Final Report

Water Management and Conservation Plan

Prepared For:

Emery Water Conservancy District

50 South 100 East, Castle Dale, Utah 84513
Jay Humphrey, General Manager

December 2016

Prepared by:

HENRIE ENGINEERING
1829 South 100 West
Orem, Utah 84058

TABLE OF CONTENTS

List of Figures

List of Tables

SECTION 1
INTRODUCTION

DESCRIPTION OF THE PROJECT

Water Development History

Original settlement of Emery County began in about 1875. Natural flows from Huntington Creek were first apportioned in 1876 when small ditches were dug to divert water onto about 320 acres of land. In 1878 canals were constructed to divert irrigation water from Cottonwood and Huntington Creeks. By about 1900, all dependable natural flows of the two creeks had been appropriated. Originally, the water users under each canal had organized independent canal companies. During the 1930s, these individual companies joined to form the Huntington Cleveland Irrigation Company and the Cottonwood Creek Consolidated Irrigation Company. These two companies then serviced the irrigated lands.

Early settlement began with a pattern typical of the intermountain region with small farm units supplemented by an allotment of range land and populations concentrated in small communities. Soon after agricultural settlement had begun, it was found that the natural water supply from Cottonwood and Huntington Creeks were insufficient for a dependable full-season irrigation supply. Storage of high flows for later use appeared to be the best alternative for sustained agricultural activity in the area. The Bureau of Reclamation studied development of this potential source of water during the 1950's. The results of the investigation indicated that the project's water supply could be improved substantially by constructing an off-stream reservoir, Huntington North Reservoir, and by impounding Seeley Creek flows at Joe's Valley Reservoir.

Construction of major power plants at Huntington and Castle Dale by Utah Power and Light Company (UP&L) during the 1970's significantly altered the economic and agricultural environment of the area. UP&L purchased primary water rights for cooling and process water and established firm markets for locally produced coal. Large scale mining of the Wasatch coal field began as distant markets for low-sulfur Utah coal were opened in the late 1970's. Some marginal agricultural lands were withdrawn from production and part of the local work force shifted to power generation, coal mining, transportation, and related service industries. Reliance on agriculture diminished in importance as employment associated with power production has assumed a significant role in the local economy. Agriculture continues to center around livestock with about 90% of the irrigated lands producing hay and grain.

Project Authorization and Construction

Water development within Emery County had been considered by local groups and government agencies at various times during the early part of the century. The Bureau of Reclamation`s first basin-type report of March 1946 served as a supplement to the December 1950 report on the Colorado River Storage Project and participating projects. The 1950 report was amended in 1953, and the final report in 1961 provided updated material leading to authorization of the project.

The Emery County Project (Project) was authorized as one of the participating projects of the Colorado River Storage Project by the act of April 11, 1956 (70 Stat. 105). Construction of the project began on June 20, 1963 and was completed by 1966. Irrigation water was first delivered in 1966, industrial water in 1973, and municipal water in 1987. Operation and maintenance responsibility for the Project was transferred by Reclamation to the District on January 1, 1970.

Project Facilities

Principal features of the Project are Joes Valley Dam and Reservoir, Huntington North Dam and East and West Dikes, Swasey Diversion Dam, Cottonwood Creek-Huntington Canal, Huntington North Feeder Canal, and Huntington North Service Canal. The Huntington North Service Canal was abandoned and replaced with pipelines constructed with funds from Reclamation's Colorado River Salinity Control Project. Project facilities are described briefly below and in greater detail in Section 2. A map of the project is shown in Figure 1.

Storage and Diversion Facilities - Joe's Valley Dam is a 192 ft high zoned earth filled dam with a reservoir capacity of 62,400 acre-feet. Huntington North Dam is an off stream reservoir with a capacity of 5,420 acre-feet. It consists of a 74 ft high zoned earth filled dam and two dikes located near Huntington Creek. The Swasey Diversion Dam is an 11 ft high concrete ogee weir with earth filled wings located on Cottonwood Creek about 10 miles below Joe's Valley Dam.

Conveyance Facilities - The project conveyance system consists of two canals. The Huntington North Feeder Canal is 3.4 ft deep, 8 ft bottom width, 100 cfs in capacity and about 300 feet long. The Cottonwood Creek-Huntington Canal is 4 ft deep, 12 ft bottom width, 165 cfs capacity, and 16.7 miles long. A third canal, the 3.5-mile long Huntington North Service Canal, was originally constructed as part of the Project but recently abandoned and replaced with pipelines. The project also includes 20 miles of underground drain lines to protect project lands from a high water table.

DESCRIPTION OF THE DISTRICT

The Emery Water Conservancy District (District) was formed on April 4, 1961 as the sponsor and repayment entity for the Project, in compliance with Reclamation law. The District is governed by a board of directors appointed by the Emery County Commissioners for four-year terms. The Directors serve without salaries, but do receive a modest stipend for each meeting they attend. The district employs a general manager, five full-time and seasonal employees as needed. The water master and ditch riders are employed by the private ditch companies who deliver the water to both project and non-project lands.

The District service area includes the Cottonwood Creek and Huntington Creek drainages, which are tributaries to the San Rafael River, which in turn is a tributary to the Colorado River. The service area lies within the Upper Colorado River Basin, in the northwestern portion of Emery County, Utah.

DESCRIPTION OF THE AREA

The Emery County Project is located in the Green River Basin in east-central Utah. The major towns in the project area are Huntington, Castle Dale, and Orangeville. Joes Valley Dam is located on Seeley Creek, a tributary of Cottonwood Creek, about 15 miles northwest of Castle Dale. Project lands extend from southwest of Castle Dale northward to the border between Emery and Carbon Counties, north of the town of Elmo. Project lands are divided into two sections. The Cottonwood Area consists of lands in the vicinity of Castle Dale and Orangeville, and the Huntington Area is made up of lands around the towns of Huntington, Lawrence, Cleveland, and Elmo.

Project lands lie at a relatively high elevation. The frost free period averages 127 days annually, with an average growing season of 180 days. The climate is arid with wide extremes of temperature and precipitation. Precipitation averages 7.6 inches annually, roughly one-third falling during the months of April through September. The average annual temperature is 47 degrees Fahrenheit with extreme temperatures varying from 100 degrees Fahrenheit to minus 20 degrees Fahrenheit in winter.

