

Canal and Penstock Emergency Release Point Plan

Sacramento Municipal Utility District

Hydro License Implementation • June 2015

Upper American River Project

FERC Project No. 2101





Table of Contents

1.0 Introduction	1
2.0 Background	1
2.1 <i>Penstocks</i>	1
2.2 <i>Canal</i>	2
2.3 <i>Physical Condition of the Gerle Canal Emergency Spillway</i>	3
3.0 Proposed Improvements	3
4.0 Summary.....	5
5.0 Plan Revisions.....	5

Figures, Photos, and Attachments

Figure 1. Emergency spillway at beginning of Gerle Canal at Gerle Creek Dam	6
Figure 2. Flow diversion channel above Robbs Peak Powerhouse used during construction but not used as an emergency spillway.	7
Photo 1. Looking south from near the dam toward the spillway below the roadway bridge.	8
Photo 2. Looking north from the middle of the spillway channel toward spillway outlet... ..	9
Photo 3. Looking north from below the bridge at the spillway outlet. Note the concrete lining at the outlet.....	10
Photo 4. Looking to the west, downslope, from the middle of the spillway channel , toward Gerle Creek.	11
Photo 5. View from middle of the channel, looking to the east toward the spillway... ..	12
Attachment 1 SWRCB 401 WQC Condition	13
Attachment 2 USFS 4(e) Condition	14
Attachment 3 Gerle Canal Historical Spill Data	15

1.0 Introduction

As a condition of the new License to operate a hydroelectric project issued by the Federal Energy Regulatory Commission (FERC) for the Upper American River Project (UARP), FERC Project No. 2101, the Sacramento Municipal Utility District (SMUD) has prepared this Canal and Penstock Emergency and Maintenance Release Point Plan (Plan). The Plan has been prepared in accordance with the terms and conditions of the Relicensing Settlement Agreement for the UARP (2007) and the FERC License issued on July 23, 2014. Specifically it has been prepared in accordance with Condition No. 11 of the State Water Resources Control Board's Water Quality Certificate and Condition No. 37 of the USFS mandatory 4(e) conditions: Canal and Penstock Emergency and Maintenance Release Points. These Conditions are found in Appendix A and B of the License, respectively (Attachments 1 and 2).

SMUD has prepared this Plan to provide the agencies listed in the above-referenced conditions with information regarding the locations and condition of any emergency and maintenance release points. The objective of the plan is to determine if there are any measures that SMUD can implement to minimize adverse impacts to water quality and aquatic resources.

2.0 Background

The Project facilities subject to this plan are all located within El Dorado County, California, primarily on lands owned by the Eldorado National Forest. The UARP is composed of eight developments: seven are existing developments and one is proposed. The existing developments from upstream to downstream are: 1) Loon Lake; 2) Robbs Peak; 3) Jones Fork; 4) Union Valley; 5) Jaybird; 6) Camino; 7) Slab Creek/White Rock; and 8) Iowa Hill. Together, the existing developments include 11 reservoirs that can store up to 425,000 acre-feet (AF) of water, 8 powerhouses that have generated an average of 1,730 gigawatt hours (GWh) of power annually since 1990, 11 transmission lines with a combined length of about 177.2 miles, about 28 miles of power tunnels/penstocks, and one, 1.9-mile long canal. Any new facilities constructed under the proposed Iowa Hill Development or any other facilities added to the UARP will be added to this plan if applicable. Additions to the plan will be reviewed and approved by USFS and SWRCB.

2.1 Penstocks

The seven penstocks in the UARP do not have emergency or maintenance release points other than at the powerhouses. There are manholes in the penstocks, which are

only used for entry of workers when the penstock is drained. The penstocks can be operated to release water through bypass valves at the powerhouses if the penstock needs to be drained and water cannot be put through the turbines. Normal operation involves running water from the penstock through the turbines or through the bypass and into the reservoir or river. As a result, there is no situation where water from a penstock is released from a point other than the penstock outlet.

In the Robbs Peak development, the penstock valvehouse is configured with a bypass valve that leads to a side diversion channel (Figure 2). The side channel discharge structure houses a 10-foot knife gate valve. The side channel was only used during construction of the Robbs Peak Powerhouse so that water could be diverted into Union Valley from the Loon Lake development. It is only used to access the penstock and tunnel when the system is dewatered. As such, this spillway is not an emergency or maintenance release point and will not be used for that purpose; therefore, it will not be discussed further in this plan.

