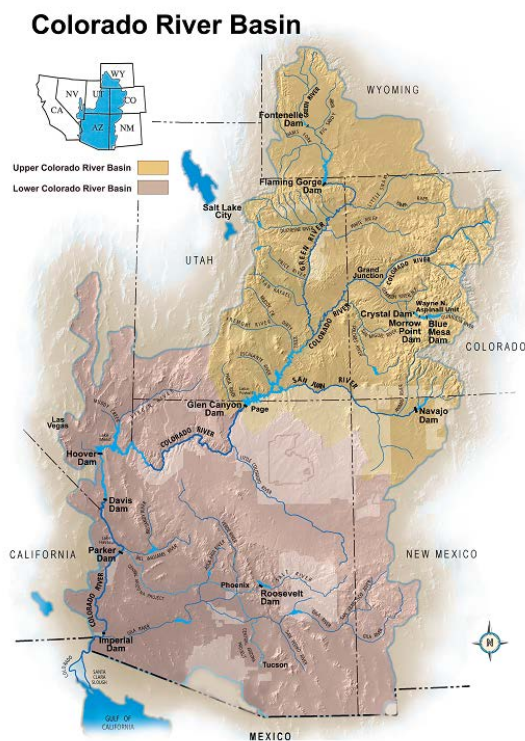


# RECLAMATION

*Managing Water in the West*

## Annual Operating Plan for Colorado River Reservoirs 2016



U.S. Department of the Interior  
Bureau of Reclamation



THE SECRETARY OF THE INTERIOR  
WASHINGTON

JAN 08 2016

The Honorable Jerry Brown  
Governor of California  
Sacramento, California 95814

Dear Governor Brown:

Enclosed is the Annual Operating Plan (AOP) for Colorado River System Reservoirs for 2016. The AOP contains the projected plan of operation of Colorado River reservoirs based on the most probable runoff conditions. The plan of operation reflects use of the reservoirs for all purposes consistent with the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs pursuant to the Colorado River Basin Project Act of September 30, 1968. The AOP for 2016 incorporates the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (2007 Interim Guidelines).

The AOP for 2016 was prepared by the Bureau of Reclamation in consultation with: the seven Colorado River Basin States Governors' representatives; representatives from Mexico; the Upper Colorado River Commission; Native American tribes; representatives of the academic and scientific communities, environmental organizations, and the recreation industry; water delivery contractors; appropriate Federal agencies; contractors for the purchase of Federal power; others interested in Colorado River operations; and the general public, through the Colorado River Management Work Group (Work Group). The Work Group held meetings on May 27, July 28, and September 2, 2015.

The water year release from Lake Powell in the 2016 water year is projected to be 9.00 million acre-feet (maf) (11,100 million cubic meters [mcm]). Given the hydrologic variability of the Colorado River System and based on actual 2016 water year operations, the projected water year release from Lake Powell in 2016 could be in the estimated range of 8.23 maf (10,150 mcm) to 11.43 maf (14,100 mcm) or greater.

Water deliveries in the Lower Basin during calendar year 2016 will be limited to 7.5 maf (9,250 mcm) plus or minus any credits for Intentionally Created Surplus (ICS). The 2007 Interim Guidelines adopted the ICS mechanism that, among other things, encourages the efficient use and management of Colorado River water in the Lower Basin. The ICS may be created and delivered in 2016 pursuant to the 2007 Interim Guidelines and appropriate delivery and forbearance agreements.

A volume of up to 1.5 maf (1,850 mcm) of water will be scheduled for delivery to Mexico during calendar year 2016 in accordance with Article 15 of the 1944 United States-Mexico Water Treaty and Minutes No. 242 and 314 (as it may be extended) of the International Boundary and Water Commission (IBWC). In accordance with IBWC Minute No. 319, Mexico may defer delivery of water pursuant to Sections III.1 and III.4, create Intentionally Created Mexican Allocation pursuant to Section III.4, or take delivery of additional water pursuant to Section III.4.

Inflow to Lake Powell has been below average in 13 of the past 16 water years (2000-2015). This 16 year period is the lowest in over 100 years of record keeping on the Colorado River. Accordingly, all water users in the Colorado River Basin are encouraged to prudently manage the use of available supplies.

The Department of the Interior continues to closely monitor water supply conditions in the Colorado River Basin and looks forward to continuing to work with your representatives and other interested stakeholders regarding the management of this vital river system.

Sincerely,



Sally Jewell

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# INTRODUCTION

## Background

Each year's Annual Operating Plan (AOP) for Colorado River Reservoirs reports on both the past operations of the Colorado River reservoirs for the completed year as well as projected operations and releases from these reservoirs for the current (i.e., upcoming) year. Accordingly, this 2016 AOP reports on 2015 operations as well as projected operations for 2016. In recent years, additions to the Law of the River such as operational rules, guidelines, and decisions have been put into place for Colorado River reservoirs including the 1996 Glen Canyon Dam Record of Decision<sup>1</sup> (ROD), the 1997 Operating Criteria for Glen Canyon Dam,<sup>2</sup> the 1999 Off-stream Storage of Colorado River Water Rule (43 CFR Part 414),<sup>3</sup> the 2001 Interim Surplus Guidelines<sup>4</sup> addressing operation of Hoover Dam, the 2006 Flaming Gorge Dam ROD,<sup>5</sup> the 2006 Navajo Dam ROD<sup>6</sup> to implement recommended flows for endangered fish, the 2007 Interim Guidelines for the operations of Lake Powell and Lake Mead,<sup>7</sup> the 2012 Aspinall ROD,<sup>8</sup> Minute No. 319 of the International Boundary and Water Commission (IBWC),<sup>9</sup> and numerous environmental assessments addressing experimental releases from Glen Canyon Dam. Each AOP incorporates these rules, guidelines, and decisions and implements the criteria contained in the applicable decision document or documents. Thus, the AOP makes projections and reports on how the Bureau of Reclamation (Reclamation) will implement these decisions in response to changing water supply conditions as they unfold during the upcoming year, when conditions become known. Congress has charged the Secretary of the Interior (Secretary) with stewardship and responsibility for a wide range of natural, cultural, recreational, and tribal resources within

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<sup>1</sup> ROD for the Operation of Glen Canyon Dam, October 9, 1996. Available online at:

[http://www.usbr.gov/uc/rm/amp/pdfs/sp\\_appndxG\\_ROD.pdf](http://www.usbr.gov/uc/rm/amp/pdfs/sp_appndxG_ROD.pdf).

<sup>2</sup> Operating Criteria for Glen Canyon Dam (62 *Federal Register* 9447, March 3, 1997).

<sup>3</sup> Off-stream Storage of Colorado River Water; Development and Release of Intentionally Created Unused Apportionment in the Lower Division States: Final Rule (43 CFR Part 414; 64 *Federal Register* 59006, November 1, 1999). Available online at:

<http://www.usbr.gov/lc/region/g4000/contracts/FinalRule43cfr414.pdf>.

<sup>4</sup> ROD for the Colorado River Interim Surplus Guidelines, January 16, 2001 (67 *Federal Register* 7772, January 25, 2001). Available online at: [http://www.usbr.gov/lc/region/g4000/surplus/surplus\\_rod\\_final.pdf](http://www.usbr.gov/lc/region/g4000/surplus/surplus_rod_final.pdf).

<sup>5</sup> ROD for the Operation of Flaming Gorge Dam, February 16, 2006. Available online at:

<http://www.usbr.gov/uc/envdocs/rod/fgFEIS/final-ROD-15feb06.pdf>.

<sup>6</sup> ROD for Navajo Reservoir Operations, Navajo Unit – San Juan River, New Mexico, Colorado, Utah, July 31, 2006. Available online at: <http://www.usbr.gov/uc/envdocs/eis/navajo/pdfs/NavWaterOpsROD2006.pdf>.

<sup>7</sup> ROD for Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (73 *Federal Register* 19873, April 11, 2008). The ROD adopting the 2007 Interim Guidelines was signed by the Secretary on December 13, 2007. Available online at:

<http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf>.

<sup>8</sup> ROD for the Aspinall Unit Operations, Final Environmental Impact Statement, April 2012. Available online at: <http://www.usbr.gov/uc/envdocs/eis/AspinallEIS/ROD.pdf>.

<sup>9</sup> IBWC Minute No. 319, Interim International Cooperative Measures in the Colorado River Basin Through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California dated November 20, 2012. Available online at:

[http://www.ibwc.gov/Files/Minutes/Minute\\_319.pdf](http://www.ibwc.gov/Files/Minutes/Minute_319.pdf).

the Colorado River Basin. The Secretary has the authority to operate and maintain Reclamation facilities within the Colorado River Basin addressed in this AOP to help manage these resources and accomplish their protection and enhancement in a manner fully consistent with applicable provisions of Federal law including the Law of the River, and other project-specific operational limitations.

The Secretary recognized in the 2007 Interim Guidelines that the AOP provides an integrated report on reservoir operations affected by numerous federal policies: *"The AOP is used to memorialize operational decisions that are made pursuant to individual federal actions (e.g., ISG [the 2001 Interim Surplus Guidelines], 1996 Glen Canyon Dam ROD, this [2007 Interim Guidelines] ROD). Thus, the AOP serves as a single, integrated reference document required by section 602(b) of the CRBPA of 1968 [Colorado River Basin Project Act of September 30, 1968 (Public Law 90-537)]<sup>10</sup> regarding past and anticipated operations."*

## **Authority**

This 2016 AOP was developed in accordance with the processes set forth in: Section 602 of the CRBPA; the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs Pursuant to the Colorado River Basin Project Act of September 30, 1968 (Public Law 90-537) (Operating Criteria), as amended, promulgated by the Secretary;<sup>11</sup> and Section 1804(c)(3) of the Grand Canyon Protection Act of 1992 (Public Law 102-575).<sup>12</sup>

Section 602(b) of the CRBPA requires the Secretary to prepare and *"transmit to the Congress and to the Governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria [i.e., the Operating Criteria] for the preceding compact water year and the projected operation for the current year."*

This AOP has been developed consistent with: the Operating Criteria; applicable Federal laws; the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, the Treaty Between the United States of America and Mexico, signed February 3, 1944 (1944 United States-Mexico Water Treaty);<sup>13</sup> interstate compacts; court decrees; the Colorado River Water Delivery Agreement;<sup>14</sup> the 2007 Interim Guidelines; and other documents relating to the use of the waters of the Colorado River, which are commonly and collectively known as the Law of the River.

The 2016 AOP was prepared by Reclamation on behalf of the Secretary, working with other Interior agencies and the Western Area Power Administration (Western). Reclamation

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<sup>10</sup> Available online at: <http://www.usbr.gov/lc/region/pao/pdfiles/crbproj.pdf>.

<sup>11</sup> Available online at: <http://www.usbr.gov/lc/region/pao/pdfiles/opcriter.pdf>.

<sup>12</sup> Available online at: <https://www.usbr.gov/uc/rm/amp/legal/gcpa1992.html>.

<sup>13</sup> Available online at: <http://www.ibwc.state.gov/Files/1944Treaty.pdf>.

<sup>14</sup> Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement for Purposes of Section 5(B) of Interim Surplus Guidelines, October 10, 2003 (69 *Federal Register* 12202, March 15, 2004). Available online at: <http://www.usbr.gov/lc/region/g4000/crwda/crwda.pdf>.



consulted with: the seven Colorado River Basin States Governors' representatives; representatives from Mexico; the Upper Colorado River Commission; Native American tribes; other appropriate Federal agencies; representatives of academic and scientific communities; environmental organizations; the recreation industry; water delivery contractors; contractors for the purchase of Federal power; others interested in Colorado River operations; and the general public through the Colorado River Management Work Group.

Article I(2) of the Operating Criteria allows for revision of the projected plan of operation to reflect current hydrologic conditions with notification to the Congress and the Governors of the Colorado River Basin States of any changes by June of each year. The process for revision of the AOP is further described in Section 7.C of the 2007 Interim Guidelines. Any revision to the final AOP may occur only through the AOP consultation process as required by applicable Federal law.

