

Willamette Basin Review Feasibility Study

APPENDIX H

BiOp Flow Objective Performance of the No Action Alternative and Agency Recommended Plan

Under Expected and Peak Demand Conditions

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BiOp Flow Objective Performance No Action Alternative and Agency Recommended Plan Under Expected and Peak Demand Conditions

The 2008 NMFS BiOp set minimum flow objectives on the Willamette mainstem at both Albany and Salem and also prescribed minimum flow requirements on tributaries with Corps dams. This appendix describes the minimum flow objectives, provides a brief overview of the analytical methods used to evaluate BiOp flow objectives performance, and provides an evaluation of performance for each of the BiOp mainstem and tributary flow objectives for the Base Year 2020, No Action Alternative in the year 2070, and the Agency Recommended Plan (ARP) in the year 2070.

1 BiOp Minimum Flow Objectives

The BiOp establishes minimum flow objectives on the mainstem Willamette at Salem and Albany, and on tributaries located downstream of Big Cliff, Blue River, Cougar, Dexter, Fall Creek, Foster, and Hills Creek dams.

Minimum flow objectives at Albany and Salem vary depending on the forecasted amount of stored water in the WVP. Appendix B of the "Willamette Project Supplemental Biological Assessment" designates four water year classifications that are used to determine the mainstem Willamette minimum flow objectives for April through October. The four classifications are Abundant, Adequate, Insufficient, and Deficit.

The water year classification is based on the maximum total conservation storage volume of the WVP reservoirs between May 10 and 20 of each year. The storage volume is determined by summing the conservation storage in all the reservoirs (not including the reregulating dams of Big Cliff and Dexter). The maximum conservation storage is 1,590,000 acre-feet, and the total conservation storage associated with each water year type is specified in Table 1.

Water Year Type	Conservation Storage between 10-20 May
Abundant	Greater than 1,480,000 acre-feet
Adequate	From 1,200,000 to 1,480,000 acre-feet
Insufficient	From 900,000 to 1,200,000 acre-feet
Deficit	Less than 900,000 acre-feet

Table 1: Water Year Types as Defined by Co	onservation Storage
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The BiOp specifies two separate flow objectives at Salem: seven-day moving average flow, and instantaneous flow. As the seven-day moving average minimum flow objectives exceed the

instantaneous minimum flow objectives by nearly 25 percent, the seven-day moving average flow objectives were used¹ in analyses of BiOp flow objective performance for Salem.

Table 2 provides the mainstem BiOp flow objectives at Salem and Albany, and tributary BiOp flow objectives are listed in Table 3.

	Sale	em Flow Objecti (cfs)	Albany Flow Objectives (cfs)			
Period	Abundant & Adequate	Insufficient	Deficit	Abundant & Adequate	Insufficient	Deficit
Apr 1-30	* 17,800	Salem flow - objectives are linearly	* 15,000			
May 1-31	* 15,000		* 15,000			
Jun 1-15	* 13,000		* 11,000	†4,500	†4,500	†4,000
Jun 16-30	*8,700	between	* 5,500	†4,500	†4,500	†4,000
Jul 1-31	†6,000	Adequate and Deficit	†5,000	[†] 4,500	†4,500	†4,000
Aug 1-15	†6,000	flow	†5,000	† 5,000	†4,500	†4,000
Aug 16-31	†6,500	objectives - based on 31	†5,000	† 5,000	†4,500	†4,000
Sep 1-30	†7,000	May system	†5,000	† 5,000	[†] 4,500	†4,000
Oct 1-31	†7,000	- storage -	†5,000	† 5,000	†4,500	†4,000

Table 2: Mainstem BiOp Flow Objectives at Salem and Albany (cfs)

* Seven-day moving average minimum flow

[†] Instantaneous minimum flow

¹ Seven-day moving average minimum flow objectives for Salem are specified for April 1 through June 30. From July 1 to October 31, instantaneous minimum flow objectives for Salem were used in the analysis.

Period ²	Big Cliff*	Blue River	Cougar	Dexter*	Fall Creek	Foster	Hills Creek
Apr 1-30	1500	50	300	1200	80	1500	400
May 1-15	1500	50	300	1200	80	1500	400
May 16-31	1500	50	300	1200	80	1100	400
Jun 1-30	1200	50	400	1200	80	1100	400
Jul 1-15	1200	50	300	1200	80	800	400
Jul 16-31	1000	50	300	1200	80	800	400
Aug 1-31	1000	50	300	1200	80	800	400
Sep 1-30	1500	50	300	1200	200	1500	400
Oct 1-15	1500	50	300	1200	200	1500	400
Oct 16-31	1200	50	300	1200	50	1100	400

Table 3: Tributary BiOp Flow Objectives Downstream of WVP Reservoirs (cfs)

*= Flow objectives out of Big Cliff and Dexter represent the flows from the storage projects above these reregulation dams, i.e. Detroit and Lookout Point.

2 ResSim Analyses

The Willamette River Basin was modeled using the Hydrologic Engineering Center (HEC) Reservoir System Simulation Program (ResSim)³ to assess the individual project and system effects of the No Action Alternative and the ARP. ResSim is used to model reservoir systems whose operations are defined by a variety of goals and constraints. The model uses a rule-based description of the operational goals and constraints that reservoir operators must consider when making release decisions. The dam is the root of an outlet hierarchy or "tree" which allows the user to describe the different outlets of the reservoir in as much detail as necessary. ResSim is not an optimization tool and can only be used to simulate rule-based reservoir operations input by the modeler. The model does not run in a forecast mode, it makes decisions based on modeled system status and inflows and given the prescribed rules.

The baseline ResSim model used for this feasibility study is detailed in Appendix C - ResSim Baseline Model Documentation Report. The Baseline Model Documentation Report identifies all of the physical parameter inputs for the thirteen reservoirs in the basin, the routing reach specifications, the inflow time series used, and the operation sets (the rules used in the ResSim model to regulate the thirteen projects) of the existing conditions model of the WVP.

The Base Year 2020 ResSim model mirrors the way the WVP is operated today, with expected demands projected to the 2020 base year. The model includes physical capacity information for all project outlets, special operations at each project during high inflow events, project rule curves, the minimum flow objectives for tributaries and the mainstem, and outflow rates of change (ramping rates) identified in the Willamette BiOps for listed fish. The No Action

 $^{^2}$ The ten periods correspond to a combined set of analysis periods, which includes all partial months as described in the BiOp. The combined set of periods was used to provide a common time period framework for all tributaries.

³ Additional information on ResSim is available on the U.S. Army Corps of Engineers HEC website: (http://www.hec.usace.army.mil/).

Alternative and ARP models also mirror the way the WVP is operated today, with the exception that additional releases are made from WVP reservoirs - diverted for out-of-stream use, and a portion of the diverted out-of-stream water recouped by the system via return flow.

3 WVP Flows Dataset

The flow dataset used for analyses are from the 2010 Level Modified Streamflows, a complete set of flows for the whole Columbia Basin developed jointly by the BPA, the Corps, and Reclamation. The use of this flow dataset for the WBR is documented in Appendix D - Flow Dataset Used for ResSim Analyses, and also in the previously mentioned Baseline Model Documentation Report. This dataset contains historical daily average flows from October 1928 through September 2008, with all years adjusted to the same level of irrigation depletions.

Several rules in the model depend on water year classification. As described above, Insufficient and Deficit water years allow for reduced minimum flow objectives at Salem. The 80 years in the flow data set were classified by water year in order to have a variable minimum flow objective in a downstream rule for Salem and to determine when some of the diversions used in the model (where water is removed from the system) are reduced in the lower water years. For ResSim modeling (upon which all analyses presented in this document are based), the water year type is defined using data from the time period stated above, and no changes are made to the water year classification during the analysis. The 80-year flow data set provides the following counts and frequencies of water types:

- Abundant 44 years (55 percent of the 80 simulated years);
- Adequate 14 years (17 percent of the 80 simulated years);
- Insufficient 11 years (14 percent of the 80 simulated years); and
- Deficit 11 years (14 percent of the 80 simulated years).

4 Performance Evaluation Procedures and Metrics

Performance of the BiOp flow objectives was evaluated for the period April 1 through October 31 in each of the simulated years, which provides 214 simulated days over 80 simulated years – a total of 17,120 simulated days. Four metrics were developed as a means of evaluating flow objective achievement:

- 1. flow objective achievement on each simulated day;
- 2. percent of flow objective volume of water met; and
- 3. percent of flow objective volume of water met on days that the flow objective is not met.

4.2 Flow Objective Achievement on Each Simulated Day

ResSim daily average outflow from each reservoir, and daily average flow at Salem and Albany were compared to the BiOp flow objectives for a simple assessment of whether each flow objective was met on each of the 17,120 simulated days. This simple metric provides a convenient summary of absolute flow objective achievement, though alone, it does not provide sufficient information to convey the degree to which a flow objective was met over the simulation period. For example, the flow objective at Salem is 6,000 cfs on July 4, and on a

simulated July 4 day where the ResSim output average daily flow is 5,999 cfs, the flow objective is not achieved.

4.3 Percent of Flow Objective Volume Met Over Simulation Period

This metric provides a means of evaluating the overall degree to which flow objectives are met over a simulated year by calculating the ratio of the total volume of water provided to the total volume of water specified by the flow objective. While ResSim modeled flows often exceed the flow objectives, this metric was limited to a maximum ratio of 100 percent in order to avoid the problem of excessive flows "averaging out" insufficient flows, which would overstate performance.

4.4 Percent of Flow Objective Volume Met on Missed Days

This metric evaluates the degree to which flow objectives are met for days on which the flow objective is not fully achieved. It represents the ratio of the total volume of water provided over days for which the flow objective was missed to the total volume of water specified by the flow objective over missed flow objective days.

5 Summary of BiOp Flow Objective Comparisons

Tables 4A, 4B, 5A, and 5B below provide summary performance comparisons of the No Action Alternative and the ARP at year 2070 in meeting mainstem and tributary flow objectives. Tables 4A and 4B show the performance comparison under expected demand conditions, and Tables 5A and 5B show the performance under peak demand conditions.

Each table shows percentages for each, with values for the No Action Alternative provided first. For example, in a comparison of the percent of days over which the flow objective is met, performance may be indicated as 97/96, which denotes that No Action Alternative meets flow objectives 97 percent of the days, and the ARP meets flow objectives on 96 percent of the days.

Also included on the table is a graphic indicator of \checkmark , \updownarrow , or \clubsuit , where:

- ✓ indicates that there is no notable difference between the No Action Alternative and the ARP;
- indicates a difference of less than two percent between the No Action Alternative and ARP performance with ARP performance superior to the No Action Alternative performance;
- indicates a difference of less than two percent between the No Action Alternative and ARP performance with No Action Alternative performance superior to ARP performance;
- ↑ indicates a difference of more than two percent between the No Action Alternative and ARP performance with ARP performance superior to the No Action Alternative performance; and
- ✓ indicates a difference of more than two percent between the No Action Alternative and ARP performance with No Action Alternative performance superior to ARP performance.

Following the table, performance in meeting each of the mainstem and tributary flow objectives is provided in detailed tables and charts.

	Performance Metric	All Years	Abundant 44 Yrs	Adequate 14 Yrs	Insufficient 11 Yrs	Deficit 11 Yrs
Salem	Pct Days	仓	\checkmark	仓	仓	\checkmark
Mainstem	Flow Objective Met	89/90	98/98	87/88	77/78	71/71
Flow Objective	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
	Volume Met	99/99	+99/+99	99/99	97/97	95/95
Albany	Pct Days	仓	\checkmark	仓	仓	\checkmark
Mainstem	Flow Objective Met	90/91	98/98	88/90	79/81	70/70
Flow Objective	Pct of Flow Objective Volume Met	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
-		99/99	+99/+99	99/99	96/96	94/94
Willamette Falls	Pct Days	\checkmark	Û	\checkmark	\checkmark	Û
Mainatam	Flow Objective Met	95/95	+99/99	96/96	87/87	83/82
Flow Objective	Pct of Flow Objective	Û	\checkmark	\checkmark	\checkmark	\checkmark
- ,	Volume Met	+99/99	+99/+99	+99/+99	99/99	98/98
 No notable differ 	ence between No Action and	ARP performa	ance			
	– ARP performance superior	† > 2	% difference –	ARP performa	ance superior	

Table 4A: Flow Objective Performance: No Action Alternative / ARP **Expected Demand Conditions - Mainstem**

 \mathbf{V} > 2% difference – No Action performance superior

	Performance Metric	All Years	Abundant 44 Yrs	Adequate 14 Yrs	Insufficient 11 Yrs	Deficit 11 Yrs
Big Cliff	Pct Days	\checkmark	\checkmark	\checkmark	\checkmark	Û
Tributory Flow	Flow Objective Met	97/97	+99/+99	+99/+99	97/97	86/85
Objective	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	\checkmark	Û
-)	Volume Met	99/99	+99/+99	+99/+99	99/99	95/94
Blue River	Pct Days	\checkmark	\checkmark	\checkmark	\checkmark	Û
	Flow Objective Met	+99/+99	100/100	100/100	100/100	99/98
I ributary Flow	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	\checkmark	Û
Objective	Volume Met	+99/+99	100/100	100/100	100/100	+99/99
Courar	Pct Days	\checkmark	\checkmark	仓	\checkmark	Û
	Flow Objective Met	98/98	100/100	99/+99	97/97	89/88
I ributary Flow	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Objective	Volume Met	99/99	100/100	+99/+99	99/99	94/94
Dexter	Pct Days	\checkmark	\checkmark	\checkmark	Û	Û
	Flow Objective Met	99/99	100/100	100/100	99/98	95/93
Objective	Pct of Flow Objective	Û	\checkmark	\checkmark	Û	Û
Objective	Volume Met	+99/99	100/100	100/100	+99/99	98/97
Fall Creek	Pct Days	$\hat{\mathbf{U}}$	\checkmark	$\mathbf{\Lambda}$	\mathbf{A}	Û
	Flow Objective Met	98/97	99/99	98/95	97/94	95/93
Objective	Pct of Flow Objective	Û	\checkmark	$\mathbf{\Lambda}$	$\mathbf{\Lambda}$	$\mathbf{\Lambda}$
Objective	Volume Met	98/97	99/99	98/95	98/95	94/91
Foster	Pct Days	\checkmark	Û	Û	\checkmark	仓
	Flow Objective Met	92/92	97/96	94/93	83/83	77/79
I ributary Flow	Pct of Flow Objective	Û	\checkmark	Û	Û	Û
Objective	Volume Met	97/96	99/99	99/98	94/92	91/90
Hills Creek	Pct Days	Û	\checkmark	\checkmark	Û	$\mathbf{\Lambda}$
	Flow Objective Met	+99/99	100/100	100/100	99/98	98/95
I ributary Flow	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	Û	Û
Objective	Volume Met	+99/+99	100/100	100/100	+99/99	99/98
In the notable difference between No Action and ARP performance						

Table 4B: Flow Objective Performance: No Action Alternative / ARP **Expected Demand Conditions - Tributaries**

No notable difference between No Action and ARP performance

 $\hat{\mathbf{U}}$ - < 2 % difference – ARP performance superior \uparrow > 2% difference – ARP performance superior

 \clubsuit - < 2 % difference – No Action performance superior \clubsuit > 2% difference – No Action performance superior

	Performance Metric	All Years	Abundant 44 Yrs	Adequate 14 Yrs	Insufficient 11 Yrs	Deficit 11 Yrs
Salem	Pct Days	\checkmark	\checkmark	√	\checkmark	Û
Mainatam	Flow Objective Met	89/89	98/98	87/87	77/77	71/70
Flow Objective	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
5	Volume Met	99/99	+99/+99	99/99	97/97	95/95
Albany	Pct Days	Û	\checkmark	仓	仓	\checkmark
Mainstem	Flow Objective Met	89/90	98/98	87/90	78/80	69/69
Flow Objective	Pct of Flow Objective Volume Met	\checkmark	\checkmark	\checkmark	\checkmark	Û
,		98/98	+99/+99	99/99	96/96	94/93
Willamette Falls	Pct Days	Û	\checkmark	Û	Û	\mathbf{A}
Mainstem	Flow Objective Met	95/94	99/99	96/95	87/86	83/80
Flow Objective	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	Û	Û
5	Volume Met	99/99	+99/+99	+99/+99	99/98	98/97
 No notable differ 	ence between No Action and	ARP performa	ance			
압 - < 2 % difference	- ARP performance superior	1 > 2	2% difference –	ARP performa	ance superior	

Table 5A: Flow Objective Performance: No Action Alternative and ARP Peak Demand Conditions - Mainstem

 \mathbf{U} - < 2 % difference – No Action performance superior \checkmark > 2% difference – No Action performance superior

Performance Metric		All Years	Abundant	Adequate	Insufficient	Deficit 11 Yrs
Big Cliff	Pct Days	Û	<u>++ 113</u> ✓	<u>I∓ II3</u>	Ţ	
Tributer / Flour	Flow Objective Met	97/96	+99/+99	+99/+99	97/95	5/80
Objective	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	Û	Û
	Volume Met	99/99	+99/+99	+99/+99	99/98	94/92
Blue River	Pct Days	\checkmark	\checkmark	\checkmark	\checkmark	Û
	Flow Objective Met	+99/+99	100/100	100/100	100/100	99/97
Objective	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	\checkmark	Û
Objective	Volume Met	+99/+99	100/100	100/100	100/100	99/98
Cougar	Pct Days	\checkmark	\checkmark	①	\checkmark	Û
Tributan Flaur	Flow Objective Met	98/98	100/100	99/+99	97/97	89/88
Objective	Pct of Flow Objective	\checkmark	\checkmark	\checkmark	仓	Û
Objective	Volume Met	99/99	100/100	+99/+99	98/99	94/93
Dexter	Pct Days	$\hat{\mathbf{U}}$	\checkmark	\checkmark	Û	$\mathbf{\Psi}$
	Flow Objective Met	99/98	100/100	100/100	99/96	95/90
Objective	Pct of Flow Objective	$\hat{\mathbf{U}}$	\checkmark	\checkmark	Û	Û
00,000,000	Volume Met	+99/99	100/100	100/100	99/98	98/96
Fall Creek	Pct Days	Û	\checkmark	$\mathbf{\Lambda}$	$\mathbf{\Lambda}$	$\mathbf{\Lambda}$
Tuibudamu Flaur	Flow Objective Met	98/96	99/99	97/94	97/92	94/91
Objective	Pct of Flow Objective	$\mathbf{\Lambda}$	\checkmark	Û	$\mathbf{\Lambda}$	$\mathbf{\Lambda}$
00,000,000	Volume Met	98/95	99/99	96/94	98/92	94/88
Foster	Pct Days	Û	$\mathbf{\Psi}$	$\mathbf{\Lambda}$	\checkmark	\checkmark
Tuibudamu Elauu	Flow Objective Met	92/90	97/94	94/90	83/83	77/77
Objective	Pct of Flow Objective	Û	Û	Û	\mathbf{A}	Û
,	Volume Met	97/95	99/98	99/97	94/90	90/88
Hills Creek	Pct Days	Û	\checkmark	\checkmark	Û	$\mathbf{\Psi}$
Tributory Flow	Flow Objective Met	+99/99	100/100	100/100	99/97	98/93
Objective	Pct of Flow Objective	Û	\checkmark	\checkmark	\checkmark	Û
0.00000	Volume Met	+99/99	100/100	100/100	99/99	99/97
 No notable differer 	ce between No Action and	ARP performa	nce			

Table 5B: Flow Objective Performance: No Action Alternative and ARP Peak Demand Conditions - Tributaries

No notable difference between No Action and ARP performance

$\hat{\mathbf{U}}$ - < 2 % difference – ARP performance superior	$\mathbf{\Lambda}$ > 2% difference – ARP performance superior

6 Salem Mainstem Flow Objective Performance

6.1 Salem Mainstem Flow Objective Performance – Expected Diversions

Table 6A provides summary metrics for the modeled Salem mainstem BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the water year types:

- Abundant: no notable difference;
- Adequate: one percent **more** flow objective days met under the ARP;
- Insufficient one percent more flow objective days met under the ARP;; and
- Deficit no notable difference.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 6A shows the following differences between the No Action Plan and the ARP for flow objective water volume provided across the water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit no notable difference.