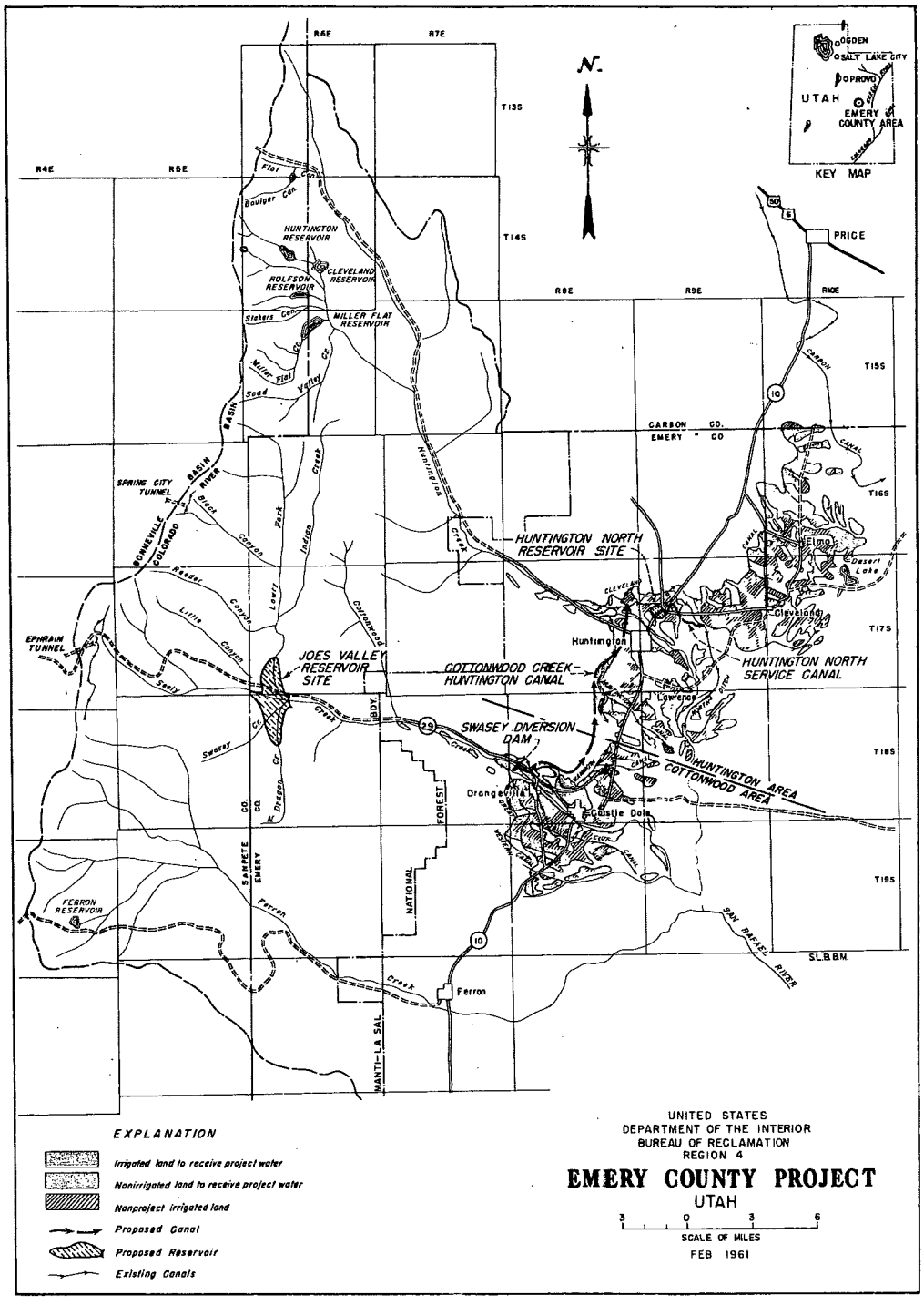
PURPOSE OF WMCP

This WMCP is intended to meet the following two objectives:

- Primary Objective – The primary objective of this WMCP is to identify measures that would improve management and conservation of water, evaluate and rank those measures, and develop an implementation plan and timetable for completing the measures.

- Secondary Objective – The secondary objective is to meet the legal requirements for preparation of water conservation plans. Section 201(b) of the Reclamation Reform Act of 1982 requires all Reclamation project sponsoring entities to submit water conservation plans to Reclamation. The law states that each district that has entered into a repayment contract or water service contract pursuant to Federal Reclamation Law; "...shall develop a water conservation plan which shall contain definite goals, appropriate water conservation measures, and a time schedule for meeting the water conservation objectives". Additionally, in 1998 the State of Utah passed the "Water Conservation Plan Act" which requires water districts and retailers with more than 500 service connections to file a water conservation plan with the Utah Division of Water Resources.

Figure 1 Map


R6E
R7E
R4E
R5E
R8E
R9E
R10E
T13S
T14S
T15S
T16S
T17S
T18S
T19S
N.
KEY MAP
OGDEN
SALT LAKE CITY
PROVO
UTAH
EMERY COUNTY AREA
PRICE
HUNTINGTON RESERVOIR
CLEVELAND RESERVOIR
ROLFSON RESERVOIR
MILLER FLAT RESERVOIR
SPRING CITY TUNNEL
BONNEVILLE
COLORADO
BASIN
RIVER
EPHRAIM TUNNEL
HUNTINGTON NORTH RESERVOIR SITE
JOES VALLEY RESERVOIR SITE
COTTONWOOD CREEK-HUNTINGTON CANAL
HUNTINGTON NORTH SERVICE CANAL
SWASEY DIVERSION DAM
HUNTINGTON AREA
COTTONWOOD AREA
CARBON CO.
EMERY CO.
Huntington
Cleveland
Elmo
Desert Lake
Lawrence
Orangeville
Castle Dale
Ferron
FERRON RESERVOIR
SAN RAFAEL RIVER
SL.B.&M.
NATIONAL FOREST
SANPETE
EMERY
MANTI-LA SAL
EXPLANATION
Irrigated land to receive project water
Nonirrigated land to receive project water
Nonproject irrigated land
Proposed Canal
Proposed Reservoir
Existing Canals
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
REGION 4
EMERY COUNTY PROJECT
UTAH
3 0 3 6
SCALE OF MILES
FEB 1961

SECTION 2
DESCRIPTION OF FACILITIES

INTRODUCTION

Project facilities include Joes Valley Dam and Reservoir on Seely Creek; Swasey Diversion Dam 10 miles downstream from Joes Valley Dam; Cottonwood Creek-Huntington Canal; and Huntington North Dam and East and West Dikes, which form Huntington North Reservoir. The Huntington North Service Canal was constructed by the Project but was recently abandoned with construction of pipelines as part of Reclamation salinity projects. Each of these Project facilities is described in greater detail below.

STORAGE FACILITIES

Joe's Valley Dam and Reservoir

Joes Valley Dam is an earth-fill dam 1,290,000 cubic yards in volume, 187 feet above streambed, and 750 feet long at the crest. The project provides for regulation of Seely Creek, a major tributary of Cottonwood Creek. The reservoir has a total capacity of 62,460 acre-feet and a surface area of 1,170 acres. Recreation facilities at Joes Valley Reservoir are operated by, or under the direction of, the U.S. Forest Service.

Huntington North Dam and Reservoir

Huntington North Reservoir, created by Huntington North Dam and by the East and West Dikes, has a total capacity of 5,420 acre-feet and a surface area of 242 acres. Storage water from this reservoir flows into a pipeline to be distributed for irrigation and stockwatering. Recreation facilities are operated by the Utah Division of Parks and Recreation.

Huntington North Dam and Dikes are of zoned earth-fill construction. The main dam is 74 feet high and 2,897 feet long. The East Dike is 31 feet high and 1,185 feet long, and the West Dike is 24 feet high and 1,919 feet long. The total volume of the main dam and two dikes is 967,000 cy. Huntington North Reservoir has a maximum capacity of 5,420 af and a surface area of 242 acres.

DISTRIBUTION FACILITIES

Swasey Diversion Dam

Swasey Diversion Dam, a concrete ogee weir type, is located 10 miles downstream from Joes Valley Dam on Cottonwood Creek. It has a diversion capacity of 165 cubic feet per second, a height of 11 feet, a crest length of 75 feet, and a volume of 9,000 cubic yards.

Cottonwood Creek – Huntington Canal

The Cottonwood Creek-Huntington Canal is membrane-lined with an initial capacity of 165 cfs. The canal extends 16.7 miles from Swasey Diversion Dam northward to the vicinity of Huntington where it terminates at North Ditch, which diverts from Huntington Creek. A short distance below this juncture, water is released from North Ditch into the Huntington North Reservoir.

Huntington North Feeder Canal

The Huntington North Feeder Canal starts at the North Ditch and runs southward about 300 feet to the Huntington North Reservoir. It is membrane lined and has a capacity of 100 cfs.

PROJECT DRAINS

Construction of the Emery County Project Drains (Project Drains) was the final phase of the Emery County Project. Although the need for drainage was recognized during the early planning of the Project, the actual requirement could not be defined until the impact of Project operation upon these lands could be observed. Construction of the Project Drains component was therefore delayed until the mid-1970s.

The Project originally provided irrigation water to approximately 18,000 acres of previously irrigated land and a full service water supply to about 770 acres of new land. Approximately 2,500 acres of Project classified lands were drainage deficient to the extent that drains were necessary to sustain crop yields and repayment capacity. These lands are located along the lower fringes of longer tracts of land and on comparatively flat lands that are adversely affected by high water tables. Approximately 24 miles of sub-surface pipe drains were installed on lands scattered about the valley. The drains are maintained by the District as needed and as requested by the irrigators.

SCADA SYSTEM FEATURES

The District has made a significant investment in a very comprehensive and effective supervisory control and data acquisition (SCADA) system. The District SCADA system monitors numerous District and private canal company sites throughout Emery County. The monitoring system includes weather stations, reservoir elevations, stream flows, canal flows, and gate positions. This system has been a model for other similar systems within the state.

ASSOCIATED FACILITIES

Associated facilities consist of private conveyance and storage facilities and recreation facilities.

Private Water Conveyance and Storage Facilities

Private facilities that transport and store Project water for agricultural, industrial, and municipal use are described below.

Cottonwood Creek Irrigation Company (CCIC)
Project water is delivered to lands within the Cottonwood Creek Irrigation Company through the Mammoth Canal, the Western Canal Pipeline, the Blue Cut Canal, and the CCH Canal. Combined, these canals consist of about 40 miles of open canal. These CCIC facilities carry water to the new Adobe Reservoir and Lower Mammoth Reservoir that provide the storage and pressure necessary to operate the recently installed sprinkler irrigation systems.

Huntington-Cleveland Irrigation Company (HCIC)
Project water to Huntington–Cleveland Irrigation Company irrigators is delivered through the Cleveland Canal, the North Ditch, and the Huntington Canal to serve recently installed pressurized irrigation systems. Regulating reservoirs within the pressure irrigation systems include the Upper Huntington, Jethro, and Snowball Reservoirs.

Pacificorp (formerly Utah Power and Light Company)
Two 24-inch pipelines deliver water the approximate 7 mile distance from the Adobe Reservoir and Cottonwood Creek to the Hunter Power Plant. Pacificorp owns and operates the pumping plant and pipelines used in delivering the water.

