ANNUAL COMPLIANCE REPORT

Instream Flow Agreement
for the
Cedar River

Cedar River Habitat Conservation Plan Year 14
January 1 through December 31, 2014

Prepared by

City of Seattle

Seattle Public Utilities
and
Seattle City Light

April, 2015

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Acknowledgements

In 2014, 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:
Voting Organizations:

- National Marine Fisheries Service
  - Randy McIntosh
- United States Fish and Wildlife Service
  - Tim Romanski
- Washington Department of Fish and Wildlife
  - Peggy Miller
- Washington Department of Ecology
  - Buck Smith
  - Toni Smith
- Muckleshoot Indian Tribe
  - Holly Coccoli
- City of Seattle
  - Paul Faulds – Seattle Public Utilities
  - Karl Burton – Seattle Public Utilities
  - Alan Chinn – Seattle Public Utilities
  - Lori Arima – Seattle Public Utilities
  - Tom Fox– Seattle Public Utilities
  - Tom Johanson – Seattle Public Utilities
  - Rand Little – Seattle Public Utilities
  - Liz Ablow – Seattle City Light

Non-Voting Organizations:

- Army Corps of Engineers
  - Ken Brettmann
  - Larry Schick
- King County
  - Kate Akyuz
  - John Engel

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 about two-thirds of the City's 1.3 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 highly 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, once per month since then. Meetings are chaired by SPU and have been very well attended.

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, 2014 through December 31, 2014.

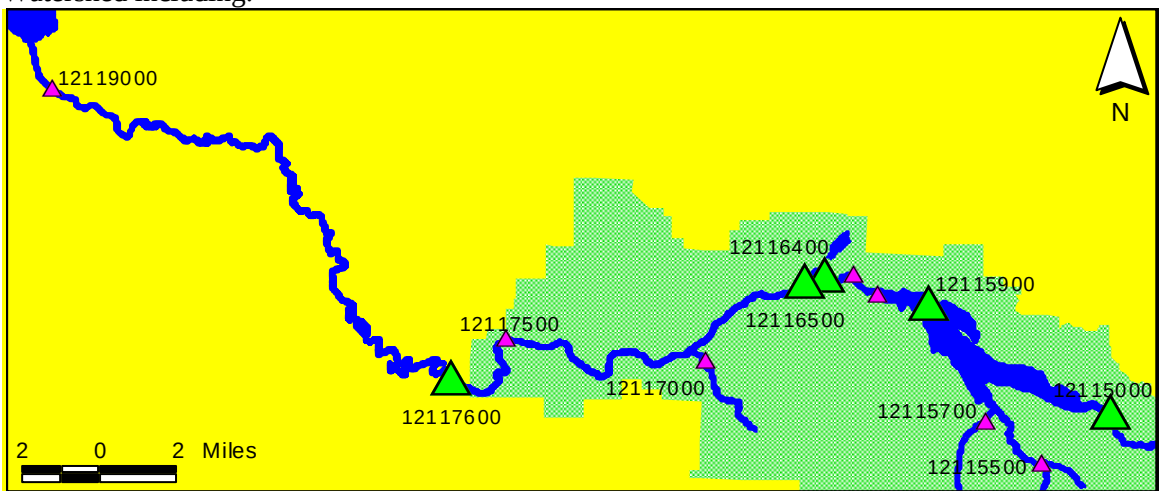
1.2 Summary

Highlights in 2014:

- Stream flows remained above the normal guaranteed levels at all times. All supplemental stream flows were provided during the year.
- In 2014, all downramping requirements below Masonry Dam and the Cedar Falls Powerhouse were met. There were nine emergency shutdowns of the Cedar Falls Powerhouse. The emergency bypass system which provides matching flow to the river after an emergency shutdown worked successfully each time. The compliance gage below the Landsburg Diversion Dam recorded five formal downramping exceedances associated with the Landsburg Diversion Dam facilities in 2014.
- The average annual Cedar River daily diversion for calendar year 2014 = 72.51 mgd.
- The estimated incubation survival of brood year 2013 sockeye was slightly lower than the 21 year average. Incubation survival for Chinook salmon was well above average.
- No steelhead (*Oncorhynchus mykiss*) redds were observed in the river during the spring of 2014. Counts of redds established by the resident/adfluvial trout (*O. mykiss and Oncorhynchus clarkii)* were low again this year with a total count of 19 redds.

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 Section B.2.c in the IFA.

3.1.2 Compliance

During the reporting period, the project was in compliance with the IFA guaranteed minimum flow at USGS Gage 12117600. See Figure 8.1 and Tables 8.1 and 8.2. From August 5 through September 15, SPU provided a voluntary augmented guaranteed minimum flow target of 105 to 120 cfs. For long-term tracking purposes, stream flows

have remained at or above guaranteed normal minimum levels at all times in HCP Years 1 through 14.

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 and exceeded the goal this year by providing more than 105 cfs of supplemental flow 100% of time (64 of 64 days). See Table 3.2.1.

Table 3.2.1

Calendar Dates	Required Normal Minimum Instream Flows (cfs)	Minimum Instream Flows Plus Non-Firm Supplemental Flows (cfs)	Actual Recorded Mean Daily Flow (cfs)	Calendar 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	601	14-Mar	273	378	2300
12-Feb	273	378	693	15-Mar	273	378	2180
13-Feb	273	378	701	16-Mar	273	378	2320
14-Feb	273	378	692	17-Mar	273	378	2340
15-Feb	273	378	696	18-Mar	273	378	2070
16-Feb	273	378	767	19-Mar	273	378	1910
17-Feb	273	378	1150	20-Mar	273	378	1770
18-Feb	273	378	1210	21-Mar	273	378	1620
19-Feb	273	378	1110	22-Mar	273	378	1510
20-Feb	273	378	1170	23-Mar	273	378	1440
21-Feb	273	378	1200	24-Mar	273	378	1420
22-Feb	273	378	1310	25-Mar	273	378	1440
23-Feb	273	378	1300	26-Mar	273	378	1430
24-Feb	273	378	1330	27-Mar	273	378	1390
25-Feb	273	378	1140	28-Mar	273	378	1330
26-Feb	273	378	886	29-Mar	273	378	1380
27-Feb	273	378	857	30-Mar	273	378	1380
28-Feb	273	378	922	31-Mar	273	378	1300
1-Mar	273	378	1120	1-Apr	273	378	1070
2-Mar	273	378	1130	2-Apr	273	378	905
3-Mar	273	378	1480	3-Apr	273	378	868
4-Mar	273	378	1640	4-Apr	273	378	782
5-Mar	273	378	1570	5-Apr	273	378	763
6-Mar	273	378	1460	6-Apr	273	378	824
7-Mar	273	378	1560	7-Apr	273	378	853
8-Mar	273	378	1840	8-Apr	273	378	917
9-Mar	273	378	2590	9-Apr	273	378	900
10-Mar	273	378	3060	10-Apr	273	378	860
11-Mar	273	378	2900	11-Apr	273	378	837
12-Mar	273	378	2800	12-Apr	273	378	819
13-Mar	273	378	2540	13-Apr	273	378	803
				14-Apr	273	378	780

For long-term tracking, this goal has been met or exceeded in twelve of fourteen years. This supplement 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 2014 Summer Supplemental Firm Block, cfs
June 17 - June 30	231	231
July 1 – July 7	174	174
July 8 – July 14	109	164
July 15 – July 18	84	164
July 19 – July 22	84	134
July 23	84	133
Jul 24 – July 28	84	118
July 29 – Aug 1	83	108
Aug 2 – Aug 4	83	95

For long-term tracking, this goal has been met or exceeded in all 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 and the Commission allocated the full 3,500 Acre-Feet Block. See Tables 3.4.1 and 8.1 and Figure 8.1.

Table 3.4.1

Calendar Dates	Required Minimum Instream Flows, cfs	Required Minimum Flow plus 2014 Summer Supplemental Firm and Non-Firm Blocks, cfs
June 17 - June 30	231	244
July 1 - July 7	174	242
July 8 - July 10	109	239
July 11 - July 14	109	209
July 15 – July 17	84	209
July 18 – July 23	84	184
July 24 - July 28	84	153
July 29- July 31	84	133
Aug 1 – Aug 3	83	113
Aug 4	83	104

For long-term tracking purposes, SPU has offered the full non-firm block in fourteen out of fifteen years (93.3%); the Commission declined allocation of the block in one year; the full non-firm block has been provided in thirteen out of fifteen years (86.7%).

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, 2014 and the City provided the 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, 2014	98	136
Sep 23 - Sep 30, 2014	98	214

For long-term tracking, increased normal flows have been provided at all times during this period in HCP Years 1 through 14.

