2017 Review

Water Quality Standards for Salinity Colorado River System

October 2017

Colorado River Basin Salinity Control Forum

2017 Review

WATER QUALITY STANDARDS FOR SALINITY
COLORADO RIVER SYSTEM

October 2017

Prepared by

Colorado River Basin Salinity Control Forum

COLORADO RIVER BASIN SALINITY CONTROL FORUM

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The Colorado River Basin
(2012 Colorado River Basin Water Supply and Demand Study)

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TRANSMITTAL LETTERS

The Federal Water Pollution Control Act requires that at least once every three years the Basin States review water quality standards relating to the salinity of the Colorado River. The states collectively initiated this review under direction of the Forum. The Forum prepared a draft review and, after providing an opportunity for public comment, prepared this final 2017 Review.

With the adoption of this final review, copies are being sent to the Colorado River Basin State Governors listed below for inclusion within their individual state water quality standards.

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LIST OF ABBREVIATIONS

208 Plan	Section 208 of the Clean Water Act amendments of 1972 and 1977 requiring integrated area-wide plans and programs for dealing with water pollution problems
Act	The Colorado River Basin Salinity Control Act (P.L. 93-320) (1974), as amended by P.L. 98-569 (1984), P.L. 104-20 (1995), P.L. 104-127 (1996), P.L. 106-459 (2000), P.L. 107-171 (2002) and P.L. 110-246 (2008)
Basin	Colorado River Basin
Basin Funds	Lower Colorado River Basin Development Fund and Upper Colorado River Basin Fund
Basin States	Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming
BSP	Basin States Program
Basinwide Program	Basinwide Salinity Control Program
BLM	United States Bureau of Land Management
Clean Water Act	P.L. 92-500
Congress	United States Congress
CRSS	Colorado River Simulation System
EQIP	Environmental Quality Incentives Program
EPA	United States Environmental Protection Agency
Forum	Colorado River Basin Salinity Control Forum
Ktons	Thousand tons of salt
maf	million acre-feet
mgd	million gallons per day
mg/L	milligrams per liter
Mtons	Million tons of salt
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
Program	Colorado River Basin Salinity Control Program
Reclamation	United States Bureau of Reclamation
Review	2017 Review, *Water Quality Standards for Salinity, Colorado River System*
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
WWTP	Waste Water Treatment Plant

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SUMMARY

This document is a review of the water quality standards for salinity in the Colorado River. Section 303 of the Clean Water Act amendments to the Federal Water Pollution Control Act require that water quality standards are reviewed every three years. Accordingly, the seven-state Colorado River Basin Salinity Control Forum has reviewed the existing state-adopted and EPA-approved water quality standards for salinity consisting of numeric criteria and a Plan of Implementation. Upon adoption by the Forum, this Review will be submitted to the governors of each of the Basin States for inclusion in their state water quality standards.

The Forum recommends no change in the numeric salinity criteria at the three stations located on the lower main stem of the Colorado River. The numeric criteria at these stations will remain:

Station	Salinity in mg/L[1]
Below Hoover Dam	723
Below Parker Dam	747
At Imperial Dam	879

The Plan of Implementation is intended to maintain the salinity concentrations at or below the numeric criteria while the Basin States continue to develop their compact-apportioned waters. The U.S. Bureau of Reclamation's (Reclamation) computer modeling indicates less than 5 percent probability of exceeding the numeric criteria in the next three years. The Colorado River Basin Salinity Control Act requires the implementation of salinity control programs to reduce the salinity of the Colorado River. Reducing the salinity of the Colorado River water reduces economic impacts to its users. While the Plan of Implementation included in this Review ensures the numeric criteria will not be exceeded during the review period, the Forum will continue to evaluate opportunities for additional salinity control that will (1) increase the economic benefits realized in the Lower Basin, and (2) provide additional direct and indirect benefits to the Upper Basin.

The Forum's Plan of Implementation includes:

1. Construction of salinity control measures by Reclamation, USDA, the Basin States Program and BLM to the extent that those measures remain viable and appropriately cost-effective.

2. State implementation of the Forum's adopted policies for effluent limitations under the National Pollutant Discharge Elimination System (Appendix B of this Review).

3. Implementation of non-point source management plans developed by the states and approved by EPA.

[1] Flow-weighted average annual salinity

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Item 1 of the plan listed above is to be implemented by federal agencies in conjunction with state, local and private participants. The Forum works jointly with federal agencies on developing measures to be implemented. Items 2 and 3 are primarily implemented by the Colorado River Basin states.

The current Plan of Implementation approved by the Forum anticipates an additional 63,500 tons of annual salinity control over the next three years. The program to date has controlled over 1.33 million tons of salt annually and the current program funding levels would control 1.66 million tons annually by 2035. Reclamation's numerical modeling indicates that there is less than 5 percent probability of exceeding the numerical criteria over the next three years with the current and planned salinity control projects. The Salinity Control Program continues to be a successful federal and state partnership that has environmental and economic benefits for users of Colorado River water.

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PURPOSE OF THE REVIEW

The 2017 Review: *Water Quality Standards for Salinity, Colorado River System* (Review) is prepared and submitted in response to Section 303(c) of Public Law (P.L.) 92-500 (Clean Water Act) by the seven-state Colorado River Basin Salinity Control Forum (Forum) on behalf of the governors of their respective states. This review of the water quality standards includes the numeric criteria and the Plan of Implementation developed and adopted by the Forum. This is the 14th review conducted by the Forum. Section 303(c)(1) of the Clean Water Act requires that:

> The governor of a state or the state water pollution control agency of such state shall from time to time (but at least once each three-year period beginning with the date of enactment of the Federal Water Pollution Control Act Amendments of 1972) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards. Results of such review shall be made available to the Administrator [of the Environmental Protection Agency].

The scope of this Review is limited to the portion of the Colorado River Basin (Basin) above Imperial Dam and how this area of the Basin is in compliance with the water quality standards approved by the United States Environmental Protection Agency (EPA) in 1975 (Standards). This Review focuses on the 2018 to 2020 period (review period) and evaluates the appropriateness of the Standards in the Basin. Background information and activities regarding historical actions relative to the development and adoption of salinity standards are contained in the Forum report, *Water Quality Standards for Salinity, Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System*, Colorado River Basin Salinity Control Forum, June 1975.

Below Imperial Dam, salinity is controlled as a federal responsibility to meet the terms of the agreement with Mexico contained within Minute No. 242 of the International Boundary and Water Commission entitled "Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River." Minute No. 242 requires that measures be taken to assure that Colorado River water delivered to Mexico upstream from Morelos Dam will have an average annual salinity concentration of no more than 115 ± 30 parts per million total dissolved solids (TDS) higher than the average annual flow-weighted salinity concentration of the Colorado River water arriving at Imperial Dam.

Nothing in this Review shall be construed to alter, amend, repeal, interpret, modify or be in conflict with the provisions of the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774), the Colorado River Basin Project Act (82 Stat. 885), the Colorado River Compact, the Colorado River Storage Project Act (70 Stat. 105), the Upper Colorado River Basin Compact, or the Treaty with the United Mexican States (Treaty Series 994).

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HISTORY AND BACKGROUND

The Colorado River Basin Salinity Control Program (Program) is a unique cooperative watershed effort between several federal agencies and seven states designated to meet national, international and state water quality objectives. The Forum participates with federal, state, local agencies and private participants to ensure the successful execution of the triennial Plan of Implementation through on-the-ground activities and encouraging legislative support for federal funding.

The Basin is 242,000 square miles[2] (approximately 155 million acres) of the western United States and a small portion of northern Mexico. Currently, about 40 million[3] people in the seven western states of Arizona, California, Nevada (Lower Basin States) and Colorado, New Mexico, Utah, and Wyoming (Upper Basin States), collectively referred to as the Basin States, rely on the Colorado River and its tributaries to provide some, if not all, of their municipal water needs. Additionally, water from the Colorado River system is utilized to irrigate nearly 5.5 million acres of land[4] in the Basin, producing some 15 percent of the nation's crops and about 13 percent of its livestock, which combined generate many billions of dollars a year in agricultural benefits.

The Colorado River also serves as the lifeblood for at least twenty-two federally recognized Native American Indian tribes, seven National Wildlife Refuges, four National Recreation Areas, and eleven National Park units. Hydropower facilities along the Colorado River supply more than 4,200 megawatts of electrical capacity to help meet the power needs of the West and reduce the use of fossil fuels. Finally, the Colorado River is vital to Mexico, supporting a thriving agricultural industry in the San Luis and Mexicali Valleys and providing municipal water supplies for communities in the Mexican States of Sonora and Baja California.

The Colorado River system is operated in accordance with the Law of the River[5]. Currently, apportioned water in the Basin exceeds the 109-year record (1906 through 2014) basinwide average long-term historical natural flow[6] of about 16.1 million acre-feet (maf). However, the Upper Basin States have not fully developed use of their 7.5 maf apportionment, and total consumptive use and losses in the Basin have averaged approximately 15.3 maf[7].

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[2] Colorado River System, Consumptive Uses and Losses Report, 1996-2000, Bureau of Reclamation.

[3] About 40 million people were estimated to be within the hydrologic boundaries of the Basin in the United States, as well as in the adjacent areas of the Basin States that receive Colorado River water, in 2015. See Colorado River Basin Water Supply and Demand Study - Technical Report C, U.S. Bureau of Reclamation, 2012.

[4] It is estimated that there were 5.5 million irrigated acres in the hydrologic boundaries of the Basin in the United States, as well as in the adjacent areas of the Basin States that receive Colorado River water, in 2015 based on interpolated acreage data from Scenario A Current Projections. See Colorado River Basin Water Supply and Demand Study - Technical Report C, U.S. Bureau of Reclamation, 2012.

[5] The treaties, compacts, decrees, statutes, regulations, contracts and other legal documents and agreements applicable to the allocation, appropriation, development, exportation and management of the waters of the Colorado River Basin are often collectively referred to as the "Law of the River."

[6] Natural flow represents the flow that would have occurred at the location had depletions and reservoir regulation not been present upstream of that location.

[7] Basinwide consumptive use and losses estimated over the period 2002-2011, including the 1944 Treaty delivery to Mexico, reservoir evaporation, and other losses due to operational inefficiencies.

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Salinity-caused impacts have long been a major concern in the United States and Mexico. The salinity in the river generally increases as it flows downstream. The Colorado River has carried an average salt load of approximately 9 million tons annually past Hoover Dam, the uppermost location at which numeric criteria have been established.

The salts in the Colorado River system are naturally occurring and pervasive. Many of the saline sediments of the Basin were deposited in prehistoric marine environments. Salts contained within the sedimentary rocks are easily eroded, dissolved, and transported into the river system.

In a 1971 study[8], EPA analyzed salt loading in the Basin and divided it into two categories, naturally occurring and human-caused. EPA concluded that about half (47 percent) of the salinity concentration measured in water arriving at Hoover Dam is from natural sources, including salt contributions from saline springs, groundwater discharge into the river system (excluding irrigation return flows), erosion and dissolution of sediments, and the concentrating effects of evaporation and transpiration. Other natural sources include salt contributions from non-point (excluding irrigated agriculture) or unidentified sources or from the vast, sparsely populated regions of the Basin, many of which are administered by the United States Bureau of Land Management (BLM) or other governmental agencies. Of the land within the Basin, about 75 percent is owned and administered by the federal government or held in trust for Indian tribes. The greatest portion of the naturally occurring salt load originates on these federally owned and administered lands.

Human activities, including livestock grazing, wildlife management, logging, mining, oil exploration, road building, recreation and urbanization can influence the rate of natural salt movement from rock formations and soils to the river system. EPA estimated that out-of-Basin exports (3 percent), agricultural irrigation (37 percent), reservoir evaporation and phreatophyte use (12 percent), and municipal and industrial uses (1 percent) account for 53 percent of the salinity concentration in water arriving at Hoover Dam. Much of the salt load contribution from irrigated agriculture is from federally developed irrigation projects.

In 1972, the federal government enacted the Clean Water Act that mandated efforts to develop and maintain water quality standards in the United States. At the same time, Mexico and the United States engaged in discussions to address the issue of increasing salinity in the Colorado River water being delivered to Mexico. The Basin States established the Forum in 1973. The Forum is composed of representatives from each of the Basin States appointed by the governors of the respective states. The Forum was created for interstate cooperation and to provide the states with the information necessary to comply with Section 303(a) and (b) of the Clean Water Act.

EPA promulgated a regulation in December 1974 which set forth a basinwide salinity control policy for the Basin. The regulation specifically stated that salinity control was to be implemented while the Basin States continue to develop their compact-apportioned water. This regulation also established a standards procedure and required the Basin States to adopt and submit for approval to EPA water quality standards for salinity, including numeric criteria and a Plan of Implementation, consistent with the policy stated in the regulation. In compliance with

[8] The Mineral Quality Problem in the Colorado River, Summary Report, Environmental Protection Agency, Regions VIII and IX, 65pp., 1971

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the regulation, the Forum selected three numeric criteria stations on the main stem of the lower Colorado River as being appropriate points to measure the salinity concentrations of the river. These stations are located at the following points: (1) below Hoover Dam, (2) below Parker Dam, and (3) at Imperial Dam. The Forum also adopted a water quality standard for the Colorado River Basin including both a Plan of Implementation and numeric criteria.

With the Plan of Implementation as proposed in this Review in place, the probability of exceeding the numeric criteria during the review period is very low based on Reclamation computer model simulations. The analysis indicates the probability of exceeding the numeric criteria with the Plan of Implementation in place in any of the next three years at the Hoover Dam, Parker Dam and Imperial Dam stations is 5 percent or less. This low probability of exceedance was an important factor in the Forum's decision to adopt the Plan of Implementation accompanying this Review.

The Colorado River Basin Salinity Control Act (P.L. 93-320) (1974) (Act), established the Colorado River Basin Salinity Control Program under Title II to address the concerns raised by EPA. The Act also created the Colorado River Basin Salinity Control Advisory Council to advise the federal agencies regarding administration of the Program. P.L. 93-320 has been amended several times since its original enactment. P.L. 98-569 (1984) authorized the United States Department of Agriculture's (USDA) on-farm program. P.L. 104-20 (1995) created the United States Bureau of Reclamation's (Reclamation) Basinwide Salinity Control Program (Basinwide Program). The Federal Agriculture Improvement and Reform Act (P.L. 104-127) (1996) (1996 Farm Bill) authorized up-front cost sharing by the Basin States and modified the USDA authorities, including the use of the Environmental Quality Incentives Program (EQIP). P.L. 106-459 (2000) increased the appropriation ceiling. The Food, Conservation, and Energy Act of 2008 (P.L. 110-246) (2008 Farm Bill) created the Basin States Program (BSP). The Agricultural Act of 2014 (P.L. 113-79) (2014) continued the authorization of EQIP.

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UNDERSTANDING THE SALINITY OF THE COLORADO RIVER

As with most large rivers, the natural flow of the Colorado River increases from its headwaters to its terminus. Today, however, the flow of the Colorado River decreases below Hoover Dam due to diversions. Imperial Dam is the last major diversion point for uses in the United States. In normal years, 1.5 maf is scheduled to pass Imperial Dam for deliveries to Mexico.

In general, the salinity concentration of the water in the Colorado River increases from the headwaters to the terminus. Much of the salt is picked up in the Upper Basin, and some of the tributary streams average higher concentrations of salt than the main stem.

Reclamation has developed a map of the Basin reflecting the relative flows and the corresponding salinity concentrations of the water across the Basin in calendar year 2015. This map is provided for general illustrative purposes as Figure 1. The average flow of the Colorado River and its important tributaries are indicated by the width of the line, and the salinity concentrations are illustrated by colors coded to ranges in TDS.

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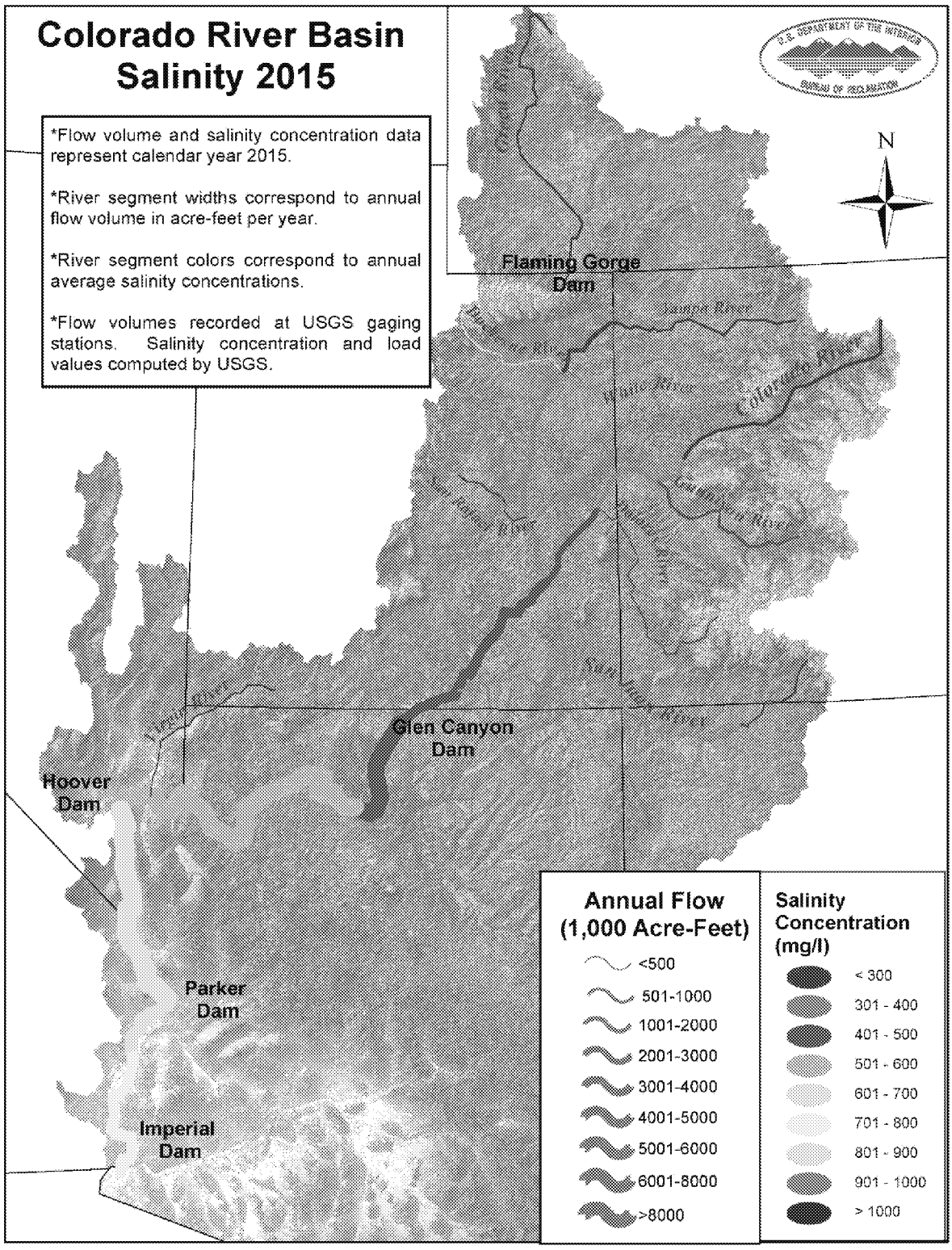

Figure 1 – 2015 (Calendar Year) Generalized Flow and Salinity Concentrations across the Colorado River Basin

In general, over the last thirty years the salinity concentrations have decreased at all three of the numeric criteria stations (see Figure 2). The values for the Observed Flow-Weighted Average Salinity at the Numeric Criteria Stations are provided in Appendix A. In this Review, the terms "salinity," "TDS" and "concentration," each in mg/L, are used interchangeably.

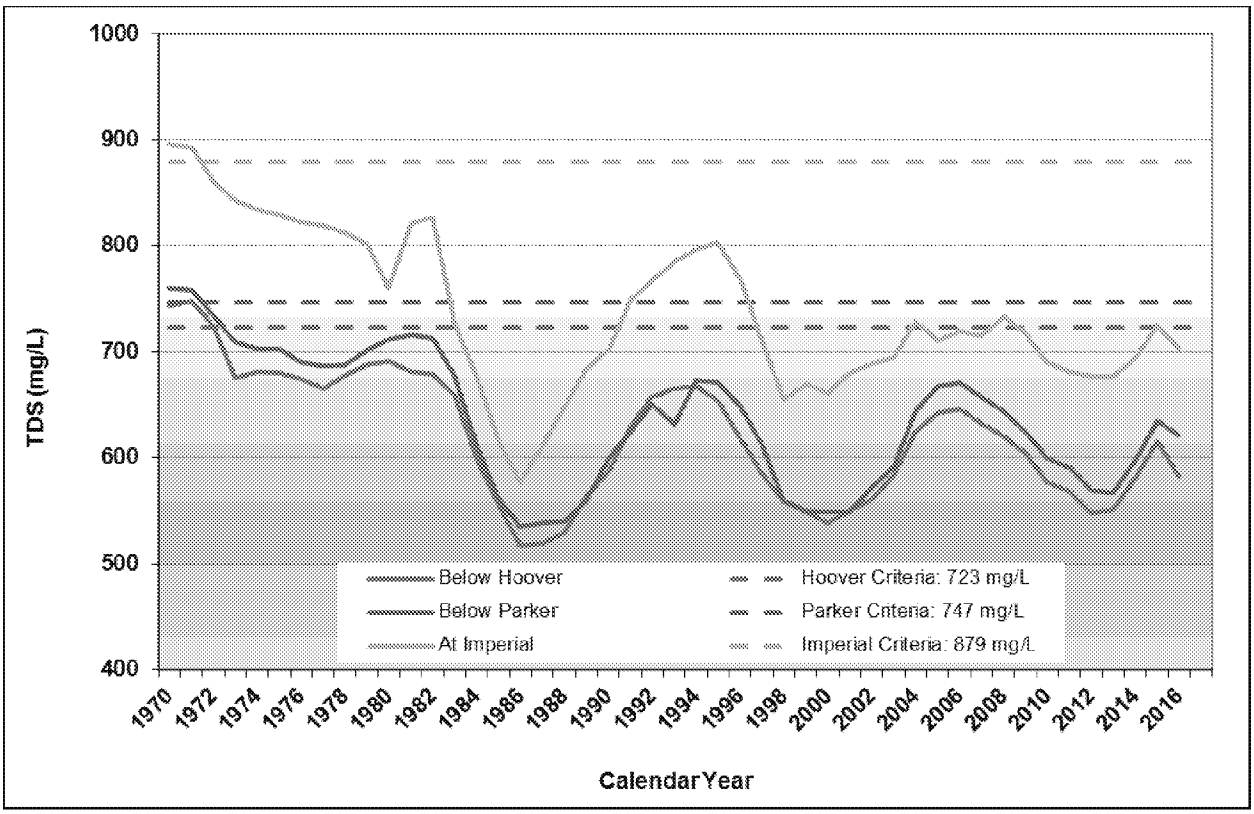

Figure 2 – Flow Weighted Average Annual Salt Concentrations at Numeric Criteria Stations

PROVISION FOR REVIEWING AND REVISING THE STANDARD

The Colorado River water quality standards for salinity and the approach taken by the Basin States in complying with the standards are unique. The salinity concentrations that are projected in the future have not been shown to have adverse effects on human health or wildlife. Thus, the Program is different from most other water quality standard compliance programs. The standards adopted by the Forum and the Basin States and approved by EPA consist of the numeric criteria and the Plan of Implementation. The numeric criteria portion of the water quality standards is established to protect against increases in economic damages to infrastructure and crop production. The Plan of Implementation is designed to maintain the flow-weighted average annual salinity at or below the numeric criteria while the Basin States continue to develop their compact-apportioned water supply.

The Program is a basinwide coordinated effort among federal, state and local agencies and participants to control salt loading. The Forum, in its statement of "Principles and Assumptions for Development of Colorado River Salinity Standards and Implementation Plan," approved by the Forum on September 20, 1974, stated under Principle 7:

> The Plan of Implementation shall be reviewed and modified as appropriate from time to time, but at least once every three years. At the same time, the (numeric) standards, as required by Section 303 (c) (1) of P.L. 92-500 shall be reviewed for the purpose of modifying and adopting standards consistent with the plan so that the Basin States may continue to develop their compact-apportioned waters while providing the best practicable water quality in the Colorado River Basin.[9]

NUMERIC CRITERIA

EPA promulgated a regulation that set forth a salinity control policy for the Basin. This policy required that the flow-weighted average annual salinity in the lower main stem of the Colorado River be maintained at or below the 1972 levels. The points in the lower main stem of the Colorado River where the flow-weighted average annual salinity is measured are at the following three stations: 1) below Hoover Dam, 2) below Parker Dam, and 3) at Imperial Dam. The basis for selecting these stations is their proximity to key diversion facilities on the lower Colorado River. Nevada diverts main stem water from Lake Mead for use in the Las Vegas area. The Metropolitan Water District of Southern California and the Central Arizona Project divert water from Lake Havasu, impounded behind Parker Dam, for millions of water users in southern California and central Arizona, respectively. The large agricultural areas in the Imperial and Coachella Valleys in California and the Yuma area in Arizona are served by diversions at Imperial Dam.

