ANNUAL COMPLIANCE REPORT

Instream Flow Agreement
for the
Cedar River

Cedar River Habitat Conservation Plan Year 18
January 1 through December 31, 2018

Prepared by

City of Seattle

Seattle Public Utilities
and
Seattle City Light

April, 2018

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Acknowledgements

In 2018, Cedar River Instream Flow Commission members devoted substantial time and effort to help manage water resources in the Cedar River Basin. Commission members also helped guide the development and implementation of supplemental biological studies and other technical analyses that continue to inform their management recommendations. The Commission members are, herein recognized for their continued commitment to effectively manage water resources in the Cedar River basin and provide beneficial conditions for instream resources.

Organizational membership and representation is as follows:
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- National Marine Fisheries Service
  - Lisa Abernathy
- United States Fish and Wildlife Service
  - Suzanne Nelson
- Washington Department of Fish and Wildlife
  - Peggy Miller
- Washington Department of Ecology
  - Buck Smith
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  - Liz Ablow – Seattle City Light

Non-Voting Organizations:

- Army Corps of Engineers
  - Ken Brettmann
  - Mike Warner
- King County
  - Scott Stolnack

In addition, it takes many people in an organization to translate good intentions into successful operations. Providing beneficial conditions for fish and other instream resources in the Cedar River is a 24-hour – 365-day a year responsibility.

Special thanks go to staff from:

- Cedar Falls Headworks (Seattle City Light)
- SPU Water Supply and Treatment (Landsburg Operators and Control Center)
- SPU Water Operations Planning and System Control Section
- SPU Watershed Management Division
- SPU Water Resources Section

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1. Introduction

The City of Seattle ("City") influences river flows in the Cedar River through its water supply and hydroelectric operations within the municipal watershed. Water from the Cedar River is used by approximately two-thirds of the City's 1.4 million customers in King and Snohomish Counties. The objective of the Cedar River Instream Flow Agreement (IFA), one of several agreements that establish the provisions of the Cedar River Watershed Habitat Conservation Plan (HCP), is to provide beneficial conditions for instream resources, while preserving Seattle's water supply and power generation capabilities.

The IFA establishes an interagency body, the Cedar River Instream Flow Oversight Commission ("Commission"), to assist the City in carrying out its river management responsibilities. The Commission was first convened in July 2000, and has met, on average, slightly less than once per month since then. Meetings are chaired by SPU.

1.1 Purpose of Report

Seattle Public Utilities and Seattle City Light, for the City of Seattle, present this report to the Commission as documentation of compliance with flow requirements established in the 2000 Instream Flow Agreement (IFA) for the Cedar River. The IFA is part of the City's Cedar River Watershed Habitat Conservation Plan (HCP). Section D.3 (a) of the IFA stipulates that an annual compliance report be submitted to the Commission. This annual report covers the period January 1, 2018 through December 31, 2018.

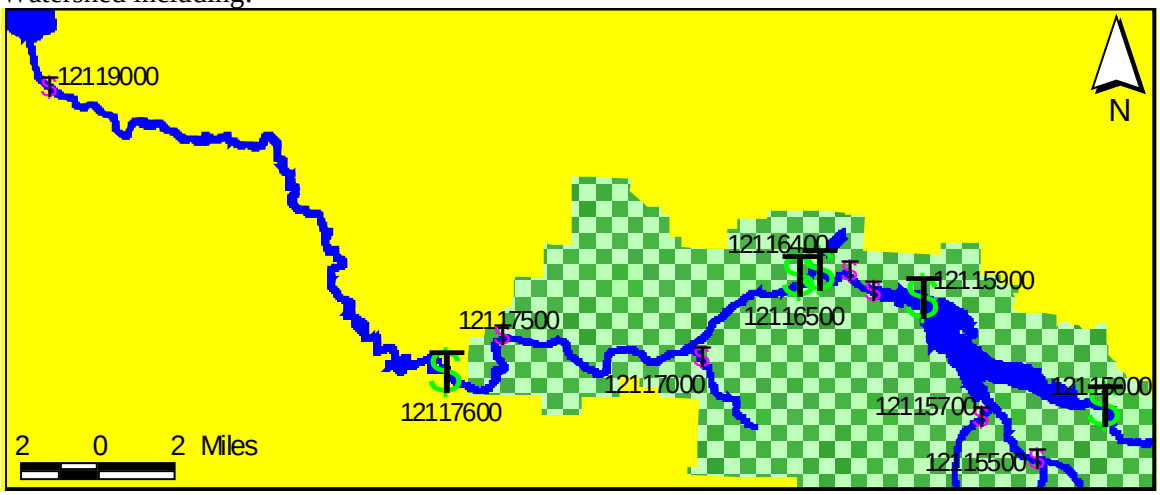
1.2 Summary

Highlights in 2018:

- Stream flows remained above the normal guaranteed levels at all times. All required supplemental stream flows were provided during the year.
- In 2018, there was one formal downramping exceedances at USGS Gage 12116500 below the Power House and one downramping exceedance at USGS Gage 12117600 below Landsburg Diversion.
- During the reporting period, the project had 5 emergency plant shutdowns (see Table 6.1). The emergency bypass system activated, and flow continuation was provided during all emergency shutdowns. Operator intervention was required to maintain flow continuation in one emergency shutdown when a butterfly valve began to close.
- The average annual Cedar River daily diversion for calendar year 2018 = 78.33 mgd.
- The estimated incubation survival of brood year 2018 sockeye was 18.3%. The incubation survival estimate for Chinook salmon was 14.2%.
- Spring redd survey conditions were excellent in 2018. Three steelhead (*Oncorhynchus mykiss*) redds were observed in the Cedar River during the spring of 2018. Counts of resident/adfluvial trout redds (*O. mykiss and Oncorhynchus clarkii)* were low again in 2018 with a total count of 29 redds. One steelhead redd was vulnerable to dewatering under summer HCP minimum flows. The summer supplemental blocks of water were allocated to protect the vulnerable steelhead redd through the completion of emergence.

2. Measuring Points

Flow and downramping compliance is measured at several locations throughout the Cedar River Watershed including:



USGS Gaging Station 12117600 – Cedar River below Diversion near Landsburg, Washington. Located at River Mile 20.4, this gage measures regulated stream flow downstream of Landsburg Diversion Dam. This is the measuring point for flows and downramping rates immediately below the Landsburg Diversion Dam, as required in Section B and sub-section C.2.c in the IFA.

Seattle Public Utilities Diversion – Cedar River at the Diversion Dam near Landsburg, Washington. Located at River Mile 21.9, this measures the volume of water (in millions of gallons per day) diverted for municipal use and is monitored at the Landsburg Diversion Dam Facility.

USGS Gaging Station 12116500 – Cedar River at Cedar Falls, Washington. Located at River Mile 33.2, immediately below the Cedar Falls Powerhouse, this gage measures regulated stream flow downstream of the Cedar Falls Powerhouse. This is the measuring point for downramping rates immediately below the Powerhouse at Cedar Falls, as required in sub-section C.2.b in the IFA.

USGS Gaging Station 12116400 – Cedar River at Powerhouse at Cedar Falls, Washington. Located at River Mile 33.7, this gage is immediately upstream of the Cedar Falls Powerhouse and measures regulated stream flow downstream of Masonry Dam. This is the measuring point for flows and downramping rates immediately above the Cedar Falls Powerhouse, as required in sub-section C.1.a in the IFA. (Note: Date of installation Oct. 1, 2001).

USGS Gaging Station 12115900 – Chester Morse Lake at Cedar Falls, Washington This gage located at the Overflow Dike at River Mile 37.2 and measures water surface elevation of Chester Morse Lake. This is the measuring point for determining reservoir elevation, as required in sub-sections B.7.b. (1) and B.8.c. (1).

USGS Gaging Station 12115000 – Cedar River near Cedar Falls, Washington. This gage located at River Mile 43.5 and measures unregulated inflows to Chester Morse Lake. This is the measuring point for determining reservoir inflows, as required in sub-sections B.7.b. (2), B.7.b. (3), and B.8.c. (2), and serves as an index for total reservoir inflow.

3. Instream Flows Below Landsburg Diversion Dam

In accordance with the IFA Section B.1.a, the City has two types of commitments:

"consist of two types of commitments by the City. The minimum instream flows or volumes, as described in sub-sections B.2., B.4., B.6., B.7., and B.8., represent requirements of the City and are referred to as "firm" flows or volumes, subject to the specific conditions and procedures set forth therein. Additional flows or volumes provided to supplement minimum flows, as described in sub-sections B.3. and B.5., represent goals of the City and are referred to as "non-firm" flows or volumes, subject to the specific conditions and procedures set forth therein."

On June 3, 2009, the Cedar River Instream Flow Oversight Commission (IFC) established interim weekly adjustments in the critical, normal and supplemental flow schedules to compensate for hydrologic alterations of the Walsh Lake Ditch that occurred as a result of the January 2009 flood event (see Appendix 1 of 2009 Annual Compliance Report). During this event, a landslide triggered a failure of the Walsh Ditch which resulted in the flow in Walsh Creek (the outlet from Walsh Lake) being reestablished in its original natural pathway flowing into Rock Creek and then to the Cedar River upstream of Landsburg Dam and upstream of the nearby instream flow compliance point at USGS gage 12117600, (Cedar River Below Diversion Near Landsburg) Prior to this event, the flow from Walsh Creek was delivered via the Walsh Lake Ditch directly to the Cedar River approximately ½ mile downstream of the compliance point at USGS gage 12117600. As long as Walsh Creek continues to flow in its current pathway to Rock Creek and the Cedar River upstream of the Landsburg Dam, SPU will comply with the revised instream flow schedule. SPU will also continue to monitor actual flows in Walsh Creek in an effort to further evaluate the degree to which the interim adjustments appropriately reflect actual Walsh Creek flow trends.

Section 3 is provided to indicate the level of compliance with the City's instream flow requirements and goals set forth in the IFA.

3.1 Minimum Instream Flows Below Landsburg Dam

Compliance with minimum flow requirements is assessed at one monitoring location in the Cedar River below Landsburg: USGS Gage 12117600 - Cedar River below Diversion near Landsburg.

3.1.1 Requirements

Required minimum flows are specified in Sections B.2.a and B.2.b in the IFA and the minimum flow requirement schedule is specified in Section B.2.c.

"*The City shall provide the minimum instream flows as set forth in sub-section B.2.c. Unless otherwise specified, the flows listed in sub-section B.2.c and elsewhere in this Agreement represent flow rates measured as "provisional real-time" data at the existing USGS gage number 12117600, located below Landsburg Diversion Dam at river mile 20.4. Normal minimum flows are defined as the minimum instream flow rates that the City will provide below Landsburg Diversion Dam except when all of the conditions and procedures specified in Section B.8. are met, in which case the City, in consultation with the Commission, may provide critical minimum flows*."

3.1.2 Compliance

During the reporting period, the project was in compliance with the IFA guaranteed minimum flows at USGS Gage 12117600. See Figure 8.1 and Tables 8.1 and 8.2.

For long-term tracking purposes, stream flows have remained at or above guaranteed normal minimum levels at all times in HCP Years 1 through 18, with the exception of a 7-day period in October of 2015 when flows were managed between low normal minimums and critical flow levels, as approved by the IFC.