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 2014, flows remained above the high normal guaranteed minimum flow range of 334 to 347 cfs throughout the entire supplemental flow period from October 8 to December 30. 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 2014	Expected		Actual 00-14	
		High	Low	High	Low
		%	%	%	%
Oct 8 - Oct 14	High	60	30	83.9	16.1
Oct 15 - Oct 21	High	60	30	94.3	5.7
Oct 22 - Oct 28	High	60	30	91.4	8.6
Oct 29 - Nov 4	High	50	40	93.4	6.6
Nov 5 - Nov 11	High	55	35	93.4	6.6
Nov 12 - Nov 18	High	65	25	93.4	3.8
Nov 19 - Nov 25	High	65	25	93.4	6.6
Nov 26 - Dec 2	High	70	20	93.4	6.6
Dec 3 - Dec 9	High	75	15	93.4	6.6
Dec 10 - Dec 16	High	75	15	95.2	3.8
Dec 17 - Dec 23	High	80	10	93.4	6.6
Dec 24 - Dec 30	High	80	10	94.3	5.7

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 reporting period. See Table 8.1 and Figure 8.1. For long-term tracking purposes, stream flows have not been reduced to critical levels at any time during HCP Years 1 through 14.

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. For the purposes of long-term compliance 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 5 formal downramping exceedences at USGS Gage 12117600 Cedar River below Landsburg. See Table 5.1.1 and Figures 8.2 and 8.3.

Table 5.1.1

Events exceeding the maximum downramping flow rate of one inch per hour

Date	Hour	Gage Height Change, (inches per hour)	Discharge @ USGS Gage 12117600
4/7/2014	14:15	-1.68	815
4/7/2014	14:30	-1.68	815
9/3/2014	13:00	-1.56	429
9/3/2014	13:15	-1.56	429
9/3/2014	14:30	-1.08	394

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, the project was in compliance with the IFA for downramping below Cedar Falls Powerhouse at USGS Gage 12116500. 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, the project was in compliance with the IFA for downramping below Masonry Dam 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 nine emergency plant shutdowns (see Table 6.1). In all nine shutdowns the emergency bypass system activated and flow continuation was provided to the Cedar River.

Table 6.2. Emergency Bypass Capability

Date	Outcome
January 1	One unit tripped off-line and the emergency bypass system successfully provided complete flow continuation.
January 22	One unit tripped off-line and the emergency bypass system successfully provided complete flow continuation.
February 12	One unit tripped off-line and the emergency bypass system successfully provided complete flow continuation.
May 28	One unit tripped off-line and the emergency bypass system successfully provided complete flow continuation.
October 3	One unit tripped off-line and the emergency bypass system successfully provided complete flow continuation.
October 22	There was a sudden load reduction due to failure of the generator excitation system. The emergency bypass system successfully provided complete flow continuation.
October 29	One unit tripped off-line and the emergency bypass system successfully provided complete flow continuation.
November 9	One unit tripped off-line and the emergency bypass system successfully provided complete flow continuation.
November 11	One unit tripped off-line and the emergency bypass system successfully provided complete 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 2014. Actual average annual water

diversion in 2014 was 72.7 mgd. See Table 8.7.

7.3 Municipal Water Service Area

The retail service and wholesale service areas remained the same as in 2013.

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
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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

