RECLAMATION

Managing Water in the West

Yuma Desalting Plant Pilot Run Final Report

U.S Department of the Interior
Bureau of Reclamation
Yuma Area Office

July 2012

Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Yuma Desalting Plant Pilot Run Final Report

Prepared for:

The Metropolitan Water District of Southern California, Central Arizona Project, Southern Nevada Water Authority

Prepared by:

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EXECUTIVE SUMMARY

The United States Bureau of Reclamation (Reclamation) conducted the Pilot Run of the Yuma Desalting Plant (YDP) in order to collect performance and cost data, to test changes to the plant which were implemented while the plant was being maintained, and to determine if any additional corrective actions to plant design or equipment would be necessary for potential long-term operation of the plant. That purpose was successfully achieved.

The plant operated continuously for 328 days. No major equipment problems occurred during the run, and the plant's performance confirmed the effectiveness of changes made to the plant while it was being maintained. The results also indicate that three previously unknown equipment-related alterations to the plant may be considered. Those alterations are:

- Installation of a permanent liquid ferric sulfate system
- Installation of a permanent sodium bisulfite system
- Modification of the Main Outlet Drain Extension 1 Diversion/Return Facility

The Pilot Run was completed ahead of schedule and under budget. The run was completed about seven weeks prior to plan. This was the result of shakedown testing and plant stabilization which proved less challenging than expected; therefore, ramp up to one-third of full capacity operation required less time than anticipated. The cost was $15.97 million which includes preparing for the run, operating, and maintaining the plant during the run, and returning the plant to pre-run conditions once operations were concluded. The cost was 31% less than budgeted. This lower cost was primarily the result of costs for Reclamation labor, power, and chemicals that were lower than expected. Less Reclamation labor was needed because plant preparations and operations were less challenging than anticipated. Power and chemical costs for operating the plant were lower largely because budgetary estimates were developed based on market prices prior to the economic downturn.

While not the purpose of the Pilot Run, operating the plant resulted in a water conservation benefit. The YDP conserved 30,496 acre-feet of water. The water conserved was included in water deliveries to Mexico and the same volume of water was not released from Lake Mead. The water in reservoir storage is available for use

by The Metropolitan Water District of Southern California, Southern Nevada Water Authority, and Central Arizona Water Conservation District. These Municipal Utilities co-funded the Pilot Run and received Intentionally Created Surplus credits in proportion to the water conserved by the YDP and their respective capital contributions.

Personnel and public safety were top priorities. Preparation for the run and the run itself were accident free and no events occurred which could have put the public at large at risk. The plant also complied successfully with Federal, State, and local statutory and regulatory requirements.

Minute 316 to the 1944 Water Treaty was implemented prior to the Pilot Run and called for joint cooperative actions by the governments of the United States (U.S.) and Mexico and non-governmental organizations (NGO). The U.S., Mexico, and the NGOs successfully completed the nine joint cooperative actions for which they were responsible.

This report is organized into five major sections. Section 1 provides background information about the YDP and discusses the reason the Pilot Run was performed. Section 2 describes how Reclamation prepared for the Pilot Run. This preparation includes conducting consultations with interested parties, meeting legal and regulatory needs, as well as making plant equipment ready to operate. Section 3 provides detailed information about the outcome of the Pilot Run, including costs and the performance of the YDP. Section 4 utilizes the results of the Pilot Run and what was known about the plant prior to the run to discuss what capital expenditures might be necessary for potential long-term operation of the YDP. Section 5 provides copies of key documents referenced in this report.

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1.0 Background

The Yuma Desalting Plant (YDP or plant) was constructed pursuant to the *Colorado River Basin Salinity Control Act of 1974* (Salinity Control Act)[1]. The Salinity Control Act authorized the construction, operation, and maintenance of certain works in the Colorado River Basin to control the salinity of water delivered pursuant to the 1944 United States (U.S.) Treaty with Mexico Relating to the Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande (1944 Water Treaty). Title I of the Salinity Control Act provides for programs downstream from Imperial Dam to implement the provisions of Minute 242 of the 1944 Water Treaty[2], including the YDP.

To implement provisions of Title I of the Salinity Control Act, construction of the YDP was largely completed in 1992. Shortly thereafter, it began operating at one-third of full capacity[3]. YDP operations were interrupted in 1993 due to flooding on the Gila River that damaged the Main Outlet Drain Extension (MODE) canal about eight miles east of the YDP. The MODE provides feed water to the YDP. Prior to the Pilot Run (run), the YDP had not operated since 1993 except for a three month demonstration run in 2007 at about 10% of full capacity. The plant was not operated due to budget constraints, as well as surplus and normal conditions on the lower Colorado River prior to the current drought.

Drought conditions, population growth, and the continuing need for water for municipal, environmental, and recreational uses on the Lower Colorado River (LCR) have created further demand on an already limited water supply. The drainage water in the MODE is from the Wellton-Mohawk Irrigation and Drainage District (WMIDD) is not counted towards Mexico's Colorado River allotment (as delineated in the 1944 Water Treaty), and could instead be used to meet 1944 Water Treaty obligations if

[1] Text of the Salinity Control Act is available at http://www.usbr.gov/lc/region/pao/pdfiles/crbsalct.pdf

[2] Text of the 1944 Water Treaty and Minute 242 are available at www.ibwc.gov

[3] At full capacity the YDP can conserve approximately 91,000 acre-feet of water annually. This estimate is based on modeling.

YDP operations resumed[4]. Water discharged by the YDP into the Colorado River means that a like amount of water need not be released from Hoover Dam for water deliveries to Mexico.

Reclamation was contacted by the Central Arizona Water Conservation District, the Metropolitan Water District of Southern California, and the Southern Nevada Water Authority (collectively the Municipal Utilities) regarding the need to obtain information about the capability and operational readiness of the YDP[5]. This information could only be obtained through actual operation of the facility. Without this information, Reclamation would not be able to determine whether the YDP could reliably operate on a long-term basis in the future, or determine what, if any, improvements to the facility may be necessary to ensure the most efficient, cost effective and reliable long-term operation. Accordingly, a Pilot Run of the YDP, operating the plant at up to one-third of full capacity for up to 365 days within a 12- to 18-month duration was proposed.

1.1 Purpose of the Pilot Run

Long-term operation of the YDP is not presently under consideration and would only be considered in the future in accordance with appropriate Federal law. Such future consideration would require YDP cost and performance data. Such data could only be collected through actual operation of the YDP at a scale and for a duration that covers seasonal variation when chemical use and power consumption are variable.

The purpose of the Pilot Run was to:

- Operate the YDP as designed at a sufficient flow and appropriate duration to gather benchmark performance and cost data which can only be obtained through actual plant operations;

[4] Drainage water from the WMIDD is commonly referred to as the bypass flow. This water is not discharged into the Colorado River (bypasses the river) in order to meet salinity requirements set forth in Minute 242 of the 1944 Water Treaty.

[5] See Appendix 5.1 for letter from the Municipal Utilities requesting the YDP Pilot Run.

- Determine whether any additional corrective actions to plant design or equipment would be necessary for long-term operation of the plant; and
- Test changes and corrections which have already been implemented at the YDP as part of maintaining it.

Each of these critical pieces of information was considered necessary to evaluate the YDP.

The YDP is located on the 60-acre site of Reclamation's Yuma Area Office (YAO) approximately four miles west of Yuma, Arizona. The YDP is adjacent to the Colorado River approximately 4,000 feet from the Northerly International Boundary (NIB) with Mexico.

Figure 1. Location and vicinity of the YDP.

2.0 Preparing for the Pilot Run

Preparation for the Pilot Run was pursued along two parallel tracks: on-site preparation of the YDP and external activities. On-site preparation included completing one-time projects, preparing equipment to operate, testing components and systems, making any necessary adjustments or repairs, securing and training operators, obtaining chemicals, and arranging for electrical power. External preparation addressed policy and regulatory compliance decisions and the actions necessary to implement those decisions. These external preparations included environmental compliance, discharge and other permits, consultations with Mexico through the International Boundary and Water Commission (IBWC), and consultations with Colorado River Basin states, water users, and other stakeholders, including environmental groups.

2.1 External Preparation Activities

2.1.1 National Environmental Policy Act

Based on the proposal for the Pilot Run, Reclamation initiated an Environmental Assessment (EA) in accordance with the *National Environmental Policy Act of 1969* (NEPA). A public scoping meeting was conducted on October 8, 2008 and the draft EA was developed from October, 2008 through April, 2009. On May 1, 2009 Reclamation released the draft EA for public comment. Over 150 comments were received, considered, and addressed. The final EA and draft Finding of No Significant Impact (FONSI) were released for public comment on August 26, 2009. The final FONSI was released on September 30, 2009[6].

[6] See Appendix 5.2 for the Finding of No Significant Impact.

2.1.2 International Consultations

In parallel with NEPA compliance activities, Reclamation conducted international consultations with Mexico through the IBWC. The statutory provisions of NEPA and the Council on Environmental Quality implementing regulations do not require assessment of environmental impacts in the sovereign territory of a foreign nation. However, in the spirit of bi-national cooperation, with regard to the ecology of the Colorado River's Limitrophe Division and its Delta as established in Minute 306 of the 1944 Water Treaty, Reclamation, through the IBWC, conducted consultations with Mexico regarding the proposed YDP Pilot Run.

Consultations were conducted between November, 2008 and July, 2009. The outcome of this process was the IBWC "Joint Report of the Principal Engineers Concerning U.S.-Mexico Joint Cooperative Actions Related to the Yuma Desalting Plant (YDP) Pilot Run and the Santa Clara Wetland," dated July 17, 2009[7]. In addition to other commitments, the U.S., Mexico, and a partnership of non-governmental environmental organizations each committed to arrange to convey 10,000 acre-feet (total of 30,000 acre-feet) of water in connection with the anticipated alteration of water flow to the wetland associated with the Pilot Run. Minute 316 to the 1944 Water Treaty is based on the Joint Report, and this Minute[8] was signed on April 16, 2010.

2.1.3 Permits

Also in parallel with NEPA compliance activities, Reclamation conducted consultations with the Arizona Department of Environmental Quality (ADEQ) regarding permits that would be necessary for the YDP. For the demonstration run of the YDP in 2007, Arizona's De Minimis general permit was utilized for discharging to the Colorado River. A temporary aquifer protection permit was also issued for the demonstration run.

[7] See Appendix 5.3 for the Joint Report of the Principal Engineers.

[8] See Appendix 5.4 for Minute 316 to the 1944 Water Treaty.

The scale and duration of the Pilot Run were inconsistent with guidelines for both the De Minimis general permit and a temporary aquifer protection permit. Accordingly, on March 2, 2009, Reclamation submitted an application to the ADEQ for an individual discharge permit for the YDP. The ADEQ signed this permit on January 6, 2010 to be effective February 8, 2010.

Reclamation voluntarily submitted an individual aquifer protection permit application to the ADEQ on August 11, 2009, although such a permit is not required for the YDP. The ADEQ issued this permit to Reclamation on April 28, 2010.

While permit applications were being reviewed and consultations conducted with the ADEQ, Reclamation prepared water sampling and analysis protocols for permit compliance. Contracts were also executed with commercial laboratories to perform analyses and with the U.S. Geological Survey to perform specialized sample collections.

2.1.4 Other External Preparation Activities

The Resource Conservation and Recovery Act, Pollution Prevention Act, and Emergency Planning and Community Right to Know Act were each reviewed in the context of the Pilot Run and compliance processes were revised for the facility to meet the needs of the run.

Additionally, the Emergency Response Plan, Emergency Action Plan, Continuity of Operations Plan, Risk Management Plan, and Process Safety and Management Program for the YAO were each revised to address specific hazards associated with the Pilot Run. Response drills for employees and contractors were conducted. In addition, a full scale mock emergency response exercise was conducted on April 21, 2010, with local emergency responders and YAO personnel (Reclamation employees and contractors).

Certain agreements between Reclamation, the Municipal Utilities, and other parties were necessary to prepare for the Pilot Run. On June 10, 2009, Reclamation and the Municipal Utilities signed an Environmental Compliance Funding Agreement for the run. Under the terms of that agreement, the Municipal Utilities made a one-time

payment totaling $330,000 to assist in costs associated with NEPA compliance, obtaining permits for the YDP, and other environmental compliance activities. On October 29, 2009, Reclamation and the Municipal Utilities signed a Funding Agreement for the Pilot Run[9]. Under the terms of this agreement the total cost (preparation, operating the plant, and returning it to pre-run condition) was estimated to be $22.86 million. Reclamation would be responsible for $9.18 million[10] of this total, and the Municipal Utilities would be responsible for the balance, $13.68 million. Prior to execution of the Funding Agreement, the Municipal Utilities retained Black and Veatch and CH2M HILL to review and analyze Reclamation's plans and estimates.

[9] See Appendix 5.5 for the Funding Agreement.

[10] Reclamation's budget was not increased to prepare for or to conduct the Pilot Run. Funding was temporarily redirected from other sources in order to support the Run.

Table 1. Budgeted Costs

Preparing for the Pilot Run	Budget
One-time projects	$ 2,605,000
Reclamation labor	$ 2,751,853
Reclamation other	$ 0
Contract labor and services[11]	$ 1,144,584
Materials, supplies, and parts	$ 130,500
Total	**$ 6,631,937**
Reclamation	*$ 5,356,853*
Municipal Utilities	*$ 1,275,084*
Conducting the Pilot Run	**Budget**
Reclamation labor	$ 3,411,492
Contract labor and services	$ 2,662,752
Power	$ 3,304,516
Chemicals	$ 6,415,610
Materials, supplies, and parts	$ 349,200
Contingency	$ 414,500
Total	**$ 16,558,070**
Reclamation	*$ 3,825,992*
Municipal Utilities	*$ 12,732,078*
Grand Total[12]	**$ 23,190,007**
Reclamation	*$ 9,182,845*
Municipal Utilities	*$ 14,007,162*

[11] Total of $1,144,584 reflects $814,584 as set forth in the Funding Agreement, plus $330,000 from the Municipal Utilities as set forth in the Environmental Compliance Funding Agreement.

[12] The estimate of eligible project costs specified in Exhibit A of the Funding Agreement was $22,860,007. The total budget for the Pilot Run was $23,190,007 and includes $330,000 specified in the Environmental Compliance Funding Agreement.

2.1.5 Expected Water Flows

Although not part of the purpose of the Pilot Run, but rather a connected action, the run conserved water in the U.S. by reducing releases from Lake Mead and afforded the opportunity for the creation of Intentionally Created Surplus (ICS) credits. ICS is a program administered by Reclamation in accordance with the "Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead" (Interim Guidelines) of December 2007. The program provides an opportunity for Colorado River contractors in Arizona, California, and Nevada to accrue credits from water conservation actions and to recover the conserved water credits at a later time. The Municipal Utilities are such contractors and did receive ICS credits in proportion to their funding contributions to and water conserved by the run. Consistent with the Interim Guidelines and other provisions of the Law of the River[13] the Municipal Utilities and other parties also executed a Delivery Agreement[14] and an exhibit to a previously executed Forbearance Agreement[15].

Internal planning, NEPA compliance, stakeholder consultations, permitting, and materials for the public and media each required information concerning the expected outcomes of water flows on the Lower Colorado River. Reclamation prepared the following planning information to satisfy that need.

Over the course of the Pilot Run, Reclamation estimated feed water to the YDP would total approximately 37,980 acre-feet of water with a salinity of about 2,664 parts per million (ppm)[16]. Water treatment by the plant would result in a total of about 22,400 acre-feet of product water during the run with an estimated salinity of 160 ppm. About 700 acre-feet of water would be used by the YDP for internal purposes (e.g.,

[13] The Colorado River is managed and operated under numerous compacts, Federal laws, court decisions and decrees, contracts, and regulatory guidelines collectively known as the "Law of the River." This collection of documents apportions the water and regulates the use and management of the Colorado River among the seven basin states and Mexico.

[14] See Appendix 5.6 for the Delivery Agreement.

[15] See Appendix 5.7 for Exhibit P to the Forbearance Agreement.

[16] Salinity is expressed as total dissolved solids in ppm. 2,664 ppm is the average (mean) salinity of the bypass flow at the Southerly International Boundary for calendar years 2004 through 2008 based on the sum of constituents methodology.

lime slaking). The remaining 21,700 acre-feet of YDP product water would be discharged into the Colorado River and included in water deliveries to Mexico.

In addition, about 7,300 acre-feet of untreated bypass flow would be discharged to the Colorado River via the MODE 1 Diversion/Return Facility. This would result in an estimated 29,000 acre-feet of water being conserved over the duration of the Pilot Run (21,700 + 7,300) at about 790 ppm.

Byproducts of YDP operation include slurry and concentrate. Slurry is produced in the water pretreatment process prior to desalination and is composed primarily of water and calcium carbonate. Slurry is transferred via pipeline to evaporative and disposal cells about 22 miles southeast of the YDP. Concentrate consists of water and salts that have been removed during the desalination process. Concentrate is discharged to the MODE downstream of the YDP where it mixes with untreated bypass flow. This is consistent with the terms of Minute 242[17] of the 1944 Water Treaty. For the Pilot Run, Reclamation estimated slurry output would total 190 acre-feet and concentrate would total 9,600 acre-feet. The net result was estimated to be a decrease in bypass flow volume at the Southerly International Boundary (SIB) of 29,880 acre-feet of water with an increase in salinity of about 540 ppm[18]. In addition, in accordance with Minute 316 to the 1944 Water Treaty, the U.S., Mexico, and a partnership of non-governmental environmental organizations committed each to arrange for 10,000 acre-feet of water to be conveyed to the Bypass Drain (30,000 acre-feet in total). Figure 2 provides an overview of expected water flows associated with the run. Table 2 depicts both expected flows and salinities for the run.

[17] Minute 242, "Permanent and definitive solution to the international problem of salinity of the Colorado River," August 30, 1973.

[18] One ppm is the equivalent of one inch in 16 miles or one minute in two years.

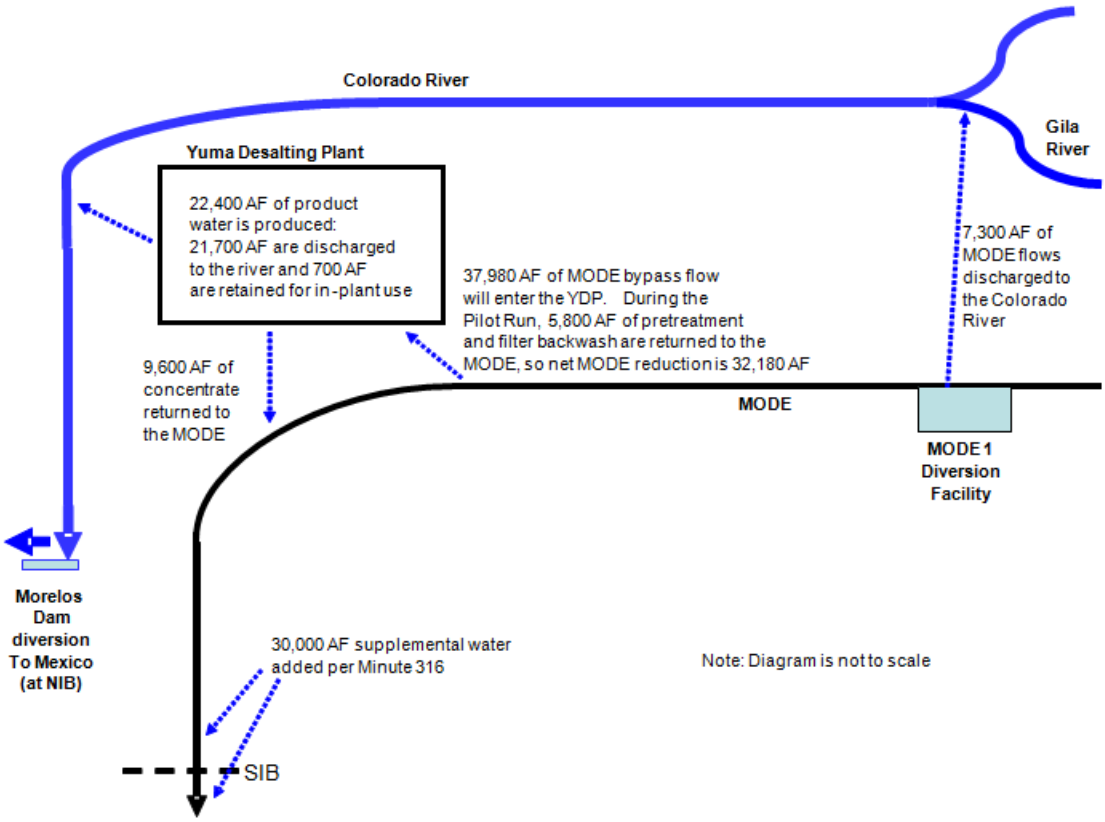


Figure 2. Expected flows.

Table 2. Expected Water Flows and Salinities

Expected Water Flows for the Pilot Run	Volume (acre-feet)	Salinity (ppm)[19]
Average Bypass Drain flow at SIB absent the Pilot Run[20]	106,897	2,664
Feed water into the YDP	-37,980	2,664
Untreated bypass flow to the River	-7,300	2,664
Concentrate from the YDP to the MODE	+9,600	7,280
Pretreated/backwash water returned to the MODE[21]	+5,800	2,280
Total	**77,017**	**3,204**

[19] Salinity is expressed as total dissolved solids in parts per million (ppm) based on the sum of constituents methodology.

[20] The Bypass Drain flow at the SIB over the past 5 years (2004-2008) has averaged approximately 106,897 acre-feet per year with a salinity of 2,664 ppm.

[21] The pretreatment of water at the YDP does result in some decrease in salinity prior to reverse osmosis desalination.

2.2 On-site YDP Preparation Activities

2.2.1 YDP's Water Treatment Process

On-site preparation included preparing equipment to operate, testing components and systems, making any necessary adjustments or repairs, securing and training operators, obtaining chemicals, and arranging for electrical power. On-site preparation required approximately 12 months to complete.

Although some equipment in the YDP had changed since its original construction, its purpose, fundamental design, and water treatment processes remain the same as when it was constructed. A summary level schematic[22] of the YDP's water treatment processes is presented in figure 3.

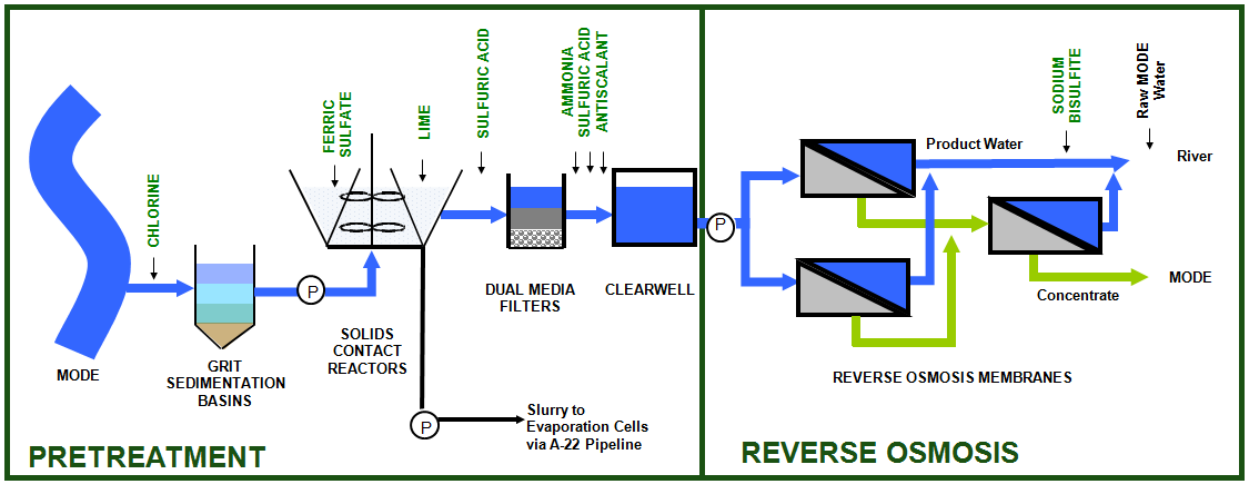


Figure 3. YDP water treatment process.

The pretreatment process begins with feed water from the MODE, passing through traveling screens to prevent large debris from entering the system. Feed water is then dosed with chlorine to halt the growth of algae and microorganisms.

[22] See Appendix 5.8 for a detailed process flow diagram associated with the Pilot Run.

The pretreatment process continues in the grit sedimentation basins, where the water flow is slowed to allow large particulate matter to settle out. Next, the feed water is pumped to the Solids Contact Reactor (SCR). In the SCR, ferric sulfate and lime are added, which results in coagulation, flocculation, and softening. These chemical processes cause particulate in the water to drop to the floor of the SCR. Treated water from the SCR travels to dual media gravity filters (DMGF) where remaining particulate in the water is removed. The media filters utilize silica sand and anthracite coal. Water from the DMGFs is dosed with ammonia, sulfuric acid and anti-scalant prior to reaching the clearwell. Ammonia converts the remaining chlorine in the water to chloramines to protect the cellulose acetate reverse osmosis (RO) membranes. Sulfuric acid is utilized to adjust the pH for optimal conditions for reverse osmosis. Anti-scalant helps prevent scale from forming on the RO membranes.

Pretreated water is stored in the clearwell. This water is largely particulate free, but still saline. The dissolved salts are removed through RO. Water under pressure is applied to the semi-permeable RO membranes, allowing the nearly pure water to pass through the membrane[23].

[23] The YDP is equipped with two reverse osmosis water treatment systems - One manufactured by Hydranautics, the other by Fluid Systems. Fluid Systems was selected for the Pilot Run primarily because Hydranautics was utilized for YDP's 2007 demonstration run.

Photograph 2. Fluid Systems reverse osmosis area.

Subsequently, product water is dosed with sodium bisulfite to neutralize any residual chloramines and the product water is then transported via gravity through 2,800 feet of concrete-lined canal and discharged into the Colorado River. The concentrate is discharged from the YDP into the MODE downstream of the YDP's intake via an underground pipe, where it mixes with untreated drainage water. This mixture then proceeds down the MODE to the Bypass Drain, a concrete-lined canal, to the SIB.

Operation of the YDP includes the discharge of untreated drainage water (bypass flow) from the MODE into the Colorado River. This discharge increases the total volume of bypass flow conserved by operation of the YDP and is consistent with how the YDP is designed. This discharge can be accomplished either at the YDP or at the MODE 1 Diversion/Return Facility which is approximately 10 miles east of the YDP. The former is achieved by diverting untreated drainage water directly from the MODE into the canal used to discharge YDP product water into the Colorado River. For the Pilot Run the MODE 1 Diversion/Return Facility was utilized. This allowed the

diversion of untreated drainage water to be more closely coordinated with overall water management activities performed by the YAO in the Yuma area.

2.2.2 On-Site Preparation Focus Areas

On-site YDP preparations for the Pilot Run focused on the following areas:

- One-time projects
- Special situations
- Hiring, training, and certification of supplemental personnel
- Obtaining power
- Chemical receiving (initial inventories)
- Membrane receiving and loading
- Equipment and systems preparation, testing, and repair

2.2.3 One-Time Projects

Seven one-time projects were necessary in order to conduct the Pilot Run. These included (1) upgrading the plant's chlorine receiving facility, (2) replacing shafts on high-pressure reverse osmosis pumps, (3) installing a temporary ammonia system, (4) installing a residual chloramines removal system, (5) replacing selected concentrate piping segments, (6) replacing flow meters, and (7) correcting the MODE 2 blend system.

(1) Chlorine Receiving: The YDP is designed to receive anhydrous chlorine from 90-ton rail cars. The railroad spur that serves the YDP requires repair. In order to accommodate the timing requirements associated with the Pilot Run and avoid the expenditures associated with repairing the rail spur at this time, an alternative approach was developed, using 20-ton tankers of chlorine delivered via semi tractor trailer trucks. A specialized facility was designed and constructed to accommodate these trucks.

Photograph 3. Chlorine tanker facility.

(2) RO Pump Shafts: The YDP is equipped with 14 high-pressure RO pumps. These are the pumps that force saline water against the semi-permeable RO membranes. Pure water molecules pass through the membranes. Dissolved salt molecules are too large to do so. In order to operate at one-third of full capacity, two and a half to three RO pumps are required. The aluminum-bronze shafts on all pumps designated as primary for the Pilot Run were replaced with 316 stainless steel shafts to better ensure performance. 316 stainless is an alloy well suited for desalination. The high-pressure RO pumps designated as backup for the run were serviced and tested but retained their original aluminum-bronze shafts.

Photograph 4. High-pressure reverse osmosis pumps.

(3) Ammonia System: In the 1990s YDP engineers determined that cellulose acetate RO membranes can rapidly degrade if exposed to chlorine in the presence of corroding iron. Pretreated water exiting the dual media gravity filters contains residual chlorine. In order to protect the RO membranes, effluent from the dual media gravity filters is dosed with ammonia prior to reaching the clearwell. This action converts chlorine to chloramines, which do not adversely impact the RO membranes. While the YDP was already equipped with such a system, it is a design deficiency[24]. Installation of a temporary ammonia system was less costly than resolution of the design deficiency.

Photograph 5. Instrumentation associated with the temporary ammonia system.

[24] When the YDP ceased operating in 1993, engineers and other technical personnel identified some plant equipment that was not operating according to design specifications. These findings came to be known as design deficiencies.

(4) Chloramines Neutralization System: A chloramines neutralization system was installed so that YDP product water could be dosed with sodium bisulfite prior to being discharged into the canal that terminates at the Colorado River. This dosing neutralizes remaining trace levels of chloramines (and any residual free chlorine) in YDP product water prior to it reaching the Colorado River. This ensures discharge permit[25] compliance and protects river flora and fauna from exposure to oxidizers.

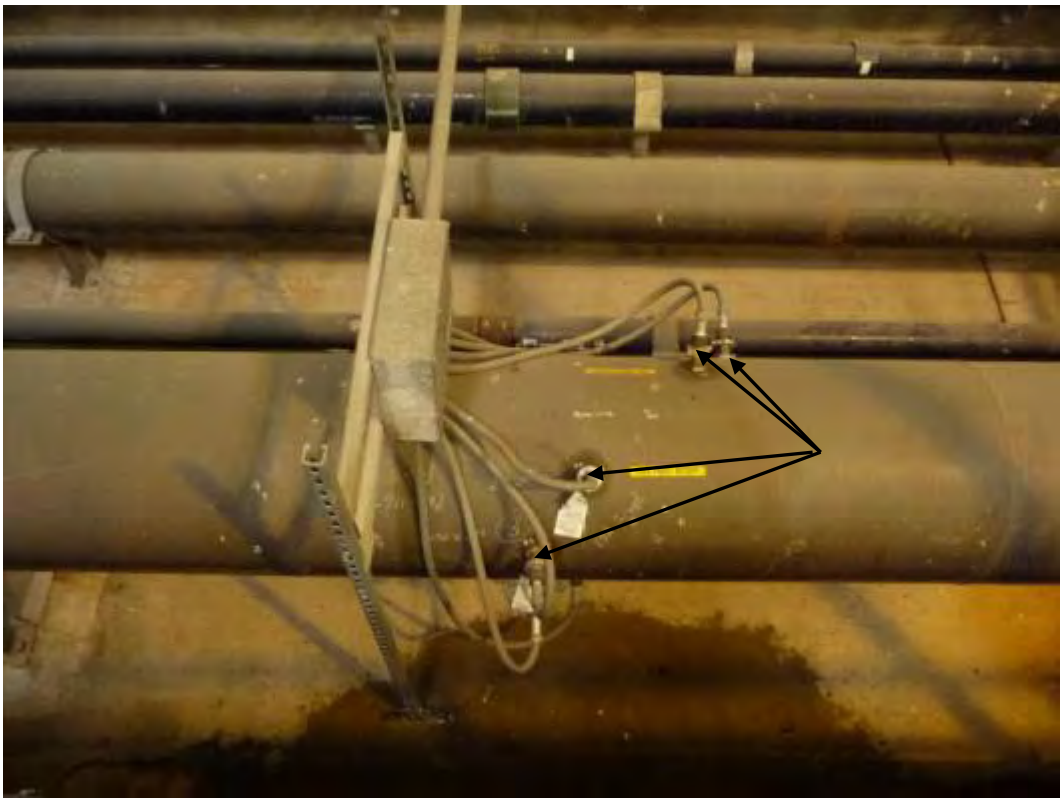
Photograph 6. Chloramines neutralization equipment.

[25] The discharge permit for the YDP limits total residual chlorine concentrations to a daily maximum of 11 parts per billion (ppb) and a monthly average of 5 (ppb). One ppb is equivalent to one second of time in 32 years.

(5) Piping Segments: When the YDP initially operated in 1993 and during the demonstration run of 2007, leaks in the plant's aluminum-bronze piping did occur. These leaks were particularly problematic in portions of the piping that convey concentrate. These segments were replaced with 316 stainless steel piping. In addition, concentrate piping that feeds the plant's energy recovery units was flanged off. The cost of replacing this piping would have exceeded the energy savings associated with one-third capacity operation of the plant.

Photograph 7. A replaced segment of concentrate piping.

(6) Flow Meters: The existing flow meters were no longer functional. To ensure the accurate measurement of YDP feed water, product water, and concentrate, all flow sensors and meters were replaced in preparation for the Pilot Run. Accusonic model 7510+ meters were utilized. Sensors and meters were linked to the YDP's distributed control system.



Photograph 8. An installed flow meter and sensors.

(7) *Blend System:* The MODE 2 canal is the conveyance facility used to transfer plant product water via gravity from the YDP to the Colorado River. At the origin of the MODE 2 canal, a structure was built when the YDP was constructed that allows untreated drainage water to be mixed with YDP product water prior to discharge into the river. This structure was redesigned and rebuilt, and it served as a back-up facility during the Pilot Run if the MODE 1 Diversion/Return Facility was ever unavailable. Temporary solutions were considered and cost estimated. Each temporary solution was more costly than permanent resolution of this design deficiency.