2.2 Canal

In addition to the penstocks, SMUD operates Gerle Canal, which transports water 1.9 miles from Gerle Creek Reservoir to Robbs Peak Forebay. The canal is 22-feet wide and 19-feet deep and is partially lined with gunite and synthetic barrier (Figure 1, Photo 1). The canal is uncovered and is built into the side of the slope, following a contour with an earth-fill levee on the downslope side. The canal has a maximum flow rate of 1,120 cubic feet per second (cfs).

Under normal operations, all flows entering Gerle Creek Reservoir are diverted into the canal with the exception of the minimum stream flow releases below Gerle Dam. Water is released from Gerle Creek Reservoir to the Gerle Creek Canal through two slide gates located on the face of the dam to the left of the spillway. The gates are electric motor-operated with local control from the dam crest or remotely controlled from the Power System Operator (PSO) Control Console in Sacramento. Under typical operations, the canal gates are maintained in the full open position, except during runoff conditions, when the gates are partially or fully closed to prohibit spill from the canal side-channel overflow spillway and to limit debris entry to the canal. In normal operation, the level of water in Gerle Creek Reservoir and the canal rise and fall together as a function of fluctuations in the volume of water flowing from the Loon Lake Powerhouse Tailrace Tunnel. At the end of the canal, the water enters the Robbs Peak Reservoir, where it merges with water entering from the South Fork Rubicon River. This is also the location of the Robbs Peak Powerhouse Intake.

The spillway is only used occasionally and is never intentionally used. Since 1996, approximately 11 spills have occurred at Gerle Canal emergency spillway. Attachment 3 contains a tabular and graphical summary of past spill events. The longest spill was

during the 1996/1997 New Year's Eve rain-on-snow event, which resulted in some of the heaviest flows ever recorded through the UARP system (Spill 4 and 5 in Attachment 3). The canal spilled for about 16 hours during that event between December 30 and January 1, releasing approximately 51.6 AF with a maximum flow rate of 86 cfs. The maximum peak flow rate occurred during a storm event in 2007 which released about 34 AF and had a peak flow of 212 cfs. When the canal spills, it is typically for a very short period of time, since operators can quickly adjust the flows through the system. Excessive flows can generally be diverted over the Gerle Dam spillway, over the Robbs Peak Forebay spillway or through the Robbs Tunnel inlet and out through the Robbs Peak Powerhouse at Union Valley. On some occasions, brief spills appear to be the result of complications with coordinated operations.

2.3 Physical Condition of the Gerle Canal Emergency Spillway

The spillway channel is 70-feet wide and 130 feet long. The spillway is concrete-lined for the first 10 feet of its length (Photos 1-5). The channel then continues over bedrock and boulders down to Gerle Creek, about 130 feet from the release point (Photo 5).

3.0 Proposed Improvements

Relevant License conditions call for SMUD to evaluate the release points and determine if improvements can be made to minimize potential adverse water quality impacts. Given that the spillway is stable, in excellent condition and located such that releases do not result in significant erosion, SMUD evaluated ways to improve the process surrounding spill events rather than make improvements to the condition of the spillway.

In order to better understand and track canal spills, SMUD will institute an internal alert system that notifies SMUD's hydrologists and License Implementation staff of canal spills. By better tracking the timing and causes of spills, SMUD hydro system operators can work to further reduce the number of unnecessary canal spills. Any time there is a spill, SMUD's staff will determine the cause of the spill and whether it could have been prevented. The system will also allow SMUD to provide a summary of spill events and causes at the Annual Review of Ecological Conditions meeting. At that meeting SMUD will inform the group about canal spills and discuss whether any additional improvements can be made and whether adaptive management measures are necessary.

3.1 Adaptive Management

SMUD's UARP system operators will be notified in the event of a spill. SMUD's license implementation staff will review the cause of the spill with the operator. If the spill could have been prevented (ie. It was not a storm-induced spill or otherwise necessary to protect staff, facilities and equipment) SMUD will work with the operators to determine the exact cause and whether procedures can be implemented to reduce unnecessary spills. In addition, should operations change over the term of the license, which lead to increased spills and increased, adverse resource impacts, SMUD will develop measures in consultation with the approving agencies to prevent, manage and/or mitigate spill-related impacts.