3.2 Non-Firm Supplemental Flow in Late Winter and Early Spring for Sockeye Outmigration

3.2.1 Goals

Flow requirements are specified in Section B.3.a in the IFA:

"Between February 11 and April 14, the City will, as a goal, expect to supplement the normal minimum instream flows listed in sub-section B.2.c. by 105 cfs at least 70% of the time throughout said period in any year in which normal flows are in effect throughout said period."

3.2.2 Compliance

The City met the goal in 2018 by providing more than 105 cfs of supplemental flow 100% of the time during the February 11 to April 14 supplemental period (63 of 63 days). See Table 3.2.1.

Table 3.2.1 Supplemental Flows for Sockeye Fry Outmigration							
Calender Dates	Required Normal Minimum Instream Flows (cfs)	Minimum Instream Flows Plus Non-Firm Supplemental Flows (cfs)	Actual Recorded Mean Daily Flow (cfs)	Calender Dates	Required Normal Minimum Instream Flows (cfs)	Minimum Instream Flows Plus Non-Firm Supplemental Flows (cfs)	Actual Recorded Mean Daily Flow (cfs)
11-Feb	273	378	1920	15-Mar	273	378	520
12-Feb	273	378	1920	16-Mar	273	378	496
13-Feb	273	378	1820	17-Mar	273	378	478
14-Feb	273	378	1730	18-Mar	273	378	466
15-Feb	273	378	1670	19-Mar	273	378	444
16-Feb	273	378	1700	20-Mar	273	378	420
17-Feb	273	378	1790	21-Mar	273	378	412
18-Feb	273	378	1350	22-Mar	273	378	429
19-Feb	273	378	1200	23-Mar	273	378	421
20-Feb	273	378	1170	24-Mar	273	378	421
21-Feb	273	378	1370	25-Mar	273	378	409
22-Feb	273	378	1360	26-Mar	273	378	418
23-Feb	273	378	1270	27-Mar	273	378	490
24-Feb	273	378	1270	28-Mar	273	378	555
25-Feb	273	378	1270	29-Mar	273	378	513
26-Feb	273	378	1170	30-Mar	273	378	514
27-Feb	273	378	841	31-Mar	273	378	506
28-Feb	273	378	715	1-Apr	273	378	504
1-Mar	273	378	623	2-Apr	273	378	516
2-Mar	273	378	548	3-Apr	273	378	703
3-Mar	273	378	462	4-Apr	273	378	748
4-Mar	273	378	449	5-Apr	273	378	957
5-Mar	273	378	442	6-Apr	273	378	1000
6-Mar	273	378	426	7-Apr	273	378	1080
7-Mar	273	378	419	8-Apr	273	378	1240
8-Mar	273	378	417	9-Apr	273	378	1260
9-Mar	273	378	470	10-Apr	273	378	1170
10-Mar	273	378	436	11-Apr	273	378	1130
11-Mar	273	378	444	12-Apr	273	378	1130
12-Mar	273	378	472	13-Apr	273	378	1160
13-Mar	273	378	509	14-Apr	273	378	1420
14-Mar	273	378	546				

For long-term tracking, this goal has been met or exceeded in sixteen of eighteen years. This supplement was not provided in 2001 and 2005, years in which the State of Washington declared statewide droughts.

3.3 Firm Block of Water in Early Summer to Supplement Normal Minimum Flows for Steelhead Incubation

3.3.1 Requirements

Flow requirements are specified in Section B.4 in the IFA:

"Between June 17 and August 4, in addition to the normal minimum flows listed in subsection B.2.c., the City shall provide such supplemental flow volumes as the Commission may direct, provided that the total volume of such supplemental flows shall not exceed 2500 acre feet of water, and that other procedures and conditions in this sub-section B.4. are met."

3.3.2 Compliance

The City provided the Firm Block as prescribed by the Commission. See Table 3.3.1 and Figure 8.1.

Table 3.3.1

Calendar Dates	Required Minimum Instream Flows, cfs	Required Minimum Flow plus 2018 Summer Supplemental Firm Block, cfs
June 17 – July 18	231	244
July 19 – July 20	174	212
July 21 – July 22	109	180
July 23 – July 24	84	148
July 25 – July 26	84	124
Jul 27	84	116
July 28	83	109
July 29 – July 30	83	108
July 31st – August 2	83	85
August 3 – August 4	83	83

For long-term tracking, this goal has been met or exceeded in all 18 HCP years.

3.4 Non-Firm Block of Water in Early Summer to Supplement Normal Minimum Flows for Steelhead Incubation

3.4.1 Goals

Flow requirements are specified in Section B.5 in the IFA:

"Between June 17 and August 4, in addition to the normal minimum flows listed in sub-section B.2.c, and the "firm block" described in sub-section B.4., the City will, as a goal and under the conditions set forth in this sub-section B.5., expect to further supplement normal minimum flows by 3500 acre feet of "non-firm" water in 63% of all years."

3.4.2 Compliance

The City offered the 3,500 Acre-Feet Supplemental Block in 2018 and the block was accepted by the IFC and allocated. See Table 8.1 and Figure 8.1.

For long-term tracking purposes, SPU has offered the full non-firm block in fifteen out of eighteen years (83% with 2003, 2015 and 2016 being the exceptions). The Commission was offered but declined allocation of the block in one year (2004).

3.5 Higher Normal and Critical Minimum Flows in September for Sockeye and Chinook Spawning

3.5.1 Requirements

Flow requirements are specified in Section B.6 in the IFA.

"In any year in which the temporary flashboards, as they presently exist in the City's Overflow Dike or may hereafter be reconstructed, are in place throughout the period of June 1 through September 30, the normal minimum flows listed in sub-section B.2.c. shall be increased by the amount of 38 cfs between September 15 and 22, and by the amount of 115 cfs between September 23 and 30, and the critical minimum flows shall be increased by the amount of 10 cfs through the period between September 1 and 15."

3.5.2 Compliance

Temporary flashboards were in place throughout the period June 1 through September 30, 2018 and the City provided the required additional flows. See Tables 3.5.1 and 8.1 and Figure 8.1.

Table 3.5.1

Calendar Dates	Required Minimum Instream Flows, cfs	Minimum Instream Flows Plus High Normal Minimum Flows, cfs
Sep 16 - Sep 22, 2018	98	136
Sep 23 - Sep 30, 2018	98	214

For long-term tracking, increased normal flows have been provided at all times during this period in HCP Years 1 through 18. See Tables 3.5.1 and 8.1, and Figure 8.1.

3.6 Two-Part Normal Minimum Flow Regime in the fall for Sockeye and Chinook Spawning

3.6.1 Requirements

Flow requirements are specified in Section B.7 in the IFA:

"Between October 8 and December 31, the City shall provide either high-normal minimum flows of 330 cfs or low-normal minimum flows of 275 cfs, except when flows are reduced to critical minimum flows under the terms of sub-section B.8. More specifically, the City, beginning on October 8, will meet the high-normal and low-normal flow regimes with the following long-term average frequencies assuming that the critical minimum flow regime will be in effect at a long-term average frequency of one of ten years:

(1) The City will follow the high-normal minimum flow regime in six of ten years, provided that it may switch down to low-normal in one of those years when actual or forecasted water availability conditions worsen significantly from those projected and understood at the time of the decision to provide high-normal minimum flows.

(2) The City may follow the low-normal minimum flows in three of ten years, provided that it will switch up to high-normal at such time after October 8 if the City determines that improving conditions allow, or when criteria for high-normal are met, whichever comes first."

3.6.2 Compliance

In 2018, the City provided high normal flows during the entire October 8th – December 31st time period. See Table 8.1 and Figure 8.1. See Table 3.6.1 for long term tracking information.

Table 3.6.1

Week Period	Actual 2018	Expected		Actual 00-18		
		High	Low	High	Low	Critical
		%	%	%	%	%
Oct 8 - Oct 14	High	60	30	76	24	NA
Oct 15 - Oct 21	High	60	30	84	16	NA
Oct 22 - Oct 28	High	60	30	84	12	4
Oct 29 - Nov 4	High	50	40	91	7	2
Nov 5 - Nov 11	High	55	35	94	6	NA
Nov 12 - Nov 18	High	65	25	94	6	NA
Nov 19 - Nov 25	High	65	25	94	6	NA
Nov 26 - Dec 2	High	70	20	94	6	NA
Dec 3 - Dec 9	High	75	15	94	6	NA
Dec 10 - Dec 16	High	75	15	96	4	NA
Dec 17 - Dec 23	High	80	10	94	6	NA
Dec 24 - Dec 31	High	80	10	95	5	NA

3.7 Reductions to Critical Minimum Flows

3.7.1 Requirements

Required minimum flows are specified in Section B.8 in the IFA:

"This sub-section describes the circumstances under which the Parties agree that the City may switch to the minimum flow levels indicated in the column headed "Critical Flows" in the table which appears in sub-section B.2.c., until such time as those criteria may be modified pursuant to section E.4."

3.7.2 Compliance

The City did not switch to the critical flow levels at any time during the 2018 reporting period. See Table 8.1 and Figure 8.1. For long-term tracking purposes, stream flows have remained at or above guaranteed normal minimum levels at all times in HCP Years 1 through 18, with the exception of a 7-day period in October of the 2015 drought when flows were managed between low normal minimums and critical flow levels, as approved by the Instream Flow Commission.

4. Instream Flows Above Landsburg Diversion Dam

4.1 Flows between Cedar Falls Powerhouse and Masonry Dam

Compliance with minimum flow requirements is assessed at one monitoring location within the Cedar River Watershed: USGS Gage 12116400 - Cedar River at Powerhouse near Cedar Falls

4.1.1 Requirements

Required minimum flows are specified in Section C.1.a in the IFA:

"After construction of a fish ladder at Landsburg Diversion Dam and subsequent upstream passage of selected species of anadromous fish, the City will provide a minimum flow of 30 cfs on a continuous basis to protect rearing habitat in the Cedar River "Canyon Reach," measured by a new USGS stream gage to be installed near river mile 33.7 and funded by the City"

Fish ladder was completed and operational September 1, 2003. The first anadromous fish passed above Landsburg Diversion Dam on September 19, 2003, which marks the date the City will start to provide a minimum flow of 30 cfs on a continuous basis in the Cedar River "Canyon Reach."

4.1.2 Compliance

During the reporting period, the project was in compliance with the IFA for minimum flow at USGS Gage 12116400. See Table 8.4 and Figure 8.6. Mean daily stream flows at this location have remained above 30 cfs at all times since completing construction of the Landsburg Fish Passage Facility on September 1, 2003.

5. Downramping below City Facilities

5.1 Downramping below Landsburg Diversion Dam

5.1.1 Requirements

Section C.2.c in the IFA:

"(b) The measuring point for downramping rates at the Landsburg Diversion Dam will be the existing USGS gage number 12117600 located below the Dam at river mile 20.4. Not later than the end of HCP Year 2, the City will install equipment to monitor this gage on a "real time" basis. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.c. will be calculated from provisional real time data and gage error, as determined by USGS, shall be factored into the ramping rate calculation.