Table 6A:Salem Mainstem Flow Objective Performance Summary:
Expected Diversions

		No	
	Base Year	Action	ARP
Abundant Years (9,416 simulated days)	2020	2070	2070
Percent of Simulated Days Flow Objective Met	98	98	98
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	96	96	96
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	88	87	88
Percent of Volume Met Over All Simulated Days	99	99	99
Percent of Volume Met Over Missed Objective Days	93	93	92
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	78	77	78
Percent of Volume Met Over All Simulated Days	97	97	97
Percent of Volume Met Over Missed Objective Days	90	89	89
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	73	71	71
Percent of Volume Met Over All Simulated Days	95	95	95
Percent of Volume Met Over Missed Objective Days	86	86	86

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 6B and Figure 1A provide additional details and a graphic representation of select table data to aid in interpretation.

Table 6B:	Salem Mainstem Flow Objective	Performance Detail:	Expected Diversions
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WY	Devied	Flow	Pct Days Flow Objective Met ^{1, 2}			ars With a Objective	Missed Day ³	Pct Volu	ıme Goal <i>I</i> All Days) ¹	Achieved	Pct Volu (M	Pct Volume Goal Achieved (Missed Days) ⁴		
Туре	Period	BY	NA	ARP	BY	NA	ARP	BY	NĂ	ARP	BY	NA	ARP	
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070	
	Apr	96	96	96	20	22	22	+ 99	+ 99	+ 99	98	98	98	
	May	99	99	99	8	9	9	+ 99	+ 99	+ 99	98	98	99	
rs /s	Jun 1-15	93	92	93	18	20	18	99	99	99	92	92	91	
ht Bay	Jun 16-30	98	97	99	8	9	8	+ 99	+ 99	+ 99	98	98	99	
ζ n da	Jul	+ 99	+ 99	+ 99	1	2	1	+ 99	+ 99	+ 99	98	98	98	
air a	Aug 1-15	+ 99	+ 99	99	1	1	1	+ 99	+ 99	+ 99	99	+ 99	97	
of	Aug 16-31	99	99	+ 99	6	4	1	+ 99	+ 99	+ 99	99	97	+ 99	
4 44	Sep	99	99	98	5	3	4	+ 99	+ 99	+ 99	96	98	97	
04	Oct	99	97	98	3	3	3	+ 99	+ 99	+ 99	96	95	97	
	SUBTOTAL	98	98	98	34	33	33	+ 99	+ 99	+ 99	96	96	96	
	Apr	78	78	79	13	13	13	99	99	99	93	93	93	
ອູທູທ	May	70	69	71	14	14	14	98	98	98	93	93	92	
ay ar	Jun 1-15	60	60	60	8	8	8	96	96	96	89	89	89	
ър ×	Jun 16-30	95	96	97	5	6	5	+ 99	+ 99	+ 99	98	98	99	
8 inde	Jul	100	100	100				100	100	100	N/A	N/A	N/A	
A S S	Aug 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
299(14 (Aug 16-31	90	94	97	4	5	2	+ 99	+ 99	+ 99	99	99	98	
	Sep	97	93	99	7	7	2	+ 99	+ 99	+ 99	98	98	95	
	Oct	97	95	93	1	3	3	+ 99	+ 99	+ 99	92	95	94	
	SUBTOTAL	88	87	88	14	14	14	99	99	99	93	93	92	
	Apr	74	75	76	11	11	11	98	99	98	94	94	94	
	Мау	43	44	44	11	11	11	93	93	93	88	88	88	
s s	Jun 1-15	42	39	44	10	10	10	94	93	94	89	89	89	
ant ag	Jun 16-30	94	93	96	2	2	2	+ 99	+ 99	+ 99	98	97	99	
ζ μ či	Jul	100	100	100				100	100	100	N/A	N/A	N/A	
iff is 8	Aug 1-15	100	100	99			1	100	100	+ 99	N/A	N/A	96	
of \$	Aug 16-31	84	79	78	4	4	4	98	97	98	90	88	89	
135	Sep	88	85	86	4	3	3	99	99	98	91	90	88	
70	Oct	80	81	79	3	3	3	98	96	95	90	80	77	
	SUBTOTAL	78	77	78	11	11	11	97	97	97	90	89	89	
	Apr	69	69	68	11	11	11	96	97	96	89	89	89	
	Мау	38	38	38	11	11	11	90	90	90	84	84	84	
s s	Jun 1-15	44	45	48	11	11	10	93	93	94	88	88	89	
ay	Jun 16-30	100	100	100				100	100	100	N/A	N/A	N/A	
я d d	Jul	96	96	99	1	1	1	+ 99	+ 99	+ 99	97	97	98	
8 in m	Aug 1-15	82	71	73	4	4	4	98	97	98	91	91	94	
Å Å	Aug 16-31	71	68	74	4	5	4	96	96	97	87	87	89	
102	Sep	88	82	76	4	5	4	99	98	97	92	89	87	
43	Oct	76	72	68	5	5	5	96	94	92	82	78	76	
	SUBTOTAL	73	71	71	11	11	11	95	95	95	86	86	86	

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Oct = 31 days, etc.).

Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.
 Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.

Salem Mainstem Pct of Vol Goal Achieved (Target Shortage Days)

Abundant Water Years

June 16-30 July

No Action Ex

Salem Mainstem Pct of Vol Goal Achieved (Target Shortage Days) Adequate Water Years

July

Base Year 2020 No Action Expected 2070 ARP Expected 2070

Salem Mainstem Pct of Vol Goal Achieved (Target Shortage Days)

Insufficient Water Years

Base Year 2020 No Action Expected 2070 ARP Expected 2070

Deficit Water Years

July

Base Year 2020 No Action Expected 2070 ARP Expected 2070

tem Pct of Vol Goal Achieved (Target Shortage Days)

August 1-15 August 16-31

May June 1-15

Base Year 2020

June 1-15 June 16-30

May June 1-15 June 16-30 July August 1-15 August 16-31 Septembe

May

June 1-15 June 16-30

Salem

August August 1-15 16-31

cted 2070 ARP Expected 2070

Septe



Figure 1A: Salem BiOp Mainstem Flow Objective Performance: Expected Diversions

Octobe

August August September 1-15 16-31

6.2 Salem Mainstem Flow Objective Performance – Peak Diversions

Table 6C provides summary metrics for the modeled Salem mainstem BiOp flow objective performance for Baseline Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent **more** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 6C shows the following differences as a percent of target water volume provided for each of the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit no notable difference.

Table 6C:Salem Mainstem Flow Objective Performance Summary:
Peak Diversions

		No	
	Base Year 2020	Action 2070	ARP 2070
Abundant Years (9,416 simulated days)		2010	
Percent of Simulated Days Flow Objective Met	98	98	98
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	96	96	96
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	88	87	87
Percent of Volume Met Over All Simulated Days	99	99	99
Percent of Volume Met Over Missed Objective Days	93	92	92
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	78	77	77
Percent of Volume Met Over All Simulated Days	97	97	97
Percent of Volume Met Over Missed Objective Days	90	89	88
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	73	71	70
Percent of Volume Met Over All Simulated Days	95	95	95
Percent of Volume Met Over Missed Objective Days	86	86	85

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 6D and Figure 1B provide additional details and a graphic representation of select table data to aid in interpretation.

Table 6D: S	Salem Mainstem Flow (Objective Performance	Detail:	Peak Diversions
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WY	Devied	Pct Days Flow Objective Met ^{1, 2}			No. Yea Flow	ars With a Objective	Missed Day ³	Pct Volu	ime Goal <i>I</i> All Days) ¹	Achieved	Pct Volu (M	ime Goal / issed Day	Achieved /s) ⁴
Туре	Period	BY	NA	ARP	BY	NA	ARP	BY	NĂ	ARP	BY	NA	ARP
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	96	96	96	20	22	22	+ 99	+ 99	+ 99	98	98	98
	Мау	99	99	99	8	9	9	+ 99	+ 99	+ 99	98	99	99
rs /s	Jun 1-15	93	92	93	18	20	18	99	99	99	92	92	91
da da	Jun 16-30	98	97	99	8	9	6	+ 99	+ 99	+ 99	98	99	98
z da	Jul	+ 99	100	100	1			+ 99	100	100	98	N/A	N/A
air si	Aug 1-15	+ 99	+ 99	100	1	1		+ 99	+ 99	100	99	99	N/A
of	Aug 16-31	99	99	100	6	2		+ 99	+ 99	100	99	98	N/A
A 4 4	Sep	99	99	98	5	4	3	+ 99	+ 99	+ 99	96	97	96
04	Oct	99	97	96	3	3	3	+ 99	+ 99	+ 99	96	95	95
	SUBTOTAL	98	98	98	34	33	31	+ 99	+ 99	+ 99	96	96	96
	Apr	78	78	79	13	13	13	99	99	99	93	93	93
ອັດເບ	Мау	70	70	70	14	14	14	98	98	98	93	92	92
lay eai	Jun 1-15	60	60	60	8	8	8	96	95	96	89	89	90
р р р	Jun 16-30	95	96	98	5	5	4	+ 99	+ 99	+ 99	98	97	98
8 ii g	Jul	100	100	100				100	100	100	N/A	N/A	N/A
A °°€	Aug 1-15	100	100	100				100	100	100	N/A	N/A	N/A
299 14 (Aug 16-31	90	94	98	4	3	2	+ 99	+ 99	+ 99	99	97	99
	Sep	97	91	96	7	6	3	+ 99	+ 99	+ 99	98	98	92
	Oct	97	94	87	1	2	4	+ 99	+ 99	99	92	93	94
	SUBTOTAL	88	87	87	14	14	14	99	99	99	93	92	92
	Apr	74	76	76	11	11	11	98	98	98	94	94	94
	May	43	44	45	11	11	11	93	93	93	88	88	88
rs <u></u>	Jun 1-15	42	41	46	10	10	10	94	93	94	89	89	90
ea	Jun 16-30	94	93	99	2	2	2	+ 99	+ 99	+ 99	98	98	99
Ă u Ci	Jul	100	100	100				100	100	100	N/A	N/A	N/A
ifi is 8	Aug 1-15	100	100	98			1	100	100	+ 99	N/A	N/A	92
of St	Aug 16-31	84	78	78	4	4	3	98	97	98	90	86	90
-18 -18	Sep	88	85	85	4	3	2	99	98	98	91	90	85
40	Oct	80	81	76	3	3	5	98	96	93	90	77	71
	SUBTOTAL	78	77	77	11	11	11	97	97	97	90	89	88
	Apr	69	69	68	11	11	11	96	97	96	89	89	89
	May	38	38	38	11	11	11	90	90	90	84	84	84
δõ	Jun 1-15	44	46	50	11	10	9	93	93	94	88	88	89
ay	Jun 16-30	100	100	100				100	100	100	N/A	N/A	N/A
Şд	Jul	96	96	99	1	1	2	+ 99	+ 99	+ 99	97	97	99
80 iiu	Aug 1-15	82	68	75	4	4	4	98	97	99	91	91	95
å4°ž	Aug 16-31	71	65	71	4	5	5	96	96	97	87	88	90
1.5	Sep	88	79	70	4	5	5	99	98	95	92	89	83
46	Oct	76	73	67	5	5	5	96	94	91	82	76	72
	SUBTOTAL	73	71	70	11	11	11	95	95	95	86	86	85

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Oct = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Figure 1B: Salem BiOp Mainstem Flow Objective Performance: Peak Diversions

BiOp Flow Objective Performance of the No Action Alternative and Agency Recommended Plan Septembe

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7 Salem Mainstem Flow Objective at Willamette Falls Performance

7.1 Salem Mainstem Flow Objective Performance at Will Falls – Expected Diversions

Table 7A provides summary metrics for the modeled Salem mainstem BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070 at Willamette Falls. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent **fewer** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 7A shows the following differences between the No Action Plan and the ARP for flow objective water volume provided across the water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit no notable difference.

Table 7A:Salem Mainstem Flow Objective Performance Summary at Will Falls:
Expected Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	+ 99	+ 99	99
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	94	94	94
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	96	96	96
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	93	93	93
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	89	87	87
Percent of Volume Met Over All Simulated Days	99	99	99
Percent of Volume Met Over Missed Objective Days	93	92	91
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	86	83	82
Percent of Volume Met Over All Simulated Days	98	98	98
Percent of Volume Met Over Missed Objective Days	89	88	88

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 7B and Figure 2A provide additional details and a graphic representation of select table data to aid in interpretation.

WY	Y		Pct Days Flow Objective Met ^{1, 2}			No. Years With a Missed Flow Objective Day ³			ume Goal <i>A</i> All Days) ¹	Achieved	Pct Volume Goal Achieved (Missed Days) ⁴		
Туре	Period	BY	NA	ARP	BY	NA	ARP	BY	NÁ	ARP	BY	NA	ARP
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May	100	100	100				100	100	100	N/A	N/A	N/A
ς s	Jun 1-15	97	97	97	3	4	4	+ 99	+ 99	+ 99	93	92	92
al a)	Jun 16-30	100	100	+ 99			1	100	100	+ 99	N/A	N/A	+ 99
χ, da	Jul	100	100	100				100	100	100	N/A	N/A	N/A
ain 80	Aug 1-15	100	100	+ 99			2	100	100	+ 99	N/A	N/A	99
ofen	Aug 16-31	100	+ 99	+ 99		1	2	100	+ 99	+ 99	N/A	+ 99	+ 99
₹ 44	Sep	+ 99	100	99	2		4	+ 99	100	+ 99	98	N/A	97
94	Oct	+ 99	99	99	1	2	1	+ 99	+ 99	+ 99	99	98	98
	SUBTOTAL	+ 99	+ 99	99	4	5	9	+ 99	+ 99	+ 99	94	94	94
	Apr	99	99	99	1	1	1	+ 99	+ 99	+ 99	93	93	93
ຍູທູທ	May	92	92	92	4	4	4	99	99	99	91	90	90
lay ar	Jun 1-15	73	72	72	6	6	6	99	98	98	95	94	94
P P P	Jun 16-30	100	100	100				100	100	100	N/A	N/A	N/A
8 8 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9	Jul	100	100	100				100	100	100	N/A	N/A	N/A
A S C	Aug 1-15	100	100	100				100	100	100	N/A	N/A	N/A
299(Aug 16-31	98	97	96	2	2	3	+ 99	+ 99	+ 99	98	98	97
	Sep	+ 99	98	+ 99	2	3	1	+ 99	+ 99	+ 99	96	98	94
	Oct	98	98	97	1	2	3	+ 99	+ 99	+ 99	95	98	97
	SUBTOTAL	96	96	96	7	8	7	+ 99	+ 99	+ 99	93	93	93
	Apr	96	96	96	3	3	3	+ 99	+ 99	+ 99	96	97	97
	May	72	70	69	8	8	8	98	98	98	92	92	92
t Irs	Jun 1-15	68	66	69	5	6	5	98	97	97	93	92	92
ea	Jun 16-30	100	99	100		1		100	+ 99	100	N/A	99	N/A
	JUI	100	100	100				100	100	100	N/A	N/A	N/A
fi is 8	Aug 1-15	100	100	99		•	1	100	100	+ 99	N/A	N/A	96
o Z S	Aug 16-31	90	81	80	2	3	3	99	98	98	90	89	88
1 <u>%</u> 1	Sep	92	88	87	3	3	2	99	99	99	93	92	91
		88	83	80	3	3	3	99	98	97	93	80	83
	SUBIUIAL	89	87	<u>8/</u>	8	9	8	99	99	99	93	92	91
	Apr	93	93	93		1	1	99	99	99	00	00	00
	lup 1 15	74	72	72	1	1	1	90	90	90	00	01	07
rs S	Jun 16 20	100	100	100	4	4	4	90	90	90	91	91	92
ay ear	Juli 10-30	100	100	100	1	1	1	100	100	100	IN/A	N/A	IN/A
ž gi		99	99 74	99		1	1	+ 99	+ 99	+ 99	99	97	99
efi 80	Aug 16 31	0/ 75	74	/4 73	3	4	4	99	90	99	94	94	90
0 <u>4</u> 2	Son	02	12	70	4	4	4	+ 00	97	91	90	00	90
1.35	Oct	92	00 70	79 75	4	4	4	- 99 07	99	90	94	9Z 92	90
210	SUBTOTAL	86	83	82	7	7	7	98	98	98	89	88	88

Table 7B: Salem Mainstem Flow Objective Performance at Willamette Falls Detail: Expected Diversions

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Oct = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.

August August 1-15 16-31

August 1-15 August 16-31

August 1-15 August 16-31 Septembe

Septe





BiOp Flow Objective Performance of the No Action Alternative and Agency Recommended Plan Octobe

August August September 1-15 16-31

7.2 Salem Mainstem Flow Objective Performance at Will Falls – Peak Diversions

Table 7C provides summary metrics for the modeled Salem mainstem BiOp flow objective performance for Baseline Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: one percent fewer flow objective days met under the ARP;
- Insufficient one percent fewer flow objective days met under the ARP; and
- Deficit three percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 7C shows the following differences as a percent of target water volume provided for each of the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient one percent less water provided under the ARP; and
- Deficit one percent less water provided under the ARP.