In the event of a significant spill event that may impact streambanks in Gerle Creek below the Gerle Creek spillway channel, SMUD will monitor the emergency spillway channel and Gerle Creek below the spillway channel. SMUD will initiate the monitoring protocol following the first ten spill events after license issuance with a magnitude in excess of 20 cfs. Photos will be taken and shared with the appropriate approving agencies of this plan to determine whether significant resource damage has occurred. If significant resource damage has occurred as a result of the spill, within 90 days SMUD will develop a restoration plan in consultation with CDFW, USFS and SWRCB. These agencies shall approve the restoration plan.

In order to determine an appropriate trigger to initiate future monitoring and potential restoration, the data from the ten spill events will be compiled by SMUD into a report detailing the duration, magnitude and erosive impact of each spill event. The report will be provided to CDFW, USFS and SWRCB for review and comment within 6 months of the cessation of spill number ten. If an appropriate trigger to initiate future monitoring and potential restoration can be determined, signified by a spill magnitude that previous monitoring data indicates will initiate erosion within Gerle Creek, the Plan will be modified to include the trigger following approval by USFS and SWRCB. If an appropriate trigger cannot be determined following a review of the data, additional monitoring followed by the issuance of a second report will continue in the manner described above. If data indicates spill events will not initiate erosion within Gerle Creek, monitoring may be discontinued following approval by USFS and SWRCB.

The monitoring requirements may be adjusted if SMUD, CDFW, USFS, and SWRCB collaboratively determine it is appropriate.

If there is a need to complete a fish rescue, SMUD will notify CDFW, USFS, and SWRCB prior to the fish rescue.

4.0 Summary

SMUD has seven penstocks and one two-mile long canal in the UARP. The penstocks are not dewatered using emergency release points; they can only be dewatered at the powerhouse where flows are normally released. The Gerle Canal, SMUD's only canal, which connects Gerle Creek Reservoir and Robbs Peak Forebay, has one emergency release point located 120 feet downstream of Gerle Creek Dam. The spillway is 70-feet wide and flows over bedrock and boulders, with little chance for significant erosion. The spillway is rarely used and to further reduce the number of unintentional spills, SMUD will implement an internal notification system that will allow spills to be tracked.

5.0 Plan Revisions

If SMUD, USFS, CDFW, or SWRCB collaboratively determine that revisions should be made to the plan, SMUD will make any revisions to the Plan in coordination and consultation with the listed resource agencies. Any revisions to the plan must be approved by USFS, CDFW, and SWRCB. Any revisions shall be filed with FERC for approval prior to implementing.