## **Purpose**

The purpose of the AOP is to illustrate the potential range of reservoir operations that might be expected in the upcoming water year, and to determine or address: (1) the quantity of water considered necessary to be in storage in the Upper Basin reservoirs as of September 30, 2016, pursuant to Section 602(a) of the CRBPA; (2) water available for delivery pursuant to the 1944 United States-Mexico Water Treaty and Minutes No. 242,<sup>15</sup> 314,<sup>16</sup> (as it may be extended) and 319 of the IBWC; (3) whether the reasonable consumptive use requirements of mainstream users in the Lower Division States will be met under a "Normal," "Surplus," or "Shortage" Condition as outlined in Article III of the Operating Criteria and as implemented by the 2007 Interim Guidelines; and (4) whether water apportioned to, but unused by one or more Lower Division States, exists and can be used to satisfy beneficial consumptive use requests of mainstream users in other Lower Division States as provided in the Consolidated Decree of the Supreme Court of the United States in *Arizona v. California*, 547 U.S. 150 (2006) (Consolidated Decree).<sup>17</sup>

Consistent with the above determinations and in accordance with other applicable provisions of the Law of the River, the AOP was developed with "appropriate consideration of the uses of the reservoirs for all purposes, including flood control, river regulation, beneficial consumptive uses, power production, water quality control, recreation, enhancement of fish and wildlife, and other environmental factors" (Operating Criteria, Article I(2)).

Since the hydrologic conditions of the Colorado River Basin can never be completely known in advance, the AOP presents projected operations resulting from three different hydrologic

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<sup>15</sup> IBWC Minute No. 242, Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River dated August 30, 1973. Available online at: <http://www.ibwc.gov/Files/Minutes/Min242.pdf>.

<sup>16</sup> IBWC Minute No. 314, Extension of the Temporary Emergency Delivery of Colorado River Water for use in Tijuana, Baja California dated November 14, 2008. Available online at: [http://www.ibwc.state.gov/Files/Minutes/Minute\\_314.pdf](http://www.ibwc.state.gov/Files/Minutes/Minute_314.pdf).

<sup>17</sup> Available online at: <http://www.usbr.gov/lc/region/pao/pdffiles/scconsolidateddecree2006.pdf>.

scenarios: the minimum probable, most probable, and maximum probable reservoir inflow conditions. Projected reservoir operations are modified during the water year as runoff forecasts are adjusted to reflect existing snowpack, basin storage, flow conditions, and as changes occur in projected water deliveries.

## Summary

**Upper Basin Delivery.** Taking into account (1) the existing water storage conditions in the basin, (2) the August 2015 24-Month Study<sup>18</sup> projection of the most probable near-term water supply conditions in the basin, and (3) Section 6.B of the 2007 Interim Guidelines, the Upper Elevation Balancing Tier will govern the operation of Lake Powell for water year 2016. The August 2015 24-Month Study of the most probable inflow scenario projects the water year 2016 release from Glen Canyon Dam to be 9.00 million acre-feet (maf) (11,100 million cubic meters [mcm]). Given the hydrologic variability of the Colorado River System and based on actual 2015 water year operations, the projected water year release from Lake Powell in 2016 is likely to be in the estimated range of 8.23 maf (10,150 mcm) to 11.43 maf (14,100 mcm) or greater.

For further information about the variability of projected inflow into Lake Powell, see the 2016 Water Supply Assumptions section and the Lake Powell section within the Summary of Reservoir Operations in 2015 and Projected 2016 Reservoir Operations, and Tables 3 and 4.

**Lower Basin Delivery.** Taking into account (1) the existing water storage conditions in the basin, (2) the most probable near-term water supply conditions in the basin, and (3) Section 2.B.5 of the 2007 Interim Guidelines, the Intentionally Created Surplus (ICS) Surplus Condition will govern the operation of Lake Mead for calendar year 2016 in accordance with Article III(3)(b) of the Operating Criteria and Article II(B)(2) of the Consolidated Decree.

No unused apportionment for calendar year 2016 is anticipated. If any unused apportionment becomes available after adoption of this AOP, Reclamation, on behalf of the Secretary, may allocate any such available unused apportionment for calendar year 2016. Any such allocation shall be made in accordance with Article II(B)(6) of the Consolidated Decree, the Lower Colorado Region Policy for Apportioned but Unused Water<sup>19</sup> (Unused Water Policy), and giving further consideration to the water conservation objectives of Section III.A of the December 10, 2014 Memorandum of Understanding (MOU) for Lower Basin Pilot Drought Response Actions.<sup>20</sup>

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<sup>18</sup> The 24-Month Study refers to the operational study conducted by Reclamation to project future reservoir operations. The most recent 24-Month Study report is available on Reclamation's Water Operations websites and is updated each month. Available online at: <http://www.usbr.gov/uc/water/crsp/studies/index.html> and <http://www.usbr.gov/lc/region/g4000/24mo/index.html>.

<sup>19</sup> Lower Colorado Region Policy for Apportioned but Unused Water, February 11, 2010. Available online at: <http://www.usbr.gov/lc/region/g4000/UnusedWaterPolicy.pdf>.

<sup>20</sup> Available online at: [http://www.usbr.gov/lc/region/g4000/LB\\_DroughtResponseMOU.pdf](http://www.usbr.gov/lc/region/g4000/LB_DroughtResponseMOU.pdf).

Colorado River water may be stored off-stream pursuant to individual Storage and Interstate Release Agreements (SIRAs) and 43 CFR Part 414 within the Lower Division States. The Secretary shall make Intentionally Created Unused Apportionment (ICUA) available to contractors in Arizona, California, or Nevada pursuant to individual SIRAs and 43 CFR Part 414.

The Inadvertent Overrun and Payback Policy (IOPP),<sup>21</sup> which became effective January 1, 2004, will be in effect during calendar year 2016.

Conserved Colorado River water is anticipated to be added to system reservoirs pursuant to system conservation agreements in calendar year 2016.

The 2007 Interim Guidelines adopted the ICS mechanism that among other things encourages the efficient use and management of Colorado River water in the Lower Basin. ICS may be created and delivered in calendar year 2016 pursuant to the 2007 Interim Guidelines and applicable delivery and forbearance agreements.

**1944 United States-Mexico Water Treaty Delivery.** A volume of 1.500 maf (1,850 mcm) of water will be available to be scheduled for delivery to Mexico during calendar year 2016 in accordance with Article 15 of the 1944 United States-Mexico Water Treaty and Minutes No. 242 and 314 (as it may be extended) of the IBWC. In accordance with IBWC Minute No. 319, Mexico may defer delivery of water pursuant to Sections III.1 and III.4, create Intentionally Created Mexican Allocation (ICMA) pursuant to Section III.4, or take delivery of additional water pursuant to Section III.4.

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<sup>21</sup> Record of Decision for Implementation Agreement, Inadvertent Overrun and Payback Policy, and Related Federal Actions, Final Environmental Impact Statement, October 10, 2003 (69 *Federal Register* 12202, March 15, 2004). Available online at: [http://www.usbr.gov/lc/region/g4000/crwda/crwda\\_rod.pdf](http://www.usbr.gov/lc/region/g4000/crwda/crwda_rod.pdf).

## 2015 HYDROLOGY SUMMARY AND RESERVOIR STATUS

Near average stream flows were observed throughout much of the Colorado River Basin during water year 2015. Unregulated<sup>22</sup> inflow to Lake Powell in water year 2015 was 10.17 maf (12,540 mcm), or 94 percent of the 30-year average<sup>23</sup> which is 10.83 maf (13,360 mcm). Unregulated inflow to Flaming Gorge, Blue Mesa, and Navajo Reservoirs was 107, 109, and 84 percent of average, respectively.

Precipitation in the Upper Colorado River Basin was below average<sup>24</sup> during the first part of water year 2015 and above average during the second part of the water year. On September 30, 2015, the cumulative precipitation received within the Upper Colorado River Basin for water year 2015 was 102 percent of average.

Snowpack conditions trended below average<sup>25</sup> across most of the Colorado River Basin throughout the snow accumulation season. The basin-wide snow water equivalent measured 62 percent of average on April 1, 2015. Total seasonal accumulation peaked at approximately 74 percent of average on March 9, 2015. On April 1, 2015, the snow water equivalents for the Green River, Upper Colorado River Headwaters, and San Juan River Basins were 74, 81, and 47 percent of average, respectively.

During the 2015 spring runoff period, inflows to Lake Powell peaked on June 15, 2015 at approximately 53,100 cubic feet per second (cfs) (1,500 cubic meters per second [cms]). The April through July unregulated inflow volume for Lake Powell was 6.71 maf (8,280 mcm) which was 94 percent of average.

Lower Basin tributary inflows above Lake Mead were below average for water year 2015. Tributary inflow from the Little Colorado River for water year 2015 totaled 0.082 maf (101 mcm), or 57 percent of the long-term average.<sup>26</sup> Tributary inflow from the Virgin River for water year 2015 totaled 0.090 maf (111 mcm), or 50 percent of the long-term average.

Tributary inflows in the Lower Colorado River Basin below Hoover Dam were below average during water year 2015. Total tributary inflow for water year 2015 from the Bill

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<sup>22</sup> Unregulated inflow adjusts for the effects of operations at upstream reservoirs. It is computed by adding the change in storage and the evaporation losses from upstream reservoirs to the observed inflow. Unregulated inflow is used because it provides an inflow time series that is not biased by upstream reservoir operations.

<sup>23</sup> Inflow statistics throughout this document will be compared to the mean of the 30-year period 1981-2010, unless otherwise noted.

<sup>24</sup> Precipitation statistics throughout this document are provided by the National Weather Service's Colorado Basin River Forecast Center and are based on the mean for the 30-year period 1981-2010, unless otherwise noted.

<sup>25</sup> Snowpack and snow water equivalent statistics throughout this document are provided by the Natural Resources Conservation Service and are based on the median for the 30-year period 1981-2010, unless otherwise noted.

<sup>26</sup> The basis for the long-term average of tributary inflows in the Lower Basin is natural flow data from 1981 to 2010. Additional information regarding natural flows may be found at <http://www.usbr.gov/lc/region/g4000/NaturalFlow/current.html>.

Williams River was 0.015 maf (19 mcm), or 16 percent of the long-term average, and total tributary inflow from the Gila River was 0.003 maf (3.7 mcm).<sup>27</sup>

The Colorado River total system storage experienced a net increase of 0.281 maf (347 mcm) in water year 2015. Reservoir storage in Lake Powell increased during water year 2015 by 0.047 maf (58 mcm). Reservoir storage in Lake Mead decreased during water year 2015 by 0.267 maf (329 mcm). At the beginning of water year 2015 (October 1, 2014), Colorado River total system storage was 50 percent of capacity. As of September 30, 2015, total system storage was 51 percent of capacity.

Tables 1 and 2 list the October 1, 2015, reservoir vacant space, live storage, water elevation, percent of capacity, change in storage, and change in water elevation during water year 2015.

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<sup>27</sup> Tributary inflow from the Gila River to the mainstream is very sporadic. These flows occur very seldom and when they do they are typically of high magnitude.

**Table 1. Reservoir Conditions on October 1, 2015 (English Units)**

Reservoir	Vacant Space	Live Storage	Water Elevation	Percent of Capacity	Change in Storage*	Change in Elevation*
	(maf)	(maf)	(ft)	(%)	(maf)	(ft)
Fontenelle	0.091	0.25	6,493.9	74	-0.060	-8.2
Flaming Gorge	0.300	3.45	6,032.6	92	0.166	4.3
Blue Mesa	0.103	0.73	7,507.7	88	0.126	15.4
Navajo	0.303	1.39	6,063.4	82	0.311	26.4
Lake Powell	11.99	12.33	3,606.0	51	0.047	0.5
Lake Mead	16.27	9.85	1,078.1	38	-0.267	-3.2
Lake Mohave	0.204	1.61	639.6	89	-0.039	-1.5
Lake Havasu	0.039	0.58	448.0	94	-0.003	-0.1
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Totals	29.3	30.2		51	0.281	

\* From October 1, 2014, to September 30, 2015.

