservoir, making spillway releases at intervals along the Canal a critical component of project operations.

This plan describes preferred canal drainage structures and release points (spillways) and is intended to establish practices that will minimize adverse impacts to water quality. Foothill yellow-legged frog flow fluctuation monitoring and reporting requirements will be conducted in accordance with the Federal Power Act, Section 4(e) Condition No. 37.3.

3.0 Spillway Overview

As Canal flows are monitored by the water level alarms, the spillways, operated in conjunction with the El Dorado Diversion Dam and the tributary stream diversions, can provide the most immediate means of partially or fully dewatering the Canal. The spillways provide both active and passive capability to relieve excess water occurring during high

inflows, to prevent high water levels as may be caused by Canal restrictions, or to prevent flows from continuing downstream due to facility maintenance and operations (e.g., powerhouse operations, downstream obstruction, etc.). The spillways can be actively controlled by removing flashboards, opening gates, and in some locations dropping a radial check gate to discharge some or all of the canal flow. In addition, with the exception of spillway 39, all spillways have passive spill capability, which allows the spillways to relieve high water over a fixed or adjustable crest of the Canal sidewall as needed. The spillways serve to convey Canal discharges into channels between the Canal and South Fork American River. With few exceptions, the spillway channels are in natural drainages which vary in composition of soil, rock and vegetation. In the interest of protecting water quality, EID has established an erosion rating as a means of ranking spillway channels used to determine spillways to be used routinely versus emergencies only.

There are 30 spillways situated generally at less than one-mile intervals along the approximately 22-mile conveyance system (see Figure 1). Eleven spillways are automated and have the capacity to spill the full canal. All automated spillways have electronic systems which must be controlled by an operator either on-site or remotely.

There are 22 alarms located at approximately one-mile intervals along the Canal including an alarm within the El Dorado Tunnel. The alarms operate in conjunction with electronic SCADA systems to monitor water elevations in the Canal. The alarms provide immediate warning to operators of any water level fluctuations that may require immediate attention.

4.0 Spillway Characteristics

Characteristics of the spillways are summarized in **Table 1** indicating the number, location, type, operation type, gate type, capacity, and channel notes. Gaps between spillway numbers result when a bypassed section of Canal was replaced with a tunnel or locations where spillways have been abandoned. Descriptions of each heading are as follows:

- **Spillway #:** Number corresponding to map.
- **Location:** Nearest identifiable feature or facility to spillway.
- **Spillway Type:** Each release point is identified as preferred, secondary, or emergency.
 - Preferred – these are preferred locations used for maintenance and emergencies which have good channels and can spill the full Canal capacity.
 - Secondary – used when a preferred spillway is not located close enough to quickly relieve a Canal flow restriction. These locations have less than optimum channels and may not be capable of spilling the full Canal capacity.
 - Emergency – For emergency use only; these spillways are used only when life or property are at risk, and then, sparingly for short duration spills. These spillways generally have poor channel conditions which could cause erosion and introduce sediment into the South Fork American River.

- **Operation Type:**
 - Automated – motor operated; can be operated in either Local or Remote (SCADA) control.
 - Manual – requires operations staff to manually open or close the gate.
- **Gate Type:** With the exception of spillway 39, all of the spillways have passive spill capabilities regulated by flashboards. The four general gate types include:
 - Flashboards – gates with stacked stop logs commonly referred to as flashboards.
 - Radial Check – a curved gate that drops down into the Canal preventing flow further down the Canal and diverting flow into a side spillway opening.
 - Slide – vertically moving gate which opens downward allowing flow over the top.
 - Sluice – vertically moving gate which opens upward allowing flow beneath the gate.
- **Capacity:** The maximum spill flow in cfs when gate is open.
- **Spill Channel Notes:** The notes describe conditions of the channel that are of significance to life and property.