Table 7C:Salem Mainstem Flow Objective Performance Summary at Will Falls:Peak Diversions

	No						
	Base Year	Action	ARP				
	2020	2070	2070				
Abundant Years (9,416 simulated days)							
Percent of Simulated Days Flow Objective Met	+ 99	99	99				
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99				
Percent of Volume Met Over Missed Objective Days	94	94	95				
Adequate Years (2,996 simulated days)							
Percent of Simulated Days Flow Objective Met	96	96	95				
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99				
Percent of Volume Met Over Missed Objective Days	93	93	93				
Insufficient Years (2,354 simulated days)							
Percent of Simulated Days Flow Objective Met	89	87	86				
Percent of Volume Met Over All Simulated Days	99	99	98				
Percent of Volume Met Over Missed Objective Days	93	91	89				
Deficit Years (2,354 simulated days)							
Percent of Simulated Days Flow Objective Met	86	83	80				
Percent of Volume Met Over All Simulated Days	98	98	97				
Percent of Volume Met Over Missed Objective Days	89	88	87				

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 7D and Figure 2B provide additional details and a graphic representation of select table data to aid in interpretation.

WY	WY Bariad		Pct Days Flow Objective Met ^{1, 2}			No. Years With a Missed Flow Objective Day ³			ume Goal <i>A</i> All Days) ¹	Achieved	Pct Volu (Mi	Pct Volume Goal Achieved (Missed Days) ⁴		
Туре	Period	BY	NA	ARP	BY	NA	ARP	BY	NA	ARP	BY	NA	ARP	
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070	
	Apr	100	100	100				100	100	100	N/A	N/A	N/A	
		100	100	100	2	4	4	100	100	100	N/A	N/A	N/A	
, irs	Jun 1-15	97	97	97	3	4	4	+ 99	+ 99	+ 99	93	92	91	
da	Jun 16-30	100	100	+ 99			1	100	100	+ 99	N/A	N/A	98	
ğεŚ		100	100	100		4	4	100	100	100	N/A	N/A	N/A	
uri 8.	Aug 1-15	100	+ 99	+ 99		1	1	100	+ 99	+ 99	N/A	99	97	
df 61 of	Aug 10-31	100	99	90	2	1	5	100	+ 99	+ 99	IN/A	99	99	
, 84	Sep	+ 99	99	90	2	3	3	+ 99	+ 99	+ 99	90	99	97	
		+ 99	99	90	4	E		+ 99	+ 99	+ 99	99	97	97	
	Apr	+ 99	99	33	4	1	1	+ 99	+ 99	+ 99	94	94 03	93	
	Api May	99	99	99	1	1	1	+ 99	+ 99	+ 99	93	93	93	
ys Irs	lup 1-15	92 73	92 70	92 71	4	4	4	99	99	99	91	90	90	
da Vea	Jun 16-30	100	100	100	0	0	0	100	100	100	93 Ν/Δ	93 N/A	93 N/A	
o a e o		100	100	100				100	100	100	N/A	N/A	N/A	
Ad 8	Δug 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
0	Aug 16-31	98	03	94	2	3	3	+ 99	+ 99	+ 99	98	08	97	
29 <u>(</u> 14	Sen	+ 99	98	97	2	2	3	+ 99	+ 99	+ 99	96	97	91	
	Oct	98	97	94	1	2	3	+ 99	+ 99	+ 99	95	95	96	
	SUBTOTAL	96	96	95	7	7	7	+ 99	+ 99	+ 99	93	93	93	
	Apr	96	96	96	3	3	3	+ 99	+ 99	+ 99	96	97	97	
	May	72	69	69	8	8	8	98	98	98	92	92	92	
ŚŚ	Jun 1-15	68	67	67	5	6	5	98	97	97	93	92	92	
ägart	Jun 16-30	100	99	100		1		100	+ 99	100	N/A	99	N/A	
ye d	Jul	100	100	100				100	100	100	N/A	N/A	N/A	
i i i i i i i i i i i i i i i i i i i	Aug 1-15	100	100	98			1	100	100	+ 99	N/A	N/A	88	
sut of 8	Aug 16-31	90	80	77	2	3	3	99	97	97	90	87	88	
1 32 1	Sep	92	88	86	3	3	2	99	99	98	93	91	87	
Чт	Oct	88	82	79	3	3	3	99	97	95	93	84	74	
	SUBTOTAL	89	87	86	8	9	8	99	99	98	93	91	89	
	Apr	93	93	93	1	1	1	99	99	99	88	88	88	
	May	67	67	67	7	7	7	96	96	96	88	87	87	
s s	Jun 1-15	74	73	73	4	4	4	98	98	98	91	91	92	
ara	Jun 16-30	100	100	100				100	100	100	N/A	N/A	N/A	
ž d Š	Jul	99	99	98	1	1	3	+ 99	+ 99	+ 99	99	96	98	
S i j j	Aug 1-15	87	72	70	3	4	4	99	98	98	94	93	94	
å t s	Aug 16-31	75	72	69	4	4	5	97	97	96	90	87	89	
10	Sep	92	85	72	4	4	5	+ 99	99	96	94	91	85	
43	Oct	82	78	72	4	5	5	97	96	94	86	81	77	
	SUBTOTAL	86	83	80	7	7	7	98	98	97	89	88	87	

Table 7D: Salem Mainstem Flow Objective Performance at Willamette Falls Detail: Peak Diversions

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Oct = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.

Pct Volume Goal Achieved (Missed Days)

ARP 2070







No Action Peak 2070 ARP Peak 2070

Salem Mainstem Pct of Vol Goal Achieved at W. Falls (Targ Short Days) Abundant Water Years 90% 80% 70% 60% 50% 40% 30% 20% 10% 0% June 16-30 July August August 1-15 16-31 May June 1-15 Septe Base Year 2020 No Ac on Peak 2070 ARP Peak 2070 Salem Mainstem Pct of Vol Goal Achieved at W. Falls (Targ Short Days) Adequate Water Years 90% 80% 70% 60% 50%







BiOp Flow Objective Performance of the No Action Alternative and Agency Recommended Plan

8 Albany Mainstem Flow Objective Performance

8.1 Albany Mainstem Flow Objective Performance – Expected Diversions

Table 8A provides summary metrics for the modeled Albany mainstem BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: no notable difference;
- Adequate: two percent **more** flow objective days met under the ARP;
- Insufficient two percent more flow objective days met under the ARP; and
- Deficit no notable difference.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 8A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit no notable difference.

Table 8A:Albany Mainstem Flow Objective Performance Summary:
Expected Diversions

	No					
	Base Year	Action	ARP 2070			
Abundant Years (9,416 simulated days)	2020	2070	2010			
Percent of Simulated Days Flow Objective Met	97	98	98			
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99			
Percent of Volume Met Over Missed Objective Days	97	94	95			
Adequate Years (2,996 simulated days)						
Percent of Simulated Days Flow Objective Met	89	88	90			
Percent of Volume Met Over All Simulated Days	+ 99	99	99			
Percent of Volume Met Over Missed Objective Days	96	94	94			
Insufficient Years (2,354 simulated days)						
Percent of Simulated Days Flow Objective Met	78	79	81			
Percent of Volume Met Over All Simulated Days	97	96	96			
Percent of Volume Met Over Missed Objective Days	87	83	81			
Deficit Years (2,354 simulated days)						
Percent of Simulated Days Flow Objective Met	73	70	70			
Percent of Volume Met Over All Simulated Days	95	94	94			
Percent of Volume Met Over Missed Objective Days	81	79	79			

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 8B and Figure 3A provide additional details and a graphic representation of select table data to aid in interpretation.

		Pct Days			No. Years With a Missed			Pct Volu	ıme Goal A	Achieved	Pct Volume Goal Achieved			
WY Type	Period	Flow Objective Met 1, 2		Flow	Objective	Day ³	(All Days) ^{1, 2}			(Missed Days) ⁴				
		BY	NA	ARP	BY	ŇA	ARP	BY	NÁ	ARP	BY	NA	ARP	
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070	
	Apr													
	May													
S S	Jun 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
ht ag	Jun 16-30	100	100	100				100	100	100	N/A	N/A	N/A	
λu α	Jul	97	99	+ 99	9	7	3	+ 99	+ 99	+ 99	97	99	97	
ain 80	Aug 1-15	92	94	95	21	17	21	+ 99	+ 99	+ 99	97	96	97	
of	Aug 16-31	98	98	98	5	5	3	+ 99	+ 99	+ 99	99	97	99	
4 44	Sep	97	97	97	8	6	4	+ 99	+ 99	+ 99	96	96	95	
94	Oct	98	97	97	2	2	2	+ 99	+ 99	+ 99	95	88	91	
	SUBTOTAL	97	98	98	28	26	26	+ 99	+ 99	+ 99	97	94	95	
	Apr													
rs /s	May	400	100	100				400	100	400				
lay eal	Jun 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	Jun 16-30	100	100	100	4	4		100	100	100	N/A	N/A	N/A	
80 sin		+ 99	+ 99	100	1	1	7	+ 99	+ 99	100	+ 99	+ 99	N/A	
و ق	Aug 1-15	63	12	80	13	12	1	+ 99	+ 99	+ 99	99	99	99	
4 99	Aug 16-31	80	87	92	8	5	0	+ 99	+ 99	+ 99	98	98	98	
42	Sep	11	13	/0	11	11	9	99	99	99	90	95	97	
		93	00	00	3	3	3	99	90	90	C0	00	CO	
	Anr	09	00	30	14	14		+ 33	33	33	30	34	54	
	May													
<i>(</i>) ()	Jun 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
ar a g	Jun 16-30	99	99	100	1	1		+ 99	+ 99	100	+ 99	+ 99	N/A	
ye d	Jul	74	80	89	5	6	4	99	99	+ 99	96	97	97	
iji ji ji	Aug 1-15	79	85	85	4	4	4	99	99	99	97	95	93	
fs ts	Aug 16-31	68	65	64	7	7	5	96	94	93	86	82	82	
1 o 22	Sep	65	64	64	6	6	7	93	93	93	80	80	81	
-85	Oct	77	76	77	3	6	4	96	93	92	80	72	68	
	SUBTOTAL	78	79	81	9	10	10	97	96	96	87	83	81	
	Apr													
	May													
s s	Jun 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
ay	Jun 16-30	100	100	100				100	100	100	N/A	N/A	N/A	
, d сi	Jul	87	87	88	2	2	5	99	99	+ 99	93	93	96	
80 sin	Aug 1-15	59	57	55	7	5	5	95	93	95	88	85	88	
Å ⁴ S	Aug 16-31	55	53	55	5	6	5	91	91	92	79	80	83	
35	Sep	58	52	50	7	7	7	91	89	88	80	78	77	
16	Oct	62	59	58	6	6	6	91	89	88	77	74	70	
	SUBTOTAL	73	70	70	9	7	7	95	94	94	81	79	79	

Table 8B: Albany Mainstem Flow Objective Performance Detail: Expected Diversions

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Oct = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.

ARP 2070



Figure 3A: Albany Mainstem Flow Objective Performance: Expected Diversions



8.2 Albany Mainstem Flow Objective Performance – Peak Diversions

Table 8C provides summary metrics for the modeled Albany mainstem BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: three percent more flow objective days met under the ARP;
- Insufficient two percent **more** flow objective days met under the ARP; and
- Deficit no notable difference.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 8C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent less water provided under the ARP.

Table 8C:Albany Mainstem Flow Objective Performance Summary:
Peak Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	97	98	98
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	97	95	93
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	89	87	90
Percent of Volume Met Over All Simulated Days	+ 99	99	99
Percent of Volume Met Over Missed Objective Days	96	94	93
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	78	78	80
Percent of Volume Met Over All Simulated Days	97	96	96
Percent of Volume Met Over Missed Objective Days	87	82	78
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	73	69	69
Percent of Volume Met Over All Simulated Days	95	94	93
Percent of Volume Met Over Missed Objective Days	81	79	78

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 8D and Figure 3B provide additional details and a graphic representation of select table data to aid in interpretation.

	Period	Pct Days Flow Objective Met ^{1, 2}		No. Years With a Missed			Pct Volume Goal Achieved			Pct Volume Goal Achieved			
WY Type				Flow	Objective	Day ³	(All Days) ¹	, 2	(Missed Days) ⁴			
		BY	NA	ARP	BY	NA	ARP	BY	NA	ARP	BY	NA	ARP
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr												
(0 , (0)	lun 1-15	100	100	100				100	100	100	ΝΙ/Δ	Ν/Δ	NI/A
ars a	Jun 16-30	100	100	100				100	100	100	N/A	N/A	N/A
yê di	Jul	97	99	100	9	7		+ 99	+ 99	100	97	99	N/A
<u>P</u>	Aug 1-15	92	95	97	21	15	13	+ 99	+ 99	+ 99	97	98	99
ou S S of 8	Aug 16-31	98	98	+ 99	5	6	1	+ 99	+ 99	+ 99	99	98	99
A#	Sep	97	96	97	8	7	6	+ 99	+ 99	+ 99	96	95	95
94	Oct	98	97	97	2	3	3	+ 99	+ 99	+ 99	95	89	90
	SUBTOTAL	97	98	98	28	25	17	+ 99	+ 99	+ 99	97	95	93
	Apr												
∕s rs	May	100	100	100				100	100	100	N1/A	N1/A	N1/A
ua Jay ea	Jun 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Juli 10-30	+ 00	+ 99	100	1	1		+ 99	+ 99	100	+ 00	+ 00	N/A N/A
air 80	Aug 1-15	63	68	84	13	11	9	+ 99	99	+ 99	99	98	99
႖ီစွင်	Aug 16-31	86	87	95	8	5	5	+ 99	+ 99	+ 99	98	98	98
14 29	Sep	77	73	79	11	11	10	99	98	99	96	94	95
	Oct	93	87	83	3	4	4	99	98	98	85	84	88
	SUBTOTAL	89	87	90	14	14	13	+ 99	99	99	96	94	93
	Apr												
	May	100	100	100				400	100	100	N1/A	N1/A	N1/A
ars ars	Jun 1-15	100	100	100	1	1		100	100	100	N/A	N/A	N/A
da /ea	Juli 10-30	99 74	99	100	5	6	2	+ 99	+ 99	+ 00	+ 99	+ 99	N/A 07
<u>S</u> EC		74	81	92 70	5 4	0	2	99	99	+ 99 Q8	90	97	97 80
fai si 18	Aug 16-31	68	65	63	7	6	5	96	93	93	86	81	82
54 0	Sep	65	64	65	6	6	6	93	93	93	80	79	80
-13-	Oct	77	76	73	3	6	4	96	92	90	80	69	64
	SUBTOTAL	78	78	80	9	10	9	97	96	96	87	82	78
	Apr												
	May	400	100	100				400	400	100			
rs /s	Jun 1-15	100	100	100				100	100	100	N/A	N/A	N/A
t day eai	Jun 16-30	100	100	100	0	0	E	100	100	100	N/A	N/A	N/A
		07 59	00 55	09 55	27	ა 5	ວ 5	99	03 99	99 95	93	93 84	90 80
efi sir 80	Aug 16-31	55	53	54	5	6	6	93	90	93	79	79	83
<u>و ۲</u> ۵	Sep	58	50	46	7	8	8	91	88	86	80	77	75
11	Oct	62	57	55	6	7	8	91	89	86	77	74	70
	SUBTOTAL	73	69	69	9	8	8	95	94	93	81	79	78

 Table 8D:
 Albany Mainstem Flow Objective Performance Detail: Peak Diversions

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Oct = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.

Pct Volume Goal Achieved (Missed Days)

Albany Mainstem Pct of Vol Goal Achieved (Target Shortage Days)





Figure 3B: Albany Mainstem Flow Objective Performance: Peak Diversions



9 Big Cliff

9.1 Big Cliff Reservoir - Tributary Flow Objective Performance – Expected Diversions

Table 9A provides summary metrics for the modeled Big Cliff Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent **fewer** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 9A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent less water provided under the ARP.

Table 9A:Big Cliff Tributary Flow Objective Performance Summary:
Expected Diversions

	No					
	Base Year	Action	ARP			
	2020	2070	2070			
Abundant Years (9,416 simulated days)						
Percent of Simulated Days Flow Objective Met	+ 99	+ 99	+ 99			
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99			
Percent of Volume Met Over Missed Objective Days	65	66	68			
Adequate Years (2,996 simulated days)						
Percent of Simulated Days Flow Objective Met	+ 99	+ 99	+ 99			
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99			
Percent of Volume Met Over Missed Objective Days	78	75	71			
Insufficient Years (2,354 simulated days)						
Percent of Simulated Days Flow Objective Met	97	97	97			
Percent of Volume Met Over All Simulated Days	99	99	99			
Percent of Volume Met Over Missed Objective Days	71	68	67			
Deficit Years (2,354 simulated days)						
Percent of Simulated Days Flow Objective Met	88	86	85			
Percent of Volume Met Over All Simulated Days	95	95	94			
Percent of Volume Met Over Missed Objective Days	66	64	63			

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 9B and Figure 4A provide additional details and a graphic representation of select table data to aid in interpretation.