**Table 2. Reservoir Conditions on October 1, 2015 (Metric Units)**

Reservoir	Vacant Space	Live Storage	Water Elevation	Percent of Capacity	Change in Storage*	Change in Elevation*
	(mcm)	(mcm)	(m)	(%)	(mcm)	(m)
Fontenelle	113	313	1,979.3	74	-74.3	-2.5
Flaming Gorge	370	4,260	1,838.7	92	205	1.3
Blue Mesa	128	895	2,288.3	88	156	4.7
Navajo	374	1,720	1,848.1	82	384	8.1
Lake Powell	14,790	15,210	1,099.1	51	58.0	0.1
Lake Mead	20,070	12,150	328.6	38	-329	-1.0
Lake Mohave	252	1,980	194.9	89	-48.1	-0.4
Lake Havasu	48.5	716	136.6	94	-3.70	0.0
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Totals	36,140	37,250		51	347	

\* From October 1, 2014, to September 30, 2015.

## 2016 WATER SUPPLY ASSUMPTIONS

For 2016 operations, three reservoir unregulated inflow scenarios were developed and analyzed: minimum probable, most probable, and maximum probable.

There is considerable uncertainty associated with streamflow forecasts and projections of reservoir operations made a year in advance. The National Weather Service's Colorado Basin River Forecast Center (CBRFC) forecasts the inflow for the minimum probable (90 percent exceedance), most probable (50 percent exceedance), and maximum probable (10 percent exceedance) inflow scenarios for 2016 using an Ensemble Streamflow Prediction model. Based upon the August CBRFC forecast, the range of unregulated inflows is projected to be as follows:

- The forecasted minimum probable unregulated inflow to Lake Powell in water year 2016 is 6.40 maf (7,890 mcm), or 59 percent of average.
- The forecasted most probable unregulated inflow to Lake Powell in water year 2016 is 9.54 maf (11,770 mcm), or 88 percent of average.
- The forecasted maximum probable unregulated inflow to Lake Powell in water year 2016 is 16.90 maf (20,850 mcm), or 156 percent of average.

Projected unregulated inflow volumes into Lake Powell for specific time periods for these three forecasted inflow scenarios are shown in Tables 3 and 4.

Inflows to the mainstream from Lake Powell to Lake Mead, Lake Mead to Lake Mohave, Lake Mohave to Lake Havasu, and below Lake Havasu are projected using historic data over the five-year period of January 2010 through December 2014, inclusive. These five years of historic data are representative of the most recent hydrologic conditions in the Lower Basin. The most probable side inflows into each reach are estimated as the arithmetic mean of the five-year record. The maximum probable and minimum probable projections for each reach are the 10 percent and 90 percent exceedance values, respectively, of the five-year record. For the reach from Lake Powell to Lake Mead, the minimum probable inflow during water year 2016 is 0.682 maf (841 mcm), the most probable inflow is 0.874 maf (1,080 mcm), and the maximum probable inflow is 1.09 maf (1,340 mcm).

The projected monthly volumes of inflow were input into the 24-Month Study and used to project potential reservoir operations for 2016. Starting with the August 2015 24-Month Study projection of the October 1, 2015 reservoir storage conditions, the projected monthly releases for each reservoir were adjusted until release and storage levels best accomplished project purposes and applicable operational objectives.

For the latest monthly projections for the major reservoirs in the Colorado River system, please see the most recent 24-Month Study report available on these Reclamation websites: <http://www.usbr.gov/uc/water/crsp/studies/index.html>, or <http://www.usbr.gov/lc/region/g4000/24mo/index.html>.

**Table 3. Projected Unregulated Inflow into Lake Powell for Water Year 2016  
(English Units)<sup>28</sup>**

Time Period	Minimum Probable (maf)	Most Probable (maf)	Maximum Probable (maf)
10/2015 – 12/2015	1.30	1.18	1.50
1/2016 – 3/2016	1.38	1.18	1.75
4/2016 – 7/2016	3.33	6.48	12.16
8/2016 – 9/2016	0.387	0.700	1.49
10/2016 – 12/2016	1.10	1.25	1.73
WY 2016	6.40	9.54	16.90
CY 2016	6.20	9.61	17.13

**Table 4. Projected Unregulated Inflow into Lake Powell for Water Year 2016  
(Metric Units)**

Time Period	Minimum Probable (mcm)	Most Probable (mcm)	Maximum Probable (mcm)
10/2015 – 12/2015	1,600	1,460	1,850
1/2016 – 3/2016	1,700	1,460	2,160
4/2016 – 7/2016	4,110	7,990	15,000
8/2016 – 9/2016	477	860	1,840
10/2016 – 12/2016	1,360	1,540	2,130
WY 2016	7,890	11,770	20,850
CY 2016	7,640	11,850	21,130

<sup>28</sup> All values in Tables 3 and 4 are projected inflows based upon the August CBRFC forecast with the exception of the values for 10/2016-12/2016. The values for 10/2016-12/2016 are based upon average unregulated inflow from 1981-2010. The calendar year totals in Tables 3 and 4 also reflect average values for the 10/2016-12/2016 time period. The CBRFC Most Probable forecast is issued as monthly values. The CBRFC Minimum and Maximum Probable forecasts are issued as water year totals, which Reclamation disaggregates to monthly values using monthly proportions of the 10<sup>th</sup> and 90<sup>th</sup> percentiles, respectively, of the 1981-2010 unregulated inflow.



## SUMMARY OF RESERVOIR OPERATIONS IN 2015 AND PROJECTED 2016 RESERVOIR OPERATIONS

The operation of the Colorado River reservoirs has affected some aquatic and riparian resources. Controlled releases from dams have modified temperature, sediment load, and flow patterns, resulting in increased productivity of some riparian and non-native aquatic resources and the development of economically significant sport fisheries. However, these same releases have detrimental effects on endangered and other native species. Operating strategies designed to protect and enhance aquatic and riparian resources have been established after appropriate National Environmental Policy Act (NEPA) compliance at several locations in the Colorado River Basin.

In the Upper Basin, public stakeholder work groups have been established at Fontenelle Dam, Flaming Gorge Dam, the Aspinall Unit, and Navajo Dam. These work groups provide a public forum for dissemination of information regarding ongoing and projected reservoir operations throughout the year and allow stakeholders the opportunity to provide information and feedback with respect to ongoing reservoir operations. Additionally, the Glen Canyon Dam Adaptive Management Work Group (AMWG)<sup>29</sup> was established in 1997 as a chartered committee under the Federal Advisory Committee Act of 1972 (Public Law 92-463).

Modifications to projected operations are routinely made based on changes in forecasted conditions or other relevant factors. Within the parameters set forth in the Law of the River and consistent with the Upper Colorado River Endangered Fish Recovery Program (UCRIP),<sup>30</sup> the San Juan River Basin Recovery Implementation Program (SJRIP),<sup>31</sup> Section 7 consultations under the Endangered Species Act, and other downstream concerns, modifications to projected monthly operations may be based on other factors in addition to changes in streamflow forecasts. Decisions on spring peak releases and downstream habitat target flows may be made midway through the runoff season. Reclamation will conduct meetings with Recovery Program participants, the U.S. Fish and Wildlife Service (Service), other Federal agencies, representatives of the Basin States, and with public stakeholder work groups to facilitate the discussions necessary to finalize site-specific projected operations.

The following paragraphs discuss reservoir operations in 2015 and the range of probable projected 2016 operations of each of the reservoirs with respect to applicable provisions of compacts, the Consolidated Decree, statutes, regulations, contracts, and instream flow needs for maintaining or improving aquatic and riparian resources where appropriate.

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<sup>29</sup> Information on the AMWG can be found at [www.usbr.gov/uc/rm/amp](http://www.usbr.gov/uc/rm/amp).

<sup>30</sup> Information on the UCRIP can be found at <http://coloradoriverrecovery.org>.

<sup>31</sup> Information on the SJRIP can be found at [www.fws.gov/southwest/sjrip](http://www.fws.gov/southwest/sjrip).

## **Fontenelle Reservoir**

Fontenelle Reservoir experienced an overall decrease in storage during water year 2015. The reservoir began water year 2015 with 0.314 maf (387 mcm) in storage, which is 91 percent of live capacity and corresponds to an elevation of 6,502.07 feet (1,981.83 meters). The end of water year 2015 reservoir elevation was 6,493.88 feet (1,979.33 meters) with 0.254 maf (313 mcm) in storage, which is 74 percent of live capacity.

Hydrologic conditions in the Upper Green River Basin were near average in water year 2015. Snowpack development tracked above average through February due to early season storms in November and December, but precipitation was well below average in the subsequent snow accumulation months from January through April. Melt began several weeks earlier than usual due to exceptionally warm winter and spring temperatures. Peak snow water equivalent reached 98 percent of seasonal median on March 27, 2015. The April forecast for the April through July inflow to Fontenelle Reservoir was 0.580 maf (715 mcm), or 80 percent of average. The observed inflow during the April to July season was 0.767 maf (946 mcm), or 106 percent of average. Due to unexpected and significantly above average precipitation in May, the resulting April through July runoff was much greater than anticipated in April.

Fontenelle Reservoir filled in water year 2015. The reservoir elevation peaked at 6,505.54 feet (1,982.89 meters) on June 18, 2015, which was 0.46 feet (0.14 meters) below the spillway crest. Inflow peaked at 7,520 cfs (213 cms) on June 13, 2015. Reservoir releases were made to balance downstream water resources needs and power production, while also allowing for filling the reservoir to maintain sufficient water in storage for use through the fall and winter months. Releases peaked at 7,030 cfs (199 cms) during June and were reduced to 1,020 cfs (28.9 cms) in September.

Based on the August 2015 24-Month Study, the most probable April through July inflow scenario for Fontenelle Reservoir during water year 2016 is 0.663 maf (818 mcm), or 91 percent of average. This volume far exceeds the 0.345 maf (426 mcm) storage capacity of Fontenelle Reservoir. For this reason, the most probable and maximum probable inflow scenarios would require releases during the spring that exceed the capacity of the powerplant to avoid uncontrolled spills from the reservoir. It is likely that Fontenelle Reservoir will fill during water year 2016. In order to minimize high spring releases and to maximize downstream water resources and power production, the reservoir will most likely be drawn down to about elevation 6,468.00 feet (1,971.45 meters) by early April 2016, which is 5.00 feet (1.52 meters) above the minimum operating level for power generation, and corresponds to a volume of 0.111 maf (137 mcm) of live storage.

## **Flaming Gorge Reservoir**

Flaming Gorge Reservoir experienced an overall increase in storage during water year 2015. The reservoir began water year 2015 with 3.28 maf (4,050 mcm) of live storage, which is 88 percent of live capacity and corresponds to an elevation of 6,028.31 feet (1,837.43 meters).

Inflow to Flaming Gorge Reservoir during water year 2015 was near average. Unregulated inflow in water year 2015 was 1.56 maf (1,920 mcm), which is 108 percent of average. The end of water year reservoir elevation was 6,032.59 feet (1,838.73 meters) corresponding to a volume of 3.45 maf (4,260 mcm) and 7.41 feet (2.26 meters) below the full pool elevation (6,040.00 feet [1,840.99 meters]) which corresponded to an available storage space of 0.302 maf (373 mcm).

Flaming Gorge Dam operations in 2015 were in compliance with the 2006 Flaming Gorge ROD. Reclamation convened the Flaming Gorge Technical Working Group (FGTWG) comprised of Service, Western, and Reclamation personnel. The FGTWG proposed that Reclamation manage releases to the Green River to meet the commitments of the ROD and, to the extent possible, meet the experimental design parameters outlined in the UCRIP Larval Trigger Study Plan (LTSP).<sup>32</sup> Larvae were detected on May 7, 2015 and releases from Flaming Gorge were increased to full powerplant capacity and additional bypass on May 11, 2015 (in combination, the peak release was approximately 7,500 cfs [212 cms]) for a total of seven days. Yampa River flows at the Deerlodge gage peaked twice during the spring runoff season, at 9,630 cfs (273 cms) on May 9, 2015 and at 10,100 cfs (286 cms) on June 4, 2015. The second peak resulted from increased precipitation in the basin during May. The peak release from Flaming Gorge occurred during a decline in the hydrograph prior to the second peak in Yampa River flows at Deerlodge. Deerlodge flows were less than or equal to 6,000 cfs (170 cms) when Flaming Gorge releases were at powerplant capacity with additional bypass in support of the LTSP.