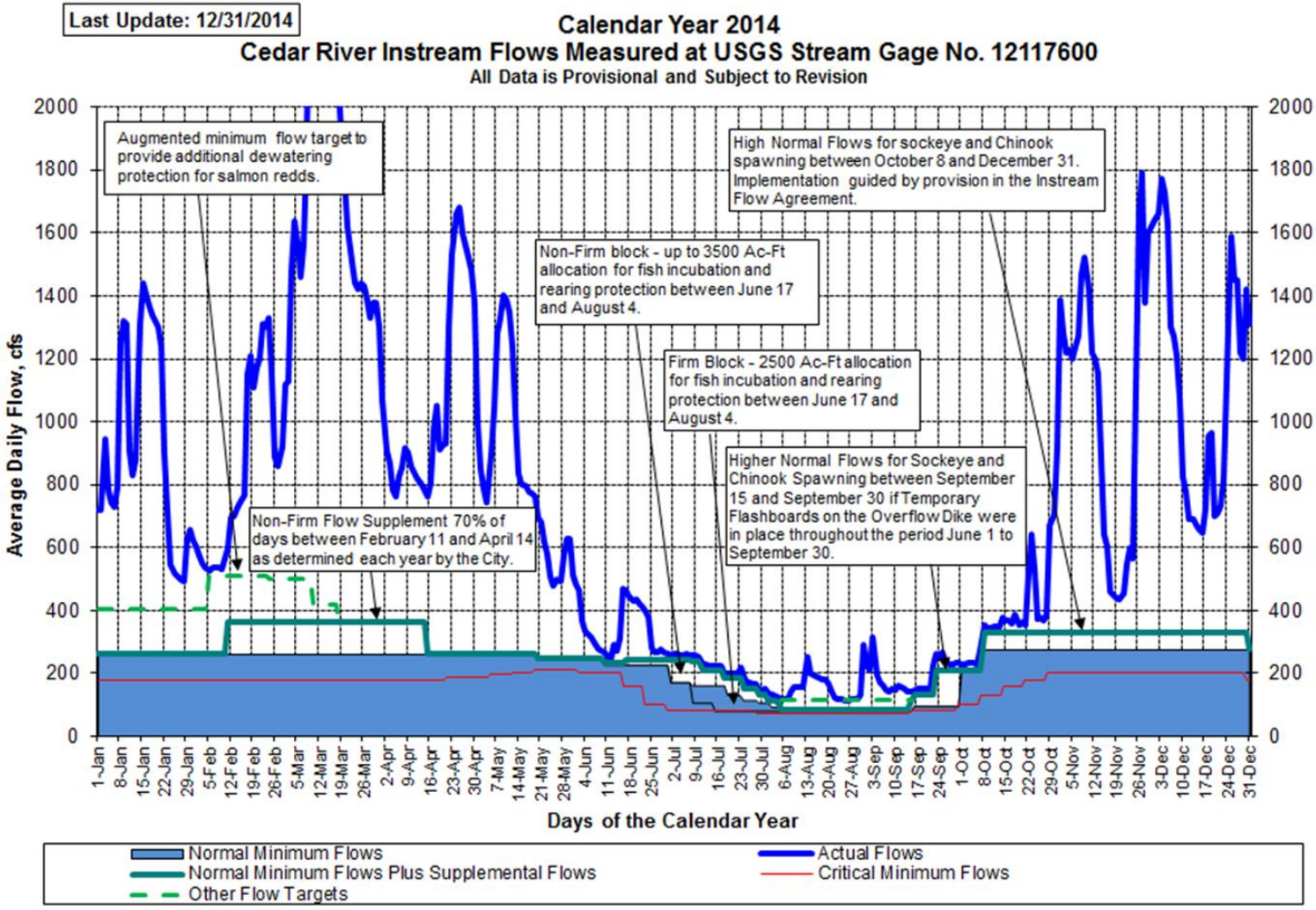

Figure 8.2 – Downramping Flows Below Landsburg Compliance Graph

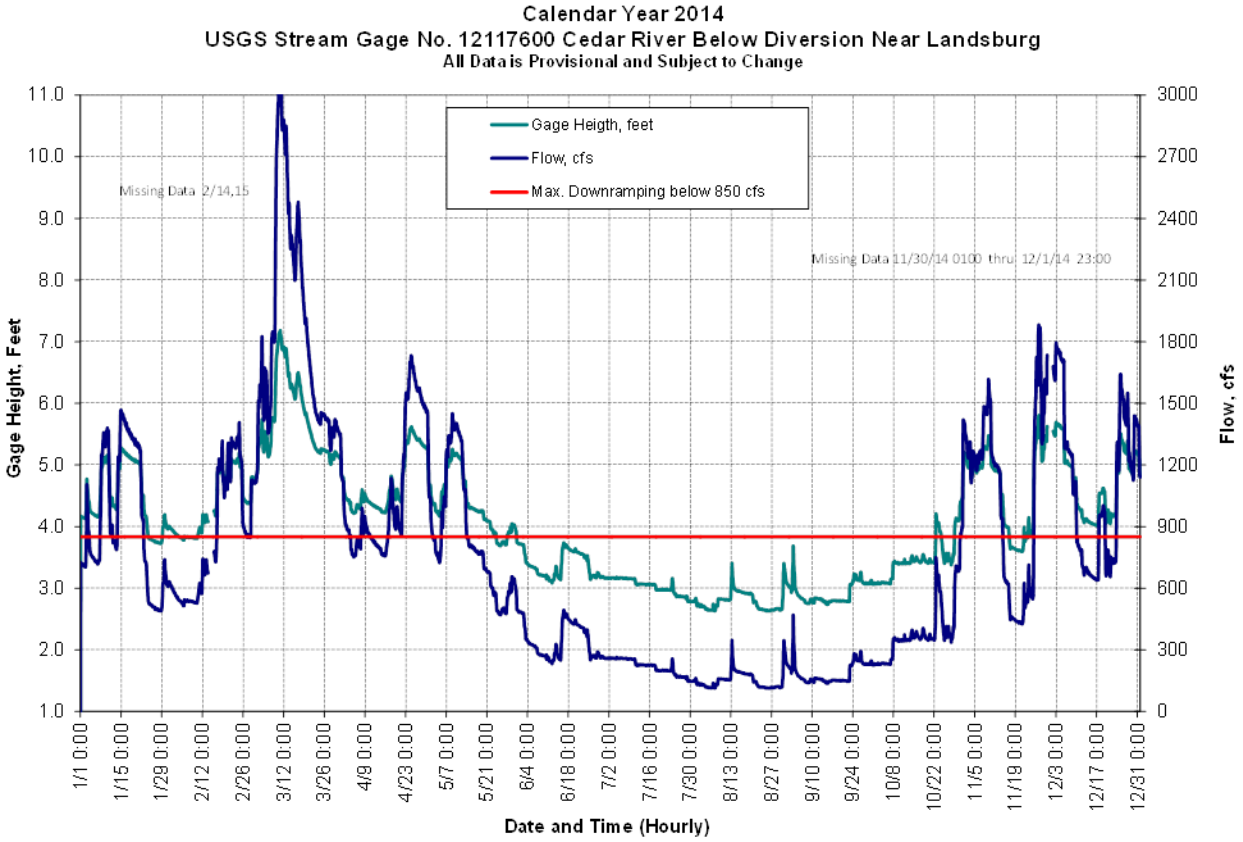

Figure 8.3 – Downramping Rate of Change Below Landsburg Compliance Graph

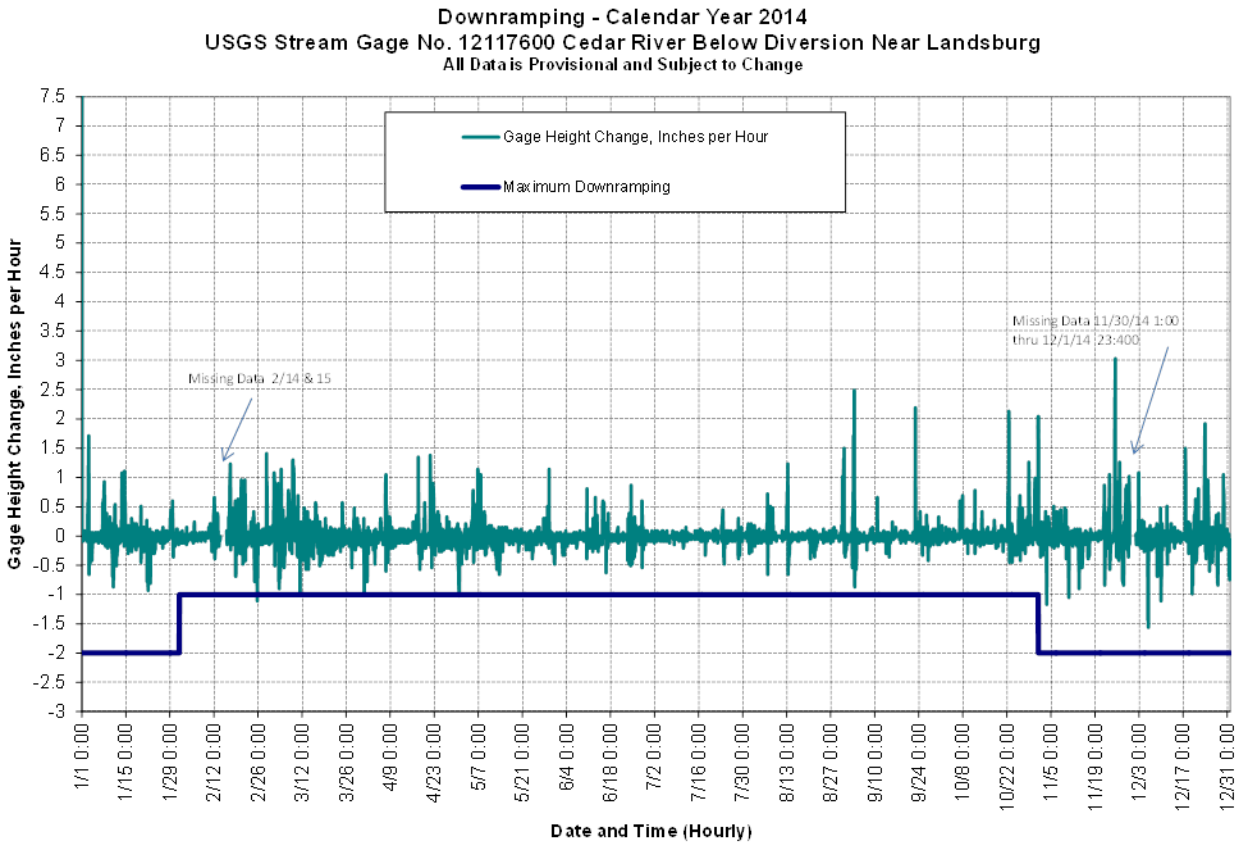

Figure 8.4 – Downramping Flows below Powerhouse Compliance Graph

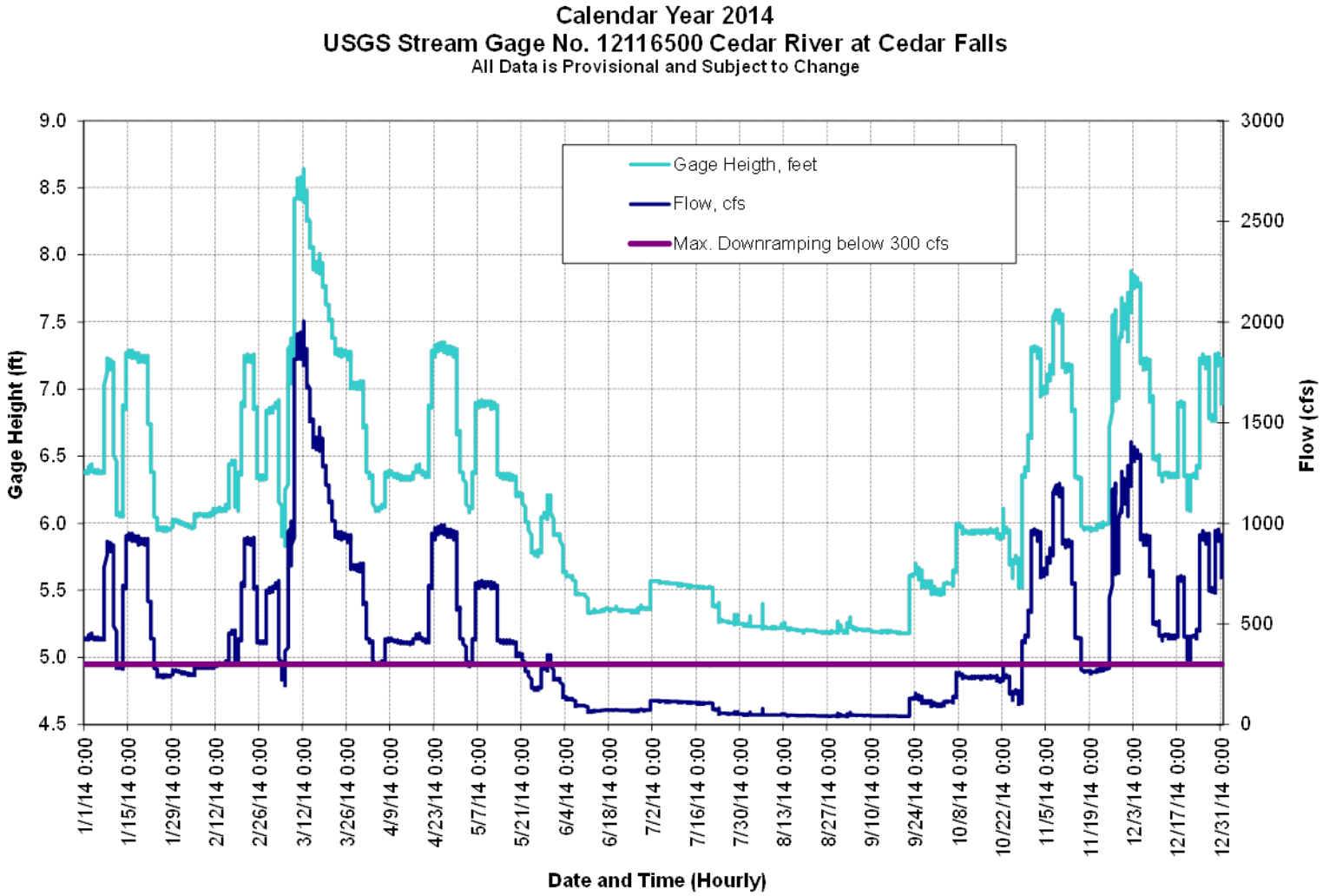

Figure 8.5 – Downramping Rate of Change Below Powerhouse Compliance Graph

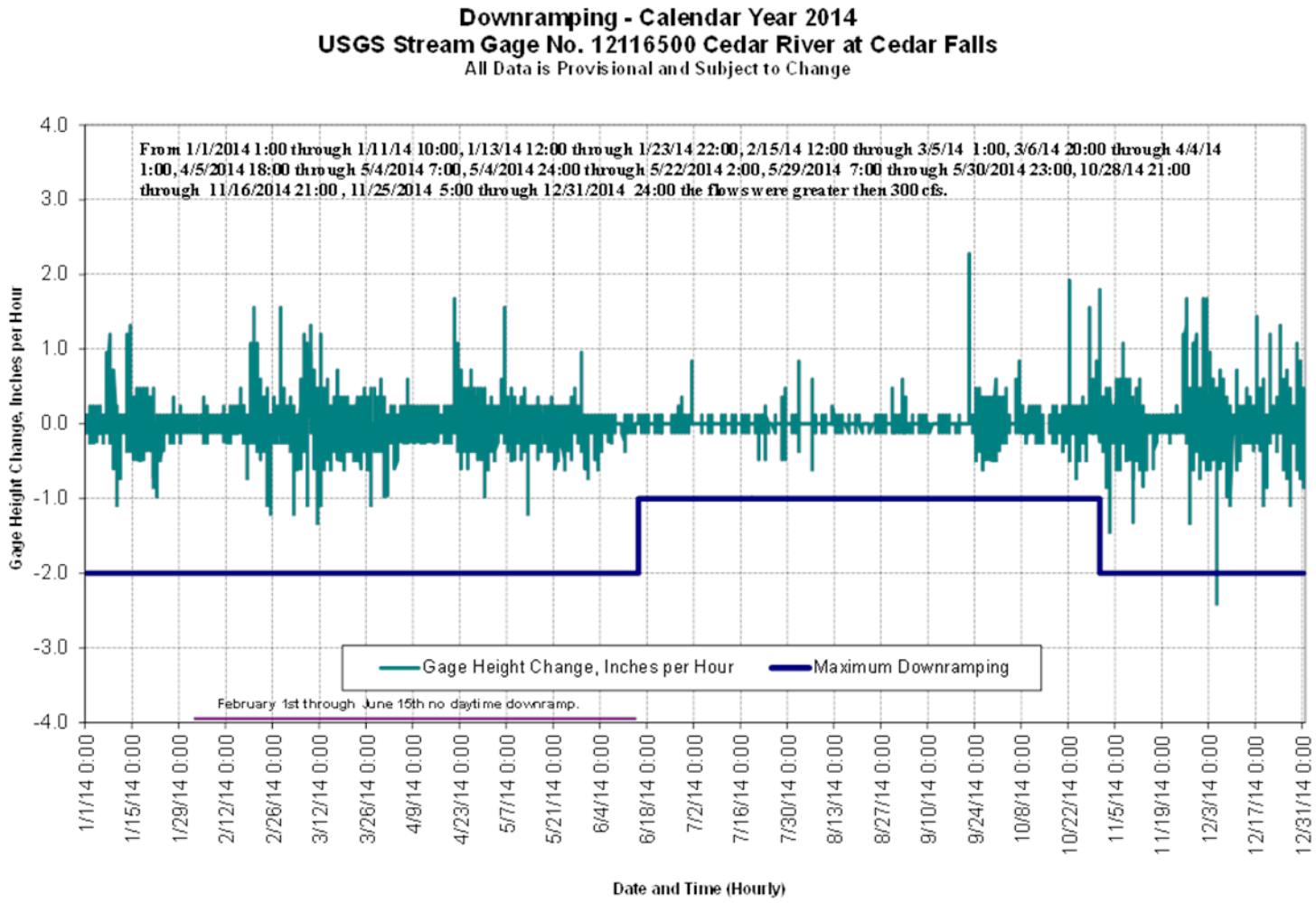

Figure 8.6 – Downramping Flows below Masonry Dam Compliance Graph

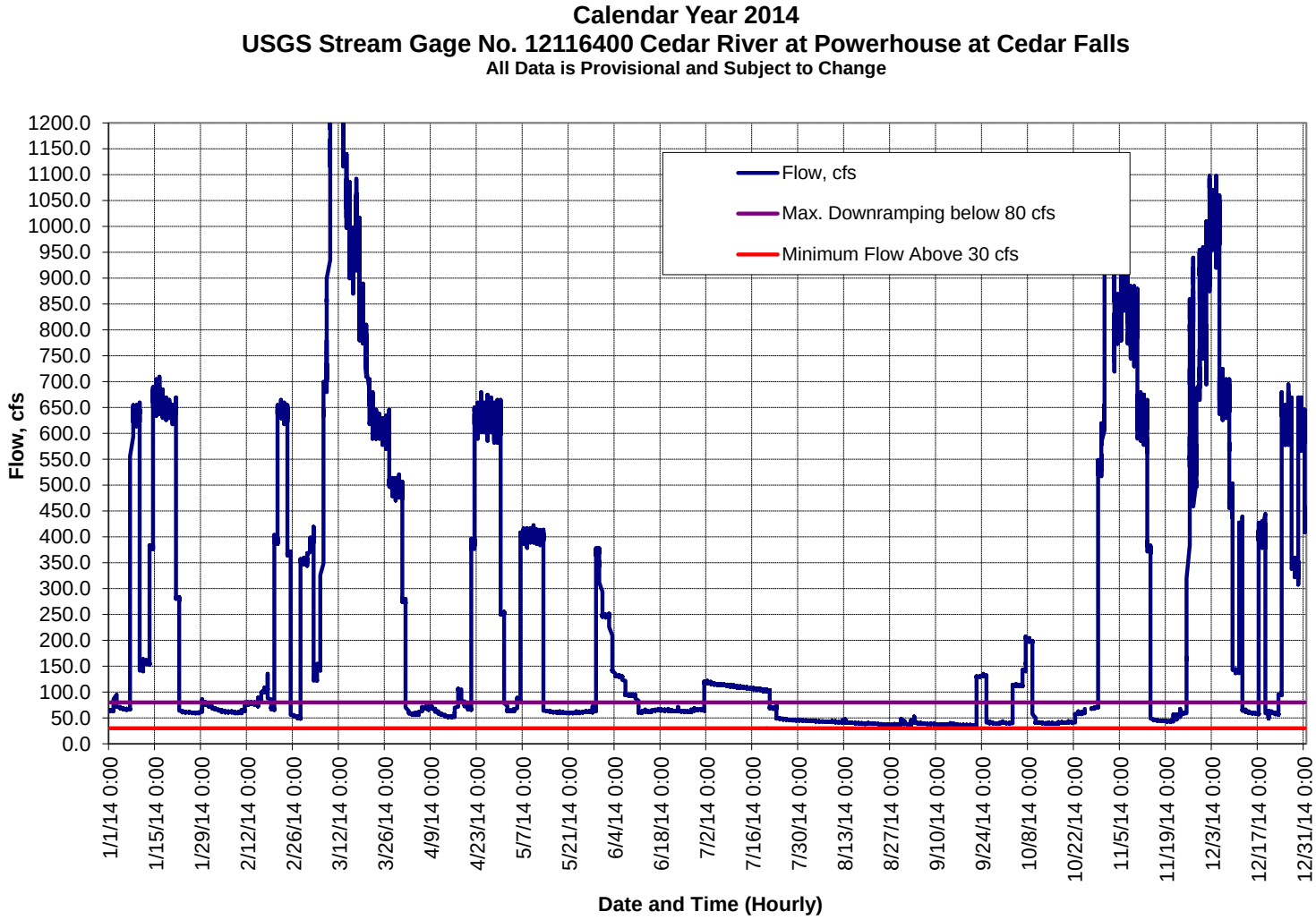

Figure 8.7 – Downramping Rate of Change Below Masonry Dam Compliance Graph

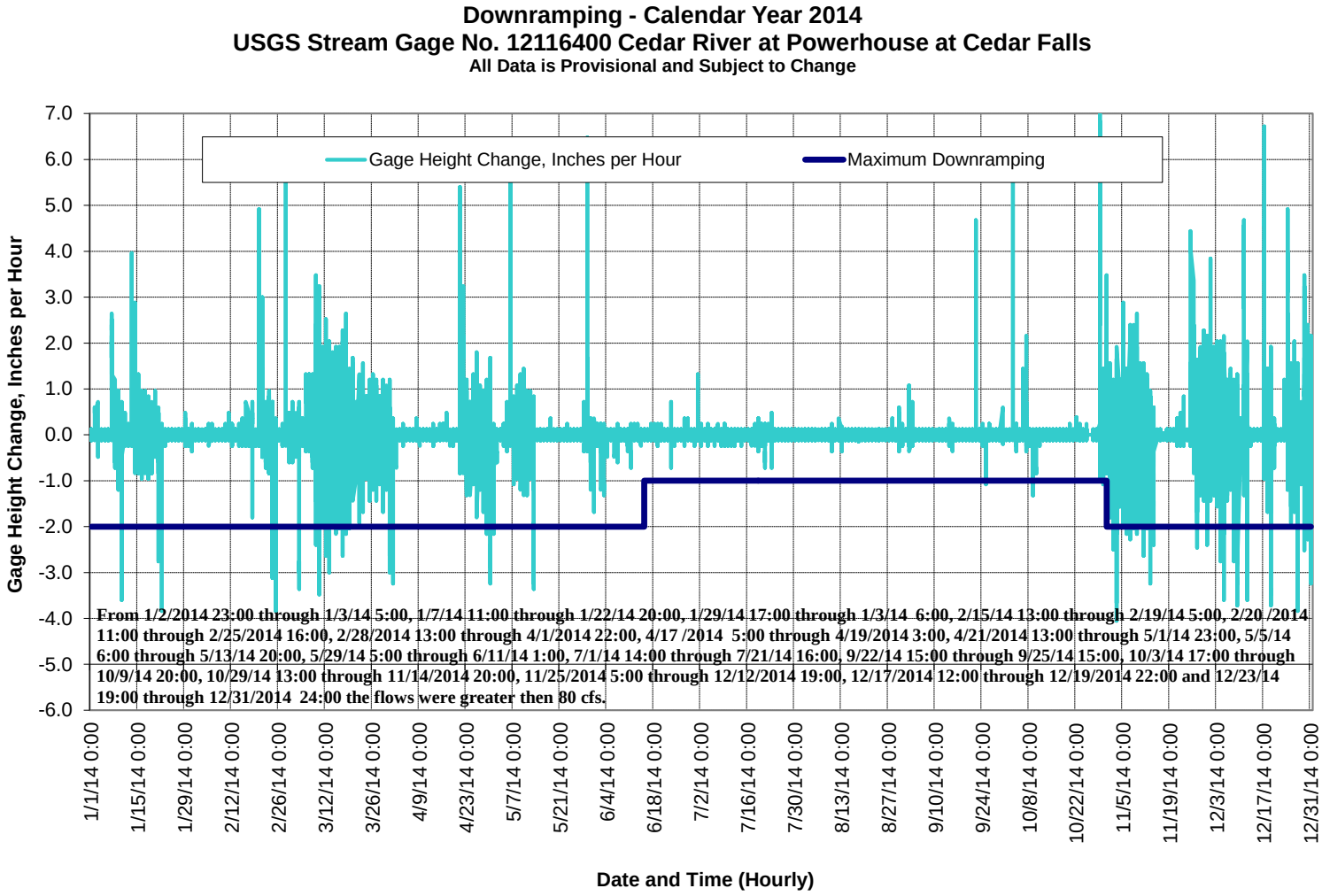

Table 8.1

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

Date Processed: 2015-03-26

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* DATUM 490 NGVD29

Data is Provisional Real-Time - SPU Downloads Weekly

Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2014

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	719	603	1120	1070	999	483	259	137	228	229	1390	1640
2	717	574	1130	905	848	465	260	132	208	230	1280	1660
3	946	551	1480	868	786	366	260	129	314	231	1220	1770
4	780	535	1640	782	743	334	259	121	197	234	1230	1730
5	745	525	1570	763	895	325	258	116	170	232	1200	1630
6	728	538	1460	824	1040	317	260	118	160	230	1240	1300
7	790	537	1560	853	1280	289	258	119	148	270	1270	1270
8	1250	535	1840	917	1330	276	255	143	140	352	1470	1210
9	1320	531	2590	900	1400	271	256	158	151	346	1520	1070
10	1310	563	3060	860	1390	266	254	157	147	346	1420	827
11	906	601	2900	837	1350	251	228	155	161	350	1220	779
12	832	693	2800	819	1240	243	227	155	158	349	1200	688
13	879	701	2540	803	1020	292	226	253	153	348	1150	692