	Period	Pct Davs		No. Years With a Missed			Pct Volu	ume Goal A	chieved	Pct Volume Goal Achieved			
WY		Flow	Obiective	Met ^{1, 2}	Flow	Objective	Dav ³	(All Davs) ^{1,}	2	(Missed Days) ⁴		
Туре		BY	NA	ARP	BY	NA	ARP	BY	NA	ARP	BY	NA	ARP
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
-	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
δõ	June	100	100	100				100	100	100	N/A	N/A	N/A
ar a ja	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ye da	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aua	100	100	100				100	100	100	N/A	N/A	N/A
bu bu bf	Sep	98	98	99	27	21	15	99	99	+ 99	65	63	69
∀ ⁴ ⁴ ⁴	Oct 1-15	99	99	99	8	5	7	+ 99	+ 99	+ 99	65	65	62
94	Oct 16-31	+ 99	99	99	3	7	6	+ 99	+ 99	+ 99	64	77	74
	SUBTOTAL	+ 99	+ 99	+ 99	37	32	27	+ 99	+ 99	+ 99	65	66	68
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ys rs	June	100	100	100				100	100	100	N/A	N/A	N/A
equate sim day 80 yea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aug	100	100	100				100	100	100	N/A	N/A	N/A
ologia	Sep	99	99	+ 99	5	3	1	+ 99	+ 99	+ 99	78	73	56
464	Oct 1-15	99	99	99	3	3	2	+ 99	+ 99	+ 99	77	83	79
40	Oct 16-31	99	+ 99	100	3	1		+ 99	+ 99	100	79	51	N/A
	SUBTOTAL	+ 99	+ 99	+ 99	11	7	3	+ 99	+ 99	+ 99	78	75	71
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
irs Irs	June	100	100	100				100	100	100	N/A	N/A	N/A
ea ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
<u>o a ci</u>	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
isi 8	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of 53	Sep	91	91	90	1	2	2	98	98	98	80	82	84
133 ⁻¹	Oct 1-15	90	85	81	2	2	3	98	95	93	80	67	61
	Oct 16-31	91	91	90	1	1	2	95	95	94	40	40	42
	SUBIUIAL	9/	<u>97</u>	97	2	3	4	100	<u>99</u>	99	/1 N/A	68 NI/A	67 NI/A
	Api May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ŚŚ	lune	100	100	100				100	100	100	N/A	N/A	N/A
ay	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
¥ þ s	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ы ы ш	Aug	94	92	91	1	1	1	97	96	96	57	56	55
f ² C	Sen	59	55	52	5	5	6	88	87	86	71	71	71
10	Oct 1-15	54	42	32	6	8	9	83	77	71	64	59	57
Ч'n	Oct 16-31	66	66	66	5	5	5	85	85	85	57	56	56
	SUBTOTAL	88	86	85	6	8	9	95	95	94	66	64	63

 Table 9B:
 Big Cliff Tributary Flow Objective Performance Detail: Expected Diversions

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.
Pct Volume Goal Achieved (Missed Days)

Big Cliff Tributary Pct of Vol Goal Achieved (Target Shortage Days)

Abundant Water Years

Octobe 1-15 Octobe 16-31

October 1-15 October 16-31

October 1-15 October 16-31

ARP Expected 2070

80%

70%

60%

50%

40% 30%

20%

10% 0%

90% 80%

70%

60%

50%

40%

30%

20%

10%

0%

70%

60%

50%

40%

30%

20%

10%

0%

90%

80%

70%

60%

50%

40%

30% 20%

10% 0% May 16-31

May May 1-15 16-31

Base Year 2020

May May 1-15 16-31

May 1-15 May 16-31 June

ear 2020

June July 1-15 July 16-31

June

June

Base Year 2020 No Action Expected 2070

No Action Expe

No Action Expe

Big Cliff Tributary Pct of Vol Goal Achieved (Target Shortage Days)

Adequate Water Years

July July 1-15 16-31

Big Cliff Tributary Pct of Vol Goal Achieved (Target Shortage Days)

Insufficient Water Years

July July 1-15 16-31

July July 1-15 16-31

Base Year 2020 No Action Expected 2070 ARP Expected 2070 Big Cliff Tributary Pct of Vol Goal Achieved (Target Shortage Days)

Deficit Water Years

August

ted 2070 ARP Expected 2070

August

August

ARP Expected 2070

ed 2070

May 1-15



Figure 4A: Big Cliff Tributary Flow Objective Performance: Expected Diversions

Base Year 2020 No Action Expected 2070 ARP Expected 2070

BiOp Flow Objective Performance of the No Action Alternative and Agency Recommended Plan

Base Year 2020 No Action Expected 2070 ARP Expected 2070

(

October 1-15 Octobe 16-31

9.2 Big Cliff Reservoir - Tributary Flow Objective Performance – Peak Diversions

Table 9C provides summary metrics for the modeled Big Cliff Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient two percent fewer flow objective days met under the ARP; and
- Deficit five percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 9C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient one percent less water provided under the ARP; and
- Deficit two percent less water provided under the ARP.

Table 9CBig Cliff Tributary Flow Objective Performance Summary
Peak Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	+ 99	+ 99	+ 99
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	65	69	70
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	+ 99	+ 99	+ 99
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	78	78	87
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	97	97	95
Percent of Volume Met Over All Simulated Days	99	99	98
Percent of Volume Met Over Missed Objective Days	71	67	66
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	88	85	80
Percent of Volume Met Over All Simulated Days	95	94	92
Percent of Volume Met Over Missed Objective Days	66	63	63

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 9D and Figure 4B provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ume Goal A	Achieved	Pct Volu	ıme Goal /	Achieved
WY - Period		Flow	Objective	Met ^{1, 2}	Flow	Objective	Dav ³	(All Davs) ¹	, 2	(M	issed Dav	(s) ⁴
Type	Period	BY	NΔ	ARP	BY	NΔ		BY	<u>ΝΔ</u>	ARP	BY		
1900		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	100	100	100				100	100	100	N/A	N/A	 N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
δõ	June	100	100	100				100	100	100	N/A	N/A	N/A
ar lay	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ye da	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ŭ i i ĝ	Aua	100	100	100				100	100	100	N/A	N/A	N/A
pu 95 Se	Sep	98	99	99	27	15	8	99	+ 99	+ 99	65	70	71
₹ 4	Oct 1-15	99	99	99	8	9	6	+ 99	+ 99	+ 99	65	66	64
94	Oct 16-31	+ 99	99	+ 99	3	6	2	+ 99	+ 99	+ 99	64	67	86
	SUBTOTAL	+ 99	+ 99	+ 99	37	29	16	+ 99	+ 99	+ 99	65	69	70
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
/s rs	June	100	100	100				100	100	100	N/A	N/A	N/A
te Jay eal	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
y nua	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
sir 80	Aug	100	100	100				100	100	100	N/A	N/A	N/A
ofed	Sep	99	+ 99	+ 99	5	1	1	+ 99	+ 99	+ 99	78	76	93
4 64 90 €	Oct 1-15	99	99	+ 99	3	2	1	+ 99	+ 99	+ 99	77	68	83
46	Oct 16-31	99	99	+ 99	3	2	1	+ 99	+ 99	+ 99	79	93	85
	SUBTOTAL	+ 99	+ 99	+ 99	11	5	3	+ 99	+ 99	+ 99	78	78	87
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
t Irs	June	100	100	100				100	100	100	N/A	N/A	N/A
ea ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
fi is 8	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of 21st	Sep	91	90	86	1	3	2	98	98	97	80	82	76
7.81	Oct 1-15	90	82	72	2	2	4	98	93	90	80	63	66
	Oct 16-31	91	90	84	1	2	3	95	94	91	40	41	46
	SUBTOTAL	97	97	95	2	4	4	99	99	98	71	67	66
	Apr May 1 15	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	IN/A	N/A	IN/A
ω.	luno	100	100	100				100	100	100	N/A	N/A	IN/A
ara		100	100	100				100	100	100	IN/A	N/A	IN/A
ۆ ۋ ا	Jul 16 21	100	100	100			1	100	100	100	IN/A	N/A	N/A
<u>ij i j</u>	Jul 10-31	100	01	97	1	1	1	07	100	99	N/A	N/A	57
f ⊗ i	Son	94 50	53	00 40	5	6	∠ 0	91	90	90 91	5/ 71	55 71	37 60
- <u>5</u> o	Oct 1 15	59	36	40	6	U Q	0	00	00 73	64	64	57	60
11	Oct 16 31	66	30 66	59	5	0 5	7	03 85	13	04 92	57	56	57
	SUBTOTAL	88	85	80	6	8	10	95	94	92	66	63	63
			~~	~~	•	•		~~	•.		~~	~~	~~

 Table 9D:
 Big Cliff Tributary Flow Objective Performance Detail: Peak Diversions

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Big Cliff Tributary Flow Objective Performance: Peak Diversions Figure 4B



Base Year 2020 No Action Peak 2070 ARP Peak 2070



10 Blue River

10.1 Blue River Reservoir Tributary Flow Objective Performance – Expected Diversions

Table 10A provides summary metrics for the modeled Blue River Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent **fewer** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 10A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit less than one percent less water provided under the ARP.

Table 10A: Blue River Tributary Flow Objective Performance Summary:Expected Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	100	99	98
Percent of Volume Met Over All Simulated Days	100	+ 99	99
Percent of Volume Met Over Missed Objective Days	n/a	30	27

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 10B and Figure 5A provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ime Goal A	chieved	Pct Volu	ime Goal A	Achieved	
WY Devied		Flow (Objective	Met ^{1, 2}	Flow	Objective	Dav ³	(All Davs) ¹	2	(M	(Missed Days) 4		
Type	Period	BY	NΔ		BY	NΔ		BY	ΝΔ	ΔRP	BY			
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070	
-	Apr	100	100	100				100	100	100	N/A	N/A	N/A	
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
S S	June	100	100	100				100	100	100	N/A	N/A	N/A	
ar Jay	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
ye da	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
<u>n ri</u> 8	Aug	100	100	100				100	100	100	N/A	N/A	N/A	
bu bu	Sep	100	100	100				100	100	100	N/A	N/A	N/A	
₹ 4	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
94	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
	SUBTOTAL	100	100	100				100	100	100	0	0	0	
	Apr	100	100	100				100	100	100	N/A	N/A	N/A	
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
s/s	June	100	100	100				100	100	100	N/A	N/A	N/A	
lay eal	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
λ μα	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
10 ju	Aug	100	100	100				100	100	100	N/A	N/A	N/A	
d o d	Sep	100	100	100				100	100	100	N/A	N/A	N/A	
A 66 4	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
44	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
	SUBTOTAL	100	100	100				100	100	100	0	0	0	
	Apr	100	100	100				100	100	100	N/A	N/A	N/A	
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
rs ys	June	100	100	100				100	100	100	N/A	N/A	N/A	
ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
sir 1	Aug	100	100	100				100	100	100	N/A	N/A	N/A	
of St	Sep	100	100	100				100	100	100	N/A	N/A	N/A	
1351	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
20	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
	SUBTOTAL	100	100	100				100	100	100	0	0	0	
	Apr	100	100	100				100	100	100	N/A	N/A	N/A	
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
iys	June	100	100	100				100	100	100	N/A	N/A	N/A	
it ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
Ça ⊑	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A	
isi 8	Aug	100	100	100				100	100	100	N/A	N/A	N/A	
72 <u></u>	Sep	100	100	95			1	100	100	96	N/A	N/A	25	
11	UCt 1-15	100	100	91			1	100	100	93	N/A	N/A	28	
•••		100	92	92		1	1	100	94	94	N/A	30	29	
	SUBIUIAL	100	33	98				100	+ 99	33	0	30	21	

Table 10B: Blue River Tributary Flow Objective Performance Detail: Expected Diversions

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Blue River Tributary Flow Objective Performance: Expected Diversions Figure 5A:



July July 1-15 16-31

Base Year 2020 No Action Expected 2070 ARP Expected 2070

August

October 1-15



Base Year 2020 No Action Expected 2070 ARP Expected 2070

10.2 Blue River Reservoir Tributary Flow Objective Performance – Peak Diversions

Table 10C provides summary metrics for the modeled Blue River Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit two percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 10C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent less water provided under the ARP.

Table 10C: Blue River Tributary Flow Objective Performance SummaryPeak Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	100	99	97
Percent of Volume Met Over All Simulated Days	100	99	98
Percent of Volume Met Over Missed Objective Days	n/a	26	26

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 10D and Figure 5B provide additional details and a graphic representation of select table data to aid in interpretation.

				Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ime Goal A	chieved	Pct Volu	ime Goal A	Achieved
WY			Flow	Objective I	Met ^{1, 2}	Flow	Objective	Day ³	(All Davs) ^{1,}	2	(M	issed Dav	(s) ⁴
Typ	•	Period	BV			BV	NA		BV		ARP	BY		
יאני	0		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
		Apr	100	100	100		_0.0	_0.0	100	100	100	N/A	 N/A	 N/A
		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
		May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
S	Ś	June	100	100	100				100	100	100	N/A	N/A	N/A
a j	ar	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
a da	ξ	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ŭ i	8	Aug	100	100	100				100	100	100	N/A	N/A	N/A
nq Sg	ž	Sep	100	100	100				100	100	100	N/A	N/A	N/A
⋖⋤	4	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
°.	4	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
		SUBTOTAL	100	100	100				100	100	100	0	0	0
		Apr	100	100	100				100	100	100	N/A	N/A	N/A
		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
		May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s/	ຸທ	June	100	100	100				100	100	100	N/A	N/A	N/A
a) te	eal	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ua.	ž	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
<u>přič</u>	8	Aug	100	100	100				100	100	100	N/A	N/A	N/A
ٽ و و	đ	Sep	100	100	100				100	100	100	N/A	N/A	N/A
∢ 6	4	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
20	~	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
		SUBTOTAL	100	100	100				100	100	100	0	0	0
		Apr	100	100	100				100	100	100	N/A	N/A	N/A
		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
		May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ys t	ร	June	100	100	100				100	100	100	N/A	N/A	N/A
da	ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
3 2	\geq	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
변망	8	Aug	100	100	100				100	100	100	N/A	N/A	N/A
<u>م کر</u>	đ	Sep	100	100	100				100	100	100	N/A	N/A	N/A
- 8	5	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
~	、	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
		SUBTOTAL	100	100	100				100	100	100	0	0	0
		Apr	100	100	100				100	100	100	N/A	N/A	N/A
		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
		May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
Š	STR.	June	100	100	100				100	100	100	N/A	N/A	N/A
ä⊒	,e	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
in E	6	Jul 10-31	100	100	100			4	100	100	100	N/A	N/A	IN/A
si Gel	<u>∞</u>	Aug	100	100	97			1	100	100	98	N/A	N/A	23
7 ²	ō	Sep	100	100	92		1	1	100	100	94	N/A	N/A	25
53		Oct 16 21	100	90	91		1	1	100	90	90	IN/A	20	20
		SUBTOTAL	100	92	9Z		1	1	100	94	94	N/A	29	29

 Table 10D:
 Blue River Tributary Flow Objective Performance Detail:
 Peak Diversions

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Figure 5B: Blue River BiOp Tributary Flow Objective Performance: Peak Diversions



Base Year 2020 No Action Peak 2070 ARP Peak 2070



11 Cougar

11.1 Cougar Reservoir - Tributary Flow Objective Performance – Expected Diversions

Table 11A provides summary metrics for the modeled Cougar Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent **fewer** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 11A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit no notable difference.

Table 11A: Cougar Tributary Flow Objective Performance SummaryExpected Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	99	99	+ 99
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	69	71	43
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	97	97	97
Percent of Volume Met Over All Simulated Days	98	99	99
Percent of Volume Met Over Missed Objective Days	52	52	53
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	89	89	88
Percent of Volume Met Over All Simulated Days	94	94	94
Percent of Volume Met Over Missed Objective Days	46	45	45

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 11B and Figure 6A provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ume Goal A	chieved	Pct Volu	ime Goal A	Achieved
WY Pariod		Flow	Obiective	Met ^{1, 2}	Flow	Objective	Dav ³	(All Davs) ^{1,}	2	(Missed Davs) ⁴		
Type	Period	BY	NA	ARP	BY	NΔ		BY	ΝΔ	ΔRP	BY	ΝΔ	
1960		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	100	100	100				100	100	100	N/A	N/A	 N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
S S	June	100	100	100				100	100	100	N/A	N/A	N/A
ar ar	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ye da	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aug	100	100	100				100	100	100	N/A	N/A	N/A
bu bu	Sep	100	100	100				100	100	100	N/A	N/A	N/A
₹ 4	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
94	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ys rs	June	100	100	100				100	100	100	N/A	N/A	N/A
ea ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
, v o	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
80 sic	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of	Sep	100	100	100				100	100	100	N/A	N/A	N/A
4 66 4	Oct 1-15	98	97	100	1	1		+ 99	+ 99	100	89	90	N/A
46	Oct 16-31	94	94	98	2	2	1	98	98	99	63	62	43
	SUBTOTAL	99	99	+ 99	2	2	1	+ 99	+ 99	+ 99	69	71	43
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
it ys	June	100	100	100				100	100	100	N/A	N/A	N/A
ea ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
fl is 8	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of 23	Sep	97	97	98	1	1	1	98	98	99	38	41	38
1 33 L	Oct 1-15	83	87	90	3	3	2	91	93	95	49	49	48
	Oct 16-31	//	//	//	3	3	3	90	90	90	57	57	58
	SUBIUIAL	97	97	97	3	3	3	98	99	<u>99</u>	52	52	53
	Apr Mov 1 15	100	100	100				100	100	100	N/A	N/A	IN/A
	May 16-31	100	100	100				100	100	100		N/A	N/A
ŚŚ	lune	100	100	100				100	100	100		N/A	N/A
ara	Jul 1-15	100	100	100				100	100	100		N/A	N/A
Яd	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ij ij og		91	90	89	2	2	2	95	94	94	44	43	42
f 8	Sen	72	70	70	5	5	5	84	83	83	43	43	42
1 o	Oct 1-15	55	55	55	5	5	5	74	74	74	44	44	44
13	Oct 16-31	65	65	65	5	5	5	83	83	83	52	52	52
	SUBTOTAL	89	89	88	5	5	5	94	94	94	46	45	45

Table 11B:	Cougar Tributar	y Flow Objective	Performance Detail:	Expected Diversions
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1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent



Figure 6A: Cougar Tributary Flow Objective Performance: Expected Diversions

Base Year 2020 No Action Expected 2070

ARP Expected 2070



Base Year 2020 No Action Expected 2070 ARP Expected 2070

11.2 Cougar Reservoir - Tributary Flow Objective Performance – Peak Diversions

Table 11C provides summary metrics for the modeled Cougar Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: less than one percent **more** flow objective days met under the ARP;
- Insufficient no notable difference; and
- Deficit one percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 11C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient one percent more water provided under the ARP; and
- Deficit one percent less water provided under the ARP.