The hydrologic conditions during spring 2015 consisted of above average snow accumulation beginning in December 2014 and continuing through February 2015. Snow water equivalent peaked on March 4, 2015 at 102 percent of average with deteriorating hydrologic conditions persisting through May. The May final forecast for the April through July unregulated inflow volume into Flaming Gorge Reservoir was 58 percent of average. Yampa River spring peak flows were much below average. The ROD hydrologic classification for the Upper Green was moderately dry. Yampa River conditions were dry. Flaming Gorge operations included the flexibility outlined in the ROD and the dry Yampa River conditions resulted in the operating hydrologic classification being decreased to dry rather than moderately dry. The May and June precipitation increased the hydrological classification to moderately dry. Releases from Flaming Gorge Dam remained at an average daily release of 1,000 cfs (28.3 cms) through May 10, 2015, when releases were increased to meet the LTSP request. After releases for the LTSP concluded, releases were decreased to base flow releases of 1,700 cfs (48.1 cms). Flows at Jensen met or exceeded ROD targets in Reach 2 for the ROD Flow Recommendation of at least one week peak duration at 8,300 cfs (235 cms) and the LTSP moderately dry target of 8,300 cfs (235 cms) for seven days, all of which occurred during larval drift.

Consistent with the ROD, considering information provided to the FGTWG, dry hydrologic conditions and in response to the Service's request, Reclamation operated Flaming Gorge

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<sup>32</sup> The LTSP's primary objective is to determine the effects of timing of Flaming Gorge spring release on razorback sucker larvae in the reach below the confluence of the Green and Yampa Rivers. The LTSP Report is available online at: <http://www.usbr.gov/uc/water/crsp/wg/fg/twg/twgSummaries.html>.

Dam to produce flows in Reach 2 to assist in the recovery of Colorado Pikeminnow during the summer of 2015. The ROD base flow period hydrologic classification was moderately dry as of August 2015. Daily base flows fluctuated during the summer to meet or exceed 1,900 cfs (53.8 cms) on the Green River at Jensen, Utah through October 31, 2015.

During water year 2016, Flaming Gorge Dam will continue to be operated in accordance with the ROD. Under the most probable inflow scenario, winter base flow releases are projected to be in the average classification range with a 25 percent increase above the average daily base flows calculated through the base flow period. Winter releases are projected to be approximately 2,200 cfs (62.3 cms). Daily base flows will likely fluctuate during the winter in response to hydropower needs during November through February and meet the average-year reservoir upper level drawdown elevation target of 6,027.00 feet (1,837.03 meters) by May 1, 2016. A spring peak release is projected to occur sometime in May or June 2016, and will be timed to coincide with either the peak flows of the Yampa River or emergence of razorback sucker larvae. Reclamation is considering long-term implementation strategies for the Recovery Program LTSP.

The UCRIP, in coordination with Reclamation, the Service, and Western, will continue conducting studies associated with floodplain inundation. Such studies may result in alternatives for meeting flow and temperature recommendations at lower peak flow levels where feasible.<sup>33</sup>

### **Blue Mesa, Morrow Point, and Crystal Reservoirs (Aspinall Unit)**

Blue Mesa Reservoir experienced an increase in storage in water year 2015. At the beginning of water year 2015 (October 1, 2014), the elevation of Blue Mesa was 7,492.28 feet (2,283.65 meters), and the storage content was 0.599 maf (739 mcm), which was 72 percent of capacity. At the end of water year 2015, the reservoir elevation was 7,507.65 feet (2,288.33 meters) with 0.726 maf (896 mcm) in storage, which is 87 percent of live capacity.

Below average snowpack conditions prevailed in the Gunnison River Basin during water year 2015. Snow measurement sites in the basin reported below average seasonal snow water equivalent levels throughout the winter and into the spring of 2015. On April 1, 2015, the snow water equivalent for the Gunnison River Basin was 63 percent of average.

The April forecast for the April through July unregulated inflow above Blue Mesa was 0.480 maf (592 mcm), which was 71 percent of average. The actual April through July unregulated inflow into Blue Mesa Reservoir in 2015 was 0.708 maf (873 mcm), which was 105 percent of average.

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<sup>33</sup> Flow and Temperature Recommendations for Endangered Fishes in the Green River Downstream of Flaming Gorge Dam, September 2000. Available online at: [http://ulpeis.anl.gov/documents/dpeis/references/pdfs/Muth\\_et\\_al\\_2000.pdf](http://ulpeis.anl.gov/documents/dpeis/references/pdfs/Muth_et_al_2000.pdf).

The fall through winter release from Crystal Dam varied between approximately 350 cfs (9.9 cms) and 1,100 cfs (31.1 cms) from October 31, 2014 through March 2015. On March 31, 2015, releases from Crystal Dam were increased for operation of Gunnison Tunnel. Flows through the Black Canyon were approximately 350 cfs (9.91 cms). Releases from the Aspinall Unit pursuant to the ROD reached over 2,000 cfs (56.6 cms) for 1 day. Flows under the ROD operations equaled or exceeded the flow rates in the Black Canyon Water Right Decree.<sup>34</sup> Flows through the Black Canyon and Gunnison River Gorge reached higher levels later during the runoff season due to unexpected wet hydrology with peak flows of 7,100 cfs (201 cms) for 5 days during June.

During water year 2015, the peak elevation of Blue Mesa Reservoir occurred on June 20, 2015 at an elevation of 7,519.40 feet (2,291.91 meters), which was at the full pool elevation. Storage in Blue Mesa Reservoir increased during water year 2015 by 0.127 maf (157 mcm). Total unregulated inflow into Blue Mesa Reservoir for water year 2015 was 1.04 maf (1,280 mcm) or 109 percent of average.

On May 3, 2012, Reclamation signed a ROD for the operation of the Aspinall Unit. For water year 2016, the Aspinall Unit will be operated in accordance with the 2012 ROD, including required consultations, while maintaining and continuing to meet its Congressionally-authorized purposes.

The projected most probable unregulated inflow for water year 2016 into Blue Mesa Reservoir is 0.880 maf (1,090 mcm), or 92 percent of average. The reservoir is expected to decrease to a seasonal low elevation of 7,482.31 feet (2,280.61 meters) by February 2016. The peak elevation is expected to be approximately 7,516.40 feet (2,291.91 meters) near the end of July 2016. By the end of water year 2016, Blue Mesa Reservoir is projected to be at elevation 7,499.75 feet (2,285.92 meters), with a storage of 0.659 maf (813 mcm), or 79 percent of capacity.

## **Navajo Reservoir**

Navajo Reservoir experienced an overall increase in storage in water year 2015. At the beginning of the 2015 water year, Navajo Reservoir was at an elevation of 6,036.99 feet (1,840.07 meters) which was 65 percent of live capacity and corresponded to a live storage content of 1.08 maf (1,330 mcm). Snowpack conditions in the San Juan River Basin were persistently below average during the winter months. On April 1, 2015, the snow water equivalent in the San Juan River Basin above Navajo Reservoir was 47 percent of the seasonal average for the basin.

Inflow to Navajo Reservoir in water year 2015 was below average. Water year 2015 modified unregulated inflow<sup>35</sup> to Navajo Reservoir was 0.903 maf (1,110 mcm), or 84

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<sup>34</sup> Decree quantifying the Federal Reserved Water Right for Black Canyon of the Gunnison National Park (State of Colorado District Court, Water Division Four, Case Number 01CW05), signed on January 8, 2009.

<sup>35</sup> Modified Unregulated inflow into Navajo Reservoir is equivalent to unregulated inflow adjusted for trans-basin diversion through the San Juan-Chama Project.

percent of average. The April through July modified unregulated inflow into Navajo Reservoir in water year 2015 was 0.619 maf (764 mcm), or 84 percent of average.

Navajo Reservoir reached a peak water surface elevation of 6,069.60 feet (1,850.01 meters) on July 20, 2015, which was 15.40 feet (4.69 meters) below full pool. The water surface elevation at Navajo Reservoir on September 30, 2015, was 6,063.41 feet (1,848.13 meters), with a reservoir storage volume of 1.39 maf (1,710 mcm) or 82 percent of capacity.

The San Juan Flow Recommendations,<sup>36</sup> completed by the SJRIP in May 1999, provide flow recommendations that promote the recovery of the endangered Colorado pikeminnow and razorback sucker, maintain important habitat for these two species as well as the other native species, and provide information for the evaluation of continued water development in the basin. The flow recommendations are scheduled to be reviewed by the SJRIP in fiscal year 2016.

In 2006, Reclamation completed a NEPA process on the implementation of operations at Navajo Dam. The ROD for the Navajo Reservoir Operations Final EIS (Navajo Reservoir ROD)<sup>37</sup> was signed by the Regional Director of Reclamation's Upper Colorado Region on July 31, 2006.

In water year 2015, Navajo Reservoir operated under the SJRIP and Reclamation's interim operations. Interim operations were discussed and adopted for water year 2015 at the SJRIP workshop held February 12-13, 2015. Under the interim operations, releases for SJRIP recovery purposes are dependent on annual hydrology and available water may be released as a spring peak release, an augmentation of existing target base flows, or some other SJRIP purposes. The interim operations specify an End of Water Year Storage Target equal to elevation 6,063.00 feet (1,848.00 meters) with a provision to decrease to 6,050.00 feet (1,844.04 meters) should the SJRIP and Reclamation determine additional releases are needed.

In response to the Gold King mine spill in the headwaters of the Animas River, Reclamation collaborated with the SJRIP to shift the timing of Navajo Reservoir releases to aid in dilution of the contaminant for the benefit of the endangered species in the San Juan River. Releases were increased from 650 cfs (18.4 cms) to 1,300 cfs (36.8 cms) on August 7-9, 2015 and reduced back to 650 cfs (18.4 cms) on August 10, 2015. This did not affect Navajo Reservoir total releases in water year 2015.

Navajo Reservoir was operated in compliance with the Navajo Reservoir ROD in 2015, including the SJRIP's target base flows. Based on the SJRIP and Reclamation's interim operations for water year 2015, there was no spring peak release in water year 2015.

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<sup>36</sup> Flow Recommendations for the San Juan River, May 1999. Available online at:

[http://www.fws.gov/southwest/sjrip/pdf/DOC\\_Flow\\_recommendations\\_San\\_Juan\\_River.pdf](http://www.fws.gov/southwest/sjrip/pdf/DOC_Flow_recommendations_San_Juan_River.pdf).

<sup>37</sup> Record of Decision for the Navajo Reservoir Operations, Navajo Unit –San Juan River, New Mexico, Colorado, Utah Final Environmental Impact Statement. Available online at:

<http://www.usbr.gov/uc/envdocs/eis/navajo/pdfs/NavWaterOpsROD2006.pdf>.

In 2012, a four-year agreement on recommendations for San Juan River operations and administration was developed among major users to limit their water use in years 2013-2016, to the rates and volumes indicated in the agreement.<sup>38</sup> The agreement includes limitations on diversions for 2013-2016, criteria for determining a shortage, and shortage-sharing requirements in the event of a water supply shortfall, including sharing of shortages between the water users and the flows for endangered fish habitat.

During water year 2016, Navajo Reservoir will be operated in accordance with the Navajo Reservoir ROD. Navajo Reservoir storage levels are expected to be near average in 2016 under the most probable inflow forecast. Base releases from the reservoir will likely range from 350 cfs (9.91 cms) to 500 cfs (14.2 cms) through the winter. Under the most probable April through July modified unregulated inflow forecast of 0.682 maf (841 mcm) in 2016, a three-week spring peak release would be recommended by the anticipated SJRIP and Reclamation's interim operations for water year 2016. The reservoir is projected to reach a peak elevation of 6,074.38 feet (1,851.47 meters) in May 2016. The reservoir is projected to reach a minimum elevation of 6,059.77 feet (1,847.02 meters) in February 2016.