(c) The downramping rates and prescriptions set forth in this sub-section C.2.c. will not apply when flows exceed 850 cfs.

(2) Downramping During Normal Operations

(a) Between February 1 and October 31, the maximum downramping flow rate will be one inch per hour.

(b) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

(c) The tainter gates will be down and closed during normal operations.

(3) Downramping During Startup Following Full System Shutdown

(a) Based on past experience, full system shutdown at flows less than 850 cfs can be expected to occur one to two times per year for scheduled and unscheduled maintenance, and at least once per year for forebay cleaning. Shutdowns for construction may also occur depending on the nature of the construction project.

(b) To minimize risk of cavitation and mechanical damage of equipment at Landsburg Diversion Dam, initial downramping following full system shutdown will be at a maximum of 60 cfs per hour."

5.1.2 Compliance

During the reporting period, there were no formal downramping exceedances at USGS Gage 12117600 Cedar River below Landsburg. See Table 8.1 and Figures 8.2 and 8.3.

5.2 Downramping below Cedar Falls Powerhouse

5.2.1 Requirements

Section C.2.b in IFA:

"(2) The measuring point for downramping rates at the Cedar Falls Powerhouse will be the existing USGS gage number 12116500 located ½ mile below the Powerhouse at river mile 33.2. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.b will be calculated from provisional real time data and gage error, as determined by USGS, and shall be factored into the ramping rate calculation.

(3) The downramping rates and prescriptions set forth in this sub-section C.2.b will not apply when flows exceed 300 cfs

b. Downramping During Normal Operations

(1) Between February 1 and June 15, the maximum downramping flow rate will be two inches per hour with no daylight downramping (defined as one hour before sunrise until one hour after sunset).

(2) Between June 16 and October 31, the maximum downramping flow rate will be one inch per hour.

(3) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

c. Downramping during full system shutdown

(1) Based on past experience, full system shutdown at flows less than 300 cfs can be expected to occur one to two times per year due to low flow conditions or for scheduled and unscheduled maintenance or construction projects.

(2) When the lone unit is shutdown the wicket gates close at a prescribed speed (a condition of the machine safety mechanisms), which results in a sudden drop in flow, averaging a total of 25 cfs per occurrence.

d. Swapping load during daytime downramping restrictions

(1) During daytime downramping restrictions there may be a need to swap loads between generators. In most circumstances it is seamless and would not show up as a change in stage. However, there are situations in moving water from one machine to the other, due to the normal shutdown sequence, that can cause a sudden drop followed by an increase, or vice-versa. These are typically short duration occurrences.

e. Extended shutdowns during the February to June 15 time frame.

(1) The City will notify the Commission ahead of time of circumstances that could require an extended shutdown of both generators and discuss the need for leniency on daytime downramping.

5.2.2 Compliance

During the reporting period, there was one downramping exceedance below the Power House at USGS Gage 12116500. On July 26th, the 1-inch/hour downramping rate at the 12116500 USGS gage was exceeded for three consecutive 15-minute increments at 9:45, 10:00 and 10:15 by 0.1, 0.1 and 0.2 consecutively. Review of the operation revealed that established protocols for downramping when the unit is generating less than 1 MW were not followed and that the SCADA system was utilizing the set point and not the current MW reading when initiating the downramp. Both of these factors contributed to the downramping exceedance. These protocols were reviewed by operators and dispatchers, to ensure they are followed in the future to prevent this type of downramping exceedance to occur again. See Figures 8.4 and 8.5.

5.3 Downramping below Masonry Dam

5.3.1 Requirements

Section C.2.a in IFA:

"(2) The measuring point for downramping rates at the Masonry Dam will be the USGS gage number 12116400 located below the Dam at river mile 33.7. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.a will be calculated from provisional real time data and gage error, as determined by USGS, and shall be factored into the ramping rate calculation.

(3) The downramping rates and prescriptions set forth in this sub-section C.2.a will not apply when flows exceed 80 cfs

b. Downramping During Normal Operations

(1) Between February 1 and October 31 the final maximum downramping flow rate will be one-inch per hour.

(2) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour."

5.3.2 Compliance

During the reporting period, downramping below the Masonry Dam was in compliance with the IFA at USGS Gage 12116400. See Figures 8.6 and 8.7

6. Emergency Bypass Capability

6.1 Requirements

Section C.2.a in IFA:

In 1999, the City installed, tested and implemented operating procedures for new equipment to provide bypass flows around its hydroelectric turbines during most emergency plant shutdowns to protect against stranding of fish and dewatering of redds as a result of such events.

In its original configuration, the Cedar Falls Hydroelectric Project was not able to provide flow to the river during emergency shutdown of electrical generating equipment. To remedy this situation, in early 1999, the City installed equipment to provide bypass flows around its hydroelectric turbines during most emergency plant shutdowns. This original bypass system's flow capacity was limited to approximately 70 percent of the original flow passing through the generator prior to the load rejection. The city decided to expand the emergency bypass system's scope to improve the flow capacity through the bypass system. This work was completed in 2002 and has resulted in a more reliable system that has provided matching flow continuation to the river during most emergency shutdowns.

6.2 Compliance

During the reporting period, the project had 5 emergency plant shutdowns (see Table 6.1). In all of the emergency shutdowns, the emergency bypass system activated, and flow continuation was provided to the Cedar River.

Table 6.1 2018 Emergency plant shutdowns

Date	Outcome
February 17	Both units tripped off-line and the emergency bypass system successfully provided flow continuation.
March 12	One unit tripped off-line and the emergency bypass systems successfully provided flow continuation.
September 23	One unit tripped off-line and the emergency bypass system successfully provided flow continuation.
November 4	One unit tripped off-line and the emergency bypass system successfully provided flow continuation.
December 15	Both units tripped off-line and the emergency bypass system successfully provided flow continuation.

7. Municipal Water Use

7.1 Requirements

The HCP provides that "The City…is dedicated to managing water diversions from the Cedar for the next 5 to 10 years in the same range that water diversions have been for the last five years (98-105 mgd on an annual average basis)."

7.2 Compliance

The City was in compliance with the provision in 2018. Actual average annual water diversion in 2018 was 78.33 mgd. See Table 8.7.

7.3 Municipal Water Service Area

In 2018, the retail service and wholesale service areas remained the same as in 2017.

8. Measurement and Reporting

Annual reports are provided to the Commission to evaluate the City's compliance with the terms of the Instream Flow Agreement Section D.3.a.

"The City will provide to the Commission, on an annual basis, the record of measurements from the locations listed in subsection D.1. Average daily flows and reservoir elevations will be provided to indicate compliance with minimum instream flow requirements and goals. A table will be provided to show flows at the measuring points compared to the critical, low-normal, high-normal, and non-firm flow levels as identified in section B. For periods affected by downramping operations, flow data will be provided in one-hour increments to indicate compliance with downramping prescriptions."

These flow and elevation records are described below.

Figure 8.1 – Instream Flows Below Landsburg Compliance Graph
Figure 8.2 – Downramping Flows Below Landsburg Compliance Graph
Figure 8.3 – Downramping Rate of Change Below Landsburg Compliance Graph
Figure 8.4 – Downramping Flows below Powerhouse Compliance Graph
Figure 8.5 – Downramping Rate of Change Below Powerhouse Compliance Graph
Figure 8.6 – Downramping Flows below Masonry Dam Compliance Graph
Figure 8.7 – Downramping Rate of Change Below Masonry Dam Compliance Graph

Table 8.1 – USGS 12117600 Mean Daily Flows
Table 8.2 – Instream Schedule with Firm and Non-Firm Flows
Table 8.3 – USGS 12116500 Mean Daily Flows
Table 8.4 – USGS 12116400 Mean Daily Flows
Table 8.5 – Seattle Public Utilities Chester Morse Lake Daily 7AM Elevation
Table 8.6 – USGS 12115000 Mean Daily Flows
Table 8.7 – Seattle Public Utilities Landsburg Daily Diversion
Table 8.8 – Seattle Public Utilities Landsburg 24 Hour Total Precipitation
Table 8.9 – Seattle Public Utilities Masonry Dam 24 Hour Precipitation