Table 11C: Cougar Tributary Flow Objective Performance Summary:Peak Diversions

		No	
	Base Year 2020	Action 2070	ARP 2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	99	99	+ 99
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	+ 99
Percent of Volume Met Over Missed Objective Days	69	68	45
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	97	97	97
Percent of Volume Met Over All Simulated Days	98	98	99
Percent of Volume Met Over Missed Objective Days	52	52	53
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	89	89	88
Percent of Volume Met Over All Simulated Days	94	94	93
Percent of Volume Met Over Missed Objective Days	46	44	45

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 11D and Figure 6B provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ime Goal A	chieved	Pct Volu	ime Goal A	Achieved
WY Desired		Flow	Objective	Met ^{1, 2}	Flow	Objective	Dav ³	(All Days) ^{1, 2}			(Missed Days) ⁴		
Type	Period	BY			BY	ΝΔ		BY	ΝΔ	ΔRP	BY		
Type		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	100	100	100				100	100	100	N/A	 N/A	 N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s s	June	100	100	100				100	100	100	N/A	N/A	N/A
agat	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
y d a	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ŭ i i ĝ	Aug	100	100	100				100	100	100	N/A	N/A	N/A
bu of 3	Sep	100	100	100				100	100	100	N/A	N/A	N/A
₹	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
94	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s.s	June	100	100	100				100	100	100	N/A	N/A	N/A
a la	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
та Херда	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
8 i.i.g	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of 6 de	Sep	100	100	100				100	100	100	N/A	N/A	N/A
A 99 4	Oct 1-15	98	98	100	1	1		+ 99	+ 99	100	89	89	N/A
2 10	Oct 16-31	94	94	98	2	2	1	98	98	99	63	61	45
	SUBTOTAL	99	99	+ 99	2	2	1	+ 99	+ 99	+ 99	69	68	45
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
างร	June	100	100	100				100	100	100	N/A	N/A	N/A
ant day eal	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ζ μ ci	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
sin 80	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of \$	Sep	97	96	98	1	1	1	98	98	99	38	38	41
135	Oct 1-15	83	85	88	3	3	2	91	92	94	49	48	46
42	Oct 16-31	77	77	78	3	3	3	90	90	91	57	57	59
	SUBTOTAL	97	97	97	3	3	3	98	98	99	52	52	53
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
lrs Irs	June	100	100	100				100	100	100	N/A	N/A	N/A
ea ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
² a ci	Jul 16-31	100	100	100	-	_	_	100	100	100	N/A	N/A	N/A
el sil	Aug	91	90	89	2	2	2	95	94	93	44	41	42
52 ^C	Sep	72	70	69	5	5	5	84	83	82	43	41	42
11 33	Oct 1-15	55	55	55	5	5	5	74	74	74	44	44	44
	Oct 16-31	65	65	65	5	5	5	83	83	83	52	52	52
	SUBTOTAL	89	89	88	5	5	5	94	94	93	46	44	45

Table 11D:	Cougar Tributar	y Flow Objective	Performance Detail:	Peak Diversions
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Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent
 Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).
 Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.
 Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.

ARP 2070



Figure 6B: Cougar Tributary Flow Objective Performance: Peak Diversions

Pct Volume Goal Achieved (All Days) Cougar Tributary Pct of Vol Goal Achieved (All Days) Abundant Water Years May 16-31 June July 1-15 July 16-31 1-15 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Tributary Pct of Vol Goal Achieved (All Days) Cougar ' Adequate Water Years May 16-31 June July 1-15 July 16-31 August Base Year 2020 No Action Peak 2070 ARP Peak 2070 tary Pct of Vol Goal Achieved (All Days) Insufficient Water Years June May May 1-15 16-31 July July 1-15 16-31 August October 1-15 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Cougar Tributary Pct of Vol Goal Achieved (All Days) Deficit Water Years

June

July July 1-15 16-31

August

October 1-15

Pct Volume Goal Achieved (Missed Days) Cougar Tributary Pct of Vol Goal Achieved (Target Shortage Days) Abundant Water Years 80% 70% 60% 50% 40% 30% 20% 10% 0% May 16-31 May 1-15 June July 1-15 July 16-31 October 1-15 Octobe 16-31 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Cougar Tributary Pct of Vol Goal Achieved (Target Shortage Days) Adequate Water Years 90% 80% 70% 60% 50% 40% 30% 20% 10% 0% May 1-15 May 16-31 June July July 1-15 16-31 August October 1-15 Octobe 16-31 B ase Year 2020 🔲 No Action Peak 2070 📄 ARP Peak 2070 Couga Pct of Vol Goal Achieved (Target Shortage Days) Insufficient Water Years 70% 60% 50% 40% 30% 20% 10% 0% May May 1-15 16-31 June July July 1-15 16-31 August October 1-15 October 16-31 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Cougar Tributary Pct of Vol Goal Achieved (Target Shortage Days) Deficit Water Years 100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0% May 1-15 May 16-31 June July July 1-15 16-31 August October 1-15 Octobe 16-31

Base Year 2020 No Action Peak 2070 ARP Peak 2070

12 Dexter

12.1 Dexter Reservoir - Tributary Flow Objective Performance – Expected Diversions

Table 12A provides summary metrics for the modeled Dexter Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient one percent fewer flow objective days met under the ARP; and
- Deficit two percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 12A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit one percent less water provided under the ARP.

Table 12A:Dexter Tributary Flow Objective Performance SummaryExpected Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	+ 99	99	98
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	99
Percent of Volume Met Over Missed Objective Days	75	64	54
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	97	95	93
Percent of Volume Met Over All Simulated Days	99	98	97
Percent of Volume Met Over Missed Objective Days	61	59	60

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 12B and Figure 7A provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ume Goal A	chieved	Pct Volu	ıme Goal A	Achieved
WY		Flow	Objective	Met ^{1, 2}	Flow	Objective	Dav ³	(All Davs) ¹	,2	(M	issed Dav	s) ⁴
Type	Period	BY	NΔ	ARP	BY	NΔ		BY	<u>ΝΔ</u>	ARP	BY		
1,960		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
-	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
S S	June	100	100	100				100	100	100	N/A	N/A	N/A
ar Jay	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
χ. da	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
8 ii ii	Aug	100	100	100				100	100	100	N/A	N/A	N/A
bu bu	Sep	100	100	100				100	100	100	N/A	N/A	N/A
∀ ⁴ ⁴ ⁴	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
94	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
∕s rs	June	100	100	100				100	100	100	N/A	N/A	N/A
la la ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
γ n a	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
1 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Aug	100	100	100				100	100	100	N/A	N/A	N/A
o	Sep	100	100	100				100	100	100	N/A	N/A	N/A
996 4 o	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
45	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
t rs	June	100	100	100				100	100	100	N/A	N/A	N/A
ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
SCI II	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of St	Sep	100	100	100				100	100	100	N/A	N/A	N/A
1351	Oct 1-15	100	100	89			3	100	100	94	N/A	N/A	47
20	Oct 16-31	94	82	79	2	3	3	98	94	91	75	64	57
	SUBTOTAL	+ 99	99	98	2	3	3	+ 99	+ 99	99	75	64	54
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
iys ars	June	100	100	100				100	100	100	N/A	N/A	N/A
it Ga	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
^o a ci	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ef 8(Aug	100	100	+ 99		_	1	100	100	+ 99	N/A	N/A	84
5 ² 5	Sep	94	89	82	2	2	3	98	96	93	63	65	63
11	Oct 1-15	82	76	67	2	3	4	93	90	84	60	57	51
***	Oct 16-31	86	80	66	4	4	5	95	91	88	62	56	64
	SUBTOTAL	97	95	93	4	4	5	99	98	97	61	59	60

 Table 12B:
 Dexter Tributary Flow Objective Performance Detail:
 Expected Diversions

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Figure 7A: Dexter Tributary Flow Objective Performance: Expected Diversions

1-15

ARP E

August Septembe

ARP Ex

August

August

cted 2070

October 1-15

October 1-15



12.2 Dexter Reservoir - Tributary Flow Objective Performance – Peak Diversions

Table 12C provides summary metrics for the modeled Dexter Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient three percent fewer flow objective days met under the ARP; and
- Deficit five percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 12C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient one percent less water provided under the ARP; and
- Deficit two percent less water provided under the ARP.

Table 12C: Dexter Tributary Flow Objective Performance SummaryPeak Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	+ 99	99	96
Percent of Volume Met Over All Simulated Days	+ 99	99	98
Percent of Volume Met Over Missed Objective Days	75	59	54
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	97	95	90
Percent of Volume Met Over All Simulated Days	99	98	96
Percent of Volume Met Over Missed Objective Days	61	58	61

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 12D and Figure 7B provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ime Goal A	chieved	Pct Volu	ime Goal A	Achieved
WY Type		Flow	Objective I	Met ^{1, 2}	Flow	Objective	Dav ³	(All Days) ^{1,}	2	(M	issed Dav	s) ⁴
Type	Period	BY			BY	ΝΔ		BY	ΝΔ	ARP	BY		
, ypc		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
δŇ	June	100	100	100				100	100	100	N/A	N/A	N/A
ar lay	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ye da	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aua	100	100	100				100	100	100	N/A	N/A	N/A
bu bu bf	Sep	100	100	100				100	100	100	N/A	N/A	N/A
₹	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
94	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
-	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s/s	June	100	100	100				100	100	100	N/A	N/A	N/A
te Jay	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
το μα	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
10 10 10 10 10 10 10 10 10 10 10 10 10 1	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of a g	Sep	100	100	100				100	100	100	N/A	N/A	N/A
996 4 0	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
70	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
rs SS	June	100	100	100				100	100	100	N/A	N/A	N/A
ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
sir 80	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of 5 su	Sep	100	100	98			2	100	100	99	N/A	N/A	57
135	Oct 1-15	100	99	74		2	3	100	+ 99	87	N/A	62	51
40	Oct 16-31	94	81	79	2	3	3	98	92	91	75	59	57
	SUBTOTAL	+ 99	99	96	2	3	3	+ 99	99	98	75	59	54
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
iys ars	June	100	100	100				100	100	100	N/A	N/A	N/A
it rea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
<u>s</u> a ci	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ef si 8	Aug	100	100	98			1	100	100	99	N/A	N/A	68
175°	Sep	94	88	75	2	2	5	98	96	90	63	64	60
11	Uct 1-15	82	73	55	2	4	5	93	88	80	60	57	57
	Oct 16-31	86	79	65	4	4	5	95	90	87	62	53	64
	SUBTOTAL	97	95	90	4	4	5	99	98	96	61	58	61

Table 12D:	Dexter Tributar	y Flow Objective	Performance Detail:	Peak Diversions
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Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent
 Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).
 Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.
 Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Figure 7B: Dexter BiOp Tributary Flow Objective Performance – Peak Diversions

Base Year 2020 No Action Peak 2070 ARP Peak 2070



Base Year 2020 No Action Peak 2070 ARP Peak 2070

13 Fall Creek

13.1 Fall Creek Res - Tributary Flow Objective Performance – Expected Diversions

Table 13A provides summary metrics for the modeled Fall Creek Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: no notable difference;
- Adequate: three percent fewer flow objective days met under the ARP;
- Insufficient three percent fewer flow objective days met under the ARP; and
- Deficit two percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 13A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: three percent less water provided under the ARP;
- Insufficient three percent less water provided under the ARP; and
- Deficit three percent less water provided under the ARP.

Table 13A: Fall Creek Tributary Flow Objective Performance Summary:Expected Diversions

		No	
	Base Year	Action	ARP
	2020	2070	2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	99	99	99
Percent of Volume Met Over All Simulated Days	99	99	99
Percent of Volume Met Over Missed Objective Days	23	27	34
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	98	98	95
Percent of Volume Met Over All Simulated Days	98	98	95
Percent of Volume Met Over Missed Objective Days	32	37	34
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	99	97	94
Percent of Volume Met Over All Simulated Days	+ 99	98	95
Percent of Volume Met Over Missed Objective Days	39	36	34
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	97	95	93
Percent of Volume Met Over All Simulated Days	96	94	91
Percent of Volume Met Over Missed Objective Days	9	19	17

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 13B and Figure 8A provide additional details and a graphic representation of select table data to aid in interpretation.