Under the minimum probable 2016 April through July inflow forecast of 0.287 maf (354 mcm), there will not be a spring peak release made during the spring of 2016. Under the maximum probable 2016 April through July inflow forecast of 1.14 maf (1,410 mcm), a full spring peak release will be recommended as described by the anticipated SJRIP and Reclamation's interim operations for water year 2016.

## **Lake Powell**

Reservoir storage in Lake Powell increased during water year 2015. On October 1, 2014, the beginning of water year 2015, reservoir storage in Lake Powell was 51 percent of capacity at elevation 3,605.53 feet (1,098.97 meters), with 12.29 maf (15,160 mcm) in storage. On September 30, 2015, the reservoir storage in Lake Powell was 12.33 maf (15,210 mcm) at 51 percent of full capacity, resulting in a net gain during water year 2015 of 0.047 maf (58 mcm). The unregulated inflow to Lake Powell during water year 2015 was 94 percent of average. Lake Powell ended the water year on September 30, 2015, at elevation 3,606.01 feet (1,099.11 meters).

The August 2014 24-Month Study was run to project the January 1, 2015, elevations of Lake Powell and Lake Mead and determine the water year 2015 operating tier for Lake Powell. Using the most probable inflow scenario, and with an 8.23 maf (10,150 mcm) annual release pattern for Lake Powell, the January 1, 2015, reservoir elevations of Lake Powell and Lake Mead were projected to be 3,596.62 feet (1,096.25 meters) and 1,083.37 feet (330.21 meters), respectively. Given these projections, the annual release volume from Lake Powell during water year 2015 was consistent with the Upper Elevation Balancing Tier (Section 6.B

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<sup>38</sup> Recommendations for San Juan River Operations and Administration for 2013-2016, July 2, 2012. Available online at: [http://www.fws.gov/southwest/sjrip/DR\\_SS03.cfm](http://www.fws.gov/southwest/sjrip/DR_SS03.cfm).



of the 2007 Interim Guidelines) and under Section 6.B.1, the annual release would be 8.23 maf (10,150 mcm).

The Upper Elevation Balancing Tier, however, does provide for the possibility of adjustments to the operation of Lake Powell based on the projected end of water year condition of Lake Powell and Lake Mead from the April 24-Month Study. The April 2015 24-Month Study was run with an 8.23 maf (10,150 mcm) annual release volume to project the September 30, 2015, elevations of Lake Powell and Lake Mead. Under the most probable inflow scenario, and with an 8.23 maf (10,150 mcm) annual release volume, the projected end of water year elevation at Lake Powell was 3,591.34 feet (1,094.64 meters) and Lake Mead was 1,066.05 feet (324.93 meters). Since the projected end of water year elevation at Lake Powell was below the 2015 Equalization elevation of 3,649.00 feet (1,112.22 meters) and above 3,575.00 feet (1,089.66 meters) and the projected Lake Mead elevation was below 1,075.00 feet (327.66 meters), Section 6.B.4 of the 2007 Interim Guidelines governed for the remainder of water year 2015. Under Section 6.B.4, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.00 maf (11,100 mcm) and not less than 8.23 maf (10,150 mcm) from Lake Powell. The annual release volume during water year 2015 was 9.00 maf (11,100 mcm).

The April through July unregulated inflow to Lake Powell in water year 2015 was 6.71 maf (8,280 mcm) which was 94 percent of average. Lake Powell reached a peak elevation for water year 2015 of 3,614.32 feet (1,101.64 meters) on July 14, 2015, which was 85.68 feet (26.12 meters) below full pool. This peak elevation corresponds to a live storage content of 13.17 maf (16,240 mcm).

The third experimental release under the 2012 High-Flow Experimental Protocol (Protocol)<sup>39</sup> was conducted during November 2014. Reclamation made releases at the maximum available capacity (38,000 cfs [1,080 cms]) during the experiment which began on November 10 and ended on November 15, 2014. The release at its maximum capacity consisted of approximately 23,000 cfs (651 cms) through the turbines and 15,000 cfs (425 cms) through the bypass tubes. Approximately 0.132 maf (163 mcm) was bypassed during the experiment. The total annual release from Glen Canyon Dam in water year 2015 did not change as a result of the High Flow Experiment.

The ten-year total flow of the Colorado River at Lee Ferry<sup>40</sup> for water years 2006 through 2015 is 90.30 maf (111,380 mcm). This total is computed as the sum of the flow of the Colorado River at Lees Ferry, Arizona, and the Paria River at Lees Ferry, Arizona, surface water discharge stations which are operated and maintained by the United States Geological Survey.

**2016 Operating Tier and Projected Operations for Glen Canyon Dam.** The January 1, 2016, reservoir elevations of Lake Powell and Lake Mead are projected under the most

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<sup>39</sup> Finding of No Significant Impact for the Environmental Assessment for Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona through 2020. Available online at: <http://www.usbr.gov/uc/envdocs/ea/gc/HFEProtocol/index.html>.

<sup>40</sup> A point in the mainstream of the Colorado River one mile below the mouth of the Paria River.



probable inflow scenario to be 3,602.46 feet (1,098.03 meters) and 1,082.33 feet (329.89 meters), respectively, based on the August 2015 24-Month Study. Given these projections, the operating tier and annual release volume from Lake Powell during water year 2016 will be consistent with the Upper Elevation Balancing Tier (Section 6.B of the 2007 Interim Guidelines) and, under Section 6.B.1, the annual release would be 8.23 maf (10,150 mcm). The Upper Elevation Balancing Tier, however, does provide for the possibility of adjustments to the operation of Lake Powell based on the projected end of water year conditions of Lake Powell and Lake Mead from the April 24-Month Study.

If the April 2016 24-Month Study, with a water year release volume of 8.23 maf (10,150 maf) projects the September 30, 2016, Lake Powell elevation to be greater than 3,651.00 feet (1,112.82 meters), operations will be adjusted and the Equalization Tier will govern the operation of Lake Powell for the remainder of the water year consistent with Section 6.B.3. If this condition occurs, and an adjustment is made, the water year release volume will likely be greater than 8.23 maf (10,150 mcm) and will be determined based on the Equalization Tier as described in Section 6.A of the 2007 Interim Guidelines.

If the April 2016 24-Month Study, with a water year release volume of 8.23 maf (10,150 mcm), projects the September 30, 2016, Lake Powell elevation to be at or above 3,575.00 feet (1,089.66 meters) and below the 2016 Equalization level of 3,651 feet (1,112.82 meters), and the September 30, 2016, Lake Mead elevation to be below 1,075.00 feet (327.66 meters), the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.00 maf (11,100 mcm) and not less than 8.23 maf (10,150 mcm) from Lake Powell in water year 2016 consistent with Section 6.B.4 of the 2007 Interim Guidelines.

Under the minimum probable inflow scenario, the August 2015 24-Month Study, with a projected water year release volume of 8.23 maf (10,150 mcm) in water year 2016, projects the elevations of Lake Powell and Lake Mead on September 30, 2016, would be 3,592.70 feet (1,095.05 meters) and 1,063.75 feet (324.23 meters), respectively. Based on these projections, an April adjustment to balancing is projected to govern Lake Powell operations under the minimum probable inflow scenario and the water year release for 2016 is projected to be 9.00 maf (11,100 mcm). The end of water year elevation and storage of Lake Powell is projected to be 3,584.83 feet (1,092.66 meters) and 10.36 maf (12,780 mcm), respectively, based on the minimum probable inflow scenario.

Under the most probable inflow scenario, the August 2015 24-Month Study, with a projected water year release volume of 8.23 maf (10,150 mcm) in water year 2016, projects the elevations of Lake Powell and Lake Mead on September 30, 2016, would be 3,616.69 feet (1,102.37 meters) and 1,066.02 feet (324.92 meters), respectively. Based on these projections, under the most probable inflow scenario, an April adjustment to balancing is projected to occur during water year 2016. Consistent with Section 6.B.4, the 2016 water year release volume projected under the most probable inflow scenario is 9.00 maf (11,100 mcm) and the end of water year elevation and storage of Lake Powell is projected to be 3,609.78 feet (1,100.26 meters) and 12.71 maf (15,680 mcm), respectively.

Under the maximum probable inflow scenario, the August 2015 24-Month Study, with a projected water year release volume of 8.23 maf (10,150 mcm) in water year 2016, projects the elevation of Lake Powell on September 30, 2016, would be 3,670.52 feet (1,118.77 meters). This elevation is above the Equalization Level for water year 2016 of 3,651.00 feet (1,112.82 meters). Based on this projection, an April adjustment to equalization is projected to occur under the maximum probable inflow scenario and the water year release for 2016 is projected to be 11.43 maf (14,100 mcm). The end of water year elevation and storage of Lake Powell is projected to be 3,648.10 feet (1,111.94 meters) and 16.98 maf (20,940 mcm), respectively, based on the maximum probable inflow scenario.

In 2016, scheduled maintenance activities at Glen Canyon Dam powerplant will require that one or more of the eight generating units periodically be offline. Coordination between Reclamation offices in Salt Lake City, Utah, and Page, Arizona, and Western will take place in the scheduling of maintenance activities to minimize impacts to operations throughout the water year including experimental releases.

Because of less than full storage conditions in Lake Powell resulting from drought in the Colorado River Basin, releases from Glen Canyon Dam for dam safety purposes are highly unlikely in 2016. If implemented, releases greater than powerplant capacity would be made consistent with the 1956 Colorado River Storage Project Act,<sup>41</sup> the CRBPA, and to the extent practicable, the recommendations made pursuant to the Grand Canyon Protection Act of 1992. Reservoir releases in excess of powerplant capacity required for dam safety purposes during high reservoir conditions may be used to accomplish the objectives of the beach/habitat-building flow according to the terms contained in the 1996 Glen Canyon Dam ROD and as published in the 1997 Glen Canyon Dam Operating Criteria (*Federal Register*, Volume 62, No. 41, March 3, 1997).<sup>42</sup>

Releases from Lake Powell in water year 2016 will continue to reflect consideration of the uses and purposes identified in the authorizing legislation for Glen Canyon Dam. Releases will reflect criteria based on the findings, conclusions, and recommendations made in the 1996 Glen Canyon Dam ROD for the Glen Canyon Dam Final Environmental Impact Statement (GCDFEIS) (consistent with the Grand Canyon Protection Act of 1992) and applicable Secretarial decisions.

Monthly releases are updated to be consistent with annual volumes determined pursuant to the 2007 Interim Guidelines. Monthly releases for 2016 will also be consistent with the GCDFEIS/ROD.

For the latest monthly projections for Lake Powell, please see the most recent 24-Month Study report available on Reclamation's Upper Colorado Region Water Operations website: <http://www.usbr.gov/uc/water/crsp/studies/index.html>.

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<sup>41</sup> Available online at: <http://www.usbr.gov/lc/region/pao/pdffiles/crspuc.pdf>.

<sup>42</sup> Available online at: <http://www.gpo.gov/fdsys/pkg/FR-1997-03-03/pdf/97-5144.pdf>.

Daily and hourly releases in 2016 will be made according to the parameters of the 1996 Glen Canyon Dam ROD for the GCDFEIS and the 1997 Glen Canyon Dam Operating Criteria. These parameters set the maximum and minimum flows and ramp rates within which reservoir releases must be made. Exceptions to these parameters will be made in accordance with the Emergency Exception Criteria as described in the 1997 Glen Canyon Dam Operating Criteria.

Following a decision to not implement a high-flow experimental release from Glen Canyon Dam in November 2015 due to concerns with the potential to further distribute non-native fish species, the Department of the Interior will conduct planning for high-flow experimental releases from Glen Canyon Dam in March-April 2016 in accordance with the Protocol, pending confirmation that the non-native fish issue has been resolved.

## **Lake Mead**

For calendar year 2015, the ICS Surplus Condition was the criterion governing the operation of Lake Mead in accordance with Article III(3)(b) of the Operating Criteria, Article II(B)(2) of the Consolidated Decree, and Section 2.B.5 of the 2007 Interim Guidelines. Delivery of water to Mexico was scheduled in accordance with Article 15 of the 1944 United States-Mexico Treaty and Minutes No. 242 and 319 of the IBWC.