14	1310	723	2300	780	835	272	224	202	144	378	886	671
15	1440	745	2185	762	803	309	225	193	141	368	643	656
16	1400	767	2320	806	794	470	225	190	149	367	604	645
17	1370	1150	2340	980	779	464	224	185	152	357	459	726
18	1340	1210	2070	1050	771	443	202	182	151	387	450	954
19	1320	1110	1910	911	760	429	198	181	151	354	439	963
20	1300	1170	1770	928	693	434	199	166	151	362	433	702
21	1240	1200	1620	932	679	419	199	144	149	352	456	710
22	904	1310	1510	1300	619	410	198	124	225	518	547	734
23	712	1300	1440	1530	578	397	218	119	264	640	600	818
24	545	1330	1420	1660	508	376	191	117	253	531	567	1290
25	517	1140	1440	1680	477	281	171	114	267	372	1100	1590
26	506	886	1430	1600	498	269	169	114	237	378	1660	1450
27	496	857	1390	1560	491	265	167	116	230	368	1790	1450
28	491	922	1330	1520	573	278	166	120	230	387	1380	1220
29	623	---	1380	1480	629	265	149	119	231	670	1600	1200
30	655	---	1380	1380	627	261	147	130	235	706	1620	1420
31	622	---	1300	---	512	---	152	289	---	921	---	1310
TOTAL	28713	23307	56225	32060	25947	10220	6684	4698	5695	12163	32044	34775
MEAN	926	832	1814	1069	837	341	216	152	190	392	1068	1122
MAX	1440	1330	3060	1680	1400	483	260	289	314	921	1790	1770
MIN	491	525	1120	762	477	243	147	114	140	229	433	645
AC-FT	56952	46229	111522	63591	51466	20271	13258	9318	11296	24125	63559	68976

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* DATUM 490 NGVD29

All Data is Provisional and Subject to Revision

Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2014

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	275	275	378	378	268	258	280	113	83	214	334	347
2	275	275	378	378	268	258	280	113	83	214	334	347
3	275	275	378	378	268	256	280	113	83	214	334	347
4	275	275	378	378	268	256	280	104	83	214	334	347