Photograph 9. New MODE 2 blend flow system under construction.

2.2.4 Preparing for Special Situations

During the conceptual planning for the Pilot Run, the plant's high-pressure aluminum-bronze piping required special attention.

The YDP contains more than 11,000 linear feet of aluminum-bronze piping, varying from two to 78 inches in diameter. About 83% of this piping is considered high-pressure piping. When the YDP initially operated in the early 1990s and again in 2007, the plant's high-pressure aluminum-bronze piping experienced some leaks. For example, during the demonstration run of 2007, nine leaks occurred. Six of these leaks were successfully repaired. Repeated attempts to repair the three remaining leaks proved unsuccessful. Equipped with this experience and a piping assessment from CH2M HILL[26], Reclamation developed a risk-mitigation plan[27] for the piping and all plant operations. The plan included 18 elements such as installing additional venting valves, modifying instrumentation trip settings, installing video cameras for continuous monitoring, replacing some piping with 316 stainless steel segments, and training all personnel (Reclamation and contractor) at the YAO. The training focused on the Controlled Access Zone (CAZ).

[26] "Aluminum-Bronze Piping Assessment for the Yuma Desalting Plant," CH2M HILL, December 2007.

[27] See Appendix 5.9 for a summary of the risk mitigation plan.

The CAZ was put into effect on February 12, 2010. The CAZ encompassed all portions of the YDP. Only personnel whose job responsibilities required working in the CAZ were allowed entrance. These personnel, who had completed the specialized CAZ training, were identified by stickers on their hard hats. Personnel who required temporary access to the CAZ but had not completed the specialized CAZ training, were provided escorts while in the CAZ[28].

Photograph 10. YDP Controlled Access Zone.

2.2.5 Personnel Necessary for the Pilot Run

The YAO is not staffed for operations and maintenance of the YDP. Supplemental contractor personnel were hired for the Pilot Run. No new Reclamation personnel were hired. However, work assignments for existing Reclamation personnel were modified to support the run.

[28] See Appendix 5.10 for additional information regarding the Controlled Access Zone for the YDP Pilot Run.

KCorp Technology Services, Inc (KTS) is Reclamation's Operations and Maintenance (O&M) services contractor for the YDP. KTS operates and maintains the Water Quality Improvement Center (WQIC) [29] at the YAO and maintains the YDP when it is not operating. KTS's contract includes an option to operate the YDP if Reclamation elects to do so, such as was the case for the Pilot Run. Initial planning by Reclamation indicated that up to 23 supplemental O&M personnel would be required.

Ultimately 20 personnel were required and utilized in the following classifications:

Table 3. Supplemental Personnel

Classification	Count
Chemical Operator	1
Control Board Operator	4
Electrician	2
Environmental Technician	1
Instrument Technician	2
Laboratory Technician	1
Mechanic	2
Operations Supervisor	1
Plant Operator	4
Quality Assurance Officer	1
Supply and Materials Management Technician	1

Screening, drug testing, and interviewing of candidates by KTS began in December 2009. All supplemental personnel were hired by the end of February, 2010. This hiring timing provided sufficient lead time in advance of commencing the Pilot Run for the supplemental personnel to complete necessary training and assist in preparing plant equipment.

[29] The Water Quality Improvement Center (WQIC) is an advanced water treatment research facility. Along with other systems, it includes an approximately 1/100th scale version of the YDP called Pilot System 1. Treated water from the WQIC provides the YAO with potable water, service water, and fire protection water when the YDP is not operating.

To support the Pilot Run (both preparation and conducting the run), the work assignments of 42 existing Reclamation personnel were modified. This included personnel at the YAO, the Regional Office in Boulder City, Nevada, and the Technical Service Center in Denver, Colorado. The personnel who were utilized covered a wide range of expertise including acquisition, contracts management, desalination, engineering, environmental compliance, finance, information technology, legal, maintenance, project management, and safety.

2.2.6 Power

Absent operation of the YDP, the YAO's power consumption averages about 872 megawatt hours (MWh) per month[30]. With the YDP operating at one-third of full capacity, planning estimates anticipated an additional consumption of 3,819[31] MWh per month. Total consumption over the duration of the Pilot Run was anticipated to be approximately 38,877 MWh which makes up about 20% of the O&M budget.

Power for the YDP is physically supplied by the Western Area Power Administration (WAPA)[32] via the Pacific Intertie and Parker-Davis system. Power can be delivered at either the West Wing substation (near Peoria, Arizona) or the Liberty Substation (in Phoenix, Arizona) at either 500 or 230 kilovolts (kV). In addition to power and transmission, WAPA also provides balancing authority and ancillary services.

[30] Based on actual YAO power billings for October 2008 through September 2009; this figure includes 3% wheeling loss.

[31] Operating at one-third of full capacity continuously for 12 months, the YDP loads are as follows: Intake pumps 2,809 MWh; SCRs 871 MWh; RO feed pumps 41,725 MWh; Chemical feed and auxiliary equipment 426 MWh; totals 45,831 MWh ÷ 12 months = 3,819.25 MWh per month.

[32] WAPA is one of four power marketing agencies of the U.S. Department of Energy.

Reclamation's Lower Colorado Region has existing power agreements[33] with WAPA. One agreement is used to provide power for the site of the YAO and for the Protective and Regulatory Pumping Unit (242 well field) regardless of whether or not the YDP is operating. Under the terms of this agreement, WAPA must provide Reclamation power from the most economical sources available.

Reclamation considered negotiating a separate power agreement for the Pilot Run. As this option was investigated, it was determined that it included unacceptable risks. These arrangements typically require power to be paid for regardless of whether or not it is actually used and/or includes monetary penalties for early termination of the agreement. Although not anticipated, it was possible that during the Pilot Run, the YDP might not be operating for an extended period of time. The length of the Pilot Run was also variable. The run could be as short as a year or as long as 18 months. Using the existing power agreement provided the necessary flexibility given the nature of the Pilot Run. In addition, the existing agreement with WAPA allowed for short notice when YDP power demands change. This flexibility minimizes imbalance fees should the YDP be off line for an unscheduled outage or for decreased production when conditions warrant it[34].

[33] Agreement No. 87-BCA-10039 for the supply of capacity and energy and Agreement No. 87-BCA-10047 for transmission service.

[34] Power from the Federal share of Navajo Generating Station for operation of the YDP is available with advance notice.

2.2.7 Chemicals

Water treatment chemicals are typically the largest single cost element associated with the operations and maintenance of a brackish water desalination plant. Planning estimates anticipated about 39% of the O&M budget would be utilized for chemicals. Chemical consumption for the Pilot Run was anticipated as follows:

Table 4. Estimated Chemical Consumption

Chemical	Low dosage consumption (tons)	High dosage consumption (tons)
Ammonia	51	127
Antiscalant	44	89
Chlorine	391	521
Ferric Sulfate	1,042	1,042
Lime	11,088	12,752
Sodium Bisulfite	116	231
Sulfuric Acid	2,205	3,035

The range associated with chemical consumption reflects uncertainty associated with actual dosage/consumption levels[35]. Conducting the run provided necessary data in this regard. Chemical deliveries commenced in December 2009. These deliveries served two purposes. They provided chemicals necessary to test the plant prior to commencing the Pilot Run and provided sufficient inventory on hand for the first several months of operations. Initial chemical deliveries for inventories were completed in April 2010.

[35] The process flow diagram in Appendix 5.8 reflects the high end range of dosage estimates used in planning the Pilot Run.

2.2.8 Membranes

Operating at one-third of full capacity requires 2,016 membranes[36]. If purchased new, these membranes would have cost approximately $4 million[37]. During the early 1990s a full set of Fluid Systems membranes was purchased in anticipation of sustained YDP operations. These membranes remained in storage until the Pilot Run.

Over the past two decades, some membranes were periodically removed from storage and performance tested for extended durations at the WQIC. The membranes performed at or near original specifications during these tests. Accordingly, these membranes were designated for use during the Pilot Run. Nevertheless, using 20-year-old cellulose acetate membranes was uncharted territory for the industry and did present some risk. Should the performance of the membranes seriously degraded during the Pilot Run, the plan was to continue the run at reduced recovery[38]. This would have extended the run and was one of the reasons the Pilot Run planning included a run duration of up to 18 months.

The RO membranes were kept in cold storage in San Diego, California. Each Fluid Systems cellulose acetate membrane is 60" in length, 12" in diameter, and weighs 140 lbs when dry. Transportation of the membranes by semi-tractor trailer truck commenced in December 2009 and was completed in March 2010. Transporting the membranes required 18 semi-tractor trailer truck loads. Membranes were inspected and loaded into the membrane vessels by plant operators as they were received from storage.

[36] 2,304 membranes were loaded for the Pilot Run, however, only 2,016 membranes were necessary at any given time for the one-third capacity operations.

[37] Assumes replacement Fluid Systems membrane (12"x60") costs $2,008 per membrane, 2,106 membranes X $2,008 per membrane = $4,048,128

[38] The recovery rate is the volume of desalinated water produced relative to the volume of feed water into the reverse osmosis membranes.

Photograph 11. Loading one of 2,304 membranes.

2.2.9 Preparing Plant Equipment

Normal and customary maintenance of the YDP includes the performance of recurring preventative maintenance (PM) work orders covering all equipment on the 60-acre YAO site. Work on PM work orders was temporarily suspended in late 2009. This allowed the contractor personnel to start inspecting, testing, repairing, and tuning YDP equipment that was to be used during the Pilot Run. Supplemental contractor personnel hired for the run joined this effort after completing their training.

A total of approximately 53,000 contractor labor hours were necessary to prepare YDP equipment and systems. Equipment for the Pilot Run was designated as follows:

Table 5. YDP Equipment Designations

Equipment	Designation	Equipment	Designation
Intake traveling screen 1	Backup	Ferric metering pumps 1, 2	None
Intake traveling screen 2	Primary	Ferric metering pumps 3, 4	Primary
Chlorine evaporator 1	Primary	Ferric metering pumps 5, 6	Backup
Chlorine evaporators 2, 3	Backup	Solids contact reactor 1	None
Chlorinators 1, 2	Backup	Solids contact reactor 2	Primary
Chlorinators 3, 4	Primary	Solids contact reactor 3	Backup
Standby chlorinator	Backup	Sludge storage tanks 1, 2	Primary
Sedimentation basins 1, 2	Backup	Sludge pumps 1, 2	Primary
Sedimentation basins 3, 4	Primary	Dual media filters 1, 2, 3	None
Intake pump 1	Primary	Dual media filter 4	Backup
Intake pump 2	Backup	Dual media filters 5, 6, 7	Primary
Intake pumps 3 through 5	None	Sump pumps 1, 2, 3	Primary
Lime silos 1, 2	Primary	Ammoniators 1, 2	Primary
Lime silos 3, 4	Backup	Ammonia pumps 1, 2	Primary
Lime slakers 1, 2	Primary	High-pressure pumps 4, 8, 9, 10	Primary
Lime slakers 3, 4	Backup	High-pressure pumps 3, 11	Backup
Lime slurry tank 1	Backup	High-pressure pumps 1, 2, 12 through 17	Primary
Lime slurry tank 2	Primary	Reverse osmosis control blocks 11 through 16	Backup
		Reverse osmosis control blocks 27 through 34, 49 through 52, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91	Primary

Overall, YDP equipment condition was as expected for a plant that had been maintained but largely not operated since 1993. Other than the seven one-time projects for the Pilot Run, no unexpected work was required on the plant[39].

As expected, because lime is corrosive the area of the plant that required the most maintenance was the YDP's lime handling and processing equipment. Lime handling and processing at the YDP takes place in four steps: lime unloading from semi-tractor trailer trucks, lime storage, batch processing, and injection of lime slurry (slaked lime) into the solids contact reactors. Major maintenance activities included modifying piping to allow the use of existing blowers for truck deliveries instead of rail car deliveries, replacing cone gaskets in two of the four lime silos, installing added vibrators to all lime silos, fabricating and installing new skins for two of the four lime slakers, and the validating software programming associated with the operation of the lime handling and processing equipment. For the demonstration run in 2007, polymers were used and tested instead of lime.

2.2.10 Shakedown Testing

After individual pieces of equipment were made ready for operation, they were tested and adjusted to ensure they were operating within specifications. Subsequently, the shakedown testing commenced. When water treatment plants are brought on line, shakedown testing begins with the equipment at the beginning of the water treatment process (e.g., traveling screens at intake and initial chlorination). Once that equipment is performing satisfactorily, the equipment that is next sequentially in the water treatment process is tested (e.g., grit sedimentation basins).

Shakedown testing of the YDP was completed as scheduled on May 2, 2010 and the Pilot Run commenced on May 3, 2010. By May 5, 2010 the YDP had reached one-third of full capacity operation.

[39] Two unanticipated and more time consuming repairs were required for the demonstration run in 2007. These repairs were patching and sealing a portion of the 72" diameter underground pipe that conveys water from the grit sedimentation basins to the solids contact reactor and relining the effluent pipes for the dual media gravity filters. Both repairs performed well and without incident during the Pilot Run.

After shakedown testing, the original schedule called for up to four weeks of pretreatment stabilization and then up to an additional four weeks for ramp up of reverse osmosis water production to one-third capacity operation. These were largely accomplished during shakedown testing, resulting in achieving one-third capacity plant operation nearly seven weeks ahead of the original schedule.

Pilot Run preparations were completed on May 2, 2010. Collaboration, consultations, compliance, and other external activities required approximately 19 months to complete. One-time projects and the on-site preparation of YDP equipment and systems required approximately 12 months to complete.

No accidents or safety incidents occurred during the preparations.

2.2.11 Preparation Costs

Table 6 is a summary of the budgeted costs to prepare for the Pilot Run.

Table 6. Total Preparation Costs

Preparing for the Pilot Run	Budget	Actual	Difference
One-time projects	$ 2,605,000	$ 2,477,035	$ 127,965
Reclamation labor	$ 2,751,853	$ 2,011,434	$ 740,419
Reclamation other	$ 0	$ 104,293	($ 104,293)
Contract labor and services[40]	$ 1,144,584	$ 1,048,131	$ 96,453
Materials, supplies, and parts	$ 130,500	$ 102,987	$ 27,513
Total	**$ 6,631,937**	**$ 5,743,880**	**$ 888,057**
Reclamation	*$ 5,356,853*	*$ 4,592,762*	*$ 764,091*
Municipal Utilities	*$ 1,275,084*	*$ 1,151,118*	*$ 123,966*

The total budget for preparing for the Pilot Run was $6,631,937. Financial responsibility for preparing for the Pilot Run was jointly shared by Reclamation and the Municipal Utilities.

Reclamation was financially responsible for one-time projects, the labor of Reclamation personnel making preparations for the Pilot Run, and other miscellaneous costs such as a $100,000 payment to Mexico for extraordinary maintenance of the Bypass Drain in Mexico in accordance with the Joint Report of the Principal Engineers and Minute 316 to the 1944 Water Treaty. Reclamation's share of the $6,631,937 budget was $5,356,853.

The Municipal Utilities were financially responsible for contract labor and services, as well as materials, supplies, and parts used to prepare the YDP to operate. The Municipal Utilities share of the $6,631,937 budget was $1,275,084.

The final cost for the preparation phase was $5,743,880 or $888,057 (13.4%), less than

[40] Total of $1,144,584 budgeted reflects $814,584 as set forth in the Funding Agreement, plus $330,000 from the Municipal Utilities as set forth in the Environmental Compliance Funding Agreement.

expected. This was primarily the result of the condition of the YDP (preparing plant equipment and systems to operate proved less challenging than anticipated).

Table 7 provides information regarding labor hours necessary for the O&M contractor personnel to prepare each portion of the plant. This data is exclusive of work performed on the seven one-time projects for the run.

Table 7. O&M Contractor Plant Preparation Work by Area of the YDP

Area #	Area Description	O&M Labor Hours	% of Effort
01	Intake and Grit Sedimentation	3,870	7.3%
02	Solids Contact Reactors	9,904	18.6%
03	Slurry Handling	1,732	3.3%
04	Dual Media Gravity Filters	3,775	7.1%
05	Ammonia	55	0.1%
06	Clearwell and RO Pumps	5,438	10.2%
07	Piping and RO Process	7,876	14.8%
08	Energy Recovery	1,160	2.2%
09	Chlorine Handling and Processing	4,048	7.6%
10	Lime and Ferric Handling	14,090	26.5%
11	Service Water	0	0%
12	Sulfuric Acid	641	1.2%
13	Membrane Cleaning	266	0.5%
14	Switchyard	0	0%
16	Water Quality Improvement Center	0	0%
18	Septic and Buffer Areas	0	0%
21	A22 Pipeline and Site	216	0.4%
25	MODE 2 Canal and Discharge	67	0.1%

About 33% of contractor labor hours were expended preparing pretreatment equipment, about 27% were expended preparing RO-related equipment, and the remaining 40% expended on support systems and chemical handling.

3.0 Conducting the Pilot Run

The Pilot Run commenced as scheduled on May 3, 2010. Operations ceased on March 26, 2011. The plant operated continuously for 328 days. Over the course of the run, 30,496 acre-feet of water were conserved. This includes 22,666 acre-feet of YDP product water and 7,830 acre-feet of untreated drainage water. This section of the report provides information regarding the outcome of the Pilot Run.

3.1 Achieving the Purpose

Operation of the YDP ceased on March 26, 2011, because the purpose and need for the run had been accomplished: The YDP had been operated at sufficient flow and duration to gather performance and cost data, determine whether any additional corrective actions to plant design or equipment were necessary, and test changes to the plant that had already been implemented. In addition to successfully accomplishing the purpose and need, no accidents involving Reclamation employees, contractor personnel or visitors occurred. The plant produced water continuously achieving a 100% on-stream factor during the Pilot Run. The plant also successfully complied with Federal, State, and local requirements.

3.2 Plant Performance

The Pilot Run represents a noteworthy milestone in the history of the YDP. The plant operated continuously for 328 calendar days. Prior to this the YDP's longest duration of continuous operation occurred when the plant first operated from July 31, 1992, to January 15, 1993, a total of 168 days.

No major equipment problems occurred during the Pilot Run. Pretreatment removed particulate as designed and appropriately protected the RO membranes from fouling. The RO portion of the plant also performed as designed, effectively desalinating water. Plant operators were able to control plant systems and water chemistry. Maintenance personnel were not required to perform any extraordinary repairs. Changes in the composition of feed water to the plant, the result of high winds, seasonal variations, and groundwater from different areas did not adversely impact

operations. Inspections of plant equipment performed after completion of the Pilot Run revealed expected wear and tear.

Additional details regarding performance of the YDP during the Pilot Run are discussed in the remaining pages of section 3 of this report.

3.2.1 One-Time Projects

Seven one-time projects were completed prior to commencing the Pilot Run. These projects included upgrading the plant's chlorine handling and processing, replacing shafts on high-pressure reverse osmosis pumps, installing a temporary ammonia system, installing a temporary residual chloramines removal system, replacing selected concentrate piping segments, replacing flow meters, and correcting the MODE 2 blend system. During the run, six of these projects performed as designed and without incident. The seventh project (MODE 2 blend system) was not used during the run.

For the Pilot Run a specialized facility was designed and constructed to accommodate 20-ton tankers of chlorine instead of 90-ton rail cars. Over the course of the run, 20 tankers of chlorine were used. No leaks or other chlorine processing problems occurred.

The aluminum-bronze shafts of the RO pumps that were designated as primary for the run were replaced with stainless steel shafts. The replacement shafts did not require any maintenance or adjustment during the run.

Another one-time project for the Pilot Run was use of a temporary ammonia system. This system was problem free, requiring only routine preventative maintenance. The system delivered nearly 134 tons of ammonia, which is used to convert chlorine to chloramines to protect the cellulose acetate membranes.

Another temporary system built and used for the Pilot Run was one to neutralize any remaining chloramines in YDP product water prior to the water being discharged into the River. This system delivered over 207 tons of sodium bisulfite and required only routine preventative maintenance.

The segments of aluminum-bronze piping that were most prone to leaking were replaced prior to commencing the Pilot Run. The replaced segments were 316 stainless steel and these segments did not experience any leaks during the run.

All feed water, product water, and concentrate flow sensors and meters were replaced for the Pilot Run and linked to the plant's distributed control system. They operated accurately, requiring no maintenance or trouble shooting during the run.

The last one-time project for the Pilot Run was repair of the MODE 2 blend system, the correction of a design deficiency. The MODE 2 blend system was designated as a backup system for the run, and it was not necessary to use that system. That system, however, was successfully tested prior to commencing the run (see Section 2.2.3).

3.2.2 Previous Changes to the Plant

The purpose and need included testing changes to the plant that were implemented while the plant was being maintained. These changes predate Pilot Run preparations. They were made in order to improve plant operations based on the operation of Pilot System 1 in the WQIC, the results of studies performed by Reclamation, and the operation of the YDP in 1992 and 1993. Six noteworthy changes were made to the YDP. Operation of the plant during the Pilot Run tested each of these. All performed as designed, and no alterations to them are planned.

Traveling screens: The YDP was originally constructed with trash racks and moving hooks at the intake of water from the MODE to the plant. The original construction also included traveling screens at the grit sedimentation basins. The racks, hooks, and screens were used to capture trash and large debris. These proved ineffective and were replaced with traveling screens at the MODE water intake along with a conveyor system that transports collected material to trash storage.

Intake pumps: The impellors and bowls of the pumps that move water from the grit sedimentation basins to the solids contact reactors were replaced. This provided increased pumping capacity which was necessary for appropriate process throughput.

Vibrating screens: At the lime batching system, the screens that vibrate were replaced with ones of a different configuration. This improved grit removal, preserved lime slurry, and allowed for the removal of the grit removal belt conveyor system.

Sulfuric acid: This chemical is used for pH control prior to the dual media gravity filters and the clearwell. When the YDP was originally constructed, it was equipped with a dilute acid system. This was replaced with a concentrated acid system that allows for improved dosage control and results in lower operating costs.

Ammonia: The YDP was originally equipped with a system that used sulfur dioxide to remove chlorine present in the partially treated water moving from the clearwell to the reverse osmosis membranes. This system was replaced with an ammonia injection system. Ammonia converts residual chlorine to chloramines; the latter do not pose a risk to cellulose acetate membranes. Ammonia provides better membrane protection at less cost than using sulfur dioxide.

Plant air: The YDP is equipped with large air compressors that serve the plant, as well as service air needs throughout the 60-acre YAO site (e.g., for the maintenance shops). The two original compressors were decommissioned and three new variable speed compressors were installed so that the system has sufficient capacity for YAO's needs while the YDP is operating.

3.2.3 Water Produced and Conserved

Table 8. Water Production and Conservation

Overall Production (acre-feet)	Total YDP product water produced	In plant product water use[41]	Net YDP product water to River	Untreated bypass flow to River	Total water conserved
May	1,659	42	1,617	758	2,375
Jun	1,973	44	1,929	1,260	3,189
Jul	2,225	58	2,167	1,244	3,411
Aug	2,319	78	2,241	966	3,207
Sep	2,233	64	2,169	0	2,169
Oct	2,317	48	2,269	0	2,269
Nov	2,190	39	2,151	0	2,151
Dec	2,212	45	2,167	0	2,167
Jan	2,184	51	2,133	1,889	4,022
Feb	2,050	81	1,969	324	2,293
Mar	1,887	33	1,854	1,389	3,243
Total Run	**23,249**	**583**	**22,666**	**7,830**	**30,496**

Total water conserved represents the sum of net YDP product water discharged to the River, plus untreated bypass flow diverted to the River at the MODE 1 diversion facility. During the period of May 3, 2010, through March 26, 2011, a total of 30,496 acre-feet of water were conserved and included in water deliveries to Mexico. This includes 22,666 acre-feet of YDP product water and 7,830 acre-feet of untreated bypass flow. ICS credits are accounted for and administered by the Lower Colorado Region Water Accounting and Conservation Group.

An estimated 29,000 acre-feet of water was expected to be conserved during the Pilot Run, and included in water deliveries to Mexico. Actual water conserved and delivered exceeded that estimate by 5.2%.

During planning for the Pilot Run, it was estimated that water conserved would be about 74.8% YDP product water (21,700 acre-feet) and about 25.2% (7,300 acre-feet)

[41] Uses include chlorine and ammonia injection and lime slaking.

untreated bypass flow. Actual results were close, 74.3% YDP product water (22,666 acre-feet) and 25.7% (7,830 acre-feet) untreated bypass flow. The ratio of product water to untreated bypass flow is based on the principle that this blend should mimic river salinity. This ratio was planned for the Pilot Run based on historic river and bypass flow salinity, and that remained static during the run. Should the YDP operate again in the future, the blend ratio would change as actual river salinity conditions vary over time.

From September 2010, through December 2010, untreated bypass flow was not added to the Colorado River in order to comply with the salinity differential in accordance with Minute 242 to the 1944 Water Treaty.

3.2.4 On-Stream Factors

Table 9. On-Stream Factors

On-stream Factors (%)	Pretreatment	Reverse Osmosis
May	100%	100%
Jun	100%	100%
Jul	100%	100%
Aug	100%	100%
Sep	100%	100%
Oct	100%	100%
Nov	100%	100%
Dec	100%	100%
Jan	100%	100%
Feb	100%	100%
Mar	100%	100%
Total Run	**100%**	**100%**

The on-stream factor is the ratio of actual operating hours over a given period of time to a hypothetical maximum. For example, if a plant operated for 10 months over a 12-month period of time, that plant's on-stream factor would be 83% (10 months ÷ 12 months). The YDP operated continuously during the Pilot Run, an on-stream factor of 100%. They were no planned or forced outages.

On four occasions an RO pump tripped off line briefly, reducing, but not stopping, water production. This occurred twice on July 25, 2010, and once on August 24 and August 25, 2010. All these were heat related and the tripped pumps were back in service in 20 minutes to three hours. At no time were all RO pumps off-line. When the trips occurred, ambient temperatures were 115 degrees or more, and the heat index was as high as 145 degrees.

3.2.5 Key Pretreatment Parameters

Table 10. Key Pretreatment Parameters

Key Pretreatment Parameters	Bypass flow at intake (Nephelometric turbidity units) (average)	RO feed water (silt density index units) (average)
May	7.0	2.2
Jun	8.3	4.3
Jul	8.0	2.3
Aug	10.8	3.2
Sep	13.9	2.3
Oct	9.8	2.6
Nov	6.6	2.8
Dec	6.9	2.3
Jan	5.7	1.6
Feb	10.1	1.4
Mar	9.8	1.7
Total Run	**8.8**	**2.4**

Turbidity is a measurement of the amount of suspended particulate in water. The Silt Density Index (SDI) is a measurement of the fouling potential to the RO membranes of suspended particulate in water.

At the YDP, water pretreatment equipment (grit sedimentation basins, solids contact reactors, dual media gravity filters) is designed to significantly reduce the level of suspended particulate in water in order to reduce potential fouling for the RO membranes. Water pretreated but still saline is stored in the clearwell and pumped to the reverse osmosis membranes for desalination.

Elevated turbidity in table 10 is the result of high winds in the area and/or fluctuating volumes in the MODE. The YDP is equipped to handle feed water with high turbidity. For example, on August 26, 2010, severe thunderstorms occurred in the Yuma Area. The National Weather Service reported wind gusts up to 60 mph, two inches of rain, and three-quarters of an inch of hail. As a result of the storm, turbidity in the MODE reached 176 Nephelometric

turbidity units (NTU) or more than 70 times the average turbidity level over the duration of the Pilot Run. During this event the YDP continued operating without incident.

SDI averaged 2.4, well within the acceptable range. The elevated SDI in June, 2010, was the result of equipment issues associated with measuring chlorine and controlling dosage. These issues were quickly resolved and SDI levels subsequently returned to nearly ideal values.

3.2.6 Key Reverse Osmosis Parameters

Table 11. Key Reverse Osmosis Parameters

Key RO Parameters	Bypass flow at intake (ppm[42])	Clearwell and RO feed water (ppm[35])	Product Water (ppm[35,43])	Recovery (%)	Salt Rejection (%)
May	2,808	2,404	203	69.7	94.9
Jun	2,922	2,508	202	70.3	95.2
Jul	2,515	2,147	172	70.1	95.2
Aug	2,516	2,152	191	70.2	94.7
Sep	2,555	2,150	209	70.1	94.2
Oct	2,475	2,089	217	69.9	93.7
Nov	2,522	2,115	269	69.9	92.9
Dec	2,580	2,173	260	69.4	92.7
Jan	2,787	2,390	305	70.1	92.3
Feb	2,344	1,983	264	70.2	92.0
Mar	2,838	2,434	378	70.2	90.4
Total Run	**2,621**	**2,228**	**241**	**70.0**	**93.5**

Pretreatment at the YDP is designed to make the water reaching the RO membranes as particulate free as possible. Pretreatment however, has relatively little impact on the salinity of bypass flow water. During the Pilot Run, bypass flow water at intake averaged 2,621 ppm. Pretreatment removed an average of 393 ppm resulting in water at the clearwell to feed the RO pumps averaging 2,228 ppm. Product water from RO and discharged to the River averaged 241 ppm over the course of the run.

[42] Values of total dissolved solids are stated in ppm based on Sum of Constituents methodology and represent average (mean) values.

[43] Approximately 58% of the increase in product water salinity in November (over previous run-to-date average salinity) is the result of declining salt rejection of the Fluid System membranes. Approximately 42% of the increase in product water salinity in November was the result of utilizing Hydranautics membranes on November 8th and 9th. Hydranautics membranes were used during the demonstration run of the YDP in 2007.

Salt rejection of the RO membranes averaged 93.5% and did decline over the course of the run from an average of 95.2% to 90.4%. The decline from May, 2010, through March, 2011, and the corresponding increase in salinity of product water is believed to be the result of the age of the membranes. Autopsies of selected membranes were inconclusive.

3.2.7 Other Effluent Data

Table 12. Other Effluent Data

Other Effluent Data	MODE volume at SIB (acre-feet[44])	MODE salinity at SIB (ppm[45])	Concentrate volume (acre-feet)	Concentrate salinity (ppm[46]) (average)	Slurry to A22 (tons[47])
Prep	11,619	2,667	-	-	1,226
May	9,316	3,159	728	7,227	2,646
Jun	6,825	3,676	835	7,647	4,103
Jul	4,885	3,461	949	6,452	4,284
Aug	3,862	3,735	982	6,488	4,147
Sep	10,342	2,929	951	6,325	4,845
Oct	13,801	2,883	990	6,100	4,028
Nov	12,694	2,928	922	6,092	4,280
Dec	11,806	2,711	959	6,125	4,306
Jan	5,902	3,561	932	6,777	4,717
Feb	5,786	3,320	871	5,479	3,555
Mar	6,966	3,424	792	6,595	3,702
Total Run[48]			**9,911**	**6,479**	**44,613**

Over the course of the Pilot Run, 44,613 tons of calcium carbonate slurry were transported via pipeline to the A22 evaporative and disposal cells. See section 3.4 for the discussion of MODE volume and salinity at the SIB.

[44] This is a provisional value. Final data for the volume of the bypass flow will be provided by the IBWC.

[45] Estimated value based on Sum of Constituents (SOC) methodology. Actual values based on Corrected Residual on Evaporation (ROE) methodology +182 ppm (historic average difference for the period 1995 through 2008).

[46] Values based on Sum of Constituents methodology and represent average (mean) values.

[47] Values are tons of solids, exclusive of water. Values indicated include slurry trucked to the A22 site during pipeline outages. Estimated volumes trucked are 176 tons (156,000 gallons) in May and 348 tons (409,400 gallons) in June.

[48] Totals do not include Pilot Run preparation in March and April 2010.

3.2.8 Power Consumption

Table 13. Power Consumption

Power Consumption	Power (MWh)	Cost ($/MWh)
Prep	438.14	32.63
May	3,117.97	31.86
Jun	3,446.37	31.76
Jul	3,503.61	39.83
Aug	3,517.36	37.80
Sep	3,392.54	33.30
Oct	3,539.33	31.93
Nov	3,423.14	31.72
Dec	3,613.65	32.80
Jan	3,599.32	31.27
Feb	3,169.95	31.67
Mar	3,218.20	24.71
Total Run[49]	**37,541.44**	**$32.68**

YDP's power consumption totaled 37,541 MWh at an average price of $32.68 per MWh. Both of these figures are exclusive of power used while preparing for the Pilot Run or after the run to return the plant to pre-run conditions.

Power consumption during the run is consistent with expectations prior to the run, within 1.37% of estimated consumption. The price of power during the run, however, is markedly below expectations during planning. During the planning phase of the Pilot Run, power was expected to cost between $64 and $85 per MWh based on long-range projections from WAPA. Planning occurred prior to the economic downturn and was based on projected electrical demand in the Southwest region that did not materialize. As a result, actual power costs were less than half of the low end of the anticipated cost range.

[49] Totals do not include power used during run preparation in March and April 2010.

Month-to-month variations in the average cost of power reflect variations in the spot market from which WAPA purchased power.