Lake Mead began water year 2015 on October 1, 2014, at elevation 1,081.33 feet (329.59 meters), with 10.12 maf (12,480 mcm) in storage, which is 39 percent of the conservation capacity<sup>43</sup> of 26.12 maf (32,220 mcm). Lake Mead ended water year 2015 at elevation 1,078.10 feet (328.60 meters) with 9.85 maf (12,150 mcm) in storage (38 percent of capacity) on September 30, 2015.

The total release from Lake Mead through Hoover Dam during water year 2015 was 9.25 maf (11,410 mcm). The total release from Lake Mead through Hoover Dam during calendar year 2015 is projected to be 9.37 maf (11,560 mcm).

The total inflow into Lake Mead is a combination of water released from Glen Canyon Dam plus inflows in the reach between Glen Canyon and Hoover Dams. In water year 2015, inflow into Lake Mead was 9.72 maf (11,990 mcm), consisting of 9.0 maf (11,100 mcm) of water released from Glen Canyon Dam and 0.724 maf (893 mcm) of inflows between Glen Canyon and Hoover Dams. For water year 2016, under the most probable inflow scenario, total inflow into Lake Mead is anticipated to be 9.87 maf (12,170 mcm).

Based on the August 2015 24-Month Study, Lake Mead's elevation on January 1, 2016, is projected to be 1,082.33 feet (329.89 meters). In accordance with Section 2.B.5 of the 2007

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<sup>43</sup> Conservation capacity is the amount of space available for water storage between Lake Mead's water surface elevations 895 feet (272.8 meters) and 1,219.6 feet (371.7 meters), the start of the exclusive flood control space as defined in the Field Working Agreement Between Department of the Interior, Bureau of Reclamation and Department of the Army, Corps of Engineers for Flood Control of Hoover Dam and Lake Mead, Colorado River, Nevada-Arizona, February 8, 1984.

Interim Guidelines, the ICS Surplus Condition will govern the releases and diversions from Lake Mead in calendar year 2016. Releases from Lake Mead through Hoover Dam for water year and calendar year 2016 are anticipated to be approximately the same as 2015 releases.

Under the most probable inflow scenario, Lake Mead is projected to end water year 2016 at elevation 1,075.03 feet (327.67 meters), with 9.60 maf (11,840 mcm) in storage (37 percent of capacity). Lake Mead is projected to increase to elevation 1,079.57 feet (329.05 meters) with 9.98 maf (12,310 mcm) in storage (38 percent of capacity) at the end of calendar year 2016.

For the latest monthly projections for Lake Mead, please see the most recent 24-Month Study report available on Reclamation's Lower Colorado Region Water Operations website: <http://www.usbr.gov/lc/region/g4000/24mo/index.html>.

## **Lakes Mohave and Havasu**

Lake Mohave started water year 2015 at an elevation of 641.03 feet (195.39 meters) with 1.65 maf (2,040 mcm) in storage. The water level of Lake Mohave was regulated between elevation 634.40 feet (193.37 meters) and 643.88 feet (196.25 meters) during the water year, ending at an elevation of 639.56 feet (194.94 meters), with 1.61 maf (1,990 mcm) in storage. During water year 2015, 8.95 maf (11,040 mcm) was released from Davis Dam. The calendar year 2015 total release is projected to be 8.98 maf (11,080 mcm).

For water and calendar years 2016, Davis Dam is projected to release approximately the same amount of water as in 2015, and the water level in Lake Mohave will be regulated between an elevation of approximately 633 feet (193 meters) and 645 feet (197 meters).

Lake Havasu started water year 2015 at an elevation of 448.17 feet (136.60 meters) with 0.583 maf (719 mcm) in storage. The water level of Lake Havasu was regulated between elevation 446.36 feet (136.05 meters) and 448.89 feet (136.82 meters) during the water year, ending at an elevation of 448.04 feet (136.94 meters), with 0.581 maf (717 mcm) in storage. During water year 2015, 6.14 maf (7,570 mcm) was released from Parker Dam. The calendar year 2015 total release is projected to be 6.25 maf (7,710 mcm).

For water and calendar years 2016, Parker Dam is expected to release approximately the same amount of water as in 2015, and the water level in Lake Havasu will be regulated between an elevation of approximately 446 feet (136 meters) and 450 feet (137 meters).

Lakes Mohave and Havasu are scheduled to be drawn down in the late summer and fall months to provide storage space for local storm runoff and will be filled in the winter to meet higher summer water needs. This drawdown also corresponds with normal maintenance at both Davis and Parker powerplants scheduled for September through March.

## **Bill Williams River**

Abnormally dry to moderate drought conditions persisted in the Bill Williams River watershed during water year 2015. Tributary inflows into Alamo Lake were below average during water year 2015 and water released by the U.S. Army Corps of Engineers (USACE) from Alamo Dam totaled 0.015 maf (19 mcm) for water year 2015, approximately 16 percent of the long-term average.

Alamo Lake storage decreased by 0.004 maf (4.9 mcm) from October 1, 2014 to September 30, 2015. During this period, Alamo Lake decreased from elevation 1,090.08 feet (332.26 meters) to elevation 1,088.25 feet (331.70 meters). In water year 2015, average daily releases from Alamo Lake ranged from 9.5 to 25 cfs (0.27 to 0.71 cms).

## **Senator Wash and Laguna Reservoirs**

Senator Wash Reservoir is an off-stream regulating storage facility below Parker Dam (approximately 142 river miles downstream) and has a storage capacity of 0.014 maf (17 mcm) at full pool elevation of 251.00 feet (76.50 meters). The reservoir is used to store excess flows from the river caused by water user cutbacks, side wash inflows due to rain, and other factors. Stored waters are utilized to meet the water demands in Arizona and California and the delivery obligation to Mexico.

Since 1992, elevation restrictions have been in place on Senator Wash Reservoir due to potential piping and liquefaction of foundation and embankment materials at West Squaw Lake Dike and Senator Wash Dam. Senator Wash Reservoir is restricted to an elevation of 240.00 feet (73.15 meters) with 0.009 maf (11 mcm) of storage, a loss of about 0.005 maf (6.2 mcm) of storage from its original capacity. Senator Wash Reservoir elevation must not exceed an elevation of 238.00 feet (72.54 meters) for more than 10 consecutive days. This reservoir restriction is expected to continue in 2016.

Laguna Reservoir is a regulating storage facility located approximately five river miles downstream of Imperial Dam and is primarily used to capture sluicing flows from Imperial Dam. The storage capability of Laguna Reservoir has diminished from about 0.0015 maf (1.9 mcm) to approximately 0.0004 maf (0.5 mcm) due to sediment accumulation and vegetation growth. Sediment accumulation in the reservoir has occurred primarily due to flood releases that occurred in 1983 and 1984, and flood control or space building releases that occurred between 1985 and 1988 and from 1997 through 1999.

Sediment removal at Laguna Reservoir has begun so that operational sluicing can be reestablished. The Laguna Basin Dredging project will dredge approximately 2.25 million cubic yards (1.7 mcm) of sediment, reestablishing 140 acres (0.57 square kilometers) of open water. As of September 2015, approximately 0.873 million cubic yards (0.67 mcm) of material have been removed. All dredged material will be disposed of in a designated area adjacent to the project site. The project incorporates the use of both land-based and

waterborne heavy equipment. The project permit was obtained from the USACE in May 2013 and is valid through May 2016.

## **Imperial Dam**

Imperial Dam is the last diversion dam on the Colorado River for United States water users. From the head works at Imperial Dam, water is diverted into the All-American Canal on the California side of the dam and into the Gila Gravity Main Canal on the Arizona side of the dam. These diversions provide water to the Gila Project, the Yuma Project, the Imperial Irrigation District, the Coachella Valley Water District, and the City of Yuma, and through Siphon Drop and Pilot Knob to the Northerly International Boundary (NIB) for diversion at Morelos Dam in Mexico. Flows arriving at Imperial Dam for calendar year 2015 are projected to be 5.22 maf (6,440 mcm). The flows arriving at Imperial Dam for calendar year 2016 are projected to be 5.45 maf (6,720 mcm).

## **Gila River Flows**

During water year 2015, there was below average snowfall in the Gila River Basin, including the Salt and Verde River watersheds. The Salt River Project did not release water from its system in excess of diversion requirements at Granite Reef Diversion Dam; therefore, no water reached or was released from Painted Rock Dam by the USACE in water year 2015.

## **Warren H. Brock Reservoir**

The Warren H. Brock (Brock) Reservoir is located near the All-American Canal in Imperial County, California. Construction of the reservoir began in 2008 and was completed in the summer of 2010 with commissioning in September. The first filling and drainage test began in September 2010 and was completed in November 2010. In February 2011, Reclamation began operating the reservoir with the Imperial Irrigation District (IID) under an interim operating agreement. On July 5, 2012, Reclamation and IID entered into a long-term operations and maintenance agreement for Brock Reservoir.

The purpose of the 0.008 maf (9.9 mcm) Brock Reservoir is to reduce nonstorable flows and to enhance beneficial use of Colorado River water within the United States. The reservoir reduces the impact of loss of water storage at Senator Wash due to operational restrictions and provides additional regulatory storage, allowing for more efficient management of water below Parker Dam.

## Yuma Desalting Plant

The Yuma Desalting Plant (YDP) was authorized in 1974 under the Colorado River Basin Salinity Control Act (Public Law 93-320)<sup>44</sup> which authorized the federal government to construct the YDP to desalt the drainage flows from the Wellton-Mohawk Division of the Gila Project. This would allow the treated water to be delivered to Mexico as part of its 1944 United States-Mexico Water Treaty allotment. The United States has met salinity requirements established in IBWC Minute No. 242 primarily through use of a canal to bypass Wellton-Mohawk drain water to the Ciénega de Santa Clara (Ciénega), a wetland of open water, vegetation, and mudflats within a Biosphere Reserve in Mexico. In calendar year 2015, the amount of water discharged from the Wellton-Mohawk Division through the bypass canal is anticipated to be 0.105 maf (130 mcm) measured at station 0+00 and 0.130 maf (160 mcm) measured at the Southerly International Boundary (SIB), at an approximate concentration of total dissolved solids of 2,400 parts per million (ppm).

## System Conservation

System conservation agreements allow water users to participate in pilot projects designed to determine whether voluntary, temporary, and compensated programs to conserve or reduce consumptive use of Colorado River water can benefit the entire Colorado River system by mitigating the effect on declining storage levels in Colorado River reservoirs.

In 2013, a pilot fallowing program agreement was executed between the Central Arizona Water Conservation District (CAWCD), through the Central Arizona Groundwater Replenishment District, and the Yuma Mesa Irrigation and Drainage District (YMIDD) (Pilot Fallowing Program).<sup>45</sup> The Pilot Fallowing Program is being conducted in two 3-year phases (2014 to 2016; 2017 to 2019). CAWCD and YMIDD proposed that the water conserved in the first phase would remain in Lake Mead as system water. Approximately 0.007 maf (8.6 mcm) will be conserved in both 2015 and 2016 under this program.

In 2014, an \$11 million funding agreement for system conservation (SC Funding Agreement) was executed among Reclamation, CAWCD, the Metropolitan Water District of Southern California (MWD), Denver Water (DW), and the Southern Nevada Water Authority (SNWA) (the Funding Partners).<sup>46</sup> The SC Funding Agreement establishes a pilot system conservation program (SC Program) for funding the creation of Colorado River system water through voluntary water conservation actions and reductions in water use

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<sup>44</sup> Available online at: <http://www.usbr.gov/lc/region/pao/pdffiles/crbsalct.pdf>.

<sup>45</sup> Yuma Mesa Irrigation and Drainage District and Central Arizona Water Conservation District Pilot Fallowing and Forbearance Agreement, dated September 12, 2013.