Figure 8.1 – *Instream Flows Below Landsburg Compliance Graph*

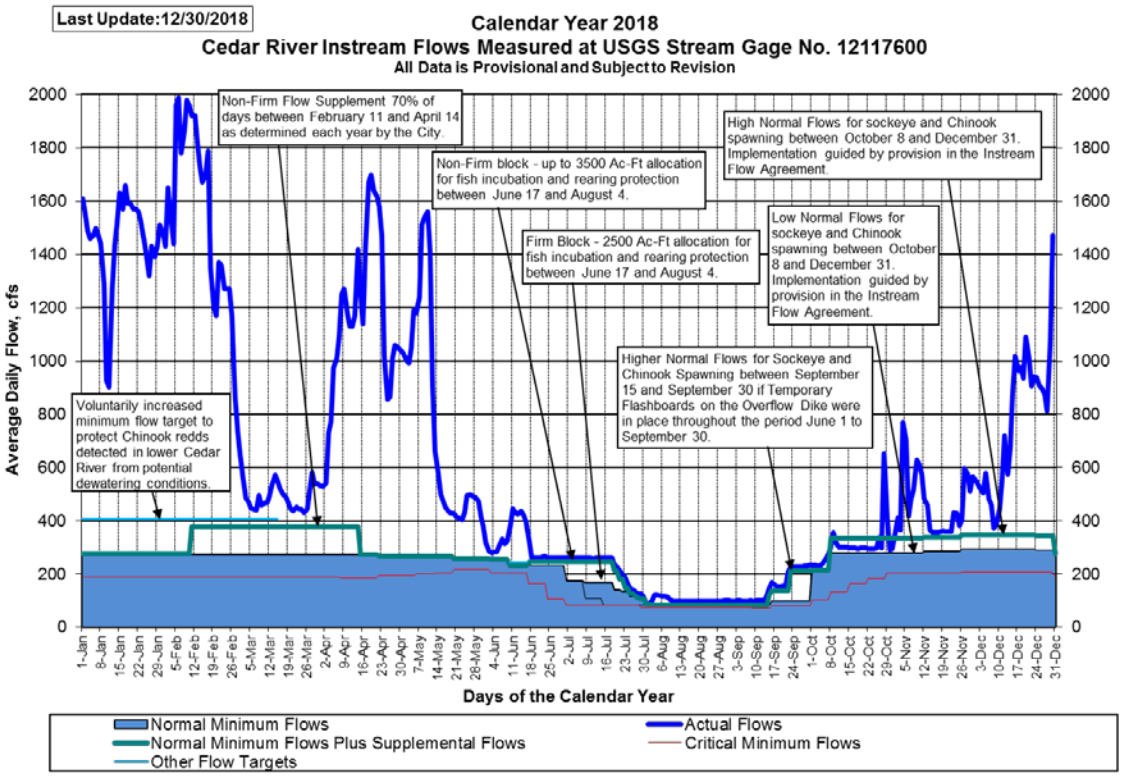


Figure 8.2 – *Downramping Flows Below Landsburg Compliance Graph*

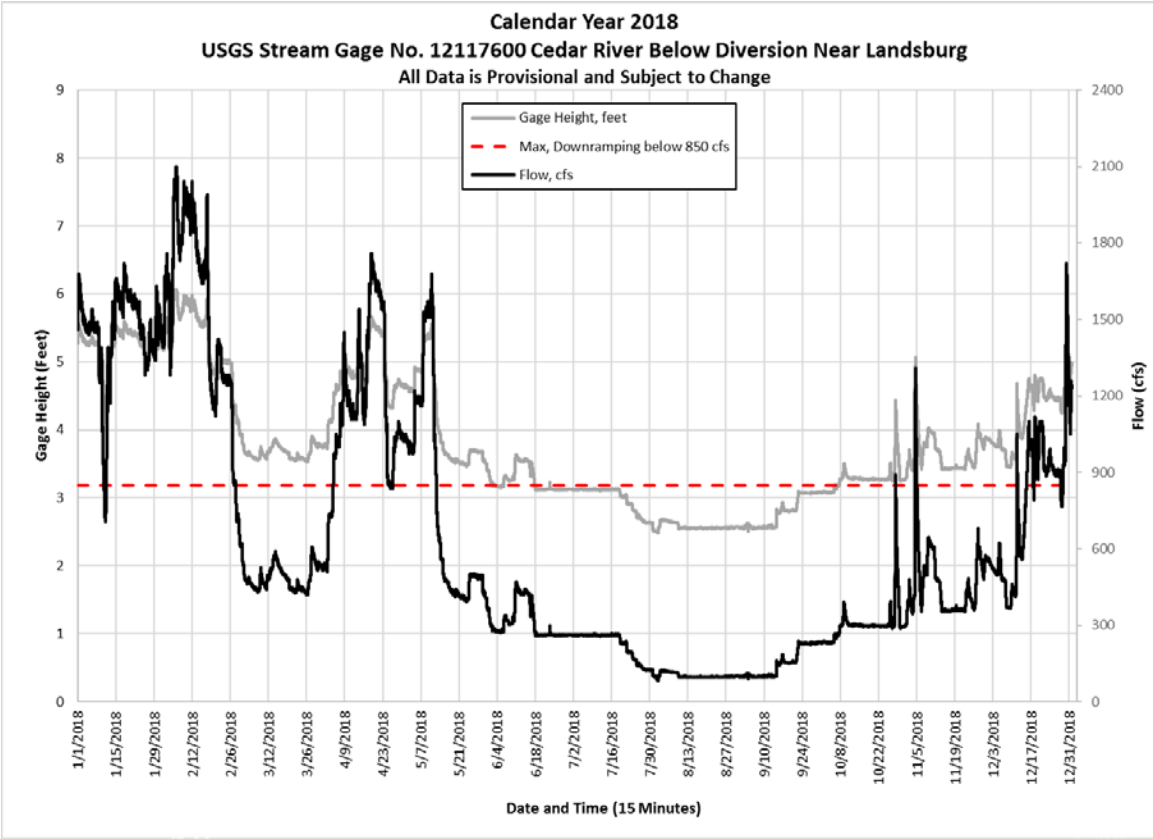


Figure 8.3 – *Downramping Rate of Change Below Landsburg Compliance Graph*

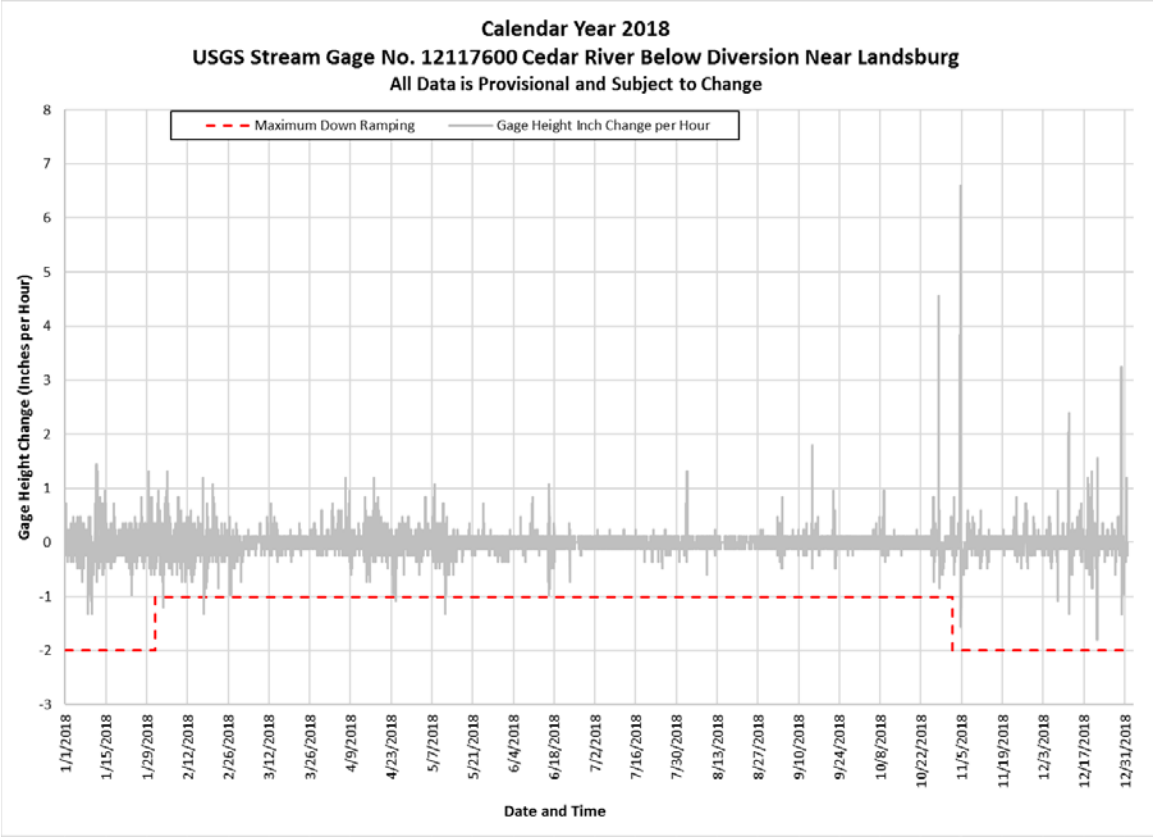


Figure 8.4 – *Downramping Flows below Powerhouse Compliance Graph*

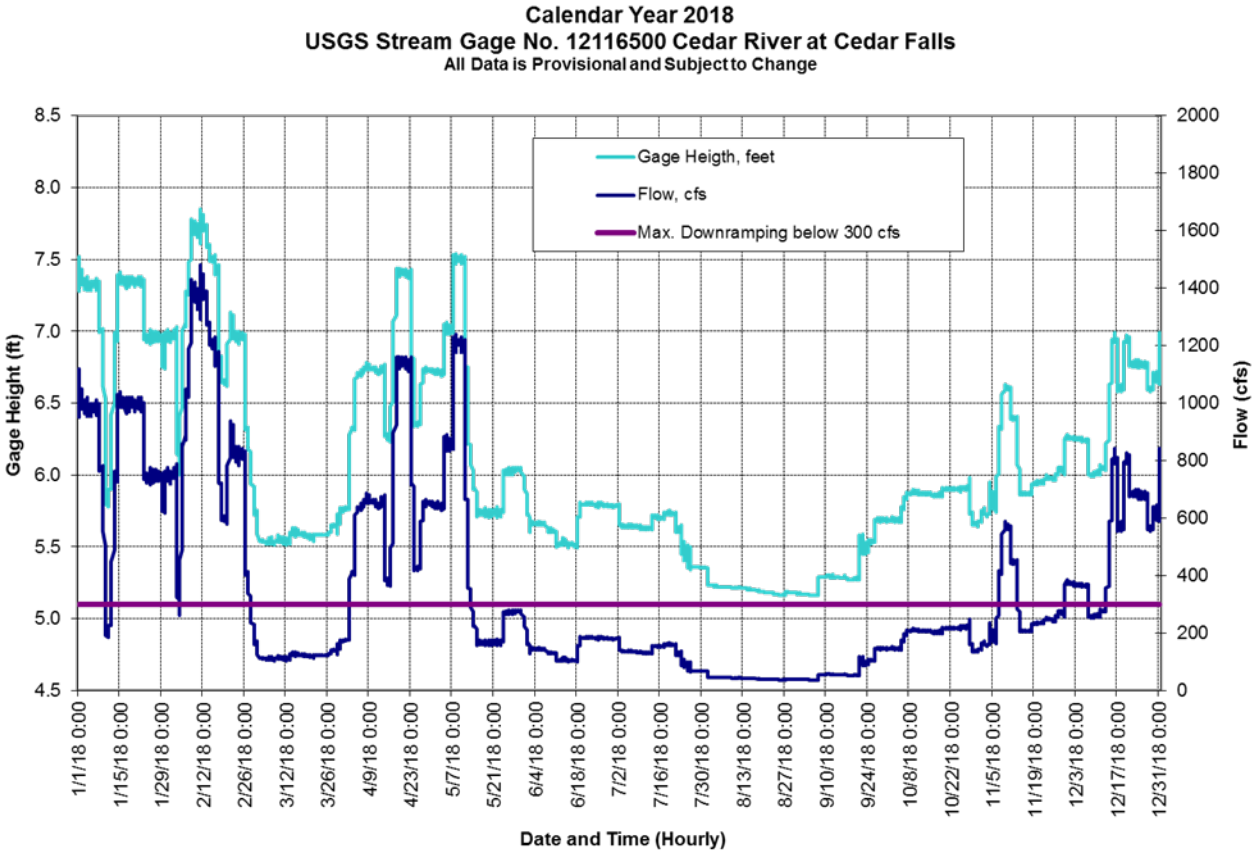


Figure 8.5 – *Downramping Rate of Change Below Powerhouse Compliance Graph*

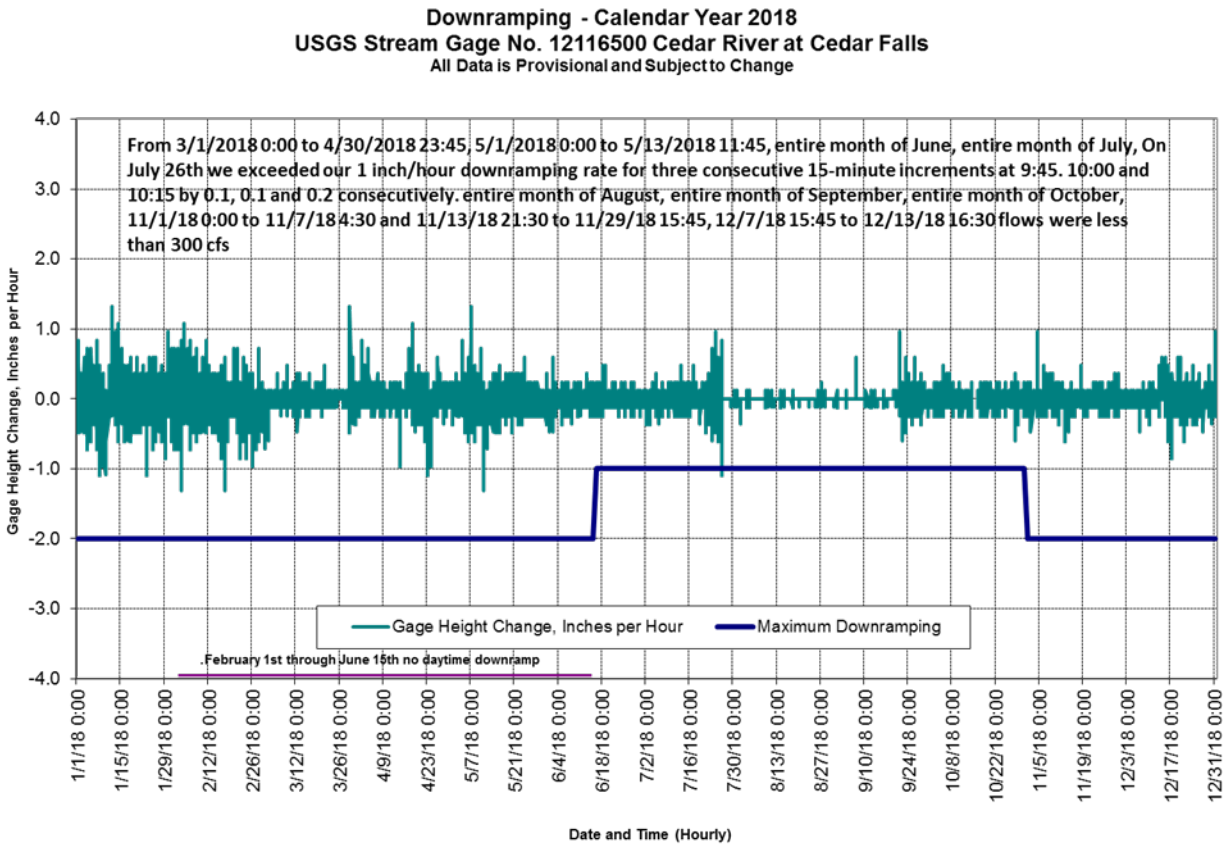


Figure 8.6 – *Downramping Flows below Masonry Dam Compliance Graph*

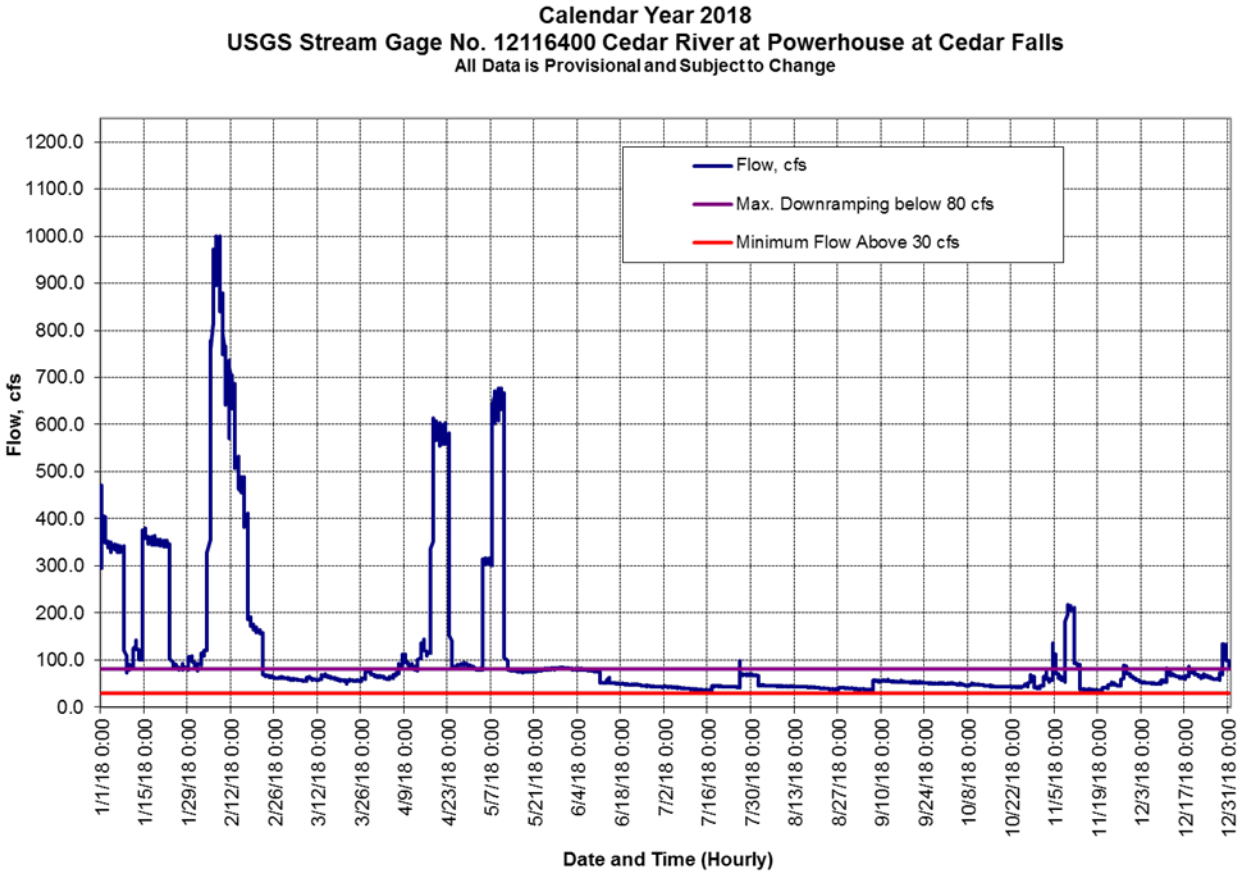


Figure 8.7 – *Downramping Rate of Change Below Masonry Dam Compliance Graph*

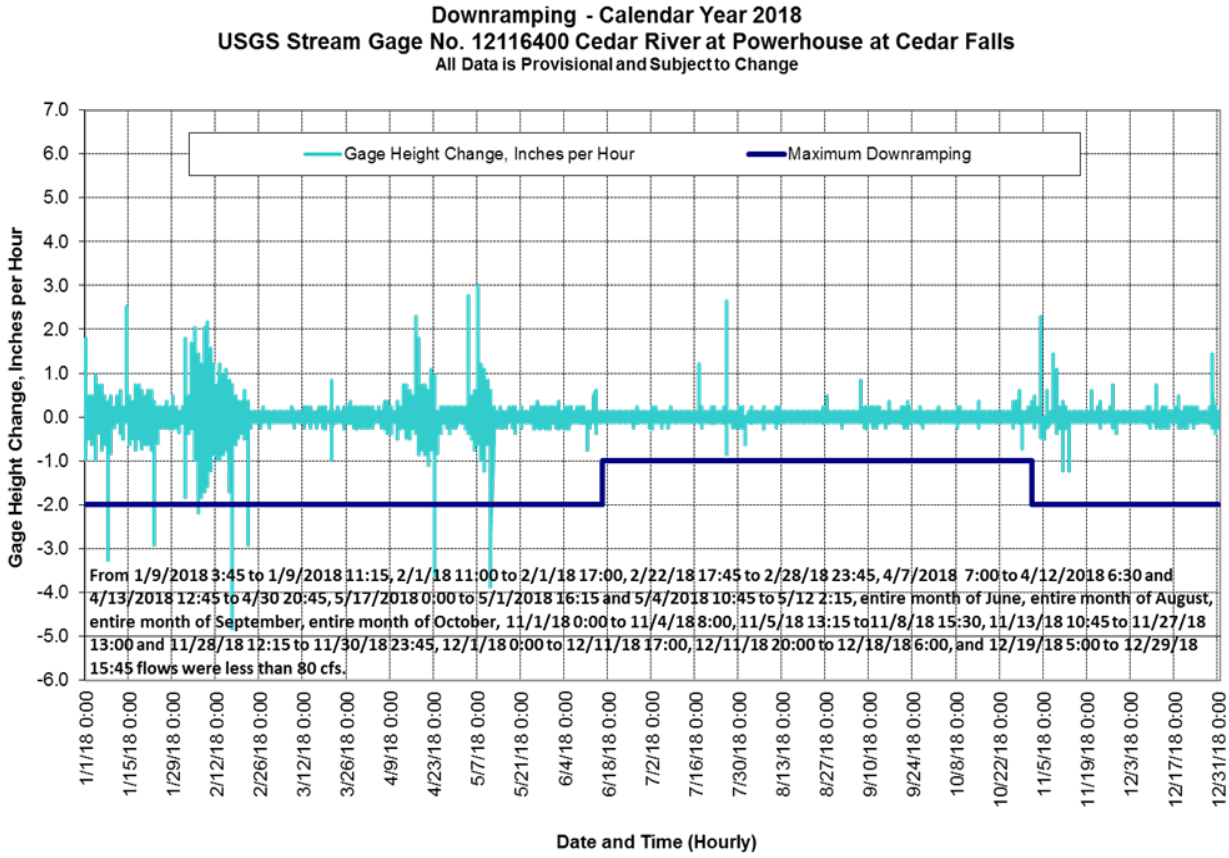


Table 8.1

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA

SOURCE AGENCY USGS STATE 53 COUNTY 033

LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 sq. mi. DATUM 490 NGVD29

Data is Provisional Real Time - SPU Downloads Weekly

Daily Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2018

DAILY MEAN VALUES

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1610	1430	650	529	1030	316	260	85.6	98.1	232	344	556
2	1550	1650	575	541	1010	285	261	102	97.6	233	413	534
3	1490	1550	486	728	991	278	260	121	101	230	367	516
4	1460	1440	472	771	1050	281	261	121	101	230	769	504
5	1470	1960	449	972	1190	282	261	119	97.8	240	701	577
6	1500	1990	442	1010	1180	311	261	117	97.2	259	418	484
7	1470	1780	440	1090	1240	331	261	115	97.7	272	484	457