The numeric criteria for each of those stations as established in 1972 are as follows:

Below Hoover Dam	723 mg/L
Below Parker Dam	747 mg/L
At Imperial Dam	879 mg/L

[9] Water Quality Standards for Salinity Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System, Colorado River Basin Salinity Control Forum, 1975 Review, p. 133.

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While the federal regulations provide for temporary increases above the numeric criteria levels if sufficient control measures are included in the Plan of Implementation, no temporary increases are anticipated during this review period.

The Forum believes the Review is the appropriate setting to recommend any changes to the numeric criteria. The Forum finds the current numeric criteria are adequate for the next three years and recommends no changes at this time. Because of the potential economic benefit to the Basin, the Forum believes there is justification to maintain salinity levels below the numeric criteria and remove additional salt from the Colorado River, thus saving several hundred million dollars in annual damages.

PLAN OF IMPLEMENTATION

General

The Plan of Implementation goal is designed to keep the flow-weighted average annual salinity concentrations at or below the 1972 numeric criteria levels while the Basin States continue to develop their compact-apportioned water supply. Measures in place are controlling 1.33 million tons of salt annually. The Plan of Implementation would implement practices to control an additional 63,500 tons of salt per year by 2020. Based on this level of control, Reclamation estimates there is less than a 5 percent probability that the numeric criteria will be exceeded in any year during the review period.

The Plan of Implementation is composed of many actions contemplated by the federal and state agencies and includes projects that remove the required salt tonnage to meet the Plan goal. This will principally be accomplished by reducing the salt contributions to the Colorado River from existing sources and minimizing future increases in salt load caused by human activities. For this Review, the Plan of Implementation can be briefly summarized as follows:

1. Implementation of salinity control measures by Reclamation, Natural Resources Conservation Service (NRCS), the BSP and BLM to the extent that those measures remain viable and appropriately cost effective.

2. Application of the Forum-adopted policies by each of the states. (The texts of the policies are included in Appendix B, and a list of National Pollutant Discharge Elimination System (NPDES) permits issued pursuant to these policies is found in Appendices C and D of this Review.)

3. Implementation of non-point source management plans developed by the states and approved by EPA (see the State Water Quality Management Plans section of this Review).

The Forum participates with federal, state and local agencies and private participants to ensure the Plan of Implementation is executed. The Forum also urges Congress to appropriate the funds needed for implementation and recommends legislative changes when necessary.

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Constructed Measures

Congress enacted Public Law 93-320 in June of 1974 with the Forum's support. Title II of the Public Law created a water quality program for addressing salinity in the Colorado River in the United States above Imperial Dam. Primary responsibility for Title II was given to the Secretary of the Interior, with Reclamation being instructed to investigate and build the Paradox Valley, Grand Valley, Las Vegas Wash and Crystal Geyser salinity control units. The Secretary of Agriculture was also instructed to support the effort within existing authorities.

Public Law 93-320 has been amended several times. The amendments directed the Secretary of the Interior and the Secretary of Agriculture to give preference to the salinity control units with the least cost per unit of salinity reduction. The amendments established a BLM program, a voluntary on-farm salinity control program to be implemented by USDA (including the voluntary replacement of incidental fish and wildlife values foregone as a result of the on-farm measures) and the Basin States Program. Through implementation of these programs, many cost-effective salt-load reducing activities have been accomplished.

USDOI-Reclamation

The Act was amended by P.L. 104-20 to authorize the Basinwide Program. The Basinwide Program uses a competitive process that has greatly increased the federal cost effectiveness of salinity control. Reclamation may implement a variety of effective salinity control measures, but most projects concentrate on improving the efficiency of off-farm irrigation delivery systems. Reclamation solicits applications through a Funding Opportunity Announcement (FOA) for projects that will reduce the salinity of the Colorado River. Reclamation evaluates and ranks each application and awards grants to the highest ranking applications. Cost effectiveness is the prime criteria in the evaluation. The timing of the FOA is based on the need for more salinity control projects, and it relates to the amount of federal appropriation Reclamation receives to implement its portion of the Program. P.L. 104-20 and P.L. 106-459 increased the authorization ceiling for Reclamation's salinity control program.

USDA-NRCS

The NRCS program generally concentrates on improving on-farm systems. NRCS salinity activities fall mainly under the authorities of EQIP. EQIP for Colorado River salinity control was authorized and initially funded under the 1996 Farm Bill and recently reauthorized by the 2014 Farm Bill. NRCS accepts applications under EQIP and evaluates, ranks and selects those applications that best meet the goals of the salinity control program. Based on the applications, NRCS provides technical and financial assistance to the producers. NRCS also offers financial assistance for voluntary replacement of fish and wildlife values forgone.

USDOI - BLM

The goal of the BLM program is to reduce the mobilization of salts to the Colorado River from BLM administered public lands. Salt reduction is achieved by controlling both point and non-point sources of salt contributions, recognizing that the majority of salt derived from public lands is of non-point source origin. Salt loading from non-point sources is mainly reduced by minimizing soil erosion.

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Basin States Program

Public Law 110-246 amended the Act and created the BSP through which money from the Lower Colorado River Basin Development Fund and the Upper Colorado River Basin Fund (Basin Funds) is used for cost sharing in Reclamation and NRCS salinity control programs. These are administered by Reclamation in consultation with the Colorado River Basin Salinity Control Advisory Council. Cost share on federal appropriations expended by both Reclamation and NRCS for salinity control in the Basin is required by the Act. The money for the Basin Funds comes from levies assessed on users of power generated within the Basin. The required cost share on the original salinity control units of Paradox, Grand Valley and Las Vegas Wash is 25 percent of the project cost. Salinity control units and programs implemented subsequent to the original units require a 30 percent cost share from the Basin Funds.

For cost-share dollars generated by the federal expenditures under the Basinwide Program, Reclamation expends the required cost-share funding, together with appropriated funds in the Basinwide Program, through a public grant process. BSP funding generated by federal appropriations expended in EQIP is managed by Reclamation to administer the BSP and to enter into the following agreements: (1) NRCS for technical assistance, (2) other federal agencies for studies and research, (3) the states of Colorado, Utah and Wyoming to fund approved salinity control activities and projects, and (4) other entities for approved salinity control activities and salinity control projects. Each of the state agencies has the same goal of providing salinity control in the most cost-effective manner. The cost-share aspects of the BSP have proven very useful as a means of achieving additional cost effective salinity control. The BSP complements the NRCS and Reclamation programs in a comprehensive manner and facilitates local water user participation.

Accomplishments and Future Control

The Plan of Implementation recognizes that the Forum, participating federal agencies and the Basin States each have specific responsibilities for addressing salinity on the Colorado River. The Forum, in conjunction with the Colorado River Basin Salinity Control Advisory Council, will continue to provide overall coordination and a continuing review of salinity conditions and program effectiveness, and advise the participating federal agencies accordingly.

To date, it is estimated that the Program has reduced the annual salt loading in the Colorado River by approximately 1,330,000 tons, resulting in over 100 mg/L reduction in salinity concentrations in the Lower Basin. Figures 3 – 5 show the comparison of measured salinity levels as compared to what salinity levels would have been without implementation of the Program at the three numeric criteria stations. Table 1 gives a brief summary of the measures that have been implemented to date, the areas where those measures have occurred and the tons of salt controlled per year associated with each area.

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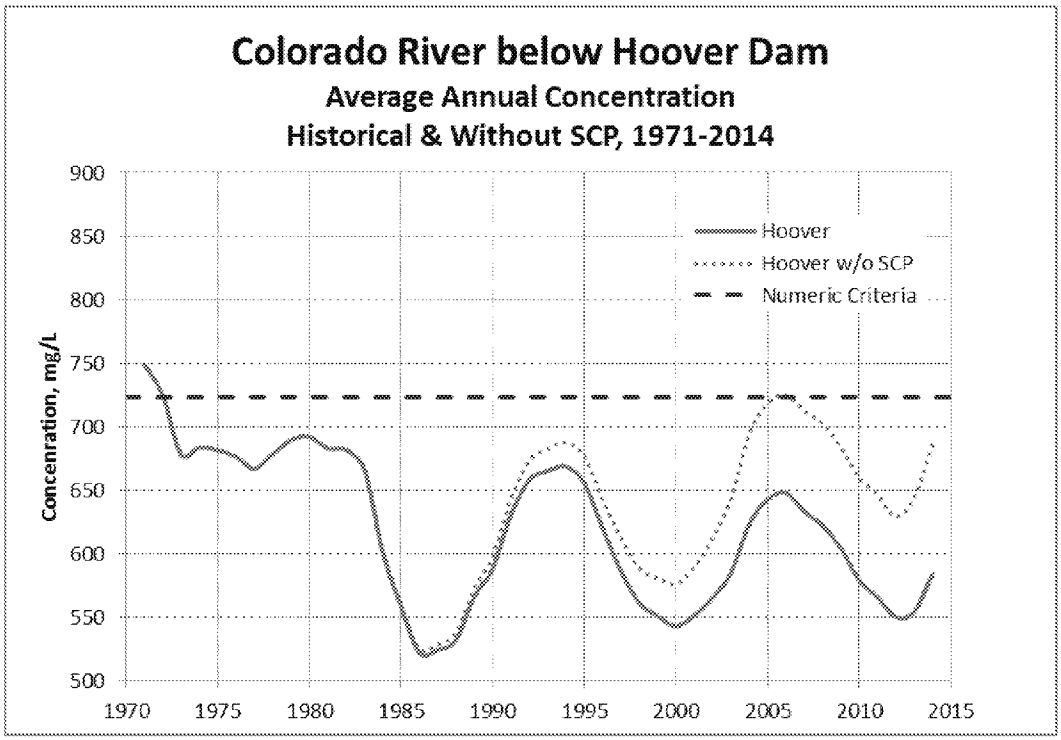

Figure 3 – Salinity Control Program Impact below Hoover Dam

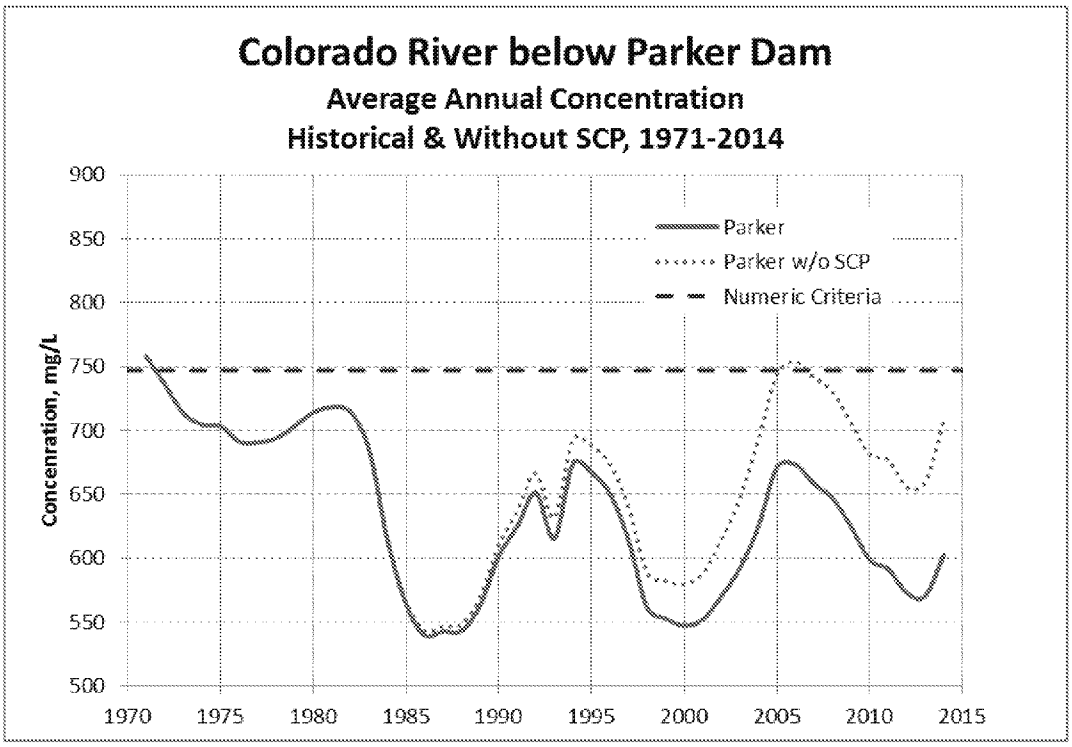

Figure 4 – Salinity Control Program Impact below Parker Dam

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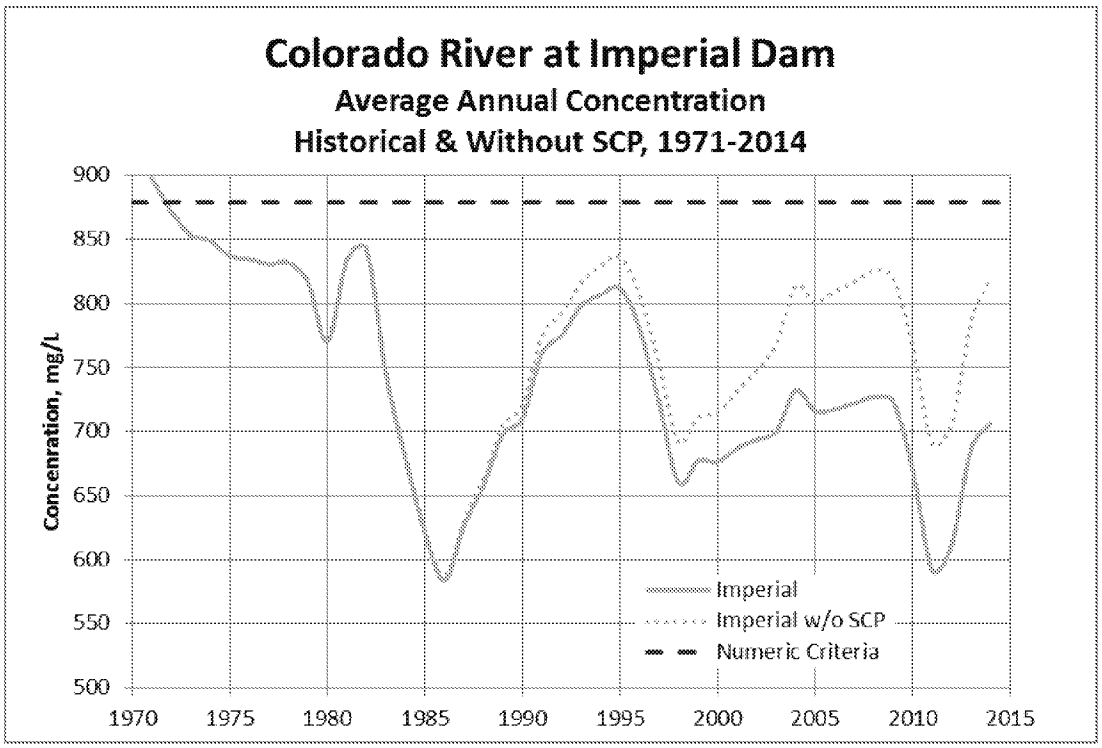

Figure 5 – Salinity Control Program Impact at Imperial Dam

Table 1
Control Measures in Place through 2017

Tons/Year		Tons/Year	
Agricultural Measures	**1,040,200**	**Non-Agricultural Measures**	**289,800**
Big Sandy	72,900	Paradox Valley Unit	100,900
Blacks Fork	1,100	Meeker Dome	48,000
Grand Valley	277,400	Las Vegas Wash	3,800
Green River	1,600	Ashley Valley WWTP	9,100
Henrys Fork	400	BLM	128,000
Lower Gunnison	218,300		
Mancos	4,700		
Manila	19,400		
McElmo (Dolores)	54,500		
Muddy Creek	600		
Paria	1,800		
Price-San Rafael	142,800		
San Juan	49,400		
Silt	2,400		
Uinta	183,700		
USDA Tier 2	7,500		
Unspecified Projects (USBR & BSP)	1,700		
TOTAL			**1,330,000**

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The Plan of Implementation assumes that measures currently in place continue to operate through the 2017 Review period and beyond. Improved water delivery and irrigation systems will need to be continually maintained and efficiently operated to provide reliable salinity control. Much of the financial burden of O&M and replacement of irrigation systems falls to salinity program participants, who are the agricultural producers in the basin. The Forum acknowledges the need for producers to maintain their improved irrigation practices through continued efforts and financial investment. The same is true for the non-agricultural measures as well. The best example may be the Paradox Valley Unit (PVU). The expected life and continued effectiveness of the PVU project is a matter of study by Reclamation and the Forum. The current EIS process and corresponding alternatives studies need to be completed, and an alternative implemented, in order to maintain the levels of salt control currently in place for the PVU.

The Plan of Implementation anticipates the continuation of the Program through the period of the Review. As presented in Table 2, it is anticipated that an additional 63,500 tons annually will be controlled by the Program as set forth in the 2017 Plan of Implementation, resulting in a total of 1,393,500 tons of annual reduction by 2020.

Table 2
Additional Controls - Plan of Implementation 2020

Funding Source	Tons/Year as of 2020
RECLAMATION (Basinwide Program)*	27,400
USDA NRCS (EQIP)	26,100
BLM	5,400
BASIN STATES PROGRAM (BSP)	4,600
TOTAL	**63,500**

*Includes cost-share dollars from Basin States Program

This Plan of Implementation mainly focuses on the improvement of agricultural practices in the Upper Colorado River Basin. These improvements include both on-farm and off-farm activities. The majority of the salt reduction will occur in established salinity project areas, but some will occur outside those areas. Table 3 provides the salinity control project areas and an estimate of the potential salt reductions for both on- and off-farm projects that could occur in those areas. Figure 6 shows the established project areas.

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Table 3

Remaining Potential Salinity Control (2018-2035)

Project Area	Total Tons/year
Big Sandy	34,264
Black's Fork	26,900
Grand Valley	207,036
Green River	12,100
Henrys Fork	17,720
Lower Gunnison	533,700
Mancos	19,000
Manila	15,200
McElmo (Dolores)	33,852
Muddy Creek	12,457
Paria	29
Price-San Rafael	66,064
San Juan	13,130
Silt	19,336
Uinta	102,796
USDA Tier 2	8,500
Saline Groundwater Sources	150,000
Nonpoint Sources*	
TOTAL	**1,272,100**

*BLM is reviewing non-point source control potential.

The potential additional controllable salt remaining in all of the identified areas is estimated to be 1,272,100 tons annually, and thus the potential available tons exceed the 63,500 tons of additional annual salinity control identified by the Plan of Implementation.

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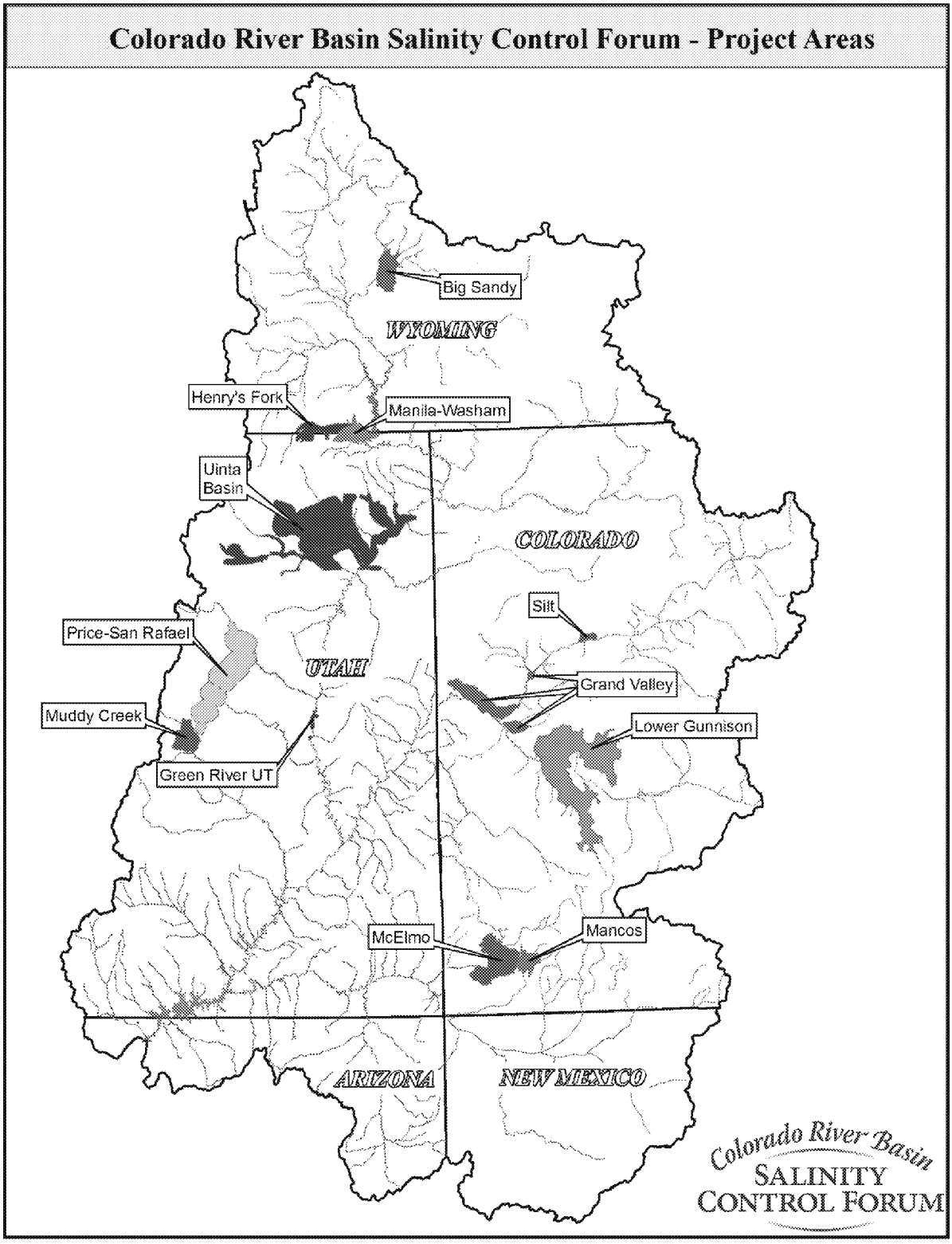

Figure 6 – Colorado River Basin Salinity Control Forum Project Areas

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Forum Policies and NPDES Permits

Important components of the Plan of Implementation are the Forum policies and NPDES permits which guide Basin States activities associated with the control of salt discharge to the Colorado River. In 1977, the Forum adopted the Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program. This policy provides guidance for the regulation of municipal and industrial point source discharges of saline water. In 1980, the Forum adopted a policy to encourage the use of brackish and/or saline waters for industrial purposes where it is environmentally sound and economically feasible. A third policy dealing with intercepted groundwater was adopted by the Forum in 1982. In 1988, the Forum adopted a fourth policy which addresses the salinity of water discharges from fish hatcheries. The Forum subsequently updated its NPDES policy in 2002 to clarify the Forum policies for consistent implementation among the Basin States. In 2015, a Forum sub-committee found that the States are consistently implementing the policies. These policies are found in Appendix B of this report.

Each of the states has adopted the Forum policies presented in Appendix B. Salinity discharge requirements for these permits are evaluated and practicable controls are required during the permit process. A listing of NPDES permits and level of compliance of discharge facilities within the Basin are presented in Appendix C. Some NPDES permits are issued by EPA for federal facilities and on Indian reservations. The EPA also issues NPDES permits for the state of New Mexico, which are then adopted by the New Mexico Environment Department. Forum policies also apply to EPA-issued NPDES permits and hence, become a part of the Plan of Implementation. The NPDES permits issued by EPA can be found in Appendix D of this report. During the period of this Review, the status of implementation of NPDES permits and water quality management plans in each of the states is as follows:

State Water Quality Management Plans

ARIZONA

Scope

The Colorado River enters Arizona and the Lower Basin near Page and travels through the Grand Canyon before turning southward at Lake Mead (Hoover Dam) and flowing to the Gulf of California. There are four major drainages in Arizona's portion of the Basin: 1) the Little Colorado River; 2) the Virgin River; 3) the Bill Williams River, formed by the Big Sandy and the Santa Maria Rivers at Alamo Lake, which empties into the Colorado River above Parker Dam; and 4) the Gila River, which joins the Colorado River below Imperial Dam. Because the Gila River is below Imperial Dam, facilities that discharge to the Gila River or its tributaries do not require conformance with the Forum policies.

NPDES Permitting

The Water Quality Division of the Arizona Department of Environmental Quality (ADEQ) administers the Arizona Pollutant Discharge Elimination System (AZPDES) program on non-Indian country lands. All permits for domestic wastewater and industrial discharges, with direct river discharges, are written in conformance with associated Forum policies. ADEQ continues to evaluate and revise other discharge permits as information becomes available.

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Currently there are 26 active individual discharge permit holders and one minor wastewater treatment plant with general permit coverage in Arizona's non-tribal portion of the Colorado River system. Of these, 21 permits are for municipal or domestic wastewater discharges. The other 5 permits are for industrial discharges related to fish hatcheries, mines, water treatment or water delivery. A specific listing of the individual permits and the status of compliance with Forum policies is contained in Appendix C.

There are currently 10 stream segments in the Basin that are listed in the state's 2016 Section 303(d) list as impaired (2 – Bill Williams, 5 – Colorado River Grand Canyon, 2 – Colorado River Lower Gila, 1 – Little Colorado River). No waters are currently listed for salinity, which only applies to the Colorado River. The primary causes of impairment are selenium (7), suspended sediment (3), *E. Coli* (3), copper (1) and ammonia (1). Complete assessment information can be found on ADEQ's website.