5	275	275	378	378	268	256	280	83	83	214	334	347
6	275	275	378	378	268	256	280	83	83	214	334	347
7	275	275	378	378	268	256	280	83	83	214	334	347
8	275	275	378	378	268	256	280	83	83	334	334	347
9	275	275	378	378	268	256	280	83	83	334	334	347
10	275	275	378	378	268	231	280	83	83	334	334	347
11	275	378	378	378	268	231	280	83	83	334	334	347
12	275	378	378	378	268	231	280	83	83	334	339	347
13	275	378	378	378	268	231	230	83	83	334	339	347
14	275	378	378	378	268	231	209	83	83	334	339	347
15	275	378	378	273	268	231	209	83	83	334	339	347
16	275	378	378	273	268	231	209	83	136	334	339	347
17	275	378	378	273	268	280	209	83	136	334	339	347
18	275	378	378	273	268	280	184	83	136	334	339	347
19	275	378	378	273	268	280	184	83	136	334	339	347
20	275	378	378	273	258	280	184	83	136	334	339	347
21	275	378	378	273	258	280	184	83	136	334	339	347
22	275	378	378	268	258	280	184	83	136	334	339	347
23	275	378	378	268	258	280	184	83	213	334	339	347
24	275	378	378	268	258	280	153	83	213	334	339	345
25	275	378	378	268	258	280	153	83	213	334	339	345
26	275	378	378	268	258	280	153	83	213	334	347	345
27	275	378	378	268	258	280	153	83	213	334	347	345
28	275	378	378	268	258	280	153	83	213	334	347	345
29	275	---	378	268	258	280	133	83	213	334	347	345
30	275	---	378	268	258	280	133	83	213	334	347	345
31	275	---	378	---	258	---	133	83	---	334	---	275
TOTAL	8525	9554	11718	9993	8188	7845	6694	2684	3901	9514	10155	10671
MEAN	275	341	378	322	264	262	216	87	130	307	339	344
MAX	275	378	378	378	268	280	280	113	213	334	347	347
MIN	275	275	378	268	258	231	133	83	83	214	334	275
AC-FT	16909	18950	23242	19821	16241	15560	13277	5324	7738	18871	20142	21166

Table 8.3

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

retrieved: 2015-03-17 12:28:14 EDT (caww02)