8	1440	1860	494	1250	1510	314	260	113	99.2	301	515	371
9	1290	1980	459	1270	1540	322	261	104	98.7	357	628	384
10	925	1960	467	1180	1560	385	262	97.4	99.6	314	613	443
11	901	1920	467	1130	1410	447	259	98.5	101	301	574	549
12	1270	1920	496	1130	903	429	261	98.1	102	301	481	721
13	1430	1820	534	1170	662	425	261	97	99.7	302	457	574
14	1520	1730	572	1420	574	435	260	97.1	120	300	364	669
15	1630	1670	546	1250	497	421	260	96.5	148	299	357	883
16	1570	1700	521	1140	473	395	262	98	167	297	357	1020
17	1660	1790	502	1420	450	322	262	97.4	158	297	357	963
18	1590	1350	490	1670	434	262	262	97.2	154	296	359	975
19	1590	1200	468	1700	428	261	232	97.4	153	298	362	935
20	1570	1170	442	1640	427	261	227	97.2	157	298	359	1090
21	1570	1370	435	1620	414	262	215	97.2	156	298	360	1010
22	1560	1360	451	1580	410	263	196	97.1	209	296	360	904
23	1520	1270	444	1470	403	267	187	98.3	227	296	431	941
24	1450	1270	444	1020	431	262	166	97.8	227	296	428	939
25	1390	1270	431	854	496	261	144	97.9	228	298	382	904
26	1320	1170	441	866	498	260	142	98.7	227	337	401	894
27	1430	861	514	1010	491	262	132	97.9	228	297	595	876
28	1390	740	581	1060	490	262	124	98.7	229	651	575	813
29	1430	---	538	1050	472	261	125	99.1	230	406	509	1080
30	1510	---	539	1040	418	262	109	99.1	232	292	565	1470
31	1480	---	531	---	375	---	89.4	99.9	---	296	---	1150
TOTAL	44986	43181	15321	34581	23457	9385	6783	3151	4541	9420	13885	24186
MEAN	1451	1542	494	1153	757	313	219	102	151	304	463	780
MAX	1660	1990	650	1700	1560	447	262	121	232	651	769	1470
MIN	901	740	431	529	375	260	89	86	97	230	344	371