Secondary Irrigation System Water to Cities
Project water is delivered to residents of Castle Dale, Orangeville, and Huntington Cities through city-owned pipelines. This Project water is used in their secondary irrigation systems.

Recreation Facilities

Joes Valley Reservoir
Recreation facilities at Joes Valley Reservoir are operated by the U.S. Forest Service. Summer activities include boating, fishing, water skiing, personal watercraft, hiking, biking, camping, horseback riding, mountain biking, motorcycle and ATV trails. Winter activities include snowmobiling, backcountry skiing, ice climbing and ice fishing.

Huntington North Reservoir
Recreation at Huntington North Reservoir is managed by Utah State Parks. Park facilities include 22 camping sites, numerous picnic sites, modern rest rooms, showers, sewage disposal station, boat launching, and a large group-use pavilion. Activities include camping, picnicking, hiking, biking, fishing, boating, and swimming.

SECTION 3
WATER INVENTORY AND BUDGET

WATER RIGHTS

Water for the Project comes primarily from snowpack within the Cottonwood Creek and Huntington Creek drainages. Project water from Cottonwood and Seeley Creek rights is stored in Joes Valley Reservoir and water from Huntington Creek rights is stored in Huntington North Reservoir. Water Rights for the Project are as shown in Table 3.1.

Table 3.1
Emery Project Water Rights

Priority	Water User	Water Right No.	Flow (cfs)	Volume (af)	Source	Period of Use
8/3/1922	Reclamation	93-952		100,000	Cottonwood Ck	Jan 1 – Dec 31
8/3/1922	Reclamation	93-953		5,500	Huntington Ck	Jan 1 – Dec 31
8/3/1922	Reclamation	93-954	75.0		Huntington Ck	Jan 1 – Dec 31
9/9/1932	Reclamation	93-980	4.46		Seeley Creek	Apr 1 – July 1
2/26/1940	Reclamation	93-1003		117,546	Cottonwood Ck	Mar 1 – Oct 31

Water stored in Joes Valley Reservoir is released down Cottonwood Creek and diverted from Cottonwood Creek at the Swasey Diversion Dam, about 10 miles downstream from Joes Valley Dam as shown in Figure 1. From Swasey Diversion Dam, water flows through existing canals and ditches to serve lands in the Castle Dale area, and through Cottonwood Creek-Huntington Canal for just over 16 miles before it is discharged into the North Ditch. From there, the water flows a short distance to the Huntington North Reservoir, an off-stream storage reservoir formed by the construction of a main dam and two dikes. Water stored in Huntington North Reservoir is distributed through a pipeline to Project lands.

CONTRACTS AND AGREEMENTS

The District entered into a number of contracts dealing with the construction and/or operation of the Project. These contracts are discussed under three headings: Key Reclamation Contracts, River Operating Agreements and Criteria, and Other Contracts and Agreements.

Key Reclamation Contracts

Repayment Contract
The District entered into Contract No. 14-06-400-2427 dated May 15, 1962 with the United States of America for repayment of project costs and, among other things, to operate and maintain Project facilities and to market Project water with approval of the United States. Under this contract, "The District shall have the permanent right to use and dispose of the annual yield of water from project works, subject to the right of the United States to have water used for fish, wild-life and recreational purposes..." The contract was amended by Contract No. 14-06-400-5906 dated November 17, 1972 to provide, among other things, for the sale of 6,000 acre-feet of

Project water for industrial purposes. The contract was further amended on August 10, 1976 and June 8, 1978 as indicated in Table 3.2.

Warren Act Contract for Huntington North Reservoir

The District entered into a Warren Act contract with Reclamation on February 7, 2007 which allows the District to convey non-Project water through Project facilities and to modify the operation of Huntington North Reservoir. Under this contract, up to 14,074 acre-feet of water can be conveyed in Project facilities subject to the availability of excess capacity. Conveyance of non-Project water is only allowed during the irrigation season with exception of incidental non-Project stock water which is allowed year round.

The contract, however, specifically excludes non-Project water from being stored in Huntington North Reservoir. It states that; "Project facilities will not be used for storage of Non-Project water. Huntington North Reservoir will act as a regulating mechanism, releasing an amount of Non-Project Water equal to the inflow of Non-Project Water, less a proportionate share of all conveyance and evaporation losses." The primary purpose of the contract was to allow the District "to utilize Huntington North Reservoir... as a regulating feature associated with their Salinity Control Project, thereby pressurizing the outlet works of Huntington North Dam, and conveying non-Project water through the reservoir".

Warren Act for Cottonwood Creek Consolidated Irrigation Company (CCCIC)

The District and CCCIC entered into a Warren Act contract with Reclamation dated August 15, 2011 which allows the District to convey non-Project water through Joes Valley Reservoir and the CC&H Canal. Under this contract, up to 5,600 acre-feet of water can be conveyed in Project facilities subject to the availability of excess capacity. Conveyance of non-Project water is only allowed during the irrigation season and is subject to seepage and evaporation losses.

River Operating Agreements and Criteria

Huntington Creek

An operating criteria document for Huntington Creek was prepared by the District and other parties titled "Operating Criteria – Emery County Project – Huntington Creek" dated September 24, 1984. A copy of this document is attached as Exhibit B.

Cottonwood Creek

A letter of Understanding among Utah Power and Light, Reclamation, the District, and Cottonwood Creek Consolidated Irrigation Company was signed on December 13, 1982. This letter of agreement was prepared following the April 30, 1982 approval by the state engineer of Change Application Number 1-10865 (93-22). As stated in the letter of understanding, "The parties wish to continue to cooperate and not interfere with their respective rights to the use of water, and it appears that any conflicts can be and have been eliminated by the agreement and intention as set forth in this Letter of Understanding. A copy of this letter of understanding is attached as Exhibit C.

Other Contracts and Agreements

Other contracts pertaining to the operation of the Project are listed in Table 3.2.

Table 3.2
Emery Project Contracts and Agreements
(As of December 16, 2016)

Date	Contract No.	Parties	Contract Description
May 15, 1962	14-06-400-2427	BOR/EWCD	Repayment Contract
June 25,1962	14-06-400-2522	CCIC/BOR/EWCD	Exchange and Adjustments of Water Rights
June 25, 1962	14-06-400-2522	CCIC/BOR/EWCD	Subcontract for the sale of irrigation water
June 27, 1962	14-06-400-2523	HCIC/BOR/EWCD	Exchange and Adjustments of Water Rights
June 27, 1962	87-07-40-WS014	HCIC/EWCD/BOR	Subcontract for the sale of irrigation water
Oct 7, 1969	14-06-400-5164	CCIC/BOR/EWCD	
Mar 27, 1970	14-06-400-5234	CCIC/BOR/EWCD	For storage and exchange of water
Nov 17, 1972	14-06-400-5906	UP&L/BOR/EWCD	For the sale of use of water
Nov 17, 1972	14-06-400-2523	HCIC/BOR/EWCD	Amending contract dated June 27, 1962
Nov 17, 1972	14-06-400-2522	CCIC/BOR/EWCD	Amending contract dated June 25, 1962
Aug 10, 1976	14-06-400-2427	BOR/EWCD	Amending contract dated June 25, 1962
June 8, 1978	14-06-400-5906	UP&L/BOR/EWCD	Amending contract dated Nov. 17, 1972
Sept 8, 1987	14-06-400-2523	HCIC/BOR/EWCD	Relinquished water sold to UP&L
Sept 8, 1987	14-06-400-2522	CCIC/BOR/EWCD	Relinquished water sold to UP&L
Sept 8, 1987	14-06-400-2427	UP&L/BOR/EWCD	Reallocation of water to UP&L
Sept 8, 1987	7-07-40-R0510	UP&L/BOR/EWCD	Water Service Contract
Dec 5, 1989	9-07-40-R1040	CVSSD/ BOR/EWCD	Repayment Contract
July 14, 1994	14-06-400-2427	CCIC/BOR/EWCD	Relinquishment of water for M&I use.
July 14, 1994	94-07-40-R1660	Orangeville City/ BOR/EWCD	Repayment Contract
July 14, 1994	94-07-40-R1650	Castle Dale City/ BOR/EWCD	Repayment Contract
July 14, 1994	14-06-400-2427	BOR / EWCD	Providing water to Castle Dale & Orangeville Cities
Feb 7, 2007	07-WC-40-100	HCIC/BOR/EWCD	Warren Act Contract - Modify Huntington North Reservoir for the Salinity Project
Feb 16, 2010	14-06-400-3818	HCIC/BOR/EWCD	Amended contract of the Enlargement and Modification of the North Ditch
Aug 15, 2011	11-WC-40-419	CCIC/BOR/EWCD	Warren Act Contract - allow carriage of private water through Joes Valley Reservoir and CCIC facilities
Dec 22, 2014	15-WC-40-562	EWCD/Pacificorp	Renewed contract for sale of use of 6,000 af of Project water to Pacificorp for use at its thermal-electric generation plants

Acronyms
BOR – Bureau of Reclamation
CCIC – Cottonwood Creek Irrigation Company
CVSSD – Castle Valley Special Service District (now Huntington City)
EWCD – Emery Water Conservancy District
HCIC – Huntington Cleveland Irrigation Company
UP&L – Utah Power and Light Company

WATER SUPPLY

The Project's 28,100 af/yr water supply is developed from the Project's two storage reservoirs. The two reservoirs have a combined storage capacity of 67,820 af; 62,400 af in Joes Valley Reservoir and 5,420 af in Huntington North Reservoir. Operation of each reservoir is explained in more detail below. The end-of-month storage content in Joes Valley Reservoir and Huntington North Reservoir for the 2000 to 2016 period is shown in Appendix A.