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* DATUM 902.10 NGVD29

All Data is Provisional and Subject to Revision

Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2014

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	425	260	669	530	516	229	91	51	44	100	960	1140
2	426	256	672	414	412	228	119	52	44	100	944	1260
3	437	251	696	391	345	148	119	49	52	106	837	1350
4	432	251	567	300	299	130	117	49	48	114	758	1340
5	431	264	281	301	345	129	117	49	46	114	779	1210
6	426	285	245	310	492	128	116	55	46	119	824	926
7	527	286	665	346	697	99	115	48	45	185	932	919
8	886	284	920	421	694	95	114	47	45	252	1170	859
9	888	283	1390	422	698	95	114	49	45	245	1160	719
10	791	285	1900	417	700	95	113	48	44	235	1030	503
11	329	289	1880	411	695	69	112	47	43	235	906	488
12	288	299	1890	408	691	66	111	48	43	235	899	433
13	418	301	1750	406	577	70	111	49	43	234	843	445
14	797	299	1580	405	414	68	110	47	44	236	607	441
15	938	304	1450	403	412	69	109	46	43	236	429	439
16	930	357	1390	411	412	71	109	46	43	238	387	437
17	926	462	1420	438	409	72	108	45	43	236	263	562
18	917	405	1350	439	410	72	107	44	43	238	263	726
19	917	363	1240	425	385	72	106	44	42	237	263	672
20	914	551	1150	419	347	72	107	46	42	233	261	387
21	836	765	1050	517	346	71	96	45	42	224	264	366
22	544	911	970	795	286	70	76	44	77	245	271	439
23	387	911	944	952	256	70	74	44	131	239	277	447
24	246	841	936	966	190	70	57	43	137	222	277	606
25	244	565	939	974	180	70	55	43	135	153	381	943
26	244	410	931	962	182	69	54	43	130	162	878	930
27	243	408	880	955	212	70	54	42	114	146	1070	882
28	244	513	783	947	280	73	56	43	113	165	810	670
29	258	---	786	945	324	73	56	43	109	428	1110	743
30	266	---	787	818	337	72	52	46	101	472	1170	937
31	262	---	720	---	233	---	52	48	---	654	---	843
TOTAL	16817	11659	32831	16848	12776	2785	2907	1443	1977	7038	21023	23062
MEAN	542	416	1059	562	412	93	94	47	66	227	701	744
MAX	938	911	1900	974	700	229	119	55	137	654	1170	1350
MIN	243	251	245	300	180	66	52	42	42	100	261	366

Table 8.4

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

STATION:12116400 CEDAR RIVER AT POWERPLANT AT CEDAR FALLS, WA TYPE:STREAM AGENCY:USGS STATE:53 COUNTY:033

LATITUDE: 472508 LONGITUDE: 1214649 NAD27 DRAINAGE AREA:83.9* CONTRIBUTING DRAINAGE AREA: DATUM:900.00 NGVD29

retrieved: 2015-03-17 12:34:17 EDT (sdww01)

Lowest aging status in period is WORKING

DD #3

Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2014

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	65	71	353	190	183	248	87	45	38	40	1040	832
2	66	68	354	60	64	248	119	45	37	40	1010	960
3	77	66	383	58	63	151	117	44	45	61	884	1040
4	70	64	264	58	64	132	116	44	41	113	811	1040
5	68	62	143	58	82	131	115	44	39	113	840	908
6	67	62	190	68	159	131	114	43	39	119	887	672
7	191	62	540	70	400	98	114	43	39	163	872	670
8	631	61	740	69	399	94	113	43	38	201	843	604
9	636	60	1230	70	405	94	112	43	39	139	830	425
10	517	63	1690	65	407	93	111	43	38	42	723	140
11	154	66	1540	60	405	64	111	42	38	41	640	250
12	158	77	1390	57	401	61	110	42	38	40	635	254
13	207	78	1230	54	261	64	109	43	38	39	574	63
14	521	77	1050	53	63	62	109	41	38	40	267	61
15	667	81	1000	52	62	63	108	41	38	40	47	60
16	662	86	940	60	62	65	107	40	37	39	45	59
17	655	105	988	92	61	66	106	40	37	40	45	212
18	650	108	926	94	61	65	106	39	37	42	44	404
19	649	75	833	76	61	65	105	39	36	41	44	342
20	644	219	753	69	60	65	104	40	36	42	44	57
21	556	474	674	186	60	64	92	39	36	42	47	61
22	206	641	632	497	60	64	69	39	74	52	52	59
23	62	640	619	632	61	63	67	39	130	60	59	68
24	61	555	614	638	60	63	49	38	132	59	59	271
25	61	232	610	635	61	63	48	37	98	62	139	627
26	60	54	610	633	62	62	47	37	41	65	607	627
27	60	51	576	630	62	63	47	37	40	68	776	589
28	60	173	498	628	63	66	46	38	39	69	600	346
29	73	---	498	629	275	66	46	38	39	247	800	434
30	79	---	498	506	363	66	46	39	41	561	858	635
31	75	---	410	---	253	---	45	41	---	705	---	549
TOTAL	8708	4431	22776	7047	5103	2700	2795	1266	1436	3425	15122	13319
MEAN	281	158	735	235	165	90	90	41	48	110	504	430
MAX	667	641	1690	638	407	248	119	45	132	705	1040	1040
MIN	60	51	143	52	60	61	45	37	36	39	44	57

Table 8.5

SEATTLE PUBLIC UTILITIES
Extract: 2015-02-03
STATION NUMBER 12115900 CHESTER MORSE LAKE AT CEDAR FALLS, WA
SOURCE AGENCY SPU ISCADA
LATITUDE 472434 LONGITUDE 1214322 NAD27 DRAINAGE AREA 78.4*
All Data is Provisional and Subject to Revision
Water Surface Elevation, Feet
CALENDAR YEAR JANUARY TO DECEMBER 2014
Daily Readings Approximately 7 am

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1554.25	1553.74	1553.20	1553.70	1558.75	1563.25	1562.80	1558.30	1554.55	1551.20	1553.68	1558.10
2	1554.12	1553.80	1552.70	1553.70	1559.02	1563.20	1562.70	1558.15	1554.45	1551.12	1553.00	1557.30
3	1554.10	1553.80	1552.45	1553.70	1559.50	1563.15	1562.65	1558.05	1554.48	1550.90	1552.55	1556.35
4	1554.00	1553.75	1552.70	1553.78	1560.00	1563.20	1562.50	1558.00	1554.50	1550.89	1552.48	1555.19
5	1553.80	1553.70	1554.50	1553.94	1560.60	1563.25	1562.38	1557.70	1554.45	1550.80	1553.15	1554.39
6	1553.65	1553.55	1557.00	1554.35	1561.15	1563.20	1562.25	1557.55	1554.38	1550.85	1553.31	1553.50
7	1553.45	1553.30	1559.01	1555.00	1561.55	1563.15	1562.10	1557.42	1554.15	1550.80	1553.30	1553.00
8	1553.00	1553.15	1559.90	1555.50	1561.53	1563.10	1561.95	1557.22	1554.15	1550.68	1552.88	1552.30
9	1552.30	1553.00	1561.45	1556.25	1561.69	1563.05	1561.79	1557.11	1554.05	1550.65	1552.25	1551.90
10	1552.26	1552.85	1563.10	1556.85	1562.02	1563.05	1561.65	1556.90	1553.95	1550.55	1552.08	1551.80
11	1552.60	1552.85	1563.10	1557.19	1562.15	1563.00	1561.45	1556.75	1553.85	1550.45	1551.90	1551.90
12	1553.81	1552.90	1562.50	1557.32	1562.10	1562.95	1561.18	1556.60	1553.62	1550.40	1551.55	1551.86
13	1555.00	1553.35	1561.50	1557.40	1561.95	1562.95	1561.10	1556.66	1553.50	1550.35	1551.20	1551.90
14	1556.50	1553.90	1560.55	1557.40	1562.00	1563.00	1560.85	1556.54	1553.40	1550.30	1550.80	1551.90
15	1556.70	1554.40	1560.11	1557.35	1562.20	1563.00	1560.70	1556.45	1553.25	1550.10	1550.55	1551.80
16	1556.60	1554.98	1559.70	1557.35	1562.50	1563.00	1560.52	1556.30	1553.05	1550.05	1550.35	1551.65
17	1556.15	1555.15	1559.70	1557.80	1562.70	1563.10	1560.30	1556.20	1553.00	1549.95	1550.12	1551.50
18	1555.65	1555.45	1559.40	1558.71	1562.80	1563.10	1560.10	1556.05	1552.90	1550.00	1550.05	1551.10
19	1555.05	1556.00	1558.85	1559.32	1562.85	1563.15	1559.88	1555.90	1552.77	1550.10	1549.90	1550.80
20	1554.70	1556.20	1558.49	1559.85	1562.85	1563.10	1559.72	1555.74	1552.65	1550.15	1549.95	1550.55
21	1554.05	1556.00	1558.02	1560.05	1562.75	1563.10	1559.80	1555.60	1552.54	1550.15	1549.70	1551.45
22	1553.55	1555.42	1557.45	1560.05	1562.75	1563.05	1559.45	1555.45	1552.35	1550.20	1549.85	1552.55
23	1553.30	1555.00	1556.86	1559.95	1562.81	1562.95	1559.25	1555.30	1552.20	1550.82	1550.10	1553.10
24	1553.20	1554.50	1556.35	1559.85	1563.05	1562.90	1559.30	1555.10	1552.10	1551.50	1550.90	1554.40
25	1553.10	1554.10	1555.70	1560.23	1563.22	1562.80	1559.25	1555.00	1551.95	1551.60	1551.54	1554.90
26	1553.10	1553.80	1554.95	1560.30	1563.35	1562.75	1559.12	1554.90	1551.80	1551.70	1556.52	1554.80
27	1553.00	1553.75	1554.40	1560.10	1563.50	1562.65	1559.05	1554.80	1551.70	1552.30	1558.55	1554.52
28	1552.90	1553.60	1554.30	1559.90	1563.54	1562.70	1558.85	1554.82	1551.50	1552.90	1558.88	1554.60
29	1552.90	---	1554.11	1559.50	1563.55	1562.80	1558.75	1554.70	1551.20	1553.45	1559.10	1554.65
30	1553.35	---	1554.45	1558.90	1563.40	1562.80	1558.62	1554.50	1551.20	1553.80	1558.75	1554.30
31	1553.60	---	1553.85	---	1563.29	---	1558.93	1554.60	---	1553.95	---	1553.70
MEAN	1553.99	1554.14	1557.43	1557.51	1562.10	1563.02	1560.61	1556.27	1553.12	1551.05	1552.63	1553.28
MAX	1556.70	1556.20	1563.10	1560.30	1563.55	1563.25	1562.80	1558.30	1554.55	1553.95	1559.10	1558.10
MIN	1552.26	1552.85	1552.45	1553.70	1558.75	1562.65	1558.62	1554.50	1551.20	1549.95	1549.70	1550.55