<sup>46</sup> Agreement Among the United States of America, through the Department of the Interior, Bureau of Reclamation, the Central Arizona Water Conservation District, the Metropolitan Water District of Southern California, Denver Water, and the Southern Nevada Water Authority, for a Pilot Program for Funding the Creation of Colorado River System Water through Voluntary Water Conservation and Reductions in Use, dated July 30, 2014. Available online at: <http://www.usbr.gov/newsroom/docs/2014-07-30-Executed-Pilot-SCP-Funding-Agreement.pdf>.

beginning in 2015 and continuing through at least 2016. The purpose of this SC Program is to explore and learn about the effectiveness of voluntary measures that could be used, when needed, to help maintain water levels in Lake Powell and Lake Mead above critical levels. All water conserved as a result of the pilot program would be considered Colorado River system water. To facilitate administration and implementation of the SC Program in the Upper Basin, the Upper Colorado River Commission and the Funding Partners entered into a facilitation agreement in May 2015, clarifying how the SC Program will be applied in the Upper Basin. Requests for proposals under the SC Program have been received by potential program participants in both the Upper and Lower Basins and implementation agreements have been, and are anticipated to be, executed in 2015.

In addition to the previously mentioned activities, Reclamation, CAWCD, MWD, SNWA, and the Lower Division States signed an MOU on December 10, 2014 to use best efforts to implement further voluntary measures designed to add to storage in Lake Mead. Furthermore, Congress has provided authorization for additional funding through Reclamation for drought-related activities to increase Colorado River system water in Lake Mead, Lake Powell, and other Colorado River system reservoirs for the benefit of the system. A report evaluating the effectiveness of the water conservation pilot projects is due to Congress in 2018, including a recommendation on whether the activities undertaken by the pilot projects should be continued.<sup>47</sup>

## **Off-stream Storage Agreements**

Colorado River water may be stored off-stream pursuant to individual SIRAs and 43 CFR Part 414 within the Lower Division States. The Secretary shall make ICUA available to contractors in Arizona, California, or Nevada pursuant to individual SIRAs and 43 CFR Part 414. SNWA has proposed to make unused Nevada basic apportionment available for storage by MWD in calendar year 2015 and may propose to make unused Nevada basic apportionment available for storage by MWD and/or the Arizona Water Banking Authority (AWBA) in calendar year 2016.<sup>48,49</sup>

## **Intentionally Created Surplus**

The 2007 Interim Guidelines included the adoption of the ICS mechanism that, among other things, encourages the efficient use and management of Colorado River water in the Lower

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<sup>47</sup> Consolidated and Further Continuing Appropriations Act, 2015 (Public Law 113-235, Div. D., Secs. 204-206) (December 16, 2014).

<sup>48</sup> Storage and Interstate Release Agreement among The United States of America, acting through the Secretary of the Interior; The Metropolitan Water District of Southern California; the Southern Nevada Water Authority; and the Colorado River Commission of Nevada, October 21, 2004. Available online at: [http://www.usbr.gov/lc/region/g4000/contracts/SNWA\\_MWDSIRAFinal.pdf](http://www.usbr.gov/lc/region/g4000/contracts/SNWA_MWDSIRAFinal.pdf).

<sup>49</sup> Storage and Interstate Release Agreement among The United States of America, acting through the Secretary of the Interior; The Arizona Water Banking Authority; the Southern Nevada Water Authority; and the Colorado River Commission of Nevada, December 18, 2002. Available online at: <http://www.usbr.gov/lc/region/g4000/contracts/SIRAFinal.pdf>.



Basin. ICS may be created through several types of activities that include improvements in system efficiency, extraordinary conservation, tributary conservation, and the importation of non-Colorado River System water into the Colorado River mainstream over the course of a calendar year. Several implementing agreements<sup>50</sup> were executed concurrent with the issuance of the ROD for the 2007 Interim Guidelines. ICS credits may be created and delivered in calendar years 2015 and 2016 pursuant to the 2007 Interim Guidelines and the implementing agreements. ICS balances by state, user, and type of ICS may be found in the annual Colorado River Accounting and Water Use Report, Arizona, California, and Nevada.<sup>51</sup>

**Extraordinary Conservation ICS.** IID has approved plans to create up to 0.025 maf (31 mcm) of Extraordinary Conservation ICS in 2015 and 2016. MWD has approved plans to create up to 0.200 maf (247 mcm) of Extraordinary Conservation ICS in 2015 and 2016. Contractors with available Extraordinary Conservation ICS may request delivery of ICS credits in 2015 and 2016.

**System Efficiency ICS.** When the Brock reservoir project was funded, CAWCD, MWD, and SNWA received System Efficiency ICS credits in exchange for funding. In 2015 and 2016, MWD and SNWA may request an annual delivery of up to 0.025 maf (31 mcm) and 0.040 maf (49 mcm) of those System Efficiency ICS credits, respectively. When the YDP Pilot Run was conducted, CAWCD, MWD, and SNWA received System Efficiency ICS credits in exchange for funding. Approximately 0.030 maf (37 mcm) of System Efficiency ICS credits from the YDP Pilot Run were created in 2010 and 2011. MWD and SNWA may request delivery of these System Efficiency ICS credits in proportion to their capital contributions in 2015 or a subsequent year. Under the funding arrangements for Brock Reservoir and the YDP Pilot Run, CAWCD has agreed not to request delivery of System Efficiency ICS credits in 2015.

**Tributary Conservation ICS.** SNWA has approved plans to create up to 0.0295 maf (36.4 mcm) of Tributary Conservation ICS in 2015 and 2016. Any Tributary Conservation ICS not delivered for use by SNWA in the calendar year created will, at the beginning of the following year, be converted to Extraordinary Conservation ICS pursuant to the 2007 Interim Guidelines.

**Imported ICS.** SNWA has approved plans to create up to 0.009 maf (11 mcm) of Imported ICS in 2015 and 2016. Any Imported ICS not delivered for use by SNWA in the calendar year created will, at the beginning of the following year, be converted to Extraordinary Conservation ICS pursuant to the 2007 Interim Guidelines.

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<sup>50</sup> Delivery Agreement between the United States and IID; Delivery Agreement between the United States and MWD; Delivery Agreement between the United States, SNWA and the Colorado River Commission of Nevada (CRCN); Lower Colorado River Basin Intentionally Created Surplus Forbearance Agreement among the Arizona Department of Water Resources, SNWA, CRCN, the Palo Verde Irrigation District (PVID), IID, Coachella Valley Water District (CVWD), MWD, and the City of Needles; and the California Agreement for the Creation and Delivery of Extraordinary Conservation Intentionally Created Surplus among the PVID, IID, CVWD, MWD, and the City of Needles. These agreements are available online at:

<http://www.usbr.gov/lc/region/programs/strategies/documents.html>.

<sup>51</sup> Available online at: <http://www.usbr.gov/lc/region/g4000/wtracct.html>.

## Delivery of Water to Mexico

Delivery to Mexico pursuant to the 1944 United States-Mexico Water Treaty, and IBWC Minute No. 319, is anticipated to be 1.500 maf (1,850 mcm) in calendar year 2015. In accordance with IBWC Minute No. 319, Mexico may defer delivery of water pursuant to Sections III.1 and III.4, create ICMA pursuant to Section III.4, or take delivery of additional water pursuant to Section III.4 in calendar year 2015. Balances of water deferred by Mexico in previous years may be found in the annual Colorado River Accounting and Water Use Report, Arizona, California, and Nevada.<sup>52</sup>

Of the scheduled delivery to Mexico in calendar year 2015, approximately 1.360 maf (1,680 mcm) is projected to be delivered at NIB and approximately 0.140 maf (173 mcm) is projected to be delivered at SIB. No water is anticipated to be delivered to Tijuana, Baja California in calendar year 2015.<sup>53</sup>

Of the total delivery at SIB projected in calendar year 2015, approximately 0.110 maf (136 mcm) is projected to be delivered from the Yuma Project Main Drain and approximately 0.030 maf (37 mcm) is expected to be delivered by the Protective and Regulatory Pumping Unit (Minute No. 242 wells).

Excess flows arriving at the NIB are anticipated to be approximately 0.020 maf (25 mcm) in calendar year 2015. Excess flows result from a combination of factors, including heavy rain from winter storms, water ordered but not delivered to United States users downstream of Parker Dam, inflows into the Colorado River below Parker Dam, and spills from irrigation facilities below Imperial Dam.

Pursuant to the 1944 United States-Mexico Water Treaty, a volume of 1.500 maf (1,850 mcm) will be available to be scheduled for delivery to Mexico in calendar year 2016. In accordance with IBWC Minute No. 319, Mexico may defer delivery of water pursuant to Sections III.1 and III.4, create ICMA pursuant to Section III.4, or take delivery of additional water pursuant to Section III.4 in calendar year 2016. Following execution and approval of an extension to IBWC Minute No. 314 and an amendment to the Emergency Delivery Agreement,<sup>54</sup> IBWC may request water to be delivered for Tijuana through MWD, the San Diego County Water Authority, and the Otay Water District's respective distribution system facilities in California. Approximately 0.140 maf (173 mcm) is projected to be delivered at SIB and the remainder of the water to be scheduled for delivery to Mexico in 2016 will be delivered at NIB.

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<sup>52</sup> Available online at: <http://www.usbr.gov/lc/region/g4000/wtracct.html>.

<sup>53</sup> IBWC Minute No. 314 and the Emergency Delivery Agreement expired on November 9, 2013; therefore, a new minute and an amendment to the Emergency Delivery Agreement are required to extend the temporary emergency delivery of Colorado River water for use in Tijuana.

<sup>54</sup> Amendment No. 1 to Agreement for Temporary Emergency Delivery of a Portion of the Mexican Treaty Waters of the Colorado River to the International Boundary in the Vicinity of Tijuana, Baja California, Mexico, and for the Operation of Facilities in the United States, dated November 26, 2008.

Drainage flows to the Colorado River from the Yuma Mesa Conduit and South Gila Drain Pump Outlet Channels are projected to be 0.020 maf (25 mcm) and 0.010 maf (12 mcm), respectively, for calendar year 2015. This water is available for delivery at NIB in satisfaction of the 1944 United States-Mexico Water Treaty. Reclamation holds a permit from the Arizona Department of Water Resources (ADWR)<sup>55</sup> to pump an additional 0.025 maf (31 mcm) of groundwater annually for water delivery to Mexico to replace water bypassed to the Ciénega through the bypass canal. Salinity conditions have not allowed for increased pumping and Reclamation will continue to monitor and evaluate conditions under the permit in the future.

As stated in Minute No. 242, the maximum allowable salinity differential is 145 ppm by the United States' measurement or count and 151 ppm by the Mexican count. The salinity differential for calendar year 2015 is projected to be 140 ppm by the United States' count.

Mexico has identified four critical months, October through January, regarding improving the quality of water delivered at SIB. Consistent with an MOU between Reclamation and the U.S. Section of the IBWC,<sup>56</sup> the United States has agreed to reduce the salinity of water delivered at SIB during this period. To accomplish the reduction in salinity, the United States constructed a diversion channel to bypass up to 0.008 maf (9.9 mcm) of Yuma Valley drainage water during the four critical months identified by Mexico. This water will be replaced by better quality water from the Minute No. 242 well field to reduce the salinity at SIB. Reclamation anticipates bypassing approximately 0.001 maf (1.2 mcm) in calendar year 2015 to the diversion channel for salinity control and up to 0.008 maf (9.9 mcm) in calendar year 2016.

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<sup>55</sup> ADWR Transport Permit Number 30-001 entitled Permit to Transport Groundwater Withdrawn from the Yuma Groundwater Basin, March 1, 2007.

<sup>56</sup> Available online at: [http://www.usbr.gov/lc/region/g4000/10\\_2001MOU.pdf](http://www.usbr.gov/lc/region/g4000/10_2001MOU.pdf).

## 2016 DETERMINATIONS

The AOP provides projections regarding reservoir storage and release conditions during the upcoming year, based upon Congressionally-mandated and authorized storage, release, and delivery criteria and determinations. After meeting these criteria and determinations, specific reservoir releases may be modified within these requirements as forecasted inflows change in response to climatic variability and to provide additional benefits coincident to the projects' multiple purposes.