Joes Valley Reservoir

Joes Valley Reservoir regulates Seely Creek flows, a major tributary of Cottonwood Creek. The drainage area above Joes Valley Dam is about 135 square miles. Discharge from the basin into the reservoir averages about 65,000 af/yr with a peak year discharge of about 152,600 af/yr (1952) and a minimum year discharge of about 23,800 af/yr (1934). Joes Valley Reservoir has a total capacity (active, inactive and dead) of 62,460 acre-feet at maximum water surface elevation 6,997.4 feet. The reservoir capacity is allocated as shown in Table 3.3.

Table 3.3
Joes Valley Reservoir - Capacity Allocation

Level	Elevation (ft above MSL)	Capacity (acre-feet)	
Crest of Dam	7,004.0		
			Freeboard
Max Water Surface	6,997.4		
		9,400	Surcharge
Top of Active	6,989.7		
		54,920	Active
Top of Inactive	6,908.9		
		6,670	Inactive
Top of Dead	6,866.5		
		870	Dead
Streambed	6,817.0		
		62,460	Total

Table 3.4 shows the maximum and minimum elevations in the reservoir for each of the 17-year record from 2000 to 2016. As shown in the table, the reservoir filled 9 of the 17 years, or about 53 percent of the time. Average reservoir drawdown was about 25.3 feet with a maximum drawdown of 32.2 feet in 2003 and a minimum drawdown of 16.9 feet in 2007.

Table 3.4
Joes Valley Reservoir - Historic Reservoir Elevations

Year	Maximum	Minimum	Draw Down
2000	***6,989.7***	6,967.8	21.9
2001	***6,989.7***	6,966.5	23.2
2002	6,967.6	6,939.5	28.1
2003	6,974.8	6,942.6	32.2
2004	6,984.0	6,958.3	25.7
2005	***6,992.3***	6,963.1	29.2
2006	***6,992.6***	6,969.4	23.2
2007	***6,988.0***	6,967.2	20.8
2008	***6,990.1***	6,964.3	25.8
2009	***6,990.7***	6,965.3	25.4
2010	***6,990.5***	6,968.9	21.6
2011	***6991.9***	6975.0	16.9
2012	*6984.6*	6959.5	25.1
2013	*6967.5*	6949.2	18.3
2014	*6986.4*	6968.8	17.6
2015	*6984.1*	6965.2	18.9
2016	*6979.0*	6956.1	22.9
Average	**6,986.9**	**6,961.6**	**25.3**

6,989.7 Elevation when full

Huntington North Reservoir

Huntington North Reservoir, an off-stream reservoir, receives its primary water supply through the North Ditch from Huntington Creek. Excess water from Cottonwood Creek delivered through the Huntington-Cleveland Canal is also stored in Huntington North Reservoir. The reservoir has a total capacity of 5,420 af. Reservoir capacity is allocated as shown in Table 3.5.

Table 3.5
Huntington North Reservoir - Capacity Allocation

Level	Elevation (ft above MSL)	Capacity (acre-feet)	
Crest of Dam	5,845.0		
			Freeboard
Max Water Surface	5,839.1		
		270	Surcharge
Top of Active	5,838.0		
		3,880	Active
Top of Inactive	5,817.0		
		340	Inactive
Top of Dead	5,814.1		
		1,200	Dead
Streambed	5,780.0		
		5,420	Total

Table 3.6 shows the maximum and minimum elevations in the reservoir for each of the 17 year record from 2000 to 2016. The reservoir is operated as regulating reservoir, filling almost every year and drawing down as needed to meet demands. Average drawdown was about 13.9 feet with a maximum drawdown of 19.1 feet in 2004 and a minimum of 3.9 in 2011.

Table 3.6
Huntington North Reservoir – Historic Reservoir Elevations

Year	Maximum	Minimum	Draw Down
2000	***5,837.9***	5,820.2	17.7
2001	***5,838.2***	5,819.5	18.7
2002	5,836.9	5,819.4	17.5
2003	***5,837.9***	5,822.4	15.5
2004	***5,838.0***	5,818.9	19.1
2005	***5,838.1***	5,823.4	14.7
2006	***5,838.1***	5,819.1	19.0
2007	***5,825.4***	5,819.1	6.3
2008	***5,835.3***	5,822.8	12.5
2009	***5,838.0***	5,824.8	13.2
2010	***5,837.2***	5,819.0	18.2
2011	***5837.6***	5833.7	3.9
2012	***5837.6***	5824.5	13.1
2013	***5837.8***	5826.4	11.4
2014	***5837.8***	5832.4	5.4
2015	***5837.6***	5822.3	15.3
2016	***5837.7***	5823.7	14.0
Average	**5,836.9**	**5,823.0**	**13.9**

5,838.0 Elevation when full

WATER DEMAND

Agricultural Demand

Agricultural areas have been developed far beyond the water resources of the area. The majority of water for irrigation comes in the early season from unregulated natural stream flows. Irrigated areas have expanded during the years of high runoff to such an extent that water shortages exist in many years even during the spring flood season. Some lands are rarely irrigated during average to dry water-years. The late season supply is never adequate in most years, restricting agriculture in the area to pasture, silage, and small grains. Most of the agricultural products are grown to support the livestock industry.

Project reservoirs provide significant benefit to the agricultural economy of the county. The Project provides an average of about 19,235 acre-feet of water annually for irrigation of 18,755 acres of land. Project irrigation water is used for agricultural crops, including alfalfa, pasture, small grains, and corn. Cropping patterns vary depending on the climate, water supply, and marketing conditions.

Municipal and Industrial Demand

In the late-1960's and early-1970's, Emery County underwent significant economic change. Coal production in the county and the surrounding area peaked, and in response to the expanding coal industry, Utah Power & Light Company (UP&L) announced plans to construct two large coal-fired power plants in the area. These early power plants required about 27,000 af/yr of water for their operations. UP&L was able to acquire 15,000 af of primary water right on Huntington Creek, and an additional 6,000 af from Cottonwood Creek. To obtain the remaining 6,000 af, UP&L contracted with the District and Cottonwood Creek Consolidated Irrigation Company for Project water stored in Joes Valley Reservoir. By February 1970, sufficient water had been secured and UP&L proceed with construction of the power plants. Since that time, UP&L has contracted for an additional 2,576 acre feet of water bringing the total demand on the Project to 8,576 af/yr.

The Project also delivers M&I water to the local communities in the county; 55 af/yr to Castle Dale City, 45 af/yr to Orangeville City, and 189 af/yr to Huntington City (formerly Castle Valley Special Service District). Project water demand for both irrigation and M&I water is summarized in Table 3.7.

Table 3.7
Project Water Supply
(Units: Acre-feet)

Entity	Total	Irrigation	M&I
Cottonwood Creek Irrigation Company	4,761	4,761	
Huntington-Cleveland Irrigation Co	14,474	14,474	
Utah Power and Light Company	8,576		8,576
Huntington City	189		189
Castle Dale City	55		55
Orangeville City	45		45
Total	**28,100**	**19,235**	**8,865**

WATER ALLOCATIONS AND SHORTAGES

Actual Project water allocations from years 1990 through 2016 are shown in Table 3.8. As shown, M&I users received a full supply each year and agricultural users received a full supply in 24 of the 27 years.

Table 3.8
Historic Project Water Allocations

Year	Agriculture (%)	M&I (%)
1990	90	100
1991	95	100
1992	100	100
1993	100	100
1994	100	100
1995	100	100
1996	100	100
1997	100	100
1998	100	100
1999	100	100
2000	100	100
2001	100	100
2002	100	100
2003	70	100
2004	100	100
2005	100	100
2006	100	100
2007	100	100
2008	100	100
2009	100	100
2010	100	100
2011	100	100
2012	100	100
2013	100	100
2014	100	100
2015	100	100
2016	100	100
Total	**2,655**	**2,700**
Average	98.3	100

SECTION 4
LEGAL, INSTITUTIONAL AND ENVIRONMENTAL

District water rights are established by Utah State law and by contract with the Bureau of Reclamation. There are no unusual requirements that would impact the water supply. District policies, in conjunction with Reclamation policies, govern the operation of the Emery County Project. The District made the final payment on their repayment contract in 2016, so the project is now "paid-out". The District is currently pursuing title transfer of all Emery County Project facilities from Federal ownership to District ownership under Reclamation's Title Transfer Policy.