Table 8.6

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

STATION:12115000 CEDAR RIVER NEAR CEDAR FALLS, WA TYPE:STREAM AGENCY:USGS STATE:53 COUNTY:033

LATITUDE: 472213 LONGITUDE: 1213726 NAD27 DRAINAGE AREA:40.7* CONTRIBUTING DRAINAGE AREA: DATUM:1560 NGVD29

retrieved: 2015-03-17 12:37:50 EDT (caw w 01)

Low est aging status in period is WORKING

DD #1

Discharge, cubic feet per second

CALENDAR YEAR JANUARY TO DECEMBER 2014

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	216	215	145	309	458	359	169	53	55	65	354	392
2	208	198	139	285	604	363	158	53	48	57	304	329
3	277	182	199	267	660	370	146	51	106	52	335	284
4	231	167	478	274	600	340	136	49	81	50	625	251
5	214	139	950	306	608	315	126	48	65	48	617	229
6	199	121	1250	572	599	285	121	47	57	46	498	239
7	193	144	1240	557	539	265	115	46	53	44	443	236
8	211	138	1000	602	510	264	109	45	50	43	371	216
9	250	136	2340	747	664	264	103	44	53	42	453	256
10	417	133	1550	590	644	240	97	43	50	41	507	311
11	584	163	1040	464	541	213	91	42	46	49	415	316
12	742	304	687	394	487	209	86	43	44	61	339	289
13	1250	433	520	355	471	236	82	83	43	49	288	277
14	965	421	633	336	523	218	77	55	41	58	251	250
15	630	403	669	334	650	207	73	52	40	63	218	227
16	468	382	734	378	701	226	70	48	39	72	193	210
17	388	385	696	622	623	216	67	46	39	72	174	195
18	342	374	544	696	526	202	65	44	39	155	158	182
19	307	343	482	561	475	196	64	43	42	129	147	187
20	275	281	432	502	439	204	67	41	39	116	139	283
21	249	245	370	436	440	179	64	41	37	112	150	1010
22	227	214	325	476	457	168	62	40	37	216	203	687
23	209	199	291	490	535	169	90	39	37	504	367	630
24	193	190	268	711	541	162	93	39	54	486	353	818
25	179	178	262	703	440	153	82	41	55	388	2240	575
26	169	163	266	551	475	149	70	38	55	485	2840	444
27	159	153	270	478	420	149	64	37	51	542	1120	418
28	151	149	327	427	370	195	61	36	46	472	842	415
29	212	---	358	376	385	213	58	37	46	537	647	345
30	254	---	368	369	339	179	56	44	72	470	483	291
31	230	---	341	---	347	---	54	81	---	422	---	257
TOTAL	10599	6553	19174	14168	16071	6908	2776	1449	1520	5946	16074	11049
MEAN	342	234	619	472	518	230	90	47	51	192	536	356
MAX	1250	433	2340	747	701	370	169	83	106	542	2840	1010
MIN	151	121	139	267	339	149	54	36	37	41	139	182

Ice affected

Backwater affected

Table 8.7

SEATTLE PUBLIC UTILITIES
Extract: 2015-02-03
LANDSBURG TUNNEL - FLOW VOL 24 HR TOT - MG
SOURCE AGENCY SPU IWRMS
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124* DATUM 490 NGVD29
All Data is Provisional and Subject to Revision
Flow Volume, Million Gallons
CALENDAR YEAR JANUARY TO DECEMBER 2014
24 Hour Total

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	70.8	65.0	49.6	56.3	64.3	74.5	102.7	117.5	50.4	78.3	16.2	70.6
2	61.0	65.2	46.8	56.4	63.6	94.2	113.0	119.2	67.1	68.5	72.0	70.6
3	23.8	65.1	0.0	56.2	63.7	100.4	111.1	118.9	62.3	64.5	80.8	70.5
4	69.2	65.4	0.0	56.3	63.9	99.9	107.2	123.2	89.6	67.0	80.5	77.1
5	69.5	65.0	0.0	56.7	63.9	99.9	103.6	124.5	89.2	66.6	80.0	79.4
6	69.5	65.2	0.0	56.6	63.7	102.6	102.7	125.1	89.7	66.1	78.9	78.8
7	69.8	65.0	0.0	19.1	25.7	103.7	100.2	117.9	94.7	65.5	80.3	79.1
8	69.9	65.4	0.0	62.2	0.0	103.5	100.5	98.4	95.8	70.0	79.8	78.9
9	69.5	65.2	0.0	64.6	0.0	103.4	97.4	95.2	95.9	66.4	79.9	79.2
10	69.1	65.6	0.0	64.4	0.0	104.8	99.8	94.9	87.9	60.8	79.9	79.3
11	63.4	68.6	0.0	64.7	0.0	99.7	112.2	95.2	80.3	64.7	80.4	78.7
12	70.0	70.1	3.5	64.5	79.8	101.8	110.1	95.4	80.4	64.7	80.3	79.3
13	57.7	70.1	66.8	64.7	89.3	104.7	108.9	67.7	83.4	63.7	79.9	78.2
14	55.2	70.2	81.2	73.4	73.7	104.8	107.4	74.8	88.9	69.6	80.5	79.7
15	55.2	70.0	49.5	75.9	70.5	37.7	105.7	74.7	85.7	69.7	80.1	79.9
16	55.4	61.6	49.6	75.5	67.0	0.0	104.4	74.4	80.7	69.8	80.0	80.7
17	55.2	0.0	108.9	53.4	67.0	0.0	105.8	75.0	79.0	68.9	72.2	81.2
18	55.0	0.0	144.4	42.6	66.9	0.0	117.6	74.9	79.3	77.3	70.0	80.8
19	55.4	0.0	143.0	75.0	65.2	0.0	117.5	72.5	79.1	78.9	69.6	81.0
20	55.3	42.0	143.0	74.9	64.8	0.0	117.4	88.1	77.9	79.8	69.8	80.2
21	63.7	129.9	142.7	74.9	64.0	0.0	109.7	98.5	78.2	78.0	70.0	79.3
22	64.8	134.3	143.2	75.2	63.9	0.0	100.0	108.8	78.4	25.2	69.5	72.0
23	65.2	134.3	143.7	75.0	63.5	0.0	115.9	109.0	78.6	16.2	68.3	41.6
24	64.6	93.0	122.5	75.3	63.8	22.3	118.5	109.1	78.9	56.5	69.6	0.0
25	65.4	69.8	105.1	66.2	63.6	77.4	112.8	109.8	78.7	76.9	7.5	23.3
26	65.1	69.2	104.5	64.1	63.5	74.7	107.4	108.8	78.8	79.4	0.0	64.1
27	65.2	62.2	105.0	64.2	63.8	87.1	104.4	106.7	77.2	69.1	4.4	65.6
28	65.3	51.2	76.9	64.1	63.6	112.8	107.3	103.8	73.3	63.4	44.2	65.7
29	65.5	---	58.1	64.2	61.1	103.9	115.4	105.9	73.8	79.7	70.3	66.0
30	65.2	---	55.7	63.7	70.8	96.3	111.1	99.6	78.3	82.7	70.5	66.3
31	65.2	---	55.4	---	74.6	---	108.1	47.5	---	53.4	---	66.0
TOTAL	1935.1	1848.6	1999.1	1900.3	1769.2	2010.1	3355.8	3035.0	2411.5	2061.3	1965.4	2173.1
MEAN	62.4	66.0	64.5	63.3	57.1	67.0	108.3	97.9	80.4	66.5	65.5	70.1
MAX	70.8	134.3	144.4	75.9	89.3	112.8	118.5	125.1	95.9	82.7	80.8	81.2
MIN	23.8	0.0	0.0	19.1	0.0	0.0	97.4	47.5	50.4	16.2	0.0	0.0