3.2.9 Chemical Consumption

Table 14. Chemical Consumption

Consumed (tons)	Ammonia	Antiscalant[50]	Chlorine	Ferric Sulfate	Lime	Sodium Bisulfite	Sulfuric Acid
Prep	2.2	0	9.9	81.2	1,545.0	0	47.2
May	12.1	11.9	22.0	85.7	1,253.0	19.5	206.0
Jun	11.0	5.3	39.7	97.0	1,100.3	15.4	175.8
Jul	12.1	5.7	31.9	105.0	1,149.0	15.4	182.0
Aug	11.6	6.1	39.5	110.0	1,241.0	19.6	208.0
Sep	13.3	6.4	33.7	120.1	1,208.0	21.6	201.9
Oct	13.0	6.1	36.1	132.0	1,158.1	23.8	209.7
Nov	13.0	6.4	23.2	113.9	1,140.2	19.4	215.8
Dec	12.9	5.5	24.4	111.5	1,002.3	19.4	214.0
Jan	12.1	2.2	21.2	121.4	984.5	19.5	246.6
Feb	10.6	3.9	23.0	102.3	605.3	18.0	218.2
Mar	12.1	4.0	25.2	101.4	826.9	15.9	217.5
Total Run[51]	**133.8**	**63.5**	**319.9**	**1,200.3**	**11,668.6**	**207.5**	**2,295.5**

Chemical consumption is indicated in table 14. Antiscalant, lime, sodium bisulfite, and sulfuric acid consumption all fell within expected consumption ranges developed during planning. Ammonia and ferric sulfate consumption, however, were higher than anticipated and chlorine consumption was lower than anticipated. The specific reasons for higher than expected ammonia and ferric sulfate consumption are unknown. Chlorine consumption was lower than expected because feed water quality was better than anticipated resulting in less chlorine demand.

Month-to-month variations in consumption of each chemical reflect adjustments by operations personnel in order to maintain appropriate plant water chemistry. Decreasing lime consumption is reflected in table 14 for December 2010, through March 2011. The YDP typically uses pebble lime. Raw lime consumption as described by table 14 is

[50] For the Pilot Run, sodium hexametaphosphate was used as the antiscalant and table 14 reflects consumption of that chemical. January consumption is atypically low because antiscalant remaining from the YDP demonstration run (Flocon 260 and Hypersperse MDC220) was used during that month.

[51] Totals do not include chemicals used during run preparation in March and April 2010.

measured by silo volume and converted to tonnage based on constant lime density. While this method accounts for all lime ordered, delivered, and used, it does not account for actual density variations either in the delivered lime (e.g., some is smaller and finer) or variations that might occur while the lime is in silo storage (e.g., settling).

3.3 Additional Plant Performance Data

The purpose of the Pilot Run included gathering performance data. This included data collected on a real time and near real time basis and utilized by plant operators and engineers to monitor and adjust water treatment parameters in the plant. The following graphs represent a sample of that data.

3.3.1 Daily Water Conserved

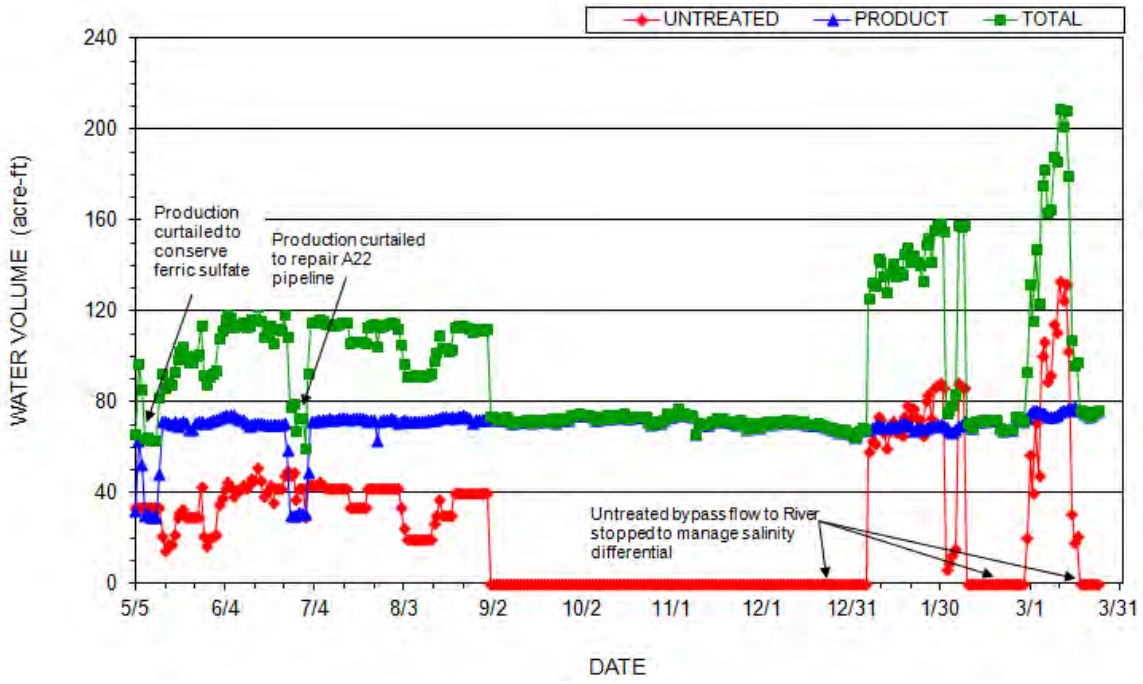


Figure 4. Daily water conserved.

Figure 4 depicts daily water conserved over the course of the run. Blue data points represent YDP product water (after in plant use) that was discharged into the River and included in water deliveries to Mexico. Red data points represent untreated bypass flow that also was included in water deliveries to Mexico, and the green data points represent the combination of the two. Early in the run, production was curtailed in order to conserve ferric sulfate as a result of a delay in the chemical's delivery. Production was also deliberately curtailed during late June to accommodate A22 pipeline earthquake repairs. There was a period during the run in which untreated bypass flow was not included in water deliveries to Mexico in order to manage the salinity differential in accordance with Minute 242 of the 1944 Water Treaty.

3.3.2 Cumulative Water Conserved

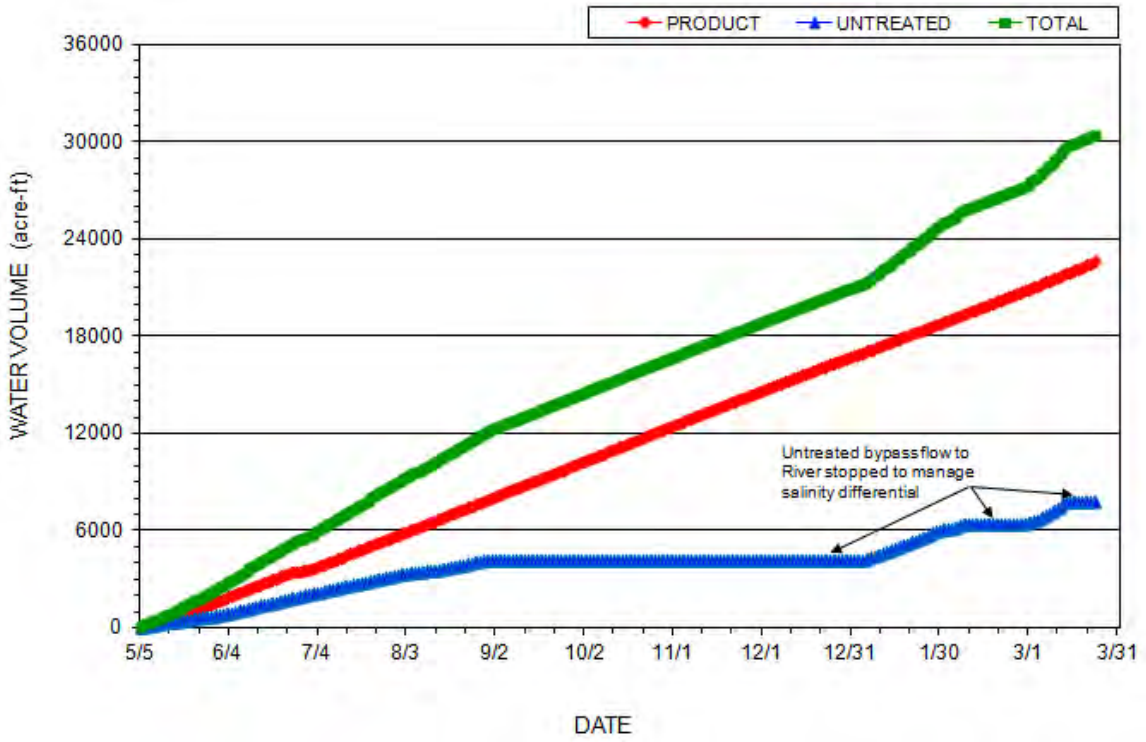


Figure 5. Cumulative water conserved

Figure 5 depicts cumulative water conserved over the course of the Pilot Run. The red line represents YDP product water (after in-plant use) that was discharged into the River and included in water deliveries to Mexico. The blue line represents untreated bypass flow that was also included in water deliveries to Mexico, and the green line represents the combination of the two.

3.3.3 Pretreatment pH

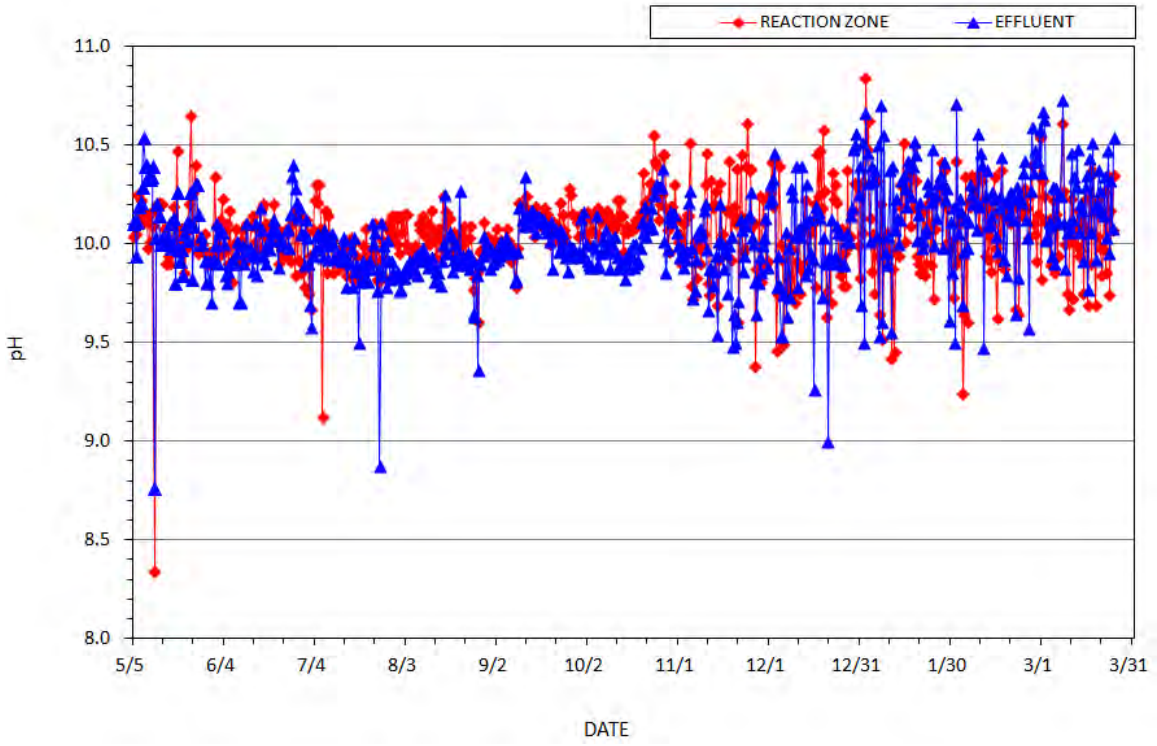


Figure 6. Pretreatment pH.

Figure 6 depicts pH during pretreatment at the solids contact reactor (SCR). Red data points represent daily pH values of partially pretreated water in the reaction zone at the middle of the SCR. Blue data points represent daily pH values of the effluent from the SCR prior to reaching the dual media gravity filters. The target pH for SCR effluent is about 10. Significant deviations from this range typically represent measurement issues associated with the buildup of scale on pH probes.

3.3.4 Pretreatment Solids Concentration

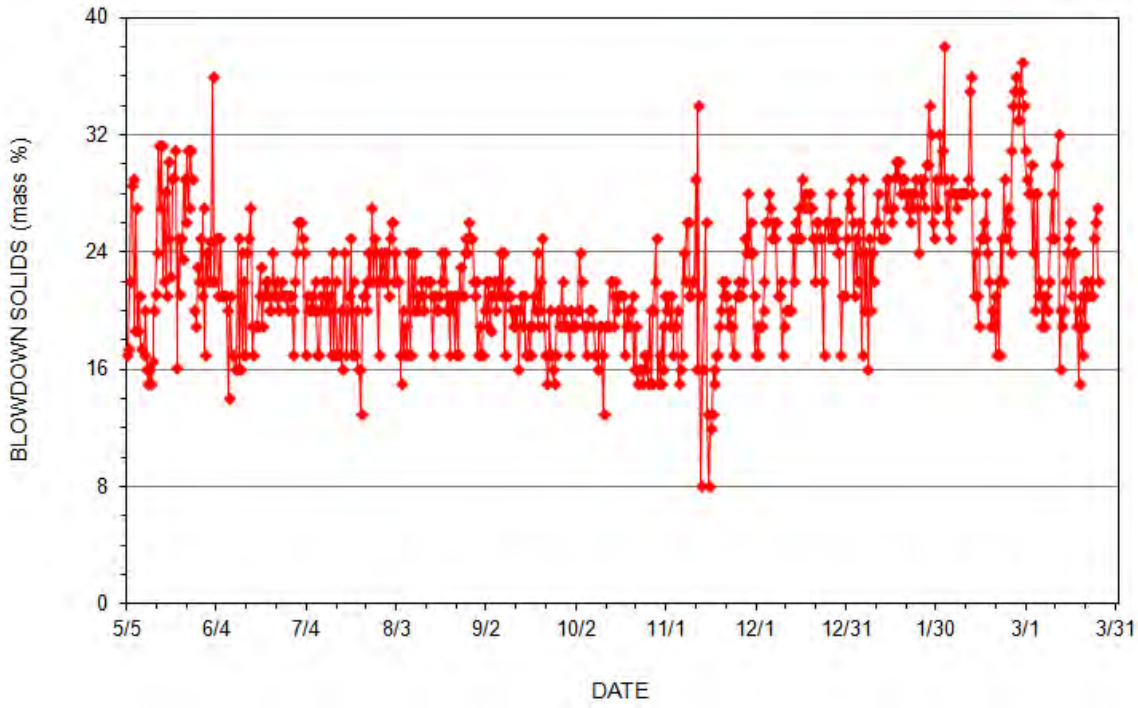


Figure 7. Pretreatment solids concentration.

Figure 7 depicts the concentration of solids in the effluent flow from the solids contact reactor to the A22 pipeline. The ideal concentration is between 16% and 24% solids. Sustained variations well below the ideal range increase flow volume and pipeline pumping costs while sustained variations well above the ideal range require higher pumping pressures.

3.3.5 Pretreatment SCR Effluent Turbidity

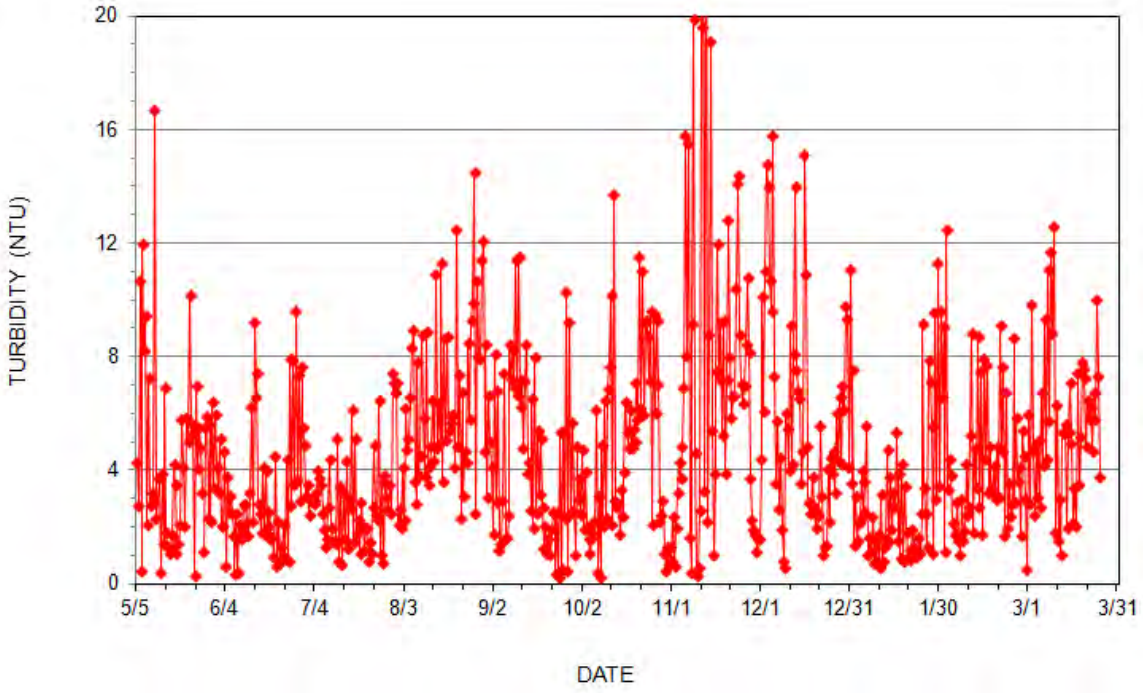


Figure 8. Pretreatment SCR effluent turbidity.

Figure 8 depicts the turbidity, in Nephelometric turbidity units (NTU), of water exiting the SCR and reflects the effectiveness of removing solids in the SCR. Values below 8 are ideal, although values above that are effectively handled by the dual media gravity filters. Values above 12 should be addressed promptly and were during the Pilot Run.

3.3.6 Pretreatment Filter Influent pH

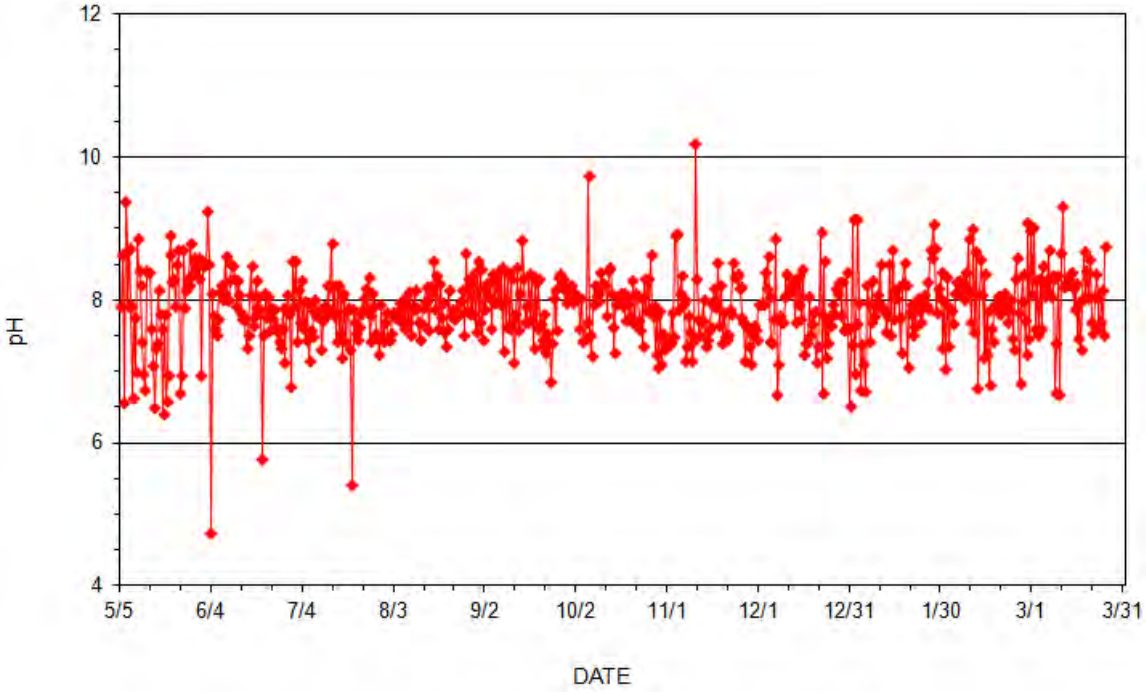


Figure 9. Pretreatment filter influent pH.

Figure 9 depicts the pH of partially pretreated water from the solids contact reactor following acidification with sulfuric acid and prior to entering the dual media gravity filters. The target pH at this point in the water treatment process is 7.8. Significant deviations from that point are manageable if they are not prolonged. This was the case with the Pilot Run.

3.3.7 Pretreatment Collective Filter Effluent Turbidity

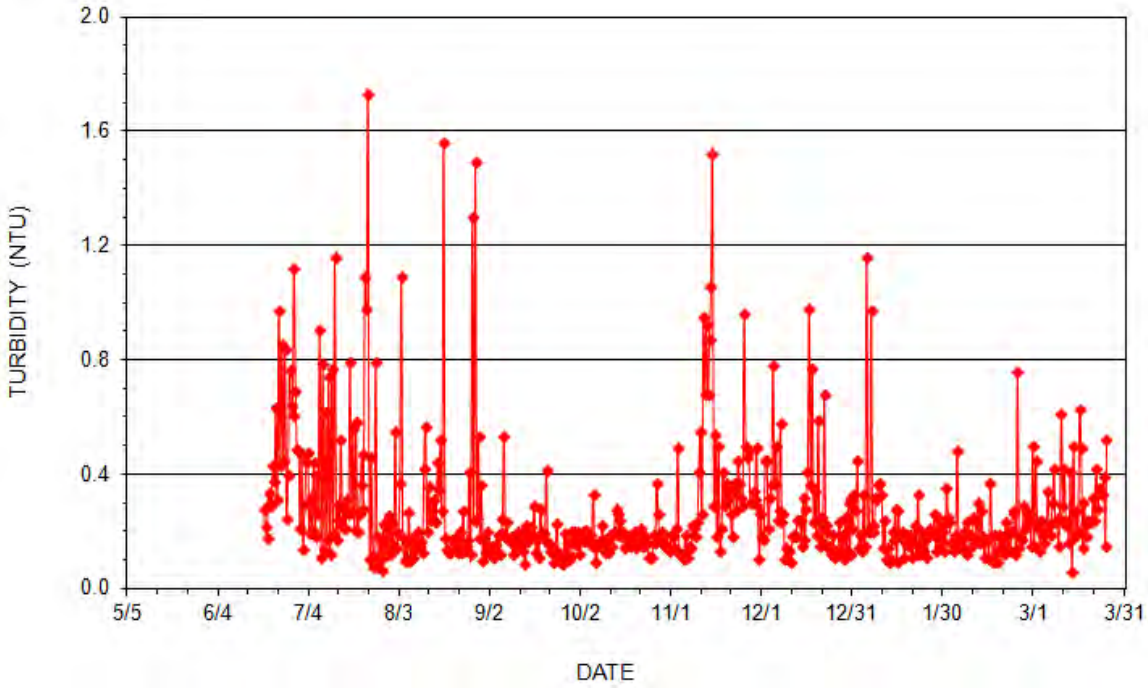


Figure 10. Pretreatment collective filter effluent turbidity

Figure 10 depicts the turbidity of water exiting the dual media gravity filters and moving to the clearwell. Data was not available prior to the middle of June because the water sampling pump that facilitates this measurement was not installed until then. Turbidity data above 0.4 NTU typically reflect maintenance issues associated with the sampling pump. The pump was not well suited for this application.

3.3.8 RO Feed Water pH

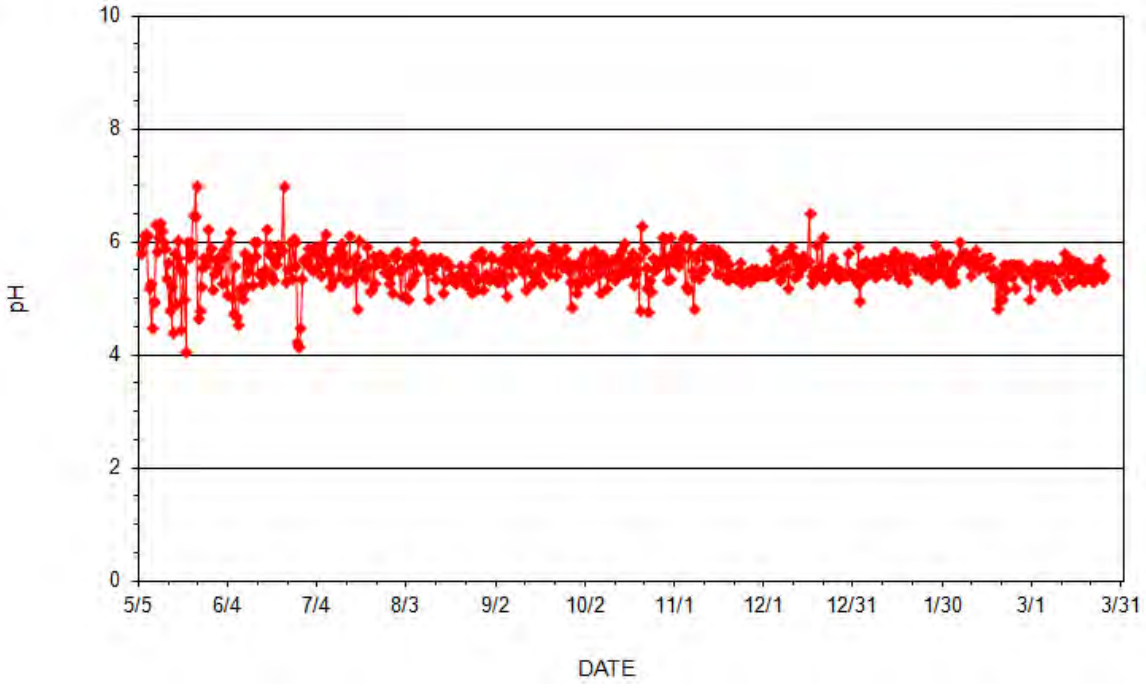


Figure 11. RO Feed Water pH.

Figure 11 depicts the pH of feed water to the reverse osmosis membranes over the course of the Pilot Run. The YDP utilizes cellulose acetate membranes. The operating life of such membranes is prolonged if optimal pH conditions of 5.5 are maintained.

3.3.9 RO Feed Water Turbidity

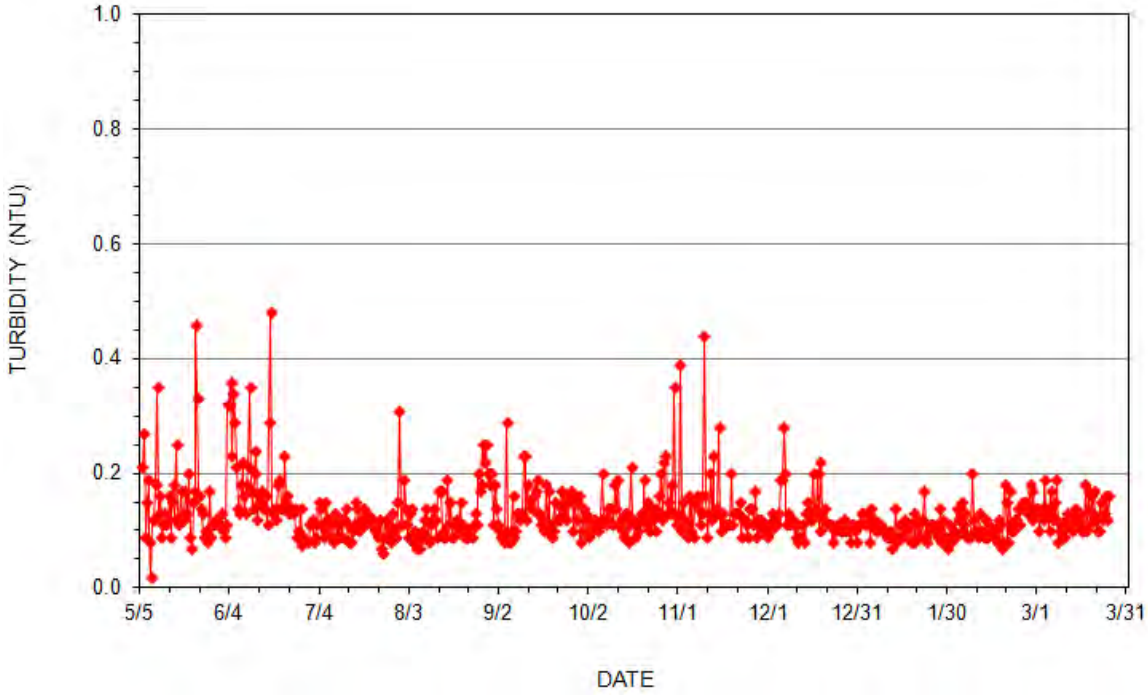


Figure 12. RO feed water turbidity.

Figure 12 depicts the turbidity of feed water entering the reverse osmosis membranes. Low NTU values help prevent fouling of the membranes. Feed water turbidity was well controlled over the course of the Pilot Run.

3.3.10 RO Feed Water Chlorine

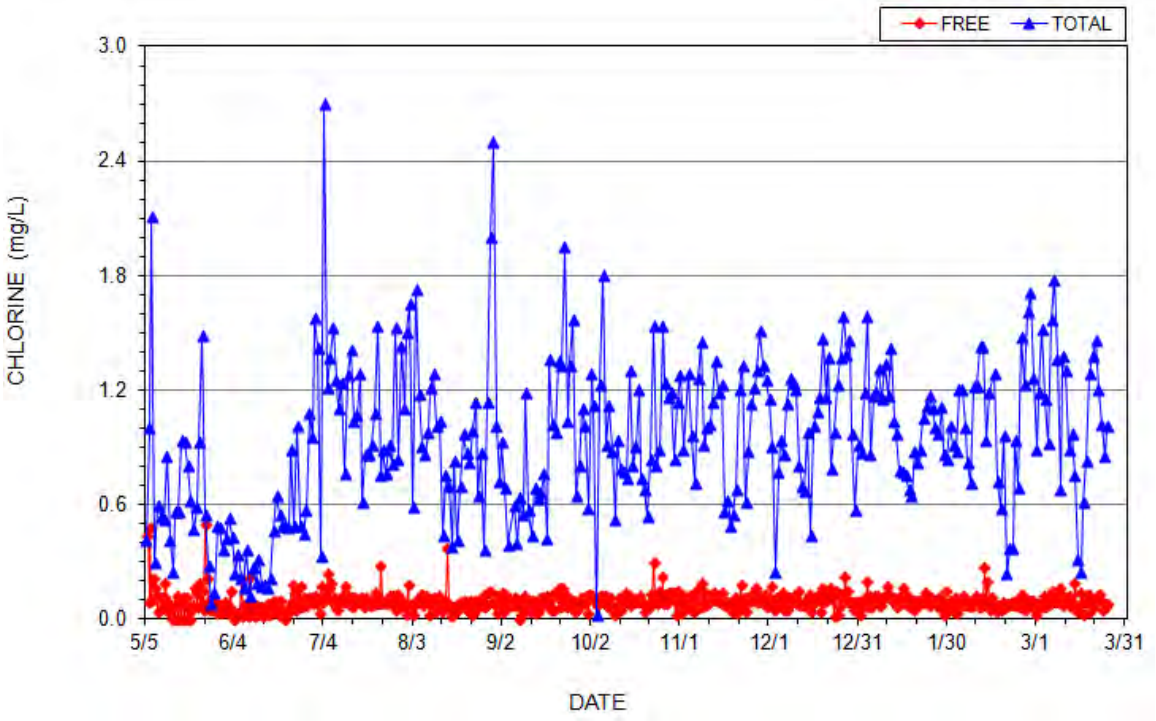


Figure 13. RO feed water chlorine.

Figure 13 depicts the chlorine levels of feed water entering the reverse osmosis membranes. Red data points represent free chlorine (chlorine that has not been converted to chloramines through exposure to ammonia). Cellulose acetate membranes will degrade if exposed to high levels of free chlorine. Such levels were avoided during the Pilot Run. Blue data points represent chloramines utilized for system disinfection. Ideally, very high and very low chloramine levels are avoided, and chloramines levels were addressed during the run.

3.3.11 RO Feed Water Temperature

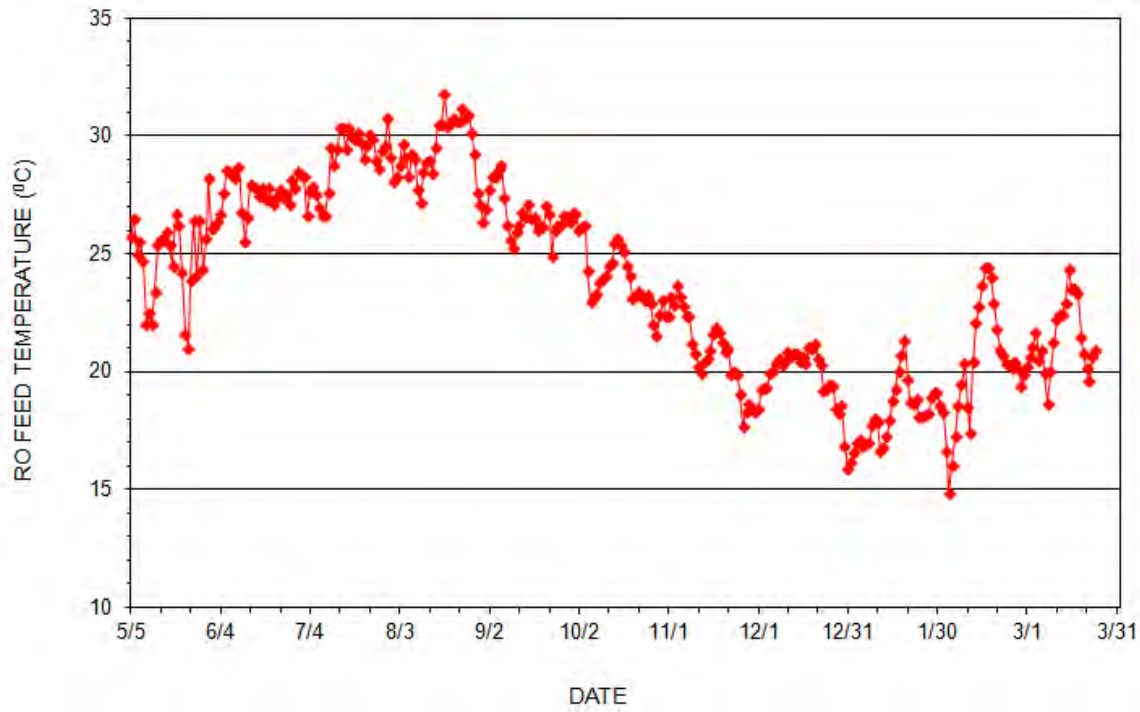


Figure 14. RO feed water temperature.