VY Type Period Flow Objective Met 1:2 Flow Objective Day 3 Flow Objective Day 3				Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ume Goal A	chieved	Pct Volu	ıme Goal A	Achieved
Period BY NA ARP BY NA	WY Turne Period	Flow	Objective	Met ^{1, 2}	Flow	Objective	Dav ³	(All Davs) 1	,2	(M	issed Dav	s) ⁴	
Product 2020 2070	Type	Period	BY	NA	ARP	BY	NA		BY	<u>ΝΔ</u>	ARP	BY		
Apr 100 100 100 100 100 100 100 100 100 100 NA	1900		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
May 1-15 100 100 100 100 100 100 100 N/A N/A N/A N/A step 0.08 June 100 100 100 100 100 100 N/A <		Apr	100	100	100				100	100	100	N/A	N/A	N/A
May 16.31 June 100 100 100 100 100 100 100 N/A N/A N/A Sep 0.0 Jul 16-31 100 100 100 100 100 100 100 100 N/A N/A N/A N/A Aug 100 100 100 100 100 100 100 N/A N/A N/A Sep +99 99 99 99 16 26 37 Cit 1-15 94 94 95 5 3 6 98 99 97 50 51 47 SUBTOTAL 99 99 99 99 99 23 27 34 May 1-5 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
search 100 100		May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
Jung bio	S S	June	100	100	100				100	100	100	N/A	N/A	N/A
Buil 16-31 (arg by 60 b) 0 b) 0 b) 0 b) 0 b) 0 b) 0 b) 0 b)	ar ja	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
Aug 100 100 100 100 100 NA N/A N/A Stp + 99 99 99 99 99 99 99 99 99 99 99 99 99 99 99 99 16 26 37 Substronal 99 99 99 99 99 99 99 99 99 99 99 99 23 27 34 Apr 100 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Stp 100 100 100 100 100 100 N/A N/A 1 June 100 100 100 100<	¥ Ja	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
Spip by by septimosy 065 Spip by by by by septimosy 065 Spip by b	n i i ß	Aua	100	100	100				100	100	100	N/A	N/A	N/A
V Oct 1-15 94 94 95 5 4 3 95 95 97 18 24 28 SUBTOTAL 99 99 99 99 99 99 99 99 99 99 99 99 23 27 34 Apr 100 100 100 100 100 100 N/A N/A N/A May 1-15 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A 1 27 Oct 1-51 84 81 73 3 3 4 88 84 26 33 40 Oct 1-51 84 81 73 3 3 4 98 99	e se	Sep	+ 99	98	98	1	3	2	+ 99	99	99	16	26	37
6 4 Oct 16-31 96 97 95 5 3 6 98 99 97 50 51 47 Apr 100 100 100 100 100 100 100 N/A N/A N/A May 1-15 100 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 N/A 1 27 Segme/G8 5 3 3 4 98 98 95 32 37 34 May 1-15 100 100 100	₹ 4	Oct 1-15	94	94	95	5	4	3	95	95	97	18	24	28
SUBTOTAL 99 99 99 99 99 99 23 27 34 Apr 100 100 100 100 100 100 100 N/A N/A N/A May 16-31 100 100 100 100 100 100 N/A N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Jul 1-51 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 100 N/A N/A N/A Oct 16.31 90 90 3 3 4 96 96 95 32 37 34 May 1-15 100 100 100 100	94	Oct 16-31	96	97	95	5	3	6	98	99	97	50	51	47
Apr 100 <th></th> <th>SUBTOTAL</th> <th>99</th> <th>99</th> <th>99</th> <th>7</th> <th>5</th> <th>7</th> <th>99</th> <th>99</th> <th>99</th> <th>23</th> <th>27</th> <th>34</th>		SUBTOTAL	99	99	99	7	5	7	99	99	99	23	27	34
seg May 16-31 June 100 100 100 100 100 100 100 NA NA NA June 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 NA NA <th></th> <th>Apr</th> <th>100</th> <th>100</th> <th>100</th> <th></th> <th></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th>N/A</th> <th>N/A</th> <th>N/A</th>		Apr	100	100	100				100	100	100	N/A	N/A	N/A
str May 16-31 June 100 100 100 100 100 100 100 N/A N/A N/A June June 100 100 100 100 100 100 100 100 100 100 N/A N/A N/A N/A Jul 1-15 100 100 100 100 100 100 100 N/A		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
str June 100 100 100 100 100 100 N/A N/A N/A str Jul 1-15 100 100 100 100 100 100 100 N/A N/A N/A N/A Aug 100 100 100 100 100 100 100 100 N/A N/A N/A Sep 100 100 99 90 1 3 100 97 N/A N/A 19 27 Oct 1-15 84 81 73 3 3 4 98 95 32 37 34 May 1-5 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 N/A N/A N/A		May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
argin Bin Bin Bin Bin Bin Bin Bin Bin Bin B	rs rs	June	100	100	100				100	100	100	N/A	N/A	N/A
Bit 16:31 Aug 100 100 100 100 100 100 100 100 100 97 N/A N/A 1 Sep 100 99 90 1 3 100 99 93 N/A 19 27 Oct 1:5 84 81 73 3 3 4 88 88 84 26 33 40 Oct 1:5:1 90 90 93 3 3 4 88 88 84 26 33 40 SuBTOTAL 98 98 95 3 3 4 98 95 32 37 34 May 1:5:1 100 100 100 100 100 100 N/A N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Step Ungs 50 6 6 6 7 + 99 <th>da da</th> <th>Jul 1-15</th> <th>100</th> <th>100</th> <th>100</th> <th></th> <th></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th>N/A</th> <th>N/A</th> <th>N/A</th>	da da	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
bits 0 over Aug Dot 1 100 100 97 N/A N/A 1 0 ct 1-15 Oct 1-15 84 81 73 3 3 3 3 99 93 N/A 19 27 0 ct 1-15 84 81 73 3 3 3 3 97 97 97 69 69 69 SUBTOTAL 98 98 95 3 3 4 98 98 95 32 37 34 Apr 100 100 100 100 100 100 N/A N/A N/A N/A May 16-31 100 100 100 100 100 100 N/A N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A	ž na	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
Ye Sep Oct 1-15 Oct 1-31 100 99 90 1 3 100 99 93 N/A 19 27 Substronal using transform Sep Oct 16-31 100 90 90 3 3 3 4 88 88 84 26 33 40 Substronal using transform 90 90 3 3 3 4 98 98 95 32 37 34 Apr May 1-15 100 100 100 100 100 100 100 100 100 N/A N/A N/A June Juli 16-31 100 100 100 100 100 100 100 N/A N/A N/A N/A N/A Step Using Step Using Using Step Using Step Using Step Oct 1-15 98 90 68 1 2 100 100 100 N/A N/A N/A Step Using Step Using Step Using Step Step Step Step Step Step Step Step	80 sir	Aug	100	100	97			1	100	100	97	N/A	N/A	1
Skip Det 16-31 Oct 11-15 Oct 16-31 84 81 73 3 3 3 4 88 88 84 26 33 40 Substrat 90 90 90 3 3 3 97 97 97 69 69 69 Apr May 1-15 100 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Juli 15-31 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 N/A N/A N/A Step 0 100 100 100 100 N/A N/A N/A Step </th <th>ofed</th> <th>Sep</th> <th>100</th> <th>99</th> <th>90</th> <th></th> <th>1</th> <th>3</th> <th>100</th> <th>99</th> <th>93</th> <th>N/A</th> <th>19</th> <th>27</th>	ofed	Sep	100	99	90		1	3	100	99	93	N/A	19	27
Nr Oct 16-31 90 90 90 3 3 3 97 97 97 69 69 69 SuBTOTAL 98 98 95 32 37 34 Apr 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A N/A June Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 100 N/A N/A N/A Step 100 98 95 1 2 100 99 97 N/A 48 34 Step 20 98 90	996 4 0	Oct 1-15	84	81	73	3	3	4	88	88	84	26	33	40
SUBTOTAL 98 98 95 3 3 4 98 98 95 32 37 34 Apr 100 100 100 100 100 100 100 N/A N/A <t< th=""><th>46</th><th>Oct 16-31</th><th>90</th><th>90</th><th>90</th><th>3</th><th>3</th><th>3</th><th>97</th><th>97</th><th>97</th><th>69</th><th>69</th><th>69</th></t<>	46	Oct 16-31	90	90	90	3	3	3	97	97	97	69	69	69
Apr 100 100 100 100 100 100 100 N/A N/A N/A May 1-15 100 100 100 100 100 100 100 N/A N/A N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 100 N/A N/A N/A Step Uisso Sep 100 100 100 100 100 100 100 100 100 100		SUBTOTAL	98	98	95	3	3	4	98	98	95	32	37	34
% May 1-15 May 16-31 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 100 N/A N/A N/A Sep 100 100 100 100 100 N/A N/A N/A StBTOTAL 99 97 94 6 6 7 + 99 98 95 39 36 34 May 1-15 100 100 100 100 100 N/A N/A N/A May 1-15 100 1		Apr	100	100	100				100	100	100	N/A	N/A	N/A
May 16-31 June 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A N/A Aug 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 N/A N/A N/A Sep 100 100 100 100 100 N/A N/A N/A Oct 1-15 98 90 68 1 2 6 98 92 78 30 18 31 Oct 16-31 88 73 65 6 6 7 + 99 98 95 39 36 34 May 16-31 100		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
See Jul 1-15 June 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 Jul 16-31 100 100 100 100 100 100 N/A N/A N/A N/A N/A Aug 100 100 100 100 100 100 100 N/A N/A N/A Sep 100 100 100 100 100 100 N/A N/A N/A Oct 1-15 98 90 68 1 2 6 98 92 78 30 18 31 Oct 1-5.31 88 73 65 6 6 7 + 99 98 95 39 36 34 May 1-15 100 100 100 100 100 N/A N/A N/A Jul 4-15 100 100 100 100 100 N/A N/A N/A <t< th=""><th></th><th>May 16-31</th><th>100</th><th>100</th><th>100</th><th></th><th></th><th></th><th>100</th><th>100</th><th>100</th><th>N/A</th><th>N/A</th><th>N/A</th></t<>		May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
Jul 1-15 100 100 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 100 100 N/A N/A <t< th=""><th>t rs</th><th>June</th><th>100</th><th>100</th><th>100</th><th></th><th></th><th></th><th>100</th><th>100</th><th>100</th><th>N/A</th><th>N/A</th><th>N/A</th></t<>	t rs	June	100	100	100				100	100	100	N/A	N/A	N/A
Jul 16-31 Aug Jul 16-31 100 100 100 100 100 100 100 100 100 100 100 100 N/A N/A N/A Sep CT Jul 16-31 Sup 100 100 100 100 100 100 100 N/A N/A N/A N/A Sep CT Jul 16-31 100 100 100 100 100 100 100 N/A N/A N/A N/A Oct 1-15 98 90 68 1 2 6 98 92 78 30 18 31 Oct 16-31 88 73 65 6 6 7 + 99 98 95 39 36 34 May 1-15 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100	ea ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
Lisson Aug 100<		Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
Sep CC Sep Cot 1-15 100 98 95 1 2 100 99 97 N/A 48 34 Oct 1-15 98 90 68 1 2 6 98 92 78 30 18 31 Oct 16-31 88 73 65 6 6 6 98 92 78 30 18 31 SUBTOTAL 99 97 94 6 6 7 + 99 98 95 39 36 34 May 1-15 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 N/A N/A N/A <	ali isi 8	Aug	100	100	100				100	100	100	N/A	N/A	N/A
See Oct 1-15 Oct 16-31 98 88 90 65 68 6 1 6 2 6 6 93 92 87 78 82 30 46 18 53 31 49 SUBTOTAL 99 97 94 6 6 6 93 87 82 46 53 49 May 1-15 100 100 100 100 100 100 100 N/A N/A N/A May 1-15 100 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4 98 95 88 5	of 31	Sep	100	98	95		1	2	100	99	97	N/A	48	34
Oct 16-31 88 73 65 6 6 6 93 87 82 46 53 49 SUBTOTAL 99 97 94 6 6 7 + 99 98 95 39 36 34 Apr 100 100 100 100 100 100 100 N/A N/A N/A May 1-15 100 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4 98 95 88 5 6 5 <	7.8 T	Oct 1-15	98	90	68	1	2	6	98	92	78	30	18	31
SUBTOTAL 99 97 94 6 6 7 + 99 98 95 39 36 34 Apr 100 100 100 100 100 100 100 N/A N/A N/A May 1-15 100 100 100 100 100 100 100 N/A N/A N/A May 16-31 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4		Oct 16-31	88	73	65	6	6	6	93	87	82	46	53	49
Apr 100 100 100 100 100 100 100 100 N/A N/A N/A May 1-15 100 100 100 100 100 100 100 N/A N/A N/A N/A May 1-15 100 100 100 100 100 100 N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4 98 95 88 5 6 5 Cot 1-15 78 66		SUBTOTAL	99	97	94	6	6	7	+ 99	98	95	39	36	34
May 1-15 100 100 100 100 100 100 100 N/A N/A N/A May 16-31 100 100 100 100 100 100 100 N/A N/A N/A N/A June 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4 98 95 88 5 6 5 Oct 1-15 78 66 52 4 4 6 80 73 62 8 21 21 Oct 16-31 80		Apr May 1 15	100	100	100				100	100	100	N/A	N/A	N/A
May 16-31 100 N/A N/A N/A June Jul 1-15 100 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 100 100 N/A N/A N/A Aug 100 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4 98 95 88 5 6 5 Oct 16-31 80 74 71 4 4 5 83 82 79 17 29 26 <tr< th=""><th></th><th>May 16 21</th><th>100</th><th>100</th><th>100</th><th></th><th></th><th></th><th>100</th><th>100</th><th>100</th><th>IN/A</th><th>N/A</th><th>IN/A</th></tr<>		May 16 21	100	100	100				100	100	100	IN/A	N/A	IN/A
Stree Juli 1-15 100 100 100 100 100 100 100 N/A N/A N/A Jul 1-15 Jul 1-15 100 100 100 100 100 100 100 N/A N/A N/A N/A Jul 1-15 Jul 16-31 100 100 100 100 100 100 N/A N/A N/A Jul 16-31 100 100 100 100 100 100 N/A N/A N/A G 5 5 Sep 98 95 87 2 2 4 98 95 88 5 6 5 Oct 1-15 78 66 52 4 4 6 80 73 62 8 21 21 Oct 16-31 80 74 71 4 4 5 83 82 79 17 29 26 SUBTOTAL 97 95 93 5 5 6 96 94 91 9 19 17 </th <th>ω m</th> <th>luno</th> <th>100</th> <th>100</th> <th>100</th> <th></th> <th></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th>N/A</th> <th>N/A</th> <th>IN/A</th>	ω m	luno	100	100	100				100	100	100	N/A	N/A	IN/A
joint 1-15 100 N/A N/A N/A N/A joint 500 Jul 16-31 100 100 100 100 100 100 100 N/A N/A N/A N/A Aug 100 100 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4 98 95 88 5 6 5 Oct 1-15 78 66 52 4 4 6 80 73 62 8 21 21 Oct 16-31 80 74 71 4 4 5 83 82 79 17 29 26 SUBTOTAL 97 95 93 5 5 6 </th <th>ars</th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th></th> <th></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th>N/A</th> <th>N/A</th> <th>IN/A</th>	ars		100	100	100				100	100	100	N/A	N/A	IN/A
See Aug 100 100 100 100 100 100 100 100 100 N/A N/A N/A Sep 98 95 87 2 2 4 98 95 88 5 6 5 Oct 1-15 78 66 52 4 4 6 80 73 62 8 21 21 Substruct 97 95 93 5 5 6 96 94 91 91 91 17	Xe di H	Jul 16_31	100	100	100				100	100	100	N/A		N/A
Ady Ady <th><u>o i i i i</u></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th></th> <th></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th>IN/A NI/A</th> <th>N/A</th> <th>N/A</th>	<u>o i i i i</u>		100	100	100				100	100	100	IN/A NI/A	N/A	N/A
Sep Sep <th>f 8 I 8</th> <th>Son</th> <th>001</th> <th>05</th> <th>97</th> <th>2</th> <th>2</th> <th>1</th> <th>001</th> <th>05</th> <th>100</th> <th>IN/A</th> <th>N/A</th> <th>IN/A</th>	f 8 I 8	Son	001	05	97	2	2	1	001	05	100	IN/A	N/A	IN/A
N: Oct 1-13 70 00 52 4 4 0 00 73 02 8 21 21 Oct 16-31 80 74 71 4 4 5 83 82 79 17 29 26 SUBTOTAL 97 95 93 5 5 6 96 94 91 9 19 17	- <u>5</u> 0	Oct 1 15	90 79	90	01 52		<u>ک</u>	4	90	90 72	00 62	0 0	21	21
SUBTOTAL 97 95 93 5 5 6 96 94 91 9 17 29 20	11	Oct 16 31	20	74	52 71	4	4	5	00	10	0Z 70	0 17	∠ı 20	21
		SUBTOTAL	97	95	93	5	5	6	96	94	91	9	19	17

 Table 13B:
 Fall Creek Tributary Flow Objective Performance Detail:
 Expected Diversions

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.

Pct Volume Goal Achieved (Missed Days)

ARP 2070



Figure 8A: Fall Creek Tributary Flow Objective Performance: Expected Diversions

Base Year 2020 No Action Expected 2070

ARP Expected 2070

Fall Creek Tributary Pct of Vol Goal Achieved (Target Shortage Days) Abundant Water Years 80% 70% 60% 50% 40% 30% 20% 10% 0% May 1-15 May 16-31 June July 1-15 July 16-31 Octobe 1-15 Octobe 16-31 ear 2020 ion Expo d 2070 ARP Expected 2070 Fall Creek Tributary Pct of Vol Goal Achieved (Target Shortage Days) Adequate Water Years 90% 80% 70% 60% 50% 40% 30% 20% 10% 0% May May 1-15 16-31 June July July 1-15 16-31 August September October 1-15 October 16-31 Base Year 2020 No Action Expe ted 2070 ARP Expected 2070 Fall Creek Pct of Vol Goal Achieved (Target Shortage Days) Insufficient Water Years 70% 60% 50% 40% 30% 20% 10% 0% May May 1-15 16-31 June July July 1-15 16-31 August October 1-15 October 16-31 Base Year 2020 No Action Expected 2070 ARP Expected 2070 Fall Creek Tributary Pct of Vol Goal Achieved (Target Shortage Days) Deficit Water Years 90% 80% 70% 60% 50% 40% 30% 20% 10% 16 K K 0% May 1-15 May 16-31 June July July 1-15 16-31 August October 1-15 Octobe 16-31 Base Year 2020 No Action Expected 2070 ARP Expected 2070

No Action Expected 2070 ARP Expected 2070

Base Year 2020

13.2 Fall Creek Reservoir - Tributary Flow Objective Performance – Peak Diversions

Table 13C provides summary metrics for the modeled Fall Creek Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: three percent **fewer** flow objective days met under the ARP;
- Insufficient five percent fewer flow objective days met under the ARP; and
- Deficit three percent **fewer** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 13C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: two percent less water provided under the ARP;
- Insufficient six percent less water provided under the ARP; and
- Deficit six percent less water provided under the ARP.

Table 13C: Fall Creek Tributary Flow Objective Performance Summary Peak Diversions

		No	
	Base Year 2020	Action 2070	ARP 2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	99	99	99
Percent of Volume Met Over All Simulated Days	99	99	99
Percent of Volume Met Over Missed Objective Days	23	28	38
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	98	97	94
Percent of Volume Met Over All Simulated Days	98	96	94
Percent of Volume Met Over Missed Objective Days	32	32	37
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	99	97	92
Percent of Volume Met Over All Simulated Days	+ 99	98	92
Percent of Volume Met Over Missed Objective Days	39	34	28
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	97	94	91
Percent of Volume Met Over All Simulated Days	96	94	88
Percent of Volume Met Over Missed Objective Days	9	19	15

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 13D and Figure 8B provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volu	ime Goal A	chieved	Pct Volu	ime Goal A	Achieved
WY Type Period		Flow	Objective I	Met ^{1, 2}	Flow	Objective	Day ³	(All Davs) ¹	2	(M	issed Dav	(s) ⁴
Type	Period	BY			BY	NΔ		BY	NA	ΔRP	BY		
Type		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	100	100	100		20.0	20.0	100	100	100	N/A	 N/A	 N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s s	June	100	100	100				100	100	100	N/A	N/A	N/A
ayat	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
y da	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ŭ ji ĝ	Aug	100	100	100				100	100	100	N/A	N/A	N/A
bu S S	Sep	+ 99	99	97	1	2	3	+ 99	99	.00	16	12	44
₹	Oct 1-15	94	94	93	5	4	5	95	96	95	18	28	30
94	Oct 16-31	96	96	93	5	5	6	98	98	96	50	48	42
	SUBTOTAL	99	99	99	7	6	8	99	99	99	23	28	38
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s's	June	100	100	100				100	100	100	N/A	N/A	N/A
al la	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
λε Γ	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
10 ju	Aug	100	98	95		1	1	100	99	95	N/A	57	8
Je a	Sep	100	93	83		1	4	100	94	89	N/A	20	35
996 4 o	Oct 1-15	84	80	73	3	3	4	88	87	84	26	34	40
10	Oct 16-31	90	90	90	3	3	3	97	97	97	69	69	69
	SUBTOTAL	98	97	94	3	3	4	98	96	94	32	32	37
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
rs rs	June	100	100	100				100	100	100	N/A	N/A	N/A
ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ž a ci	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
si Ei	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of 3 c	Sep	100	98	91		1	4	100	99	93	N/A	41	26
- 8 -	Oct 1-15	98	89	45	1	2	8	98	91	59	30	18	25
20	Oct 16-31	88	70	60	6	6	7	93	86	81	46	53	52
	SUBTOTAL	99	97	92	6	6	8	+ 99	98	92	39	34	28
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
(0 , 10)	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ars a	June	100	100	100				100	100	100	N/A	N/A	N/A
it Jeá	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
Ça ï	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
el 8	Aug	100	100	100		0	0	100	100	100	N/A	N/A	N/A
_72 <u>p</u>	Sep	98	93	80	2	3	6	98	94	81	5	9	6
11	Uct 1-15	/8	63	46	4	5	6	80	/1	57	8	21	21
•••	Oct 16-31	80	73	70	4	5	5	83	81	78	1/	30	25
	SUBIDIAL	97	94	91	5	6	6	96	94	88	9	19	15

Table 13D:	Fall Creek Tributar	y Flow Objective	Performance Detail:	Peak Diversions
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Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent
 Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).
 Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.
 Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Figure 8B: Fall Creek Tributary Flow Objective Performance: Peak Diversions

Pct Volume Goal Achieved (All Days) Fall Creek Tributary Pct of Vol Goal Achieved (All Days) Abundant Water Years May 16-31 June July 1-15 July 16-31 1-15 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Fall Creek Tributary Pct of Vol Goal Achieved (All Days) Adequate Water Years May 16-31 June July 1-15 July 16-31 August Septemb Base Year 2020 No Action Peak 2070 ARP Peak 2070 ributary Pct of Vol Goal Achieved (All Days) Insufficient Water Years June May 16-31 July July 1-15 16-31 August October 16-31 October 1-15 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Fall Creek Tributary Pct of Vol Goal Achieved (All Days) Deficit Water Years May 16-31 June July July 1-15 16-31 August October 1-15 Octobe 16-31



14 Foster

14.1 Foster Reservoir - Tributary Flow Objective Performance – Expected Diversions

Table 14A provides summary metrics for the modeled Foster Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: one percent fewer flow objective days met under the ARP;
- Adequate: one percent **fewer** flow objective days met under the ARP;
- Insufficient no notable difference; and
- Deficit two percent **more** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 14A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: one percent less water provided under the ARP;
- Insufficient two percent less water provided under the ARP; and
- Deficit one percent less water provided under the ARP.

Table 14A:Foster Tributary Flow Objective Performance SummaryExpected Diversions

		No	
	Base Year 2020	Action 2070	ARP 2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	97	97	96
Percent of Volume Met Over All Simulated Days	+ 99	99	99
Percent of Volume Met Over Missed Objective Days	87	84	71
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	93	94	93
Percent of Volume Met Over All Simulated Days	99	99	98
Percent of Volume Met Over Missed Objective Days	86	83	76
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	81	83	83
Percent of Volume Met Over All Simulated Days	94	94	92
Percent of Volume Met Over Missed Objective Days	69	65	55
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	76	77	79
Percent of Volume Met Over All Simulated Days	91	91	90
Percent of Volume Met Over Missed Objective Days	63	61	54

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 14B and Figure 9A provide additional details and a graphic representation of select table data to aid in interpretation.