Watershed Planning

ADEQ's TMDL Program and the Water Quality Improvement Grant Program utilize comprehensive watershed-based plans, which contain EPA's required nine elements, to help focus funding to those areas and projects that have the greatest chance for improving water quality. These plans contain implementation strategies for many of the impaired waters, as well as Best Management Practices to address existing and potential issues in the watershed. Recent activities within the Basin have been focused on reducing sediment in the Little Colorado River and the Colorado Grand Canyon.

Work plans are developed to secure grant funding under the Clean Water Act, Section 319(h) for watershed level planning and implementation. The work plans identify and coordinate efforts by state, federal and local agencies, along with watershed groups and private citizens, to reduce or prevent nonpoint source pollution through the use of Best Management Practices and "on-the-ground" projects.

CALIFORNIA

Water Quality Management Planning

The Water Quality Control Plan for the Colorado River Basin (Basin Plan) was adopted by the California Regional Water Quality Control Board, Colorado River Basin (Regional Water Board) in November 1993 and approved by the State Water Resources Control Board (State Water Board) in February 1994. The revised plan became effective upon approval by the Office of Administrative Law (OAL) in August 1994. Subsequent Basin Plan updates include amendments adopted by the State and Regional Water Boards and approved by OAL through March 2017. The salinity control component of the Basin Plan is consistent with the Forum's Plan of Implementation for salinity control. The Regional Water Board collaborates with local entities and the Colorado River Board of California to ensure that implementation of the water quality plan is achieved.

Salinity control in ground and surface waters is a high priority for the State and Regional Water Boards and a very significant concern in arid areas like the Colorado River Basin Region, which relies heavily on water from the lower Colorado River for municipal and agricultural supply. To address rising salinities in groundwater, the State Water Board adopted a *Recycled Water Policy*

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in February 2009 which requires the development of Salt and Nutrient Management Plans for groundwater basins throughout California. The plans require basinwide management of salts and nutrients from all sources in a manner that protects groundwater quality and beneficial uses. The salinity of the Colorado River is a critical factor in the development of Salt and Nutrient Management Plans for this region, given the large quantities of water that are diverted from the Colorado River to replenish the Coachella Valley municipal aquifer (over 3.2 million acre-feet to date), and to irrigate crops throughout the Imperial, Palo Verde, Bard and Coachella Valleys.

Controlling nonpoint source pollution generated from agricultural operations is also a top priority of the State and Regional Water Boards. Wastewater discharges from agricultural activities such as irrigation runoff, flows from tile drains and storm water runoff impact water quality by transporting pollutants - pesticides, sediment, nutrients, salts, pathogens, heavy metals and others - from cultivated fields into surface waters. To prevent agricultural discharges from impairing waters that receive these discharges, the State Water Board established the *Irrigated Lands Regulatory Program* in 2003. This program regulates discharges from irrigated agricultural lands by issuing waste discharge requirements (WDRs) or conditional waivers of WDRs (Orders) to growers. The Regional Water Board adopted Conditional Waivers of WDRs for Palo Verde Valley in 2012 and Bard Unit in 2013. Agricultural discharges in these areas are discharged to drains that are tributaries to the Colorado River. These Orders contain conditions requiring water quality monitoring of receiving waters and corrective actions when impairments are discovered.

COLORADO

Scope

Colorado's portion of the Colorado River Basin is comprised of six major drainages: 1) the main stem of the Colorado River from the continental divide to the Utah border, 2) the Roaring Fork River Basin, 3) the Yampa/White River Basin which flows to the Green River in Utah, 4) the Gunnison River Basin, 5) the Dolores River which flows to the main stem in Utah, and 6) the San Juan Basin which flows into New Mexico and then to the main stem in Utah.

NPDES Permitting

The Colorado Department of Public Health and Environment, Water Quality Control Division, administers the NPDES permitting program in the Colorado River Basin, with the exception that EPA issues permits for point source discharges on the Southern Ute and Ute Mountain Ute Reservations, as well as for federally owned lands such as National Parks. This would include permits for discharges to groundwater that would contribute salinity to the Colorado River system through a hydrologic connection to surface waters. Permits for industrial and municipal discharges are written in conformance with the associated Forum policies. Colorado continues to issue stormwater permits to construction of oil and gas development sites and related infrastructure (e.g. roads) of one or more acres of disturbance, even though the Energy Policy Act had exempted this activity from the requirement to obtain a permit at the federal level.

Currently there are more than 250 active discharge permits in the Colorado portion of the Colorado River Basin where the salinity requirements have been applied. A specific listing of the individual permits and compliance status is contained in Appendix C.

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Water Quality Assessments and TMDLs

The waters in Colorado's portion of the Colorado River Basin, particularly at higher elevation, are generally of good quality. There are 279 water quality impaired stream segments, including provisional listings, in the Colorado River Basin in Colorado (Gunnison River Basin: 92 impaired segments; Upper and Lower Colorado River Basin: 152 impaired segments; San Juan River Basin: 35 impaired segments) which are included on the 2016 303d List of Impaired Waters. Of these, a significant majority in the lower ends of these basins are impaired for selenium. Water quality impairments in the mountainous portions of these basins are due to high concentrations of metals, primarily caused by the remnants of historic mining activities. No waters are currently listed for salinity related impacts.

The lower portions of each of these basins are underlain by bedrock deposits of the cretaceous period, most notably Mancos Shale and Dakota Sandstone. The Mancos Shale is a marine deposit and, as such, contains significant amounts of readily soluble constituent materials, including selenium. Groundwater which leaches to the relatively impermeable shale deposits tends to dissolve selenium and, as it flows atop the bedrock strata toward surface drainages, carries elevated levels of dissolved selenium with it. Various anthropogenic activities like sand and gravel extraction and agricultural and urban landscape irrigation accelerate the mobilization and transport of selenium from shale and shale-derived soil to surface water.

Watershed Planning - Colorado River Basin Selenium/Salinity Nonpoint Source Activities

Recent activities in the Basin range from watershed planning to Best Management Practices implementation for selenium and salinity reduction. The Middle Colorado Watershed Plan for the area from Glenwood Canyon to DeBeque Canyon has been completed and covers selenium impacted water bodies. The watershed stakeholders are now doing more detailed sampling and source characterization in a high priority sub-watershed. The Colorado Water Quality Control Division continues to monitor streams and lakes on or tributary to the main stem of the Colorado River and conduct outreach in preparation for developing TMDLs for impaired water bodies from DeBeque Canyon to the Utah state line.

Selenium reduction goals are highly dependent upon salinity control efforts occurring in the Basin where selenium is often found in conjunction with salinity. Numerous projects for selenium and salinity control are ongoing in the Basin. The Gunnison River Basin Selenium Management Program provides details of past, current and planned projects. Salinity reductions associated with this program are attributed to previous and on-going off-farm and on-farm salinity control efforts implemented through the Colorado River Basin Salinity Control Program, Environmental Quality Incentives Program, National Irrigation Water Quality Program, and Colorado Nonpoint Source Program. Of recent note is the marked increase in funding for the 2014 Lower Gunnison Project entitled, *Modernizing Agricultural Water Management in the Lower Gunnison River Basin: A Cooperative Approach to Increased Water Use Efficiency and Water Quality Improvement* through the U.S. Department of Agriculture, Natural Resources Conservation Service, Regional Conservation Partnership Program. This funding will significantly accelerate and expand control activities.

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NEVADA

Scope

The Basin within Nevada consists of three major tributaries: 1) the Virgin River, 2) the Muddy River, and 3) the Las Vegas Wash. All of these tributaries flow into Lake Mead and provide nearly all of the inflow to the river from Nevada.

NPDES Permitting

The Nevada Division of Environmental Protection is the EPA delegated authority for the issuance of NPDES Permits. As of December 31, 2016, there were 94 active discharge permits in the Nevada portion of the Colorado River System. The largest dischargers, the City of Las Vegas, the Clark County Water Reclamation District, the City of Henderson, and the City of North Las Vegas are permitted to discharge a maximum flow up to 91 mgd, 150 mgd, 40 mgd, and 25 mgd respectively. The quality of the water affected by these permits is closely monitored and all necessary programs to protect water quality standards are being implemented. Nevada continues to apply the policies adopted by the Forum.

Water Quality Management Planning

Area-wide water quality management planning duties and powers have been vested to certain counties and entities. The Clark County Board of Commissioners was designated the Area-Wide Water Quality Management Planning organization within Clark County. The initial 208 Plan was adopted by the Clark County Board of Commissioners in 1978 and was approved by the EPA. Since that time, several 208 Plan revisions have been made as needed to address changing needs.

TMDLs

In 1987, the Nevada Division of Environmental Protection established total phosphorus and total ammonia Waste Load Allocations (WLAs) in the Las Vegas Wash at Northshore Road as needed to meet the Las Vegas Bay water quality standards. The WLAs set are applicable for only April through September and were based upon target concentrations (0.64 mg/L total phosphorus, 1.43 mg/L total ammonia) and average stream flows.

NEW MEXICO

Scope

New Mexico's portion of the Basin above Imperial Dam is comprised of two major drainages: 1) the Rio Puerco, which is a tributary of the Little Colorado River, and 2) the San Juan River, which is a major tributary of the Colorado River.

NPDES Permitting

In New Mexico, authority for issuing permits is administered by EPA Region 6, except for facilities located on the Navajo Indian Reservation, which are administered by Region 9. Permits for industrial and municipal discharges are written in conformance with the associated Forum policies. The State of New Mexico Water Quality Standards for Interstate and Intrastate

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Surface Waters 20.6.4.54 adopt the standards of the Colorado River Basin Salinity Control Forum by reference. Currently, there are 34 discharge permits (active and inactive) in the New Mexico portion of the Basin, of which Region 6 administers 21 permits and Region 9 administers 13 Navajo Reservation permits. Of these, 18 permits (14 non-Indian, 4 Navajo) are for industrial discharges and 16 permits (6 non-Indian, 1 Jicarilla Apache, 9 Navajo) are associated with municipal wastewater discharges.

Water Quality Assessment and TMDLs

The New Mexico Water Quality Control Commission has adopted the framework for water quality in New Mexico, which includes the State of New Mexico Water Quality Management Plan and the New Mexico Nonpoint Source Management Plan. Both plans cover the entire state, except for that portion of the tribal and pueblo lands lying therein. Planning within the reservations is the sole responsibility of the Tribes and Pueblos. Much of the Basin in New Mexico falls within the boundaries of the Navajo Tribe's reservation.

The following TMDLs have been adopted by the New Mexico Water Quality Control Commission and approved by EPA within the New Mexico portion of the Basin at this time:

- Animas River: *E. coli*, nutrients
- Gallegos Canyon: selenium
- La Plata River: *E. coli*, siltation, dissolved oxygen
- San Juan River: *E. coli*, sedimentation/siltation

Sample collection for the most recent San Juan Basin Surface Water Quality Survey was completed in 2010 by the Surface Water Quality Bureau of the New Mexico Environment Department. A new survey for this basin begins March 2017 and will span 2 years for sampling throughout the basin. These surveys are normally scheduled throughout the various watersheds and basins in the state on a 7 to 8 year cycle.

Watershed Planning

Work plans are developed and grant funding secured under Clean Water Act Section 319(h) for watershed-associated development, riparian area restoration, certification of Section 404 permits, spill response and treatment of abandoned mines. The work plans identify and coordinate efforts by state, federal and local agencies, along with other groups and private citizens, to reduce or prevent non-point source pollution and implement Best Management Practices to reduce non-point source pollutants. The New Mexico Environment Department and the San Juan Watershed Group, an unincorporated citizen and interagency group funded by the Section 319(h) program, are working to improve water quality in the San Juan River by implementing Best Management Practices for non-point source contributors of nutrients and *E. coli*. State Revolving Loan Funds and other funds are authorized and available for use in funding salinity control projects. State actions in support of salinity control include: 1) inclusion of salinity control measures in the Section 208 plans, 2) dissemination of information on salinity sources and control, 3) consultation with industries on potential salinity reduction measures, 4) implementation of Forum policy through NPDES permits, and 5) maintaining a continuous water quality planning program whereby new or additional salinity control measures can be addressed.

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UTAH

Scope

Utah's portion of the Colorado River Basin is comprised of ten major sections: 1) the main stem of the Colorado River from the Colorado border to the Arizona Border in Lake Powell, 2) the Green River Basin from the Wyoming state line in Flaming Gorge Reservoir to the confluence with the Colorado River, 3) the Duchesne River Basin, 4) the lower Yampa and White River Basins which flow to the Green River in Utah, 5) the Price and San Rafael River Basins, 6) the Dirty Devil and Escalante Rivers, 7) the lower portion of the San Juan River Basin which flows into the main stem of the Colorado River in Utah, 8) the Paria River, 9) the Kanab Creek Basin to the Arizona State Line, and 10) the Virgin River Basin to the Arizona state line.

NPDES Permitting

The Utah Division of Water Quality (DWQ) within the Utah Department of Environmental Quality administers the NPDES permitting program in Utah. Permits for industrial and municipal discharges within the Colorado River Basin are written in conformance with the associated Forum policies and are available for viewing on line at:
https://deq.utah.gov/Permits/water/updes/index.htm.

As of December 31, 2016, there are 74 discharge permits as issued by DWQ in the Utah portion of the Colorado River Basin. Of these, 32 are for municipal discharges and 42 are for industrial discharges, of which 6 industrial permits have been recently terminated. A specific listing of the individual permits and their compliance status is contained in Appendix C. Multiple discharge permits for coal mining operations in Utah were developed to offset salinity contributions from industrial sources in accordance with the Forum policy initially adopted as part of the 2002 Triennial Review. The salinity-offset project plans have been finalized previously, with projects implemented to offset salinity contributions in excess of the one ton per day requirement from those facilities.

Water Quality Assessments and TMDLs

The waters in Utah's portion of the Colorado River Basin are generally of good quality. There have been 30 stream segments listed for impacts from salinity/TDS/chlorides. These segments are generally in the lower reaches of the respective basins and are the result of a combination of natural salt loadings and agricultural drainage. TMDLs have been developed to address these salinity/TDS/chloride impairments. For information about the completed studies and to view the current Utah 303(d) list of impaired water bodies, please visit:
https://deq.utah.gov/ProgramsServices/programs/water/watersheds/index.htm.

Watershed Planning

Utah's Watershed Protection program is focused on protecting and restoring the water quality of its streams, lakes and groundwater resources by employing the following key elements: Stewardship, Monitoring and Assessment, Coordination, Implementation of Best Management Practices and Watershed Planning. Although projects exist in other regions, currently the Upper Colorado Basin region in Utah has no watershed planning projects in progress to specifically

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address Total Dissolved Solids. The Basin Plans for the Utah State Water Plan include water quality as part of the process and these plans are updated periodically.

WYOMING

Scope

Wyoming's portion of the Basin is comprised of two major main stream drainages: 1) the Little Snake River, which is a tributary of the Yampa River in Colorado, and 2) the Green River, which empties into Flaming Gorge Reservoir on the Wyoming-Utah border.

NPDES Permits

Currently there are 32 active discharge permits in the Wyoming portion of the Colorado River system. All permits for industrial and municipal discharges are written in conformance with Forum policies. Of the 32 permits, 13 are for industrial discharges related to fish hatcheries, coal mines, power plants or oil and gas production facilities and 19 of the permits are associated with municipal wastewater discharges. These facilities serve a total population of approximately 50,000 people. A specific listing of the individual permits and compliance status is contained in Appendix C.

Water Quality Assessments and TMDLs

In general, water quality in the Upper Colorado River basin in Wyoming is good. There are currently only 11 streams and rivers identified as either impaired or threatened in the State's 2014 Section 303(d) List (12 pollutant/segment combinations on 7 streams/rivers in the Green River Basin and 7 pollutant/segment combinations on 4 streams in the Little Snake River Basin). Of these impaired waters, Bitter Creek in the Green River Basin and Muddy Creek in the Little Snake River Basin are listed for salinity related impacts (chloride). A TMDL for Bitter Creek was initiated in 2012. A TMDL for Muddy Creek is not scheduled for development at this time. Complete assessment information can be found at http://deq.wyoming.gov/wqd/watershed-protection/.

Watershed Planning

Local watershed groups have conducted watershed planning activities for several of the impaired waters within the Green River and Little Snake River Basins. These groups have worked to implement the watershed plans through Wyoming's Clean Water Act Section 319 Grant Program and other state and federal cost-share programs.

In 2010, the Wyoming Water Development Commission (WWDC) revised the river basin water plan for the Green River and Little Snake River drainages. This report updates information about the current uses and projected future uses of water in the basin and includes other useful information such as irrigated lands delineation, hydrologic modeling of major streams, estimated availability of surface and groundwater for future use, and recommendations and strategies for facing current and future water use challenges. Detailed information can be accessed at: http://waterplan.state.wy.us.

In 2012, the WWDC completed a study to identify a consistent viewpoint and accounting

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process for environmental and recreational water demands and to help guide river basin planning efforts in moving forward. The study identified the need for available data sources to be defined and analyzed in a way that would assess their interactions with traditional water uses throughout the State of Wyoming. The methodologies developed in the 2012 study are currently being employed in the Green River Basin. This study is scheduled to be completed in the fall of 2017.

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CONCLUSION AND ADOPTION OF THE STANDARDS

The Standards consist of two components, the numeric criteria and the Plan of Implementation. No change has been made in the numeric criteria since their adoption in 1975 by the Basin States and approval by EPA. After having conducted this Review, the Forum has again found the numeric criteria to be appropriate and recommends no changes in these criteria. The Forum also finds that the updated Plan of Implementation is adequate to keep the salinity concentration of the Colorado River below the numeric criteria through 2020, thus providing significant benefits to the Basin. The effect of the Plan of Implementation on the Standard is that the probability of exceeding the numeric criteria is extremely low, less than 5 percent in any given year, for the review period and provides a measurable improvement to the quality of the Colorado River.

The Forum and the Basin States remain committed to continued improvement of the water quality of the Colorado River.

The Program is truly unique and it cannot be successful without cooperation from a multitude of agencies and governments involved at the local, state and federal levels. First, the Program is reliant on the cooperation of land owners in implementing important and cost-effective salinity control measures. Second, the Program is dependent on a multitude of agreements among the Basin States which have always been accomplished by consensus. Last, the Program depends on the cooperation of a number of federal agencies for its success. In addition to the three federal implementing agencies, there are other federal agencies which are involved in the Program, and cooperation and coordination with these agencies is also essential. Three notable agencies are: United States Fish & Wildlife Service, United States Geological Survey and EPA. All the federal agencies are a critical part of the Program. It is expected that by their involvement in the preparation of this Review, those federal agencies will support the Plan of Implementation and its programs.

In June of 2017, the Forum adopted their proposed 2017 Review. During the summer of 2017 comments on the proposed 2017 Review were solicited. Each state sent out notice of the proposed 2017 Review and it was posted on the Forum's website. No comments were received requesting modification of the draft 2017 Review. At the Forum meeting held October 24, 2017, the Forum approved this 2017 Review.

With the approval of this Review by the Forum, each of the Basin States will include these standards as a part of its own water quality standards through its own procedures and obtain approval of its own water quality standards from EPA. Because the Basin contains portions of three EPA regions, the States of Utah, Colorado and Wyoming submit their triennial reviews to EPA Region 8 in Denver, Colorado; New Mexico to EPA Region 6 in Dallas, Texas; and Nevada, Arizona and California to EPA Region 9 in San Francisco, California. It is anticipated that EPA, by approval of the states' submittals, will fully support this salinity control effort.

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FUTURE PROGRAM

As described in earlier sections of this report, the water quality standard for salinity in the Colorado River Basin is expected to be met during the review period (over the next three years, 2018-2020). Given average hydrology in the basin, the probability of exceeding the numeric criteria, while putting into practice the outlined Plan of Implementation, is well within the established water quality standard. Nonetheless, as water development continues to occur throughout the Basin, salinity concentrations and the associated economic damages are projected to increase. Therefore, this section will analyze the comparative changes in Colorado River salinity under different implementation scenarios from the present through 2035. The efforts of the Program are to minimize downstream economic damages while the Upper Basin States continue to develop their Compact-apportioned water supplies. This effort is increasingly challenging as economic damage levels and costs increase over time, thus placing greater burdens on Program implementation.

Reclamation used its Colorado River Simulation System (CRSS) model to project salinity levels for the period 2017 through 2035 with the varying levels of Program implementation. The CRSS model simulates 107 separate hydrologic traces for each year and then calculates the average annual salinity. A detailed description of the CRSS model and the model runs made for this Review are found in Appendix E.

The Forum requested that Reclamation analyze the effects on the salinity of the River for four levels of program implementation (tons of salt removed). The Forum chose the levels of implementation based on different assumptions regarding federal funding and state cost share and the tons of salt available for future control. Scenario 1 shows implementation ceasing new salinity control measures post 2017 without executing the Plan of Implementation described in the Review. Scenario 2 shows execution of the Plan of Implementation through 2020 and ceasing to implement new salinity control measures thereafter. Two additional scenarios evaluate the water quality improvement of the Colorado River with continued implementation of salinity control beyond 2020. These scenarios differ by levels of anticipated funding to support implementation. Scenario 3 assumes a consistent level of federal appropriation provided to the program as in recent years and implements measures to control an additional 270 Ktons by 2035. Scenario 4 targets longer term Forum goals to implement measures to control an additional 400 Ktons by 2035. These additional measures will require a 30% increase in Program funding above current levels (Scenario 3).

Table 4 shows the four scenarios modeled by Reclamation with the tons of annual salinity control in place by the year 2035.

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Table 4
Plan of Implementation Levels Modeled by CRSS

Description	Total Control
Scenario 1 - No additional controls beyond 2017 (does not implement the Plan of Implementation identified herein)	1.33M tons
Scenario 2 - No additional controls after this review period (i.e. Program ceases after 2020)	1.39M tons
Scenario 3 - Controls associated with recent Program funding levels through 2035	1.66M tons
Scenario 4 - Controls associated with expanded Program funding levels through 2035	1.79M tons

Note: "No additional controls" contemplates some continuing O&M expenditures to maintain existing facilities.

The modeling shows that the difference between no additional salinity controls (Scenario 1) and an optimistic level of Program implementation of 1.79 million tons (Scenario 4) is approximately 30-40 mg/L by the year 2035. These values are summarized in Figures 7, 8 and 9 below for the three numeric criteria points.