Figure 14 depicts the temperature of feed water entering the reverse osmosis membranes. This data basically follows ambient weather conditions in the Yuma area.

3.3.12 RO Feed Water Plugging Factor

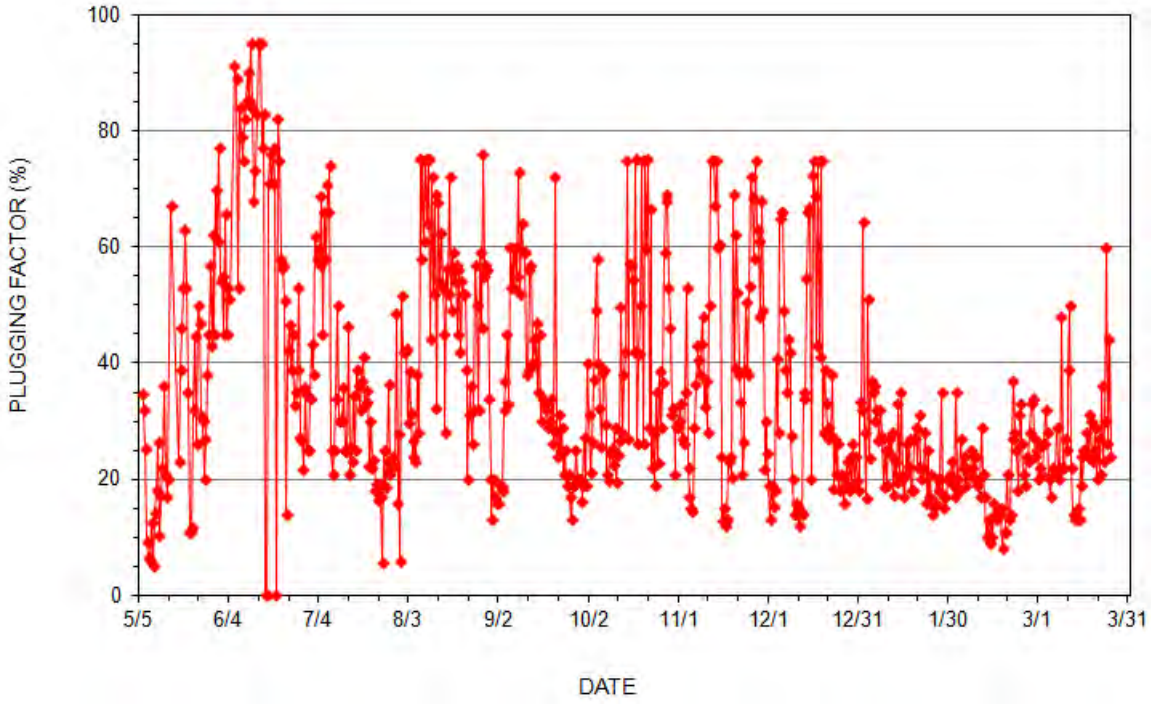


Figure 15. RO feed water plugging factor.

Figure 15 depicts plugging factor, which is a measure of the tendency of water to foul a membrane, based on the 15-minute timed flow of a liquid through a 0.45 angstrom membrane filter at a constant pressure. Plugging factor levels below 75 are the target.

3.3.13 RO Flows

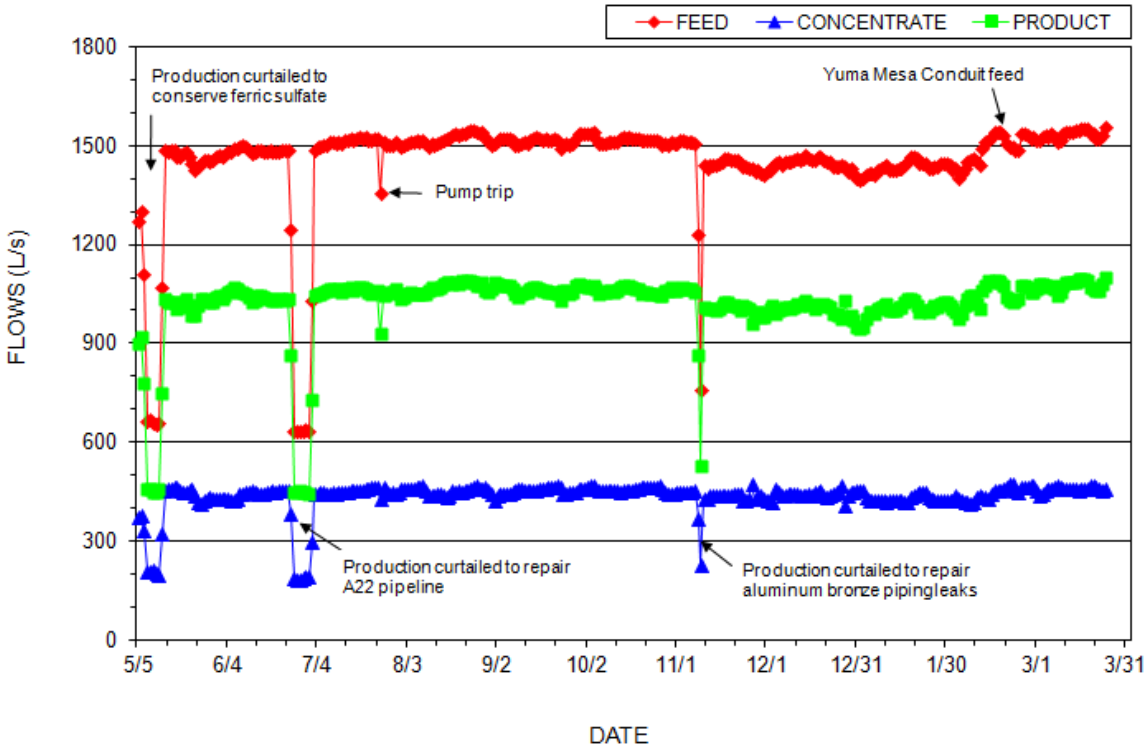


Figure 16. RO flows.

Figure 16 depicts the reverse osmosis flows during the Pilot Run. Red data points represent feed water flow to the membranes. Green data points are product water, and blue data points reflect the concentrate flow.

3.3.14 RO Pressures

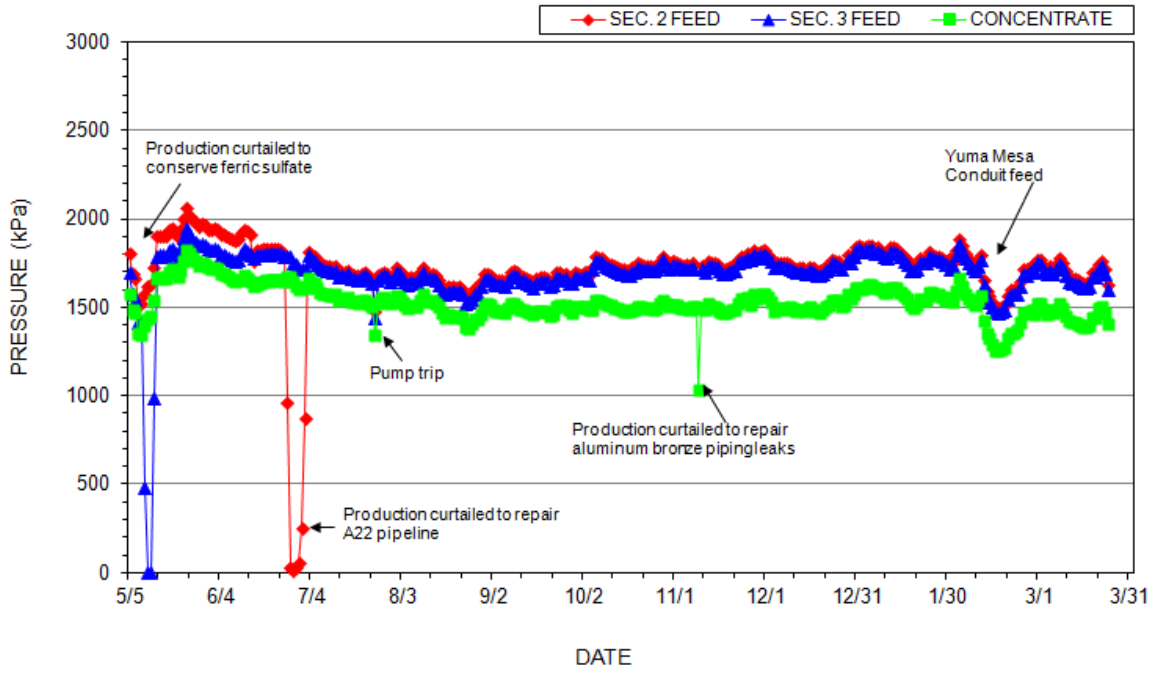


Figure 17. RO pressures.

Figure 17 depicts reverse osmosis pressures during the Pilot Run for feed water to the control blocks, as well as the pressure of the concentrate flow. Red data points represent feed water pressure for section 2 control blocks. Blue data points represent feed water pressure for section 3 control blocks, and green data points are concentrate flow pressures. Pressures at the plant are measured in kilopascals (KPa). To convert kilopascals to pounds per square inch: $P_{psi} = 0.145038 \times P_{kPa}$

3.3.15 RO Pressure Differential

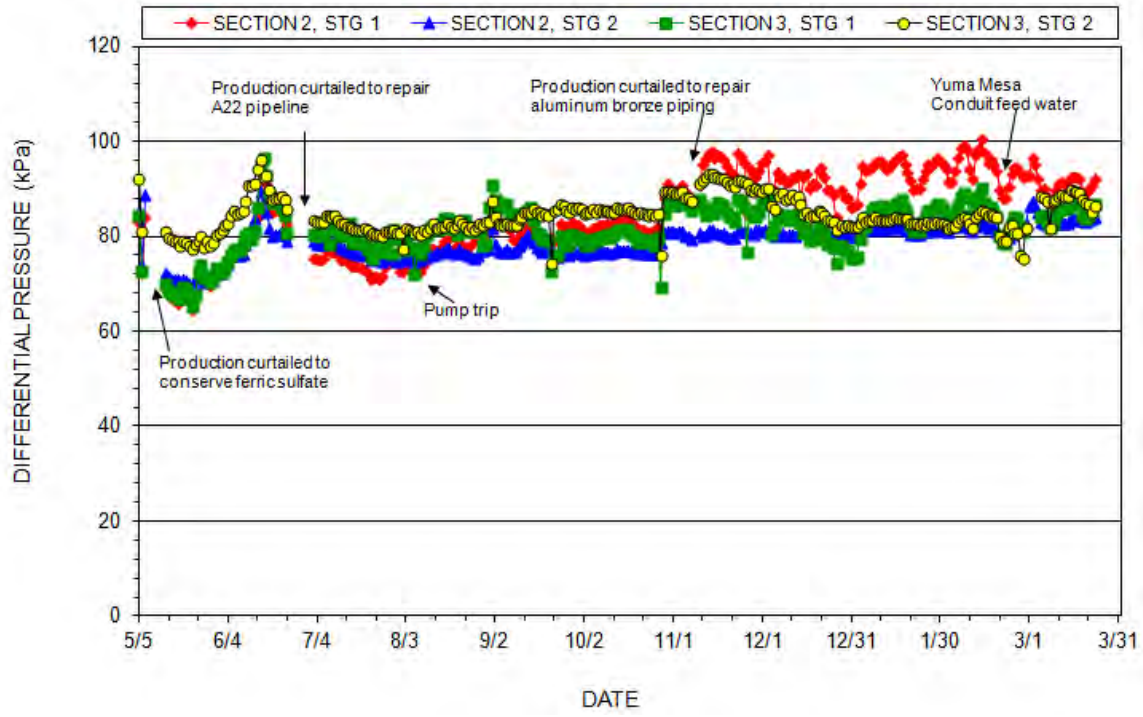


Figure 18. RO feed pressure differential.

Figure 18 depicts the difference in pressure between the front end and tail end of each RO section used during the Pilot Run. The differences are unremarkable, as expected.

3.3.16 TDS of Flows

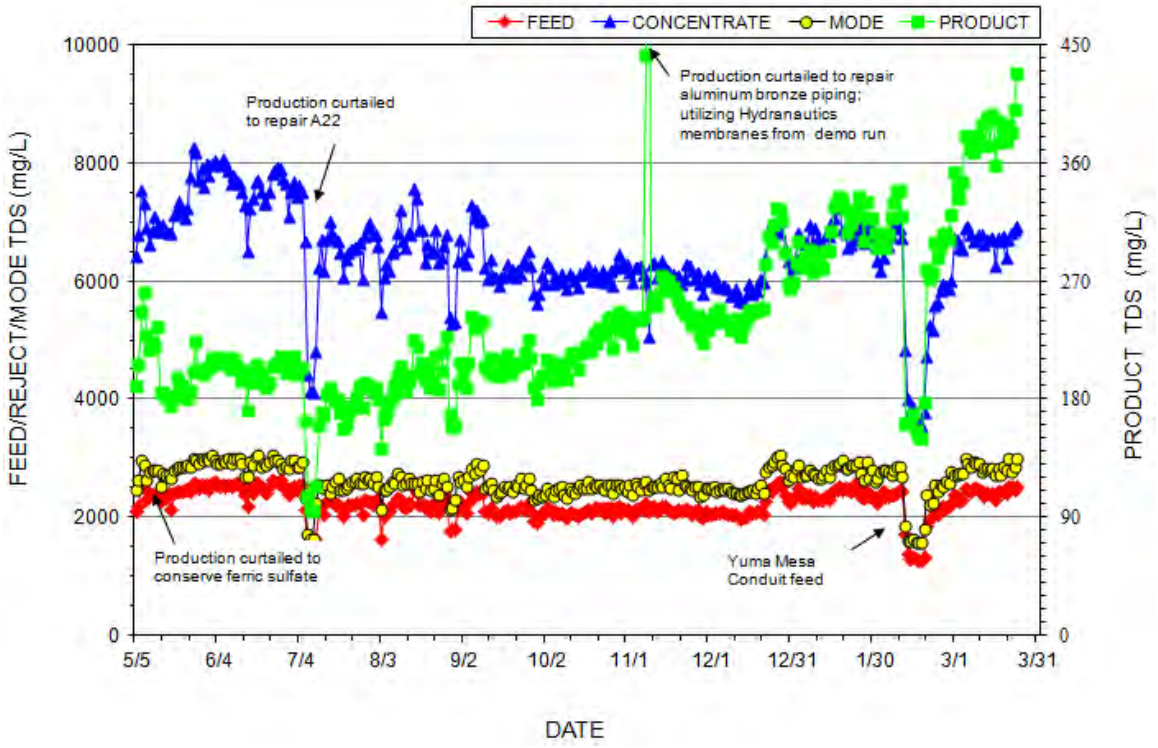


Figure 19. TDS of flows.

Figure 19 depicts the salinity (total dissolved solids or TDS) of untreated bypass flow (yellow), feed water to the RO membranes (red), product water (green), and concentrate (blue). TDS is expressed in milligrams per liter (mg/L), the equivalent of parts per million (ppm) and based on the sum of constituents methodology. Increasing salinity of product water over the course of the run reflects declining performance of the 20-year-old membranes. The difference in the salinity between untreated bypass flow and RO feed water reflects TDS removed during pretreatment.

3.3.17 RO Recovery

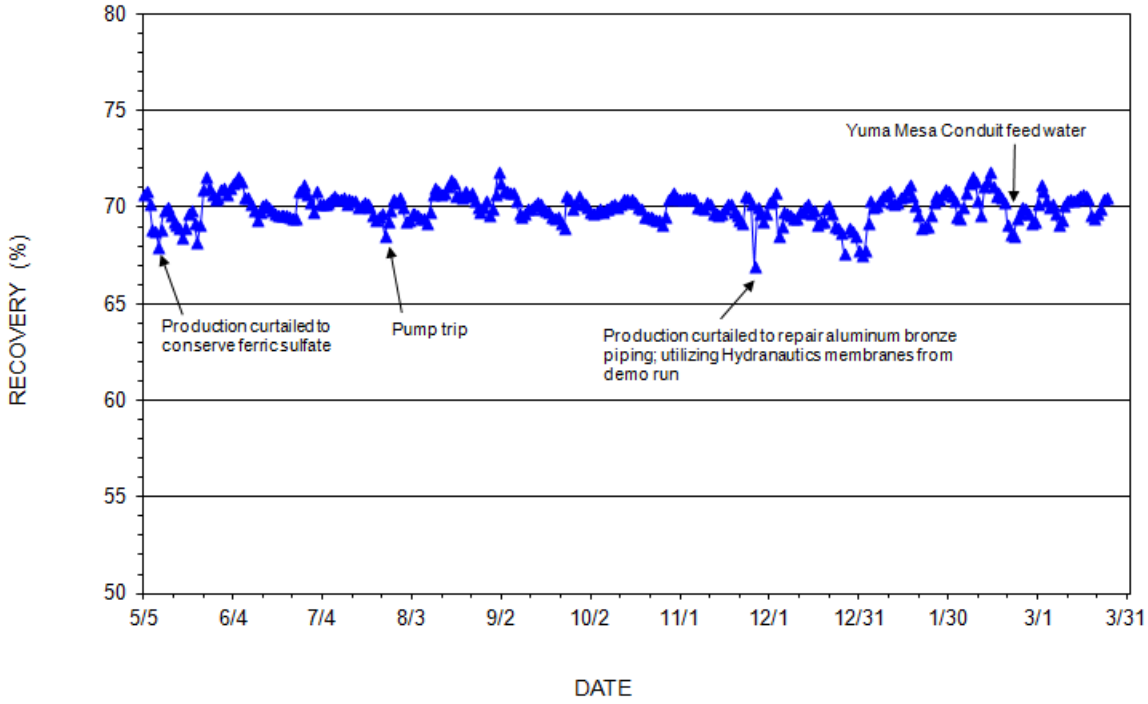


Figure 20. RO recovery.

Reverse osmosis recovery is the product water flow ÷ feed water flow to the membranes. Figure 20 depicts reverse osmosis recovery over the course of the Pilot Run. Recovery averaged 70.0% for the run which was the target.

3.3.18 RO Water Flux

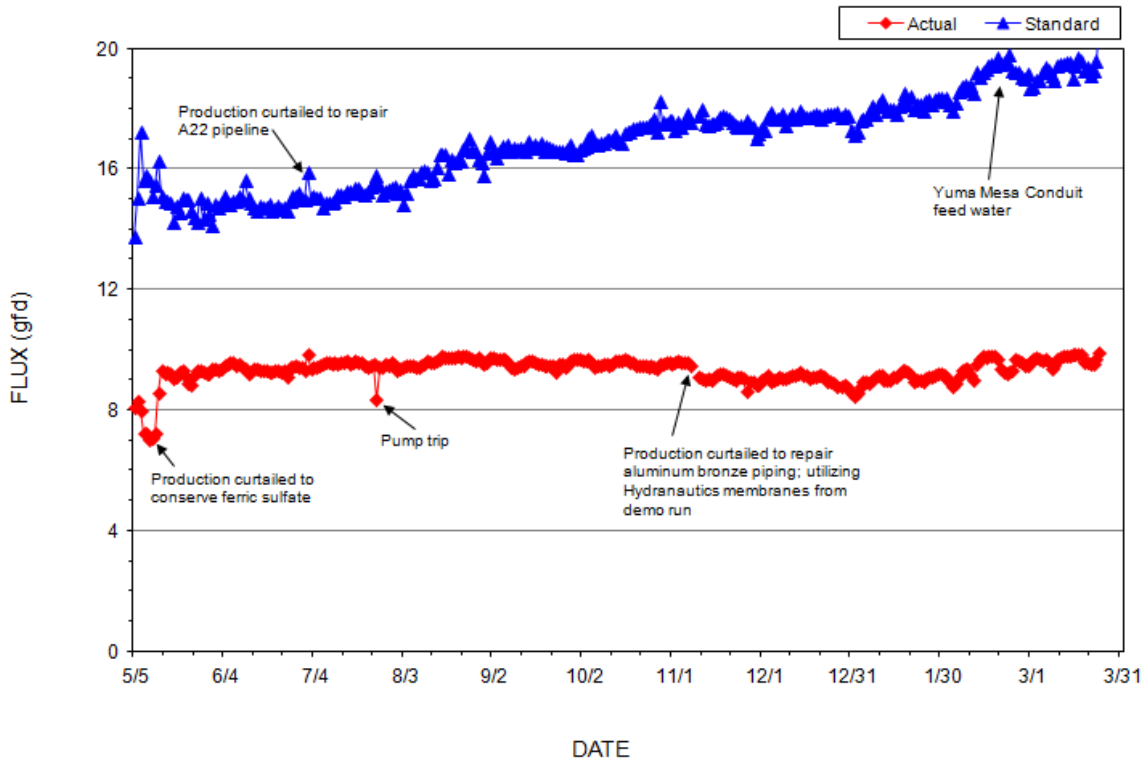


Figure 21. RO water flux.

Flux is used to express the rate at which water permeates a reverse osmosis membrane (the flow through the membrane over a given area of membrane over a given period of time). Flux is measured in gallons per square foot (of membrane) per day or gfd. In figure 21 the red data points reflect actual flux during the run. The blue data points reflect flux normalized for a net driving pressure of 350 pounds per square inch (psi) and 24 degrees Celsisus (C). Increasing standard flux over the course of the Pilot Run reflects that more energy is being required for driving water through the same membrane surface area and also reflects increased risk of membrane fouling.

3.3.19 RO Salt Rejection

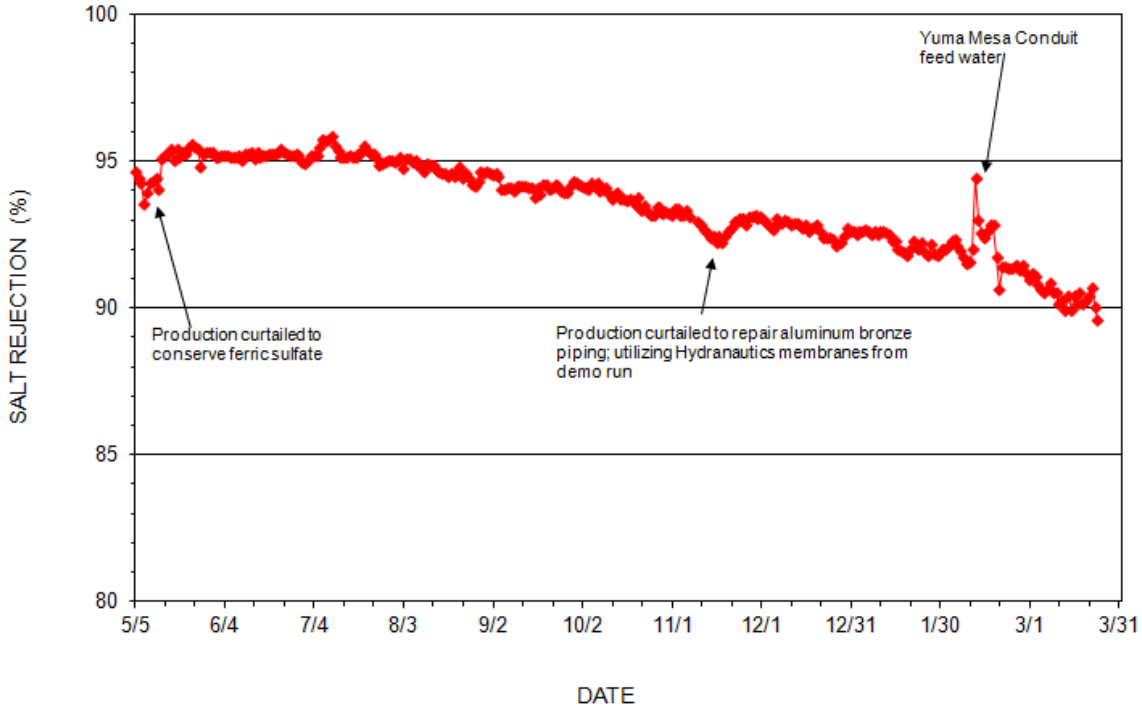


Figure 22. RO salt rejection.

Salt rejection is the ratio of salts not passing through the membrane (rejected) compared to the average feed-reject salt concentration. A hypothetical 100% salt rejection would mean only pure water passed through the reverse osmosis membrane and all salts were rejected. Figure 22 depicts salt rejection during the Pilot Run. Declining salt rejection is indicative of declining membrane performance.

3.3.20 Water Transport Coefficient (A) – Stage 1 Membranes

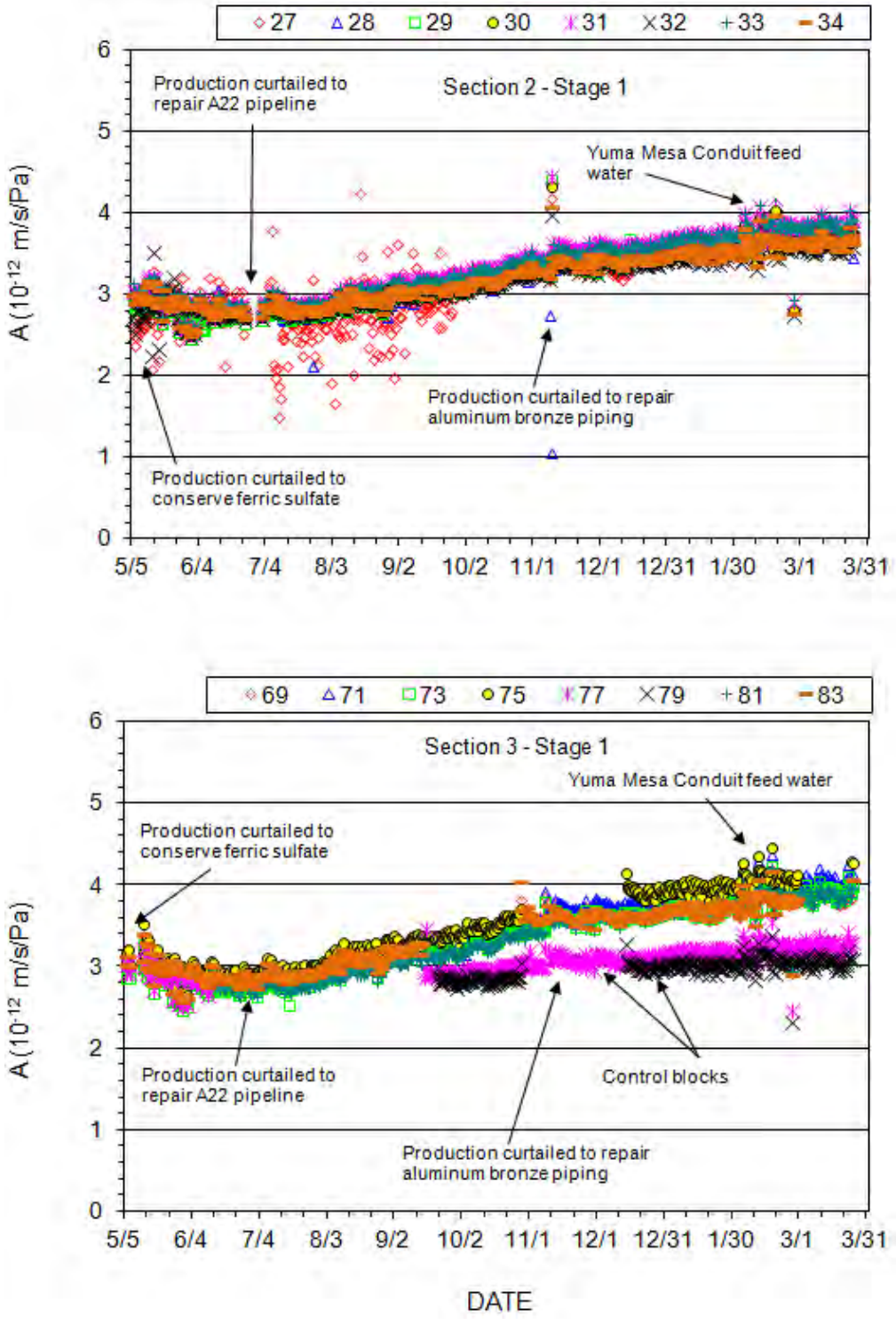


Figure 23. Water transport coefficient (A).

Figure 23 depicts the Water Transport Coefficient (A) for the stage 1 membranes. (A) is a parameter to describe reverse osmosis hydraulic performance, normalized (factoring out) for changes in operating pressure and temperature. In other words, A isolates membrane performance from changes in process conditions. Higher values of A mean that the RO equipment can produce the same flow of product water at lower feed pressures. These graphs indicate that (A) increased over the course of the Pilot Run. At a reference temperature of 25 degrees C, (A) is calculated as follows:

$$A = 1.033^{(25-T)} \times q / [0.5 (Pf + Pr) - PP - \Pi C + \Pi p]$$

where, q is the product water flux = (Q_P/S) (m/s)
Q_P is the volume rate of flow of product water
S is the membrane surface area
Pf, Pr and PP are the pressures (Pa) in the unit feed, concentrate (average of feed and reject), and product water streams, respectively, and ΠC and Πp are the osmotic pressures (Pa) in the unit concentrate (log mean average of feed and reject) and product water
T = RO feed temperature (C)

The YDP utilizes a two-stage desalination process in which concentrate from the first set of membranes (stage 1) is subsequently sent to a second set of membranes (stage 2) for additional desalination. Figure 23 is for the stage 1 membranes.

3.3.21 Water Transport Coefficient (A) – Stage 2 Membranes

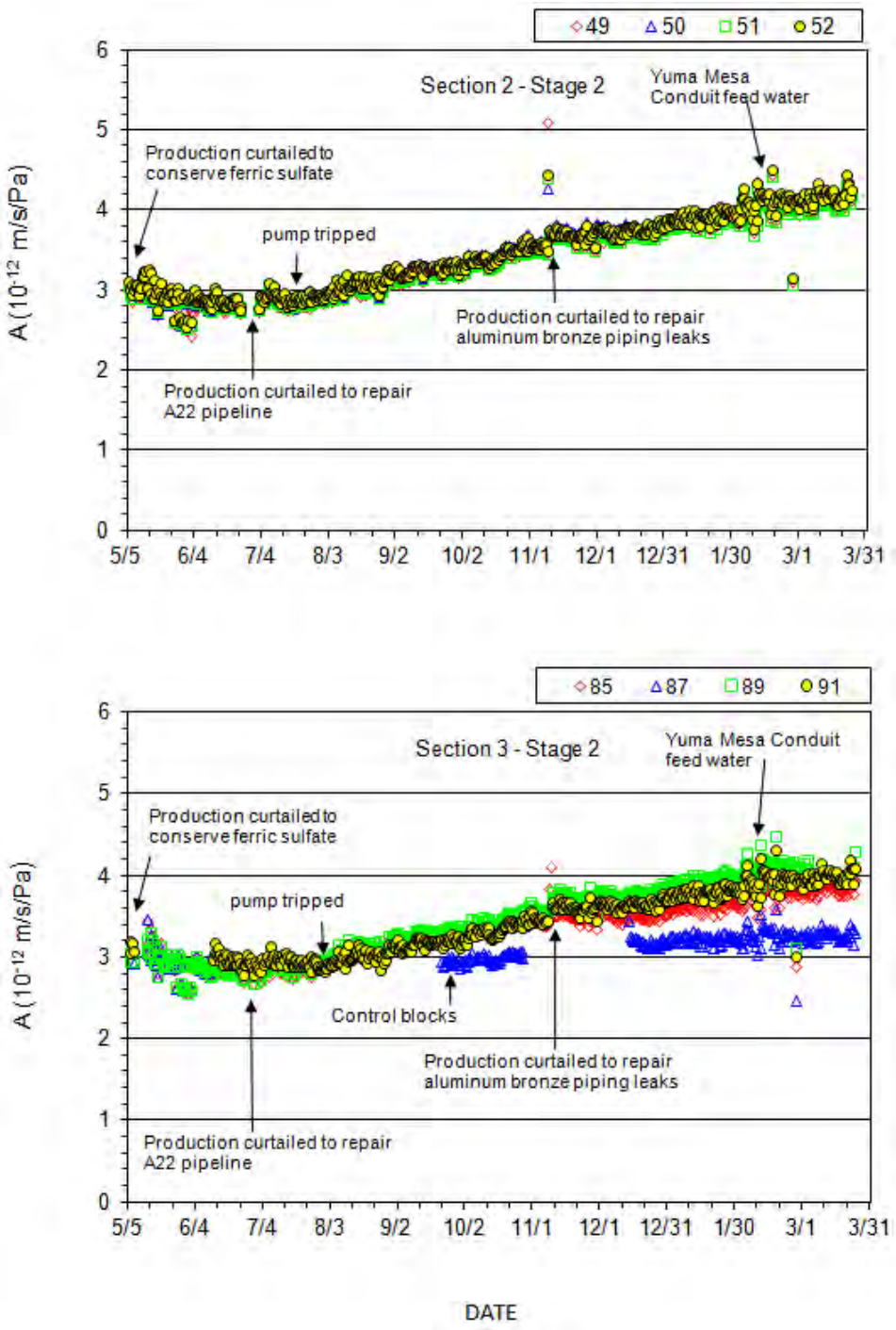


Figure 24. Water transport coefficient (A).