The emergency spillways are used only as a last resort and in severe events to prevent overtopping of the Canal. The emergency spillways are used exclusively for short duration spills. For example, a complete breach of the Canal due to a large boulder, tree, or landslide in close vicinity to an emergency spillway may result in the need to release the full capacity of the Canal into an emergency spillway. Partial blockage of the Canal due to ice build-up or a small landslide, boulder or tree may also result in partial release into an emergency spillway. The emergency spillways may also be opened during extreme flood events (e.g., January 1997 flood event) to control natural flows entering the Canal.

All designated emergency spillways (as described in Table 1) will be monitored for turbidity at the confluence with the South Fork American River (SFAR) after every spill over 20 cfs. Turbidity is defined by the California Regional Water Quality Control Board (RWQCB) - Central Valley Region (1998) Water Quality Control Plan (Basin Plan) or equivalent document. If turbid, the channels will be investigated to determine the source and identify measures needed to re-stabilize the channel.

The spillway locations are shown on Figure 1 and Appendix A includes example photographs of a sluice gate, radial check gate, flashboards, manual sluice gate with wheel-type operator, passive spill, and a rock-lined channel.

Table 1: El Dorado Canal Spillways

Spillway #	Milepost	Location	Spillway Type	Operation Type	Gate Type	Capacity in (cfs)	Spill Channel Notes
1	0	El Dorado Diversion Dam	Preferred	Automated	Slide	165	None
2	0.5	Flume 2 Carpenter Creek	Preferred	Manual	Flashboards	100	Sand Flat Campground
3	1	Downstream Alarm 1	Emergency	Manual	Radial Check	100	30 Milestone Tract residents
5	1.8	Flume 4	Preferred	Manual	Flashboards	100	None
7	2.5	Flume 8/9	Preferred	Manual	Flashboards	80	None
8	2.7	Upstream Flume 10	Emergency	Manual	Sluice	165	None
9	3.1	Upstream Flume 11	Emergency	Manual	Sluice	100	None
10	3.5	Flume 13	Preferred	Automated	Radial Check and Slide	165	None
10A	3.7	Alder Creek Siphon House Alder Creek	Preferred	Manual	Flashboards	120	Alder Creek Tract residents
11	4.1	Flume 20	Emergency	Manual	Flashboards	100	None
20	7	Flume 30 Bull Creek	Preferred	Automated	Sluice (3)	165	Bull Creek Tract residents
20A	7.5	Alarm 10	Emergency	Automated	Radial Check	40	Bull Creek Tract residents
20B	7.6	Plum Creek Siphon	Emergency	Manual	Flashboards	40	Bull Creek Tract
22	8.3	Flume 39/40 Channel feeds Plum Creek	Preferred	Manual	Flashboards	75	None

Spillway #	Milepost	Location	Spillway Type	Operation Type	Gate Type	Capacity in (cfs)	Spill Channel Notes
23	8.7	Flume 41	Emergency	Automated	Slide	165 (may be used at reduced capacity)	None
25	9.8	Camp P	Secondary	Manual	Sluice	120	Culvert under Hwy 50
27	11	Camp 3 Ogilby Creek	Preferred	Automated	Slide and Radial Check	165	Bridal Veil Picnic Area
28	11.5	u/s Esmeralda Tunnel	Emergency	Manual	Flashboards	80	Bridal Veil Picnic Area
30	12	d/s Esmeralda Tunnel	Emergency	Manual	Sluice	80	Bridal Veil Falls & Picnic Area
32	13.2	Camp 4	Emergency	Automated	Sluice and Radial Check	165	Pacific House tract water system
33	13.9	d/s Flume 46A	Emergency	Manual	Flashboards	80	Pacific House tract water system
35	14.7	Hazel Creek Tunnel	Emergency	Manual	Radial Check	80	None
37	16.1	d/s Flume 47B Fresh Pond	Preferred	Automated	Radial Check	165	None
39	17.1	d/s Flume 47B Fresh Pond	Emergency	Manual	Gate - blocked out	80	None
40	17.5	u/s Flume 47 Fresh Pond	Emergency	Manual	Sluice	80	None
42	18.4	Flume 48	Preferred	Automated	Radial Check and Slide	165	None
44	19.2	Flume 49/50	Preferred	Automated	Slide	165	None