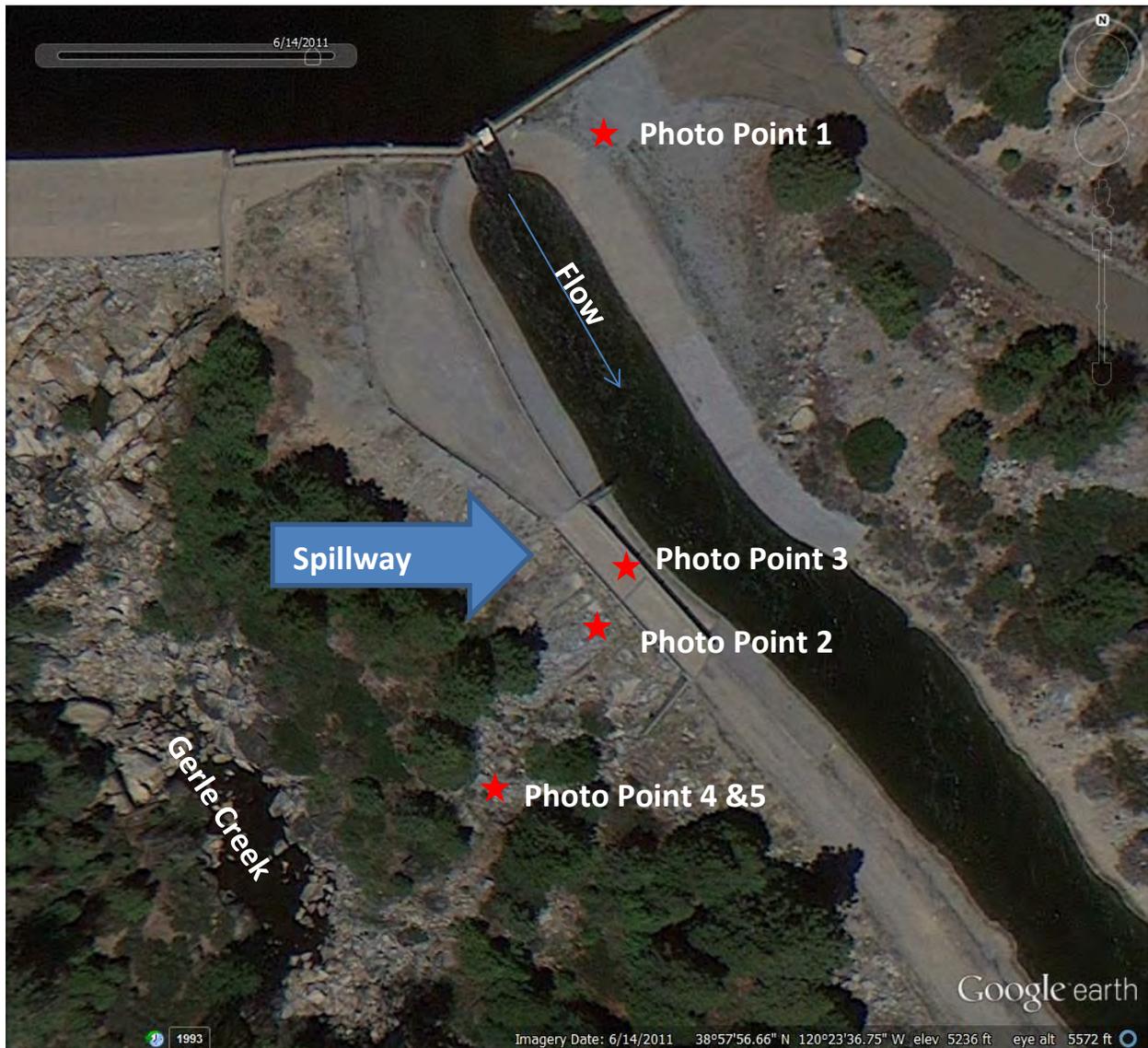


Figure 1. Emergency spillway at beginning of Gerle Canal at Gerle Creek Dam



Figure 2. Flow diversion channel above Robbs Peak Powerhouse used during construction but not used as an emergency spillway.



Photo 1. Looking south from near the dam toward the spillway below the roadway bridge.



Photo 2. Looking north from the middle of the spillway channel toward spillway outlet.



Photo 3. Looking north from below the bridge at the spillway outlet. Note the concrete lining at the outlet.



Photo 4. Looking to the west, downslope, from the middle of the spillway channel , toward Gerle Creek.



Photo 5. View from middle of the channel, looking to the east toward the spillway.

Attachment 1***SWRCB 401 Water Quality Certificate, CONDITION 11, CANAL AND PENSTOCK EMERGENCY AND MAINTENANCE RELEASE POINTS***

The Licensee shall, within one year after license issuance, file with the Commission a plan, approved by the Deputy Director, to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made to minimize potential adverse water quality impacts when the release points are used. The Licensee shall consult with USFS, CDFW, USFWS, and the State Water Board in the development of the plan. The Licensee shall provide the Deputy Director with any comments provided by the agencies during the consultation process. The Licensee shall submit the plan to the Deputy Director for review and approval after agency consultation. The Licensee shall provide the Deputy Director with at least 90 days to review and approve the plan prior to submittal to the Commission, if applicable. The Deputy Director may require modifications as part of the approval. The Licensee shall file the Deputy Director's approval, together with any required plan modifications, with the Commission.