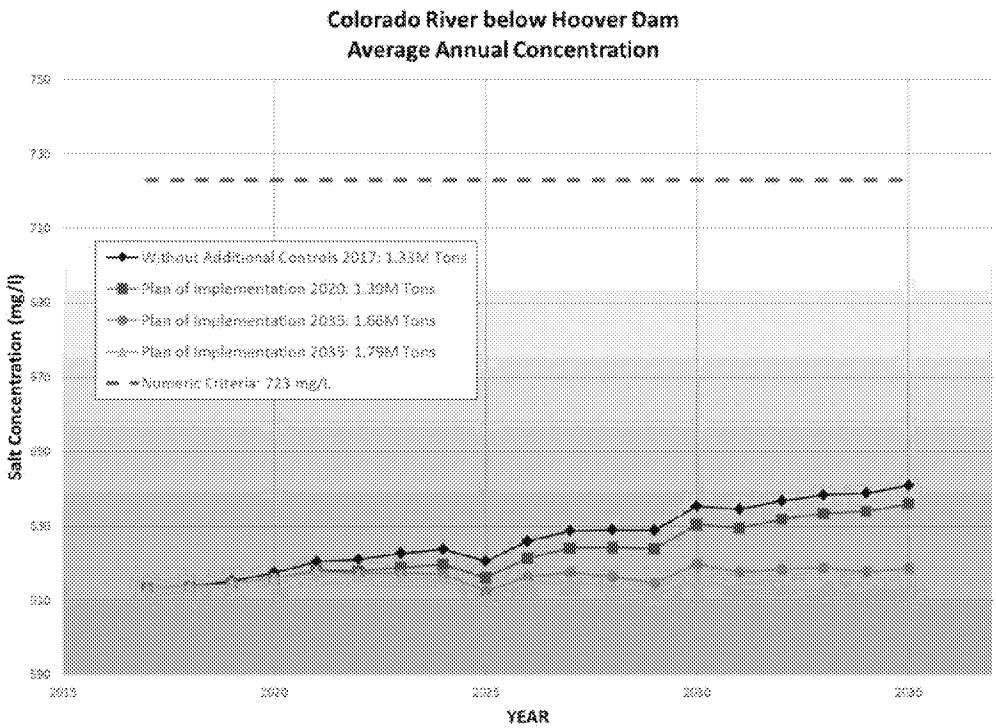

Figure 7 – Projected Average Annual Salinity Concentration below Hoover Dam

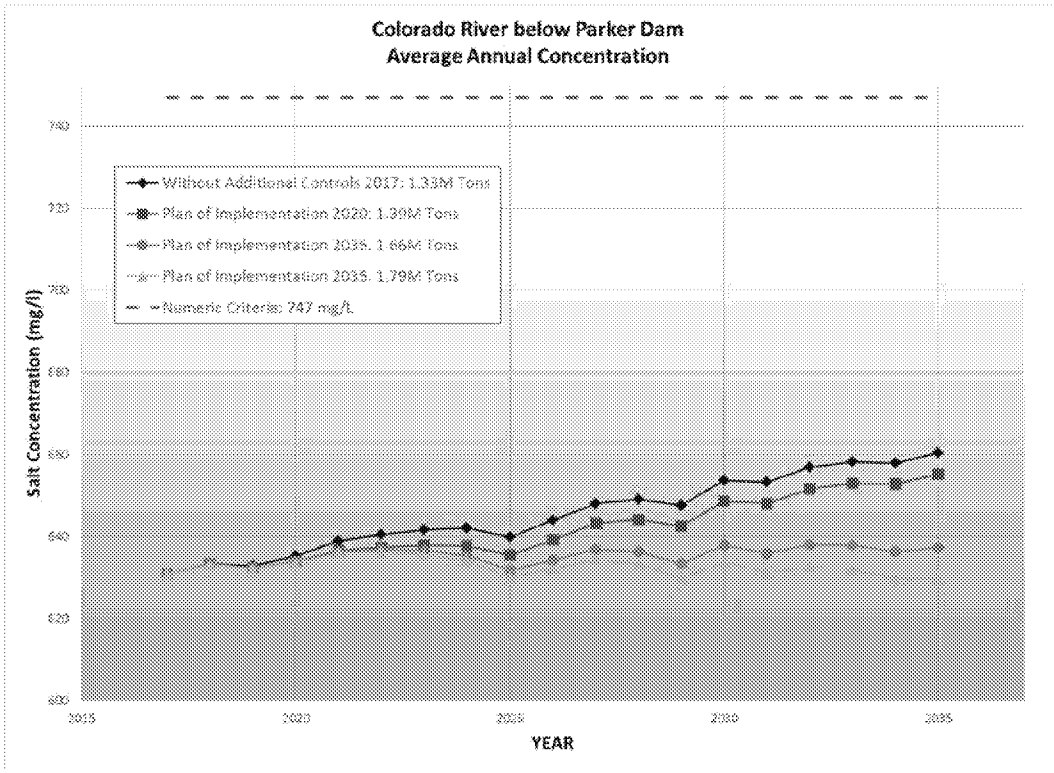

Figure 8 – Projected Average Annual Salinity Concentration below Parker Dam

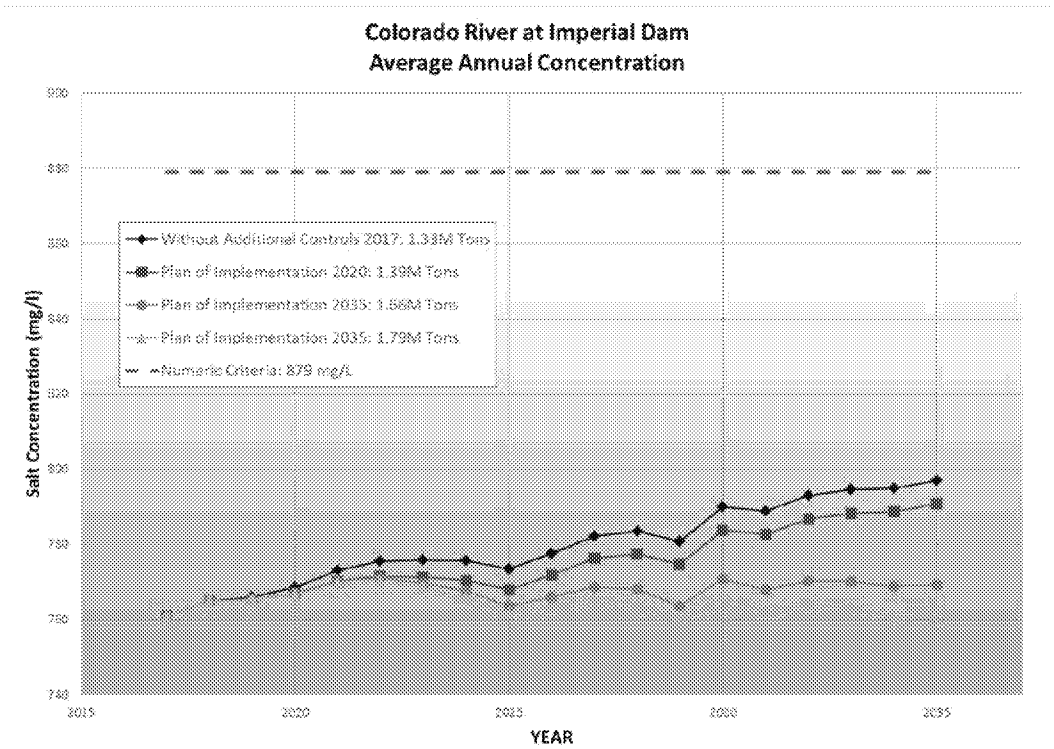

Figure 9 – Projected Average Annual Salinity Concentration at Imperial Dam

To further understand the impacts of reducing the salinity concentrations in the Lower Basin, the Forum used Reclamation's Salinity Economic Impact Model (SEIM), which is described in Appendix F, to estimate damages under the four Plan of Implementation alternatives. Damage estimates for each alternative are listed in Table 5 under the heading "Total Quantified Damages." Estimated damage reductions resulting from lower salinity concentrations projected under each alternative were derived by subtracting the "Total Quantified Damages" from the base case of 1.33 Mtons removed, or $574.2M. These estimates are listed in Table 5 as "Annual Damage Reductions." The SEIM model only estimates damages to the Lower Basin that can be reasonably *quantified* at the present time (see Appendix F). In addition to the currently *unquantified* damages in the Lower Basin, there are also benefits from the Program in the Upper Basin that have yet to be quantified.

Table 5
Annual Damages and Damage Reductions for Plan of Implementation Alternatives

Alternative	Salinity Reduction at Imperial Dam in 2035 (mg/L)	Total Quantified Damages (2014 Dollars)	Annual Damage Reductions as Compared to No Additional Future Controls Beyond 2017
1.33 Mtons removed	--	$574.2M	--
1.39 Mtons removed	6	$558.1M	$16.1M
1.66 Mtons removed	28	$500.4M	$73.8M
1.79 Mtons removed	37	$477.4M	$96.8M

All damage and reduced-damage estimates correspond to year 2035.

From these calculations, it can be seen that as more salinity control is implemented and the concentrations at the numeric criteria points are reduced, the *quantified* economic damages projected to be experienced annually by users in the Lower Basin are also reduced. For example, as indicated in Table 5, with the additional 63,500 tons of control (the difference between the 1.33 million ton and 1.39 million ton alternatives) annually, the *quantified* economic damages to agricultural and municipal and industrial water users are reduced by approximately $16.1 million annually.

While it is essential to continue to maintain salinity concentrations at or below the numeric criteria, the Forum will continue to focus on opportunities to further reduce future economic damages. The Forum believes a more robust salinity control program is needed to achieve the reductions indicated in Table 5. Two of the challenges facing the Forum in pursuing such a program are finding cost effective salinity control projects and acquiring the necessary funding to implement those projects. The Forum is committed to continue working with the federal

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agencies to identify cost effective projects. The Forum is also committed to working with the federal agencies and Congress to seek additional appropriations and to generate the cost share revenues needed to support additional federal expenditures. The Forum determines that all of the alternatives evaluated above are economically justifiable. However, given the current financial constraints, the Forum, for this review period, will pursue a Program designed to remove at least 1.66 million tons annually by the year 2035. This may require legislation to alter the states' cost share or other actions to meet the identified Program levels.

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APPENDIX A

Flow Weighted Salinity Values
at the Three Numeric Criteria Stations

Observed Flow-Weighted Average Salinity at the Numeric Criteria Stations (Total Dissolved Solids in mg/L)[1]

Calendar Year (Numeric Criteria)	Below Hoover Dam (723 mg/L)	Below Parker Dam (747 mg/L)	At Imperial Dam (879 mg/L)
1970	743	760	896
1971	748	758	892
1972	724	734	861
1973	675	709	843
1974	681	702	834
1975	680	702	829
1976	674	690	822
1977	665	687	819
1978	678	688	812
1979	688	701	802
1980	691	712	760
1981	681	716	821
1982	679	713	827
1983	659	678	727
1984	598	611	675
1985	556	561	615
1986	517	535	577
1987	519	538	612
1988	529	540	648
1989	564	559	683
1990	587	600	702
1991	629	624	749
1992	657	651	767
1993	665	631	785
1994	667	673	796
1995	654	671	803
1996	618	648	768
1997	585	612	710
1998	559	559	655
1999	549	550	670
2000	539	549	661
2001	550	549	680
2002	561	572	689
2003	584	592	695
2004	625	644	729
2005	643	668	710
2006	646	671	720
2007	632	657	715
2008	620	644	733
2009	604	624	717
2010	577	600	690
2011	568	591	681
2012	548	569	677
2013	551	567	677
2014	581	598	695
2015	615	635	725
2016 [2]	583	621	702

[1] Determined by the USGS from data collected by Reclamation and USGS
[2] 2016 values are provisional

Salinity concentrations are based on TDS as the sum of constituents whenever possible. The sum of constituents is defined to include calcium, magnesium, sodium, chloride, sulfate, a measure of the carbonate equivalent of alkalinity and, if measured, silica and potassium.

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APPENDIX B

Forum Policies

POLICY FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS THROUGH THE NPDES PERMIT PROGRAM

Adopted by
The Colorado River Basin Salinity Control Forum

February 28, 1977
Revised October 30, 2002

In November 1976, the United States Environmental Protection Agency Regional Administrators notified each of the seven Colorado River Basin states of the approval of the water quality standards for salinity for the Colorado River System as contained in the document entitled "Proposed Water Quality Standards for Salinity Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System, June 1975, and the supplement dated August 25, 1975. The salinity standards including numeric criteria and a plan of implementation provide for a flow weighted average annual numeric criteria for three stations in the lower main stem of the Colorado River: below Hoover Dam, below Parker Dam, and at Imperial Dam.

In 1977, the states of the Colorado River Basin adopted the "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program." The plan of implementation is comprised of a number of federal and non-federal projects and measures to maintain the flow- weighted average annual salinity in the Lower Colorado River at or below numeric criteria at the three stations as the Upper and Lower Basin states continue to develop their compact-apportioned waters. One of the components of the Plan consists of the placing of effluent limitations, through the National Pollutant Discharge Elimination System (NPDES) permit program, on industrial and municipal discharges.

NPDES Policy for Municipal and Industrial Discharges of Salinity in the Colorado River

The purpose of this policy is to provide more detailed guidance in the application of salinity standards developed pursuant to Section 303 and through the NPDES permitting authority in the regulation of municipal and industrial sources. (See Section 402 of the Federal Water Pollution Control Act.) The objective of the policy, as provided in Sections I.A. and I.B., is to achieve "no salt return" whenever practicable for industrial discharges and an incremental increase in salinity over the supply water for municipal discharges. This policy is applicable to discharges that would have an impact, either direct or indirect on the lower main stem of the Colorado River System. The lower main stem is defined as that portion of the River from Hoover Dam to Imperial Dam.

In October, 2002, the Forum substantially amended the NPDES policies relating to industrial discharges but made no changes to the procedures for municipal discharges. In the printing of the 2002 Review, however, the section relating to municipal discharges and an additional appendix entitled “Guidance on New Construction Determination” were inadvertently omitted.

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Both errors have been corrected in this printing and the Forum reaffirms the validity of all of the policies as they appear in this document.

NPDES Policies Separately Adopted by the Forum

The Forum developed a separate and specific policy for the use of brackish and/or saline waters for industrial purposes on September 11, 1980. The Forum addressed the issue of intercepted ground water and adopted a specific policy dealing with that type of discharge on October 20, 1982. On October 28, 1988, the Forum adopted a specific policy addressing the water use and discharge associated with fish hatcheries. Each of these separately adopted policies is attached hereto.

NPDES Policies for Specified Industrial Discharges – 2002 Amendments

On October 30, 2002, the Forum amended this policy for implementation of Colorado River salinity standards through the NPDES permit program in order to address the following three additional types of industrial discharges: (1) water that has been used for once-through noncontact cooling water purposes; (2) new industrial sources that have operations and associated discharges at multiple locations; and (3) "fresh water industrial discharges" where the discharged water does not cause or contribute to exceedances of the salinity standards for the Colorado River System. This policy was also amended to encourage new industrial sources to conduct or finance one or more salinity-offset projects in cases where the permittee has demonstrated that it is not practicable to prevent the discharge of all salt from proposed new construction.

Discharges Of Once-Through Noncontact Cooling Water

Section I.C. of this policy has been added to address discharges of water that has been used for once-through noncontact cooling water purposes. The policy for such discharges shall be to permit these uses based upon a finding that the returned water does not contribute to the loading or the concentration of salts in the waters of the receiving stream beyond a *de minimis* amount. A *de minimis* amount is considered, for purposes of this policy, as an average annual increase of not more than 25 milligrams per liter (mg/L) in total dissolved solids measured at the discharge point or outfall prior to any mixing with the receiving stream in comparison to the total dissolved solids concentration measured at the intake monitoring point of the cooling process or facility. This policy is not intended to supersede any other water quality standard that applies to the receiving stream, including but not limited to narrative standards promulgated to prohibit impairment of designated uses of the stream. It is the intent of the Forum to permit the return of once-through noncontact cooling water only to the same stream from which the water was diverted. Noncontact cooling water is distinguished from blowdown water, and this policy specifically excludes blowdown or any commingling of once-through noncontact cooling water with another waste stream prior to discharge to the receiving stream. Sections I.A. and I.B. of this policy govern discharges of blowdown or commingled water.

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New Industrial Sources with Operations and Discharges at Multiple Locations under Common or Affiliated Ownership or Management

Recently there has been a proliferation of new industrial sources that have operations and associated discharges at multiple locations. An example is the recent growth in the development of energy fuel and mineral resources that has occurred in the Upper Colorado River Basin. This type of industrial development may involve the drilling of relatively closely spaced wells into one or more geological formations for the purpose of extracting oil, gas or minerals in solution. Large-scale ground water remediation efforts involving multiple pump and treat systems operating for longer than one year may share similar characteristics. With such energy and mineral development and ground water remediation efforts there is the possibility of a single major industrial operation being comprised of numerous individual point source discharges under common or affiliated ownership or management that produce significant quantities of water as a waste product or byproduct over a long period. Given the large areal scope of these types of major industrial sources and the often elevated concentrations of salinity in their produced water, the total amount of salt loading that they could generate may be very large in comparison to the Forum's past and present salt removal projects. Relatively small quantities of this produced water could generate one ton per day in discharges to surface waters. Since salinity is a conservative water quality constituent, such discharges of produced water, if uncontrolled, could have an adverse effect on achieving the adopted numeric salinity standards for the Colorado River System.

These kinds of major industrial sources strain the conventional interpretation of the industrial source waiver for new construction set forth in Section I.A.1.a. of this policy, which authorizes a discharge of salinity from a single point source of up to one ton per day in certain circumstances. The Forum adopted this provision in 1977, well before most of the new major industrial sources that have operations and discharges at multiple locations began to appear in the Colorado River Basin. A new category of industrial sources is, therefore, warranted. NPDES permit requirements for New Industrial Sources with Operations and Discharges at Multiple Locations under Common or Affiliated Ownership or Management are set forth in Section I.D. of this policy. These new requirements are intended to apply to new industrial sources with operations that commence discharging after October 30, 2002.

For purposes of interpreting this policy, "common or affiliated ownership or management" involves the authority to manage, direct, superintend, restrict, regulate, govern, administer, or oversee, or to otherwise exercise a restraining or directing influence over activities at one or more locations that result in a discharge of salinity into the Colorado River System. Common or affiliated ownership or management may be through the ownership of voting securities or may be indicated where individual sources are related through one or more joint ventures, contractual relationships, landlord/tenant or lessor/lessee arrangements. Other factors that indicate two or more discharging facilities are under common or affiliated ownership or management include: sharing corporate executive officers, pollution control equipment and responsibilities, common

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workforces, administrative functions, and/or payroll activities among operational facilities at different locations.

Fresh Water Industrial Discharges

Sections I.A. and I.B. of this policy have been amended to allow the permitting authority to authorize "fresh water industrial discharges" where the discharged water does not cause or contribute to exceedances of the adopted numeric salinity standards for the Colorado River System. Different end-of-pipe concentrations of salinity as shown in Table 1 of the policy, are appropriate for discharges to tributaries depending upon their location within the Basin. The concept of "benchmark concentrations" has been developed in order to address this need for different end-of-pipe concentrations. These benchmark concentrations are not to be interpreted as water quality standards. Rather, they are intended to serve solely for the establishment of effluent limits for implementing the waiver for "fresh water discharges." The allowance for freshwater discharges is intended to preserve flows from discharges in the Basin, which do not cause significant degradation of existing ambient quality with respect to salinity. Operations or individual discharges that qualify for the freshwater waiver shall not be subject to any further limitation on salt loading under this policy.

Salinity-Offset Projects

This policy has been amended to allow the permitting authority to authorize industrial sources of salinity to conduct or finance one or more salinity-offset projects when the permittee has determined that it is not practicable: (i) to prevent the discharge of all salt from proposed new construction; (ii) to reduce the salt loading to the Colorado River to less than one ton per day or 366 tons per year; or (iii) the proposed discharge is of insufficient quality in terms of TDS concentrations that it could be considered "fresh water" as defined below. Presently, the permitting authority can consider the costs and availability of implementing off-site salinity control measures to mitigate the adverse impacts of the permitted salt load. It is not intended that the applicant be required to develop or design an off-site salinity control project or establish a salt bank, but rather to assess the costs of conducting or buying into such projects where they are available. In the future the Forum or another entity may create a trading/banking institution to facilitate the implementation of a salinity-offset program, basin-wide. This would allow industrial sources to conduct or finance the most cost effective project available at the time an offset project is needed regardless of the project's location in the Basin.

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NPDES PERMIT PROGRAM POLICY
FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS

I. Industrial Sources

The Salinity Standards state that "The objective for discharges shall be a no-salt return policy whenever practicable." This is the policy that shall be followed in issuing NPDES discharge permits for all new industrial sources, and upon the reissuance of permits for all existing industrial sources, except as provided herein. The following addresses those cases where "no discharge of salt" may be deemed not to be practicable.

A. New Construction

1. "New construction" is defined as any facility from which a discharge may occur, the construction of which is commenced after October 18, 1975. (Date of submittal of water quality standards as required by 40 CFR 120, December 11, 1974.) Attachment 1 provides guidance on new construction determination. "A new industrial source with operations and discharging facilities at multiple locations under common or affiliated ownership or management" shall be defined for purposes of NPDES permitting, as an industrial source that commenced construction on a pilot, development or production scale on or after October 30, 2002.

   a. The permitting authority may permit the discharge of salt upon a satisfactory demonstration by the permittee that:

      i. It is not practicable to prevent the discharge of all salt from the new construction or,

      ii. In cases where the salt loading to the Colorado River from the new construction is less than one ton per day or 366 tons per year, or

      iii. The proposed discharge from the new construction is of sufficient quality in terms of TDS concentrations that it can be considered "fresh water" that would have no adverse effect on achieving the adopted numeric standards for the Colorado River System. The permitting authority may consider a discharge to be fresh water if the maximum TDS concentration is: (i) 500 mg/L for discharges into the Colorado River and its tributaries upstream of Lees Ferry, Arizona; or, (ii) 90% of the applicable in-stream salinity standard at the appropriate benchmark monitoring station for discharges into the Colorado River downstream of Lees Ferry as shown in Table 1, below

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Table 1

	Benchmark Monitoring Station	Applicable Criteria	Freshwater Discharge (mg/L)
1	Colorado River at Lees Ferry, Arizona	N/A	500
2	Colorado River below Hoover Dam	723	650
3	Colorado River below Parker Dam	747	675
4	Colorado River at Imperial Dam	879	790

b. Unless exempted under Sections I.A.1.a.ii. or iii., above, the demonstration by the applicant must include information on the following factors relating to the potential discharge:

i. Description of the proposed new construction.

ii. Description of the quantity and salinity of the water supply.

iii. Description of water rights, including diversions and consumptive use quantities.

iv. Alternative plans that could reduce or eliminate salt discharge. Alternative plans shall include:

(A) Description of alternative water supplies, including provisions for water reuse, if any;

(B) Description of quantity and quality of proposed discharge;

(C) Description of how salts removed from discharges shall be disposed of to prevent such salts from entering surface waters or groundwater aquifers;

(D) Costs of alternative plans in dollars per ton of salt removed; and

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(E) Unless the permitting authority has previously determined through prior permitting or permit renewal actions that it is not practicable to prevent the discharge of all salt from the new construction in accordance with Section I.A.1.a.i., the applicant must include information on project options that would offset all or part of the salt loading to the Colorado River associated with the proposed discharge or that would contribute to state or interstate salinity control projects or salt banking programs.

v. A statement as to the one plan among the alternatives for reduction of salt discharge that is recommended by the applicant and also information as to which of the other evaluated alternatives are economically infeasible.

vi. Such other information pertinent to demonstration of non- practicability as the permitting authority may deem necessary.

c. In determining what permit conditions shall be required under I.A.1.a.i., above, the permit issuing authority shall consider, but not be limited to the following:

i. The practicability of achieving no-discharge of salt from the new construction.

ii. Where "no discharge" is determined not to be practicable:

(A) The impact of the total proposed salt discharge of each alternative on the lower main stem in terms of both tons per year and concentration.

(B) Costs per ton of salt removed from the discharge for each plan alternative.

(C) Capability of minimizing salinity discharge.

(D) If applicable under I.A.1.b.(iv)(E), costs and practicability of offsetting all or part of the salt load by the implementation of salt removal or salinity control projects elsewhere in the Colorado River Basin. The permittee shall evaluate the practicability of offsetting all or part of the salt load by comparing such factors as the cost per ton of salt removal for projects undertaken by the Colorado River Basin Salinity Control Forum and the costs in damages associated with increases in salinity concentration against the permittee's cost in conducting or buying into such projects where they are available.

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iii. With regard to subparagraphs, (b) and (c) above, the permit issuing authority shall consider the compatibility of state water laws with either the complete elimination of a salt discharge or any plan for minimizing a salt discharge.

B. Existing Facilities or any discharging facility, the construction of which was commenced before October 18, 1975

1. The permitting authority may permit the discharge of salt upon a satisfactory demonstration by the permittee that it is not practicable to prevent the discharge of all salt from an existing facility.

2. The demonstration by the applicant must include, in addition to that required under Section I.A.1.b the following factors relating to the potential discharge:

a. Existing tonnage of salt discharged and volume of effluent.

b. Cost of modifying existing industrial plant to provide for no salt discharge.

c. Cost of salt minimization.

3. In determining what permit conditions shall be required, the permit issuing authority shall consider the items presented under I.A.1.c.(ii), and in addition; the annual costs of plant modification in terms of dollars per ton of salt removed for:

a. No salt return.

b. Minimizing salt return.

4. The no-salt discharge requirement may be waived in those cases where:

a. The discharge of salt is less than one ton per day or 366 tons per year; or

b. The permitting authority determines that a discharge qualifies for a "fresh water waiver" irrespective of the total daily or annual salt load. The maximum TDS concentration considered to be fresh water is 500 mg/L for discharges into the Colorado River and its tributaries upstream of Lees Ferry, Arizona. For discharges into the Colorado River downstream of Lees Ferry the maximum TDS concentration considered to be afresh water shall be 90% of the applicable in-stream standard at the appropriate benchmark monitoring station shown in Table 1, above.

C. Discharge of Once-Through Noncontact Cooling Water

1. Definitions:

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a. The terms "noncontact cooling water" and "blowdown" are defined as per 40CFR 401.11 (m) and (n).

b. "Noncontact cooling water" means water used for cooling that does not come into direct contact with any raw material, intermediate product, waste product or finished product.

c. "Blowdown" means the minimum discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentration in amounts exceeding limits established by best engineering practice.

d. "Salinity" shall mean total dissolved solids as the sum of constituents.

2. Permits shall be authorized for discharges of water that has been used for once-through noncontact cooling purposes based upon a finding that the returned water does not contribute to the loading of salts or the concentration of salts in the waters of the receiving stream in excess of a *de minimis* amount.

3. This policy shall not supplant nor supersede any other water quality standard of the receiving stream adopted pursuant to the Federal Clean Water Act, including but not limited to impairment of designated uses of the stream as established by the governing water quality authority having jurisdiction over the waters of the receiving stream.

4. Noncontact cooling water shall be distinguished from blowdown, and Section 1.C. of this policy specifically excludes blowdown or any commingling of once-through noncontact cooling water with another waste stream prior to discharge to the receiving stream. Sections I.A. and I.B of this policy shall in all cases govern discharge of blowdown or commingled water.

5. Once-through noncontact cooling water shall be permitted to return only to the same stream from which the water was diverted.

6. Because the increase in temperature of the cooling water will result in some evaporation, a *de minimis* increase in the concentration of dissolved salts in the receiving water may occur. An annual average increase in total dissolved solids of not more than 25 milligrams per liter (mg/L) measured at the intake monitoring point, as defined below, of the cooling process or facility, subtracted from the effluent total dissolved solids immediately upstream of the discharge point to the receiving stream, shall be considered *de minimis*.

7. At the time of NPDES discharge permit issuance or reissuance, the permitting authority may permit a discharge in excess of the 25 mg/L increase based upon a satisfactory demonstration by the permittee pursuant to Section 1.A.1.a.