The District manages the project to protect and enhance environmental resources. This WMCP identifies candidate measures that would help meet specific goals of the District. Potential legal, environmental, or institutional constraints are identified for each measure as described in Section 6. Each candidate measure is then evaluated, based on these and other considerations, as described in Section 7.

SECTION 5
WATER MANAGEMENT PLANNING

The District has always emphasized the need for water conservation and good management practices. This section of the report describes past water management planning and provides an overview of the District's existing water management program.

PAST PLANNING

The District's first water conservation plan was prepared in March 30, 1987. A subsequent plan was prepared June 2, 1997 and revised on March 29, 1999. The most recent plan was prepared in March 2011. This WMCP is an update to the 2011 plan. Each plan evaluated options for improving water management, identified specific measures from among the options, and made recommendations for implementation. The March 2011 plan identified sixteen measures to be implemented over the five-year period from 2011 through 2016. These measures, along with the status of each measure, are listed in Table 5.1. As shown, 14 of the 16 measures were completed, 2 were not completed, and 12 are being carried over to the new plan.

Table 5.1
Status of 2011 WMCP Measures

#	Candidate Measure	Status		
		Complete	Not Complete	Carried Over
Water Measurement and Accounting				
1	Determine best flow meter for pipeline application	X		
2	Install flow meter in Huntington North Reservoir outlet pipeline	X		
3	Assist shareholders with installing flow meters in pipe turnouts	X		X
4	Maintain and upgrade SCADA system software and hardware	X		X
5	Fine tune SCADA system to integrate with private systems	X		X
Facility Maintenance and Upgrade				
6	Proactive participation in Reclamation programs	X		X
7	Prepare infrastructure maintenance and upgrade plan		X	
8	Encourage the upgrade of private conveyance facilities	X		X
9	Evaluate sedimentation impacts to Project reservoirs	X		
10	Pursue installing seismograph at Joes Valley Dam		X	X
Project Management and Operations				
11	Protect against invasive aquatic species	X		X
12	Investigate options for mitigating algae-related impacts	X		X
13	Prepare right-of-way encroachment management plan	X		X
14	Pursue Warren Act contract for Joes Valley Reservoir	X		X
15	Continue precipitation enhancement activities	X		X
16	Develop and maintain Project operating criteria	X		X

CURRENT PROGRAM

The District's goal is to meet the needs of its shareholders in the most efficient and environmentally sound manner possible. This goal requires the District to utilize the most efficient and up-to-date management practices. Over the years, the District has developed a set of management practices to assist them in meeting this goal and continue to look for ways to improve these management practices. This section describes the District's current water management program. The program can be categorized into three general areas: 1) water measurement and accounting, 2) facility operation and maintenance, and 3) management policies and practices.

Water Measurement and Accounting

The District understands that good water management is dependent on having accurate and timely data. The District has made significant progress in recent years in developing a very comprehensive and effective supervisory control and data acquisition system (SCADA). This system has been a model for similar systems throughout the state.

The District SCADA system monitors numerous sites throughout Emery County. The monitoring system includes weather stations, reservoir elevations, stream flows, canal flows, and gate positions. In addition to flow monitoring, the District has installed automation devices on four District facilities; Joes Valley Dam outlet gates, Huntington North Dam outlet gates, Swasey Diversion Dam gates, and two gates on the Cottonwood Canal. All District facilities are on the system in addition to all private canals that carry project water. The District-wide SCADA system allows water managers to see changes as they develop and take the necessary actions to effectively manage their water.

The District has also developed a District website (www.ewcd.org) to distribute the real-time information to shareholders, public, and other water managers. The website includes five major real-time data collection categories; reservoirs, rivers, canals, springs, and weather. Significant amounts of real-time and historic data are available under each of these categories. In addition to water-related data, the SCADA system also includes webcams which displays live still images from cameras stationed at several locations throughout the county.

Infrastructure Management

Maintaining the integrity and serviceability of infrastructure is critically important to the District. They understand that aging and deteriorating facilities limit management opportunities. The District has been very proactive in caring for its facilities and identifying ways to improve them.

District personnel perform regular inspections of all District facilities. In addition, Reclamation performs annual and three-year interval comprehensive inspections as part of their operation, maintenance, and safety programs. As part of these inspections, Reclamation issues "Category Recommendations" to the District which identify specific maintenance work to be completed and the urgency of each. The District has aggressively worked to complete these recommendations, and in some instances has completed the work prior to the report being issued. As a result of this

level of inspection and maintenance, the dams are generally in very good condition.

Water Management and Operations

The District has established several effective water management policies that encourage water conservation.

- Water Education - The District is the focal point for water related issues and information in the county. As such, district personnel are often asked to participate in school functions, civic events, and at other community events. These events provide opportunities for the District to educate the public on the wise use of water.
- Water Measurement and Accounting – As stated above, the District provides a significant amount of water related data to water users and residents in the county through the District's website.
- Conserved Water Policy – District policy is that water conserved from wise management and conservation practices is available first to the shareholder conserving the water to meet shortages, then to the District to be used for other authorized Project purposes.
- Technical Assistance – The District offers technical assistance to any water user company or organization in the county on water management or development issues.
- Encroachment Management – Due to the steady residential growth in the area, the District has had to address numerous issues of encroachment onto Project lands and/or facilities. They have developed a set of guidelines to assist them in this important effort.

SECTION 6
CANDIDATE MEASURES

This section identifies and describes candidate measures (proposed actions) that could be implemented to improve the management and conservation of water. These measures were developed by first identifying "issues" that adversely affect good water management, then establishing "goals" for managing or eliminating the issues, and finally identifying "candidate measures" to meet the goals. Candidate measures are presented under the following headings:

- Water Measurement and Accounting
- Infrastructure Management
- Water Management and Operations

Each candidate measure is then described in the sub-categories listed below and assigned a "ranking value" for each of the three evaluation factors.

- Background (the "issue")
- Objective (the "goal")
- Proposed Action
- Evaluation Factors
    - Cost - Low, Moderate, or Significant
    - Benefits – Low, Moderate, or Significant
    - Feasibility: Excellent, Good, or Poor

WATER MEASUREMENT AND ACCOUNTING

An essential requirement for good water management is having ready access to accurate flow data. The District has identified three candidate measures within this category.

CM-1: Maintain and Upgrade SCADA System Software and Hardware

Background – SCADA systems require constant maintenance and upgrade for several reasons. First, computer technology is constantly changing and each change in either hardware or software can cause a ripple effect throughout the system. Second, needs of the District change. Adding new equipment, such as cameras or new sites, requires adding new or upgrading existing equipment. Third, failure of older and outdated equipment requires replacement. And fourth, legal requirements may also change, such as with radios or other communication mediums

Objective – The District goal is to keep all SCADA system equipment well maintained and up to date in order to maximum its value in the most efficient and cost effective manner.

Proposed Action – The first action is to prepare a SCADA system maintenance and upgrade plan that projects future needs and resource. Then follow the plan.

Evaluation

- Cost – The District spends about $70,000 per year (labor and materials) on SCADA system maintenance and upgrade activities. This level of annual expenditure will be needed in the future to adequately implement this measure. Assigned rating: "Moderate"

- Benefits – The primary benefit is to retain the value currently provided by the SCADA system. Implementation would also protect the considerable investment the District has already expended in the system. Having a good SCADA system adds significantly to the District's ability to manage and conserve water. Assigned rating: "Significant"

- Feasibility – Excellent feasibility as it is under full control of the District and there are no significant environmental or institutional constraints. Assigned rating: "Excellent"

CM-2: Assist Shareholder Flow Measurement Improvement Activities

Background – Flows at most of the shareholder pipeline diversions are measured but some are not. Even though installing flow measurement at these unmeasured locations is not a District responsibility, having accurate measurement of all Project water would greatly improve the ability of the District to manage its water supply.

Objective – Have flow meters installed at all currently unmeasured diversions by 2018.

Proposed Action – Identify canal diversions that are not currently being metered and develop a program, by negotiation with shareholders, to get the meters installed.

Evaluation

- Cost – District involvement would be negotiated with each canal company prior to installation of any meters. The cost of this measure is therefore unknown at this time. Assigned rating: "Low"

- Benefits – Having accurate flow measurement on all Project water diversions would help ensure that Project water is delivered to those with a right to receive it. It would also help water users better manage their water supply. Having all Project water measured would significantly assist the District in meeting its water conservation goals. Assigned rating: *"Moderate"*

- Feasibility – The primary constraints to implementation are cost and getting the shareholder to initiate the action. Assigned rating: "Good"

CM-3: Fine-tune SCADA System to More Fully Integrate with Private Systems

Background – Currently there is limited communication between the District's SCADA system and those of other shareholder and private irrigation systems. Improved communication and integration among systems would improve both District and water users capability to manage water. For example, better communication could allow flows to be reduced or terminated when

shareholder regulating ponds are full.