Spillway #	Milepost	Location	Spillway Type	Operation Type	Gate Type	Capacity in (cfs)	Spill Channel Notes
45	19.9	d/s Flume 52	Secondary	Manual	Sluice	100	Houses below
46	20.6	Bullion Bend	Secondary	Manual	Sluice	80	Houses below
47C	21.4	Flume 52A	Emergency (To be used only in extreme emergency until channel upgrades are completed; at which time, it is anticipated the spillway will be operated as Preferred)	Automated	Radial Check	165	Culvert under Randolph Canyon Rd.

5.0 Spillway Channels

5.0 Spillway Channels

As part of in-field sub-committee meetings held during the summer of 2007, each of the channels listed in Table 2 were examined to identify improvements to minimize potential erosion associated with spillway operation and establish timetables for those improvements. Some descriptions of existing conditions are based on field investigations of the Project 184 spillway channels conducted by Richard Harris Ph. D. and summarized in the report entitled *Emergency Spill Management*. Where appropriate, Table 2 also describes the interim guidelines for use until channel improvements are completed. Appendix B includes representative photographs of the spillway channels.

5.1 Plan Modifications

After assessment of the improvements initially contemplated in the Plan for Spillways 11 and 47C, the District has subsequently identified improvements different than those contemplated in the Plan. A description of each modification is provided below and incorporated into Table 2.

Spillway 11

Staff has evaluated the site and determined that some of the dead trees have fallen on their own and those that remain standing would be hazardous to fall manually. Therefore, the Plan modification is to allow the remaining dead trees to fall on their own accord over time. This approach meets the objective of the trees falling into the spill channel to slow water and trap sediment.

Spillway 47C

After improvements (discussed below) to SW 46 are complete, SW 47C will no longer be necessary and thereafter decommissioned, including removal of the spillway box chute, slide gates, stop logs, radial gate and associated building and controls. Implementation of these measures remove the spillway eliminating potential water quality impacts associated with continued operation of SW 47C.

Spillway 46

The improvements to SW 46 include increasing the spill capacity to be able to convey 160 cfs and automation to allow remote operation of the spillway. SW 46 releases into Randolph Creek, therefore, improvements also include stabilizing the spillway channel and approximately 150 linear feet of Randolph Creek to accommodate increased flow from the spillway.

Table 2. Overview of Spillway Channel Improvements

Spillway Number	Existing Conditions	Identified Improvements	Priority Rating	Interim Guidelines	Appendix B Photo Reference
3	Some unstable banks.	Wooden box flume outlet needs to be replaced.	2	Passive spill only not-to exceed 20 cfs.	Photo B1 and B2
10	Well vegetated channel that is in good condition.	None	N/A	N/A	
11	Well vegetated channel with some bank erosion. Numerous snags (cut off at top) are located near spillway channel.	Allow snags (standing dead trees) located within striking distance of the spillway channel to fall on their own accord into the existing channel to slow water and trap sediment.	N/A	None	Photo B3 and B4
20 A/B	Unstable banks, bank sloughing and caving.	Repair gabion located near confluence with SFAR and install two rocks dams (roughly 18 inches high) upstream at even intervals along the channel to slow water and trap sediment.	2	Passive spill only not-to exceed 40 cfs.	Photo B5
23	Well vegetated channel on steep slope. Bedrock substrate with small boulders and cobbles.	Monitor for turbidity* at confluence with SFAR after every spill over 20 cfs and, if turbid, investigate channel as described on page 3 for all emergency spillways.	N/A	N/A	Photo B6
27	Good channel, well vegetated.	None	N/A	N/A	Photo B7
32	Intermittent channel with bedrock substrate. Infrequent use of spillway channel; used roughly every 10 years.	Monitor for turbidity at confluence with SFAR after every spill over 20 cfs and, if turbid, investigate channel as described on page 3 for all emergency spillways.	N/A	N/A	Photo B8
33	Bedrock and boulder substrate. Infrequent use of spillway channel;	Monitor for turbidity at confluence with SFAR after every spill over 20 cfs and, if turbid,	N/A	N/A	Photo B9