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8. Once-through demonstration data requirements:

   a. Description of the facility and the cooling process component of the facility.

   b. Description of the quantity, salinity concentration and salt load of intake water sources.

   c. Description of the discharge, covering location, receiving waters, quantity of salt load and salinity concentration of both the receiving waters and the discharge.

   d. Alternative plans for minimizing salt discharge from the facility which shall include:

      i. Description of alternative means to attain no discharge of salt.

      ii. Cost of alternative plans in dollars per ton of salt removed from discharge.

      iii. Such other information pertinent to demonstration of non- practicability as the permitting authority may deem necessary.

9. If, in the opinion of the permitting authority, the database for the salinity characteristics of the water source and the discharge is inadequate, the permit will require that the permittee monitor the water supply and the discharge for salinity. Such monitoring program shall be completed in two years and the permittee shall then present the once-through demonstration data as specified above.

10. All new and reissued NPDES permits for once-through noncontact cooling water discharges shall require at a minimum semiannual monitoring of the salinity of the intake water supply and the effluent, as provided below.

    a. The intake monitoring point shall be the point immediately before the point of use of the water.

    b. The effluent monitoring point shall be prior to the discharge point at the receiving stream or prior to commingling with another waste stream or discharge source.

    c. Discrete or composite samples may be required at the discretion of the permitting authority, depending on the relative uniformity of the salinity of the water supply.

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d. Analysis for salinity may be either total dissolved solids or electrical conductivity where a satisfactory correlation with total dissolved solids has been established. The correlation shall be based on a minimum of five different samples.

D. Discharges of Salinity from a New Industrial Source with Operations and Discharging Facilities at Multiple Locations

1. The objective for discharges to surface waters from a new industrial source with operations and discharging facilities at multiple locations shall be to assure that such operations will have no adverse effect on achieving the adopted numeric salinity standards for the Colorado River System.

2. NPDES permit requirements for a new industrial source with operations and discharging facilities at multiple locations shall be defined, for purposes of establishing effluent limitations for salinity, as a single industrial source if these facilities meet the criteria:

   a. The discharging facilities are interrelated or integrated in any way including being engaged in a primary activity or the production of a principle product; and

   b. The discharging facilities are located on contiguous or adjacent properties or are within a single production area e.g. geologic basin, geohydrologic basin, coal or gas field or 8 digit hydrologic unit watershed area; and

   c. The discharging facilities are owned or operated by the same person or by persons under common or affiliated ownership or management.

3. The permitting authority may permit the discharge of salt from a new industrial source with operations and discharging facilities at multiple locations if one or more of the following requirements are met:

   a. The permittee has demonstrated that it is not practicable to prevent the discharge of all salt from the industrial source. This demonstration by the applicant must include detailed information on the factors set forth in Section I.A.1.b of the Policy for implementation of Colorado River Salinity Standards through the NPDES permit program; with particular emphasis on an assessment of salinity off-set options that would contribute to state or interstate salinity control projects or salt banking programs and offset all or part of the salt loading to the Colorado River associated with the proposed discharge.

   b. In determining what permit conditions shall be required under I.A.1.a.i., above, the permit issuing authority shall consider the requirement for an offset project to be feasible if the cost per ton of salt removal in the offset

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project options (i.e. the permittee's cost in conducting or buying into such projects where they are available) is less than or equal to the cost per ton of salt removal for projects undertaken by the Colorado River Basin Salinity Control Forum or less than the cost per ton in damages caused by salinity that would otherwise be cumulatively discharged from the outfalls at the various locations with operations controlled by the industrial source; or

c. The pemittee has demonstrated that one or more of the proposed discharges is of sufficient quality in terms of TDS concentrations to qualify for a "fresh water waiver" from the policy of "no salt return, whenever practical." An individual discharge that can qualify for a fresh water waiver shall be considered to have no adverse effect on achieving the adopted numeric salinity standards for the Colorado River System.

4. For the purpose of determining whether a freshwater waiver can be granted, the quality of water discharged from the new industrial source with operations and discharging facilities at multiple locations, determined as the flow weighted average of salinity measurements at all outfall points, must meet the applicable benchmark concentration in accordance with Section I.A.1.a.iii., as set forth above.

5. Very small-scale pilot activities, involving 5 or fewer outfalls, that are sited in areas not previously developed or placed into production by a new industrial source operations and discharges at multiple locations under common or affiliated ownership or management, may be permitted in cases where the discharge of salt from each outfall is less than one ton per day or 366 tons per year. However, no later than the date of the first permit renewal after the pilot activities have become part of a larger industrial development or production scale effort, all discharging facilities shall be addressed for permitting purposes as a single industrial source with operations and discharges at multiple locations under common or affiliated ownership or management.

6. The public notice for NPDES permits authorizing discharges from operations at multiple locations with associated outfalls shall be provided promptly and in the most efficient manner to all member states in the Colorado River Basin Salinity Control Forum in relation to this policy.

II. Municipal Discharges

The basic policy is that a reasonable increase in salinity shall be established for municipal discharges to any portion of the Colorado River stream system that has an impact on the lower main stem. The incremental increase in salinity shall be 400 mg/L or less, which is considered to be a reasonable incremental increase above the flow weighted average salinity of the intake water supply.

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F. The permitting authority may permit a discharge in excess of the 400 mg/L incremental increase at the time of issuance or reissuance of a NPDES discharge permit, upon satisfactory demonstration by the permittee that it is not practicable to attain the 400 mg/L limit.

G. Demonstration by the applicant must include information on the following factors relating to the potential discharge:

1. Description of the municipal entity and facilities.

2. Description of the quantity and salinity of intake water sources.

3. Description of significant salt sources of the municipal wastewater collection system, and identification of entities responsible for each source, if available.

4. Description of water rights, including diversions and consumptive use quantities.

5. Description of the wastewater discharge, covering location, receiving waters, quantity, salt load, and salinity.

6. Alternative plans for minimizing salt contribution from the municipal discharge. Alternative plans should include:

   a. Description of system salt sources and alternative means of control.

   b. Cost of alternative plans in dollars per ton, of salt removed from discharge.

7. Such other information pertinent to demonstration of non-practicability as the permitting authority may deem necessary.

H. In determining what permit conditions shall be required, the permit issuing authority shall consider the following criteria including, but not limited to:

1. The practicability of achieving the 400 mg/L incremental increase.

2. Where the 400 mg/L incremental increase is not determined to be practicable:

   a. The impact of the proposed salt input of each alternative on the lower main stem in terms of tons per year and concentration.

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b. Costs per ton of salt removed from discharge of each alternative plan.

c. Capability of minimizing the salt discharge.

D. If, in the opinion of the permitting authority, the data base for the municipal waste discharger is inadequate, the permit will contain the requirement that the municipal waste discharger monitor the water supply and the wastewater discharge for salinity. Such monitoring program shall be completed within 2 years and the discharger shall then present the information as specified above.

E. Requirements for establishing incremental increases may be waived in those cases where the incremental salt load reaching the main stem of the Colorado River is less than one ton per day or 366 tons per year. Evaluation will be made on a case-by-case basis.

F. All new and reissued NPDES permits for all municipalities shall require monitoring of the salinity of the intake water supply and the wastewater treatment plant effluent in accordance with the following guidelines:

Treatment Plant Design Capacity	Monitoring Frequency	Type of Sample
<1.0 MGD*	Quarterly	Discrete
1.0 - 5.0 MGD	Monthly	Composite
>5.0 - 50.0 MGD	Weekly	Composite
50.0 MGD	Daily	Composite

1. Analysis for salinity may be either as total dissolved solids (TDS) or be electrical conductivity where a satisfactory correlation with TDS has been established. The correlation should be based on a minimum of five different samples.

2. Monitoring of the intake water supply may be at a reduced frequency where the salinity of the water supply is relatively uniform.

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Attachment 1

Guidance on New Construction Determination

For purposes of determining a new construction, a source should be considered new if by October 18, 1975, there has not been:

I. Significant site preparation work such as major clearing or excavation; and/or

II. Placement, assembly or installation of unique facilities or equipment at the premises where such facilities or equipment will be used; and/or

III. Any contractual obligation to purchase unique facilities or equipment. Facilities and equipment shall include only the major items listed below, provided that the value of such items represents a substantial commitment to construct the facility:

   A. structures; or
   B. structural materials; or
   C. machinery; or
   D. process equipment; or
   E. construction equipment.

IV. Contractual obligation with a firm to design, engineer, and erect a completed facility (i.e., a turnkey plant).

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POLICY FOR USE OF
BRACKISH AND/OR SALINE WATERS
FOR INDUSTRIAL PURPOSES

Adopted by
The Colorado River Basin Salinity Control Forum

September 11, 1980

The states of the Colorado River Basin, the Federal Executive Department, and the Congress have all adopted as a policy that the salinity in the lower main stem of the Colorado River shall be maintained at or below the flow-weighted average values found during 1972, while the Basin states continue to develop their compact-apportioned waters. In order to achieve this policy, all steps which are practical and within the framework of the administration of states' water rights must be taken to reduce the salt load of the river. One such step was the adoption in 1975 by the Forum of a policy regarding effluent limitations for industrial discharges with the objective of "no-salt return" wherever practicable. Another step was the Forum's adoption in 1977 of the "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program." These policies are part of the basinwide plan of implementation for salinity control which has been adopted by the seven Basin states.

The Forum finds that the objective of maintaining 1972 salinity levels would be served by the exercise of all feasible measures including, wherever practicable, the use of brackish and/or saline waters for industrial purposes.

The summary and page 32 of the Forum's 1978 Revision of the Water Quality Standards for Salinity state: "The plan also contemplates the use of saline water for industrial purposes whenever practicable,..." In order to implement this concept and thereby further extend the Forum's basic salinity policies, the Colorado River Basin states support the Water and Power Resources Service (WPRS) appraisal study of saline water collection, pretreatment and potential industrial use.

The Colorado River Basin contains large energy resources which are in the early stages of development. The WPRS study should investigate the technical and financial feasibility of serving a significant portion of the water requirements of the energy industry and any other industries by the use of Basin brackish and/or saline waters. The Forum recommends that:

I. The Colorado River Basin states, working with federal agencies, identify, locate and quantify such brackish and/or saline water sources.

II. Information on the availability of these waters be made available to all potential users.

III. Each state encourage and promote the use of such brackish and/or saline waters, except where it would not be environmentally sound or economically feasible, or would significantly increase consumptive use of Colorado River System water in the state above that which would otherwise occur.

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IV. The WPRS, with the assistance of the states, encourages and promotes the use of brackish return flows from federal irrigation projects in lieu of fresh water sources, except where it would not be environmentally sound or economically feasible, or would significantly increase consumptive use of Colorado River System water.

V. The WPRS considers a federal contribution to the costs of industrial use of brackish and/or saline water, where cost-effective, as a joint private-government salinity control measure. Such activities shall not delay the implementation of the salinity control projects identified in Title II of P.L. 93-320.

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POLICY FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS THROUGH THE NPDES PERMIT PROGRAM FOR INTERCEPTED GROUND WATER

Adopted by
The Colorado River Basin Salinity Control Forum

October 20, 1982

The States of the Colorado River Basin in 1977 agreed to the "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program" with the objective for industrial discharge being "no-salt return" whenever practicable. That policy required the submittal of information by the applicant on alternatives, water rights, quantity, quality, and costs to eliminate or minimize the salt discharge. The information is for use by the NPDES permit-issuing agency in evaluating the practicability of achieving "no-salt" discharge.

There are mines and wells in the Basin which discharge intercepted ground waters. The factors involved in those situations differ somewhat from those encountered in other industrial discharges. Continued development will undoubtedly result in additional instances in which permit conditions must deal with intercepted ground water.

The discharge of [1]intercepted ground water needs to be evaluated in a manner consistent with the overall objective of "no-salt return" whenever practical. The following provides more detailed guidance for those situations where ground waters are intercepted with resultant changes in ground-water flow regime.

I. The "no-salt" discharge requirement may be waived at the option of the permitting authority in those cases where the discharged salt load reaching the main stem of the Colorado River is less than one ton per day or 366 tons per year. Evaluation will be made on a case-by-case basis.

II. Consideration should be given to the possibility that the ground water, if not intercepted, normally would reach the Colorado River System in a reasonable time frame. An industry desiring such consideration must provide detailed information including a description of the topography, geology, and hydrology. Such information must include direction and rate of ground-water flow; chemical quality and quantity of ground water; and the location, quality, and quantity of surface streams and springs that might be affected. If the information adequately demonstrates that the ground water to be intercepted normally would reach the river system in a reasonable time frame and would contain approximately the same or greater salt load than if intercepted, and if no significant

[1]The term "intercepted ground water" means all ground water encountered during mining or other industrial operations.

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localized problems would be created, then the permitting agency may waive the "no-salt" discharge requirement.

III. In those situations where the discharge does not meet the criteria in I or II above, the applicant will be required to submit the following information for consideration:

A. Description of the topography, geology, and hydrology. Such information must include the location of the development, direction and rate of ground-water flow, chemical quality and quantity of ground water, and relevant data on surface streams and springs that are or might be affected. This information should be provided for the conditions with and without the project.

B. Alternative plans that could substantially reduce or eliminate salt discharge. Alternative plans must include:

1. Description of water rights, including beneficial uses, diversions, and consumptive use quantities.

2. Description of alternative water supplies, including provisions for water reuse, if any.

3. Description of quantity and quality of proposed discharge.

4. Description of how salts removed from discharges shall be disposed of to prevent their entering surface waters or ground-water aquifers.

5. Technical feasibility of the alternatives.

6. Total construction, operation, and maintenance costs; and costs in dollars per ton of salt removed from the discharge.

7. Closure plans to ensure termination of any proposed discharge at the end of the economic life of the project.

8. A statement as to the one alternative plan for reduction of salt discharge that the applicant recommends be adopted, including an evaluation of the technical, economic, and legal Practicability of achieving no discharge of salt.

9. Such information as the permitting authority may deem necessary.

IV. In determining whether a "no-salt" discharge is Practicable, the Permit-issuing authority shall consider, but not be limited to, the water rights and the technical, economic, and legal practicability of achieving no discharge of salt.

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V. Where "no-salt" discharge is determined not to be Practicable the permitting authority shall, in determining permit conditions, consider:

A. The impact of the total proposed salt discharge of each alternative on the lower main stem in terms of both tons per year and concentration.

B. Costs per ton of salt removed from the discharge for each plan alternative.

C. The compatibility of state water laws with each alternative.

D. Capability of minimizing salinity discharge.

E. The localized impact of the discharge.

F. Minimization of salt discharges and the preservation of fresh water by using intercepted ground water for industrial processes, dust control, etc. whenever it is economically feasible and environmentally sound.

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POLICY FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS THROUGH THE NPDES PERMIT PROGRAM FOR FISH HATCHERIES

Adopted by
The Colorado River Basin Salinity Control Forum

October 28, 1988

The states of the Colorado River Basin in 1977 adopted the "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program." The objective was for "no-salt return" whenever practicable for industrial discharges and an incremental increase in salinity over the supply water for municipal discharges. The Forum addressed the issue of intercepted ground water under the 1977 policy, and adopted a specific policy dealing with that type of discharge.

A specific water use and associated discharge which has not been here-to-fore considered is discharges from fish hatcheries. This policy is limited exclusively to discharges from fish hatcheries within the Colorado River Basin. The discharges from fish hatcheries need to be addressed in a manner consistent with the 1977 and 1980 Forum policies.

The basic policy for discharges from fish hatcheries shall permit an incremental increase in salinity of 100 mg/L or less above the flow weighted average salinity of the intake supply water. The 100 mg/L incremental increase may be waived if the discharged salt load reaching the Colorado River system is less than one ton per day, or 366 tons per year. Evaluation is to be made on a case-by-case basis.

I. The permitting authority may permit a discharge in excess of the 100 mg/L incremental increase at the time of issuance or reissuance of a NPDES discharge permit. Upon satisfactory demonstration by the permittee that it is not practicable to attain the 100 mg/L limit.

II. Demonstration by the applicant must include information on the following factors relating to the potential discharge:

   A. Description of the fish hatchery and facilities.

   B. Description of the quantity and salinity of intake water sources.

   C. Description of salt sources in the hatchery.

   D. Description of water rights, including diversions and consumptive use quantities.

   E. Description of the discharge, covering location, receiving waters, quantity salt load, and salinity.

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F. Alternative plans for minimizing salt discharge from the hatchery. Alternative plans should include:

1. Description of alternative means of salt control.

2. Cost of alternative plans in dollars per ton, of salt removed from discharge.

G. Such other information pertinent to demonstration of non-practicability as the permitting authority may deem necessary.

III. In determining what permit conditions shall be required, the permit-issuing authority shall consider the following criteria including, but not limited to:

A. The practicability of achieving the 100 mg/L incremental increase.

B. Where the 100 mg/L incremental increase is not determined to be practicable:

1. The impact of the proposed salt input of each alternative on the lower main stem in terms of tons per year and concentration.

2. Costs per ton of salt removed from discharge of each alternative plan.

3. Capability of minimizing the salt discharge.

IV. If, in the opinion of the permitting authority, the database for the hatchery is inadequate, the permit will contain the requirement that the discharger monitor the water supply and the discharge for salinity. Such monitoring program shall be completed within two years and the discharger shall then present the information as specified above.

V. All new and reissued NPDES permits for all hatcheries shall require monitoring of the salinity of the intake water supply and the effluent at the time of peak fish population.

A. Analysis for salinity may be either as total dissolved solids (TDS) or be electrical conductivity where a satisfactory correlation with TDS has been established. The correlation should be based on a minimum of five different samples.

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APPENDIX C

States NPDES Permits List

LEGEND

NPDES PERMITS
EXPLANATION CODES

COLORADO RIVER BASIN SALINITY CONTROL FORUM
January 1, 2014 through December 31, 2016

NPDES permits are reviewed under two different criteria under Forum policy; these being municipal and industrial. In order for a permittee to be in compliance under the municipal criteria, the increase in concentration between inflow and outflow cannot be greater than 400 mg/L. Forum industrial criteria requires that no industrial user discharges more than 1.00 ton/day. Under Forum policy there can be granted exceptions to these limitations by the states. The following gives an explanation of the current status of the NPDES permits. Because at any given time many of the permits identified in this list are being reviewed, reissued, and/or terminated, and new discharge permits are being filed, this list must be considered as being subject to frequent change.

MUNICIPAL

(M) Municipal user in compliance with Forum policy.

(M-A) Municipal user in compliance with the 400 mg/L incremental increase provision.

(M-B) Municipal user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(M-1)* Permit has expired or been revoked. No discharge.

(M-2) Permittee did not discharge during the reporting period.

(M-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both inflow and outflow when the permit is reissued.

Measurements of inflow are not consistent with Forum policy;

(M-4A) Therefore, it is not known whether or not this municipal user is in compliance.

(M-4B) However, since outflow concentration is less than 500 mg/L it is presumed that this permit is not in violation of the ≤400 mg/L increase.

(M-5) Permittee is in violation of Forum policy in that there is an increase in concentration of >400 mg/L over the source waters. No provision has been made allowing this violation of Forum policy.

(M-5A) The state and/or EPA is currently working to bring permittee into compliance.

(M-5B) Though discharge is >400 mg/L over source waters, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(M-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(M-7) Insufficient data to know the current status of this permit.

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* Permits that have been expired or revoked and listed with the M-1 and I-1 explanation codes shall be removed from the NPDES list during the subsequent triennial review.

INDUSTRIAL

(I) Industrial user in compliance with Forum policy.

(I-A) Industrial user in compliance with the Forum's salinity offset policy.

(I-B) Industrial user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(I-1)* Permit has expired or been revoked. No discharge.

(I-2) Permittee did not discharge during the reporting period.

(I-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both volume and concentration of outflow when the permit is reissued.

(I-4) Either concentration or volume of outflow are not currently being reported, thus the permittee is in violation of Forum policy. It is not known if the discharge is in excess of the <1.00 ton/day requirement.

(I-5) Permittee is in violation of Forum policy in that discharge of salts is >1.00 ton/day. No provision has been made allowing this violation of Forum policy.

(I-5A) The state and/or EPA is currently working to bring permittee into compliance.

(I-5B) Though discharge is >1.00 ton/day, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(I-5C) The use of ground water under this permit is for geothermal energy and only heat is extracted. The intercepted salt and water are naturally tributary to the Colorado River System and hence, this discharge does not increase salt in the river. The permit is covered by the Forum's policy on intercepted ground waters.

(I-5D) This permit is in compliance with the Forum's policy for fish hatcheries. The use of the water is a one-time pass through, and the incremental increase in salinity is ≤ 100 mg/l.

(I-5E) This permit is for the interception and passage of ground waters and thus is excepted under the Forum's policy on intercepted ground waters.

(I-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(I-7) Insufficient data to know the current status of this permit.

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LEGEND (continued)

NPDES PERMITS

REACH DEMARCATIONS

COLORADO RIVER BASIN SALINITY CONTROL FORUM

In order to provide a better understanding of the location of the various NPDES permits and the geographical sequence in the Colorado River System, each of the following NPDES permits is identified with a Colorado River reach number. The reach numbers have their origin in the old CRSS river model. Though this model is no longer used, the reach numbers assist in understanding the general location of the permits. The reaches are defined as:

100	Upper Main Stem	from headwaters of Colorado River to Colorado River near Cameo
190	Taylor Park	from headwaters of Gunnison River to above Blue Mesa Reservoir
200	Blue Mesa	from above Blue Mesa Reservoir to below Blue Mesa Dam
210	Morrow Point	from below Blue Mesa Dam to Crystal Reservoir
220	Lower Gunnison	from Crystal Reservoir to confluence with Colorado River
300	Grand Valley	from Colorado River near Cameo to confluence with Green River
310	Dolores River	from headwaters of Dolores River to confluence with Colorado River
401	Fontenelle	from headwaters of Green River to Green River near Green River, WY
411	Flaming Gorge	from Green River near Green River, WY to confluence with White and Duchesne Rivers
500	Yampa River	from headwaters of Yampa River to confluence with Green River
510	White River	from headwaters of White River to confluence with Green River
600	Green River	Green River from confluence with White and Duchesne Rivers to confluence with Colorado River
610	Duchesne River	from headwaters of Duchesne River to confluence with Green River
700	Lake Powell	Colorado River from confluence of with Green River to Lees Ferry
710	San Rafael River	from headwaters of San Rafael River to confluence with Green River
801	Upper San Juan River	from headwaters of San Juan River to San Juan near Bluff
802	Lower San Juan River	from San Juan near Bluff to confluence with Lake Powell
900	Glen Canyon to Lake Mead	Colorado River from Lees Ferry to backwaters of Lake Mead
905	Virgin River	from headwaters of Virgin River to backwaters of Lake Mead
910	Lake Mead	from backwaters of Lake Mead to Colorado River below Hoover Dam
920	Lake Mohave	Colorado River from below Hoover Dam down to I-40 bridge
930	Lake Havasu	Colorado River from I-40 bridge to below Parker Dam
940	Parker Dam to Imperial Dam	Colorado River from below Parker Dam to above Imperial Dam
945	Imperial Dam	Colorado River from above Imperial Dam to Gila and Yuma users

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NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2014 through December 31, 2016