Objective – Enhance the District SCADA system to more fully integrate with other shareholder and private irrigation company SCADA systems.

Proposed Action – This candidate measure consists of identifying and pursuing areas where benefits of system integration could be realized, and then integrate those systems.

Evaluation

- Cost – Costs for this measure are included in the routine maintenance and upgrade costs shown in Candidate Measure 1. Assigned rating: "Low"

- Benefits – Implementing this measure would result in improved water management and conservation of both Project and private irrigation water. While difficult to quantify, moderate water savings would be expected. Assigned rating: "Moderate"

- Feasibility - Excellent feasibility as it is under full control of the District and there are no significant environmental or institutional constraints. Assigned rating: "Excellent"

INFRASTRUCTURE MANAGEMENT

Maintaining infrastructure integrity is an important part of water management as aging water facilities limit management opportunities. Keeping Project facilities in good working order continues to be a top priority for the District. The District has identified six candidate measures within this category.

CM-4: Support Reclamation Inspection and Maintenance Programs

Background – Reclamation's current inspection and maintenance programs affecting the Emery County Project include: the Review of Operation and Maintenance (RO&M), Periodic Facility Review (PFR), and Comprehensive Facility Review (CFR) programs. These programs require a significant amount of commitment from the District in both assisting with the inspections and maintaining the facilities to Reclamation standards.

Objective – Project facilities are maintained and upgraded in a manner that maximizes benefits to the District and its shareholders in the most efficient and cost effective manner possible.

Proposed Action – This candidate measure consists of the District continuing to provide full support of these programs as directed by Reclamation. This includes participation in inspections and following up with timely completion of maintenance recommendations.

Evaluation

- Cost – Costs are budgeted annually as part of the District's normal operation and maintenance program. No additional cost is anticipated. Assigned rating: "Low"

- Benefits – Implementing this measure ensures that proper operation and maintenance practices and procedures are implemented such that the project will meet its long-term intended purposes. Implementation is expected to save considerable replacement costs in the long-term. Assigned rating: "Significant"

- Feasibility - Excellent feasibility as it is under full control of the District and there are no significant environmental or institutional constraints. Assigned rating: "Excellent"

CM-5: Continue Project Canal Lining Replacement Program

Background – Due to the age and deterioration in the currently unlined sections of the Cottonwood Creek – Huntington Canal, the District is concerned about the excessive water losses and safety of the canal. Of the 11-mile-long canal, only about 1 mile has been replaced. Most of the original lining material in the remaining sections has now been lost.

Objective – Replace the remaining 10-mile long sections of the canal by as funds become available.

Proposed Action – The proposed action is to: 1) prepare a preliminary scope of work, cost estimate, funding plan, and schedule for completing the project, 2) pursue and obtain the necessary funds, and 3) prepare final designs, bid, and construct the project.

Evaluation

- Cost – A preliminary cost estimate based on actual costs for the portion already lined is about at about $1.2 million per mile, or a total of about $12 million. Assigned rating: "Significant"
- Benefits – Projected benefits are anticipated to be significant, both with water savings and improved structural integrity and safety of the canal. Assigned rating: "Significant"
- Feasibility – Cost is the primary constraint to accomplishing the work. Environmental evaluation and compliance with NEPA would also be needed. Assigned rating: "Good"

CM-6: Support Upgrade of Customer Conveyance Facilities

Background – While shareholders have made significant efficiency improvements in their delivery systems in recent years, approximately 40% of the private conveyance systems that carry Project water are open canals. The District has no authority to dictate the maintenance or upgrade of these privately owned systems but has an interest in how they are maintained since they also deliver Project water.

Objective – Maximize the efficient delivery of all Project water by assisting, as requested and feasible, the upgrade of shareholder conveyance facilities.

Proposed Action – This measure consists of the District assisting the private canal companies in their maintenance and upgrade efforts. Assistance would primarily be in the form of technical support but could also include financial assistance.

Evaluation

- Cost – Costs are contingent on the level of assistance provided and the extent of the improvement. For purposes of this analysis, costs are assumed to be negligible and within the current District management budget. Assigned rating: "Low"

- Benefits – Improving the efficiency of conveyance systems through lining, piping, or making other efficiency modifications would greatly improve the management and conservation of water. The magnitude of these projected benefits is dependent on the number of miles of canal that would be improved. Assigned rating: "Moderate"

- Feasibility – Cost may be a factor depending on negotiations with the shareholders. No significant environmental or institutional constraints are anticipated. Assigned rating: "Good"

CM-7: Identify Risks and Mitigation Strategies for the Safe Operation of Joes Valley Reservoir

Background – Of concern to the District in the operation of Joes Valley Reservoir is the significant amount of sediment that has and continues to flow into the reservoir. Landslides on Seeley Creek and Lowry Creek above the reservoir continue to serve as a source of sediment deposits to the reservoir. This large sediment load affects recreation at the reservoirs, impedes flow through canals and diversion structures, and reduces reservoir capacity.

The existence and perceived lack of maintenance of four Forest Service reservoirs in the drainage basin above Joes Valley Reservoir is another concern to the District. Failure of any one of these reservoirs – Potter's Pond, Pete's Hole, Soup Bowl, and Grassy Lake – could adversely impact Joes Valley Reservoir.

Of additional concern are the coal mining activities taking place in the vicinity of the dam. A study was conducted in 2005 "…to quantify the potential ground-shaking hazard to Joes Valley Dam, a 58-m-high earthfill dam, posed by mining-induced seismicity (MIS) from future underground coal mining, which could approach as close as 1 km to the dam." The study indicates that mining operations within 1 kilometer of Joes Valley Dam could cause mining-induced seismicity (MIS) events of up to magnitude 3.9 at the dam.

Objective – Obtain a better understanding of the potential risk to Joes Valley facilities caused by "external activities" adjacent to Joes Valley Dam and identify measures to mitigate the risks.

Proposed Action – The proposed action would be to conduct an evaluation of the drainage basin to identify potential adverse impacts and then develop plans for mitigating the impacts. Potential impacts could include 1) landslides in the drainage basin causing increased sedimentation into the reservoir, 2) major floods bringing large trees and other debris into the reservoir and through the "glory hole" spillway, 3) failure of one or more of the Forest Service's upstream reservoirs, and 4) seismic events or other risks caused by neighboring mining operations.

Evaluation

- Cost – The cost for conducting the investigation is estimated at about $25,000. The cost of mitigating impacts would be determined during the investigation. Assigned rating: "Moderate"

- Benefits – Knowing the extent of sedimentation in the reservoirs would help the District more accurately compute the volume of water that is available each year to allocate. This knowledge would help them better manage the water supply and help ensure that shareholders receive their proportionate share. Knowing the rate of sediment deposition would also help the District better estimate future impacts and plan accordingly. Assigned rating: Moderate"

- Feasibility – Cost and time commitment on District staff would be a factor. All activities, however, would be within District control. Assigned rating: "Good"

CM-8: Install Seismograph at Joes Valley Reservoir

Background – As mentioned above, studies indicate that mining operations within 1 kilometer of Joes Valley Dam and are capable of causing mining-induced seismicity (MIS) events of up to magnitude 3.9 at the dam.

Objective – Improve the District's understanding and monitoring capability of the potential risks caused by the nearby mining operations and/or other seismic activity in the vicinity of Joes Valley Dam.

Proposed Action – This candidate measure consists of the District performing an evaluation and a benefit/cost analysis of installing a seismograph at Joes Valley Dam. Depending on the results of the evaluation, the District would install the seismograph.

Evaluation

- Cost – The work would be performed by Distract staff or a consultant. The estimated cost of the investigation and feasibility analysis is $2,000. The cost of a seismograph will be determined during the analysis. Assigned rating: "Moderate"

- Benefits – A seismograph at Joes Valley Dam would assist in determining the magnitude of MIS risks to the dam from local mining operations. The seismograph would measure actual seismic activity at the dam which could be correlated with mining activities and seismic readings at other locations to better determine potential risks. Knowing the risks would help the District better manage the risk and improve the safety of Joes Valley Dam. Assigned rating: "Low"

- Feasibility - Installing a seismograph would require coordination with the State of Utah and the University of Utah Department of Geology and Geophysics to have the station monitored as part of the seismograph stations monitoring program. Assigned rating: "Good"

CM-9: Conduct Proactive Right-of-Way Encroachment Management

Background - Protecting Project lands from encroachment is a continual problem for the District due to development occurring on lands adjacent to Project facilities and the associated requests for road and utility crossings. Project lands and rights must be protected in order for the District to perform the necessary inspections and maintenance of their facilities. If not managed well, encroachment will increase District operation and maintenance costs and jeopardize its ability to properly access the facilities for maintenance or emergency activities.