Figure 24 depicts the water transport coefficient (A) for the stage 2 membranes, and like the stage 1 membranes, shows increasing values over time.

3.3.22 Salt Transport Coefficient (B) – Stage 1 Membranes

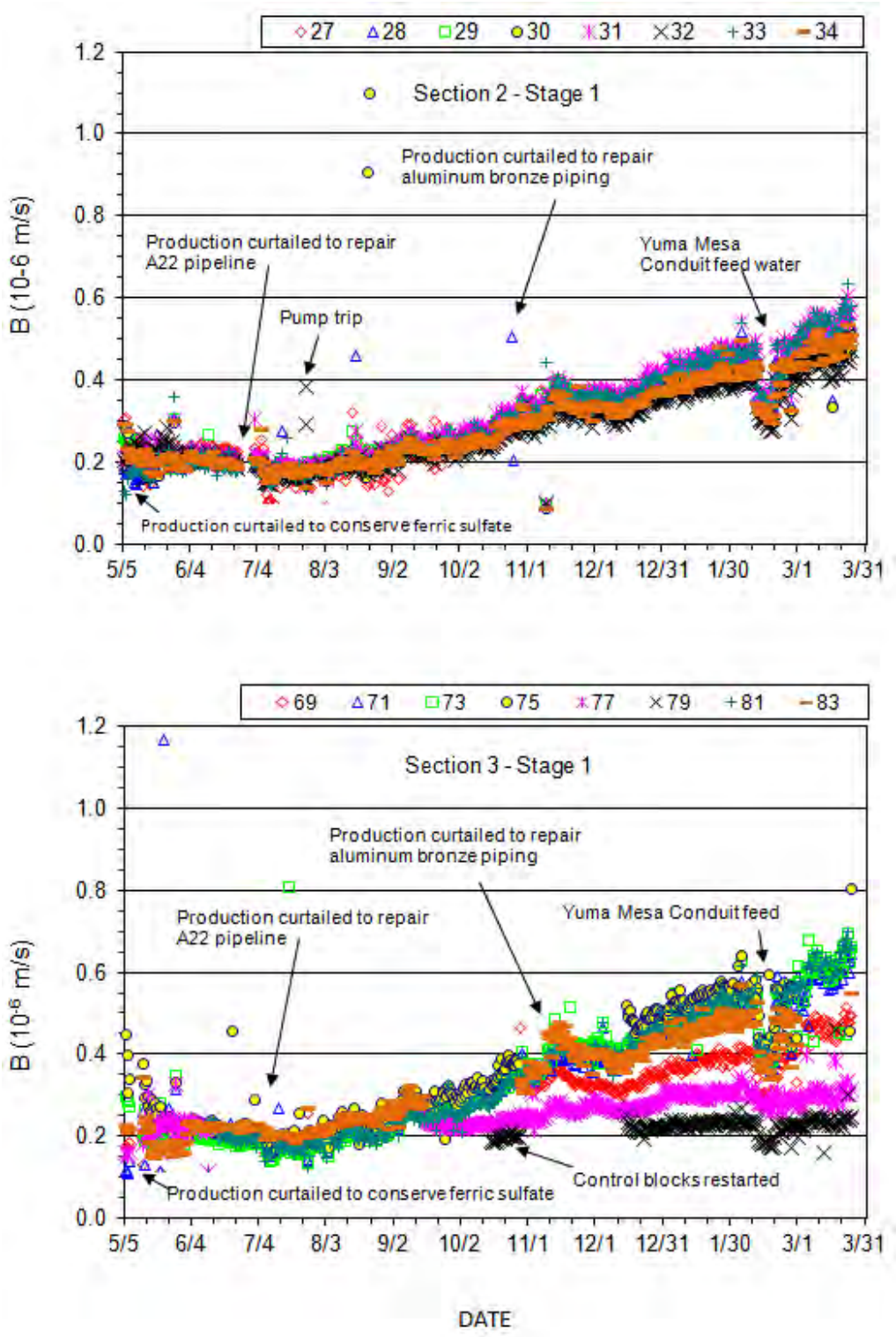


Figure 25. Salt transport coefficient (B).

Figure 25 depicts the salt transport coefficient (B) for the stage 1 membranes. (B) is a parameter to describe reverse osmosis salt rejection performance. This parameter is also normalized for changes in operating pressure and temperature. A hypothetical perfect membrane would have a B value of zero. It would be perfectly semi-permeable and allow only pure water molecules through, but no salts. These graphs indicate that (B) increased over the course of the Pilot Run, meaning that the membranes allowed more salts to pass through them over time regardless of changes in operating pressure and temperature. B at a reference temperature of 25 degrees C is calculated as follows:

$$B = 1.033^{(25-T)} \times q \times C_P/(C_C - C_P)$$

where, q is the flux of water through the membrane (m/sec)
C_P is the product water salt concentration (mg/L)
C_C (mg/L) is the logmean average salt concentration on the feed (and reject) side of the membrane. That is,
$C_C = Cf \times [\ln (C_r / C_f)] / [1 - (C_f - C_r)]$
C_f= salt concentration in the unit feed (mg/L)
C_r= salt concentration in the unit reject (mg/L)
T = RO feed temperature (C)

3.3.23 Salt Transport Coefficient (B) – Stage 2 Membranes

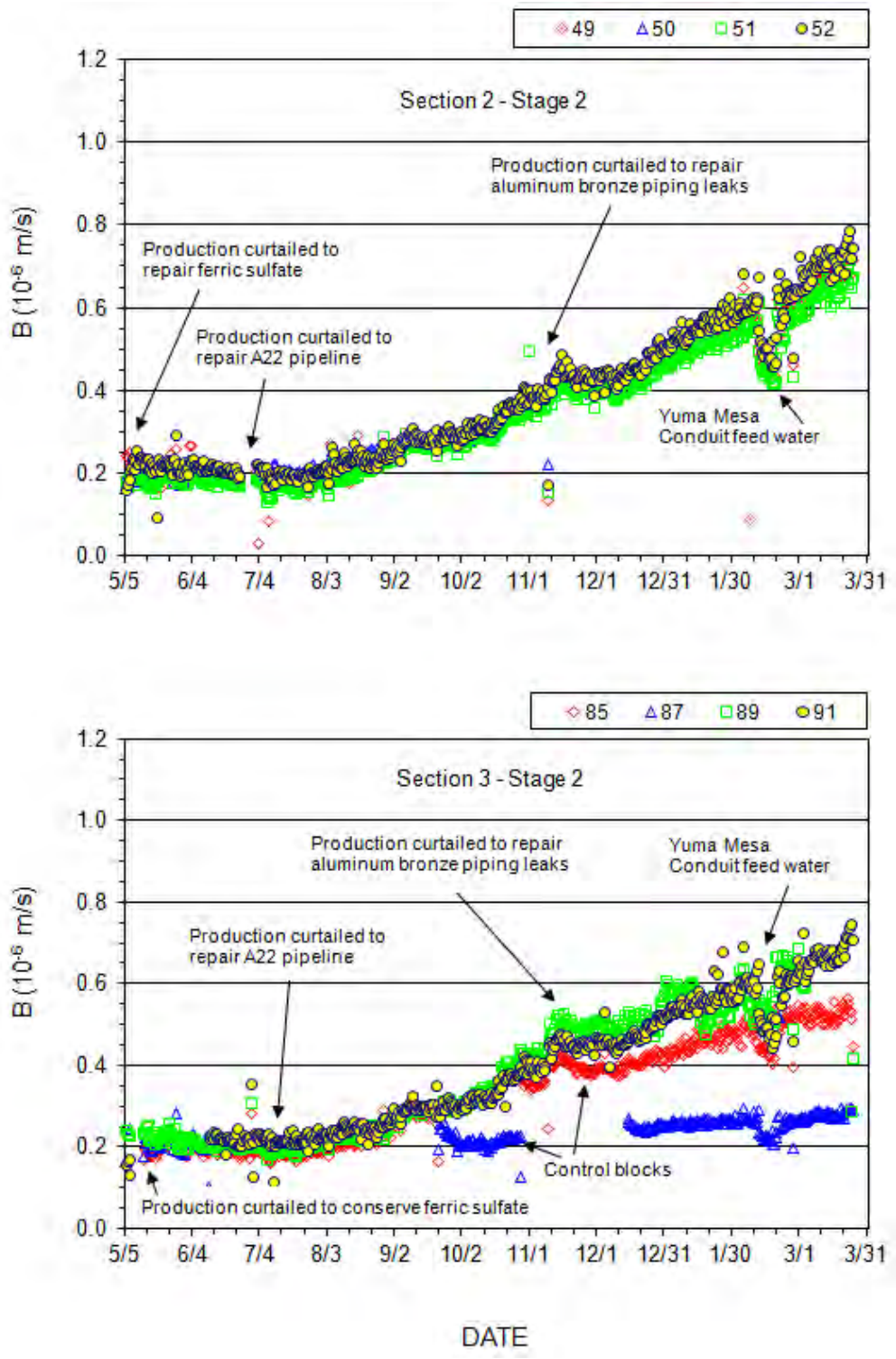


Figure 26. Salt transport coefficient (B).

Figure 26 depicts the Salt Transport Coefficient (B) for the stage 2 membranes, and, like the stage 1 membranes, shows that the membranes allowed more salts to pass through them over time.

3.3.24 B/A – Stage 1 Membranes

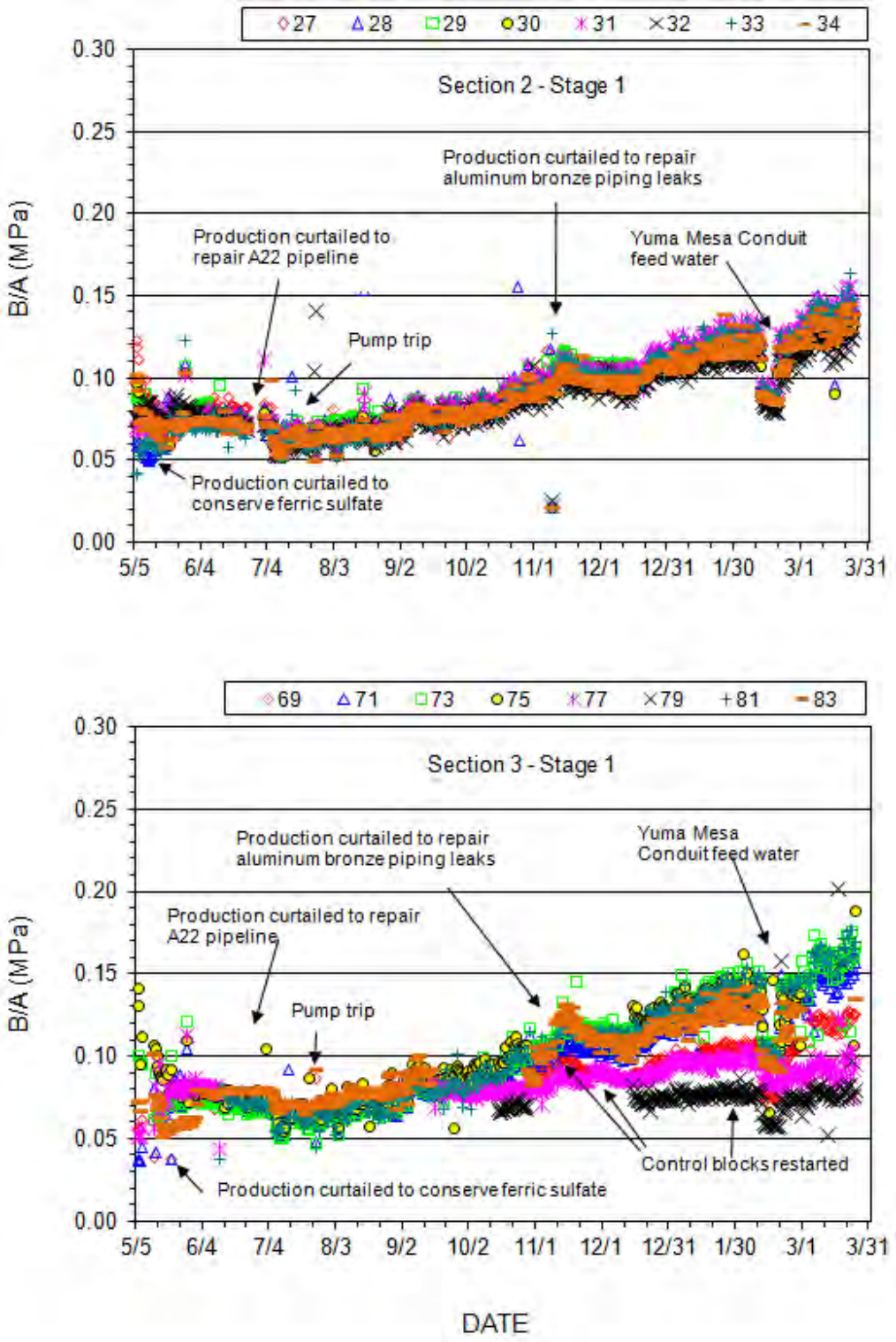


Figure 27. B/A for stage 1 membranes.

Figure 27 depicts the Salt Transport Coefficient (B) relative to the Water Transport Coefficient (A). This view of reverse osmosis performance does not require estimates of membrane surface area or temperature correction and is a method that combines (B) and (A) into a single parameter. This parameter also confirms that the salt-rejection of the 20-year-old RO membranes declined over time during the Pilot Run. Figure 27 is for the stage 1 membranes.

3.3.25 B/A – Stage 2 Membranes

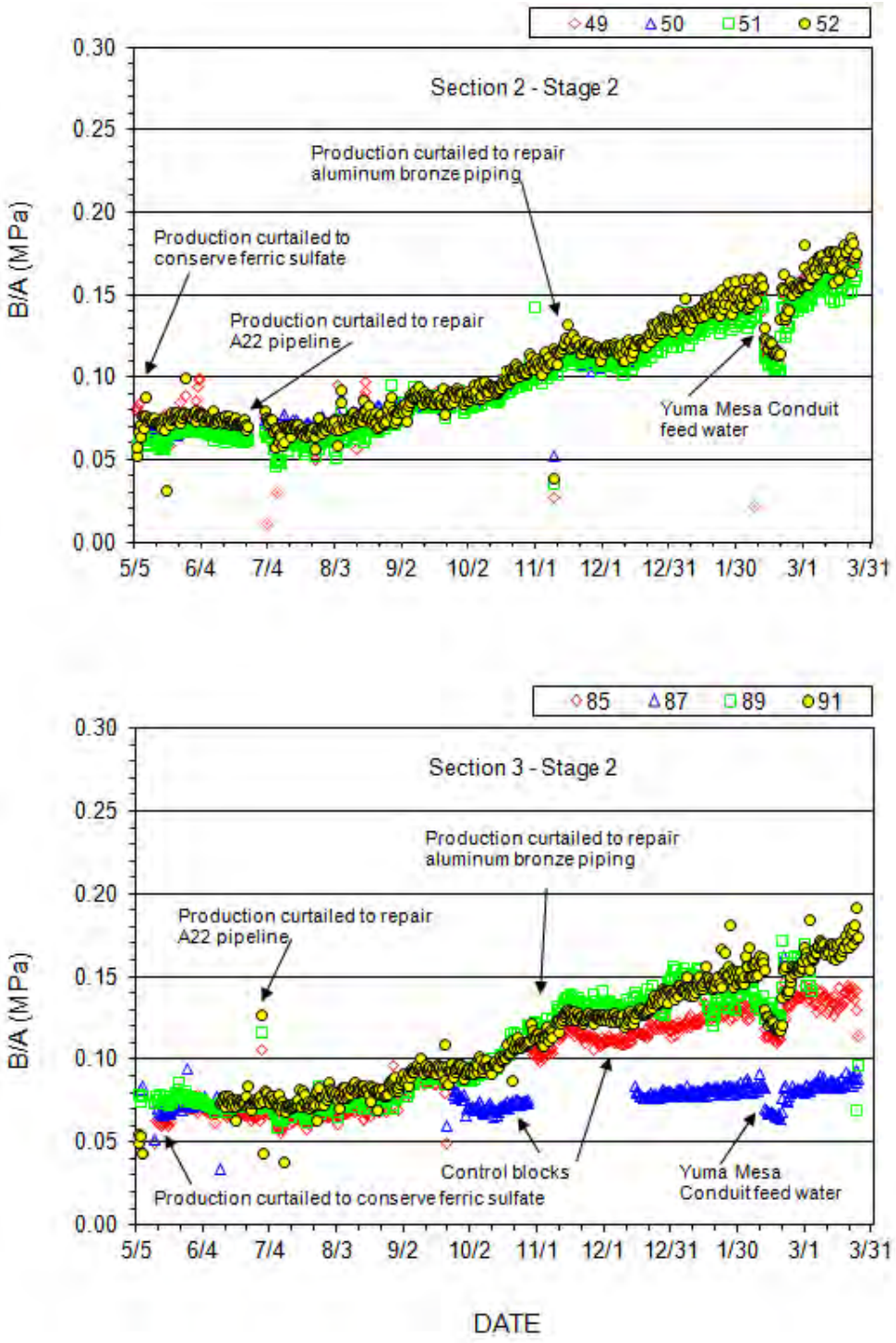


Figure 28. B/A for stage 2 membranes.

Figure 28 depicts B/A for the stage 2 membranes.

3.3.26 Efficiency of RO Pumps and Motors

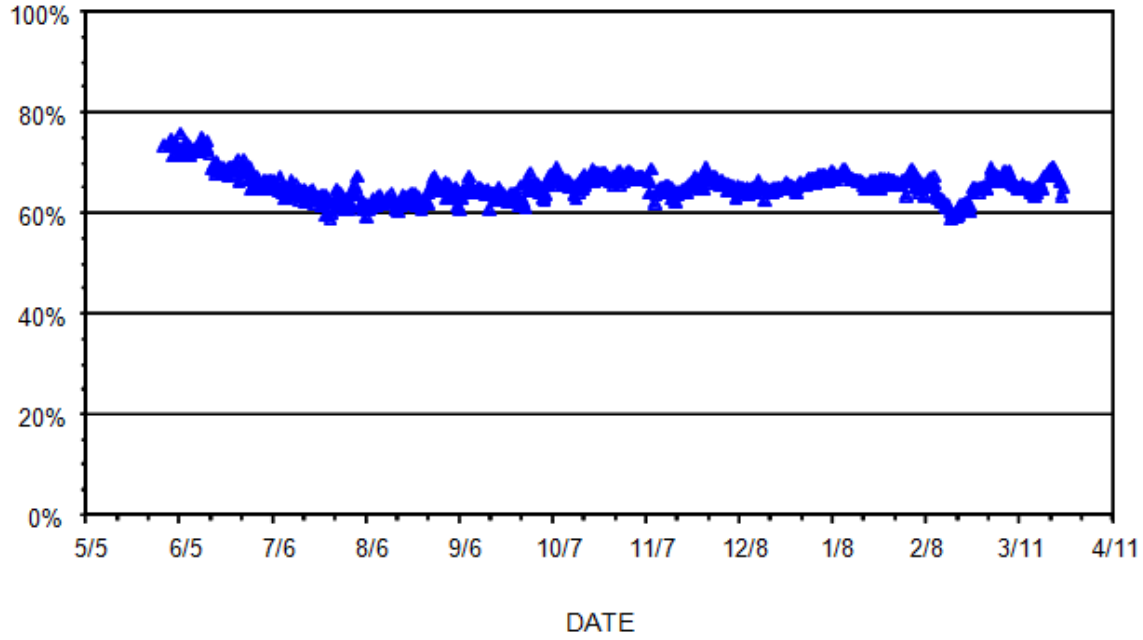


Figure 29. Efficiency of RO pumps and motors.

The YDP's RO pumps have a rated maximum overall efficiency of 82% if operated at 430 psi. Operating at lower pressures results in decreased pump efficiency, as figure 29 illustrates.

For the majority of the Pilot Run, the RO pumps were operated between 210 and 270 psi resulting in pump efficiency in the 60 to 70% range. This provided sufficient pressure in the membrane vessels to accomplish desalination while lowering power demand, and, therefore, lowering expenditures for power. Lower operating pressures were also part of the risk mitigation plan associated with using the plant's high-pressure aluminum- bronze piping.

The bowls and impellors of the YDP's RO pumps are fabricated of aluminum-bronze and are a known design deficiency. Potential long-term sustained operation of the plant would require replacement of the RO pumps. Replacement pumps would be better matched to the expected operating pressures based on the results of the Pilot Run and operating experience on systems in the WQIC.

3.4 Water Chemistry of the MODE

The EA for the Pilot Run indicates "The proposed YDP Pilot Run will result in a reduction of flow and an increase in salinity in the Bypass Drain[52]. …Given that the Cienega is located wholly within Mexico, Mexico has exclusive control over any water that crosses into Mexico's sovereign boundaries."[53]

Over the course of the Pilot Run, an estimated 92,185 acre-feet of water[54] crossed the SIB. Had the run not been conducted, an additional 31,079 acre-feet of water[55] would have crossed the SIB in the Bypass Drain.

Over the course of the Pilot Run, water salinity at the intake of the YDP averaged 2,621 ppm. During that same period, water crossing the SIB (which contained concentrate from plant operations) averaged 3,137 ppm. The run reduced the flow in the Bypass Drain crossing the border by 31,079 acre-feet and increased the salinity of that flow 516 ppm.

During planning, an estimated reduction in the bypass flow at the SIB of 29,880 acre-feet of water with an increase in salinity of about 540 ppm was determined. The actual reduction in the volume of the bypass flow was 1,199 acre-feet greater than anticipated because plant testing and start up were less challenging than expected.

[52] The MODE and the Bypass Drain are the same canal. The MODE refers to the portion of the canal that was completed in 1965 and extends from near the confluence of Gila and Colorado Rivers to near Morelos Dam. The Bypass Drain refers to the portion of the canal which was completed in 1977 and extends from near Morelos Dam 16 miles in the U.S. before crossing the border into Mexico. The Bypass Drain continues another 35 miles within Mexico.

[53] "Final Environmental Assessment Yuma Desalting Plant Pilot Run," Bureau of Reclamation, August 2009, page 7

[54] Actual Bypass Drain volumes are reported by the IBWC.

[55] 31,079 AF = 22,666 AF YDP product water included in water deliveries to Mexico + 583 AF of water for in-plant use + 7,830 untreated bypass flow included in water deliveries to Mexico.

The actual increase in the salinity of the bypass flow was 24 ppm less than anticipated primarily because the actual salinity of the bypass flow at intake to the YDP was lower than its historical average, which was the average used in planning.

During the run, Reclamation performed an analysis of Bypass Drain water chemistry at the SIB once a month. Those results are included in appendix 5.11 of this report. These results were provided to Dr. Flessa of the University of Arizona and his Cienega monitoring team.

3.5 Risk Mitigation Outcomes

One of the primary goals was the safety of all personnel on the site and the public at large. This safety goal was achieved. No industrial accidents or illnesses occurred before or during the run, and no incidents occurred that might have endangered the public. In addition, no complaints were filed by any parties concerning the Pilot Run.

3.5.1 Controlled Access Zone

A key component to safe operation of the YDP was use of a Controlled Access Zone (CAZ). The zone encompassed all portions of the YDP and only personnel whose job responsibilities required working in the CAZ were allowed unescorted access to the zone. Formal communications and training for all personnel preceded implementing the CAZ about three months prior to commencing the Pilot Run. Implementation and use of the CAZ was uneventful. Personnel did have some clarifying questions about some aspects of the CAZ in the first several weeks after its implementation. All questions were answered promptly. The CAZ proved to be a useful tool for helping to ensure a safe run. Use of the CAZ stopped on April 4, 2011, when the plant and the YAO site were considered safe for the use of pre-Pilot Run ingress and egress procedures.

3.5.2 Industrial Accidents and Illnesses

As noted earlier, no industrial accidents or illnesses occurred during the Pilot Run. During the Pilot Run some tours were conducted. These tours followed specialized safety procedures since the plant was operating and the CAZ was in effect. Visitors did not have any accidents during these tours.

3.6 Operations, Maintenance and Repair Costs, and Total Costs

Table 15 is a summary of the budgeted costs and actual expenditures for operating and maintaining the plant including returning it to its pre-run condition.

Table 15. Costs of Operating and Maintaining the YDP and Return to Maintenance Status

Cost Element	Budget	Actual	Difference
Reclamation labor	$ 3,411,492	$ 1,502,568	$ 1,908,924
Contract labor and services	$ 2,662,752	$ 2,656,869	$ 5,883
Power	$ 3,304,516	$ 1,396,904	$ 1,907,612
Chemicals	$ 6,415,610	$ 3,645,652	$ 2,769,958
Materials, supplies, and parts	$ 349,200	$ 614,641	($ 265,441)
Contingency	$ 414,500	$ 404,496	$ 10,004
Total	**$ 16,558,070**	**$ 10,221,130**	**$ 6,336,940**

The budget for O&M and returning the plant to maintenance status was $16,558,070. Financial responsibility for this was shared jointly by Reclamation and the Municipal Utilities. Reclamation was financially responsible for Reclamation labor[56] necessary to manage, direct, and oversee the plant, and for the contingency. Reclamation's share of the $16,558,070 budget was $3,825,992. The Municipal Utilities were financially responsible for contract labor and services, as well as for power, chemicals and materials, supplies, and parts. The Municipal Utilities share of the $16,558,070 budget was $12,732,078.

[56] The labor of some Reclamation employees was temporarily redirected to support the Pilot Run.

The final cost for plant O&M and return to maintenance status was $10,221,130[57] or $6,336,940 (38%) less than expected. This under run was primarily the result of lower than expected costs associated with Reclamation labor, power, and chemicals. Less Reclamation labor was needed because plant operations were less challenging than anticipated. Power and chemical costs for operating the plant were lower largely because budgetary estimates were developed based on market prices prior to the economic downturn.

[57] Included in this total are expenditures of $544,768 to return the YDP to its pre-run condition. This includes Reclamation expenditures of $78,467 for Reclamation labor and Municipal Utilities expenditures of $470,301 ($431,548 for contract labor and services + $16,031 for reservation of power transmission services + $29,722 for materials and supplies).

Table 16 provides information regarding labor expended by O&M contractor personnel, by area of the plant during the Pilot Run.

Table 16. Work by Area of the Plant

Area #	Area Description	O&M Labor Hours	% of Effort
01	Intake and Grit Sedimentation	10,708	18.5%
02	Solids Contact Reactors	10,557	18.2%
03	Slurry Handling	6,891	11.9%
04	Dual Media Gravity Filters	5,940	10.3%
05	Ammonia	62	0.1%
06	Clearwell and RO Pumps	3,972	6.9%
07	Piping and RO Process	11,658	20.2%
08	Energy Recovery	55	0.1%
09	Chlorine Handling and Processing	3,293	5.7%
10	Lime and Ferric Handling	3,365	5.8%
11	Service Water	0	0%
12	Sulfuric Acid	538	0.9%
13	Membrane Cleaning	0	0%
14	Switchyard	0	0%
21	A22 Pipeline and Site	765	1.3%
25	MODE 2 Canal and Discharge	48	0.1%

About 47% of contractor labor hours were expended operating and maintaining pretreatment equipment, about 27% were expended on RO-related equipment, and the remaining 26% expended on operating and maintaining support systems and chemical handling.

Under the funding agreements the total budgeted cost of the Pilot Run (preparing for the run, operating and maintaining the plant, and returning it to pre-run condition) was estimated to be $23.19[58] million. Reclamation would be responsible for $9.18 million of

[58] Reflects $22.86 million for the Pilot Run Funding Agreement + $330,000 reflected in the Environmental Compliance Funding Agreement.

this total and the Municipal Utilities would be responsible for the $14.01 million balance. The final total cost of the Pilot Run, including preparing for the run, conducting the run, and returning the plant to its pre-run condition was $15,965,010. This is $7,224,997 (31%) less than budgeted.

Table 17. Total Pilot Run costs

Preparing for the Pilot Run	Budget	Actual	Difference
One-time projects	$ 2,605,000	$ 2,477,035	$ 127,965
Reclamation labor	$ 2,751,853	$ 2,011,434	$ 740,419
Reclamation other	$ 0	$ 104,293	($ 104,293)
Contract labor and services[59]	$ 1,144,584	$ 1,048,131	$ 96,453
Materials, supplies, and parts	$ 130,500	$ 102,987	$ 27,513
Total	**$ 6,631,937**	**$ 5,743,880**	**$ 888,057**
Reclamation	*$ 5,356,853*	*$ 4,592,762*	*$ 764,091*
Municipal Utilities	*$ 1,275,084*	*$ 1,151,118*	*$ 123,966*
Conducting the Pilot Run	**Budget**	**Actual**	**Difference**
Reclamation labor	$ 3,411,492	$ 1,502,568	$ 1,908,924
Contract labor and services	$ 2,662,752	$ 2,656,869	$ 5,883
Power	$ 3,304,516	$ 1,396,904	$ 1,907,612
Chemicals	$ 6,415,610	$ 3,645,652	$ 2,769,958
Materials, supplies, and parts	$ 349,200	$ 614,641	($ 265,441)
Contingency	$ 414,500	$ 404,496	$ 10,004
Total	**$ 16,558,070**	**$ 10,221,130**	**$ 6,336,940**
Reclamation	*$ 3,825,992*	*$ 1,907,064*	*$ 1,918,928*
Municipal Utilities	*$ 12,732,078*	*$ 8,314,066*	*$ 4,418,012*
Grand Total	**$ 23,190,007**	**$ 15,965,010**	**$ 7,224,997**
Reclamation	*$ 9,182,845*	*$ 6,499,826*	*$ 2,683,019*
Municipal Utilities	*$ 14,007,162*	*$ 9,465,184*	*$ 4,541,978*

[59] Total of $1,144,584 reflects $814,584 as set forth in the Funding Agreement, plus $330,000 from the Municipal Utilities as set forth in the Environmental Compliance Funding Agreement.

3.7 Compliance Outcomes

Every effort was made to ensure the plant was operated in an environmentally responsible manner and in full compliance with Federal, State, and local requirements. No citations, notices of violation, or corrective notices were received during the Pilot Run.

3.7.1 Laws and Permits

The YDP operated under a discharge permit and aquifer protection permit issued by the ADEQ. On May 6, 2010, three days into the Pilot Run, the water level of the MODE unexpectedly dropped which resulted in an influx of sediments and organic matter, necessitating additional chlorination. Chlorine and sodium bisulfite dosing (residual chlorine neutralization) were insufficiently coordinated, resulting in effluent total residual chlorine in excess of discharge permit limitations.

The situation was corrected immediately and water samples taken an hour later reflected total residual chlorine within permit limits. Subsequently, all operators were again informed of the permit's requirements and operating procedures were modified as a preventative measure. Reclamation notified the ADEQ of this situation. No further incidents for either permit occurred throughout the remainder of the run.

On August 18, 2010, Mr. Benjamin Grumbles, the Director of the ADEQ visited and toured the YDP. On February 2, 2011, personnel from the ADEQ formally inspected the YDP. No actions resulted from this inspection.

In order to accommodate the Pilot Run, the Resource Conservation and Recovery Act, Pollution Prevention Act, and Emergency Planning and Community Right to Know Act were each reviewed and compliance processes were revised for the facility. Additionally, the Risk Management Plan, Process Safety and Management Program, Emergency Response Plan, Emergency Action Plan, and Continuity of Operations Plan for the YAO were each revised to address specific hazards associated with the Pilot Run. The modified processes proved successful and will be utilized again if YDP operation occurs in the future.

3.7.2 Joint Cooperative Actions

Minute 316 to the 1944 Water Treaty is based on the "Joint Report of the Principal Engineers Concerning U.S.-Mexico Joint Cooperative Actions Related to the Yuma Desalting Plant (YDP) Pilot Run and the Santa Clara Wetland," dated July 17, 2009. Minute 316 became effective on April 16, 2010, and called for nine joint cooperative actions by the U.S., Mexico, and the NGOs. The following is Reclamation's understanding of the status of each of the cooperative actions:

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1. "If, the proposed 365 day YDP Pilot Run, is approved by the appropriate U.S. agency, it is recommended that the Joint Cooperative Actions described in this document be carried out."

   Status: On October 29, 2010, Reclamation notified the IBWC of its intention to conduct the Pilot Run.

2. "During the YDP Pilot Run, each one of the parties, the U.S., Mexico and non-Governmental Organizations (NGOs) each intend to arrange for 10,000 acre-feet (12.3 mcm) of water for a total of 30,000 acre-feet (37.0 mcm) pursuant to the letters of commitment that have been received from the respective participants." Status:

   U.S.: 10,285 acre-feet conveyed.

   Mexico: 10,191 acre-feet conveyed.

   NGO: 10,001 acre-feet conveyed.

   On December 6, 2011 the IBWC provided the arranged water update set forth in table 18. On February 14, 2011 the IBWC confirmed these values are final.

Table 18. Status of Arranged Water from the IBWC

INTERNATIONAL BOUNDARY AND WATER COMMISSION UNITED STATES AND MEXICO
UNITED STATES SECTION

VOLUMES DIVERTED INTO THE CIENEGA DE SANTA CLARA IN ACCORDANCE WITH MINUTE 316

Acre-feet				
Month	* U.S. Delivered through the Bypass Drain	* Mexico Delivered through the Bypass drain	* NGO Delivered through the Bypass drain	** NGO Delivered through Santa Clara drain
October 2009	149	0	0	0
November 2009	4,363	0	0	0
December 2009	1,785	0	0	0
January 2010	1,778	0	0	0
February 2010	194	0	0	0
March 2010	2,016	0	0	0
April 2010	0	0	1,792	0
May 2010	0	0	857	0
June 2010	0	0	5	0
July 2010	0	0	318	0
August 2010	0	0	87	0
September 2010	0	0	0	0
October 2010	0	0	1,807	0
November 2010	0	0	145	0
December 2010	0	0	0	84
January 2011	0	0	0	361
February 2011	0	0	127	409
March 2011	0	0	0	546
April 2011	0	2,580	0	768
May 2011	0	3,304	1,019	854
June 2011	0	3,939	231	591
July 2011	0	368	0	0
TOTAL	10,285	10,191	6,388	3,613

* Calculated by USIBWC
** Data provided by CILA

3. "All actions undertaken pursuant to this agreement will be carried out in such a way as not to interfere with deliveries of water to Mexico either at Morelos Dam or the Southerly International Boundary (SIB) nor interfere with the rights of the U.S. or Mexico in accordance with the 1944 Water Treaty."