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
Arizona						
AZ0025224	900	APACHE-SITGREAVES NATIONAL FOREST BLACK MESA	375	0.0025	0.0039	M
AZ0025399	900	BISON RANCH			0.0000	M-1
AZ0024015	900	CANYON-VALLE AIRPORT WWTP			0.0000	M-2
AZ0025755	900	CITY OF WILLIAMS - WASTEWATER TREATMENT PLANT	278	0.16	0.1855	M
AZ0023639	900	FLAGSTAFF, CITY OF RIO DE FLAG POTW	210	1.25	1.0946	M-4B
AZ0020427	900	FLAGSTAFF, CITY OF WILDCAT HILL POTW	550	1.15	2.6375	M-A
AZ0024279	900	HIGH COUNTRY PINES			0.0000	M-1
AZ0025542	900	HOLBROOK, CITY OF PAINTED MESA POTW			0.0000	M-2
AZ0025437	900	PINETOP LAKESIDE SANITARY DISTRICT WWTP			0.0000	M-2
AZ0024422	900	SANDERS SCHOOL DISTRICT NO. 6 WWTP			0.0000	M-1
AZ0023841	900	SHOW LOW, CITY OF POTW	555	0.99	2.2912	M-A
AZ0026034	900	SNOWFLAKE, CITY OF POTW	413	0.26	0.4478	M-2
AZ0023477	900	SOUTH GRAND CANYON SANITARY DISTRICT WWTP	687	0.09	0.2578	M
AZ0026069	900	USBR/GLEN CANYON WWTP	1048	0.015	0.0656	M
AZ0025666	900	USBR/GLEN CANYON PPDS	566	0.85	2.0062	I
AZ0023612	900	USNPS/GRAND CANYON/ DESERT VIEW	1090	0.009	0.0409	M
AZ0023621	900	USNPS/GRAND CANYON/INDIAN GARDENS	166	1.25	0.8653	I
AZ0110426	900	USNPS/GRAND CANYON/NORTH RIM	599	0.15	0.3747	M
AZ0022152	900	USNPS/GRAND CANYON/SOUTH RIM WWTP	688	0.26	0.7459	M
AZ0023833	900	WINSLOW, CITY OF POTW	1003	0.2	0.8365	M-B
AZ0023655	905	VIRGIN RIVER DOMESTIC WASTEWATER IMP DISTRICT	840	0.015	0.0525	M
AZ0025160	910	USBR/HOOVER DAM	876	0.03	0.1096	M
AZ0000132	910	USFWS/WILLOW BEACH NATIONAL FISH HATCHERY	748	7.63	23.7992	I-5D
AZ0110248	920	USBR/DAVIS DAM			0.0000	I-2
AZ0023523	920	USNPS/KATHERINE'S LANDING WTP			0.0000	M-1
AZ0023990	930	CAWCD-HAVASU PUMPING PLANT	584	0.017	0.0414	I-B
AZ0026018	930	KINGMAN, CITY OF DOWNTOWN POTW	716	0.238	0.7106	M
AZ0022756	930	PETRO STOP CENTER/KINGMAN	720	0.0300	0.0901	M
AZ0022268	930	FREEPORT-McMoRan BAGDAD Inc.			0.0000	I-3
AZ0023752	940	QUARTZSITE, CITY OF POTW	1234	0.2	1.0292	M-A
Colorado						
CO0000051	100	Iles Dome Unit Production	1743.333	0.728	5.292	I-5
CO0000230	100	Henderson Mill				I-2
CO0000248	100	Climax Mine	1258.167	24.857	130.412	I-5B
CO0020451	100	Frisco Sanitation District WWTF	438.200	0.624	1.141	M-A
CO0020699	100	Granby Sanitation District		0.317		M-7
CO0020826	100	Blue River WWTF	398.618	1.228	2.042	M-A
CO0021369	100	Vail WWTF	388.455	1.369	2.218	M-A
CO0021385	100	Red Cliff WWTF	202.000	0.039	0.032	M-A
CO0021539	100	Farmers Korner WWTF	353.313	1.193	1.757	M-A
CO0021598	100	Copper Mtn Cons Metro District WWTF	342.333	0.284	0.405	M-A
CO0023086	100	Snowmass Water Sanitation Dist WWTF	264.515	0.738	0.814	M-A
CO0023876	100	Arapahoe Basin Ski Area	736.333	0.009	0.026	M-5/M-B
CO0024431	100	Avon WWTF				M-2
CO0026051	100	Winter Park Water and Sanitation District WWTF		0.160		M-7
CO0026069	100	Eisenhower Tunnel		0.363		I-4
CO0026387	100	Aspen Consolidated San Distrct WWTF	580.774	1.261	3.054	M-A
CO0029955	100	Summit County Snake River WWTF	328.152	0.595	0.815	M-A
CO0037311	100	Edwards WWTF	365.538	0.967	1.475	M-5

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NPDES PERMITS						
Colorado River Basin Salinity Control Forum						
January 1, 2014 through December 31, 2016						
NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG (MGD)	Salt Load Tons/Day	Explanantion Code
CO0037681	100	Willow Creek Lagoons	315.833	0.451	0.595	M-A
CO0038342	100	Mcclane Canyon Mine	868.000	0.076	0.274	I-B
CO0038598	100	Sunlight WWTF	380.875	0.005	0.007	I-B
CO0040142	100	Upper Fraser Valley Treatment Plant		0.762		M-7
CO0040487	100	Valleywide Sewerage System	823.000	0.076	0.260	M-5/M-B
CO0042447	100	Rifle Station	1893.667	0.027	0.215	I-B
CO0042480	100	Eagle Mine Remediation WWTF	3112.000	0.308	3.993	I-5B
CO0044750	100	Roaring Fork Water and San District WWTF	839.917	0.066	0.232	M-A
CO0045411	100	Crooked Creek Ranch	956.667	0.009	0.037	M-5/M-B
CO0045420	100	Iowa Hill Water Reclamation	396.771	0.397	0.657	M-A
CO0045501	100	Tabernash Meadows WSD WWTF		0.044		M-7
CO0045802	100	Oak Meadows WWTF	700.167	0.016	0.046	M-A
CO0046124	100	Spring Valley Sanitation Dist WWTF	829.750	0.031	0.107	M-A
CO0046175	100	Gilsonite Refinery Sand And Gravel Facility				I-2
CO0046370	100	Redstone Water Sanitation Dist WWTF	535.000	0.025	0.056	M-B
CO0046566	100	Devil's Thumb Ranch	456.400	0.013	0.024	M-A
CO0048119	100	Golden Wonder Mine	4014.750	0.000	0.004	I-B
CO0048135	100	Debeque WWTF	917.833	0.044	0.169	M-B
CO0048151	100	Rifle Regional WW Reclamation Facility	1171.619	0.790	3.859	M-4A
CO0048233	100	North Thompson Creek Mines				I-2
CO0048241	100	Eagle WWTF	624.800	0.512	1.335	M-A
CO0048437	100	Kremmling Sanitation District WWTF	238.518	0.119	0.119	M-A
CO0048577	100	Redstone Well 21-9 Geothermal Project	21200.000	0.489	43.219	I-5B
CO0048815	100	South Canyon Landfill				I-2
CO0048823	100	Avalanche Ranch	1354.068	0.122	0.691	I-B
CO0048830	100	Gypsum WWTF	331.417	0.420	0.580	M-A
CO0048847	100	Cameo Eagle Travel Center	438.182	0.004	0.007	I-B
CO0048852	100	Glenwood Springs Regional WWTF	727.500	0.915	2.777	M-5B
CO0048901	100	Eagle Valley Clean Energy LLC	12.300	0.115	0.006	M-A
CO0048952	100	Lib 4	241.875	0.174	0.175	I-B
CO0048958	100	Glenwood Hot Spgs Lodge and Pool	16300.000	3.057	207.793	I-5B
CO0048999	100	Steamboat Springs Health and Recreation Association	888.000	0.250	0.926	M-B
COG130001	100	Crystal River Fish Hatchery		5.831		I-5D
COG130007	100	Finger Rock Rearing Unit		2.565		I-5D
COG130011	100	Rifle Falls Fish Hatchery		5.485		I-5D
COG315285	100	NGL Release Bargath Parachute Facility	1245.000	0.004	0.023	I-B
COG500003	100	Latham-Burkett Pit				I-2
COG500062	100	Williams Fork Pit				I-2
COG500088	100	Eagle West Pit	1226.333	0.603	3.081	I-5
COG500119	100	Rifle Pit (Chambus Pit)	1339.250	6.527	36.453	I-5
COG500216	100	River Road Pit	3737.500	0.275	4.292	I-5
COG500299	100	Railhead Gravel Pit	7153.333	0.102	3.034	I-5
COG500342	100	Gypsum Ranch Pit				I-2
COG500356	100	Yule Marble Quarry				I-2
COG500380	100	Monument View Gravel Pit	5177.333	0.650	14.033	I-5
COG500433	100	Maryland Creek Ranch Pit	143.600	7.649	4.580	I-5
COG500437	100	15 Road Pit	2812.857	0.168	1.970	I-5
COG500467	100	Glens Pit	1240.333	0.235	1.218	I-5
COG500482	100	North Bank Pit	796.071	1.688	5.605	I-5
COG500497	100	15.5 Road Pit	560.000	4.650	10.859	I-5
COG501534	100	Steamboat Sand and Gravel Fisker Trail		1.613		I-4
COG501590	100	Hayden Pit		0.054		I-4
COG588006	100	Riverbend Subdivision	1588.727	0.007	0.048	M-B
COG588008	100	West Glenwood Springs Sanitation Dist WWTF	318.597	0.274	0.364	M-A

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NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG (MGD)	Salt Load Tons/Day	Explanantion Code
COG588029	100	El Rocko Mhp	461.792	0.004	0.007	M-A
COG588035	100	H Lazy F Mhp WWTF	816.583	0.021	0.070	M-A
COG588041	100	Ouray Ranch Homeowners Assn WWTF	216.167	0.008	0.007	M-A
COG588046	100	Silt WWTF	738.417	0.147	0.452	M-A
COG588049	100	Lazy Glen HOA WWTF	407.364	0.030	0.052	M-A
COG588050	100	Carbondale WWTF	322.833	0.520	0.700	M-A
COG588051	100	Ranch At Roaring Fork HOA WWTF	413.818	0.048	0.083	M-A
COG588061	100	Talbott Enterprises WWTF	1248.000	0.066	0.342	M-5/M-B
COG588062	100	New Castle WWTF	790.083	0.241	0.793	M-5/M-B
COG588063	100	Basalt Sanitation District WWTF	402.364	0.455	0.763	M-A
COG588067	100	Grizzly Creek Rest Area WWTF	763.775	0.002	0.005	M-A
COG588070	100	Two Rivers Village Metro Dist WWTF	416.909	0.022	0.039	M-A
COG588072	100	C Lazy U Ranch	325.917	0.008	0.010	M-A
COG588074	100	Blue Creek Ranch	786.727	0.011	0.038	M-5/M-B
COG588075	100	Bair Ranch Rest Area	1184.808	0.001	0.006	M-5/M-B
COG588076	100	Hanging Lake Rest Area WWTF	754.000	0.002	0.005	M-A
COG588079	100	East River Regional Sanitation Dist WWTF	281.042	0.050	0.058	M-A
COG588083	100	Rock Gardens MHP & Campground	362.917	0.004	0.006	M-A
COG588084	100	Hot Sulphur Springs WWTF	374.509	0.076	0.119	M-A
COG588085	100	Aspen Village	422.909	0.034	0.059	M-A
COG588103	100	Woody Creek Mobile Home Park	394.000	0.017	0.027	M-5/M-B
COG588105	100	Mid Valley Metro Dist WWTF	414.364	0.395	0.683	M-A
COG588116	100	Roundup River Ranch WWTF	1203.417	0.006	0.032	M-A
COG589067	100	Nucla WWTF	960.400	0.080	0.320	M-5/M-B
COG589086	100	Battlement Mesa Metro Dist WWTF	619.417	0.405	1.045	M-A
COG589094	100	Fruita WWTF				M-2
COG589110	100	Cottonwood Springs Mhp WWTF	811.636	0.035	0.118	M-A
COG603008	100	Founders Garage Eagle	525.818			I-4
COG603012	100	Ski and Bike Kare Project	334.000			I-4
COG603013	100	Winter Park Base Area	91.250			I-4
COG603031	100	Parking Garage Pitkin Co	505.556			I-4
COG603050	100	Little Nell Well City Well 4	158.686			I-4
COG603076	100	Mountain Plaza Parking Garage (Formerly Vail's Front Door)	280.000			I-4
COG603117	100	Frisco Sanitation District WWTP	214.250			I-4
COG603127	100	Ritz-Carlton Residences And Club At Vail	1.169			I-4
COG603151	100	Arrabelle Hotel	599.208			I-4
COG603155	100	Solaris	892.625			I-4
COG603170	100	Fraser Crossing Founders Pointe	91.250			I-4
COG603205	100	Passport Parking Garage	637.091			I-4
COG603217	100	Snowmass Base Village	384.929			I-4
COG603219	100	Springs Lodge	194.167			I-4
COG603220	100	Keystone Lodge And Argentine Condos	150.955			I-4
COG603222	100	Manor Vail Lodge	786.909			I-4
COG603223	100	Red Hawk Lodge	123.727			I-4
COG603295	100	Strata Vail Residences	982.200			I-4
COG603318	100	Copper Mountain Alluvial Well No 4	226.000			I-4
COG605009	100	Covered Bridge Building	270.500	0.036	0.041	I-B
COG605015	100	Main St Station Breckenridge		0.113		I-7
COG641006	100	Dillon Straight Creek WTP	132.000	0.421	0.232	I-B
COG641019	100	Hot Sulphur Springs WTP	146.158	0.005	0.003	I-B
COG641052	100	Red Mountain WTP				I-2
COG641066	100	Castle Creek WTP	266.138	0.045	0.050	I-B
COG641067	100	Wayne Bristol WTP	90.055	0.040	0.015	I-B
COG641072	100	Gateway Metro WTP	820.182	0.003	0.011	I-B

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COG641092	100	New Castle WTP	708.500	0.003	0.007	I-B
COG641095	100	Basalt Springs WTP	96.091	0.003	0.001	I-B
COG641105	100	Edwards WTP				I-2
COG641108	100	Beaver Creek WTP	187.817	0.148	0.116	I-B
COG641112	100	Silt WTP	540.909	0.002	0.003	I-B
COG641135	100	Red Sky Ranch WTP	515.667	0.012	0.025	I-B
COG641154	100	Hamilton Creek Metropolitan District		0.014		I-4
COG641181	100	Peak 9 Water Plant	57.000	0.058	0.014	I-B
COG840002	100	Greenback Schaeffer Ranch				I-2
CO0020443	190	Crested Butte WWTF		0.195		M-7
CO0022756	190	Pitch Reclamation Project	791.500	0.543	1.791	I-5B
CO0027171	190	Mt Crested Butte WSD WWTF	262.161	0.324	0.354	M-A
CO0035394	190	Mt Emmons Project	797.083	0.550	1.827	I-5
CO0045217	190	Irwin Mountain Lodge				M-2
CO0048900	190	Bear Ranch	403.556	0.001	0.001	M-B
COG130004	190	Pitkin State Fish Hatchery		4.405		I-5D
COG130006	190	Roaring Judy Fish Hatchery		5.099		I-5D
COG500010	190	Gunnison Pit	605.200	0.452	1.142	I-5
COG500420	190	Sea Horse No 2 Pit	224.286	1.329	1.243	I-5
COG500464	190	Anderson Pit	1405.000	1.702	9.972	I-5
COG500498	190	Tri County Pit	2191.000	0.830	7.583	I-5
COG501510	190	Scott Pit	990.667	1.393	5.756	I-5
COG588012	190	Almont WWTF	411.088	0.013	0.022	M-A
COG588045	190	Crested Butte South Metro Dist WWTF	316.004	0.072	0.095	M-A
COG588109	190	Ute Trail Ranch	489.425	0.002	0.005	M-A
COG588123	190	Camp Red Cloud	514.450	0.000	0.000	M-B
COG588132	190	Vickers Horse River Ranch	427.977	0.007	0.013	M-5/M-B
COG588138	190	Taylor River Canyon LLC	302.500	0.005	0.006	M-A
CO0040673	200	Lake City WWTF	321.181	0.068	0.091	M-A
CO0043133	200	Blue Mesa Recreation Ranch				I-2
COG588052	200	L and N Inc	710.600	0.003	0.009	M-A
COG589091	200	Elk Meadows	500.583	0.004	0.009	M-A
COG603287	200	Montrose Community Recreation Center and Park	2656.167			I-4
COG603285	210	Town of Hotchkiss Drain Seep Line	1679.500			I-4
CO0000132	220	Sanborn Crk & Elk Crk Mines				I-2
CO0020907	220	Olathe WWTF	1888.833	0.249	1.960	M-5B
CO0022969	220	Morrison Creek Metro WSD WWTF	432.575	0.065	0.118	M-A
CO0030449	220	West Montrose Sanitation Dist WWTF	575.583	0.288	0.691	M-A
CO0031984	220	Cedaredge WWTF	330.875	0.144	0.198	M-A
CO0037206	220	Ruby Trust Mine	191.900	0.021	0.017	I-B
CO0037729	220	Crawford WWTF	288.727	0.024	0.029	M-A
CO0038776	220	West Elk Mine		0.010		I-4
CO0039624	220	Montrose WWTF	967.735	2.231	9.003	M-5/M-B
CO0039641	220	Delta WWTF	1321.088	0.957	5.274	M-5
CO0041530	220	Gunnison WWTF	411.040	1.085	1.859	M-A
CO0042617	220	Horizon Health Care & Retirement Community	373.000	0.009	0.014	M-A
CO0043397	220	Ouray WWTF	710.900	0.248	0.735	M-5/M-B
CO0044776	220	Bowie No. 2 Mine	668.565	0.011	0.032	I-B
CO0044903	220	Hotchkiss WWTF	1005.411	0.142	0.594	M-5/M-B
CO0047431	220	Paonia WWTF	808.167	0.163	0.548	M-5/M-B
COG500127	220	No 500 Pit	1471.556	0.040	0.245	I-B
COG500210	220	Mule Farm Gravel Pit	840.000			I-4
COG500444	220	Delta Paving Pit				I-2
COG500458	220	Janet Pit	1176.000	1.640	8.042	I-5

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NPDES PERMITS						
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COG501532	220	Gunnison River Gravel Pit 5		0.290		I-4
COG501615	220	Western Gravel Inc				I-2
COG588032	220	Delta Correctional Center	480.727	0.031	0.063	M-A
COG588066	220	Riversbend Apartments	787.583	0.001	0.003	M-A
COG588112	220	Camp Gunnison Church Camp	312.673	0.003	0.004	M-A
COG600544	220	Ouray Hot Springs Pool	1644.385	0.328	2.246	I-5
COG641015	220	Cedaredge WTP	73.677	0.009	0.003	I-B
COG641081	220	Orchard City WTP	47.691	0.027	0.005	I-B
COG641104	220	Spaulding Peak Treatment Plant	104.600	0.052	0.023	I-B
COG641134	220	Paonia WTP aka Lower Plant		0.021		I-4
COG641170	220	Dos Rios WTF		0.003		I-4
CO0000012	300	Palisade WWTF	317.000	0.215	0.284	M-B
CO0023485	300	Grande Mesa Metro Dist 2 WWTF	320.000	0.017	0.022	M-A
CO0027146	300	Roadside North & South Mines	1245.000	0.396	2.056	I-5B
CO0033791	300	Clifton Sanitation District WWTF	602.222	1.105	2.775	M-A
CO0040053	300	Persigo WWTF	836.576	8.584	29.946	M-5
CO0047562	300	Whirlwind Project				I-2
CO0048143	300	Mesa Water And San Dist WWTF	795.000	0.008	0.027	M-B
CO0048854	300	Fruita Wastewater Reclamation Facility	519.194	0.873	1.890	M-A
COG500001	300	Bunn Ranch Pit	668.000	0.144	0.401	I-B
COG500114	300	Silt Pit				I-2
COG500161	300	South Fruita Pit Arcuby Pit	3351.667	0.753	10.524	I-5
COG500229	300	West Rifle Pit				I-2
COG500252	300	Loesch Pit				I-2
COG500308	300	Feuerborn Gravel Pit				I-2
COG500364	300	Soaring Eagle Gravel Pit	1932.727	0.293	2.363	I-5
COG500408	300	Mamm Creek Gravel Pit				I-2
COG500435	300	D Road Gravel Pit				I-2
COG501505	300	Una Pit	765.636	0.890	2.842	I-5
COG501525	300	Gehrman Pit	312.000	0.911	1.185	I-5
COG501542	300	Debeque Pit No 2	2930.000	0.755	9.219	I-5
COG501567	300	Otter Creek Pit	5547.273	0.492	11.381	I-5
COG501614	300	Breeze Basin Sand and Gravel Pit		0.864		I-4
COG501617	300	5 Mile Pit				I-2
COG588086	300	SW Mesa County Rural Public Improvement District WWTF	1142.000	0.022	0.107	M-A
COG589139	300	Canyon Creek Estates	829.333	0.010	0.035	M-B
COG603260	300	Bank of the West GJ	5761.444			I-4
COG603314	300	Xcel Energy Mesa Service Center Groundwater Management System	4300.000			I-4
COG641068	300	Battlement Mesa Metro Dist WTP				I-7
COG840020	300	Elk Springs 3 Water Disposal	4780.000	14.355	286.132	I-5
CO0000003	310	Revenue Mine	223.600	0.668	0.623	I-B
CO0000213	310	New Horizon Mine	2420.667	0.472	4.760	I-5B
CO0000540	310	Nucla Station	1658.917	0.163	1.126	I-5B
CO0024007	310	Naturita WWTF	608.666	0.027	0.069	M-A
CO0036251	310	Jd-7 And Jd-9 Mines				I-2
COG588047	310	Ridgway WWTF	466.182	0.085	0.165	M-A
CO0000221	500	Seneca Mine Complex	2279.655	0.166	1.582	I-5B
CO0020834	500	Steamboat Springs WWTF	345.966	2.482	3.581	M-A
CO0027154	500	Mines 1&2 And Eckman Park Mine	2830.345	0.167	1.970	I-5B
CO0030635	500	Yampa WWTF	438.258	0.032	0.059	M-A
CO0031062	500	Whiteman School	297.167	0.002	0.003	M-A
CO0032115	500	Trapper Mine		0.172		I-4
CO0034142	500	Williams Fork Mine	1604.167	0.008	0.052	I-B

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CO0035556	500	Steamboat Lake Water & Sanitation Dist WWTF	474.000	0.051	0.100	M-A
CO0036684	500	Fish Creek Tipple	3818.000	0.020	0.315	I-B
CO0040037	500	Craig WWTF	618.667	0.842	2.171	M-4B
CO0040959	500	Hayden WWTF	453.450	0.195	0.370	M-5/M-B
CO0041106	500	Oak Creek WWTF	501.636	0.194	0.405	M-5/M-B
CO0042161	500	Foidel Creek Mine	3132.333	0.048	0.626	I-B
CO0045161	500	Colowyo Mine	2090.308	0.049	0.423	I-B
CO0047449	500	Milner Community WWTF	661.636	0.015	0.041	M-A
CO0048275	500	Sage Creek Mine Complex	3821.885	0.201	3.205	I-5B
CO0048623	500	Barn Spring WTP	2040.000	0.018	0.149	I-B
COG500243	500	Hogue River Pit	371.000	0.595	0.921	I-B
COG500267	500	Sievers Ranch Pit	295.625	0.039	0.048	I-B
COG500312	500	Mesa Gravel Pit				I-2
COG500350	500	Tellier Pit	342.286	0.546	0.779	I-B
COG500396	500	Camilletti Milner Pit No2	291.400	1.145	1.391	I-5
COG500419	500	Deakins Pit	2011.800	1.000	8.389	I-5
COG501522	500	Lyster Pit	1146.889	0.093	0.447	I-B
COG501524	500	Wand Pit	687.000	1.000	2.865	I-5
COG589026	500	Routt County for Phippsburg Community WWTF	623.455	0.019	0.050	M-A
COG589040	500	Maybell WWTF	385.333	0.002	0.003	M-A
COG603045	500	Lake Catamount WWTF	245.333			I-4
COG850054	500	Foidel Creek Mine	908.000	0.003	0.012	I-B
CO0000010	510	Rangely WWTF	679.100	0.205	0.581	M-A
CO0038024	510	Deserado Mine	5439.111	0.119	2.710	I-5
CO0047139	510	Meeker Sanitation District WWTF	609.292	0.121	0.307	M-A
CO0048739	510	Bopco Lp Yellow Creek Water Management Facility				I-2
CO0048859	510	Corral Gulch WWTF				I-2
COG500484	510	White River City Pit	839.909	0.091	0.319	I-B
Nevada						
NV0000060	910	Titanium Metals Corporation	780.0	0.150	0.488	I
NV0020192	910	NDOW - Lake Mead Fish Hatchery			0.000	I - 5D
NV0021750	910	Las Vegas Hilton Hotel and Casino Parking Garage		0.003		I-7
NV0022195	910	Valley Hospital Medical Center	130.77	0.006	0.004	I-5E
NV0022691	910	Lake Las Vegas Resort (Dam)	0.0	0.000	0.000	I-1
NV0022772	910	Sterling/Squire/Crescendo HOA (formerly Saxton)	4704	0.621	12.190	I-5E
NV0022781	910	Shanghai Partners - Tomiyasu Residence	2400.0	0.010	0.100	I-5E
NV0022837	910	Conoco Phillips Company - Circle K Store No. 0695	2950.0	0.000	0.001	I-5E
NV0022870	910	7-Eleven Store # 19653	0.0	0.000	0.000	I-1
NV0022888	910	Las Vegas Sands-Venetian Casino Resort	1462.0	0.094	0.573	I-5E
NV0022942	910	Lloyd D. George Federal Courthouse	2240.0	0.025	0.234	I-5E
NV0022985	910	Planet Hollywood Resort Casino (formerly Aladdin Resort)	91.0	0.000	0.000	I-5E
NV0023035	910	Neonopolis Project	1130.0	0.013	0.061	I
NV0023043	910	Maryland Villas Apartment Complex	1598.0	0.056	0.373	I
NV0023060	910	Tronox LLC	3900.0	1.350	21.970	I
NV0023159	910	Clark County Regional Justice Center	1391.0	0.008	0.046	M
NV0023191	910	Caesar's Palace Hotel and Casino	2166.0	0.070	0.633	I
NV0023221	910	7-Eleven Store # 27607	0.0	0.000	0.000	I-1
NV0023256	910	The Stirling Club	2500.0	0.046	0.480	I
NV0023477	910	Sky Las Vegas Master Association	671.0	0.052	0.146	I
NV0023485	910	Las Vegas Academy	2600.0	0.002	0.026	M
NV0023507	910	NNSA/NSO North Las Vegas Facility	1460.0	0.003	0.017	M
NV0023515	910	The Cosmopolitan Resort & Casino	1800.0	0.049	0.368	I