Spillway Number	Existing Conditions	Identified Improvements	Priority Rating	Interim Guidelines	Appendix B Photo Reference
	used roughly every 10 years.	investigate channel as described on page 3 for all emergency spillways.			
37	Bedrock substrate. Infrequent use of spillway channel; used roughly every 10 years.	Monitor for turbidity at confluence with SFAR after every spill over 20 cfs and, if turbid, investigate channel as described on page 3 for all emergency spillways.	N/A	N/A	Photo B10
47C	Massive erosion and unstable banks.	Decommissioned by removing remote capabilities and remove the box chute, slide gates, stop logs, radial gate, and associated buildings.	1	No passive spill. Use in extreme and unprecedented emergency only.	Photo B11 and B12

Priority 1 = Scheduled to be completed within the next 5 years (December 2012)

Priority 2 = Scheduled to be completed within the next 10 years (December 2017)

*Turbidity - as defined by the California RWQCB Basin Plan (1998) or equivalent document.

5.2 General Practices and Maintenance Measures to Reduce Erosion and Sedimentation along Spillway Channels

The following measures, on a case-by-case basis, may be incorporated into ongoing project operations and maintenance activities in order to minimize scour and erosion along spillway channels:

- Where appropriate, fall snags (standing dead trees) and hazard trees into spillway channels perpendicular to flow.
- Where appropriate, install small (roughly 18 inches high) loose rock dams in channel.
- If logs are diverting erosive flow into stream banks and causing scour, buck up logs and re-position in the channel to remove pressure from vulnerable stream banks.

References

California Regional Water Quality Control Board – Central Valley Region. 1998. *Fourth Edition of the Water Quality Control Plan (Basin Plan)*.

El Dorado Irrigation District. 1999. *Emergency Spill Management*. Prepared by Richard Harris, Ph.D. (on file).

El Dorado Irrigation District. 2003. El Dorado Project FERC Project No. 184. *El Dorado Relicensing Settlement Agreement*.

Figure 1: Spillways Located Along the El Dorado Canal

(see next page)

Appendix A: Photo Documentation – Spillway Facilities



Photo A1 – Example Passive Spillway with Canal Level Controlled by Flashboards



Photo A2 – Example Radial Check Gate in Open Position



Photo A3 – Example Sluice Gate



Photo A4 – Example Manual Sluice Gate with Wheel-Type Operator



Photo A5 – Example Passive Spill



Photo A6 – Example Rock-Lined Spill Channel

Appendix B: Photo Documentation – Spillway Channels



Photo B1 – Spillway 3 Channel



Photo B2 – Wooden Box Outlet at Spillway 3



Photo B3 – Spillway 11 Outlet and Channel



Photo B4 – Spillway 11 Channel with Snags



Photo B5 – Spillway 20 A/B Gabion (sediment trap)