Table 8.8

SEATTLE PUBLIC UTILITIES
Extract: 2015-02-03
LANDSBURG WEATHER STATION - PRECIP 24HR TOT ODE 8412
SOURCE AGENCY SPU IWRMS
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124* DATUM 490 NGVD29
All Data is Provisional and Subject to Revision
Rainfall, Inches
CALENDAR YEAR JANUARY TO DECEMBER 2014
24 Hour Total

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.01	0.11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
2	0.99	0.00	0.81	0.00	0.14	0.00	0.00	0.01	0.80	0.00	0.31	0.00
3	0.22	0.00	0.61	0.26	0.57	0.00	0.00	0.00	0.41	0.00	0.68	0.00
4	0.00	0.00	1.09	0.20	0.71	0.00	0.00	0.00	0.00	0.01	0.63	0.03
5	0.00	0.00	1.50	0.42	1.07	0.00	0.00	0.00	0.00	0.00	0.24	0.14
6	0.05	0.00	0.39	0.14	0.09	0.00	0.00	0.00	0.00	0.00	0.42	0.45
7	0.55	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.61	0.03	1.23	0.42	0.69	0.00	0.00	0.00	0.30	0.00	0.00	0.19
9	0.34	0.07	0.62	0.00	0.27	0.00	0.00	0.00	0.14	0.00	0.82	0.44
10	0.20	0.72	1.07	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.50
11	0.93	0.66	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.81	0.00	0.14
12	0.20	0.30	0.00	0.00	0.00	0.44	0.00	0.40	0.00	0.02	0.00	0.00
13	0.07	0.07	0.00	0.00	0.00	0.87	0.00	1.16	0.00	0.39	0.00	0.13
14	0.02	0.42	0.46	0.00	0.00	0.04	0.00	0.02	0.00	0.42	0.00	0.00
15	0.00	0.54	0.33	0.02	0.00	0.18	0.00	0.14	0.00	0.41	0.00	0.00
16	0.00	0.89	1.90	0.98	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.01
17	0.00	1.67	0.17	0.98	0.00	0.20	0.00	0.00	0.00	0.41	0.00	0.09
18	0.00	0.58	0.00	0.00	0.36	0.00	0.00	0.00	0.02	0.15	0.00	0.36
19	0.00	0.24	0.30	0.80	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.17
20	0.00	0.19	0.00	0.05	0.00	0.07	0.04	0.00	0.00	0.50	0.13	0.93
21	0.00	0.11	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.11	0.81	0.00
22	0.05	0.19	0.00	0.91	0.00	0.00	0.00	0.00	0.03	1.26	0.48	0.00
23	0.00	0.36	0.00	0.37	0.20	0.00	1.43	0.00	0.47	0.50	0.65	1.24
24	0.00	0.54	0.00	0.92	0.00	0.00	0.06	0.00	0.83	0.22	0.08	0.39
25	0.00	0.01	0.32	0.06	0.34	0.00	0.00	0.00	0.18	0.29	1.52	0.07
26	0.00	0.00	0.13	0.12	0.14	0.04	0.00	0.00	0.47	0.18	0.02	0.00
27	0.00	0.00	0.25	0.34	0.00	0.52	0.00	0.00	0.00	0.00	0.04	0.40
28	0.34	0.00	0.57	0.00	0.24	0.64	0.00	0.00	0.00	0.58	0.87	0.47
29	1.43	---	0.67	0.00	0.00	0.05	0.00	0.00	0.20	0.29	0.08	0.00
30	0.08	---	0.04	0.00	0.00	0.00	0.00	1.57	0.00	0.77	0.00	0.00
31	0.21	---	0.00	---	0.00	---	0.00	0.41	---	0.53	---	0.00
TOTAL	6.30	7.70	12.47	7.17	4.94	3.35	1.53	3.74	3.85	7.86	7.78	6.15
MEAN	0.20	0.28	0.40	0.24	0.16	0.11	0.05	0.12	0.13	0.25	0.26	0.20
MAX	1.43	1.67	1.90	0.98	1.07	0.87	1.43	1.57	0.83	1.26	1.52	1.24
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
Extract: 2015-02-03
MASONRY WEATHER STATION - PRECIP 24HR TOT ODE 8435
SOURCE AGENCY SPU IWRMS
LATITUDE 472443 LONGITUDE 1214504 NAD27 DRAINAGE AREA 78.4* DATUM 490 NGVD29
All Data is Provisional and Subject to Revision
Rainfall, Inches
CALENDAR YEAR JANUARY TO DECEMBER 2014
24 Hour Total

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.05	0.00	0.33	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.03	0.00
2	1.84	0.00	2.36	0.00	0.23	0.00	0.00	0.00	1.84	0.00	0.90	0.00
3	0.00	0.00	1.61	0.76	0.84	0.00	0.00	0.00	0.04	0.00	1.46	0.00
4	0.00	0.00	2.24	0.39	1.85	0.00	0.00	0.00	0.00	0.00	0.39	0.12
5	0.00	0.00	1.25	1.06	0.73	0.00	0.00	0.00	0.00	0.00	0.39	0.39
6	0.15	0.00	0.49	0.12	0.21	0.00	0.00	0.00	0.00	0.00	0.55	0.40
7	0.68	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.04	0.00
8	0.98	0.08	2.88	0.94	1.40	0.00	0.00	0.00	0.43	0.00	0.50	0.34
9	0.67	0.55	0.85	0.00	0.44	0.00	0.00	0.00	0.00	0.01	1.27	0.88
10	1.22	1.11	0.67	0.00	0.19	0.00	0.00	0.00	0.00	0.22	0.00	0.21
11	1.55	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.03
12	0.10	0.71	0.00	0.00	0.00	0.00	0.00	1.49	0.00	0.02	0.00	0.37
13	0.20	0.28	0.60	0.00	0.00	0.65	0.00	0.18	0.00	0.72	0.00	0.00
14	0.00	0.40	0.18	0.17	0.00	0.06	0.00	0.05	0.00	0.27	0.00	0.00
15	0.00	1.21	1.10	0.75	0.00	0.61	0.00	0.10	0.00	0.50	0.00	0.00
16	0.00	1.75	1.64	1.82	0.01	0.40	0.00	0.00	0.00	0.04	0.00	0.03
17	0.00	1.16	0.11	1.23	0.00	0.02	0.00	0.00	0.03	1.05	0.00	0.12
18	0.00	1.56	0.05	0.02	0.31	0.00	0.00	0.00	0.12	0.24	0.00	0.87
19	0.00	0.71	0.97	0.81	0.00	0.40	0.30	0.00	0.00	0.41	0.26	0.65
20	0.00	0.10	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.50	0.19	1.11
21	0.01	0.22	0.00	0.72	0.00	0.00	0.02	0.00	0.00	0.74	1.55	0.05
22	0.00	0.35	0.00	0.85	0.00	0.00	0.08	0.00	0.05	1.76	1.22	0.00
23	0.00	0.58	0.00	1.08	0.30	0.01	1.37	0.00	1.00	0.61	0.85	2.51
24	0.00	0.77	0.00	1.07	0.00	0.00	0.31	0.00	0.46	0.20	1.70	0.40
25	0.00	0.00	0.30	0.06	0.55	0.00	0.00	0.00	0.54	0.62	1.68	0.01
26	0.00	0.00	0.34	0.39	0.25	0.21	0.00	0.00	0.43	0.83	0.15	0.29
27	0.00	0.00	0.68	0.40	0.05	1.15	0.00	0.00	0.00	0.36	0.87	1.52
28	1.27	0.00	0.78	0.00	0.83	0.63	0.00	0.00	0.00	1.17	1.37	0.04
29	2.00	---	1.11	0.00	0.04	0.09	0.00	0.03	0.82	0.13	0.00	0.00
30	0.61	---	0.06	0.00	0.00	0.00	0.00	2.47	0.26	0.76	0.00	0.00
31	0.35	---	0.00	---	0.00	---	0.00	0.38	---	0.27	---	0.00
TOTAL	11.68	12.91	20.60	12.64	8.25	4.23	2.26	4.73	6.02	11.85	15.37	10.34
MEAN	0.38	0.46	0.66	0.42	0.27	0.14	0.07	0.15	0.20	0.38	0.51	0.33
MAX	2.00	1.75	2.88	1.82	1.85	1.15	1.37	2.47	1.84	1.76	1.70	2.51
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

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