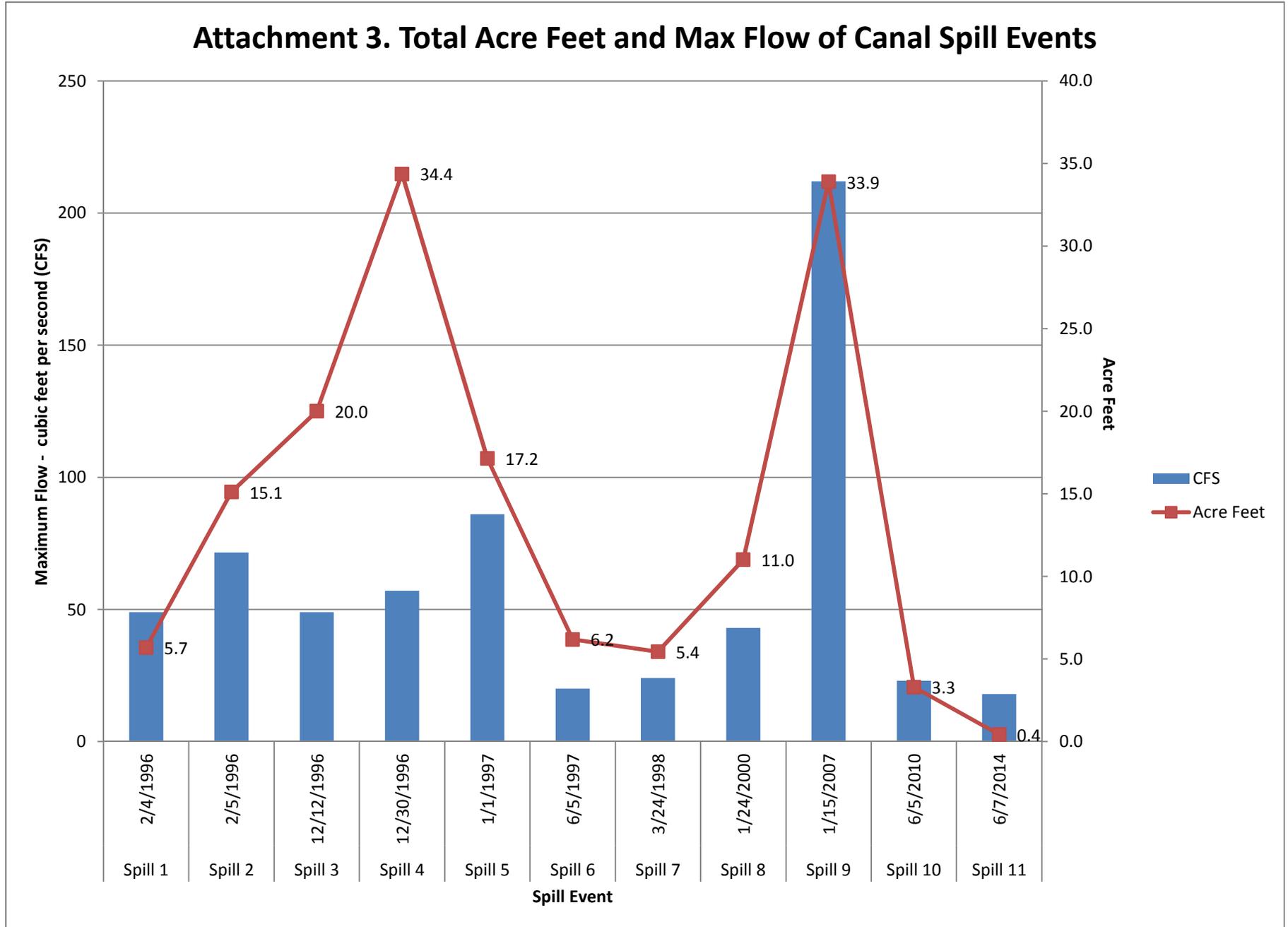
Attachment 2***USFS 4(e) Condition 37.***

The licensee shall, within 1 year after license issuance, file with FERC a plan approved by FS and SWRCB, to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made to minimize potential adverse water quality impacts when the release points are used. The licensee shall also consult with CDFG and FWS in the development of the plan. The licensee shall implement the recommendations contained in the plan upon approval.