Table 8.2

SEATTLE PUBLIC UTILITIES

OPERATIONAL MINIMUM INSTREAM FLOW SCHEDULE WITH FIRM AND NON-FIRM FLOWS

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA

SOURCE AGENCY SPU - (With Walsh Ditch adjustment)

LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 sq. mi. DATUM 490 NGVD29

All Data is Provisional and Subject to Revision

Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2018

DAILY MEAN VALUES

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	275	275	378	378	268	258	244	85	83	214	334	347
2	275	275	378	378	268	258	244	85	83	214	334	347
3	275	275	378	378	268	256	244	83	83	214	334	347
4	275	275	378	378	268	256	244	83	83	214	334	347
5	275	275	378	378	268	256	244	83	83	214	334	347
6	275	275	378	378	268	256	244	83	83	214	334	347
7	275	275	378	378	268	256	244	83	83	214	334	347
8	275	275	378	378	268	256	244	83	83	334	334	347
9	275	275	378	378	268	256	244	83	83	334	334	347
10	275	275	378	378	268	231	244	83	83	334	334	347
11	275	378	378	378	268	231	244	83	83	334	334	347
12	275	378	378	378	268	231	244	83	83	334	339	347
13	275	378	378	378	268	231	244	83	83	334	339	347
14	275	378	378	378	268	231	244	83	83	334	339	347
15	275	378	378	273	268	231	244	83	121	334	339	347
16	275	378	378	273	268	231	244	83	136	334	339	347
17	275	378	378	273	268	244	244	83	136	334	339	347
18	275	378	378	273	268	244	244	83	136	334	339	347
19	275	378	378	273	268	244	212	83	136	334	339	347
20	275	378	378	273	258	244	212	83	136	334	339	347
21	275	378	378	273	258	244	180	83	136	334	339	347
22	275	378	378	268	258	244	180	83	136	334	339	347
23	275	378	378	268	258	244	148	83	213	334	339	347
24	275	378	378	268	258	244	148	83	213	334	339	345
25	275	378	378	268	258	244	124	83	213	334	339	345
26	275	378	378	268	258	244	124	83	213	334	347	345
27	275	378	378	268	258	244	116	83	213	334	347	345
28	275	378	378	268	258	244	109	83	213	334	347	345
29	275	---	378	268	258	244	108	83	213	334	347	345
30	275	---	378	268	258	244	108	83	213	334	347	345
31	275	---	378	---	258	---	85	83	---	334	---	275
TOTAL	8525	9554	11718	9615	8188	7341	6246	2577	3939	9514	10155	10671
MEAN	275	339	378	322	264	245	202	83	128	306	338	344
MAX	275	378	378	378	268	258	244	85	213	334	347	347
MIN	275	275	378	268	258	231	85	83	83	214	334	275
AC-FT	16557	18555	22758	18674	15902	14257	12131	5005	7650	18478	19723	20725

Table 8.3												
U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES												
Retrieved from SPU IMS SCADA Database: 2019-02-26												
STATION NUMBER 12116500 CEDAR RIVER AT CEDAR FALLS, WA												
SOURCE AGENCY USGS STATE 53 COUNTY 033												
LATITUDE 472502 LONGITUDE 1214727 NAD27 DRAINAGE AREA 84.2 sq. mi. DATUM 902.10 NGVD29												
Data is Provisional Real Time - SPU Downloads Weekly												
Discharge, cubic feet per second												
CALENDAR YEAR JANUARY TO DECEMBER 2018												
DAILY MEAN VALUES												
DAY	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	1060	744	180	241	636	147	164	49.1	37.5	147	165	375
2	1020	757	153	404	632	149	135	49	37.5	147	156	371
3	990	603	115	451	730	148	133	48	36.9	146	206	370
4	987	314	114	595	845	148	133	44.6	36.2	160	185	368
5	987	672	113	601	845	147	133	44.6	36.2	185	189	367
6	986	877	113	612	964	145	133	44.6	44.5	202	367	366
7	986	999	113	627	1230	132	132	44.6	55.6	207	441	326
8	936	1180	111	624	1230	125	132	43.9	55.6	211	574	256
9	715	1260	119	615	1230	123	131	43.3	55.9	208	569	258
10	343	1250	117	611	991	103	130	43.5	55.2	208	521	263
11	206	1260	114	606	498	101	130	43.2	55.4	207	447	271
12	276	---	120	609	304	103	142	43.1	54.1	207	395	276
13	627	1210	133	500	237	103	151	42.8	53.9	206	214	295
14	865	1130	132	377	173	101	150	41.9	53.9	205	206	473
15	1020	1110	130	402	171	101	150	41.7	54.7	203	205	716
16	999	1070	127	655	171	99.7	159	41.6	53.2	203	205	808
17	999	891	125	976	170	117	165	40.6	52.3	202	219	731
18	1000	587	124	1040	170	169	165	40.3	52.4	210	231	570
19	1000	565	123	1040	171	179	164	40	53.1	216	233	644
20	999	606	123	1040	169	179	145	38.9	80.8	217	236	803
21	997	822	125	1030	172	180	134	38.9	101	217	240	743
22	993	800	125	1000	173	180	117	38.3	93.6	217	248	685
23	906	748	126	538	224	178	101	37.5	100	216	249	685
24	747	746	125	425	272	178	88.8	37.5	107	218	245	686
25	746	751	128	475	277	179	84.8	36.8	123	222	249	683
26	746	639	137	632	275	177	71.8	37.4	146	221	270	681
27	754	390	145	648	278	176	71.8	39.8	146	198	269	648
28	749	275	140	644	279	175	71	38.9	146	150	294	564
29	702	---	173	642	276	176	70	38.9	146	138	377	584
30	678	---	176	640	235	176	69.9	38.8	146	138		617
31	750	---	177	---	173	---	60.1	37.7	---	157	---	705
TOTAL	25769	*22256*	4076	19300	14201	4395	3817	1290	2270	5989	8405	16188
MEAN	831	*824*	131	643	458	146	123	42	76	193	290	522
MAX	1060	*1260*	180	1040	1230	180	165	49	146	222	574	808
MIN	206	*275*	111	241	169	100	60	37	36	138	156	256

Table 8.4												
U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES												
Retrieved from SPU IMS SCADA Database: 2019-02-26												
STATION NUMBER 12116400 CEDAR RIVER AT POWERPLANT AT CEDAR FALLS,WA												
SOURCE AGENCY USGS STATE 53 COUNTY 033												
LATITUDE 472508 LONGITUDE 1214649 NAD27 DRAINAGE AREA 83.9 sq. mi. DATUM 940 NGVD29												
Data is Provisional Real Time - SPU Downloads Weekly												
Discharge, cubic feet per second												
CALENDAR YEAR JANUARY TO DECEMBER 2018												
DAILY MEAN VALUES												
DAY	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	400	83.4	65	65.6	79.1	78.4	44.3	47.1	39.1	51.9	66.2	58.2
2	356	106	63.5	64	77.8	77.7	43.4	46.6	38.7	50.9	57.5	55.3
3	331	117	62.2	65.3	169	77.1	43.1	46.4	38.5	50.4	105	53.2
4	326	176	61.7	67.3	283	76.4	42.4	45.2	38	50.9	---	52.1
5	325	576	61.1	73.8	282	76	41.9	45.1	37.7	50.3	86.5	51.1
6	324	818	60.2	89.7	379	75.3	41.3	44.9	45.1	49	66.2	50.5
7	323	874	59.5	106	563	74.8	40.8	44.6	54.7	48.3	60.5	49.9
8	272	814	61.3	106	564	74.8	40.3	---	54.6	51.9	86.9	49.6
9	87.4	737	64.5	95.2	566	73.9	40	44.2	54.9	50.1	214	51.5
10	86.5	636	62	90.7	375	---	39.5	44.3	54.4	---	210	54.9
11	105	594	61.7	85	77.4	51.4	39	44	54.7	---	163	63.9
12	136	613	66.6	89.2	75.2	52.1	38.6	43.7	53.8	48.1	92.6	70.5
13	113	547	71	129	74.6	53.2	38.2	43.3	53.5	47.1	66.4	68.4
14	210	462	68.3	133	73.8	51.4	37.7	43	53	46.5	39	66.1
15	354	446	65.4	108	72.5	50.8	37.5	42.6	54	46	38.1	62.8
16	340	408	63.4	166	72.3	50.2	40.3	42.3	52.8	45.7	38.4	61.9
17	337	286	61.8	456	72.7	49.8	45.8	41.8	52.2	45.4	37.7	60.8
18	340	177	60.5	514	73.1	49.3	45.5	41.5	53	45.2	37.3	80
19	337	169	59.5	507	73.3	48.8	44.9	40.9	53.8	45	36.7	77.3
20	336	164	59.1	507	73.8	48.3	44.4	40.5	52.9	44.9	38.1	71.8
21	335	160	60	507	74.7	48	43.9	40	53.8	44.9	41.5	66.8
22	333	126	59.1	387	75.7	48.1	43.5	39.6	53	44.7	43.4	63.9
23	253	69.7	59.3	88.5	76.4	46.8	43.3	39.2	52.6	44.8	50.7	66.1
24	90.2	68.1	58.4	82	77.4	46.3	43	38.6	52.1	45.9	50.7	65
25	88.5	67.1	60.8	84.7	77.9	45.8	61.5	38.4	51.7	47.9	47.7	62.2
26	83.9	64.9	71.3	87.4	78.6	45.1	67.5	39	---	46.9	51.3	60.7
27	90.5	64.8	80.4	88.7	79	44.5	67.1	40.9	51.6	66.4	78.9	59.1
28	85	65	74.3	86.6	79.6	44	67	40.4	51.4	54.5	78.4	62.1
29	91.8	---	70.4	83.4	79.6	43.6	66.7	40.1	51.2	41.1	67	83.1
30	105	---	68.1	80.9	79.3	43.4	66.1	39.9	51.2	42.5	62.1	117
31	89.7	---	67.8	---	78.7	---	57	39.4	---	60.8	---	87.9
TOTAL	7085	9489	1988	5094	4934	1645	1456	1268	1458	1408	2112	2004
MEAN	229	339	64	170	159	57	47	42	50	49	73	65
MAX	400	874	80	514	566	78	68	47	55	66	214	117
MIN	84	65	58	64	72	43	38	38	38	41	37	50