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NV0023523	910	Terrible's Hotel and Casino	2500.0	0.000	0.002	I
NV0023558	910	Panorama Towers	2160.0	0.003	0.027	I
NV0023566	910	Fountainbleau Casino and Resort	2565.0	0.169	1.809	I-5E
NV0023604	910	Howard Hughes Office Complex	2370.0	0.011	0.109	I
NV0023621	910	Echelon Resort	2100.0	0.269	2.357	I-5E
NV0023647	910	City of North Las Vegas Water Reclamation Facility	1040.0	17.100	74.159	M-4A
NV0023663	910	Former Conoco Station No. 28003	1600.0	0.001	0.007	I
NV0023701	910	City Center Land	2600.0	0.052	0.564	I
NV0023744	910	Baymont Inn and Suites (formerly Holiday Inn Hotel)	254.03	0.0134	0.014	I-5A
NV0023761	910	McCarran International Airport	1254.0	0.0310	0.162	I
NV0023809	910	Terrible Herbst #225	1000.0	0.0073	0.030	I
NV0023841	910	Hudson Cleaners	2400.0	0.0325	0.325	I-5E
NV0023931	910	Mendenhall Center - UNLV	3022.0	0.0044	0.055	I-7
NV0024112	910	American Pacific Corp AGTS	2700.0	1.0700	12.050	I-7
NV0024202	910	Sunset Regional Park Splash Pad	588	0.0900	0.221	I-7
NV0024206	910	The Waterhole	5187.0	0.0130	0.340	I-7
NV0024210	910	Las Vegas Wash Channel Improvement Project	6120.0	0.0050	0.128	I-2
NV0022845	910	Harrah's Las Vegas Hotel & Casino	0.0	0.000	0.000	I-1
NV0023094	910	Former Union 76 Station No. 4616				I-1
NV0023183	910	City Center Place				M-1
NV0023230	910	Kinder Morgan Las Vegas Terminal				I-1
NV0023248	910	Riviera Hotel and Casino				I-1
NV0023396	910	7-Eleven Store # 20826				I-1
NV0023787	910	Tesoro Refining & Marketing Co LLC #05326				I-1
NV0023833	910	Southern Nevada Water Authority - 5 Upper Wash Weirs				I-1
NV0023876	910	SNWA - Three Kids (Demonstration Replacement) Weir	0.0	0.0000	0.000	I-1
NV0023914	910	SNWA - Historic Lateral Weir Expansion	3523.6	0.4689	6.890	I-1
NV0023949	910	Former Texaco Service Station	655.3	0.0012	0.003	I-1
NV0024082	910	Whitney Mesa Trails & Trailhead	0.0	0.0000	0.000	I-1
NV0024155	910	Pecos Express Sinclair				I-1
NV0024180	910	Maryland Parkway Lift Station Decommissioning				I-1
NV0024198	910	Tropicana East Shopping Center				I-1
NV0024200	910	Central Plant Membranes Phase 2				I-1
NV0024209	910	Section Seven Community Association				I-1
NV0024211	910	Cooper Street Bridge Improvements		0.0000		I-1
NV0020133	910	City of Las Vegas	1080.0	43.400	195.570	M-A
NV0021261	910	Clark County Water Reclamation District - AWT Plant	1070.0	87.350		M-A
NV0021563	920	Clark County Water Reclamation District - Laughlin Plant	1150.0	1.650	7.917	M-A
NV0022098	910	Kurt Segler Water Reclamation Facility - City of Henderson	1139.5	17.310	63.631	M-A
NV0022993	910	Golden Nugget Hotel and Casino	1130.0	0.000	0.000	I-1
NV0023311	910	7-Eleven Store # 25586	0.0	0.014	0.000	I-2
NV0023671	910	Former Cappy's Cleaners	5700.0	0.144	3.425	I
NV0023736	910	Bowman Reservoir & Muddy River Outfalls				M-1
NV0023817	910	Alfred Merritt Smith WTF	665.0	.15-2	5.546	M-A
NV0024074	910	7-Eleven Store # 29643		0.0157		I-1
NV0024121	910	City of North Las Vegas Utilities Water System O&M		0.0050	-	I-7
NV0024139	910	City of Henderson Water Systems and Facilities	335	0.1130	-	M-B
NV0021911	910	Las Vegas Valley MS4			0.00	I-7
NV0024214	910	Las Vegas Wash & Flamingo Wash	2000	1.4000	11.68	I-5A
NV0024222	910	Low Lake Level Pumping Station	665		0.00	M-B
NV0024104	910	LVVWD/SNWA Operations and Maintenance	665		0.00	M-A
NV0024201	910	STATEWIDE VAULT MAINTENANCE DEWATERING		0.00015		I-7
NV0024220	910	VILLAGE SHOP #4/SINCLAIR STATION	1016	0.0288	0.12	I-7

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NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2014 through December 31, 2016

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
New Mexico*						
NM0028762	801	Aztec, City of / WTP	407.5	0.1625	0.1614	I
NM0020168	801	Aztec, City of / WWTP	253	0.584	0.61	M
NM0029319	801	Central Consolidated School District	0	0	0	I-1
NM0020770	801	Bloomfield, City of / WWTP	315	0.85	1.11	M
NM0000043	801	Farmington, City of / Animas Steam Plant	0	0	0	I-1
NM0031135	801	Farmington Electric Utiltiy System (FEUS)	NA	NA	2000	I
NM0028258	801	Farmington Sand & Gravel Co.	0	0	0	I-1
NM0020583	801	Farmington WWTP	420.54	5.15	9.03	M-5A
NM0029025	801	Harper Valley Subd.	372.4	0.4	0.05	M-5A
NM0030953	801	Navajo Dam DWC & NSW, Inc	0	0	0	I-2
NM0027995	801	Oldcastle SW Group, Inc.	0	0	0	I-1
NM0028606	801	Public Service Co of NM - San Juan	0	0	0	I-1
NM0029505	801	San Juan Coal Company - La Plata	0	0	0	I-3
NM0028746	801	San Juan Coal Company - San Juan	0	0	4000	I
NM0029432	801	Yampa Mining Co. (De-na-zin Mine)	0	0	0	I-1
NM0029475	801	Yampa Mining Co. (Gatew.)	0	0	0	I-1
NM0031160	801	Bloomfield, City of- Primary Raw Water Source	0	0	0	I-2
NM0020672	900	Gallup WWTP	NA	2.25	9.97	M-4A
NM0020524	900	Quivira Mining Company - Church Rock	0	0	0	I-1
NM0023396	900	Ramah Water & Sanitation Dist.	580	0.03	0.045	M-5
***Permits in New Mexico are issued by the U.S. EPA and certified by the State of New Mexico Environmental Department.**						
Utah						
UT0025828	300	Capitol Wash Water	788.4	0.019	0.062	I-B
UT0025712	300	Energy Queen Mine	-	0	0	I-2
UT0025917	300	Harley Dome	207.5	0.19	0.16	I
UT0020419	300	Moab, City of	364	0.987	1.49	M
UT0023922	300	Rim Mine	-	0	0	I-2
UT0025810	300	Velvet Mine	-	0	0	I-2
UTG640027	411	Ashely Valley WTP	-	-	-	M-6
UTG640003	411	Ashley Springs WTP	-	-	-	M-6
UT0025348	411	Ashley Valley Water & Sewer, Mechanical	494.4	2.8	5.77	M-5B
UTG640014	411	Dutch John WTP	-	-	-	M-6
UT0000035	411	Golden State Operating	1235	1.09	5.61	I-5B
UT0024015	411	Intermountain Concrete	257.9	0.018	0.019	I-B
UTG640023	411	Manilla WTP	-	-	-	M-6
UT0020338	411	USBOR-Flaming Gorge Dam	856	0.0012	0.004	M
UTG130001	411	USFWS-Jones Hole Fish Hatchery	188	6.38	5.001	I-5D
UT0000124	411	Western Energy Operating-Pan American Lease	-	0	0	I-1
UTG040007	600	Andalex Wildcat Loadout	-	0	0	I-2
UTG790028	600	Bill Barrett Corp-Nine Mile Compressor Station	458.7	0.034	0.065	I
UTG040011	600	Canyon Fuel Co.- Banning Loadout	-	0	0	I-2
UT0025593	600	Canyon Fuel Co.- Dugout Mine	1091.7	0.64	2.91	I-A
UT0023540	600	Canyon Fuel Co.- Skyline Mine	553.9	3.56	8.22	I-A
UT0023680	600	Canyon Fuel Co.-Soldier Creek Coal	-	0	0	I-2
UTG040028	600	Carbon Resources-Kinney No. 2 Mine	-	0	0	I-2
UTG640012	600	E. Carbon City-Sunnyside CWTP	-	-	-	M-6
UTG640017	600	Green River WTP	-	-	-	M-6
UT0025771	600	Green River, City of	4841.3	0.95	19.17	M-B
UT0023094	600	Hiawatha Coal Co.	583.5	0.192	0.467	I-B
UTG040019	600	Horizon Coal	-	0	0	I-2
UTG040024	600	Lila Canyon Mine	3662	0.106	1.62	I-A
UTG040010	600	NEICO	-	0	0	I-1
UTG790014	600	Olsen-Durrant (Former Bulk Fuel Facility)	-	0	0	I-1
UT0000094	600	PacifiCorp-Carbon Plant	1980.8	1.87	15.44	I-5B
UTG640035	600	Price City WTP	-	-	-	M-6
UT0021814	600	Price River Water Imp. Dist.	1085	1.52	6.87	M-A
UTG640034	600	Price River WID	-	-	-	M-6

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NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2014 through December 31, 2016

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
UTG040005	600	Savage Industries Coal Terminal (CV-Spur)	-	0	0	I-2
UTG040025	600	Star Point Refuse Pile(Sunnyside Cogen)	-	0	0	I-1
UT0024759	600	Sunnyside Cogen.	-	0	0	I-2
UT0025640	600	West Ridge Resources Mine	1030.1	2.32	9.96	I-A
UT0020095	610	Duchesne City Corp.	-	0	0	M-2
UT0025801	610	Duchesne Valley WTP	352.8	0.147	0.216	M-B
UTG640008	610	Myton Community Water System	-	-	-	M-6
UT0023001	610	Neola Town Water & Sewer Assoc.	-	0	0	M-2
UTG640002	610	Tridell-Lapoint Water WTP	-	-	-	M-6
UTG130012	610	UDWR-Whiterocks Fish Hatchery	246.1	4.89	5.02	I-5D
UT0022918	700	Canyon Fuel Co.- SUFCo Mine	971.6	3.44	13.93	I-A
UT0025798	700	Capital Reef National Park	-	-	-	I-2
UTG040026	700	Consolodated Coal Co.-Hidden Valley Mine Site	-	0	0	I-1
UT0022616	700	Consolodated Coal Co.-Underground	2659.3	0.164	1.82	I-5B
UTG040006	700	Hiawatha Coal Co.-Bear Canyon Mine	1033.6	0.0576	0.248	I
UTG130003	700	UDWR-Egan/Bicknell Fish Hatchery	131.2	9.43	5.16	I-5D
UTG130007	700	UDWR-Loa Fish Hatchery	158.6	8.18	5.41	I-5D
UTG640004	700	USNPS-Glen Canyon Hite WTP	-	-	-	M-6
UT0023663	710	Castle Valley SSD-Castle Dale	591.3	0.25	0.616	M-B
UT0020052	710	Castle Valley SSD-Ferron	-	0	0	M-2
UT0021296	710	Castle Valley SSD-Huntington	3905	0.216	3.52	M-B
UTG640030	710	Emery WTP	-	-	-	M-6
UTG640039	710	Ferron WTP	-	-	-	M-6
UT0024368	710	Genwal Resources, Inc.-Crandall Canyon Mine	550.2	0.437	1.002	I-A
UTG640040	710	Huntington WTP	-	-	-	M-6
UT0025534	710	James Canyon Well System	-	0	0	I-2
UTG640031	710	Orangeville WTP	-	-	-	M-6
UT0023604	710	PacifiCorp-Deer Creek Mine	546.1	1.55	3.53	I-5B
UTG040009	710	PacifiCorp-Hunter Plant Coal Prep & Blend Facility	-	0	0	I-1
UT0025607	710	PacifiCorp-Huntington Plant	-	0	0	I-1
UT0023728	710	PacifiCorp-Trail Mountain Mine	-	0	0	I-2
UT0022896	710	PacifiCorp-Wilberg Mine	682.8	0.028	0.079	I
UTG640019	802	Blanding Culinary Water Treatment	-	-	-	M-6
UT0024503	802	Monticello	-	0	0	M-2
UTG640015	802	Monticello City (Culinary WTP)	-	-	-	M-6
UT0025992	900	Alton Coal Development	537	0.011	0.024	I
UT0025224	905	Springdale	958.8	0.419	1.67	M-A
UTG640021	905	St. George WTP	-	-	-	M-6
UT0024686	905	St. George, City of	1218.6	9.31	47.31	M-5B
Wyoming						
WY0000027	401	Green River-Rock Springs JPB Water Plant			0	M-2
WY0000086	401	Daniel Fish Hatchery	11		0	I-1
WY0000094	401	Boulder Rearing Station	0		0	I-5D
WY0020133	401	Big Piney Wastewater Lagoon	93.3	0.07	0.03	M-A
WY0020656	401	Pinedale Wastewater Lagoons	166	0.73	0.51	M-4B
WY0021806	401	Superior Waste Water Lagoon	225		0	M-B
WY0021997	401	Marbleton Wastewater Lagoon	231	0.3	0.3	M-A
WY0022080	401	LaBarge Wastewater Lagoon	578	0.024	0.06	M-B
WY0022128	401	B & R Mobile Home Village	400	0.05	0.08	M-B
WY0022357	401	Rock Springs WWTP	812	2.41	8.16	M-5B
WY0023124	401	Daniels Mobile Home Park			0	M-2
WY0023825	401	Stansbury Mine			0	I-2
WY0028886	401	Leucite Hills Mine			0	I-2
WY0030261	401	Black Butte Mine		0	0	I-2
WY0030350	401	Jim Bridger Mine	1558		1	I-B
WY0054224	401	Jensen Disposal Facility - New Fork Discharge	128	0.17	0.09	I
WY0054232	401	Jensen Disposal Facility - Sand Draw Discharge			0	I-2
WY0020443	411	Green River Wastewater Lagoon	355	1.05	1.61	M-A
WY0056499	411	Pioneer Cryogenic Gas Plant	2000	0.025	0.22	I
WY0022896	411	Mountain View Wastewater Lagoon	393	0.2	0.33	M-B
WY0000051	411	Kemmerer Mine			0.26	I-B

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NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2014 through December 31, 2016

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG (MGD)	Salt Load Tons/Day	Explanantion Code
WY0000116	411	Kemmerer Water Treatment Plant	500	0.31	0.98	M-4B
WY0020117	411	Lyman Wastewater Lagoon	508	0.3	0.66	M-B
WY0020311	411	Naughton Plant	1300	2.32	19	I-5B
WY0020320	411	Kemmerer Wastewater Treatment	735	0.31	0.95	M-5B
WY0022071	411	Fort Bridger Sewer District	562	0.2	0.47	M-B
WY0022373	411	Granger Wastewater Lagoon			0	M-2
WY0032697	411	Carter Creek Gas Plant			0	I-2
WY0036153	411	Ft. Bridger Travel Stop		0	0	M-2
WY0094811	411	Haystack Coal				I-2
WY0021938	500	Dixon Wastewater Lagoon	269	0.05	0.04	M-A
WY0022888	500	Baggs Wastewater Lagoons	733	0.06	0.19	M-B
WY0042145	500	Cow Creek Unit	2130	0.05	0.44	I
WY0054038	500	Cow Creek CBNG Project			0	I-2
WY0056847	500	Morgan Run Unit II			0	I-2

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APPENDIX D

EPA NPDES Permits List

LEGEND

NPDES PERMITS
EXPLANATION CODES

COLORADO RIVER BASIN SALINITY CONTROL FORUM
January 1, 2014 through December 31, 2016

NPDES permits are reviewed under two different criteria under Forum policy; these being municipal and industrial. In order for a permittee to be in compliance under the municipal criteria, the increase in concentration between inflow and outflow cannot be greater than 400 mg/L. Forum industrial criteria requires that no industrial user discharges more than 1.00 ton/day. Under Forum policy there can be granted exceptions to these limitations by the states. The following gives an explanation of the current status of the NPDES permits. Because at any given time many of the permits identified in this list are being reviewed, reissued, and/or terminated, and new discharge permits are being filed, this list must be considered as being subject to frequent change.

MUNICIPAL

(M) Municipal user in compliance with Forum policy.

(M-A) Municipal user in compliance with the 400 mg/L incremental increase provision.

(M-B) Municipal user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(M-1)* Permit has expired or been revoked. No discharge.

(M-2) Permittee did not discharge during the reporting period.

(M-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both inflow and outflow when the permit is reissued.

Measurements of inflow are not consistent with Forum policy;

(M-4A) Therefore, it is not known whether or not this municipal user is in compliance.

(M-4B) However, since outflow concentration is less than 500 mg/L it is presumed that this permit is not in violation of the ≤400 mg/L increase.

(M-5) Permittee is in violation of Forum policy in that there is an increase in concentration of >400 mg/L over the source waters. No provision has been made allowing this violation of Forum policy.

(M-5A) The state and/or EPA is currently working to bring permittee into compliance.

(M-5B) Though discharge is >400 mg/L over source waters, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(M-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(M-7) Insufficient data to know the current status of this permit.

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* Permits that have been expired or revoked and listed with the M-1 and I-1 explanation codes shall be removed from the NPDES list during the subsequent triennial review.

INDUSTRIAL

(I) Industrial user in compliance with Forum policy.

(I-A) Industrial user in compliance with the Forum's salinity offset policy.

(I-B) Industrial user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(I-1)* Permit has expired or been revoked. No discharge.

(I-2) Permittee did not discharge during the reporting period.

(I-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both volume and concentration of outflow when the permit is reissued.

(I-4) Either concentration or volume of outflow are not currently being reported, thus the permittee is in violation of Forum policy. It is not known if the discharge is in excess of the <1.00 ton/day requirement.

(I-5) Permittee is in violation of Forum policy in that discharge of salts is >1.00 ton/day. No provision has been made allowing this violation of Forum policy.

(I-5A) The state and/or EPA is currently working to bring permittee into compliance.

(I-5B) Though discharge is >1.00 ton/day, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(I-5C) The use of ground water under this permit is for geothermal energy and only heat is extracted. The intercepted salt and water are naturally tributary to the Colorado River System and hence, this discharge does not increase salt in the river. The permit is covered by the Forum's policy on intercepted ground waters.

(I-5D) This permit is in compliance with the Forum's policy for fish hatcheries. The use of the water is a one-time pass through, and the incremental increase in salinity is ≤ 100 mg/l.

(I-5E) This permit is for the interception and passage of ground waters and thus is excepted under the Forum's policy on intercepted ground waters.

(I-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(I-7) Insufficient data to know the current status of this permit.

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LEGEND (continued)

NPDES PERMITS

REACH DEMARCATIONS

COLORADO RIVER BASIN SALINITY CONTROL FORUM

In order to provide a better understanding of the location of the various NPDES permits and the geographical sequence in the Colorado River System, each of the following NPDES permits is identified with a Colorado River reach number. The reach numbers have their origin in the old CRSS river model. Though this model is no longer used, the reach numbers assist in understanding the general location of the permits. The reaches are defined as:

100	Upper Main Stem	from headwaters of Colorado River to Colorado River near Cameo
190	Taylor Park	from headwaters of Gunnison River to above Blue Mesa Reservoir
200	Blue Mesa	from above Blue Mesa Reservoir to below Blue Mesa Dam
210	Morrow Point	from below Blue Mesa Dam to Crystal Reservoir
220	Lower Gunnison	from Crystal Reservoir to confluence with Colorado River
300	Grand Valley	from Colorado River near Cameo to confluence with Green River
310	Dolores River	from headwaters of Dolores River to confluence with Colorado River
401	Fontenelle	from headwaters of Green River to Green River near Green River, WY
411	Flaming Gorge	from Green River near Green River, WY to confluence with White and Duchesne Rivers
500	Yampa River	from headwaters of Yampa River to confluence with Green River
510	White River	from headwaters of White River to confluence with Green River
600	Green River	Green River from confluence with White and Duchesne Rivers to confluence with Colorado River
610	Duchesne River	from headwaters of Duchesne River to confluence with Green River
700	Lake Powell	Colorado River from confluence of with Green River to Lees Ferry
710	San Rafael River	from headwaters of San Rafael River to confluence with Green River
801	Upper San Juan River	from headwaters of San Juan River to San Juan near Bluff
802	Lower San Juan River	from San Juan near Bluff to confluence with Lake Powell
900	Glen Canyon to Lake Mead	Colorado River from Lees Ferry to backwaters of Lake Mead
905	Virgin River	from headwaters of Virgin River to backwaters of Lake Mead
910	Lake Mead	from backwaters of Lake Mead to Colorado River below Hoover Dam
920	Lake Mohave	Colorado River from below Hoover Dam down to I-40 bridge
930	Lake Havasu	Colorado River from I-40 bridge to below Parker Dam
940	Parker Dam to Imperial Dam	Colorado River from below Parker Dam to above Imperial Dam
945	Imperial Dam	Colorado River from above Imperial Dam to Gila and Yuma users

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EPA ADMINISTERED NPDES PERMITS
Colorado River Basin Salinity Control Forum
January 1, 2014 through December 31, 2016

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code

* Permit issued to a federal agency or an Indian tribe and the responsibility of EPA
** Issued by a tribal entity with delegation of the NPDES program

Region 6 Permits
Permits in New Mexico are issued by the U.S. EPA and certified by the
State of New Mexico Environment Department as reported in Appendix B.

Region 8 Permits

CO0034975*	190	USNPS - Colorado National Monument				M-6
CO0000086*	220	HOTCHKISS NTL. FISH HATCHERY	19	4.31	0.341	I-5D
CO0022853*	801	SOUTHERN UTE INDIAN TRIBE(E)	323	0.321	0.432	M
CO0034398*	801	USDINPS-MESA VERDE NAT PARK (E)	326	0.034	0.046	M
CO0034622*	801	USDINPS-MESA VERDE NAT PARK (E)		0.044		M-3
CO0034665*	801	FOUR CORNER MATERIALS	154	1.251	0.803	I
CO0034959*	801	IGNACIO PEAK WASTEWATER LAGOON				M-6
CO0034967*	801	SOUTHERN UTE WATER TRTMNT PLNT				M-2
COG589201*	801	TOWAOC WASTEWATER LAGOON				M-6
COG589202*	801	WHITE MESA WASTEWATER LAGOONS				M-6
COG589203*	801	TOWAOC WASTEWATER LAGOON 2				M-6
UT0000167*	510	American Gilsonite Co.	2,714	0.385	4.357	I-7
UT0025259*	510	American Gilsonite Co.			19.080	I-2

Region 9 Permits

AZ0022560*	900	BIA/KEAMS CANYON		0.03		M-1
AZ0024619*	900	HOPI INDIAN NATION/ UPPER VILLAGE OF MOENKOPI WWTP				M
AZ0021415*	940	COLORADO RIVER JOINT VENTURE	<400	1.2		M
NN0110094**	801	BIA/TEEC NOS POS TI'IS NAS BAZ SCHOOL	<400	0.08		M-1
NN0000019	801	APS Four Corners Power Plant		4.2		I-7
NN0028193	801	NTEC Navajo Mine				I-7
NN0020869	801	BIA Crystal Boarding School		0.015		M-6
NN0021016	801	BIA Lake Valley Boarding School		0.012		M-6
NN0020800	801	BIA Nenahnezad Community School		0.024		M-6
NN0020991	801	BIA Pueblo Pintado		0.016		M-6
NN0028584	801	Consolidation Coal Co Burnham Mine				I-7
NN0020621	801	NTUA Shiprock		1		M-6
NN0020265**	802	NTUA/CHINLE	<400	0.783		M
NN0020281**	802	NTUA/KAYENTA	<400	0.9		M
NN0110043**	802	BIA/NAZLINI BOARDING SCHOOL	<400	0.013		M
NN0020133	803	NACOGDOCHES OIL & GAS	<400	0.01		I-1
NN0020290**	900	NTUA/TUBA CITY	<400	1.1		M-6
NN0021555**	900	NTUA/WINDOW ROCK-FT.DEFIANCE	<400	1.32		M-6
NN0021610**	900	CAMERON TRADING POST		0.054		M-6
NN0022179**	900	PEABODY WESTERN COAL COMPANY/BLACK MESA COMPLEX				I
NN0022195**	900	NTUA/GANADO	<400	0.4		M
NN0024228**	900	NTUA/PINON WWTP				M
NN0030337**	900	BIA/LOW MOUNTAIN BOARDING SCHOOL	<400	0.014		M
NN0110167**	900	BIA/HUNTERS POINT SCHOOL	<400	0.014		M
NN0110183**	900	BIA/SEBA DALKAI BOARDING SCHOOL	<400	0.01		M
NN0020958	900	BIA Wingate School		0.1		M-6
NN0029386	900	Chevron Mining, Inc. / McKinley Mine				I-7
NN0030335	900	NTUA Navajo Townsite		0.32		M-6
NN0030325	900	Ramah Navajo School Board - Pine Hill		0.035		M-6
NN0025178	900	RJG Inc. - Gouldings Lodge		0.072		M-6
NN0030342	900	NTUA Cane Valley		0.001		M-1
NN0030339**		BIA/LUKACHUKAI COMMUNITY SCHOOL				M-6
NN0030341**		BIA/TORREON DAY SCHOOL				M-6
NN0030343		NTUA Northern Edge Casino		0.03		M
NN0030344		NTUA Twin Arrows Casino		0.13		M
NN0030345		Navajo Engineering & Construction Authority (NECA)				M
NN0030346		Mariano Lake Waterline Project				M

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APPENDIX E

Colorado River Simulation System Model Description

COLORADO RIVER SIMULATION SYSTEM
MODEL DESCRIPTION

The Colorado River Simulation System (CRSS) is the official long-term basin-wide planning model used by Reclamation's Upper Colorado and Lower Colorado Regions to simulate future Colorado River system conditions. The model framework used for this process is commercial software called RiverWare™, a generalized river basin modeling software package developed by the University of Colorado through a cooperative arrangement with Reclamation, the Tennessee Valley Authority and the U.S. Army Corps of Engineers.