Wy Type Period Flow Objective Met ^{1,2} Plow Objective Day ³ CAI Days) ^{1,2} CM (All Days) ^{1,2} CM (Missed Days) ⁴ Apr May 1-5 100 100 100 2070 2				Pct Davs		No. Ye	ars With a	Missed	Pct Volu	ume Goal A	chieved	Pct Volu	ime Goal A	Achieved
Period By Control ARP By Contro ARP	WY Type Period		Flow	Objective	Met ^{1, 2}	Flow	Objective	Day ³	(All Days) ¹	, 2	(M	issed Dav	(s) ⁴
1/10 2020 2070 2070 2070 2020 2070 2020 2070 2020 2070 2020 2070 2020 2070 2070 2020 2070 2070 2020 2070 2020 2070 <th< th=""><th>Type</th><th>Period</th><th>BY</th><th>NΔ</th><th>ARP</th><th>BY</th><th>NA</th><th></th><th>BY</th><th><u>ΝΔ</u></th><th>ARP</th><th>BY</th><th>ΝΔ</th><th></th></th<>	Type	Period	BY	NΔ	ARP	BY	NA		BY	<u>ΝΔ</u>	ARP	BY	ΝΔ	
Apr 100 100 100 100 100 100 100 100 N/A N/A N/A step May 16-31 87 87 89 23 23 23 99 99 99 99 80 80 80 N/A N/A <th>1,960</th> <th></th> <th>2020</th> <th>2070</th> <th>2070</th> <th>2020</th> <th>2070</th> <th>2070</th> <th>2020</th> <th>2070</th> <th>2070</th> <th>2020</th> <th>2070</th> <th>2070</th>	1,960		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
May 1-15 100 100 100 100 100 100 100 N/A N/A N/A set point 11-15 87 89 98 16 15 12 99 +99 90 88 85 Juit 16.31 +99 +99 100 1 1 +99 +99 100 98 99 N/A Sup 94 95 63 6 91 14 99 <th></th> <th>Apr</th> <th>100</th> <th>100</th> <th>100</th> <th></th> <th></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th>N/A</th> <th>N/A</th> <th> N/A</th>		Apr	100	100	100				100	100	100	N/A	N/A	 N/A
May 16-31 B7 B7 B9 23 23 23 99 90 88 88 88 86 Subscript 99 99 99 99 99 98 98 99 99 99 98 87 84 61 Cit 1-51 96 95 85 6 99 100 <th></th> <th>May 1-15</th> <th>100</th> <th>100</th> <th>100</th> <th></th> <th></th> <th></th> <th>100</th> <th>100</th> <th>100</th> <th>N/A</th> <th>N/A</th> <th>N/A</th>		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
set by 0,000 5,000 june (16,000) 96 (10,000) 96 (10,000) 96 (10,000) 96 (10,000) 97 (10,000) 10 (10,000) 100 (10,000) 98 (10,000) 98 (10,000) 98 (10,000) 98 (10,000) 98 (10,000) 98 (10,000) 98 (10,000) 98 (10,000) 98 (10,000) 98 (11,000) 98 (11,000)<		May 16-31	87	87	89	23	23	23	99	99	99	89	89	89
Liggend Burger Burger Step Ung Ver Juli 1-55 Aug 96 + 99 + 99 + 99 + 99 + 99 + 99 + 99 +	S S	June	95	96	98	16	15	12	99	+ 99	+ 99	90	88	85
Built 16-31 + 99 + 99 + 99 + 99 + 99 + 99 + 99 NA Sep 94 95 85 6 9 14 99 99 98 90 NA Oct 11-15 96 95 85 6 9 14 99 98 94 68 68 61 Subrotal 97 96 37 39 31 + 99 99 98 82 22 201 May 1-15 100 100 100 100 100 100 N/A N/A N/A May 1-5.31 75 76 79 12 12 12 100 100 N/A N/A N/A June 89 90 94 9 99 </th <th>al ay</th> <th>Jul 1-15</th> <th>96</th> <th>97</th> <th>100</th> <th>18</th> <th>13</th> <th></th> <th>+ 99</th> <th>+ 99</th> <th>100</th> <th>92</th> <th>95</th> <th>N/A</th>	al ay	Jul 1-15	96	97	100	18	13		+ 99	+ 99	100	92	95	N/A
Ling Aug + 99 + 99 + 99 + 99 + 99 90 95 98 N/A Sep Sep 96 95 85 6 9 14 99 99 98 90 84 64 Oct 1-15.1 96 97 97 96 37 39 31 + 99 99 98 82 282 80 SUBTOTAL 97 97 96 37 39 31 + 99 99 99 98 82 84 71 May 1-15.1 100 100 100 100 100 N/A N/A N/A June 89 90 94 9 9 99 99 99 99 99 99 99 99 99 99 99 90 90 92 95 N/A Step 99 99 99 99 99 99 98 80 <	χ, da	Jul 16-31	+ 99	+ 99	100	1	1		+ 99	+ 99	100	98	99	N/A
Gen Sep 94 95 93 22 23 17 99 99 98 90 84 64 Col 16-31 98 97 92 4 7 11 +99 99 98 84 68 68 61 SUBTOTAL 97 97 96 37 39 31 +99 99 98 87 84 71 May 16-31 75 76 77 96 97 97 98 88 88 86 86 June 89 90 94 9 9 99 99 99 88 88 86 86 Jul 1-31 99 99 100 12 2 2 99 99 100 88 88 86 Oct 1-51 90 90 90 100 100 100 100 100 100 100 100 100 100	8 ii i	Aug	+ 99	+ 99	100	2	1		+ 99	+ 99	100	95	98	N/A
C Oci 1-15 (0:16-31) 96 (0:16-31) 95 (0:16-31) 95 (0:16-31) 95 (0:16-31) 97 (0:16-31) 98 (0:16-31) 99 (0:16-31) 99 (0:16-31) 99 (0:16-31) 99 (0:16-31) 99 (0:16-31) 99 (0:16-31) 99 (0:16-31) 99 (0:16-31) 90 (0:16-31)	bu bu	Sep	94	95	93	22	23	17	99	99	98	90	84	64
6 * 4 Oct 16:31 98 97 92 4 7 11 + 99 99 98 82 82 80 Apr 100 100 100 100 100 100 100 100 100 100 100 N/A N/A N/A May 16:31 75 76 79 99 100 10 90 99 99 100 99 99 100 99 99 90 100 90 90 10 100 100 100 100 100 100 100 100 1	A <u>+</u> 4	Oct 1-15	96	95	85	6	9	14	99	98	94	68	68	61
SUBTOTAL 97 97 96 37 39 31 +99 99 97 84 71 Apr 100 100 100 100 100 100 100 N/A N/A N/A N/A N/A May 16-31 75 76 79 12 12 12 97 97 97 88 88 86 86 June 89 90 94 9 9 90 90 92 95 N/A 88 86 66 66 66 67 66 96 92 60 57 68 68 87 66 68 87 66 68 68 87 <t< th=""><th>94</th><th>Oct 16-31</th><th>98</th><th>97</th><th>92</th><th>4</th><th>7</th><th>11</th><th>+ 99</th><th>99</th><th>98</th><th>82</th><th>82</th><th>80</th></t<>	94	Oct 16-31	98	97	92	4	7	11	+ 99	99	98	82	82	80
Apr 100 100 100 100 100 100 100 N/A N/A N/A Step apr.bg Ver Apr 100 100 100 100 100 100 100 N/A N/A N/A N/A Apr 300 90 94 9 9 90 76 2 2 5 96 96 92 80 86 83 76 Cit16-31 98 99 93 13 13 12 99		SUBTOTAL	97	97	96	37	39	31	+ 99	99	99	87	84	71
May 16-31 100 100 100 100 100 100 N/A N/A N/A May 16-31 75 76 79 12 12 97 97 98 88 88 87 June 89 90 94 9 9 90 100 10 77 7 99 99 99 N/A 88 88 10 10 70 79 98 99 N/A 88 88 76 66 02 60 57 66 02 60 57 66 02 60 57 66 02 50 55 53 83		Apr	100	100	100				100	100	100	N/A	N/A	N/A
sep May 16-31 75 76 79 12 13 10 10 10 10 10 10 10 10 11 13 12 13 13 12 13 13 12 13 13		May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
str June 89 90 94 9 9 99 99 99 99 99 98 88 86 86 str Jul 16-31 99 99 100 1 2 +99 +99 100 92 95 N/A Aug 98 100 +99 2 1 +99 +99 100 +99 90 90 90 90 90 90 90 90 90 90 90 90 90 90 91 100 <th></th> <th>May 16-31</th> <th>75</th> <th>76</th> <th>79</th> <th>12</th> <th>12</th> <th>12</th> <th>97</th> <th>97</th> <th>97</th> <th>88</th> <th>88</th> <th>87</th>		May 16-31	75	76	79	12	12	12	97	97	97	88	88	87
etp 0. bit 0.	ys rs	June	89	90	94	9	9	9	99	99	99	88	88	86
Bit of all of all and all and all all all all all all all all all al	daj	Jul 1-15	95	95	100	7	7		+ 99	+ 99	100	92	95	N/A
bis border Aug 98 100 + 99 99 N/A 88 Sep Sep 89 88 88 10 10 7 99 98 96 92 87 66 Oct 1-15 90 90 76 2 2 5 96 92 60 57 68 Oct 16-31 98 + 99 86 1 1 4 + 99 + 99 98 80 86 87 SubBTOTAL 93 94 93 13 13 12 99 99 98 86 86 87 May 16-31 66 71 71 11 11 195 95 95 85 83 83 33 33 33 34 92 99 99 99 99 99 99 99 90 90 90 90 90 90 90 90 90 90 90 <th>n n 2</th> <th>Jul 16-31</th> <th>99</th> <th>99</th> <th>100</th> <th>1</th> <th>2</th> <th></th> <th>+ 99</th> <th>+ 99</th> <th>100</th> <th>98</th> <th>98</th> <th>N/A</th>	n n 2	Jul 16-31	99	99	100	1	2		+ 99	+ 99	100	98	98	N/A
\$\$ sp of \$\$ cord 1-15 \$\$ 90 \$88 88 88 10 10 7 99 98 96 92 87 66 \$\$ 0ct 1-15 90 90 76 2 2 5 96 96 92 60 57 68 \$UBTOTAL 93 94 93 13 13 12 99 99 98 80 86 87 May 1-15 99 99 99 99 99 99 99 99 99 99 99 99 99 90 90 90 90 90 91 May 16-31 66 71 71 11 11 11 99 99 93 87 88 Jul 1-15 83 92 95 8 6 4 99 99 93 87 88 Step of the 31 96 80 77 72 10 11 99 99	sir 80	Aug	98	100	+ 99	2		1	+ 99	100	+ 99	99	N/A	88
A Oct 1-15 Oct 16-31 90 98 90 94 96 93 1 1 1 4 4 99 99 99 98 98 86 86 87 86 Apr May 1-15 99 99 94 93 13 13 12 99 99 98 86 83 76 May 1-15 99 99 99 9 1 1 1 99 99 90 91 June 78 85 90 9 9 9 9 9 93 87 88 84 <	of	Sep	89	88	88	10	10	7	99	98	96	92	87	66
Oct 16-31 98 + 99 86 1 1 4 + 99 + 99 98 80 86 87 SUBTOTAL 93 94 93 13 13 12 99 99 98 86 87 Apr 100 <th< th=""><th>4 66 4</th><th>Oct 1-15</th><th>90</th><th>90</th><th>76</th><th>2</th><th>2</th><th>5</th><th>96</th><th>96</th><th>92</th><th>60</th><th>57</th><th>68</th></th<>	4 66 4	Oct 1-15	90	90	76	2	2	5	96	96	92	60	57	68
SUBTOTAL 93 94 93 13 13 12 99 99 98 86 83 76 Apr 100 100 100 100 100 100 N/A N/A N/A May 16-31 66 71 71 11 11 11 95 95 95 85 83 83 June 78 85 90 9 9 9 98 98 99 92 90 </th <th>40</th> <th>Oct 16-31</th> <th>98</th> <th>+ 99</th> <th>86</th> <th>1</th> <th>1</th> <th>4</th> <th>+ 99</th> <th>+ 99</th> <th>98</th> <th>80</th> <th>86</th> <th>87</th>	40	Oct 16-31	98	+ 99	86	1	1	4	+ 99	+ 99	98	80	86	87
Apr 100 100 100 100 100 100 100 N/A N/A N/A May 1-15 99 99 99 1 1 1 +99 +99 +99 90 90 91 May 16-31 66 71 71 11 11 11 95 95 85 83 83 June 78 85 90 9 9 98 98 99 92 90 90 Jul 16-31 86 90 90 2 2 3 98 98 86 83 84 Aug 89 89 99 94 4 1 99 99 99 93 93 93 Sep 80 77 72 10 11 9 94 92 85 70 66 46 Oct 1-15 55 52 47 5 7 7		SUBTOTAL	93	94	93	13	13	12	99	99	98	86	83	76
May 1-15 99 99 99 1 1 1 + 99 + 99 + 99 90 90 91 May 16-31 66 71 71 11 11 11 95 95 95 85 83 83 93 83 84 Juin 16-31 80 77 77 77 77 77 77 77 73 4		Apr	100	100	100				100	100	100	N/A	N/A	N/A
May 16-31 66 71 71 11 11 11 11 95 95 95 85 83 83 June 78 85 90 9 9 9 98 98 99 92 90 90 90 90 93 87 88 Jul 1-15 83 92 95 8 6 4 99 99 92 93 87 88 Sep Jul 1-15 83 92 95 8 6 4 99 99 93 87 88 May 89 89 99 4 4 1 99 99 99 94 95 93 Sep 80 77 72 10 11 94 94 92 85 70 66 46 Oct 1-15 55 52 47 5 7 7 77 76 73 49		May 1-15	99	99	99	1	1	1	+ 99	+ 99	+ 99	90	90	91
Sore June 78 85 90 9 9 98 98 99 92 90 90 Jul 1-15 83 92 95 8 6 4 99 99 99 93 87 88 Jul 1-15 83 92 95 8 6 4 99 99 99 93 87 88 Jul 1-15 86 90 90 2 2 3 98 98 98 86 83 84 Aug 89 89 + 99 4 4 1 99 99 + 99 95 93 Sep 80 77 72 10 11 9 94 92 85 70 66 46 Oct 1-15 55 52 47 5 7 7 77 76 73 49 50 48 SubBrotAL 81 83 83		May 16-31	66	71	71	11	11	11	95	95	95	85	83	83
Jul 1-15 83 92 95 8 6 4 99 99 99 93 87 88 Jul 16-31 86 90 90 2 2 3 98 98 98 98 86 83 84 Aug 89 89 99 4 4 1 99 99 99 99 99 99 93 87 88 Sep 80 77 72 10 11 99 99 99 99 99 99 99 99 99 99 99 93 87 88 Sep 80 77 72 10 11 99 99 99 99 99 99 93 43 42 Oct 1-15 55 52 47 5 7 7 77 76 73 49 50 48 Subbrotal 81 83 83 11 11 1 99 99 99 51 50 50 50 <	ars ars	June	78	85	90	9	9	9	98	98	99	92	90	90
Juli 16-31 86 90 90 2 2 3 98 98 98 86 83 84 Aug 89 89 +99 4 4 1 99 99 +99 94 95 93 Sep 80 77 72 10 11 9 94 92 85 70 66 46 Oct 1-15 55 53 43 6 7 8 75 74 67 43 43 42 Oct 16-31 55 52 47 5 7 7 77 76 73 49 50 48 SUBTOTAL 81 83 83 11 11 94 94 92 69 65 55 May 1-15 96 96 97 2 2 2 99 99 49 91 92 92 77 77 May 16-31 59	da	Jul 1-15	83	92	95	8	6	4	99	99	99	93	87	88
Lisson Aug 89 89 + 99 4 4 1 99 99 + 99 94 95 93 Sep 80 77 72 10 11 9 94 92 85 70 66 46 Oct 1-15 55 53 43 6 7 8 75 74 67 43 43 42 Oct 16-31 55 52 47 5 7 7 77 76 73 49 50 48 SUBTOTAL 81 83 83 11 11 11 94 94 92 69 65 55 May 1-15 96 96 97 2 2 2 99 99 99 64 64 57 May 16-31 59 60 64 10 10 10 91 92 92 79 77 77 June 79 82 88 9 9 8 97 97 98 99	^o a ici	Jul 16-31	86	90	90	2	2	3	98	98	98	86	83	84
Sep 80 77 72 10 11 9 94 92 85 70 66 46 Oct 1-15 55 53 43 6 7 8 75 74 67 43 43 42 Oct 1-15 55 52 47 5 7 7 77 76 73 49 50 48 SUBTOTAL 81 83 83 11 11 94 94 92 69 65 55 May 1-15 96 96 97 2 2 2 99 99 99 64 64 57 May 16-31 59 60 64 10 10 10 91 92 92 79 79 77 June 79 82 88 9 9 8 4 97 98 99 87 89 90 Jul 1-15 78 80 </th <th>isis:</th> <th>Aug</th> <th>89</th> <th>89</th> <th>+ 99</th> <th>4</th> <th>4</th> <th>1</th> <th>99</th> <th>99</th> <th>+ 99</th> <th>94</th> <th>95</th> <th>93</th>	isis:	Aug	89	89	+ 99	4	4	1	99	99	+ 99	94	95	93
L Oct 1-15 Oct 16-31 55 55 53 52 43 47 6 5 7 7 7 7 76 77 74 77 67 73 49 49 50 48 43 43 42 48 SUBTOTAL 81 83 83 11 11 11 94 94 92 69 65 55 Apr + 99 + 99 + 99 + 99 + 99 + 99 + 99 51 50 50 May 1-15 96 96 97 2 2 2 99 99 99 64 64 57 May 16-31 59 60 64 10 10 10 91 92 92 79 79 77 June 79 82 88 9 9 8 47 97 98 96 86 84 81 Jul 1-15 78 80 89 9 8 44 97 98 99 87 89 90 <th>of 51s</th> <th>Sep</th> <th>80</th> <th>//</th> <th>/2</th> <th>10</th> <th>11</th> <th>9</th> <th>94</th> <th>92</th> <th>85</th> <th>70</th> <th>66</th> <th>46</th>	of 51s	Sep	80	//	/2	10	11	9	94	92	85	70	66	46
Oct 16-31 55 52 47 5 7 7 77 76 73 49 50 48 SUBTOTAL 81 83 83 11 11 11 94 94 92 69 65 55 Apr + 99 + 99 + 99 + 99 1 1 1 + 99 + 99 + 99 50 48 May 1-15 96 96 97 2 2 2 99 99 99 64 64 57 May 16-31 59 60 64 10 10 10 91 92 92 79 79 77 June 79 82 88 9 9 8 4 97 98 99 87 89 90 Jul 1-15 78 80 89 9 8 4 97 98 99 87 89 90 Jul 16-31	1 33 L	Oct 1-15	55	53	43	6	7	8	75	74	67	43	43	42
SUBIOIAL 81 83 83 11 11 11 94 94 92 69 65 55 Apr + 99 + 99 + 99 + 99 + 99 + 99 + 99 51 50 50 May 1-15 96 96 97 2 2 2 99 99 99 64 64 57 May 16-31 59 60 64 10 10 10 91 92 92 79 79 77 June 79 82 88 9 9 8 97 97 98 86 84 81 Jul 1-15 78 80 89 9 8 4 97 98 99 87 89 90 Jul 16-31 90 91 99 3 3 2 99 99 + 99 91 93 87 G Sep 56 55		Oct 16-31	55	52	47	5		(//	76	73	49	50	48
Apr + 99 + 99 + 99 + 1 1 1 1 + 99 + 99 + 99 51 50 50 May 1-15 96 96 97 2 2 2 99 99 99 64 64 57 May 16-31 59 60 64 10 10 10 91 92 92 79 79 77 June 79 82 88 9 9 8 97 97 98 86 84 81 Jul 1-15 78 80 89 9 8 4 97 98 99 87 89 90 Jul 16-31 90 91 99 3 3 2 99 99 + 99 91 93 87 Aug 83 86 91 4 3 3 98 98 89 88 76 Sep 56 55 52 9 9 10 79 78 74 53 51 47		SUBIUIAL	81	83	83	11	11	11	94	94	92	69	65	55
May 16-31 59 60 64 10 10 10 91 92 92 79 79 77 May 16-31 59 60 64 10 10 10 91 92 92 79 79 77 June 79 82 88 9 9 8 97 97 98 86 84 81 Jul 1-15 78 80 89 9 8 4 97 98 99 87 89 90 Jul 16-31 90 91 99 3 3 2 99 99 + 99 91 93 87 Aug 83 86 91 4 3 3 98 98 98 89 88 76 Sep 56 55 52 9 9 10 79 78 74 53 51 47 Otd 44 44 9 9 9 79 78 74 53 51 47		Apr May 1 15	+ 99	+ 99	+ 99	1	1	1	+ 99	+ 99	+ 99	51	50	50
Nilay 10-51 39 60 64 10 10 10 10 91 92 92 92 13 13 17 See June 79 82 88 9 9 8 97 97 98 86 84 81 Jul 1-15 78 80 89 9 8 4 97 98 99 87 89 90 Jul 16-31 90 91 99 3 3 2 99 99 + 99 91 93 87 Aug 83 86 91 4 3 3 98 98 98 89 88 76 56 55 52 9 9 10 79 78 74 53 51 47 67 56 55 52 9 9 10 79 78 74 53 51 47 68 56 55 52 9 9 10 79 78 74 53		May 1-15	90 50	90	97	10	10	10	99	99	99	70	70	57
Jul 1-15 78 80 89 9 8 4 97 98 99 87 89 90 Jul 1-15 78 80 89 9 8 4 97 98 99 87 89 90 Jul 16-31 90 91 99 3 3 2 99 99 + 99 91 93 87 Go Aug 83 86 91 4 3 3 98 98 98 89 88 76 Go Sep 56 55 52 9 9 10 79 78 74 53 51 47	Ś	luno	70	82	04 88	10	10	10	91	92	92	86	24	91
Jul 16-31 90 91 99 3 3 2 99 99 + 99 91 93 87 Jul 16-31 90 91 99 3 3 2 99 99 + 99 91 93 87 Generation Sep 56 55 52 9 9 10 79 78 74 53 51 47 Generation Sep 56 55 52 9 9 10 79 78 74 53 51 47	ars		79	80	00 80	9	9	0	97	97	90	87	04 80	01
Superson Superson <th< th=""><th>, g d ≓i</th><th>Jul 16 31</th><th>70</th><th>01</th><th>09</th><th>3</th><th>0</th><th>4</th><th>97</th><th>90</th><th>+ 00</th><th>01</th><th>03</th><th>90</th></th<>	, g d ≓i	Jul 16 31	70	01	09	3	0	4	97	90	+ 00	01	03	90
Sep 56 55 52 9 9 10 79 78 74 53 51 47	ij ij o		83 90	90	99 01	1	2	2	08	00 99	- 99 00	80	90 90	76
-70 Och -70	f 8 I 8	Sen	63 56	00 55	91 52	4	3	3 10	90 70	90 78	90 74	09 53	00 51	/0
	- <u>5</u> -	Oct 1-15	48	55 44	5Z 40	9	9	7	79	70 68	64	13	42	47
$\mathbf{N}_{\mathbf{r}}^{\mathbf{r}}$ Octation $\mathbf{r}_{\mathbf{r}}_{\mathbf{r}_{\mathbf{r}}}}}}}}}}$	1133	Oct 16-31	61	44 60	40 56	8	U R	י 8	83	82	80	43 57	42 56	40
SUBTOTAL 76 77 79 11 11 11 91 91 90 63 61 54		SUBTOTAL	76	77	79	11	11	11	91	91	90	63	61	54