Table 8.5												
SEATTLE PUBLIC UTILITIES												
Retrieved from SPU IMS SCADA Database: 2019-02-25												
CHESTER MORSE LAKE - DAILY 7AM ELEVATION												
SOURCE AGENCY SPU IMS												
LATITUDE 472434 LONGITUDE 1214322 NAD27 DRAINAGE AREA 78.4 sq mi*												
All Data is Provisional and Subject to Revision												
Elevation, Feet												
CALENDAR YEAR JANUARY TO DECEMBER 2018												
Daily Water Level												
DAY	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	1557.9	1553.95	1551.85	1555.7	1561.52	1563.3	1558.95	1552.65	1550.4	1548.59	1545.65	1553.9
2	1557.35	1554.05	1551.85	1555.9	1561.5	1563.1	1558.7	1552.5	1550.35	1548.48	1547.3	1553.82
3	1556.9	1554.95	1551.87	1555.85	1561.4	1563	1558.56	1552.3	1550.32	1548.39	1548.7	1553.67
4	1556.15	1556.48	1551.85	1555.61	1561.35	1562.87	1558.5	1552.17	1550.3	1548.25	1550.17	1553.49
5	1555.35	1559.25	1551.85	1555.55	1561.25	1562.74	1558.15	1552.01	1550.25	1548.07	1552.79	1553.21
6	1554.55	1560.75	1551.85	1555.43	1561.2	1562.59	1558.1	1551.85	1550.2	1547.95	1553	1552.95
7	1554.21	1561.13	1551.85	1555.5	1561.16	1562.5	1557.89	1551.71	1550.1	1547.83	1554.05	1552.6
8	1553.55	1561	1551.9	1556.13	1561.19	1562.34	1557.69	1551.56	1550.1	1547.68	1554.1	1552.4
9	1553	1560.8	1552.02	1557.29	1560.68	1562.24	1557.4	1551.4	1550.02	1547.56	1553.85	1552.28
10	1552.94	1560.4	1552.24	1557.93	1560.8	1562.18	1557.28	1551.21	1550	1547.47	1553.35	1552.04
11	1553.3	1559.76	1552.42	1558.48	1560.65	1562.15	1557.05	1551.05	1550	1547.3	1552.85	1551.94
12	1554.55	1559.05	1552.4	1558.81	1560.65	1562	1556.85	1550.98	1549.9	1547.09	1552.5	1552.6
13	1556.35	1558.25	1552.5	1559	1560.9	1561.91	1556.6	1550.83	1549.95	1546.9	1551.85	1553.1
14	1557.1	1557.4	1552.85	1559.75	1561.4	1561.91	1556.4	1550.76	1550	1546.7	1551.6	1553.75
15	1557.15	1556.67	1553.2	1560.89	1561.9	1561.9	1556.15	1550.78	1549.95	1546.49	1551.5	1553.85
16	1557.05	1555.87	1553.4	1562.3	1562.5	1561.81	1555.99	1550.6	1549.97	1546.29	1551.4	1553.62
17	1556.6	1555.32	1553.6	1563.17	1562.9	1561.72	1555.6	1550.57	1549.98	1546.05	1551.3	1553.24
18	1556.35	1555.47	1553.71	1563.35	1563.2	1561.6	1555.39	1550.6	1549.93	1545.85	1551.25	1553.23
19	1556.05	1555.47	1553.8	1562.99	1563.42	1561.5	1555.1	1550.52	1549.85	1545.6	1551.12	1554.42
20	1555.72	1555.37	1553.9	1562.42	1563.62	1561.31	1554.95	1550.5	1549.9	1545.35	1551.05	1554.7
21	1555.22	1555.02	1553.9	1561.88	1563.82	1561.1	1554.8	1550.51	1549.85	1545.08	1550.95	1554.95
22	1555	1554.68	1553.9	1561.35	1564	1560.91	1554.6	1550.47	1549.8	1544.85	1551	1554.8
23	1554.4	1554.1	1554	1560.68	1564.01	1560.75	1554.25	1550.45	1549.7	1544.65	1551.15	1554.63
24	1554.2	1553.58	1554.1	1560.3	1564.18	1560.51	1553.9	1550.45	1549.6	1544.3	1551.3	1554.43
25	1553.75	1552.98	1554.1	1560.35	1564.19	1560.3	1553.9	1550.45	1549.5	1544.1	1551.3	1554.12
26	1553.95	1552.45	1554.13	1560.38	1564.15	1560.1	1553.7	1550.45	1549.4	1544.1	1551.25	1553.7
27	1553.7	1552.05	1554.29	1560.7	1564.02	1559.9	1553.55	1550.45	1549.25	1544	1551.2	1553.35
28	1553.5	1551.9	1554.85	1561.04	1563.9	1559.95	1553.35	1550.45	1549.08	1544.09	1552.7	1553
29	1553.4	---	1555	1561.4	1563.7	1559.4	1553.19	1550.45	1548.9	1544.52	1553.5	1552.95
30	1553.7	---	1555.32	1561.55	1563.59	1559.22	1553	1550.4	1548.62	1544.93	1553.8	1554.91
31	1554.01	---	1555.54	---	1563.4	---	1552.86	1550.4	---	1545.32	---	1555.68
TOTAL	48207	43578	48150	46782	48436	46847	48232	48081	46495	47934	46548	48161
MEAN	1555	1556	1553	1559	1562	1562	1556	1551	1550	1546	1552	1554
MAX	1558	1561	1556	1563	1564	1563	1559	1553	1550	1549	1554	1556
MIN	1553	1552	1552	1555	1561	1559	1553	1550	1549	1544	1546	1552

Table 8.6

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

Retrieved from SPU IMS SCADA Database: 2019-02-26

STATION NUMBER 12115000 CEDAR RIVER NEAR CEDAR FALLS,WA

SOURCE AGENCY USGS STATE 53 COUNTY 033

LATITUDE 472213 LONGITUDE 1213726 NAD27 DRAINAGE AREA 40.7 sq. mi. DATUM 1560.0 NGVD29

All Data is Provisional and Subject to Revision

Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2018

DAILY MEAN VALUES

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	448	360	155	249	---	---	113	39	28.4	27.9	572	339
2	356	640	149	228	---	---	106	41	27.7	33.7	538	280
3	302	894	140	232	---	---	97.5	39.3	27.2	30.3	1400	240
4	263	1590	137	267	---	---	92.4	37.6	26.8	30	---	212
5	248	1490	134	340	---	---	89.4	36.4	26.3	42.5	1120	190
6	246	1000	128	559	---	---	86.5	35.4	25.8	34.4	969	173
7	227	741	125	770	---	---	80.8	34.7	26.2	32.1	665	159
8	221	683	142	794	---	---	76.9	33.9	26	61.2	458	147
9	249	707	216	670	---	---	75	33.6	28	47.4	351	139
10	254	566	174	631	---	---	71.3	34.8	32.6	39.1	282	142
11	369	460	165	546	---	---	68.1	39.3	33.8	35.2	234	291
12	805	380	206	537	---	---	65	35.5	32.4	32.7	199	448
13	762	326	252	858	---	---	62.5	33.8	32.8	31.2	176	458
14	689	301	236	863	---	---	59.9	32.8	31.3	29.8	171	419
15	595	264	213	793	---	---	57.6	32	34.4	28.7	156	352
16	521	264	198	---	---	---	55.5	31.7	39.5	27.8	170	309
17	461	380	187	---	---	---	53.8	31.5	32.8	27.2	157	279
18	492	361	177	---	---	---	53.1	31	30.2	26.6	144	708
19	435	295	169	---	---	---	51.4	30.9	30.8	26.1	135	805
20	394	260	163	---	---	---	50	30.2	30.1	25.9	127	568
21	353	234	178	---	---	136	48.7	29.6	30.5	25.4	121	440
22	325	214	178	---	---	135	47.2	29.1	32.2	25	125	356
23	311	199	173	---	---	122	45.8	29.4	30.3	25.1	178	319
24	371	191	163	---	---	125	44.6	29.7	28.3	26.3	178	283
25	326	186	169	---	---	115	43.4	31	27.1	74.8	168	247
26	284	170	261	---	---	106	42.5	34.2	26.3	60.8	219	224
27	292	165	320	---	---	101	41.8	31.6	25.4	213	808	202
28	294	158	295	---	---	96.3	41	29.8	24.8	184	789	196
29	337	---	276	---	---	95.6	40	28.9	24.8	210	568	682
30	502	---	268	---	---	106	38.9	28.9	25	232	423	1110
31	403	---	267	---	---	---	38.2	29.1	---	375	---	644
TOTAL	12135	*13479*	6014	*8337*	---	*1138*	1938	1026	878	2121	*11601*	11361
MEAN	391	*481*	194	*556*	---	*114*	63	33	29	68	*400*	366
MAX	805	*1590*	320	*863*	---	*136*	113	41	40	375	*1400*	1110
MIN	221	*158*	125	*228*	---	*96*	38	29	25	25	*121*	139
AC-FT	23568	*26178*	11680	*16192*	---	*2210*	3763	1992	1705	4120	*22531*	22065

Table 8.7												
SEATTLE PUBLIC UTILITIES												
Data Retrieved from SPU IMS SCADA Database: 2019-02-25												
LANDSBURG TUNNEL - FLOW VOL 24 HR TOT - MG												
SOURCE AGENCY SPU IMS												
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 sq. mi. DATUM 490 NGVD29												
All Data is Provisional and Subject to Revision												
Flow Volume, Million Gallons												
CALENDAR YEAR JANUARY TO DECEMBER 2018												
24 Hour Total												
DAY	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	67	68.6	58.8	64	67	124	133	134	96	70.4	83.9	73.5
2	69	60	81	66	69.3	126	128	111	93	79.6	82	73.7
3	68	59	90	66.2	66	126	107.8	105	93	74.2	84.7	73.5
4	67.6	5	90	65.2	68	124	101.4	104	92	68.3	0	62.6
5	66	0	91.6	64.6	68	121	100.9	103	92.5	77	49.7	33.9
6	68	70.1	90	65.3	68	91.9	98	104	92	82	105.7	76.1
7	67	120.5	90.1	64	68	89.1	98	104	93	72	117.6	73.1
8	69	119.2	90.1	53	68	89	97	104	100	68.3	119.4	74
9	67.4	87.7	89.6	66	68	91	94.1	112.3	102	70.6	117.7	75
10	67.2	69	85	69.3	69.1	29	94	110.3	109	68.8	120.2	75.7
11	31.4	70	66	66.1	70	0	91.1	108	111.1	66.3	119.6	42.7
12	0	70	54	61.9	70.9	0	89.6	111	109.8	62	121	24
13	19	70.6	49	60	69	0	95.6	109	107	61	106.1	76.3
14	65	68.9	49.7	43	69	0	99	110.1	83	59.7	55.8	76.5
15	68	71.3	49.5	62	69.1	1.7	99	107.5	73.6	59.5	47.6	75.1
16	69.3	61.2	49.2	66.7	67.8	9	98	104.8	74	58.5	55.5	76.2
17	67.9	51	49.1	65.4	80.1	67	101.8	104	73.4	57.8	43.5	76.1
18	69	60	49.3	62	83	102	107	105	67.6	56.5	47.8	59.1
19	67	59	59.3	61.6	83	135.2	126.2	103	66.2	58.6	48.9	76.2
20	69	59	64.1	60.6	83	138.9	124	105.7	73.4	62.3	50.4	76
21	68	60.1	64.1	60	83	136	124	103.2	75	63.5	50.7	74.8
22	69.9	59	65.1	67	85.3	133	126	98.9	62	62.9	73.2	75.4
23	68.9	59.3	64.6	67	82.7	142	126.8	99.9	49	63	78.7	75.3
24	68.3	58	64	68.9	83.3	137	124.5	99.6	45	63.2	79.1	74.4
25	96	60	64	67.7	81	138.9	129	96	0.48	74.7	83.7	75.8
26	118.2	59	65	67	83	134.3	128	100	56.7	93	85.5	74.9
27	115	60.6	65.5	67	82	131.1	127.7	101	67.7	76.1	84.3	67.7
28	118	58.8	64.9	68	85	130.1	126.7	100.9	68	0	84.1	64.7
29	77	---	64.7	68	105.8	128.6	125	96.7	0.54	51.2	84.3	36.9
30	65.6	---	64	68	127.4	126	127	94.7	66	60.4	84.3	33.2
31	68.3	---	65	---	129	---	137	97	---	63.4	---	65.4
TOTAL	2135	1775	2106	1922	2452	2802	3485	3248	2292	2005	2365	2068
MEAN	69	63	68	64	79	93	112	105	76	65	79	67
MAX	118	121	92	69	129	142	137	134	111	93	121	77
MIN	0	0	49	43	66	0	90	95	0	0	0	24