Objective - The District wishes to proactively manage the Project in a manner that prevents encroachments from occurring onto District facilities and lands.

Proposed Action – This measure consists of the District preparing, and then following, an "Encroachment Management Plan" for District lands and facilities. The plan would identify existing encroachments, develop policy consistent with Reclamation policy for managing lands and dealing with encroachments, and work with local jurisdictions to implement the policies. The plan would focus on preventing encroachment.

Evaluation

- Cost – Cost of developing the plan is estimated at $5,000. Managing encroachment is budgeted into the District annual budget. Assigned rating: "Low"

- Benefits – Implementing the measure would help protect District and Federal assets, protect water quality, reduce future costs caused by encroachments, and ensure the ability of the District to continue delivering water to its customers. Assigned rating: "Moderate"

- Feasibility - Excellent feasibility as it is under full control of the District and there are no significant environmental or institutional constraints. Assigned rating: "Excellent"

WATER MANAGEMENT AND OPERATIONS

Identifying management issues and establishing policies and procedures to more effectively manage the issues is an effective tool the District uses to improve Project management. Five candidate measures have been identified under this category, as described below.

CM-10: Conduct Proactive Water Quality Management

Background - Algae growth has become a concern for the District, particularly as more water users convert to sprinkler systems. Aside from the water quality concerns associated with algae growth in reservoirs, algae also reduces the carrying capacity of the canal, gets trapped in headgates and turnouts, and plugs sprinkler system heads causing un-even water distribution. Poor water quality in the streams also impacts fisheries and could become an Endangered Species Act concern.

Objective - The District would like to eliminate or minimize these algae and water quality related impacts.

Proposed Action – This candidate measure consists of identifying and evaluating alternatives for mitigating the effects of algae growth and other water quality concerns in Project Reservoirs and conveyance facilities. Potential mitigating measures could include one or a combination of: 1) biological control of algae growth, 2) mechanical methods for removing the algae prior to reaching the sprinkler systems, or 3) methods of dealing with the algae in the sprinkler systems, such as using different sprinkler heads. The analysis could be performed by District staff or a consultant.

Evaluation

- Cost – The cost of this measure is within the range of the District's current annual budget. Assigned rating: "Low"

- Benefits – Benefits would come primarily to the water users in the form of improved watering application and reduced maintenance associated with plugged sprinkler heads. There would also be some minor improvement expected in reservoir water quality. It could also improve water quality in streams and protect the District against potential impacts of dealing with ESA issues. Assigned rating: "Moderate"

- Feasibility - Excellent feasibility as it is under full control of the District and there are no significant environmental or institutional constraints. Assigned rating: "Excellent"

CM-11: Support Cloud-Seeding Programs

Background - The District is currently involved in two cloud-seeding programs: one with the State of Utah and the other in partnership with the State of Utah, Sanpete County, and Emery County. The District currently contributes about $10,000 per year to the state program and about $15,000 to the other program.

Objective – Improve District water supply through participation in the cloud seeding programs.

Proposed Action – This measure consists of the District participating in future cloud seeding programs at about the same level as in the past.

Evaluation

- Cost – Assuming a similar level of contribution as in recent years, the cost of this measure is estimated at about $25,000 per year. Assigned rating: "Moderate"

- Benefits – Reclamation has performed two studies to estimate the benefits derived from cloud-seeding programs in the Project area; one in about 1992 and the other in about 1996. The studies estimate precipitation enhancement at about 5 to 8 percent. Assigned rating: "Moderate"

- Feasibility - Some permitting is required each year from the U.S. Forest Service and the State of Utah. Assigned rating: "Excellent"

CM-12: Update Project Operating Criteria

Background - The District has entered into a number of contracts and agreements (see Table 3.2) since the Project was constructed. These contracts/agreements, along with District water rights (see Table 3.1), Huntington Creek operating criteria (Appendix B), and Cottonwood Creek operating criteria (Appendix C), form the foundation and sideboards for Project operation. These criteria need to be constantly updated to maintain their value.

Objective – Ensure that Association policies are kept current and are actively followed in order to maximize their usefulness as a management tool.

Proposed Action – This measure consists of the District formalizing updated Project operation criteria consistent with District contracts/agreements, water rights, and river system operating criteria; and modifying the criteria as needed in the future to keep it current. The scope of the analysis would be: 1) conduct a thorough review of all District contracts/agreements, water rights, and operating criteria, 2) identify opportunities to improve water management within the provisions of these documents, 3) prepare operating criteria, 4) implement the criteria, and 5) update the criteria on an annual basis.

Evaluation

- Cost – Cost of the measure is estimated at $5,000 to complete the analysis and prepare the operating criteria. Assigned rating: "Low"

- Benefits – Better and more accurate information promotes improved water management. A fresh review of contracts and how they relate to water rights and Project operation would allow the District manager and Board of directors to fine-tune project operations to maximize benefits to shareholders. Assigned rating: "Moderate"

- Feasibility - Excellent feasibility as it is under full control of the District and there are no significant environmental or institutional constraints. Assigned rating: "Excellent"

CM-13: Protect Against Invasive Species

Background - There is a growing threat of introduction of Zebra Mussels (or Quagga muscles) in reservoirs in Utah. Zebra mussels, native to Eastern Europe and Western Asia were first discovered in North America in 1988 in Lake St. Clair, one of the water bodies connecting the Great Lakes, and subsequently discovered in other waterways of California, Nevada, Arizona, Colorado, and now in Utah. These mussels can cause significant economic and ecological damage. Decontaminating boats is currently the preferred method of preventing the spread of these mussels. The District has partnered with UDWR and others in efforts to prevent the spread of these invasive species.

Objective - Ensure that invasive aquatic species do not enter Project reservoirs or waterways

Proposed Action – This measure consists of the District working with the Utah Division of Wildlife Resources in its state-wide efforts to clean boats and perform other activities to ensure that invasive species are not spread to reservoirs in Utah. The District will participate by providing funding to the program in the amount of about $10,000 per year plus performing other activities as necessary to support the effort.

Evaluation

- Cost – The District currently contributes about $10,000 per year to the program. It is anticipated that future costs will be similar to the current level of funding. Assigned rating: "Moderate"

- Benefits – Protecting District reservoirs and waters from invasive species is very important for the District and the State of Utah. This preventive measure helps protect the District's ability to deliver a full water allotment to its customers. It also helps protect the ecological values of the reservoir and save thousands of dollars in operation and maintenance costs. Assigned rating: "Moderate"

- Feasibility – Cost is the primary constraint. Assigned rating: "Excellent"

CM-14: Improve Public Relations Program

Background – As the demand for water increases and as residential development encroaches on Project facilities, there is greater need for the public to be aware of the existence of the District and the role it plays in the community.

Objective – District management would like to improve public awareness of the District in order to ensure the Districts continued ability to meet its purposes.

Proposed Action – The proposed action is to first develop a public involvement plan that clearly defines the issues, program objectives, target audiences, and specific measures to be followed. Step two would be to implement the measures which could include: preparing regular newspaper articles, mailing newsletters, and greater participation in school and civic events. A public involvement specialist consultant may be hired to help develop the plan.

Evaluation

- Cost – Cost of the measure is within the District's current annual operation and maintenance budget. Assigned rating: "Low"

- Benefits – Anticipated benefits of the measure would include: 1) better understanding by the public of the District and its role in water development in the county, 2) improved relationship among the District, its shareholders, and the public, 3) reduced occurrences of right-of-way encroachment, and 4) more efficient use of Project water. Assigned rating: "Moderate"

- Feasibility – Excellent feasibility as it is under full control of the District and there are no significant environmental or institutional constraints. Assigned rating: "Excellent"

SUMMARY

Table 6.1 lists the candidate measures and evaluation ratings. Each is evaluated in Section 7.

Table 6.1
Candidate Measure Summary and Evaluation Ratings

#	Candidate Measure	Evaluation Rating		
		Cost	Benefits	Feasibility
Flow Measurement and Accounting				
1	Maintain and Upgrade SCADA System software and hardware	Moderate	Significant	Excellent
2	Assist shareholder flow measurement improvement activities	Low	Moderate	Good
3	Fine tune SCADA System to more fully integrate with private systems	Low	Moderate	Excellent
Infrastructure Management				
4	Support Reclamation inspection and maintenance programs	Low	Significant	Excellent
5	Continue Project canal lining replacement program	Significant	Significant	Good
6	Support upgrade of customer conveyance facilities	Low	Moderate	Good
7	Identify risks and mitigation strategies for the safe operation of Joes Valley Reservoir	Moderate	Moderate	Good
8	Install seismograph at Joes Valley Reservoir	Moderate	Low	Good
9	Conduct proactive right-of-way encroachment management	Low	Moderate	Excellent
Water Management and Operations				
10	Conduct proactive water quality management	Low	Moderate	Excellent
11	Support cloud-seeding programs	Moderate	Moderate	Excellent
12	Update Project operating criteria	Low	Moderate	Excellent
13	Protect against invasive species	Moderate	Moderate	Excellent
14	Improve public relations program	Low	Moderate	Excellent

SECTION 7
IMPLEMENTATION PLAN

Each candidate measure is evaluated and ranked based on the projected benefits ratings given in Section 6. The candidate measures are then adopted into the implementation plan.