	Table 14B:	Foster Tributar	y Flow Obje	ctive Performa	nce Detail: E	Expected Diversions
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1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent



Figure 9A: Foster Tributary Flow Objective Performance: Expected Diversions

1-15

ted 2070

October 1-15

October 1-15



14.2 Foster Reservoir - Tributary Flow Objective Performance – Peak Diversions

Table 14C provides summary metrics for the modeled Foster Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: three percent fewer flow objective days met under the ARP;
- Adequate: four percent fewer flow objective days met under the ARP;
- Insufficient no notable difference; and
- Deficit no notable difference.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 14C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: one percent less water provided under the ARP;
- Adequate: two percent less water provided under the ARP;
- Insufficient four percent less water provided under the ARP; and
- Deficit two percent less water provided under the ARP.

Table 14C: Foster Tributary Flow Objective Performance SummaryPeak Diversions

		No	
	Base Year 2020	Action 2070	ARP 2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	97	97	94
Percent of Volume Met Over All Simulated Days	+ 99	99	98
Percent of Volume Met Over Missed Objective Days	87	83	63
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	93	94	90
Percent of Volume Met Over All Simulated Days	99	99	97
Percent of Volume Met Over Missed Objective Days	86	82	69
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	81	83	83
Percent of Volume Met Over All Simulated Days	94	94	90
Percent of Volume Met Over Missed Objective Days	69	64	49
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	76	77	77
Percent of Volume Met Over All Simulated Days	91	90	88
Percent of Volume Met Over Missed Objective Days	63	60	53

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 14D and Figure 9B provide additional details and a graphic representation of select table data to aid in interpretation.

			Pct Davs		No. Yea	ars With a	Missed	Pct Volume Goal Achieved			Pct Volume Goal Achieved			
WY Type		Flow Objective Met ^{1, 2}		Flow	Objective	Dav ³	(All Days) ^{1, 2}			(Missed Days) ⁴				
	Period	BY			BY	NΔ		BY	ΝΔ	ΔRP	BY			
1,960		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070	
	Apr	100	100	100		20.0	_0.0	100	100	100	N/A	 N/A	 N/A	
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	May 16-31	87	88	90	23	23	23	99	99	99	89	89	88	
S S	June	95	96	98	16	15	11	99	+ 99	+ 99	90	88	86	
ar Jay	Jul 1-15	96	98	100	18	10		+ 99	+ 99	100	92	95	N/A	
¥ da	Jul 16-31	+ 99	+ 99	100	1	1		+ 99	+ 99	100	98	+ 99	N/A	
a ii 8	Aug	+ 99	100	+ 99	2		2	+ 99	100	+ 99	95	N/A	81	
bu bu	Sep	94	95	88	22	22	18	99	99	94	90	82	52	
₹ 4	Oct 1-15	96	95	69	6	8	25	99	98	87	68	67	59	
94	Oct 16-31	98	95	87	4	7	15	+ 99	99	97	82	82	78	
	SUBTOTAL	97	97	94	37	36	32	+ 99	99	98	87	83	63	
	Apr	100	100	100				100	100	100	N/A	N/A	N/A	
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A	
	May 16-31	75	76	79	12	12	12	97	97	97	88	88	88	
ys rs	June	89	91	96	9	9	6	99	99	99	88	88	84	
ea	Jul 1-15	95	96	100	7	6		+ 99	+ 99	100	92	94	N/A	
2 n a	Jul 16-31	99	+ 99	100	1	1		+ 99	+ 99	100	98	99	N/A	
80 sir	Aug	98	100	+ 99	2		1	+ 99	100	+ 99	99	N/A	87	
ope	Sep	89	89	80	10	10	8	99	98	91	92	83	55	
4 66 4	Oct 1-15	90	89	53	2	2	10	96	96	84	60	60	66	
20	Oct 16-31	98	99	79	1	1	6	+ 99	+ 99	97	80	80	85	
	SUBTOTAL	93	94	90	13	13	13	99	99	97	86	82	69	
	Apr	100	100	100				100	100	100	N/A	N/A	N/A	
	May 1-15	99	99	99	1	1	1	+ 99	+ 99	+ 99	90	90	92	
<i>(</i>) <i>(</i>)	May 16-31	66	/1	//	11	11	11	95	95	95	85	83	80	
ars are	June	78	85	93	9	9	9	98	98	99	92	90	90	
ler /e	Jul 1-15	83	92	97	8	6	3	99	99	99	93	87	76	
o a lic	Jul 16-31	86	90	93	2	2	3	98	98	99	86	83	84	
la isi	Aug	89	89	+ 99	4	4	1	99	+ 99	+ 99	94	96	93	
0.54 0.	Sep	60 55	// 50	59	10	7	10	94	91	62	10	04	44	
13	Oct 16 21	55 55	52	39	0	1	0	75	73	03 70	43	44	39	
		90 81	83	40 83	11	11	11	94	94	90	49	49 64	40	
	Apr	+ 99	+ 99	+ 99	1	1	1	+ 99	+ 99	+ 99	51	50	49	
	May 1-15	96	96	97	2	2	2	99	99	99	64	64	57	
	May 16-31	59	61	65	10	10	10	91	92	92	79	79	77	
ς δ	June	79	82	88	9	9	8	97	97	98	86	84	81	
lay er	Jul 1-15	78	81	95	9	7	3	97	98	+ 99	87	90	94	
ج d cit	Jul 16-31	90	91	99	3	3	1	99	99	+ 99	91	92	75	
efi 80	Aug	83	86	89	4	2	4	98	98	97	89	88	75	
ă4 ⁴ ,≚	Sep	56	53	43	9	9	10	79	76	68	53	49	44	
35	Oct 1-15	48	47	32	8	7	8	70	69	61	43	42	43	
- 10	Oct 16-31	61	61	51	8	8	8	83	83	79	57	56	57	
	SUBTOTAL	76	77	77	11	11	11	91	90	88	63	60	53	

Table 14D:	Foster Tributar	y Flow Objective	Performance Detail:	Peak Diversions
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Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent
 Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).
 Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.
 Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.



Figure 9B: Foster Tributary Flow Objective Performance: Peak Diversions

Pct Volume Goal Achieved (All Days) Foster Tributary Pct of Vol Goal Achieved (All Days) Abundant Water Years May 16-31 June July 1-15 July 16-31 1-15 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Foster Tributary Pct of Vol Goal Achieved (All Days) Adequate Water Years May 16-31 June July 1-15 July 16-31 August Base Year 2020 No Action Peak 2070 ARP Peak 2070 butary Pct of Vol Goal Achieved (All Days) Insufficient Water Years June May May 1-15 16-31 July July 1-15 16-31 August October 1-15 Base Year 2020 No Action Peak 2070 ARP Peak 2070 Foster Tributary Pct of Vol Goal Achieved (All Days) Deficit Water Years

June

July July 1-15 16-31

August

October 1-15 Octobe 16-31



15 Hills Creek

15.1 Hills Creek Res - Tributary Flow Objective Performance – Expected Diversions

Table 15A provides summary metrics for the modeled Hills Creek Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp flow objectives are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient one percent fewer flow objective days met under the ARP; and
- Deficit three percent **fewer** flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 15A shows the following differences between the No Action Plan and the ARP as a percent of flow objective water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient less than one percent less water provided under the ARP; and
- Deficit one percent less water provided under the ARP.

Table 15A: Hills Creek Tributary Flow Objective Performance SummaryExpected Diversions

		No	
	Base Year 2020	Action 2070	ARP 2070
Abundant Years (9,416 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Adequate Years (2,996 simulated days)			
Percent of Simulated Days Flow Objective Met	100	100	100
Percent of Volume Met Over All Simulated Days	100	100	100
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a
Insufficient Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	+ 99	99	98
Percent of Volume Met Over All Simulated Days	+ 99	+ 99	99
Percent of Volume Met Over Missed Objective Days	47	48	55
Deficit Years (2,354 simulated days)			
Percent of Simulated Days Flow Objective Met	+ 99	98	95
Percent of Volume Met Over All Simulated Days	+ 99	99	98
Percent of Volume Met Over Missed Objective Days	72	64	61

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 15B and Figure 10A provide additional details and a graphic representation of select table data to aid in interpretation.

		Pct Davs		No. Years With a Missed			Pct Volu	ime Goal A	chieved	Pct Volume Goal Achieved			
WY	Period	Flow	Objective I	Viet ^{1, 2}	Flow	Objective	Day ³	(All Days) ^{1, 2}			(Missed Days) ⁴		
Type		BY			BY	NA		BY	ΝΔ	ΔRP	BY		
Type		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
	Apr	100	100	100		20.0	2010	100	100	100	N/A	N/A	 N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s s	June	100	100	100				100	100	100	N/A	N/A	N/A
arad	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ye dar	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ă ji jo	Aug	100	100	100				100	100	100	N/A	N/A	N/A
bu S S	Sep	100	100	100				100	100	100	N/A	N/A	N/A
A 10	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
94	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s s	June	100	100	100				100	100	100	N/A	N/A	N/A
aye	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ye iat	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
dequ S sim f 80	Aug	100	100	100				100	100	100	N/A	N/A	N/A
	Sep	100	100	100				100	100	100	N/A	N/A	N/A
A 66 4	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
15	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
S S	June	100	100	100				100	100	100	N/A	N/A	N/A
a) ala	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
ž č či	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
8 i ti	Aug	100	100	100				100	100	100	N/A	N/A	N/A
of 9	Sep	100	100	96			1	100	100	98	N/A	N/A	54
1.85	Oct 1-15	100	93	85		1	2	100	97	93	N/A	50	52
70	Oct 16-31	97	97	90	1	1	2	98	98	96	47	46	60
	SUBTOTAL	+ 99	99	98	1	1	2	+ 99	+ 99	99	47	48	55
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ys rs	June	100	100	100				100	100	100	N/A	N/A	N/A
t ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
ef 80	Aug	100	100	100				100	100	100	N/A	N/A	N/A
<u>- 4 2</u>	Sep	100	100	92			4	100	100	97	N/A	N/A	64
135	Oct 1-15	100	94	64		2	4	100	98	85	N/A	64	60
70	Oct 16-31	94	82	77	2	4	4	98	94	91	72	64	61
	SUBTOTAL	+ 99	98	95	2	4	4	+ 99	99	98	72	64	61

 Table 15B:
 Hills Creek Tributary Flow Objective Performance Detail:
 Expected Diversions

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.








15.2 Hills Creek Reservoir - Tributary Flow Objective Performance – Peak Diversions

Table 15C provides summary metrics for the modeled Hills Creek Reservoir Tributary BiOp flow objective performance for Base Year 2020, the No Action Plan in Year 2070, and the ARP in Year 2070. The table shows the following differences between the No Action Plan and the ARP for the percent of days for which BiOp targets are met across the four water year types:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient two percent fewer flow objective days met under the ARP; and
- Deficit five percent fewer flow objective days met under the ARP.

The percentage of flow objective volume provided over the simulation provides insight on differences in performance, as unmet flow objective days can be triggered by a shortage of as little as one cfs. Table 15C shows the following differences between the No Action Plan and the ARP as a percent of target water volume provided for each water year type:

- Abundant: no notable difference;
- Adequate: no notable difference;
- Insufficient no notable difference; and
- Deficit two percent less water provided under the ARP.

Table 15C: Hills Creek Res Tributary Flow Objective Performance SummaryPeak Diversions

	No					
	Base Year 2020	Action 2070	ARP 2070			
Abundant Years (9,416 simulated days)						
Percent of Simulated Days Flow Objective Met	100	100	100			
Percent of Volume Met Over All Simulated Days	100	100	100			
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a			
Adequate Years (2,996 simulated days)						
Percent of Simulated Days Flow Objective Met	100	100	100			
Percent of Volume Met Over All Simulated Days	100	100	100			
Percent of Volume Met Over Missed Objective Days	n/a	n/a	n/a			
Insufficient Years (2,354 simulated days)						
Percent of Simulated Days Flow Objective Met	+ 99	99	97			
Percent of Volume Met Over All Simulated Days	+ 99	99	99			
Percent of Volume Met Over Missed Objective Days	47	54	56			
Deficit Years (2,354 simulated days)						
Percent of Simulated Days Flow Objective Met	+ 99	98	93			
Percent of Volume Met Over All Simulated Days	+ 99	99	97			
Percent of Volume Met Over Missed Objective Days	72	62	61			

Note: + 99 indicates a value that exceeds 99.49 percent, which would ordinarily be rounded to 100 percent.

Table 15D and Figure 10B provide additional details and a graphic representation of select table data to aid in interpretation.

		Pct Days		No. Years With a Missed		Pct Volume Goal Achieved			Pct Volume Goal Achieved				
WY Type		Flow Objective Met ^{1, 2}		Flow Objective Day ³		(All Days) ^{1, 2}			(Missed Days) ⁴				
	Period	BY			BY	NΔ		BY	ΝΔ	ΔRP	BY		
		2020	2070	2070	2020	2070	2070	2020	2070	2070	2020	2070	2070
Abundant 9416 sim days 44 of 80 years	Apr	100	100	100		_0.0	_0.0	100	100	100	N/A	N/A	 N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	June	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aug	100	100	100				100	100	100	N/A	N/A	N/A
	Sep	100	100	100				100	100	100	N/A	N/A	N/A
	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
s s	June	100	100	100				100	100	100	N/A	N/A	N/A
al a	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
Adequat 2996 sim d 14 of 80 ye	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aug	100	100	100				100	100	100	N/A	N/A	N/A
	Sep	100	100	100				100	100	100	N/A	N/A	N/A
	Oct 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Oct 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	SUBTOTAL	100	100	100				100	100	100	0	0	0
	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
rs ys	June	100	100	100				100	100	100	N/A	N/A	N/A
ea	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
Insufficie 2354 sim c 11 of 80 y	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aug	100	100	100				100	100	100	N/A	N/A	N/A
	Sep	100	+ 99	92		1	2	100	+ 99	97	N/A	58	56
	Oct 1-15	100	91	82		1	2	100	95	92	N/A	47	54
	Oct 16-31	97	93	90	1	2	2	98	97	96	47	62	60
	SUBTOTAL	+ 99	99	97	1	2	2	+ 99	99	99	47	54	56
Deficit 2354 sim days 11 of 80 years	Apr	100	100	100				100	100	100	N/A	N/A	N/A
	May 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	May 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	June	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 1-15	100	100	100				100	100	100	N/A	N/A	N/A
	Jul 16-31	100	100	100				100	100	100	N/A	N/A	N/A
	Aug	100	100	100				100	100	100	N/A	N/A	N/A
	Sep	100	100	78		0	4	100	100	92	N/A	N/A	62
	Uct 1-15	100	89	64		2	4	100	96	85	N/A	63	60
	Oct 16-31	94	78	()	2	4	4	98	92	91	/2	62	61
	SUBIUIAL	+ 99	98	93	Z	4	4	+ 99	33	9/	12	02	01

 Table 15D:
 Hills Creek Tributary Flow Objective Performance Detail:
 Peak Diversions

Notes:

1. Values designated as "+ 99" exceed 99.49 percent, which would ordinarily be rounded to 100 percent

2. Subtotals for percentage metrics represent weighted averages based on number of days in each period (e.g., Apr = 30 days, Aug = 31 days, etc.).

3. Subtotals are not calculated as a sum of numbers in the column, as multiple periods may be missed in the same year.

4. Values designated as "N/A" cannot be calculated when "Pct Volume Goal Achieved (All Days)" is equal to 100 percent, as there are no missed days.