Table 8.8												
SEATTLE PUBLIC UTILITIES												
Data Retrieved from SPU IMS SCADA Database: 2019-02-26												
LANDSBURG WEATHER STATION - PRECIP 24HR TOT ODE 8412												
SOURCE AGENCY SPU IMS												
LATITUDE 472247 LONGITUDE 1215856 NAD27 DATUM 490 NGVD29												
All Data is Provisional and Subject to Revision												
Rainfall, Inches												
CALENDAR YEAR JANUARY TO DECEMBER 2018												
24 Hour Total												
DAY	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	0.02	0.95	0.26	0.26	0.07	0	0.12	0	0	0.3	0.11	0.03
2	0	0.31	0.35	0	0	0	0.07	0.03	0	0.4	0.47	0.02
3	0	0.51	0	0	0	0	0	0.12	0	0	0.5	0
4	0.1	0.44	0.34	0.59	0.03	0	0	0	0	0	0.57	0
5	0.38	0.26	0	0.43	0.03	0	0	0	0	0.7	0.04	0
6	0.2	0.06	0	0.03	0	0	0.19	0	0	0	0.23	0
7	0.29	0	0.03	0.83	0.03	0	0	0	0.06	0.03	0	0.03
8	0.11	0.31	0.15	1.1	0.12	0.19	0	0	0	0.35	0	0.04
9	0.62	0.07	0	0.01	0.19	0.13	0	0	0.06	0.58	0.14	0.87
10	0.27	0	0	0.18	0.2	0.14	0.01	0	0.86	0	0	0.28
11	1.41	0	0	0.48	0.06	0.02	0	0.26	0.36	0	0	0.95
12	0.24	0.02	0	0.26	0	0	0	0.03	0.26	0	0	0.12
13	0.1	0.16	0.36	0.73	0	0	0	0	0.24	0	0	0.23
14	0	0.41	0.13	1.34	0	0	0	0	0.11	0	0.13	0.03
15	0.05	0.08	0	0.26	0	0	0	0	0.08	0	0.01	0.03
16	0.39	0.67	0	0.61	0	0	0	0	0.81	0	0.19	0.38
17	0.85	0.85	0.01	0.28	0	0	0	0	0	0	0	0.24
18	0.53	0.06	0	0.03	0.08	0	0	0	0	0	0.01	0.92
19	0.08	0	0	0	0.13	0	0	0	0.16	0	0	0.04
20	0.31	0	0	0	0.03	0	0	0	0.16	0	0	0.17
21	0.21	0.13	0.06	0.16	0	0.03	0	0	0.1	0	0.04	0
22	0.37	0	0.67	0	0	0	0	0	0.51	0	1	0.32
23	0.81	0.05	0.14	0	0	0.26	0	0	0.06	0.03	1.16	0.74
24	0.63	0.21	0.2	0	0	0	0	0.04	0	0	0	0
25	0.31	0.23	0	0	0	0.13	0	0	0	0.48	0.01	0.02
26	0.63	0	0.43	0	0	0	0	0.24	0	0.98	0.85	0.33
27	0.64	0.07	0.18	0.01	0	0	0	0.07	0	0.7	0.75	0.01
28	0.08	0.21	0.03	0.45	0	0	0	0	0	1.72	0.27	0.86
29	0.96	---	0	0.15	0.02	0	0	0	0	0.67	0.02	1.53
30	0.06	---	0	0.05	0.03	0.05	0	0.04	0.02	0.65	0.22	0.18
31	0.08	---	0	---	0.04	---	0	0.03	---	0.09	---	0.02
TOTAL	10.7	6.1	3.3	8.2	1.1	1.0	0.4	0.9	3.9	7.7	6.7	8.4
MEAN	0.3	0.2	0.1	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3
MAX	1.41	0.95	0.67	1.34	0.20	0.26	0.19	0.26	0.86	1.72	1.16	1.53
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 8.9

SEATTLE PUBLIC UTILITIES

Data Retrieved from SPU IMS SCADA Database: 2019-02-26

MASONRY WEATHER STATION - PRECIP 24HR TOT ODE 8435

SOURCE AGENCY SPU IWRMS

LATITUDE 472443 LONGITUDE 1214504 NAD27 DATUM 490 NGVD29

All Data is Provisional and Subject to Revision

Rainfall, Inches

CALENDAR YEAR JANUARY TO DECEMBER 2018

24 Hour Total

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	1.48	0.44	0.67	0	0	0.7	0	0	0.82	1.21	0.06
2	0	0.77	0.02	0	0	0	0	0.1	0	0.4	0.33	0
3	0	0.88	0.02	0.11	0.02	0.04	0.05	0.01	0	0.01	2.09	0
4	0.25	0.99	0.57	0.77	0.02	0	0	0	0	0	0.85	0
5	0.78	0.53	0.02	0.68	0	0	0.01	0	0	0.78	0.38	0
6	0.1	0.08	0	0.65	0.1	0	0.17	0	0	0.01	0.69	0
7	0.35	0.01	0	1.12	0.01	0	0	0	0.06	0.06	0	0
8	0.81	0.89	1.24	1.63	0.26	0.24	0	0	0	1.36	0	0.01
9	1.12	0.01	0	0.08	0.36	0.48	0	0	0.42	0.05	0.16	1.95
10	1.01	0	0	0.54	0.72	0.25	0.05	0.01	0.44	0	0	0.48
11	2.19	0	0	0.63	0.05	0	0	0.46	0.56	0	0	1.56
12	0.66	0	0	0.52	0	0.01	0	0	0.48	0	0	0.71
13	0.07	0.44	0.44	2.59	0	1.34	0	0	0.28	0	0.01	0.29
14	0	0.6	0.31	1.88	0	0.1	0	0	0.06	0	0.33	0.19
15	0.24	0.69	0	0.49	0.01	0.01	0	0	0.39	0	0.28	0.4
16	0.12	1.98	0	2.36	0.02	0	0	0	0.74	0	0.07	0.47
17	1.44	0.57	0	0.19	0.08	0	0	0	0	0	0	1.88
18	0.32	0.29	0.4	0.01	0.05	0	0	0	0	0	0	0.58
19	0.89	0	0	0	0.5	0	0	0	0.6	0	0	0.06
20	0.29	0	0	0.43	0.03	0	0	0	0.18	0	0.05	0.56
21	0.84	0.11	0.02	0.02	0	0.02	0	0	0.23	0	0.5	0.01
22	0.13	0	0.75	0	0	0.42	0	0	0.7	0	1.71	0.33
23	2.16	0.47	0.51	0	0	0.01	0	0.03	0	0.03	1.12	0.8
24	0.85	0.69	0	0	0	0.28	0	0	0	0	0	0
25	0.61	0.08	0.18	0	0	0.1	0	0.05	0	1.95	0.1	0.02
26	1.4	0.12	1.15	0	0	0.05	0	0.3	0	0.29	1.91	0.46
27	0.44	0.32	1.03	0.31	0	0	0	0	0	1.87	0.79	0.02
28	0.11	0.42	0.19	0.6	0	0	0	0	0	0.93	0.12	1.5
29	1.31	---	0.02	0.43	0.17	0.01	0	0	0.03	0.73	0.1	2.93
30	0.05	---	0.01	0.14	0	0.2	0	0.12	0.09	0.47	0.44	0.09
31	0.23	---	0.02	---	0.02	---	0	0.05	---	0.88	---	0
TOTAL	18.8	12.4	7.3	16.9	2.4	3.6	1.0	1.1	5.3	10.6	13.2	15.4
MEAN	0.6	0.4	0.2	0.6	0.1	0.1	0.0	0.0	0.2	0.3	0.4	0.5
MAX	2.2	2.0	1.2	2.6	0.7	1.3	0.7	0.5	0.7	2.0	2.1	2.9
MIN	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX 1: Guaranteed Instream Flow Schedule with June 4, 2009 Walsh Ditch Adjustment

Water Week Starting	Critical Instream Flow Requirement	Normal Instream Flow Requirement	Normal Supplemental Instream Flow Requirement
1-Oct.	103	214	214
8-Oct.	133	279	334
15-Oct.	163	279	334
22-Oct.	183	279	334
29-Oct.	203	279	334
5-Nov.	203	279	334
12-Nov.	203	284	339
19-Nov.	203	284	339
26-Nov.	206	292	347
3-Dec.	206	292	347
10-Dec.	206	292	347
17-Dec.	206	292	347
24-Dec.	206	290	345
31-Dec.	188	275	275
7-Jan.	188	275	275
14-Jan.	188	275	275
21-Jan.	188	275	275
28-Jan.	188	275	275
4-Feb.	188	275	275
11-Feb.	188	273	378
18-Feb.	188	273	378
25-Feb.	188	273	378
4-Mar.	188	273	378
11-Mar.	188	273	378
18-Mar.	188	273	378
25-Mar.	188	273	378
1-Apr.	188	273	378
8-Apr.	186	273	378
15-Apr.	186	273	273
22-Apr.	196	268	268
29-Apr.	196	268	268
6-May	200	268	268
13-May	205	268	268
20-May	215	258	258
27-May	215	258	258
3-Jun.	205	256	256
10-Jun.	205	231	231
*17-Jun.	164	231	246
24-Jun.	104	231	246
1-Jul.	84	174	240
8-Jul.	84	109	209
15-Jul.	84	84	200
22-Jul.	83	84	168
29-Jul.	73	83	119
5-Aug.	73	83	83
12-Aug.	73	83	83
19-Aug.	73	83	83
26-Aug.	73	83	83
2-Sept.	73	83	83
9-Sept.	72	83	83
16-Sept.	82	98	136
23-Sept.	82	98	213

*From June 17 through August 4, actual annual supplemental flow levels will vary according to daily allocations established by Cedar River Instream Flow Commission