   Status: All actions were carried out in a manner that did not interfere with water deliveries to Mexico at Morelos Dam and the SIB and did not interfere with the rights of the U.S. and Mexico under the 1944 Water Treaty.

4. "The non-federal U.S. parties (MWD, SNWA, CAWCD) intend to contribute a total of $250,000 towards a comprehensive bi-national monitoring program for the Santa Clara Wetland."

   Status: Collectively MWD, SNWA and CAWCD provided a total of $352,000 for the monitoring program of the wetland. Dr. Karl Flessa of the University of Arizona and principal researcher for the monitoring program indicates a report concerning the results of the program is expected to be completed in 2012.

5. "Mexico is willing to allocate resources to perform the necessary dredging work in order to allow Santa Clara drain flows to reach the Wetland."

   Status: Mexico completed dredging the Santa Clara drain in January 2011.

6. "If deemed necessary, the U.S. is willing to allow for the use of the amphibious excavator to excavate the Santa Clara Drain, and Mexico will provide funds for the operation, maintenance, and, if necessary, repair of the equipment."

   Status: The amphibious excavator, amongst other equipment was utilized by Mexico to dredge the Santa Clara drain.

7. "Reclamation will provide a one-time contribution of $100,000 for additional maintenance activities related to the Wellton-Mohawk Bypass Drain."

   Status: Reclamation made this payment in April 2010.

8. "Upon the request of Mexico and pursuant to further arrangements and in a manner that poses no conflicts with the provisions of the 1944 Water Treaty, the U.S. is willing to arrange for the use of the Wellton-Mohawk Bypass Drain for the conveyance of water that Mexico and the non-governmental

organizations intend to contribute to the Santa Clara Wetland through said Drain."

Status: Further arrangements were successfully made and used.

9. "Both countries are willing to continue work, under the auspices of Minute No. 306, and to include this topic in the Colorado River Joint Cooperative Process discussions, to specifically identify the true requirements for long term sustainability of the Santa Clara Wetland based on specific habitat requirements instead of historical flows reaching the Santa Clara Wetland."

Status: This work continues.

3.8 Returning the Plant to Pre-run Condition

On March 27, 2011, activities commenced to return the YDP to its pre-run condition. These activities included draining residual water, removing and disposing of the membranes, inspecting and cleaning of all systems and equipment, and safe storage of the remaining chemicals. These activities were completed on June 30, 2011, and the plant returned to maintenance status.

3.9 Pilot Run Milestones

The following are major milestones associated with the YDP Pilot Run:

Table 19. Pilot Run Milestones

Milestone	Date
Publish press release for Public Scoping Meeting	9/25/08
Conduct Public Scoping Meeting	10/8/08
Initiate voluntary Cienega Literature Review based on scoping meeting and other comments received	11/1/08
Conduct initial consultation with the IBWC	11/14/08
Conduct second consultation with the IBWC	2/12/09
Submit ADEQ permit applications	3/2/09
Conduct third consultation with the IBWC (re: Cienega Literature Review)	4/22/09
Release draft EA with Cienega Literature Review attached for 30 day public comment period	5/1/09
Close of public comment period	6/1/09
Sign YDP Environmental Compliance Funding Agreement *(Begin finalization of Risk Management Plan)*	6/10/09
Pilot Run Agreements complete and circulating for review by Boards: Funding, Delivery, Forbearance, and Monitoring Plan Agreements	8/2/09
Release Final EA with all comments addressed *(Dependency – complete agreement with IBWC and Section 8 consultations)*	8/26/09
Release draft Finding of No Significant Impact (FONSI) for public review for 30 days	8/26/09
Close of public review period	9/28/09
Release final FONSI	9/30/09
All parties sign YDP Pilot Run Funding Agreement *(Dependency – agreement cannot be executed prior to final FONSI*	10/29/09
Notification to IBWC: Reclamation intends to conduct the Pilot Run of the YDP	10/29/09
Reclamation initiates arranged water to the Bypass Drain	10/30/09
Receipt of 1st installment payments from the Municipal Utilities	12/1/09
Final Preparation phase of the Pilot Run begins	12/1/09

Milestones (continued)	Date
Meeting at annual Colorado River Water Users Association conference – initial planning of celebratory event -- Pilot Run/Drop 2 Reservoir	12/9/09
Discharge permit issued for the YDP and WQIC	1/8/10
Receipt of 2nd installment payments from the Municipal Utilities	4/16/10
Minute 316 to the 1944 Water Treaty Signed	4/16/10
Reclamation makes $100,000 payment to Mexico for extraordinary Bypass Drain maintenance	4/16/10
Aquifer protection permit received for the YDP and WQIC	4/28/10
Celebration Event for the YDP Pilot Run and Drop 2 Reservoir	4/28/10
Completion of the final preparation phase of the Pilot Run	5/2/10
Commencement of the Pilot Run (as scheduled)	5/3/10
Coffer Dam removed in MODE 2 and discharge of YDP product water to the River commences	5/5/10
Total water conserved by the Pilot Run reaches 2,375 acre-feet	5/31/10
Total water conserved by the Pilot Run reaches 5,564 acre-feet	6/30/10
Total water conserved by the Pilot Run reaches 8,975 acre-feet	7/31/10
Total water conserved by the Pilot Run reaches 12,182 acre-feet	8/31/10
IBWC confirms U.S. has fulfilled its arranged water commitment	9/8/10
Total water conserved by the Pilot Run reaches 14,351 acre-feet	9/30/10
Secretary of the Interior Salazar tours the YDP	10/19/10
Total water conserved by the Pilot Run reaches 16,620 acre-feet	10/31/10
Total water conserved by the Pilot Run reaches 18,771 acre-feet	11/30/10
Total water conserved by the Pilot Run reaches 20,938 acre-feet	12/31/10
Total water conserved by the Pilot Run reaches 24,960 acre-feet	1/31/11
Total water conserved by the Pilot Run reaches 27,255 acre-feet	2/28/11
Cease operation of reverse osmosis portion of the plant and commence shut down activities	3/26/11
Total water conserved by the Pilot Run reaches 30,496 acre-feet	3/26/11
Completion of major activities to return YDP to pre-run condition	6/30/11
Release of supplemental personnel hired for the Pilot Run	6/30/11
IBWC provides information that Mexico and the NGOs have fulfilled their arranged water commitments set forth in Minute 316	10/4/11
IBWC provides final values for arranged water conveyed consistent with Minute 316	2/14/12

4.0 Work for Long-Term YDP Operation[60]

The purpose of the Pilot Run included determining if any previously unknown corrective actions to plant design or equipment would be necessary for long-term sustained operation of the plant. The results of the run indicate that three previously unknown equipment-related alterations to the plant might be considered if long-term sustained operation of the plant were to occur. Those alterations are installation of a permanent liquid ferric sulfate system, installation of a permanent sodium bisulfite system, and modification of the MODE 1 Diversion/Return Facility.

- **Liquid ferric sulfate system:** When the YDP was constructed, ferric sulfate storage, handling, and dosing equipment was for the dry form of the chemical. Since then liquid ferric sulfate has become widely available and less costly. Liquid ferric sulfate allows for more precise dosages and is easier to handle in large quantities than the dry form. A temporary liquid ferric system was successfully used during the Pilot Run, and a permanent system has been in use at the Water Quality Improvement Center for more than a decade. For sustained operation of the YDP, a permanent liquid ferric sulfate system may be installed.

- **Sodium bisulfite system:** The discharge permit for the YDP requires neutralization of any residual chloramines that might be present in plant product water. For the Pilot Run, a temporary system that delivered doses of sodium bisulfite was successfully used for this purpose. Sustained operation of the YDP might require installation of a permanent system.

- **MODE 1 Diversion/Return Facility:** For the Pilot Run, untreated bypass flow was diverted to the Colorado River at the MODE 1 Diversion/Return Facility. While this facility performed satisfactorily during the run modifications to its configuration, and added instrumentation might be beneficial for extended use of the facility associated with long-term YDP operation.

[60] This section reflects operation of the YDP as it is presently configured: conventional pretreatment and cellulose acetate membrane reverse osmosis.

Prior to the Pilot Run, other work that would be necessary for long-term sustained operation of the plant was already known. This work includes resolving remaining design deficiencies, purchasing new reverse osmosis membranes, replacing high-pressure aluminum-bronze piping, repairing the rail road spur that serves the plant, other repairs, and routine start-up activities.

- **Remaining design deficiencies:** Of the YDP's eighteen design deficiencies, five remain. These would need to be resolved for long-term sustained operation of the YDP. Those deficiencies are: upgrading the chlorine system, replacing the high-pressure reverse osmosis pumps, upgrading the ammonia system, completing the change out of control block valves and actuators, and recoating Solids Contact Reactor #1.

- **New reverse osmosis membranes:** The YDP requires thousands of reverse osmosis membranes; over 2,000 for one-third capacity operation and nearly 10,000 for full capacity operation. There are sufficient membranes on hand in storage for one-third capacity operation of the YDP. For long-term operation of the YDP these existing 20-year-old membranes would be used until they ceased performing. Since that duration is unknown, but likely limited to about one year, new membranes would need to be purchased for long-term plant operation. The expected service life of new membranes for brackish water RO plants like the YDP is about 5 years.

- **High-pressure aluminum-bronze piping:** The YDP contains just over 11,000 linear feet of aluminum-bronze piping. About 83% of that is considered high-pressure piping. In December, 2007, an assessment of the plant's aluminum-bronze piping was completed. The assessment included specialized metallurgical tests, ultrasonic thickness gauging, shear-wave flaw detection, x-rays, and physical inspections. The assessment concluded that sustained operation of the YDP would require replacement of the plant's high-pressure aluminum-bronze piping. A combination of 316 stainless steel and fiberglass piping may be used; this is the prevailing norm in RO plants since the YDP was constructed. Replacement of the high-pressure piping would likely be considered in parallel with replacement of the high-pressure reverse

osmosis pumps (a design deficiency) and a re-evaluation of the YDP's energy recovery units.

- **Rail road spur:** Running the YDP at one-third of full capacity or more results in one of the largest operating RO plants in the world. Water treatment chemicals are one of the largest single cost components for operation of water treatment plants, and this cost can be lowered through bulk chemical purchases and deliveries. This was the original rationale for building the rail spur from Union Pacific's main line in Yuma to the YDP. The approximately six mile long rail spur has not been used since 1993. Repairs and upgrades to the spur are necessary in order to comply with current railroad regulations. Operation of the YDP at one-third of full capacity and perhaps two-thirds could be accommodated through the use of truck deliveries in lieu of rail, though this results in cost and other tradeoffs.

- **Other repairs:** Other miscellaneous repairs would also be necessary. These were also already known prior to the Pilot Run and include repairs to the effluent piping of the dual media gravity filters (DMGF), replacement of aluminum-bronze valves at the DMGFs, upgrades to the grit handling system, possible replacement of the pump motors that force water from the grit sedimentation basins to the solids contact reactors, additional plant instrumentation, and the refinement of distributed control system (DCS) strategies.

- **Routine start-up activities:** Routine plant start-up activities would also be necessary in order for the plant to operate. All mechanical and electrical equipment such as valves and pumps would need to be tested and repaired, as needed. Wear parts such as packing and belts would need to be reinstalled on equipment. Instrumentation would need to be tested and calibrated. Equipment control strategies and data acquisition routines provided by the YDP's distributed monitoring and control system would need to be tested and verified.

Certain other repairs to Yuma Area Office infrastructure will be necessary regardless of whether or not the YDP operates:

- **A22 slurry pipeline:** This pipeline serves the WQIC and the YDP. The pipeline has been in continuous services for more than two decades. In the 10 years prior to the Pilot Run, the A22 pipeline experienced three leaks. During the run, three additional leaks occurred, all within a six week period between May 10, 2010, and June 29, 2010. The leaks during the Pilot Run are believed to be the result of a combination of two factors: a magnitude 7.2 earthquake on April 4, 2010, within 60 miles of pipeline, and the pipeline maybe reaching the end of its service life.

- **MODE/Bypass Drain:** Spot repairs to a 65-mile stretch of the MODE and Bypass Drain are necessary. These repairs would occur regardless of whether or not the YDP operates.

The following information presents the costs associated with making the YDP ready for long-term sustained operations. These costs were developed using methods appropriate for Class 4 estimates as set forth by the American Association of Cost Engineers (AACE). According to the AACE, Class 4 estimates are appropriate for strategic planning, business development, project screening, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary approval to proceed. While these estimates are appropriate for the appraisal level analysis required for the purposes of this document, they are not appropriate for budget authorization, funding agreements, or bid or tender offers. Accuracy ranges are considered to be -15% to -30% on the low side and +20% to +50% on the high side.
To make the plant ready for long-term sustained operations, estimated one-time expenditures would be $23.1 million for one-third capacity operation, an additional $19.7 million for two-thirds capacity operation, and an additional $12.4 million for full capacity operation[61]. The total one-time expenditures for full capacity plant operations would be approximately $55 million. This includes the findings of the Pilot Run and necessary work that was already known prior to the run:

[61] One-time environmental compliance activities for sustained and ongoing operation of the YDP have not been cost estimated or included.

Table 20. One-Time Expenditures for Sustained Operation of the YDP

One time project	Capacity of Operations			Amortization period
	One third	Two thirds	Full	
Pilot Run Outcome				
Liquid ferric sulfate system	920,000			20
Sodium bisulfite system	250,000			20
MODE 1 diversion facility	1,000,000			45
Design Deficiencies				
Chlorine system	2,000,000			30
Reverse osmosis pumps	2,000,000	2,000,000	2,000,000	20
Ammonia system	1,650,000			20
Control block valves/actuators	590,000	590,000		20
Solids contact reactor		420,000		15
Reverse osmosis membranes	4,000,000	4,000,000	4,000,000	5
High pressure piping*	7,000,000	6,000,000	5,000,000	40
Railroad spur		5,000,000		50
Other repairs				
Media filter effluent piping	700,000			15
Media filter valves	680,000			20
Grit handling	340,000			20
Plant instrumentation	850,000	850,000	850,000	10
DCS strategies	200,000	100,000	50,000	10
Routine start-up activities	900,000	700,000	500,000	10
Totals	23,080,000	19,660,000	12,400,000	

*Assumes 3 separate projects

All values are exclusive of Reclamation labor

At one-third capacity operation, the YDP conserves[62] approximately 31,361 acre-feet of water annually, at two-thirds capacity operation it conserves approximately 67,202[63]

[62] Total water conserved represents the sum of YDP product water discharged to the River plus untreated bypass flow discharged to the River. The combination mimics the salinity of the Colorado River below Imperial Dam.

[63] Two-thirds capacity operation conserves more than twice the water associated with one-third capacity operation because the former would utilize 45 Fluid Systems control blocks while the latter would utilize 21 Fluid Systems control blocks. It is presumed that the Fluid Systems portion of the plant would be operated prior to the Hydranautics portion of the plant because Reclamation still has Fluid Systems membranes in storage sufficient for one-third capacity plant operation.

acre-feet annually, and at full capacity it conserves approximately 91,153 acre-feet annually[64]. Based on these volumes and the amortization periods associated with each one-time expenditure making the plant ready for long term sustained operations would be a total of $52 per acre-foot for one-third capacity operation, $45 per acre-foot for two-thirds capacity operation, and $46 per acre-foot for full capacity plant operation.

Reclamation will continue to work with interested parties regarding the YDP as a means to extend Lower Colorado River water supplies.

[64] Assumes 70% process recovery factor for all capacities of operation; 94% on-stream factor for one-third and two-thirds capacity operation and 88% on-stream for full capacity operation. Also assumes conserved water (YDP product water + untreated bypass flow) would average 750 ppm. The YDP can operate at 80% process recovery which increases water conserved thereby decreasing per acre-foot operating costs compared to operating at 70% process recovery. The salinity of YDP concentrate increases as process recovery factor increases.

5.0 Appendices

Appendix 5.1

Letter from Municipal Utilities requesting the YDP Pilot Run

Central Arizona Water Conservation District
Metropolitan Water District of Southern California
Southern Nevada Water Authority

January 14, 2009

Ms. Lorri Gray
Regional Director
United States Bureau of Reclamation
Lower Colorado Region
P.O. Box 61470
Boulder City, Nevada 89006-1470

RE: *Yuma Desalting Plant Proposed Pilot Operation*

Dear Ms. Gray:

We are writing on behalf of the Central Arizona Water Conservation District (CAWCD), the Metropolitan Water District of Southern California (MWD) and the Southern Nevada Water Authority (SNWA) (hereinafter collectively referred to as the Municipal Utilities). The Municipal Utilities have initiated discussions with the U.S. Bureau of Reclamation (Reclamation) regarding a proposed pilot operation of the Yuma Desalting Plant (YDP). The Municipal Utilities are exploring the feasibility of partially funding the pilot operation, as described more fully below, in order to obtain information regarding the capability and operational readiness of the YDP that can only be understood through actual operation of the facility.

We understand that Reclamation has held a public meeting to help gather information to determine the scope of issues associated with the proposed action, and has received comment letters from some environmental organizations raising concerns with the scope and timing of the proposal. It is clear from the comments that some confusion exists with regard to the intended purpose of the pilot operation. For that reason, the Municipal Utilities want to clarify for purposes of our ongoing discussions with Reclamation and what we see as the limited purpose and need for the pilot operation of the YDP.

In furtherance of our discussions, the Municipal Utilities retained the consulting firms of CH2M Hill and Black & Veatch to make an independent evaluation of both the purpose and estimated cost of a pilot operation of the YDP. That evaluation is summarized in the attached September 2008 Report entitled "Yuma Desalting Plant Pilot Operation Overview" (the Pilot Operation Report). As discussed in more detail below, the Pilot Operation Report finds that a pilot operation of the YDP for 12 months is necessary to evaluate the operational capabilities of the YDP and potential operating costs. Without this real-time information, it is impossible to determine whether the YDP could reliably operate on a long-term basis and what, if any, improvements to the facility may be necessary to ensure the most efficient, cost effective and reliable long-term operation.

Background

The Colorado River Basin Salinity Control Act of 1974 (Salinity Control Act) authorized construction of the Yuma Desalting Plant as part of the "permanent and definitive solution" to Colorado River salinity embodied in Minute 242 of the International Boundary and Water Commission, United States and Mexico. Built to treat brackish irrigation return flow from the Welton Mohawk Irrigation and Drainage District (WMIDD), the YDP was completed and placed into operation in 1992. It operated at one-third capacity for about six months until heavy flooding on the Gila River in January 1993 damaged the canal

that transports WMIDD drain water to the YDP, causing the plant to shut down. For the next several years, high flows on the Colorado River made it unnecessary to operate the YDP to meet the water quality requirement of Minute 242. As a result, Reclamation placed the plant in ready-reserve status and, except for a brief demonstration run in 2007, has maintained it in that state since. Periodically, Reclamation has conducted readiness assessments to assess steps necessary to return the YDP to operation.

With the YDP not operating, return flows from the WMIDD that otherwise would have been treated at the plant and delivered to the Colorado River have instead been conveyed through the bypass drain to the Cienega de Santa Clara (Cienega) in Mexico. Water conveyed through the bypass drain is not credited to the U.S. as a delivery to Mexico under the 1944 Treaty, and the U.S. is under no obligation to continue bypassing WMIDD return flows. However, because these flows have been conveyed through the bypass drain instead of being discharged to the Colorado River upstream of Morelos Dam, the U.S. has had to release an equal amount of water from Colorado River System storage to meet the Mexican Treaty obligation – water that otherwise would have been available for beneficial use in the U.S.

In 2007, Reclamation operated the YDP for three months at 10% capacity, producing 2,632 acre-feet of product water (the 2007 Demonstration Run). The purposes of the 2007 Demonstration Run were to show that the plant could run, demonstrate the plant's use of current technologies, validate cost and performance estimates for the plant, improve overall plant readiness and provide measurements of water quality impacts. As discussed below, however, the Municipal Utilities believe that the 2007 Demonstration Run did not fully meet a number of these objectives. As a result, further testing is warranted.

Description of Proposed Pilot Run in 2009

It is widely recognized that the regions served by the Municipal Utilities have a rapidly growing population but limited water supplies. The continuing need for water for municipal, agricultural, environmental and recreational uses in the Lower Colorado River Basin has generated interest by the Municipal Utilities in using the YDP as a tool to conserve additional water in Colorado River System storage. Therefore, the Municipal Utilities want to better understand the potential of operating the YDP.

To that end, the Municipal Utilities propose that Reclamation undertake a pilot operation of the YDP to assess its operational capability for 365 days of operation over an 18-month period at one-third capacity (Pilot Run). The Pilot Run would use agricultural return flow resulting from the use of Colorado River water on WMIDD lands that is conveyed to the plant through the Main Outlet Drain and the Main Outlet Drain Extension (MODE). The product water produced from the Pilot Run would be blended with additional water from the MODE to reach a target total dissolved solids (TDS) concentration and then discharged to the Colorado River for credited delivery to Mexico under the Treaty. It is anticipated that approximately 30,000 acre-feet of water would be released to the Colorado River during the Pilot Run, conserving an equivalent amount of water in Lake Mead. The reject brine stream from the Pilot Run would be discharged to the MODE in accordance with Minute 242.

The Pilot Run would utilize a different pretreatment process and different reverse osmosis membranes than were utilized for the 2007 Demonstration Run to allow for additional testing and data collection. Operating the YDP at its full capacity is not possible at present, but also not required to collect the data necessary for potential full-capacity operation. However, running the plant at a very low capacity, as was done in 2007, would not be valuable because such a limited operation could result in over- or under-estimating capabilities of some of the treatment processes, given that performance is a function of the flow rate. Therefore, the Municipal Utilities are proposing that the YDP be operated at one-third capacity for the Pilot Run.

Purpose and Need for the Pilot Run

Depending upon the results of the proposed Pilot Run, the Municipal Utilities are potentially interested in subsequent discussions and processes that would evaluate the long-term viability and operation of the YDP. For example, on a long-term basis it is possible that the YDP might be operated for its

originally authorized purpose, as a municipal water supply, for a combination of these purposes, or for other, yet-to-be-determined purposes. The YDP could be operated using its existing design or it could be modified to use different pre-treatment methods and reverse osmosis membranes. The source water for long-term operation of the YDP could be as originally intended or a different source altogether. The results of the proposed Pilot Run along with research and other information would be important in assessing long-term alternatives for the YDP, whether it be operation or a temporary return to ready reserve status. However, these are long-term questions that are beyond the scope and proposed purpose of the Pilot Run. Any decision on long-term operation would require independent environmental compliance and perhaps additional Congressional authorization depending upon the purpose of such operation. However, the Pilot Run is a preliminary action designed to gain information necessary to inform any such later decision. The Pilot Run would neither preclude nor commit resources toward any later use or operation of the YDP.

The Municipal Utilities view the principal benefit of conducting the Pilot Run as generating information to better understand both the operational readiness of the YDP and its long-term capabilities

As more fully discussed in Section 6 of the Pilot Operation Report, the specific information that would be gained from conducting the Pilot Run at this time includes the following.

- The Pilot Run would be designed to be at a flow and for a duration sufficient to (1) assess the cost of long-term YDP operation at design capacity, and (2) verify the suitability of the treatment processes and associated facilities currently in place at the YDP to reliably produce product water that could be used for multiple end uses. This will help determine whether any additional improvements to the YDP are necessary to ensure reliable medium and long-term operation beyond those already identified by Reclamation and the cost implications of such improvements. (Pilot Operation Report at 18-19).

  More specifically, in the more than two decades since the initial design of the YDP, water treatment technology has advanced substantially in terms of both type and efficiency. For example, reverse osmosis (RO) membranes have improved salt removal while reducing energy use and operational requirements. While lime softening followed by dual-media filtration – the original pretreatment process used at the YDP – is still considered standard technology, many utilities are turning to the use of microfiltration or ultrafiltration as pretreatment preceding RO. Before making a commitment to long-term operation of any facility, it is important to assess its capabilities, cost of operation, and treatment processes. A desktop evaluation is important, but has a high level of uncertainty due to the unknown condition of the facility and equipment. Simply assuming that everything needs to be replaced would artificially increase the cost without considering the actual condition of equipment. To more accurately determine its capabilities and cost, the facility should be tested.

- The Pilot Run would also be used to provide a baseline cost for evaluation of other pretreatment processes and membrane types identified by Reclamation and the Municipal Utilities. Performance and cost data developed during the Pilot Run will provide a baseline by which alternative treatment configurations can be benchmarked, including those previously developed by Reclamation. The Municipal Utilities are interested in evaluating additional testing using Reclamation's Water Quality Improvement Center facilities in conjunction with the Pilot Run to better quantify the actual costs for all operational alternatives that could potentially provide more cost effective and reliable YDP operation in the long term. (Pilot Operation Report at 19).

- The Pilot Run will also fully test the distributed control system (DCS) implemented by Reclamation so that potential future operating costs could be reduced. The original DCS systems supplier went out of business several years ago and Reclamation has been working on an upgrade with a new system supplier. Although most of the original local manual and local automatic controls are still operational at the YDP, a majority of the DCS automatic controls and monitoring have not been tested using the new system. The Pilot Run will allow the testing and completion of the fully automated DCS control.

- Additionally, the Pilot Run can provide information to help determine the viability of the YDP to treat saline water supplies for the benefit of the Colorado River Basin States.

Although Reclamation operated the facility for a short time in 2007, the information gained from the 2007 Demonstration Run was inadequate to evaluate the facility's long-term water supply capabilities. For example, the 2007 Demonstration Run used a polymer pretreatment method, rather than the lime softening process included in the original YDP design. The Demonstration Run used a combination of new and "used" membranes, with the used membranes showing increasing salt passage. Reclamation concluded that the polymer pretreatment did not produce suitable results with the plant's cellulose acetate membranes to justify its continued use. As a result, the cost and performance data from the 2007 Demonstration Run are not accurate indicators of longer-term YDP operating costs. By comparison, the Pilot Run would include the lime softening process and unused Fluid Systems RO membranes, of which Reclamation has a stockpile The Pilot Run would provide additional baseline data to help assess YDP capabilities, cost of operation, and impacts.

Implementation of a pilot operation in advance of full-scale operation is conventional practice in the industry. The objectives of pilot operation usually include minimization of overall operational costs, insuring that the finished water quality meets required standards, and allowing operational flexibility, particularly related to the costs of operation associated with the use of chemicals and energy. In general, the larger the pilot operation, the more closely the pilot results will match full-scale plant operations. The determination of the size of the pilot operation is usually based on balancing piloting costs versus information obtained to assess the design and operation of the full scale plant. Another general rule of pilot operations is that the piloting be conducted over an adequate length of time to allow for the full range of variation of influent water quality. This period is typically one year to allow for seasonal variations. The 2007 Demonstration Run did not constitute a true pilot operation of the YDP, as it lasted only 90 days and the plant operated at only 10% capacity during that time.

Public Concerns

Some environmental groups have already written Reclamation commenting on the potential environmental impacts from the Pilot Run. In part, these groups are concerned with potential loss of biological habitat and water quality impacts to the Cienega from reduced flows in the bypass drain. The reduction in flow in the bypass drain, however, would be within the range of variability in both the quantity and quality of flows that have occurred historically. As discussed above, bypass drain flows are irrigation return flows, and as such are inherently variable and dependent on the extent and continuation of irrigation.

There is no obligation, either under U.S. law or the 1944 Treaty, on the part of WMIDD, the United States or any other entity to maintain flows in the bypass drain of any particular quantity or quality. In fact, Minute 242 expressly provides that the United States may discharge the YDP brine stream to the Cienega through the bypass drain.

As discussed above, however, the Municipal Utilities are considering providing a portion of the funding for the environmental review of the Pilot Run. Environmental groups also commented that Reclamation should undertake a broader range analysis of various operational configurations of the YDP. Such review is unnecessary and inappropriate in light of the limited purposes and scope of the Pilot Run. Of course, any consideration of long-term YDP operations would involve a different set of potential environmental or other impacts. This proposal does not raise those considerations.

Conclusion

The YDP is a resource that should be fully considered to help conserve water in the Lower Colorado River Basin. The Municipal Utilities would support and to the extent appropriate participate in consultations by Reclamation with Mexico pursuant to Minute 242, concerning the Pilot Run.

The Municipal Utilities believe a Pilot Run of the limited scope and duration described above would provide valuable data to inform future decisions about options for long-term YDP operation. The

Municipal Utilities are willing to enter into a cost sharing arrangement with Reclamation to fund the environmental compliance costs necessary to evaluate the Pilot Run. Such funding would be used by the United States, and the environmental compliance and permitting would be subject to the procedural and substantive requirements of applicable federal and state law. The Municipal Utilities would reserve their rights to participate in and challenge the results of any environmental review and permitting decision, as would any other affected person. Moreover, even though we do not anticipate material adverse impacts to the Cienega from the proposed Pilot Run, the Municipal Utilities have proposed an environmental monitoring program that would evaluate conditions in the Cienega before, during and after the Pilot Run.

Should a decision be made to conduct the proposed Pilot Run, the Municipal Utilities would also consider providing additional funds to partially fund the cost of implementing the Pilot Run in exchange for intentionally created surplus (ICS) credits in accordance with the 2007 Colorado River Interim Guidelines. . While operation of the Pilot Run would provide the Municipal Utilities with some additional water, this is a one-time water supply opportunity and not the primary purpose of the Pilot Run. The Municipal Utilities will not be asking Reclamation to make any long-term commitment with regard to how or even if the YDP would operate in the future prior to completion of the Pilot Run.

for David S. "Sid" Wilson, Jr.,
General Manager
Central Arizona Water Conservation District

Jeffrey Kightlinger,
General Manager
Metropolitan Water District of Southern California

Patricia Mulroy,
General Manager
Southern Nevada Water Authority

Appendix 5.2

Finding of No Significant Impact (National Environmental Policy Act)

United States Department of the Interior

BUREAU OF RECLAMATION
Yuma Area Office
7301 Calle Agua Salada
Yuma, Arizona 85364

IN REPLY REFER TO:
YAO -7210
ENV -1.10

TAKE PRIDE IN AMERICA

FINDING OF NO SIGNIFICANT IMPACT
Proposed Yuma Desalting Plant Pilot Run

U.S. Department of the Interior
Bureau of Reclamation
Yuma Area Office

Introduction

In accordance with the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190 as amended), the Bureau of Reclamation (Reclamation) has issued the attached Environmental Assessment (EA) to disclose the environmental impacts resulting from the proposed Yuma Desalting Plant Pilot Run. The EA provides details on the Proposed Action and an analysis of potential impacts; it should be used as the basis for this Finding of No Significant Impact (FONSI).

Proposed Action

The purpose of the Proposed Action is to operate the Yuma Desalting Plant (YDP) as designed at a sufficient flow and appropriate duration to gather benchmark performance and cost data which can only be obtained through actual plant operations; determine whether any additional corrective actions to plant design or equipment would be necessary for long-term operation of the plant; and test changes and corrections (such as the fully-automated distributed control system) which have already been implemented at the YDP as part of maintaining its ready reserve status. The need for the Proposed Action is to obtain information regarding actual plant operation which will test theoretical analyses and provide information about the plant's operating capability to reliably produce product water which could be used for multiple end uses; as well as to verify the suitability of treatment processes and associated facilities during actual plant performance, determine baseline operating costs, test the effectiveness of completed plant improvements, and assess how plant equipment will respond to daily operation; and provide process related effluent and emissions data for a sufficient period of time to provide a basis to analyze, in a separate, future decision, potential environmental consequences of long-term YDP operation.

Resource Analysis

The EA focused on those resource areas identified as potentially impacted by the alternatives considered, including the No Action Alternative. Based on the location and nature of the Proposed Action, there would be no effects to aesthetics, cultural resources, geology and soils,

and land use. Potential negative effects of the Proposed Action were identified for air quality, biological resources, water resources, hazardous materials, Indian trust assets, environmental justice, noise, and climate change:

1. Air quality will be affected by the Proposed Action through increased particulate matter that is 10 microns in diameter or less (PM_{10}) emissions and ozone as a result of a slight increase in traffic to the YDP. However, the analysis in the EA indicates effects to PM_{10} and ozone will be negligible and not significant.

2. Biological resources may be impacted from the Proposed Action due to the conveyance of drainage water into the Colorado River from the MODE 1 Diversion/Return Facility. However, because this type of conveyance is a routine operational practice which occurs regularly, and because the additional water will not result in any significant changes in salinity and river level, no effects to fish and wildlife, including endangered species in the U.S., will occur (U.S. Fish and Wildlife Service letter dated July 13, 2009). Reclamation will obtain a National Pollutant Discharge Elimination System permit for the discharge of product water from the YDP prior to initiating the Proposed Action. This discharge will not result in any significant impacts.