Photo B6 – Spillway 23 Alluvial Fan Deposit at South Fork American River



Photo B7 – Spillway 27 Channel

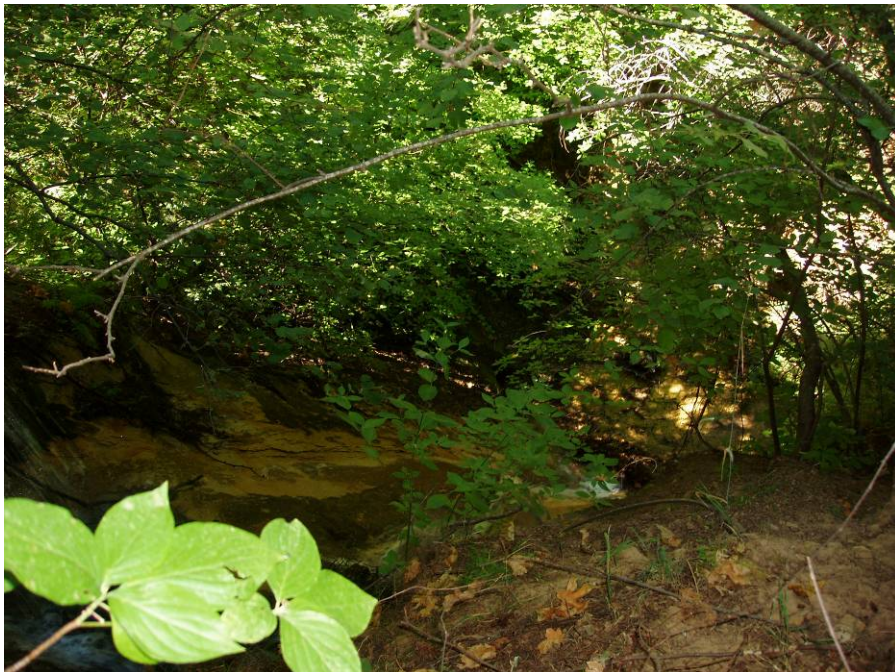


Photo B8 – Spillway 32 Outlet and Channel



Photo B9 – Spillway 33 Outlet and Channel



Photo B10 – Spillway 37 Downstream Channel near Freshpond



Photo B11 – Spillway 47c Wooden Spillway Outlet



Photo B12 – Spillway 47c Headcut/Erosion

**FEDERAL ENERGY REGULATORY COMMISSION
Washington, D. C. 20426**

OFFICE OF ENERGY PROJECTS

**Project No. 184-151—California
El Dorado Hydroelectric Project
El Dorado Irrigation District**

February 16, 2012

**Mr. Brian Mueller
El Dorado Irrigation District
2890 Mosquito Road
Placerville, CA 95667**

Re: Revised Canal Drainage Structure and Release Plan

Dear Mr. Mueller:

This is in reference to your revised Canal Drainage Structure and Release Plan, filed with the Federal Energy Regulatory (Commission) on January 30, 2012, for the El Dorado Hydroelectric Project No. 184. You also filed documentation of U.S. Forest Service (FS) approval of the revised plan on February 14, 2012. Ordering paragraphs (D) and (E) of the project license¹ require compliance with the California State Water Resources Control Board's (State Water Board) water quality certification and the FS Section 4(e) Conditions, respectively. Condition No. 10 of the water quality certification and FS 4(e) Condition No. 41 require that you develop a Canal Drainage Structure and Release Plan to designate preferred canal drainage structures and release points to be used in the event of an emergency and for maintenance that will minimize adverse effects to water quality. The plan is to be developed in consultation with both agencies and filed with the Commission upon resource agency approval. You originally filed the plan with the Commission on April 17, 2008, which was subsequently accepted by Commission letter dated May 8, 2008.

In your January 30, 2012 letter, you explain that some of the proposed canal improvements in the original plan need to be modified, including: tree management at spillway 11; various improvements to spillway 46; and decommissioning of spillway 47C. You developed these modifications in consultation with the project Ecological Resources Committee, including the State Water Board and FS. The State Water Board and FS formally approved your modified plan by letters dated September 9, 2011, and February 7, 2012, respectively. Review of your revised plan indicates that it adequately meets the requirements of the project license.

¹ See 117 FERC ¶ 62,044. Order Issuing New License (issued October 18, 2006).

Project No. 184-151

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We note that your proposal to modify spillway 46 was submitted to the Regional Engineer of the Commission's San Francisco Regional Office on January 6, 2012. Please note that your proposal to decommission spillway 47C should also be coordinated with the San Francisco Regional Engineer, pursuant to 18 CFR §12.11.

Thank you for your cooperation. If you have any questions regarding this matter, please contact Mr. John Aedo at (415) 369-3335.

Sincerely,



Thomas J. LoVullo
Chief, Aquatic Resources Branch
Division of Hydropower Administration and
Compliance

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