CRSS was originally developed by Reclamation in the early 1970s and was implemented in RiverWare™ in 1996. The model projects future river and reservoir conditions on a monthly timestep over a period of decades into the future. CRSS has been used for most major modeling studies on the Colorado River, including several National Environmental Policy Act Environmental Impact Statements (EIS), the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead EIS. CRSS was also the primary modeling tool for system projections in Reclamation's Colorado River Basin Water Supply and Demand Study under WaterSMART.

There are numerous inputs to, and assumptions made by, CRSS with respect to future conditions on the Colorado River. The input data for CRSS includes hydrologic inflows, various physical process parameters such as the evaporation rates for each reservoir, initial reservoir conditions, and the future diversion and depletion schedules for entities in the Basin States and for Mexico. These future schedules are based on demand and depletion projections prepared and submitted by the Basin States. The rules of operation of the Colorado River mainstream reservoirs, including Lakes Powell and Mead, are also provided as input to the model. These sets of operating rules describe how water is released and delivered under various hydrologic and system conditions.

As the period of analysis increases, the uncertainty in these inputs and assumptions also increases. Therefore, a large amount of uncertainty in the corresponding outputs is expected. Consequently, CRSS is not used to predict future conditions, but rather to simulate what might occur. CRSS is especially useful in making a relative comparison between hydrologic and salinity concentration impacts from different alternatives by holding constant most inputs, as well as other key modeling assumptions, so as to isolate the differences due to each alternative. Additionally, sensitivity analyses that answer the question, "What is the sensitivity of the output to a particular set of inputs or assumptions?" are commonly performed.

Future conditions of the Colorado River system are most sensitive to assumptions with respect to future inflows. Because it is impossible to predict the actual future inflows into the system, a range of possible future inflows are analyzed and used to quantify the probability of occurrences of particular events (e.g., higher or lower lake elevations). This technique involves running multiple hydrologic sequences for each scenario or operational alternative. These sequences can be derived from a number of techniques. Reclamation has used techniques based on (1) the historical observed natural flow record (1906-2012), (2) the paleo record derived from tree-rings

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(762-2005), and (3) 112 downscaled Global Climate Model (GCM) projections based on 16 unique GCMs.

The CRSS RiverWare™ model includes a salinity module to analyze salinity concentrations throughout the Colorado River Basin. The salinity model simulates the effects of water development projects and the salinity control program (SCP) on future salinity concentration levels in the Colorado River. The salinity control criteria are purposely designed to be long-term and non-degradational goals, rather than exceedance standards such as those used for industry or drinking water. Efforts of the SCP are designed to meet the criteria by implementing, as needed, the most cost effective salinity control projects. This ensures that the salinity control numeric criteria will continue to be met in the future, even with the salinity impacts produced by increasing Upper Basin depletions.

Salinity module inputs include salinity accompanying hydrologic inflows, initial reservoir salinity concentrations, estimates of salt loading due to agricultural return flows and salt removed by salinity control projects. Model results simulate annual average salinity concentrations at the numeric criteria stations downstream of Hoover Dam and Parker Dam and at Imperial Dam and can be used to analyze the probability of exceeding the numeric criteria in future years.

The salinity module within CRSS is intended for long-term (15 to 20 years) simulation and it is highly sensitive to initial conditions during the first 10 to 12 years. The model assumes salinity is a conservative water quality parameter, and reservoirs are modeled as fully mixed systems.

Modeling Assumptions for the 2017 Triennial Review

The following lists major modeling assumptions in a bulleted format for the 2017 Triennial Review. These assumptions reflect the January 2017 Configuration of CRSS. Documents referenced in these assumptions include the Final Environmental Impact Statement (Final EIS), Record of Decision (ROD) for Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead and the Prairie and Rajagopalan (2007) article entitled "A basin wide stochastic salinity model." Refer to these documents for additional detail regarding specific assumptions. All runs were performed using the CRSS long-term planning model.

Key Assumptions Common to All Scenarios Updated Since the 2014 Triennial Review

- Simulations performed from January 2017 through December 2035 at a monthly time step
- Initial conditions for all reservoirs are 2016 end-of-calendar year (EOCY) actual values
    - Includes pool elevation and reservoir salt concentration
- For modeling purposes, certain provisions (i.e., Shortage, Surplus, and Coordinated Operations) of the Interim Guidelines as adopted in the ROD (Section XI.G.) were extended from 2026 through 2035.
- Future water demands for Upper Division water users are based on depletion projections prepared by the Upper Division states in coordination with the Upper Colorado River Commission (UCRC) dated December 2007.

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- Future water demands for the Lower Division States (during Normal Conditions) are according to the schedules provided for the 2007 FEIS for the Colorado River Interim Guidelines modeling with updates to Nevada's demands in December 2016.
- Intentionally Created Surplus (ICS)
    - ICS creation and delivery schedules were updated in 2009, 2012, and 2016 by the Lower Division states. Initial ICS balances were updated January 2017
    - Rules for ICS activity remain unchanged from the ROD
- Water Quality Improvement Projects (WQIP) have been updated to reflect historical and projected control levels.

Description of Four 2017 Triennial Review Scenarios

1.	**Without Additional Controls 2017: 1.33M Tons** • No additional future control beyond 2017 • 1,330,000 tons of control in 2035
2.	**Plan of Implementation 2020: 1.39M Tons** • No additional controls after this review period beyond 2020 • 1,394,000 tons of control in 2035
3.	**Plan of Implementation 2035: 1.66M Tons** • Controls associated with recent Program funding levels • 1,662,000 tons of control in 2035
4.	**Plan of Implementation 2035: 1.79M Tons** • Controls associated with preferred Program control levels • 1,786,000 tons of control in 2035

Other Assumptions Common to All Scenarios

1. Future hydrologic inflows are generated at 29 separate inflow points or nodes in the Colorado River watershed using the Indexed Sequential Method (Final Interim Guidelines EIS, Chapter 4.2.5). This technique is applied to the 107-year (1906 through 2012) historical record of calculated natural flows to produce 107 hydrologic inflow sequences or traces for each scenario.

2. Future salinity concentrations are generated at 20 nodes in the Colorado River watershed using Reclamation's nonparametric natural salt model. The natural salt model includes annual (Upper Basin) and monthly (Lower Basin) regressions built with 1971-2012 natural flow and salt mass data. The natural salt model provides salt mass based on flows. Salt concentrations are computed from flow and salt mass. Prairie and Rajagopalan (2007) describes the methods used in the basin-wide salinity modeling framework.

3. Annual salt loading values from agriculture are assumed constant throughout the simulation horizon. Variations in salt mass resulting from variation in flow conditions (high and low) are not considered; therefore, when computing natural salt we expect negative natural salt values.

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4. Reservoirs upstream of Lake Powell are generally operated to meet monthly storage targets or downstream demands (Final EIS, Appendix A).

5. Lake Mead flood control procedures are always in effect.

6. Except during flood control conditions, Lake Mead is operated to meet downstream demands under the applicable water supply condition (Normal, Surplus, or Shortage).

7. If Lake Mead elevation falls below 1,000 feet, delivery to the Southern Nevada Water Authority (SNWA) is reduced to zero for that month.

8. Lake Mohave and Lake Havasu are operated in accordance with their existing rule curves.

9. Future water demands for Lower Division water users are based on depletion schedules prepared by the Lower Division states for the Final EIS (Final EIS, Appendix D).

10. Future water deliveries to Mexico are made as follows:
    a. CRSS accounts for the entire delivery to Mexico at the Northerly International Boundary (NIB).
    b. Mexico's annual delivery schedule is set to 1,500 kaf.
    c. An additional 70 kaf is delivered at the NIB for a total annual delivery to Mexico of 1,570 kaf.
    d. Mexico's annual delivery schedule is set to 1,700 kaf during Flood Control.

11. Non-storable flows arriving at NIB are assumed to be 70 kaf (1964 through 2015 average excluding flood years) for all years except the first year of the model simulation. In the first model year, the non-storable flows arriving at NIB are assumed to be 30 kaf. Bypass of return flows from the Wellton-Mohawk Irrigation and Drainage District to the Cienega de Santa Clara in Mexico is assumed to be 113 kaf annually (historical average from 1990 through 2016) and is not counted as part of the 1944 Treaty delivery to Mexico.

12. Yuma Desalting Plant is assumed to not operate.

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APPENDIX F

Salinity Economic Impact Model Executive Summary

SALINITY ECONOMIC IMPACT MODEL
EXECUTIVE SUMMARY

The Salinity Economic Impact Model (SEIM) estimates the annual quantified damages (economic impacts) incurred in metropolitan and agricultural areas in the Lower Colorado River Basin (LCRB) that depend, either wholly or in part, on Colorado River water.

The SEIM is the current version of a salinity model that was originally developed in the late 1980s by the Milliken Chapman Research Group, Inc. (Lohman, 1988) to quantify the economic impacts of salinity from projects improving water efficiency in the Lower Colorado River Basin. Strategies to improve agricultural water efficiency included concrete-lining canals and retrofitting flood irrigation systems with drip or sprinkler irrigation systems. Prior to the use of salinity models such as the SEIM, the impacts of the salinity reduction on the economies of Lower Colorado River water users were unknown.

The model development in the 1980s was funded by the Bureau of Reclamation to quantify the efforts of the Colorado River Basin Salinity Control Advisory Council (Advisory Council). The Advisory Council's function is to:

> *"...advise the Secretaries of the Departments of the Interior and Agriculture...on all matters relating to efficient and timely planning and execution of salinity control measures...specified in the Colorado River Basin Salinity Control Act."*

The original salinity model estimated the economic impact due to salinity by considering five economic sectors that may be impacted by high-salinity Colorado River water. Over time, the original salinity model was updated and modified as new data became available. Brummer and Yahnke (1999) provided improved agricultural economic impact procedures for all areas except the Metropolitan Water District (MWD) service area. The MWD service area improvements are documented in MWD and Bureau of Reclamation (1999) and included updated procedures and data across all economic sectors.

A second salinity model was developed in the early 2000s based on this revised salinity model to improve the representation of the Central Arizona portion of the original model and support salinity economic impact analysis for the Central Arizona Salinity Study (Bureau of Reclamation, 2003). From 2003 until 2016, these two salinity models were run in tandem whenever an economic impact analysis was needed. In 2016, these two models were combined into a single Excel workbook model or the SEIM.

The SEIM was reviewed by representatives from Arizona, California and Nevada to provide recommendations on redefining model regions and updating data for use in the 2017 triennial review. Another objective of the SEIM review was to improve usability, efficiency and transparency of the SEIM.

Where possible, published data has been used in the SEIM. In some cases, current published data are not available, so historical data has been indexed to 2014 dollars using either the *Consumer Price Index* (Bureau of Labor Statistics, 2017) or the *Producer Price Index* (Bureau of Labor Statistics, 2017).

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The SEIM estimates economic impact attributed to salinity levels greater than a baseline value of 500 mg/L[1] total dissolved solids (TDS) on household water-using appliances, the treatment and infrastructure replacement costs in the commercial, industrial and water utilities sectors, and income losses to agriculture. It also estimates the additional costs related to meeting California water quality standards for groundwater and recycled and publicly-owned treatment work (POTW) water use in the MWD service area. The model does not calculate an absolute value of the economic impacts due to salinity. The model estimates salinity impacts from the baseline condition and then calculates the change in economic impacts when salinity rises or declines in the Colorado River water used in the LCRB.

The SEIM accepts salinity concentrations, either measured from actual sampling or projected from the Colorado River Simulation System (CRSS), from three diversion points along the mainstem Lower Colorado River. Quantified damages due to salinity concentration are estimated for seven economic sectors across five regions. Table 1 summarizes the diversion points, economic sectors and regions that are included in SEIM.

Table 1
Names of Locations, Damage Sectors, and Regions Included in SEIM

Diversion Points	Economic Sectors	Regions
Hoover Dam	Agriculture	Central Arizona
Parker Dam	Residential	Mainstem Arizona
Imperial Dam	Commercial	Mainstem Nevada
	Utility	Mainstem California, Non-MWD
	Industrial	MWD Service Area
	Groundwater[2]	
	Recycling & POTW[2]	

Table 2 lists the subdivision of the regions as subareas. It should be noted that some subarea names are county names and the subarea may not include the entire county, only the portion that received Lower Colorado River mainstem waters.

Table 2
Subareas within Each Region in SEIM

Region	Subarea
Central Arizona	Phoenix AMA[3], Pinal AMA, Tucson AMA
Mainstem Arizona	Mohave County, La Paz County, Yuma County
Mainstem Nevada	Clark County
Mainstem California Non-MWD	Imperial County, San Bernardino County, Riverside County
MWD	Northwest, Los Angeles, West Basin, Central Basin, San Gabriel, Chino Basin, Orange County, Western Riverside, San Diego, Eastern Riverside

[1] U.S. EPA's secondary drinking water quality standard
[2] Only applies to MWD Service Area
[3] These are active management areas (AMA) in Central Arizona in which groundwater use is strictly regulated by the Arizona Department of Water Resources. Nearly 80% of Arizona's population resides in these 3 AMAs.

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The SEIM estimates the annual quantitative damages by diversion point, economic sector for each region and subarea listed above. Table 3 presents the impacted items that are included in each economic sector's categories.

Table 3
Economic Sector Impact Category Items Included in the SEIM

Economic Sector	Impact Category Items
Residential	Water Pipes, Water Heater, Faucet, Garbage Disposal, Clothes Washer, Dishwasher, Water Softener, Detergent
Commercial	Sanitary, Cooling, Irrigation, Kitchen, Laundry, Misc.
Industrial	Process Water, Cooling Tower, Boiler, Sanitation, Irrigation
Water Utilities	Treatment Plant, Distribution System
Groundwater	Direct Recharge, Indirect Recharge, Incidental Recharge
Recycled Water & POTW	Irrigation, Direct Groundwater Recharge, Indirect Groundwater Recharge
Agriculture	**MWD Subareas Crops:** Strawberry, Nursery, Cut Flowers, Misc. Vegetable, Citrus, Avocado, Vineyard, Pasture/grain, Deciduous, Field Crops **All Other Subareas Crops:** Head Lettuce, Leaf Lettuce, Romaine Lettuce, Broccoli, Cauliflower, Alfalfa Hay, Onions, Avocados, Cantaloupe, Carrots, Oranges, Tangerines, Lemon/Limes, Grapefruit, Table Grapes, Potatoes, Corn, Wheat, Cotton, Barley, Olives, Honeydews, Tomatoes, Leaching Management Costs

The SEIM estimates damages (economic impact) on household, industrial, commercial, water utilities, agriculture sectors, groundwater, recycled and POTW. A general description of how each sector is calculated in the SEIM model is provided below.

Household Damage Calculation
The SEIM model estimates damages for 10 household items that have reduced useful life due to salinity. Each area in the model was updated with the best available data for the number of units per household and average cost per unit. Useful life functions based on given salinity values were developed from previous salinity research and can be found in the Milliken-Chapman study (1988). The SEIM model estimates the annual cost per household for each area based on the reduced useful life from increased salinity during the year of interest.

Commercial Damage Calculation
Commercial damages are calculated using one of two methods, which is determined by the data available for commercial water users. Method 1: Areas where commercial water use data resolution aligned with the five SEIM commercial categories are calculated as the product of the annual water use and the salinity cost function for each commercial category. The salinity cost functions were developed by MWD specifically for the SEIM. Method 2: Areas without the commercial water use data resolution required to use the salinity cost functions use an alternative approach based on the relationship between commercial and household water use. The relationship is the average ratio of annual commercial water use to annual residential water use. The commercial costs for these areas are calculated as the product of the commercial water use ratio and the cost of residential damages.

Industrial Damage Calculation
Salinity damages are estimated in the SEIM for five major types of industrial water use. Damage functions developed for these categories are applied to the amount of industrial water use by

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category for each area in the model. Industries with processes requiring better quality water have larger costs associated with increasing salinity.

Water Utilities Damage Calculation

The SEIM estimates the damages to water utilities using two methods, depending on if per capita or total capital investment replacement costs are available. Method 1: In subareas with per capita costs of capital improvement replacement of water production and distribution facilities due to salinity, the damages are estimated using useful life functions of water production and distribution facilities that were developed by MWD. The per capita costs for water production and distribution costs are divided by the average life of the facilities based on the given salinity level and then multiplied by the metropolitan population for the year of interest. Method 2: In subareas with total capital improvement costs, the damages are estimated using only the useful life functions of distribution facilities that were developed by MWD. The total distribution costs are divided by the average life of the facilities based on the given salinity level. Under method two, water utility distribution replacement costs are not available.

Agriculture Damage Calculation

Agriculture damages are estimated in the SEIM through changes in gross revenue due to reduced crop yields of salt sensitive crops. Crop yield functions for the most common types of agriculture were developed or used from available research. The number of acres and current crop price per acre were updated with best available data in the current SEIM model. The gross crop revenue is estimated based on the crop yield per acre at a given salinity level and the price per acre for that crop. The revenue of the projected salinity is compared to the baseline TDS based revenue to determine the reduced revenue from increases in salinity for each area in the model. Areas that have more acres of crops sensitive to salinity changes have the largest amount of damages from reduced crop yields.

Groundwater, Recycling and Public-Owned Treatment Works

In the MWD service area, the SEIM calculates the costs of removing salts to maintain water quality requirements for groundwater and recycled water that are used extensively in the service area. MWD estimates the amount of water that drains into the groundwater system and the amount that is used for recycled water purposes. Salinity cost functions (costs to desalt these sources of water) estimate the costs at given salinity levels.

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Figure 1 presents a map of the regions included in the SEIM with shading indicating the portion of each subarea that receives Colorado River mainstem waters, along with the economic sectors impacted within each respective subarea. The commercial and utilities economic sectors have two methods available to calculate economic impact. The map indicates whether method 1 or method 2 was used within each subarea.

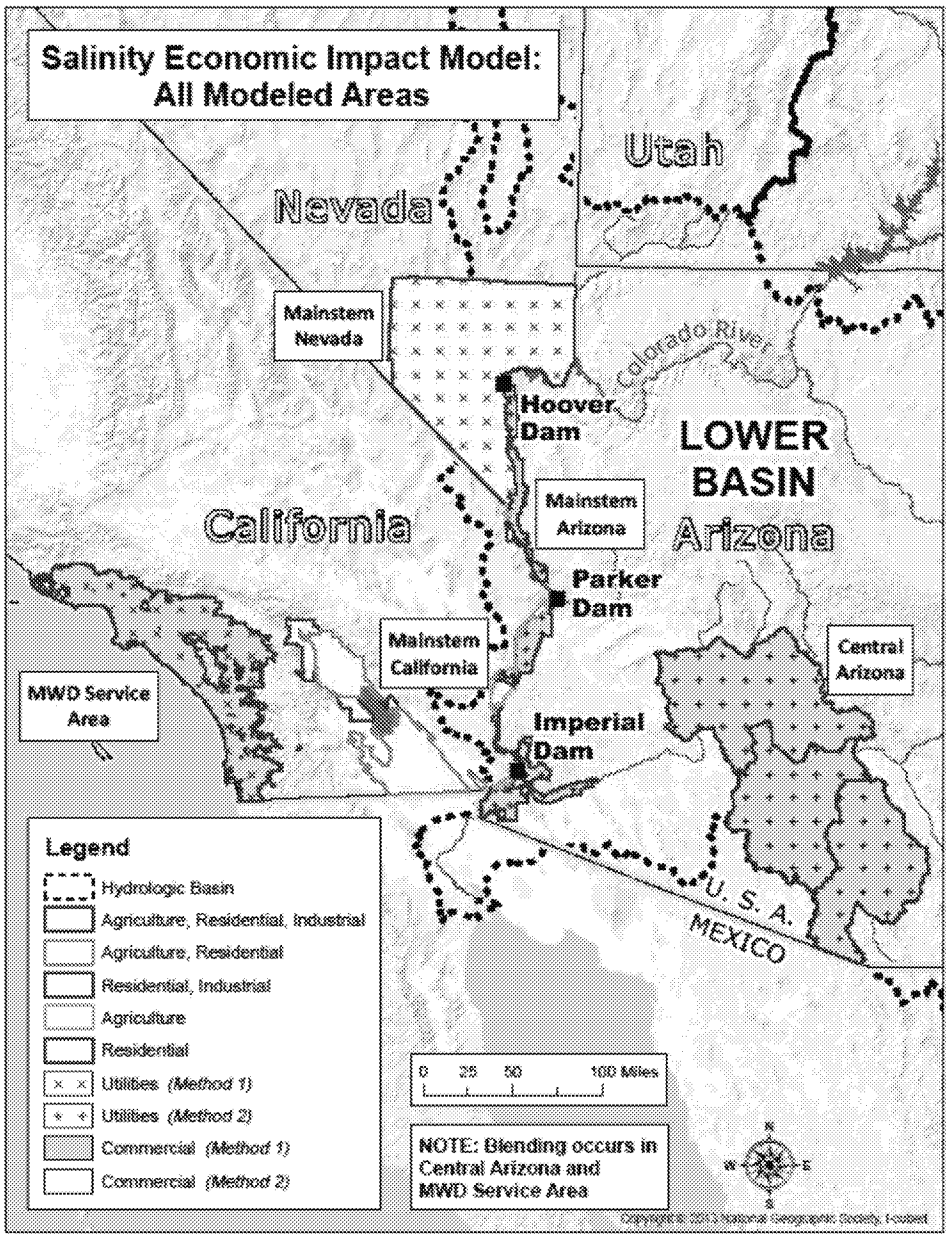

Figure 1 – Economic Sectors for the Regions Included in the SEIM

The impacts or damages estimated by the SEIM are based on the change in impacts from the 500 mg/L baseline with the projected increase in salinity from another modeling effort conducted by Reclamation, which includes incorporation of current and future salinity control projects mainly in the Upper Colorado River Basin. The model applies projected diversion point salinity to projected demographics and future water supply portfolios for each subarea. Reclamation collects projected demographics and water supply portfolios from Forum members. Collected data include projected population, housing and employment, along with projected residential, commercial and industrial water demands by subarea. The model currently projects annual damages for any year between 2015 and 2040.

The latest SEIM dated 06/29/17 was used during the 2017 Triennial Review to estimate quantified damages in the Lower Colorado River Basin. Table 4 presents the diversion point projected salinity concentrations from CRSS and the SEIM average annual quantified damages for the years 2017 and 2035.

Table 4
CRSS Projected Average Annual Concentration and the SEIM Economic Impact

2017							
	Average Annual Concentration (mg/L)			Average Annual Quantified Damages ($ millions)			
Alternative	Hoover	Parker	Imperial	Hoover	Parker	Imperial	Total
1.33M tons removed	613	631	761	$48.524	$169.327	$236.262	$454.113
1.39M tons removed	613	631	761	$48.524	$169.327	$236.262	$454.113
1.66M tons removed	613	631	761	$48.524	$169.327	$236.262	$454.113
1.79M tons removed	613	631	761	$48.524	$169.327	$236.262	$454.113

2035							
	Average Annual Concentration (mg/L)			Average Annual Quantified Damages ($ millions)			
Alternative	Hoover	Parker	Imperial	Hoover	Parker	Imperial	Total
1.33M tons removed	641	660	797	$78.361	$222.814	$273.013	$574.188
1.39M tons removed	636	655	791	$75.583	$215.347	$267.124	$558.054
1.66M tons removed	619	637	769	$66.120	$188.775	$245.541	$500.436
1.79M tons removed	611	630	760	$61.665	$179.040	$236.710	$477.415

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Table 5 presents the annual reduction in salinity concentration and quantified damages as compared to the No Additional Future Controls Beyond 2017 (1.33M tons removed) alternative at each diversion point and as a LCRB total.

Table 5
Annual Reduction in Salinity Concentration and Quantified Damages as Compared to the No Additional Future Controls Beyond 2017 (1.33M tons removed)

2017							
	Annual Concentration Reduction (mg/L)			Annual Quantified Damage Reduction ($ millions)			
Alternative	Hoover	Parker	Imperial	Hoover	Parker	Imperial	Total
1.33M tons removed	0	0	0	$0.000	$0.000	$0.000	$0.000
1.39M tons removed	0	0	0	$29.837	$0.000	$0.000	$29.837
1.66M tons removed	0	0	0	$29.837	$0.000	$0.000	$29.837
1.79M tons removed	0	0	0	$29.837	$0.000	$0.000	$29.837

2035							
	Annual Concentration Reduction (mg/L)			Annual Quantified Damage Reduction ($ millions)			
Alternative	Hoover	Parker	Imperial	Hoover	Parker	Imperial	Total
1.33M tons removed	0	0	0	$0.000	$0.000	$0.000	$0.000
1.39M tons removed	5	5	6	$2.778	$7.467	$5.889	$16.134
1.66M tons removed	22	23	28	$12.241	$34.039	$27.472	$73.752
1.79M tons removed	30	30	37	$16.696	$43.774	$36.303	$96.773

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