3. Potential impacts to water resources include the disposal of biosolids (a byproduct of the YDP) to the A-22 evaporative ponds. These biosolids, if not disposed of properly, could affect groundwater in the Yuma area. However, the A-22 ponds (evaporative cells) are lined, which will prevent biosolids from reaching the groundwater and adversely affecting groundwater. As appropriate, Reclamation will notify the Arizona Department of Environmental Quality of the proposed quantity change discharged to the A-22 cells for the Proposed Action. In addition, during operation of the YDP about 21,700 acre feet (AF) of desalinated product water and 7,300 AF of MODE flow will be conveyed to the Colorado River. As a result, depending upon the delivery of Intentionally Created Surplus (ICS) credits, temporary reduced releases from Hoover Dam may occur, thus producing slightly lowered water elevations along the river between Hoover and Imperial Dams. However, effects resulting from the lower elevation levels would be so small as to be immeasurable, and the change in water releases would not conflict with water delivery obligations, cause significant groundwater depletion, or alter existing drainage. There will not be any significant impacts on water resources.

4. Hazardous materials to be used on-site during the proposed YDP Pilot Run will increase. Hazardous materials will continue to be managed in accordance with Environmental Protection Agency and Occupational Safety and Health Administration requirements. The existing Risk Management Plan/Process Safety Management Plan (RMP/PSMP) documents which outline preventative actions to avoid an accidental release will be revised before the Proposed Action is initiated in order to continue to ensure employee, public, and environmental safety due to the greater amounts of chemicals necessitated by the YDP Pilot Run. In addition, hazardous waste generated from the Proposed Action would continue to be transported to an off-site hazardous waste facility for treatment or disposal in accordance with state regulations. There will be no significant impact resulting from hazardous materials.

5. The Proposed Action will not affect Indian trust assets (ITA). Reclamation will continue to coordinate with the Quechan and Cocopah tribes to ensure ITA's remain unaffected.

6. The Proposed Action will not affect environmental justice considerations. It will not result in any disproportionately high and adverse human health or environmental effects on minority or low-income populations in the U.S.

7. A slight increase in ambient noise levels is anticipated as a result of the Proposed Action. However, because sensitive noise receptors are in locations which are sufficiently distant from the YDP, and existing mechanisms to minimize noise are in place, impacts will not be significant.

8. Based on the Pilot Run's short term duration, the Proposed Action will not be affected by global climate change. The Proposed Action will not cause any significant contribution of hydrocarbons to the environment; therefore, no significant climate change impact will result.

Connected Actions

The potential environmental impacts of two connected actions were also analyzed in the EA: (1) the potential approval of ICS credits associated with the proposed YDP Pilot Run; and (2) Reclamation actions within the U.S. that are documented in the "Joint Report Of The Principal Engineers Concerning U.S.-Mexico Joint Cooperative Actions Related To The Yuma Desalting Plant (YDP) Pilot Run And The Santa Clara Wetland" (Joint Report). Neither of these actions were determined to result in significant environmental impacts for the reasons identified in the EA.

NEPA Finding

Based on the analysis of the environmental impacts and mitigation measures as presented in the EA, Reclamation has determined that implementation of the Proposed Action of conducting a Pilot Run of the Yuma Desalting Plant would not significantly impact the human environment and that preparation of an environmental impact statement is not warranted. The Proposed Action does not exceed any of the significance criteria outlined in the NEPA implementing regulations at 40 CFR Section 1508.27. In addition, Reclamation has determined the implementation of the two connected actions addressed in the EA would not significantly affect the human environment.

International Considerations

Under the proposed Pilot Run, flows in the Bypass Drain would be reduced by approximately 29,000 AF, while salinity levels would be increased by about 540 parts per million (expressed as total dissolved solids). A number of public comments on the EA focused on this potential impact of the proposed Pilot Run on the environmental resources of the Cienega de Santa Clara (Cienega). As noted in Section 1.6 of the EA, the statutory provisions of NEPA and the Council on Environmental Quality implementing regulations do not require assessment of environmental impacts in the sovereign territory of a foreign nation. However, in the spirit of bi-national cooperation, with regard to the ecology of the Colorado River's Limitrophe Division and its Delta as established in Minute No. 306, Reclamation, through the International

Boundary and Water Commission, initiated consultation with Mexico regarding the proposed YDP Pilot Run.

The outcome of this consultation is Joint Report, dated July 17, 2009. The United States, Mexico, and a partnership of non-governmental organizations, as stated in commitment letters from each party and further outlined in the Joint Report, will each arrange for 10,000 AF of water (for a total of 30,000 AF) in connection with the reduction in flow and increase in salinity level. Furthermore, the United States, Mexico, and a partnership of non-governmental organizations committed to working through the Colorado River Joint Cooperative Process, pursuant to Minute 306, to continue to address long-term approaches to maintain the environmental values of the Cienega. The Joint Report and other related documents are included in the EA for informational purposes as Appendix C.

Decision

In light of the foregoing, I hereby approve:

1) implementation of the Proposed Action to initiate a Pilot Run of the YDP; and
2) implementation of the Reclamation actions outlined in the Joint Report.

Jennifer McCloskey

SEP 30 2009

Jennifer McCloskey, Area Manager
Yuma Area Office

Date

Appendix 5.3

Joint Report of the Principal Engineers

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

Ciudad Juarez, Chihuahua
July 17, 2009

JOINT REPORT OF THE PRINCIPAL ENGINEERS CONCERNING U.S.-MEXICO JOINT COOPERATIVE ACTIONS RELATED TO THE YUMA DESALTING PLANT (YDP) PILOT RUN AND THE SANTA CLARA WETLAND

To the Honorable Commissioners
International Boundary and Water Commission
United States and Mexico
El Paso, Texas-Ciudad Juarez, Chihuahua.

Sirs:

In accordance with your instructions, we respectfully submit this Joint Report concerning U.S.-Mexico joint cooperative actions related to the proposed Yuma Desalting Plant (YDP) Pilot Run. The purpose of this report is to identify actions that could be carried out by each country related to the proposed YDP Pilot Run and to identify other efforts related to the Santa Clara Wetland in Mexico.

To continue with the binational spirit of cooperation with regard to the Colorado River limitrophe section and the Santa Clara Wetland as established in Commission Minute No. 306 entitled, "Conceptual Framework for United States-Mexico Studies for Future Recommendations Concerning the Riparian and Estuarine Ecology of the Limitrophe Section of the Colorado River and its associated Delta," signed on December 12, 2000, and in accordance with the resolutions in Minute No. 242, "Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River," signed on August 30, 1973, in November 2008, the U.S. and Mexico, through the International Boundary and Water Commission, initiated binational consultations regarding the proposed Pilot Run to operate the YDP.

Proposed Pilot Run of the YDP and Alteration of Flow to the Santa Clara Wetland.

The United States passed the *Colorado River Basin Salinity Control Act of 1974* (Salinity Control Act), which authorized the construction, operation, and maintenance of certain works in the Colorado River Basin to control the salinity of water that is delivered to Mexico in accordance with the 1944 Water Treaty. Title I of the Salinity Control Act provides the legal basis for programs to comply with the provisions of Minute No. 242 downstream from Imperial Dam. To implement provisions of Title I of the Salinity Control Act, construction of the YDP in Yuma, Arizona was largely completed in 1992. Shortly thereafter, it operated at one-third capacity for a brief trial period. With above average flow on the Colorado River and other considerations, operation of the YDP was then suspended and has not operated since, with the exception of a 90-day demonstration run at 10% of its capacity in 2007.

The Metropolitan Water District of Southern California (MWD), Southern Nevada Water Authority (SNWA), and Central Arizona Water Conservation District (CAWCD) have requested that the U.S. Bureau of Reclamation (Reclamation) conduct a Pilot Run of the YDP and are considering providing some funds needed for operation. These parties, as well as other U.S. entities, are interested in gaining additional information under low water conditions in the Colorado River Basin that can be used when considering long term, sustained operation of the YDP as a tool to extend water supplies. Such consideration requires gathering information that can only be obtained through actual operation of the YDP. This includes collecting performance and cost data, identifying any remaining improvements to equipment, and testing changes already performed on the plant. Reclamation has developed a plan for the proposed Pilot Run, in which the plant would operate for 365 days within a period of up to 18 months at one-third capacity to gather such information. The proposed Pilot Run would produce approximately 29,000 acre-feet (35.8 million cubic meters (mcm)) of water for use within the United States. Reclamation, as the owner and operator, will comply with all the applicable requirements of federal law prior to determining whether to commence the Pilot Run.

Under current conditions, saline flows are bypassed to Mexico via the Wellton-Mohawk Bypass Drain and eventually flow into the Santa Clara Wetland. We observe that the Santa Clara Wetland is part of the Upper Gulf of California and Colorado River Delta Biosphere Reserve, the highest category of protection that Mexico assigns to a wetland, in addition to being declared a protected wetland under the RAMSAR Wetlands Convention. This area provides wetland habitat for migratory birds on the Pacific Flyway and for various species including threatened and endangered species. When the YDP is not operating, flows to the Santa Clara Wetland from the Wellton-Mohawk Bypass Drain between 2004 and 2008 averaged an estimated 107,000 acre-feet (132.0594 mcm) annually with a salinity of approximately 2,664 parts per million. Under the proposed Pilot Run, absent any joint cooperative actions, flows that reach the Santa Clara Wetland from the Wellton-Mohawk Bypass Drain would be reduced to approximately 77,000 acre-feet (95.0334 mcm), while salinity would increase to approximately 3,204 parts per million.

We observed that both countries are interested in preserving the environmental value of the Santa Clara Wetland during the proposed YDP Pilot Run, and we also observe that Mexico, the United States and the potential YDP funding partners, in the interest of binational cooperation, are willing to undertake joint cooperative actions that are responsive to address the Santa Clara Wetland and the U.S. interest in conducting the proposed YDP Pilot Run.

U.S.-Mexico Discussions Concerning the YDP Pilot Run and the Santa Clara Wetland

We observed that Resolution 4 of Minute No. 242 states that Mexico shall permit the United States to discharge to the Santa Clara Slough "the volumes of brine from such desalting operations in the United States as are carried out to implement the Resolution of this Minute, and any other volumes of brine which Mexico may agree to accept" and Resolution 6 stipulates that "With the objective of avoiding future problems, the United States and Mexico shall consult with each other prior to undertaking any new development of either the surface or the groundwater resources, or undertaking substantial modifications of present developments, in its own territory in the border area that might adversely affect the other country."

We also observed that Minute No. 306 provides, "That in recognition of their respective governments' interest in the preservation of the riparian and estuarine ecology of the Colorado River in its limitrophe section and its associated delta, the Commission shall establish a framework for cooperation by the United States and Mexico through the development of joint studies that include possible approaches to ensure use of water for ecological purposes in this reach and formulation of recommendations for cooperative projects, based on the principle of an equitable distribution of resources."

In November 2008, in order to further both the consultation process established under Minute No. 242 and the spirit of binational cooperation with regard to the ecology of the Colorado River limitrophe and its delta as established in Minute No. 306, the U.S. and Mexico, through the International Boundary and Water Commission, initiated consultations regarding the proposed YDP Pilot Run.

The binational consultation consisted of a series of meetings held over a period of five months where the details of the Pilot Run were presented and expert stakeholders from both countries had an opportunity to discuss the proposed action. The following were the primary items of discussion:

- Whether or not current average annual flows reaching the Santa Clara Wetland would be reduced and if so, what the impact would be that reduced volumes and increased salinity could have on the biodiversity and the ecosystem,
- Need for a comprehensive binational monitoring program of the Santa Clara Wetland,
- Importance of the YDP Pilot Run in order to gather data required for future decision making,
- Ensuring that all agreements with regards to this YDP consultation are limited to the proposed YDP Pilot Run and its duration,
- Addressing the importance of understanding the requirements for long term sustainability of the Santa Clara Wetland based on specific habitat requirements instead of historical flows reaching the Santa Clara Wetland, and
- Importance of maintaining existing infrastructure such as the Wellton-Mohawk Bypass Drain and the Santa Clara drain to ensure flows reach the intended locations within the Santa Clara Wetland.

Proposed Joint Cooperative Actions

Based on the binational discussions regarding the YDP Pilot Run discussed during the preceding five months, a program of joint cooperative actions was developed and proposed to address the interests of both countries in the event Reclamation determines to commence the Pilot Run. The suggested joint cooperative actions discussed to date regarding the proposed YDP Pilot Run are described below.

1) If, the proposed 365 day YDP Pilot Run, is approved by the appropriate U.S. agency, it is recommended that the Joint Cooperative Actions described in this document be carried out.
2) During the YDP Pilot Run, each one of the parties, the U.S., Mexico and Non-Governmental Organizations (NGOs) each intend to arrange for 10,000 acre-feet (12.3 mcm) of water for a

total of 30,000 acre-feet (37.0 mcm) pursuant to the letters of commitment that have been received from the respective participants.

3) All actions undertaken pursuant to this agreement will be carried out in such a way as not to interfere with deliveries of water to Mexico either at Morelos Dam or the Southerly International Boundary (SIB) nor interfere with the rights of the United States or Mexico in accordance with the 1944 Water Treaty.
4) The non-federal U.S. parties (MWD, SNWA and CAWCD) intend to contribute a total of $250,000 toward a comprehensive binational monitoring program for the Santa Clara Wetland.
5) Mexico is willing to allocate resources to perform the necessary dredging work in order to allow Santa Clara drain flows to reach the Santa Clara Wetland.
6) If deemed necessary, the U.S. is willing to allow for the use of the amphibious excavator to excavate the Santa Clara Drain, and Mexico will provide funds for the operation, maintenance and, if necessary, repair of the equipment.
7) The U.S. Bureau of Reclamation will provide a one-time contribution of $100,000 for additional maintenance activities related to the Wellton-Mohawk Bypass Drain.
8) Upon request of Mexico and pursuant to further arrangements and in a manner that poses no conflicts with the provisions of the 1944 Water Treaty, the U.S. is willing to arrange for the use of the Wellton-Mohawk Bypass Drain for the conveyance of water that Mexico and the non-governmental organizations intend to contribute to the Santa Clara Wetland through said drain.
9) Both countries are willing to continuing work, under the auspices of Minute No. 306, and to include this topic in the Colorado River Joint Cooperative Process discussions, to specifically identify the true requirements for long term sustainability of the Santa Clara Wetland based on specific habitat requirements instead of historical flows reaching the Santa Clara Wetland.

Specific Details of the Proposed Joint Cooperative Actions

1. The proposed YDP Pilot Run consists of the operation of the YDP at one-third capacity for 365 days during a period of up to eighteen months. The implementation of this pilot run is subject to the conclusion of the Environmental Assessment (EA) and subject to a decision by Reclamation to proceed. In order to carry out the proposed Pilot Run, 37,980 acre-feet (46.8 mcm) of water from the Wellton-Mohawk Bypass Drain will be treated at the plant, resulting in about 21,700 acre-feet (26.8 mcm) of treated and desalinated product water. This treated and desalinated product water will be discharged along with an estimated 7,300 acre-feet (9 mcm) of untreated water from the Wellton-Mohawk Bypass Drain, resulting in discharge to the Colorado River of approximately 29,000 acre-feet (35.8 mcm) of water with salinity substantially similar to current river salinity. The saline concentrate that is a byproduct of the treatment process will be discharged to the Wellton-Mohawk Bypass Drain, which would increase the salinity to an estimated salinity of 3,204 ppm.

2. The United States, Mexico, and a partnership of non-governmental organizations intend to each arrange for 10,000 acre-feet (12.3 mcm) of water, for a total of 30,000 acre-feet (37 mcm), in connection with the reduction in flow to the Santa Clara Wetland and the increase in salinity that would occur during the proposed YDP Pilot Run in the absence

of the Joint Cooperative Actions identified in this agreement. These volumes shall be conveyed during the YDP Pilot Run period, however each party may initiate conveyance of their respective volumes starting on the date a decision is made by the appropriate U.S. agency to proceed with the proposed YDP Pilot Run until the conclusion of the proposed YDP Pilot Run.

(a) As a matter of binational cooperation, the U.S. intends to convey through the Wellton-Mohawk Drain to the Santa Clara Wetland 10,000 acre-feet (12.3 mcm) of non-storable Colorado River flows, which arrive in Mexico due to limitations in U.S. system operations and are not part of its Colorado River allocation.

(b) Mexico intends to provide 10,000 acre-feet (12.3 mcm) of water to the Santa Clara Wetland. To do so, Mexico is making the necessary arrangements and investments to send water to the Santa Clara Wetland.

(c) U.S. and Mexican non-governmental organizations intend to use existing water rights that are property of the NGOs trust and lease sufficient water rights from the Mexicali Valley Irrigation District to provide 10,000 acre-feet (12.3 mcm) of water for delivery to the Santa Clara Wetland. This responsibility is limited to the NGOs without responsibility to the U.S. or Mexican government. It is recommended that Mexico and the U.S. work with the NGOs to document through the Commission this agreement and deliver this water through the Wellton-Mohawk Bypass Drain.

3. The U.S. is willing to operate its systems in a manner that allows conveyance of the contribution stated in point 2 (a) above, 10,000 acre-feet (12.3 mcm) of water, directly into the Wellton-Mohawk Bypass Drain. The U.S. conveyance of 10,000 acre-feet (12.3 mcm) of non-storable Colorado River water identified in point 2 (a) above should not be considered part of Mexico's Colorado River water allocation as provided for under the 1944 Water Treaty, nor impact the delivery of said waters, including monthly allocations and delivery schedules.

4. It is recommended that the U.S. and Mexico coordinate regarding system operations to ensure conveyance of the water volumes described in 2 (b) and 2 (c) above to the Santa Clara Wetland, including consideration of the feasibility of delivering Mexican water to the Santa Clara Wetland through the Wellton-Mohawk Bypass Drain or by means of other infrastructure owned or operated by the United States. It is recommended that the Commission develop a new Minute to facilitate the conveyance of said water using the Wellton-Mohawk Bypass Drain.

5. The volume of 10,000 acre-feet (12.3 mcm) conveyance stated in point 2 (a) above during the YDP Pilot Run will not be accounted in favor of Mexico as part of its Colorado River water allocation provided for under the 1944 Water Treaty.

6. For the contribution stated in point 2 (b) above, Mexico intends to, using Mexican resources and infrastructure, perform the necessary maintenance work on the Santa Clara Drain, including removal of sediment, to ensure that Santa Clara Drain flows reach the Santa Clara Wetland, and if appropriate, any other actions to guarantee its commitment as required.

7. Reclamation's non-federal funding partners for the YDP Pilot Run intend to contribute a total of $250,000 for a comprehensive binational monitoring program of the Santa Clara Wetland and related activities. It is recommended that a binational group be established by the Commission to make recommendations to the Commission for the program's terms of reference, scope, and duration. The terms of reference should outline what agencies will be participating, how the information will be exchanged, and how the final product will be published.

8. As may be requested by the Mexican Section, the U.S. Section is willing to authorize the Mexican Section to use the U.S. Section's amphibious excavator, two 19-foot aluminum boats, and the air boat and trailer, currently loaned to the Mexican Section for Wellton-Mohawk Bypass Drain maintenance, for maintenance of the Santa Clara Drain, using Mexican funds for the operation, maintenance and, if necessary, repairs to the equipment. The use of the equipment for the Santa Clara Drain shall be consistent with the conditions established for this purpose. Use of the equipment and the conditions for its use will be coordinated between the two Sections of the Commission.

9. Reclamation, through the U.S. Section, is willing to provide a one-time contribution to the Mexican Section of $100,000 dollars for extraordinary maintenance of the Wellton-Mohawk Bypass Drain. Performing extraordinary maintenance on the Wellton-Mohawk Bypass Drain will assure reliable flows to the Santa Clara Wetland by effectively improving the conveyance capacity to transport sediment through the canal and avoid sediment build-up at the terminus of the canal that could disrupt flow to the wetland. The Mexican Section intends to provide to the U.S. Section a detailed list of the actions to be performed for review and concurrence.

10. It is recommended that Colorado River Joint Cooperative Process' Work Groups and Core Group address the future needs of the Santa Clara Wetland. Consistent with Minute No. 306, the Colorado River Joint Cooperative Process intends to address long-term approaches to maintain the environmental values of the Santa Clara Wetland. Such approaches should focus on identifying and quantifying the habitat values to be preserved then identifying the amount, timing, quality and source of water associated with preservation of those values.

Recommendations

Based on the foregoing and that the U.S. and Mexico participants involved in the consultation process have provided their concurrence with the implementation of the proposed Joint Cooperative Actions Program, we respectfully recommend that the Commissioners approve the aforementioned program of joint cooperative actions.

After the approval of this report by the Commissioners and in the event that any of the recommended joint cooperative actions described in this report are not implemented due to unforeseen conditions, it is recommended that under the auspices of the Commission and in the interest of binational cooperation, all parties involved in the process reinitiate discussions, in good faith, to expeditiously resolve any unforeseen issues related to the proposed YDP Pilot Run.

Respectfully submitted for your consideration,

Alfredo J. Riera
Principal Engineer
United States Section

Luis Antonio Rascón Mendoza
Principal Engineer
Mexican Section

Appendix 5.4

Minute 316 to the 1944 Water Treaty

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

Yuma, Arizona, April 16, 2010

MINUTE NO. 316

UTILIZATION OF THE WELLTON-MOHAWK BYPASS DRAIN AND NECESSARY INFRASTRUCTURE IN THE UNITED STATES FOR THE CONVEYANCE OF WATER BY MEXICO AND NON-GOVERNMENTAL ORGANIZATIONS OF BOTH COUNTRIES TO THE SANTA CLARA WETLAND DURING THE YUMA DESALTING PLANT PILOT RUN

The Commission met at the offices of the Yuma Desalting Plant in Yuma, Arizona, at 1:00 PM on April 16, 2010, to consider the utilization of the Wellton-Mohawk Bypass Drain and necessary infrastructure in the United States for the conveyance of water by Mexico and non-governmental organizations of both countries through said Drain to the Santa Clara Wetland during the Yuma Desalting Plant (YDP) Pilot Run, scheduled by the United States Government to commence in May 2010.

The Commissioners noted the duties, powers and responsibilities entrusted by the Governments of the United States and Mexico to the International Boundary and Water Commission, specifically, those provisions concerning the rights and obligations assumed by the United States and Mexico in the "Treaty for Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande," signed February 3, 1944.

The Commissioners reviewed the report entitled "Joint Report of the Principal Engineers Concerning U.S.-Mexico Joint Cooperative Actions Related to the Yuma Desalting Plant (YDP) Pilot Run and the Santa Clara Wetland," dated July 17, 2009, signed by Principal Engineers Alfredo J. Riera of the U.S. Section and Luis Antonio Rascón of the Mexican Section, an original copy of which is attached and forms an integral part of this Minute.

Both Commissioners observed that according to said Joint Report, the United States, Mexico, and the non-governmental organizations each intend to arrange for 10,000 acre-feet (12.3 million cubic meters (mcm)) of water to convey to the Santa Clara Wetland, and that they intend to convey all or part of these volumes through the Wellton-Mohawk Bypass Drain.

They further observed that according to the Joint Report "It is recommended that the U.S. and Mexico coordinate regarding system operations to ensure conveyance of the water volumes described in 2 (b) and 2 (c) above to the Santa Clara Wetland, including consideration of the feasibility of delivering Mexican water to the Santa Clara Wetland through the Wellton-Mohawk Bypass Drain or by means of other infrastructure owned or operated by the United States. It is recommended that the Commission develop a new

Minute to facilitate the conveyance of said water using the Wellton-Mohawk Bypass Drain."

Consistent with the foregoing provisions of the Joint Report, the Principal Engineers recommended that the Commission adopt a Minute to memorialize the binational agreement that would allow the utilization of the Wellton-Mohawk Bypass Drain and necessary infrastructure in the United States for the conveyance of water by Mexico and non-governmental organizations of both countries through the Drain to the Santa Clara Wetland during the YDP Pilot Run.

The U.S. Commissioner stated that the United States Bureau of Reclamation (Reclamation) owns and operates the aforementioned U.S. conveyance system and is willing to make the necessary arrangements for the conveyance of water by Mexico and non-governmental organizations of both countries to the Santa Clara Wetland, in connection with the YDP Pilot Run, as recommended by the Principal Engineers in the Joint Report. Exhibit 1 shows a diagram of the U.S. conveyance system and the Wellton-Mohawk Bypass Drain.

The U.S. Commissioner further stated that the YDP Pilot Run is proposed to begin in May 2010 and that Reclamation will operate the desalting plant for a total of 365 days within an 18-month period.

Based on the above, the Commissioners submit the following resolutions for the approval of both Governments:

1. Approval of the utilization of the Wellton-Mohawk Bypass Drain and necessary infrastructure in the United States, under appropriate arrangements, for the temporary conveyance of water by Mexico and non-governmental organizations of both countries through this Drain to the Santa Clara Wetland, up to 10,000 acre-feet (12.3 mcm) each as described in the Joint Report referred to in Resolution 2, in connection with the YDP Pilot Run.

2. Approval of the "Joint Report of the Principal Engineers Concerning U.S.-Mexico Joint Cooperative Actions Related to the Yuma Desalting Plant (YDP) Pilot Run and the Santa Clara Wetland," dated July 17, 2009, which forms an integral part of this Minute.

3. The temporary conveyance of the volumes of water by Mexico and the non-governmental organizations through the U.S. conveyance system, via the Wellton-Mohawk Bypass Drain to the Santa Clara Wetland, will be coordinated through the Commission.

4. The operation of the YDP Pilot Run and the utilization of the Wellton-Mohawk Bypass Drain and necessary infrastructure as provided herein will not affect the rights and obligations assumed by the United States and Mexico in the 1944 Water Treaty.

5. All activities undertaken pursuant to this Minute shall be subject to the availability of funds, resources, and corresponding personnel, as well as to applicable laws and regulations in each country.

6. This Minute shall enter into force when the Government of the United States of America and the Government of the United Mexican States have each provided written notification through the respective IBWC Sections of its approval.

The meeting was adjourned.

Edward Drusina
U.S. Commissioner

Roberto F. Salmon Castelo
Mexican Commissioner

Adolfo Mata
U.S. Section Secretary

Jose de Jesus Lnevano Grano
Mexican Section Secretary

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

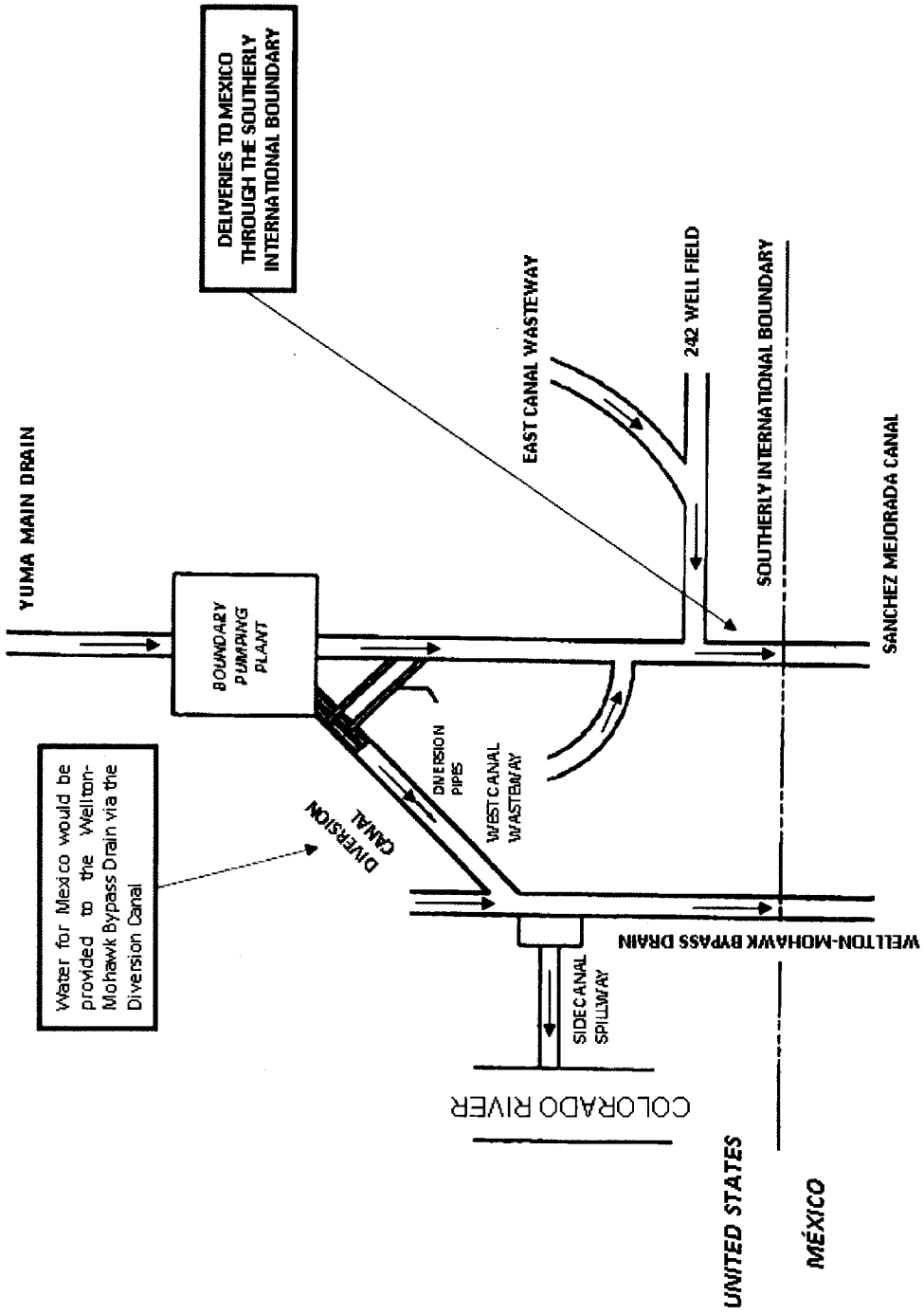

DIAGRAM OF THE OPERATING SYSTEM IN THE SOUTHERLY INTERNATIONAL BOUNDARY OF THE COLORADO RIVER

EXHIBIT 1

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

Ciudad Juarez, Chihuahua
July 17, 2009

JOINT REPORT OF THE PRINCIPAL ENGINEERS CONCERNING U.S.-MEXICO JOINT COOPERATIVE ACTIONS RELATED TO THE YUMA DESALTING PLANT (YDP) PILOT RUN AND THE SANTA CLARA WETLAND

To the Honorable Commissioners
International Boundary and Water Commission
United States and Mexico
El Paso, Texas-Ciudad Juarez, Chihuahua.

Sirs:

In accordance with your instructions, we respectfully submit this Joint Report concerning U.S.-Mexico joint cooperative actions related to the proposed Yuma Desalting Plant (YDP) Pilot Run. The purpose of this report is to identify actions that could be carried out by each country related to the proposed YDP Pilot Run and to identify other efforts related to the Santa Clara Wetland in Mexico.

To continue with the binational spirit of cooperation with regard to the Colorado River limitrophe section and the Santa Clara Wetland as established in Commission Minute No. 306 entitled, "Conceptual Framework for United States-Mexico Studies for Future Recommendations Concerning the Riparian and Estuarine Ecology of the Limitrophe Section of the Colorado River and its associated Delta," signed on December 12, 2000, and in accordance with the resolutions in Minute No. 242, "Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River," signed on August 30, 1973, in November 2008, the U.S. and Mexico, through the International Boundary and Water Commission, initiated binational consultations regarding the proposed Pilot Run to operate the YDP.

Proposed Pilot Run of the YDP and Alteration of Flow to the Santa Clara Wetland.

The United States passed the *Colorado River Basin Salinity Control Act of 1974* (Salinity Control Act), which authorized the construction, operation, and maintenance of certain works in the Colorado River Basin to control the salinity of water that is delivered to Mexico in accordance with the 1944 Water Treaty. Title I of the Salinity Control Act provides the legal basis for programs to comply with the provisions of Minute No. 242 downstream from Imperial Dam. To implement provisions of Title I of the Salinity Control Act, construction of the YDP in Yuma, Arizona was largely completed in 1992. Shortly thereafter, it operated at one-third capacity for a brief trial period. With above average flow on the Colorado River and other considerations, operation of the YDP was then suspended and has not operated since, with the exception of a 90-day demonstration run at 10% of its capacity in 2007.

The Metropolitan Water District of Southern California (MWD), Southern Nevada Water Authority (SNWA), and Central Arizona Water Conservation District (CAWCD) have requested that the U.S. Bureau of Reclamation (Reclamation) conduct a Pilot Run of the YDP and are considering providing some funds needed for operation. These parties, as well as other U.S. entities, are interested in gaining additional information under low water conditions in the Colorado River Basin that can be used when considering long term, sustained operation of the YDP as a tool to extend water supplies. Such consideration requires gathering information that can only be obtained through actual operation of the YDP. This includes collecting performance and cost data, identifying any remaining improvements to equipment, and testing changes already performed on the plant. Reclamation has developed a plan for the proposed Pilot Run, in which the plant would operate for 365 days within a period of up to 18 months at one-third capacity to gather such information. The proposed Pilot Run would produce approximately 29,000 acre-feet (35.8 million cubic meters (mcm)) of water for use within the United States. Reclamation, as the owner and operator, will comply with all the applicable requirements of federal law prior to determining whether to commence the Pilot Run.

Under current conditions, saline flows are bypassed to Mexico via the Wellton-Mohawk Bypass Drain and eventually flow into the Santa Clara Wetland. We observe that the Santa Clara Wetland is part of the Upper Gulf of California and Colorado River Delta Biosphere Reserve, the highest category of protection that Mexico assigns to a wetland, in addition to being declared a protected wetland under the RAMSAR Wetlands Convention. This area provides wetland habitat for migratory birds on the Pacific Flyway and for various species including threatened and endangered species. When the YDP is not operating, flows to the Santa Clara Wetland from the Wellton-Mohawk Bypass Drain between 2004 and 2008 averaged an estimated 107,000 acre-feet (132.0594 mcm) annually with a salinity of approximately 2,664 parts per million. Under the proposed Pilot Run, absent any joint cooperative actions, flows that reach the Santa Clara Wetland from the Wellton-Mohawk Bypass Drain would be reduced to approximately 77,000 acre-feet (95.0334 mcm), while salinity would increase to approximately 3,204 parts per million.