### Upper Basin Reservoirs

Section 602(a) of the CRBPA provides for the storage of Colorado River water in Upper Basin reservoirs and the release of water from Lake Powell that the Secretary finds reasonably necessary to assure deliveries to comply with Articles III(c), III(d), and III(e) of the 1922 Colorado River Compact without impairment to the annual consumptive use in the Upper Basin. The Operating Criteria provide that the annual plan of operation shall include a determination of the quantity of water considered necessary to be in Upper Basin storage at the end of the water year after taking into consideration all relevant factors including historic streamflows, the most critical period of record, the probabilities of water supply, and estimated future depletions. Water not required to be so stored will be released from Lake Powell:

- to the extent it can be reasonably applied in the States of the Lower Division to the uses specified in Article III(e) of the 1922 Colorado River Compact, but these releases will not be made when the active storage in Lake Powell is less than the active storage in Lake Mead;
- to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell; and
- to avoid anticipated spills from Lake Powell.

Taking into consideration all relevant factors required by Section 602(a)(3) of the CRBPA and the Operating Criteria, it is determined that the active storage in Upper Basin reservoirs projected for September 30, 2016, under the most probable inflow scenario would be below the threshold required under Section 602(a) of the CRBPA.

Taking into account (1) the existing water storage conditions in the basin, (2) the August 2015 24-Month Study projection of the most probable near-term water supply conditions in the basin, and (3) Section 6.B of the 2007 Interim Guidelines, the Upper Elevation Balancing Tier will govern the operation of Lake Powell for water year 2016. The August 2015 24-Month Study of the most probable inflow scenario projects the water year 2016 release from Glen Canyon Dam to be 9.00 maf (11,100 mcm). Given the hydrologic variability of the Colorado River System and based on actual 2015 water year operations,

the projected water year release from Lake Powell in 2016 could be in the estimated range of 8.23 maf (10,150 mcm) to 11.43 maf (14,100 mcm) or greater.

## **Lower Basin Reservoirs**

Pursuant to Article III of the Operating Criteria and consistent with the Consolidated Decree, water shall be released or pumped from Lake Mead to meet the following requirements:

- (a) 1944 United States-Mexico Water Treaty obligations;
- (b) Reasonable beneficial consumptive use requirements of mainstream users in the Lower Division States;
- (c) Net river losses;
- (d) Net reservoir losses;
- (e) Regulatory wastes; and
- (f) Flood control.

The Operating Criteria provide that after the commencement of delivery of mainstream water by means of the Central Arizona Project, the Secretary will determine the extent to which the reasonable beneficial consumptive use requirements of mainstream users are met in the Lower Division States. Reasonable beneficial consumptive use requirements are met depending on whether a Normal, Surplus, or Shortage Condition has been determined. The Normal Condition is defined as annual pumping and release from Lake Mead sufficient to satisfy 7.500 maf (9,250 mcm) of consumptive use in accordance with Article III(3)(a) of the Operating Criteria and Article II(B)(1) of the Consolidated Decree. The Surplus Condition is defined as annual pumping and release from Lake Mead sufficient to satisfy in excess of 7.500 maf (9,250 mcm) of consumptive use in accordance with Article III(3)(b) of the Operating Criteria and Article II(B)(2) of the Consolidated Decree. An ICS Surplus Condition is defined as a year in which Lake Mead's elevation is projected to be above elevation 1,075.0 feet (327.7 meters) on January 1, a Flood Control Surplus has not been determined, and delivery of ICS has been requested. The Secretary may determine an ICS Surplus Condition in lieu of a Normal Condition or in addition to other operating conditions that are based solely on the elevation of Lake Mead. The Shortage Condition is defined as annual pumping and release from Lake Mead insufficient to satisfy 7.500 maf (9,250 mcm) of consumptive use in accordance with Article III(3)(c) of the Operating Criteria and Article II(B)(3) of the Consolidated Decree.

The 2007 Interim Guidelines are being utilized in calendar year 2016 and serve to implement the narrative provisions of Article III(3)(a), Article III(3)(b), and Article III(3)(c) of the Operating Criteria and Article II(B)(1), Article II(B)(2), and Article II(B)(3) of the Consolidated Decree for the period through 2026. The 2007 Interim Guidelines will be used annually by the Secretary to determine the quantity of water available for use within the Lower Division States.

Consistent with the 2007 Interim Guidelines, the August 2015 24-Month Study was used to forecast the system storage as of January 1, 2016. Based on a projected January 1, 2016 Lake Mead elevation of 1,082.33 feet (329.89 meters) and consistent with Section 2.B.5 of the 2007 Interim Guidelines, the ICS Surplus Condition will govern releases for use in the states of Arizona, Nevada, and California during calendar year 2016 in accordance with Article III(3)(b) of the Operating Criteria and Article II(B)(2) of the Consolidated Decree. Water deliveries in the Lower Basin during calendar year 2016 will be limited to 7.500 maf (9,250 mcm) plus or minus any credits for ICS.

Article II(B)(6) of the Consolidated Decree allows the Secretary to allocate water that is apportioned to one Lower Division State but is for any reason unused in that state to another Lower Division State. This determination is made for one year only, and no rights to recurrent use of the water accrue to the state that receives the allocated water. No unused apportionment for calendar year 2016 is anticipated. If any unused apportionment becomes available after adoption of this AOP, Reclamation, on behalf of the Secretary, shall allocate any such available unused apportionment for calendar year 2016 in accordance with Article II(B)(6) of the Consolidated Decree, the Unused Water Policy, and giving further consideration to the water conservation objectives of Section III.A of the December 10, 2014 MOU for Lower Basin Pilot Drought Response Actions.

Water may be stored off-stream pursuant to individual SIRAs and 43 CFR Part 414 within the Lower Division States. The Secretary shall make ICUA available to contractors in Arizona, California, or Nevada pursuant to individual SIRAs and 43 CFR Part 414. SNWA may propose to make unused Nevada basic apportionment available for storage by MWD and/or AWBA in calendar year 2016.

The IOPP, which became effective January 1, 2004, will be in effect during calendar year 2016. Payback balances by state and user may be found in the annual Colorado River Accounting and Water Use Report, Arizona, California, and Nevada.<sup>57</sup>

In calendar year 2016, conserved Colorado River water is anticipated to be added to system reservoirs pursuant to the SC Funding Agreement and the Pilot Fallowing Program.

The 2007 Interim Guidelines included the adoption of the ICS mechanism that among other things encourages the efficient use and management of Colorado River water in the Lower Basin. The ICS Surplus Condition will govern Lower Basin operations in calendar year 2016 and ICS credits will be created and delivered pursuant to the 2007 Interim Guidelines and appropriate delivery and forbearance agreements.

Given the limitation of available supply and recent low inflow amounts within the Colorado River Basin, the Secretary, through Reclamation, will continue to review Lower Basin operations to assure that all deliveries and diversions of mainstream water are in strict accordance with the Consolidated Decree, applicable statutes, contracts, rules, and agreements.

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<sup>57</sup> Available online at: <http://www.usbr.gov/lc/region/g4000/wtracct.html>.

As provided in Section 7.C of the 2007 Interim Guidelines, the Secretary may undertake a mid-year review to consider revisions of the current AOP. For Lake Mead, the Secretary shall revise the determination in any mid-year review for the current year only to allow for additional deliveries from Lake Mead pursuant to Section 7.C of the 2007 Interim Guidelines.

### **1944 United States-Mexico Water Treaty**

Under the minimum probable, most probable, and maximum probable inflow scenarios, water in excess of that required to supply uses in the United States and the guaranteed quantity of 1.500 maf (1,850 mcm) allotted to Mexico will not be available, subject to any increased amounts delivered consistent with Section III.4 of IBWC Minute No. 319. Vacant storage space in mainstream reservoirs is substantially greater than that required by flood control regulations. Therefore, a volume of 1.500 maf (1,850 mcm) of water will be available to be scheduled for delivery to Mexico during calendar year 2016 subject to and in accordance with Article 15 of the 1944 United States-Mexico Water Treaty and Minutes No. 242 and 314 (as it may be extended) of the IBWC. In accordance with IBWC Minute No. 319, Mexico may defer delivery of water pursuant to Sections III.1 and III.4, create ICMA pursuant to Section III.4, or take delivery of additional water pursuant to Section III.4.

Calendar year schedules of the monthly deliveries of Colorado River water are formulated by the Mexican Section of the IBWC and presented to the United States Section before the beginning of each calendar year. Pursuant to the 1944 United States-Mexico Water Treaty, the monthly quantity prescribed by those schedules may be increased or decreased by not more than 20 percent of the monthly quantity, upon 30-day notice in advance to the United States Section. Any change in a monthly quantity is offset in another month so that the total delivery for the calendar year is unchanged, subject to the provisions of the 1944 United States-Mexico Water Treaty and IBWC Minute No. 319 (which contains specific provisions regarding adjustment of delivery schedules).

## DISCLAIMER

Nothing in this AOP is intended to interpret the provisions of the Colorado River Compact (45 Stat. 1057); the Upper Colorado River Basin Compact (63 Stat. 31); the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Treaty Between the United States of America and Mexico (Treaty Series 994, 59 Stat. 1219); the United States/Mexico agreement in Minute No. 242 of August 30, 1973, (Treaty Series 7708; 24 UST 1968) or Minute No. 314 of November 26, 2008 (as it may be extended), or Minute No. 319 of November 20, 2012; the Consolidated Decree entered by the Supreme Court of the United States in *Arizona v. California* (547 U.S 150 (2006)); the Boulder Canyon Project Act (45 Stat. 1057; 43 U.S.C. 617); the Boulder Canyon Project Adjustment Act (54 Stat. 774; 43 U.S.C. 618a); the Colorado River Storage Project Act (70 Stat. 105; 43 U.S.C. 620); the Colorado River Basin Project Act (82 Stat. 885; 43 U.S.C. 1501); the Colorado River Basin Salinity Control Act (88 Stat. 266; 43 U.S.C. 1951); the Hoover Power Plant Act of 1984 (98 Stat. 1333); the Hoover Power Allocation Act of 2011 (125 Stat. 777); the Colorado River Floodway Protection Act (100 Stat. 1129; 43 U.S.C. 1600); the Grand Canyon Protection Act of 1992 (Title XVIII of Public Law 102-575, 106 Stat. 4669); or the Decree Quantifying the Federal Reserved Right for Black Canyon of the Gunnison National Park (Case No. 01CW05, District Court, Colorado Water Division No. 4, 2008).



## ACRONYMS AND ABBREVIATIONS

ADWR	Arizona Department of Water Resources
AMP	Glen Canyon Dam Adaptive Management Program
AMWG	Glen Canyon Dam Adaptive Management Work Group
AOP	Annual Operating Plan
AWBA	Arizona Water Banking Authority
CAWCD	Central Arizona Water Conservation District
CBRFC	National Weather Service's Colorado Basin River Forecast Center
CFR	Code of Federal Regulations
cfs	cubic feet per second
cms	cubic meters per second
CRBPA	Colorado River Basin Project Act of 1968
CRCN	Colorado River Commission of Nevada
CVWD	Coachella Valley Water District
DW	Denver Water
EIS	Environmental Impact Statement
FGTWG	Flaming Gorge Technical Work Group
GCDFEIS	Glen Canyon Dam Final Environmental Impact Statement of 1996
IBWC	International Boundary and Water Commission, United States and Mexico
ICMA	Intentionally Created Mexican Allocation
ICS	Intentionally Created Surplus
ICUA	Intentionally Created Unused Apportionment
IID	Imperial Irrigation District
IOPP	Inadvertent Overrun and Payback Policy
LTSP	Larval Trigger Study Plan
maf	million acre-feet
mcm	million cubic meters
MOU	Memorandum of Understanding
MWD	The Metropolitan Water District of Southern California
NEPA	National Environmental Policy Act of 1969, as amended
NIB	Northerly International Boundary
ppm	parts per million
PVID	Palo Verde Irrigation District
Reclamation	United States Bureau of Reclamation
ROD	Record of Decision
SC	System Conservation
Secretary	Secretary of the United States Department of the Interior
Service	United States Fish and Wildlife Service
SIB	Southerly International Boundary
SIRA	Storage and Interstate Release Agreement
SJRIP	San Juan River Basin Recovery Implementation Program
SNWA	Southern Nevada Water Authority
USACE	United States Army Corps of Engineers
UCRIP	Upper Colorado River Endangered Fish Recovery Program
Western	Western Area Power Administration

YDP  
YMIDD

Yuma Desalting Plant  
Yuma Mesa Irrigation and Drainage District