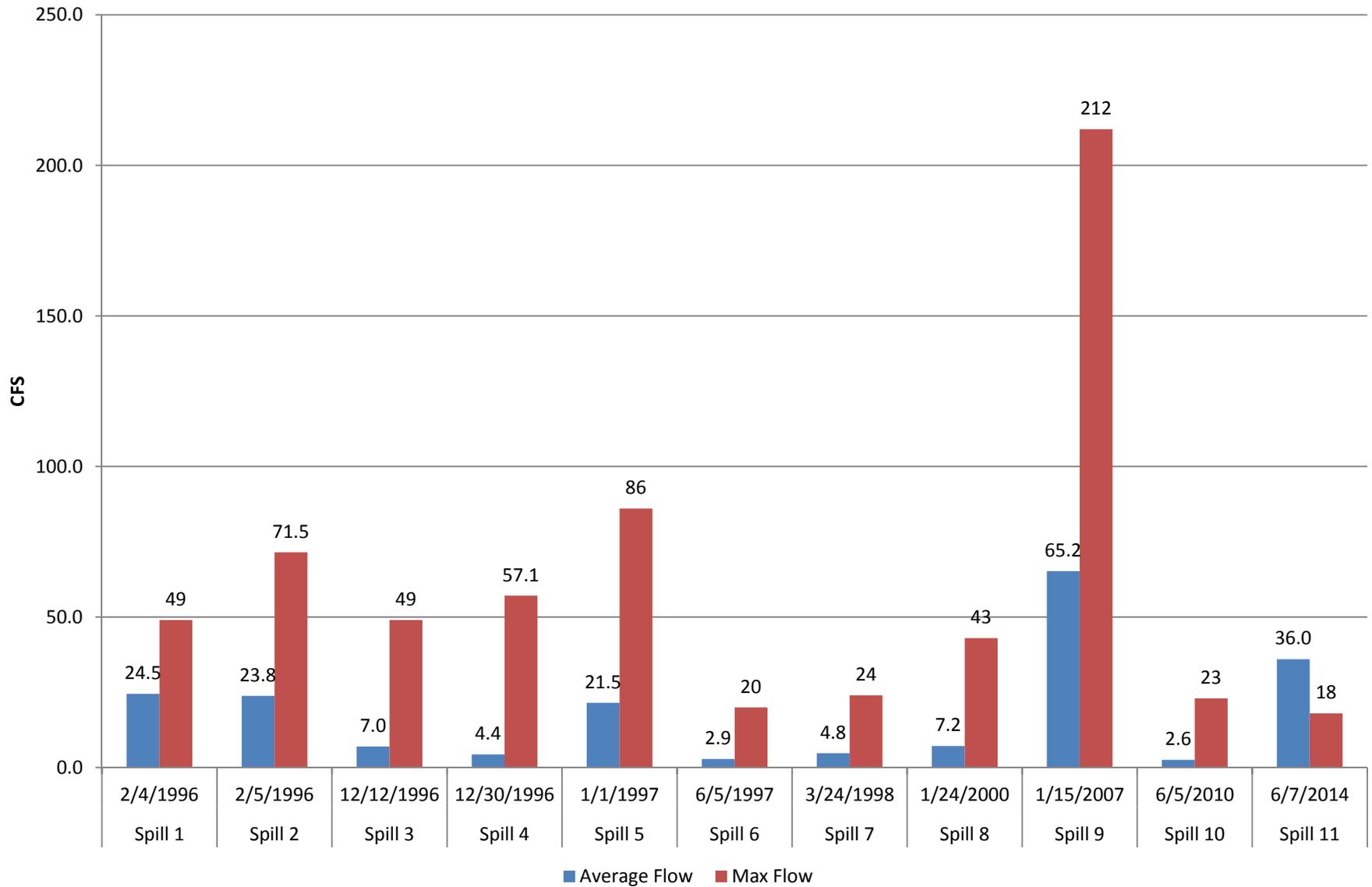
Attachment 3**Gerle Canal Historical Spill Data**

Attachment 3

Spill Number	Date	Max. Flow (CFS)	Total Volume (Acre-Feet)	Duration (Hours)	Average Flow (CFS)
<i>Spill 1</i>	2/4/1996	49	5.6925	2	24.5
<i>Spill 2</i>	2/5/1996	71.5	15.114	3	23.833333333
<i>Spill 3</i>	12/12/1996	49	20.00625	7	7
<i>Spill 4</i>	12/30/1996	57.1	34.3695	13	4.392307692
<i>Spill 5</i>	1/1/1997	86	17.15175	4	21.5
<i>Spill 6</i>	6/5/1997	20	6.1875	7	2.857142857
<i>Spill 7</i>	3/24/1998	24	5.445	5	4.8
<i>Spill 8</i>	1/24/2000	43	11.01375	6	7.166666667
<i>Spill 9</i>	1/15/2007	212	33.89925	3.25	65.23076923
<i>Spill 10</i>	6/5/2010	23	3.3	9	2.555555556
<i>Spill 11</i>	6/7/2014	18	0.433125	0.5	36



Attachment 3. Gerle Creek Canal Average/Maximum Flow (Approx.) by Spill



Attachment 3. Duration (Approx.) of Spills at Gerle Creek Canal 1996- Present