CANDIDATE MEASURE RANKING

Based on the evaluation ratings described in Section 6 and shown in Table 6.1, the District has ranked each candidate measure in order of implementation priority as shown in Table 7.1 below.

Table 7.1
Candidate Measure Ranking

#	Candidate Measure	Rank
Flow Measurement and Accounting		
1	Maintain and Upgrade SCADA System software and hardware	1
2	Assist shareholder flow measurement improvement activities	2
3	Fine tune SCADA System to more fully integrate with private systems	2
Infrastructure Management		
4	Support Reclamation inspection and maintenance programs	1
5	Continue canal lining replacement program	1
6	Support upgrade of customer conveyance facilities	3
7	Identify risks and mitigation strategies for the safe operation of Joes Valley Reservoir	1
8	Install seismograph at Joes Valley Reservoir	3
9	Conduct proactive right-of-way encroachment management	1
Water Management and Operations		
10	Conduct proactive water quality management	2
11	Support cloud-seeding programs	2
12	Update Project operating criteria	1
13	Protect against invasive species	1
14	Improve public relations program	2

IMPLEMENTATION PLAN

Based on the evaluation and ranking above, the District Board of Directors selected all 14 candidate measures for implementation. The schedule and cost of implementation is shown in Table 7.2.

Table 7.2
Implementation Plan

#	Candidate Measure	Year
Flow Measurement and Accounting		
1	Maintain and Upgrade SCADA System software and hardware	Each Year
2	Assist shareholder flow measurement improvement activities	Each Year
3	Fine tune SCADA System to more fully integrate with private systems	2017-2018
Infrastructure Management		
4	Support Reclamation inspection and maintenance programs	Each Year
5	Continue Project canal lining replacement program	2018-2022
6	Support upgrade of customer conveyance facilities	Each Year
7	Identify risks and mitigation strategies for the safe operation of Joes Valley Reservoir	2018
8	Install seismograph at Joes Valley Reservoir	2019
9	Conduct proactive right-of-way encroachment management	Each Year
Water Management and Operations		
10	Conduct proactive water quality management	Each Year
11	Support cloud-seeding programs	Each Year
12	Update Project operating criteria	2017
13	Protect against invasive species	Each Year
14	Improve public relations program	2017

PLAN MONITORING

Monitoring implementation progress will occur in two ways. First, the District will review the plan on an annual basis in conjunction with the District's goals and budget review process. Second, the plan will be updated on its five-year anniversary to evaluate progress, re-assess needs, and modify the plan based on the most current information at the time.

APPENDIX A

END-OF-MONTH STORAGE CONTENT

JOES VALLEY RESERVOIR

HUNTINGTON NORTH RESERVOIR

Joes Valley Reservoir

End of Month Storage Content

Units: Acre-feet

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2001										38,970	38,970	38,820
2002	38,592	38,130	37,878	37,878	39,562	36,728	28,670	20,506	20,954	22,121	21,184	21,885
2003	22,711	23,380	24,372	25,132	38,634	45,700	39,906	33,951	32,126	32,200	32,052	32,500
2004	33,258	34,105	39,000	39,476	52,645	57,482	47,248	39,390	34,105	34,806	35,280	36,080
2005	37,218	38,046	39,306	38,634	53,810	64,590	58,755	52,225	45,230	43,820	44,290	45,136
2006	46,084	46,660	47,150	42,010	65,070	63,282	57,890	49,438	42,010	42,820	43,456	44,854
2007	46,084	47,052	49,135	52,225	60,014	57,538	48,531	41,120	39,562	39,734	39,648	40,337
2008	41,298	42,190	43,183	39,306	45,136	62,578	56,980	48,333	39,934	38,046	38,046	37,962
2009	38,382	39,054	39,906	39,684	60,371	63,164	57,890	46,660	41,700	40,946	41,120	41,654
2010	42,460	43,183	44,102	45,136	45,230	62,462	55,027	47,005	41,088	41,440	41,705	42,150
2011	43,325	44,293	43,508	35,647	36,289	65,059	62,461	55,244	47,788	46,714	47,690	47,690
2012	48,401	49,181	50,703	53,248	56,657	49,563	42,276	37,021	34,104	33,594	33,357	33,787
2013	34,470	34,525	34,768	34,580	39,837	38,369	31,620	26,098	27,777	28,491	29,476	30,172
2014	30,931	32,110	33,067	35,265	52,310	58,677	51,104	45,344	41,387	41,176	41,026	41,123
2015	41,581	42,017	42,536	42,888	49,695	56,118	50,263	42,861	38,269	38,344	38,277	37,960
2016	37,670	37,712	38,027	36,906	43,692	50,703	42,581	35,456	3,105			
Total	**582,465**	**591,638**	**606,641**	**598,015**	**738,952**	**832,013**	**731,202**	**620,652**	**529,139**	**563,222**	**565,577**	**572,110**
Ave	38,831	39,443	40,443	39,868	49,263	55,468	48,747	41,377	35,276	37,548	37,705	38,141

Reservoir fills (62,400 af)

Huntington North Reservoir

End of Month Storage Content

Units: Acre-feet

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2001										1,891.0	2,238.5	2,754.0
2002	3,242.9	3,866.8	4,811.2	4,707.8	4,527.4	3,630.0	2,144.0	1,989.5	1,995.5	2,000.0	2,003.0	2,582.3
2003	3,725.0	4,644.0	5,136.8	5,218.4	5,139.2	4,307.4	2,972.8	2,468.4	2,386.3	2,369.0	3,400.6	4,202.8
2004	4,613.2	4,923.9	5,278.4	5,321.6	4,359.0	3,778.0	3,446.2	2,094.5	1,794.8	2,139.5	2,692.8	3,393.0
2005	4,277.1	4,811.2	5,235.2	5,350.4	5,434.4	5,340.8	5,168.0	4,630.8	3,147.9	2,466.8	2,698.8	3,513.0
2006	4,236.4	5,022.2	5,391.2	5,146.4	5,355.2	4,549.4	3,734.0	2,238.5	1,816.8	1,821.0	1,830.8	1,828.0
2007	1,828.0	1,826.6	1,821.0	1,814.0	1,812.6	1,808.4	1,808.4	1,808.4	1,814.0	1,813.0	2,205.5	2,825.4
2008	3,324.6	3,798.0	4,608.8	4,498.8	5,271.2	5,146.4	4,540.6	4,013.8	3,431.0	2,960.3	2,487.2	2,714.9
2009	3,066.4	5,093.6	5,360.0	5,304.8	4,357.6	5,004.8	4,278.8	3,456.0	2,884.9	3,083.3	3,419.6	3,572.0
2010	3,600.0	3,791.4	4,569.2	5,232.8	4,712.3	3,965.5	2,958.0	2,728.0	2,017.0	1,804.0	2,528.0	3,151.0
2011	3,899.0	4,667.0	5,252.0	5,304.0	5,150.0	5,316.0	4,992.0	5,060.0	4,880.0	4,428.0	4,416.0	4,876.0
2012	5,309.0	5,266.0	5,223.0	4,824.0	4,513.0	4,411.0	4,244.0	3,448.0	2,980.0	2,629.0	2,987.0	3,624.0
2013	4,313.0	4,762.0	5,360.0	5,273.0	4,270.0	3,864.0	3,680.0	3,041.0	2,985.0	2,957.0	3,000.0	3,373.0
2014	4,261.0	5,319.0	5,360.0	5,058.0	4,760.0	4,858.0	5,147.0	4,508.0	4,145.0	4,167.0	5,207.0	5,032.0
2015	5,321.0	5,259.0	5,276.0	4,506.0	4,407.0	4,413.0	3,689.0	3,072.0	2,743.0	2,271.0	3,025.0	3,608.0
2016	4,371.0	5,142.0	5,338.0	4,965.0	4,400.0	3,879.0	4,199.0	3,533.0	2,574.0			
Total	**59,387.6**	**68,192.7**	**74,020.8**	**72,525.0**	**68,468.9**	**64,271.7**	**57,001.8**	**48,089.9**	**41,595.2**	**38,799.9**	**44,139.8**	**51,049.4**
Ave	3,959.2	4,546.2	4,934.7	4,835.0	4,564.6	4,284.8	3,800.1	3,206.0	2,773.0	2,586.7	2,942.7	3,403.3