We observed that both countries are interested in preserving the environmental value of the Santa Clara Wetland during the proposed YDP Pilot Run, and we also observe that Mexico, the United States and the potential YDP funding partners, in the interest of binational cooperation, are willing to undertake joint cooperative actions that are responsive to address the Santa Clara Wetland and the U.S. interest in conducting the proposed YDP Pilot Run.

U.S.-Mexico Discussions Concerning the YDP Pilot Run and the Santa Clara Wetland

We observed that Resolution 4 of Minute No. 242 states that Mexico shall permit the United States to discharge to the Santa Clara Slough "the volumes of brine from such desalting operations in the United States as are carried out to implement the Resolution of this Minute, and any other volumes of brine which Mexico may agree to accept" and Resolution 6 stipulates that "With the objective of avoiding future problems, the United States and Mexico shall consult with each other prior to undertaking any new development of either the surface or the groundwater resources, or undertaking substantial modifications of present developments, in its own territory in the border area that might adversely affect the other country."

We also observed that Minute No. 306 provides, "That in recognition of their respective governments' interest in the preservation of the riparian and estuarine ecology of the Colorado River in its limitrophe section and its associated delta, the Commission shall establish a framework for cooperation by the United States and Mexico through the development of joint studies that include possible approaches to ensure use of water for ecological purposes in this reach and formulation of recommendations for cooperative projects, based on the principle of an equitable distribution of resources."

In November 2008, in order to further both the consultation process established under Minute No. 242 and the spirit of binational cooperation with regard to the ecology of the Colorado River limitrophe and its delta as established in Minute No. 306, the U.S. and Mexico, through the International Boundary and Water Commission, initiated consultations regarding the proposed YDP Pilot Run.

The binational consultation consisted of a series of meetings held over a period of five months where the details of the Pilot Run were presented and expert stakeholders from both countries had an opportunity to discuss the proposed action. The following were the primary items of discussion:

- Whether or not current average annual flows reaching the Santa Clara Wetland would be reduced and if so, what the impact would be that reduced volumes and increased salinity could have on the biodiversity and the ecosystem,
- Need for a comprehensive binational monitoring program of the Santa Clara Wetland,
- Importance of the YDP Pilot Run in order to gather data required for future decision making,
- Ensuring that all agreements with regards to this YDP consultation are limited to the proposed YDP Pilot Run and its duration,
- Addressing the importance of understanding the requirements for long term sustainability of the Santa Clara Wetland based on specific habitat requirements instead of historical flows reaching the Santa Clara Wetland, and
- Importance of maintaining existing infrastructure such as the Wellton-Mohawk Bypass Drain and the Santa Clara drain to ensure flows reach the intended locations within the Santa Clara Wetland.

Proposed Joint Cooperative Actions

Based on the binational discussions regarding the YDP Pilot Run discussed during the preceding five months, a program of joint cooperative actions was developed and proposed to address the interests of both countries in the event Reclamation determines to commence the Pilot Run. The suggested joint cooperative actions discussed to date regarding the proposed YDP Pilot Run are described below.

1) If, the proposed 365 day YDP Pilot Run, is approved by the appropriate U.S. agency, it is recommended that the Joint Cooperative Actions described in this document be carried out.
2) During the YDP Pilot Run, each one of the parties, the U.S., Mexico and Non-Governmental Organizations (NGOs) each intend to arrange for 10,000 acre-feet (12.3 mcm) of water for a

total of 30,000 acre-feet (37.0 mcm) pursuant to the letters of commitment that have been received from the respective participants.

3) All actions undertaken pursuant to this agreement will be carried out in such a way as not to interfere with deliveries of water to Mexico either at Morelos Dam or the Southerly International Boundary (SIB) nor interfere with the rights of the United States or Mexico in accordance with the 1944 Water Treaty.
4) The non-federal U.S. parties (MWD, SNWA and CAWCD) intend to contribute a total of $250,000 toward a comprehensive binational monitoring program for the Santa Clara Wetland.
5) Mexico is willing to allocate resources to perform the necessary dredging work in order to allow Santa Clara drain flows to reach the Santa Clara Wetland.
6) If deemed necessary, the U.S. is willing to allow for the use of the amphibious excavator to excavate the Santa Clara Drain, and Mexico will provide funds for the operation, maintenance and, if necessary, repair of the equipment.
7) The U.S. Bureau of Reclamation will provide a one-time contribution of $100,000 for additional maintenance activities related to the Wellton-Mohawk Bypass Drain.
8) Upon request of Mexico and pursuant to further arrangements and in a manner that poses no conflicts with the provisions of the 1944 Water Treaty, the U.S. is willing to arrange for the use of the Wellton-Mohawk Bypass Drain for the conveyance of water that Mexico and the non-governmental organizations intend to contribute to the Santa Clara Wetland through said drain.
9) Both countries are willing to continuing work, under the auspices of Minute No. 306, and to include this topic in the Colorado River Joint Cooperative Process discussions, to specifically identify the true requirements for long term sustainability of the Santa Clara Wetland based on specific habitat requirements instead of historical flows reaching the Santa Clara Wetland.

Specific Details of the Proposed Joint Cooperative Actions

1. The proposed YDP Pilot Run consists of the operation of the YDP at one-third capacity for 365 days during a period of up to eighteen months. The implementation of this pilot run is subject to the conclusion of the Environmental Assessment (EA) and subject to a decision by Reclamation to proceed. In order to carry out the proposed Pilot Run, 37,980 acre-feet (46.8 mcm) of water from the Wellton-Mohawk Bypass Drain will be treated at the plant, resulting in about 21,700 acre-feet (26.8 mcm) of treated and desalinated product water. This treated and desalinated product water will be discharged along with an estimated 7,300 acre-feet (9 mcm) of untreated water from the Wellton-Mohawk Bypass Drain, resulting in discharge to the Colorado River of approximately 29,000 acre-feet (35.8 mcm) of water with salinity substantially similar to current river salinity. The saline concentrate that is a byproduct of the treatment process will be discharged to the Wellton-Mohawk Bypass Drain, which would increase the salinity to an estimated salinity of 3,204 ppm.

2. The United States, Mexico, and a partnership of non-governmental organizations intend to each arrange for 10,000 acre-feet (12.3 mcm) of water, for a total of 30,000 acre-feet (37 mcm), in connection with the reduction in flow to the Santa Clara Wetland and the increase in salinity that would occur during the proposed YDP Pilot Run in the absence

of the Joint Cooperative Actions identified in this agreement. These volumes shall be conveyed during the YDP Pilot Run period, however each party may initiate conveyance of their respective volumes starting on the date a decision is made by the appropriate U.S. agency to proceed with the proposed YDP Pilot Run until the conclusion of the proposed YDP Pilot Run.

(a) As a matter of binational cooperation, the U.S. intends to convey through the Wellton-Mohawk Drain to the Santa Clara Wetland 10,000 acre-feet (12.3 mcm) of non-storable Colorado River flows, which arrive in Mexico due to limitations in U.S. system operations and are not part of its Colorado River allocation.

(b) Mexico intends to provide 10,000 acre-feet (12.3 mcm) of water to the Santa Clara Wetland. To do so, Mexico is making the necessary arrangements and investments to send water to the Santa Clara Wetland.

(c) U.S. and Mexican non-governmental organizations intend to use existing water rights that are property of the NGOs trust and lease sufficient water rights from the Mexicali Valley Irrigation District to provide 10,000 acre-feet (12.3 mcm) of water for delivery to the Santa Clara Wetland. This responsibility is limited to the NGOs without responsibility to the U.S. or Mexican government. It is recommended that Mexico and the U.S. work with the NGOs to document through the Commission this agreement and deliver this water through the Wellton-Mohawk Bypass Drain.

3. The U.S. is willing to operate its systems in a manner that allows conveyance of the contribution stated in point 2 (a) above, 10,000 acre-feet (12.3 mcm) of water, directly into the Wellton-Mohawk Bypass Drain. The U.S. conveyance of 10,000 acre-feet (12.3 mcm) of non-storable Colorado River water identified in point 2 (a) above should not be considered part of Mexico's Colorado River water allocation as provided for under the 1944 Water Treaty, nor impact the delivery of said waters, including monthly allocations and delivery schedules.

4. It is recommended that the U.S. and Mexico coordinate regarding system operations to ensure conveyance of the water volumes described in 2 (b) and 2 (c) above to the Santa Clara Wetland, including consideration of the feasibility of delivering Mexican water to the Santa Clara Wetland through the Wellton-Mohawk Bypass Drain or by means of other infrastructure owned or operated by the United States. It is recommended that the Commission develop a new Minute to facilitate the conveyance of said water using the Wellton-Mohawk Bypass Drain.

5. The volume of 10,000 acre-feet (12.3 mcm) conveyance stated in point 2 (a) above during the YDP Pilot Run will not be accounted in favor of Mexico as part of its Colorado River water allocation provided for under the 1944 Water Treaty.

6. For the contribution stated in point 2 (b) above, Mexico intends to, using Mexican resources and infrastructure, perform the necessary maintenance work on the Santa Clara Drain, including removal of sediment, to ensure that Santa Clara Drain flows reach the Santa Clara Wetland, and if appropriate, any other actions to guarantee its commitment as required.

7. Reclamation's non-federal funding partners for the YDP Pilot Run intend to contribute a total of $250,000 for a comprehensive binational monitoring program of the Santa Clara Wetland and related activities. It is recommended that a binational group be established by the Commission to make recommendations to the Commission for the program's terms of reference, scope, and duration. The terms of reference should outline what agencies will be participating, how the information will be exchanged, and how the final product will be published.

8. As may be requested by the Mexican Section, the U.S. Section is willing to authorize the Mexican Section to use the U.S. Section's amphibious excavator, two 19-foot aluminum boats, and the air boat and trailer, currently loaned to the Mexican Section for Wellton-Mohawk Bypass Drain maintenance, for maintenance of the Santa Clara Drain, using Mexican funds for the operation, maintenance and, if necessary, repairs to the equipment. The use of the equipment for the Santa Clara Drain shall be consistent with the conditions established for this purpose. Use of the equipment and the conditions for its use will be coordinated between the two Sections of the Commission.

9. Reclamation, through the U.S. Section, is willing to provide a one-time contribution to the Mexican Section of $100,000 dollars for extraordinary maintenance of the Wellton-Mohawk Bypass Drain. Performing extraordinary maintenance on the Wellton-Mohawk Bypass Drain will assure reliable flows to the Santa Clara Wetland by effectively improving the conveyance capacity to transport sediment through the canal and avoid sediment build-up at the terminus of the canal that could disrupt flow to the wetland. The Mexican Section intends to provide to the U.S. Section a detailed list of the actions to be performed for review and concurrence.

10. It is recommended that Colorado River Joint Cooperative Process' Work Groups and Core Group address the future needs of the Santa Clara Wetland. Consistent with Minute No. 306, the Colorado River Joint Cooperative Process intends to address long-term approaches to maintain the environmental values of the Santa Clara Wetland. Such approaches should focus on identifying and quantifying the habitat values to be preserved then identifying the amount, timing, quality and source of water associated with preservation of those values.

Recommendations

Based on the foregoing and that the U.S. and Mexico participants involved in the consultation process have provided their concurrence with the implementation of the proposed Joint Cooperative Actions Program, we respectfully recommend that the Commissioners approve the aforementioned program of joint cooperative actions.

After the approval of this report by the Commissioners and in the event that any of the recommended joint cooperative actions described in this report are not implemented due to unforeseen conditions, it is recommended that under the auspices of the Commission and in the interest of binational cooperation, all parties involved in the process reinitiate discussions, in good faith, to expeditiously resolve any unforeseen issues related to the proposed YDP Pilot Run.

Respectfully submitted for your consideration,

Alfredo J. Riera
Principal Engineer
United States Section

Luis Antonio Rascón Mendoza
Principal Engineer
Mexican Section

Appendix 5.5

Funding Agreement for the Pilot Run

ORIGINAL

Agreement No. 09-XX-30-W0541

AGREEMENT AMONG
THE UNITED STATES OF AMERICA, THROUGH THE
DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA,
THE COLORADO RIVER COMMISSION OF NEVADA,
THE SOUTHERN NEVADA WATER AUTHORITY, AND
THE CENTRAL ARIZONA WATER CONSERVATION DISTRICT,
FOR A PILOT PROJECT FOR OPERATION OF THE
YUMA DESALTING PLANT

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FOR A PILOT PROJECT FOR OPERATION OF THE
YUMA DESALTING PLANT

1. PREAMBLE: THIS AGREEMENT made this 29th day of October, 2009, pursuant to the Act of Congress approved June 17, 1902 (32 Stat. 388), designated the Reclamation Act, and acts amendatory thereof or supplementary thereto; the Act of March 4, 1921, referred to as the Contributed Funds Act (41 Stat. 1404, 43 U.S.C. §395); the Act of January 12, 1927 (44 Stat. 957, 43 U.S.C. §397a); the Act of December 21, 1928 (45 Stat. 1057), designated the Boulder Canyon Project Act; the Act of September 30, 1968 (82 Stat. 885), designated the Colorado River Basin Project Act; the Act of June 24, 1974 (88 Stat. 266), designated the Colorado River Basin Salinity Control Act, as amended; and Section 397 of the Act of December 20, 2006, (120 Stat. 2922); all of which acts are part of the body of law commonly known and referred to as Federal Reclamation law; among the UNITED STATES OF AMERICA, hereinafter referred to as the "United States," represented by the Secretary of the Interior, hereinafter referred to as the "Secretary," and acting through the officer executing this Agreement; THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA, a regional public water district duly organized under California law, hereinafter referred to as "MWD;" the COLORADO RIVER COMMISSION OF NEVADA, an agency of the State of Nevada, hereinafter referred to as "CRCN;" the SOUTHERN NEVADA WATER AUTHORITY, a political subdivision of the State of Nevada, hereinafter referred to as "SNWA;" and the CENTRAL ARIZONA WATER CONSERVATION DISTRICT, a multi-county water conservation district duly organized and

existing under the laws of the State of Arizona, hereinafter referred to as "CAWCD;" each of which is at times referred to individually as "Party" and which are at times collectively referred to as "Parties."

WITNESSETH THAT:

2. EXPLANATORY RECITALS:

2.1 WHEREAS, for the purposes of controlling floods, improving navigation, regulating the flow of the Colorado River, and providing for storage and the delivery of stored water for the reclamation of public lands and other beneficial uses exclusively within the United States, the Secretary, acting under and pursuant to the provisions of the Colorado River Compact and the Boulder Canyon Project Act, has constructed and is now operating and maintaining in the mainstream of the Colorado River at Black Canyon that certain structure known as and designated Hoover Dam and incidental facilities, creating thereby a reservoir designated Lake Mead;

2.2 WHEREAS, the Boulder Canyon Project Act provides, among other things, that the Secretary is authorized, under such general regulations as he or she may prescribe, to contract for the storage of water in Lake Mead and for the delivery of such water at such points as may be agreed upon for irrigation and domestic uses;

2.3 WHEREAS, the Boulder Canyon Project Act provides further that no person shall have or be entitled to have the use, for any purpose, of the stored water in Lake Mead, except by contract with the Secretary;

2.4 WHEREAS, acting under the authority of the Colorado River Basin Salinity Control Act of 1974, the United States Bureau of Reclamation, hereinafter referred to as "Reclamation," constructed the Yuma Desalting Plant, hereinafter referred to as "YDP," which is a brackish-water desalting plant located west of Yuma, Arizona, near the Colorado River, and constructed the Main Outlet Drain Extension (MODE) to carry the YDP reject stream and other drainage waters;

2.5 WHEREAS, MWD, SNWA, and CAWCD under Agreement No. 09-XX-30-W0538 contributed funds toward Reclamation's costs for environmental compliance to provide a basis for Reclamation to determine whether to elect to proceed with a Proposed Pilot Project as described in said Contract, and by which Reclamation provided to MWD, SNWA and CAWCD the first opportunity to enter into this funding agreement;

2.6 WHEREAS, the environmental compliance has been completed and resulted in a Finding of No Significant Impact approved September 30, 2009, and Reclamation, after review and consideration of the environmental compliance, has elected to proceed with a "Pilot Project" as defined in Section 3.20 of this Agreement;

2.7 WHEREAS, MWD, SNWA, and CAWCD are willing and able to contribute capital in the form of monetary contributions and/or in-kind services pursuant to the provisions of the "Interim Guidelines" as defined in Section 3.16 of this Agreement for Reclamation's use in paying the "Eligible Project Costs" of the Pilot Project, as such costs are defined in Section 3.7 of this Agreement, in exchange for any "System Efficiency ICS" credits to be developed as a result of the Pilot Project, as such System Efficiency ICS is defined in Section 3.24 of this Agreement;

2.8 WHEREAS, the Parties desire to set forth their understanding as to the monetary contributions and/or in-kind services that will be provided by MWD, SNWA, and CAWCD, the responsibilities of Reclamation with respect to these contributions and services, and the quantity of System Efficiency ICS credits that each such Contractor shall receive in exchange for such capital contributions;

2.9 WHEREAS, CRCN and SNWA have jointly consulted to acquire supplemental Colorado River water and are in compliance with N.R.S. § 538.186;

2.10 WHEREAS, no operation of the YDP other than the Pilot Project is contemplated or proposed by Reclamation at this time; and

2.11 WHEREAS, any decision to operate the YDP after the completion or termination of the Pilot Project will be made in the future by the United States, subject to and based upon appropriate compliance with Federal law.

NOW, THEREFORE, in consideration of the mutual covenants herein contained, the Parties agree as follows:

3. DEFINITIONS: For the purpose of this Agreement, the following definitions shall apply:

3.1 Colorado River Compact means the document signed on November 24, 1922, at Santa Fe, New Mexico, pursuant to an act of Congress approved August 19, 1921 (42 Stat. 171). The Colorado River Compact was approved in Section 13(a) of the Boulder Canyon Project Act.

3.2 Colorado River System shall have the same meaning as defined in the Colorado River Compact.

3.3 Conserved Water means the quantity of water that would have been released from Colorado River system storage but for the release of the Pilot Project's YDP-desalted water to the Colorado River and untreated MODE water to the Gila River Pilot Channel to supply delivery requirements under the Mexican Water Treaty of February 3, 1944, and includes water conserved through avoided conveyance losses between Parker Dam and the Northerly International Boundary otherwise incurred by the release of water from Colorado River system storage for delivery to Mexico.

3.4 Consolidated Decree means the Consolidated Decree of the Supreme Court of the United States in the case of *Arizona v. California* entered March 27, 2006, 126 S. Ct. 1543, 547 U.S. 150 (2006).

3.5 Contracting Officer means the Secretary, a duly appointed successor, or a duly authorized representative acting pursuant to this Agreement or applicable Reclamation law or regulation. Unless otherwise directed by the Secretary, the Regional Director, Bureau of Reclamation, Boulder City, Nevada, and her designees shall be the Contracting Officer.

3.6 Contractor means an entity holding an entitlement to Mainstream water under a water delivery contract with the United States through the Secretary.

3.7 Eligible Project Costs means costs for which Reclamation may expend appropriated or contributed funds or receive in-kind services under the Pilot Project.

3.8 Exhibit A is an estimate of Eligible Project Costs, Yuma Desalting Plant Pilot Project, categorized as Plant Preparation Costs beginning on the first day of the pilot run preparation phase and OMR&R Costs, for three hundred sixty-five (365) days of YDP operation.

3.9 Exhibit B is the Schedule for Project Completion, Yuma Desalting Plant Pilot Project.

3.10 Exhibit C sets forth the anticipated Funding Periods.

3.11 Forbearance Agreement means the Lower Colorado River Basin Intentionally Created Surplus Forbearance Agreement dated December 13, 2007, entered into among the Arizona Department of Water Resources, the Palo Verde Irrigation District, the Imperial Irrigation District, the City of Needles, the Coachella Valley Water District, MWD, SNWA, and the CRCN, as amended to incorporate an Exhibit P which extends the parties' forbearance to the System Efficiency ICS developed under the Pilot Project.

3.12 Funding Committee means the Funding Committee established pursuant to Section 5.3 hereof.

3.13 Funding Committee Representative means each Party's representative on the Funding Committee pursuant to Section 5.3.1 hereof.

3.14 Funding Period means the particular period identified by the Contracting Officer in a request for capital contributions. Anticipated Funding Periods are set forth in Exhibit C to this Agreement.

3.15 ICS Account means the separate ICS Accounts established under Section 3.D.3 of the Interim Guidelines and in accordance with the YDP Pilot Project Delivery Agreements for MWD, SNWA, and CAWCD required under Section 3.C.1 of the Interim Guidelines and

accounted for by the Secretary in the Colorado River Accounting and Water Use Report prepared annually containing the compilation of records in accordance with Article V of the Consolidated Decree.

3.16 Interim Guidelines means the guidelines adopted by the Secretary on December 13, 2007, in a Record of Decision, Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead.

3.17 Intentionally Created Surplus, heretofore and hereinafter referred to as "ICS," means surplus Colorado River System water available for use under the terms and conditions of a YDP Pilot Project Delivery Agreement, the Forbearance Agreement, and the Interim Guidelines.

3.18 Mainstream shall have the same meaning as defined in the Consolidated Decree.

3.19 OMR&R Costs means those costs necessary, as determined solely by the Contracting Officer following consultation with the Funding Committee, for the operation, maintenance, repair and replacement of the YDP during the Pilot Project. Estimated OMR&R Costs are set forth in Exhibit A.

3.20 Pilot Project means plant preparation and not more than three hundred sixty-five (365) days of YDP operation by Reclamation for at least twelve (12) hours within a day, ramping up to not more than thirty-three percent (33%) of YDP capacity, and discharging the desalted water for release to the Colorado River and untreated water from the MODE for release to the Gila River Pilot Channel in an amount which, if the YDP is operated as anticipated for this period, will discharge approximately 29,000 acre-feet of water to the Colorado River for delivery to Mexico under the Mexican Water Treaty of 1944. The three hundred sixty-five (365) days of YDP operation may be non-continuous, but in no event shall Reclamation continue Pilot Project operation beyond the date that is eighteen months from the first date of YDP operation under the Pilot Project as established by the notice referenced in Section 7.5. Plant preparation activities shall be excluded from the calculation of days of YDP operation under the Pilot Project.

3.21 Pilot Project Augmentation Water is YDP product water discharged to the Colorado River, plus the water discharged from the MODE into the Gila River Pilot Channel via the MODE 1 Diversion/Return facility and then flowing into the Colorado River, as a result of the operation of the YDP under the Pilot Project to meet delivery requirements under the Mexican Water Treaty of 1944. Pilot Project Augmentation Water is a portion of Conserved Water and will result in System Efficiency ICS.

3.22 Pilot Project Costs means actual Plant Preparation Costs and actual OMR&R Costs expended by Reclamation for the Pilot Project.

3.23 Plant Preparation Costs means those costs necessary, as determined solely by the Contracting Officer following consultation with the Funding Committee, to prepare the YDP for operation during the Pilot Project. Estimated Plant Preparation Costs are set forth in Exhibit A.

3.24 System Efficiency ICS has the same definition as ascribed in Section 3.A.3 of the Interim Guidelines.

3.25 Total Project Cost Summary means a Pilot Project Costs summary documenting the total actual reasonable and necessary costs, as determined solely by the Contracting Officer following consultation with the Funding Committee, incurred in implementing the Pilot Project, including Plant Preparation Costs and OMR&R Costs.

3.26 YDP Pilot Project Delivery Agreement means an agreement entered into between a Contractor and the Secretary, as required by Section 3.C.1 of the Interim Guidelines, which provides for the creation, certification, delivery, and accounting of System Efficiency ICS developed under the Pilot Project, in accordance with the provisions of the Guidelines.

4. GENERAL TERMS AND CONDITIONS:

4.1 This Agreement shall become effective upon the date set forth in Article 1 of this Agreement and shall remain in effect until terminated in accordance with Article 10.

4.2 This Agreement may only be amended or revised in writing and by mutual agreement of the Parties.

5. CAPITAL CONTRIBUTION – ADVANCE FUNDING AND REFUNDS:

5.1 Estimated Plant Preparation Costs and Estimated OMR&R Costs. Reclamation has developed cost estimates relating to the Pilot Project. Estimated Plant Preparation Costs and estimated OMR&R Costs are set forth in Exhibit A to this Agreement and together constitute Eligible Project Costs. MWD, SNWA, and CAWCD acknowledge that the figures set forth in Exhibit A are estimates based on Reclamation's cost forecasts. Reclamation shall use best efforts to minimize Pilot Project Costs. Reclamation does not guarantee that actual Pilot Project Costs will be equal to or less than the cost estimates set forth in Exhibit A.

5.2 Proportionate Contributions. Subject to the withdrawal and early termination provisions of Article 10 herein, MWD, SNWA, and CAWCD shall advance capital in the form of monetary contributions and/or in-kind services to Reclamation for Pilot Project Costs in accordance with the provisions of this Article 5. Except as may otherwise be agreed under the provisions of this Section and Article 10, for each capital contribution required by this Article 5, whether provided in the form of monetary contributions and/or in-kind services, MWD shall provide eighty percent (80%), SNWA shall provide ten percent (10%), and CAWCD shall provide ten percent (10%). Each in-kind service provided by a non-federal Party as part of a capital contribution shall be assigned a monetary value by the Contracting Officer in consultation with the Funding Committee and that value shall reduce the amount of that Party's required capital contribution by an equivalent amount. Notwithstanding the provisions of Article 17, MWD, SNWA, and CAWCD may agree to alter the proportionate shares that each would otherwise be required to pay under this Section 5.2; provided, however that the modified proportionate shares shall total one hundred percent (100%) and further provided that the agreement shall be reduced to writing and provided to the Contracting Officer. Beginning with the first Funding Period after the effective date of such agreement, MWD, SNWA, and CAWCD shall advance capital in accordance with such proportionate shares.

5.3 Establishment of Funding Committee and Capital Contributions. The Parties shall establish a Funding Committee.

5.3.1 MWD, SNWA, and CAWCD shall each identify a Funding Representative to serve as the contact point for Reclamation with respect to the non-federal funding for the Pilot Project by these agencies and shall provide contact information for each Funding Representative.

5.3.2 The Contracting Officer shall request capital contributions from MWD, SNWA, and CAWCD through the Funding Committee Representatives based solely on Pilot Project Costs incurred to date and projected Eligible Project Costs for the upcoming Funding Period, as determined solely by the Contracting Officer following consultation with the Funding Committee. The magnitude of requested capital contribution requests may vary between Funding Periods. The Contracting Officer shall utilize good faith efforts to request "pay as you go" capital contributions. MWD, SNWA, and CAWCD recognize that the Contracting Officer may, either in the interests of economy or as a result of the market, procure goods or services for the entire period of the Pilot Project following consultation with the Funding Committee and not simply for the Funding Period identified in a particular request.

5.3.3 The Contracting Officer shall, in writing, request capital contributions from MWD, SNWA, and CAWCD through the Funding Committee Representatives in advance of each Funding Period during the term of the Pilot Project, to be funded in accordance with Exhibit C to this Agreement which sets forth the anticipated Funding Periods and as provided below. Each such written request shall specify the number of days of YDP operation that have occurred to date under the Pilot Project and the total amount of Pilot Project Augmentation Water.

5.3.4 The Contracting Officer shall provide each request for funding to the Funding Committee Representatives together with a brief written explanation of the basis for the request. Upon request of any of the Funding Committee Representatives, the Contracting

Officer shall meet or otherwise communicate with the Funding Committee Representatives to provide further explanation as to the basis of the request.

5.3.5 Subject to the provisions of Article 10 relating to withdrawal from or termination of this Agreement, within thirty (30) days of the Funding Committee Representative's receipt of a notice of a request for a capital contribution from the Contracting Officer identifying a Funding Period and requesting an advance of funds for the Pilot Project for that Funding Period, MWD, SNWA, and CAWCD shall each make payment as set forth in Section 5.4 for that Funding Period in the proportionate amounts established in Section 5.2, or shall provide in-kind services within the time and as specified in said notice. Any funds in excess of that necessary for Pilot Project Costs within any Funding Period shall be applied to Pilot Project Costs for the next succeeding Funding Period.

5.4 Method of Transfer of Monetary Contributions and Provision of In-Kind Services. All transfers of monetary contributions shall be made electronically in accordance with the instructions of the Contracting Officer. The method of provision of in-kind services shall be determined by the Contracting Officer in consultation with the agency providing such services.

5.5 Refund of Unexpended Capital Contributions. At the end of the one hundred eighty (180) day period specified in Section 5.6, the Contracting Officer shall issue the Total Project Cost Summary; provided, however, that the Contracting Officer may extend this period as necessary in the judgment of the Contracting Officer for the purpose of addressing comments, if any, provided by MWD, SNWA, and CAWCD on the draft Summary Report in accordance with Article 9 of this Agreement. Any capital contribution funds provided for use by Reclamation for the Pilot Project but determined by the Contracting Officer in the Total Project Cost Summary to be in excess of Pilot Project Costs shall be refunded to MWD, SNWA, and CAWCD in the same respective proportions as the funds were contributed. If a refund is due, the Contracting Officer shall make such refund within ninety (90) days from the date of issuance of the Total Project Cost Summary.

5.6 Funding After Suspension or Completion. In the event the Contracting Officer suspends the Pilot Project under the provisions of Section 7.6 of this Agreement, or the YDP had been operated for three hundred sixty-five (365) days, the Contracting Officer shall continue to have access to funds provided by MWD, SNWA, and CAWCD for a period of one hundred eighty (180) days from the Contracting Officer's determination to suspend or from the completion of three hundred sixty-five (365) days of operation; provided, however, that the Contracting Officer may use those funds solely for Pilot Project purposes as, for example, fulfilling contractual commitments entered into in furtherance of the Pilot Project. MWD, SNWA, and CAWCD shall have no claim to a refund of such funds as expended by the Contracting Officer during such one hundred eighty (180) day period for Pilot Project purposes.

6. DETERMINATIONS RELATING TO ELIGIBILITY, APPROVAL, QUANTITY AND VERIFICATION OF ICS:

6.1 Eligibility. The Secretary, acting through Reclamation, hereby determines the Pilot Project to be an eligible System Efficiency ICS project under the Interim Guidelines.

6.2 Approval. The Secretary, acting through Reclamation, hereby determines that this Agreement constitutes a valid multi-year plan for creation of System Efficiency ICS under Sections 3.A.3 and 3.B.1 of the Interim Guidelines.

6.3 Quantity. The Secretary, acting through Reclamation, hereby determines pursuant to Section 3.A.3. of the Guidelines that, in light of the limited time of operation of the Pilot Project, the capital contributions of MWD, SNWA, and CAWCD to Reclamation for the Pilot Project, the benefit to Reclamation and the non-Federal Parties of an opportunity to secure YDP data and operational knowledge from the Pilot Project that has the potential to result in additional system efficiency opportunities over time, and the risk assumed by these agencies with respect to how much Pilot Project Augmentation Water will actually result from operation of the Pilot Project, that the Pilot Project Augmentation Water shall be the basis for

the amount of System Efficiency ICS credits, to be calculated in acre-feet on a one-for-one basis and made available to MWD, SNWA, and CAWCD under Article 8 of this Agreement.

6.4 Verification. The Secretary, acting through Reclamation, hereby determines that, because the calculation of ICS credits developed from YDP operation during the Pilot Project shall be made by Reclamation from readings of YDP meters and the Yuma Area Water Management System under Reclamation's control as provided in Section 7.8 of this Agreement, this Agreement further constitutes a verified Certification Report under Sections 3.D.1 and 3.D.2 of the Guidelines for System Efficiency ICS in an amount, as determined by Reclamation under Sections 6.2 and 6.3 of this Agreement.

7. RESPONSIBILITIES OF RECLAMATION REGARDING PLANT PREPARATION, OPERATION AND ACCOUNTING:

7.1 Expenditure of Contributed Funds. The Contracting Officer may expend the funds and make use of the in-kind services contributed to Reclamation under Article 5 of this Agreement for Eligible Project Costs, the categories of which are set forth in Exhibit A to this Agreement. The Contracting Officer shall not be bound by the estimates provided within each category of Eligible Project Costs in Exhibit A but shall not expend in excess of a total of Thirteen Million-Six Hundred Seventy Seven Thousand-One Hundred Sixty Two Dollars ($13,677,162) of contributed funds and in-kind services contributed to Reclamation for such costs unless the unanimous consent of the Funding Representatives is first obtained.

7.2 Plant Preparation. The Contracting Officer shall perform or cause to be performed all plant preparation activities, as described in Exhibit A to this Agreement or as determined exclusively by the Contracting Officer to be otherwise necessary following consultation with the Funding Committee Representatives to ensure YDP readiness to operate for a three hundred sixty-five day (365-day) period during the course of the Pilot Project. The Contracting Officer shall utilize Reclamation's design standards and specifications and acceptable industry practices, all as determined exclusively by the Contracting Officer.

7.3 Schedule for Project Completion. Reclamation's schedule for the Pilot Project is attached hereto as Exhibit B. The schedule shall be periodically reviewed and updated by the Contracting Officer to reflect significant changes. Any revisions to the schedule shall be provided to MWD, SNWA, and CAWCD without the necessity of formal amendment of Exhibit B to this Agreement.

7.4 Operation. Reclamation shall be solely responsible for all decisions relating to, and control of, the operation, maintenance, repair and replacement of the YDP during the Pilot Project, and MWD, SNWA, and CAWCD shall have no responsibility therefor. The Contracting Officer shall use best efforts to operate the YDP during the Pilot Project, including performing maintenance, repair and replacement activities, in a continuous manner for three hundred sixty-five (365) days, to the extent such operation, as determined exclusively by the Contracting Officer, will not jeopardize any future long-term operation of the YDP.

7.5 Notice of First Day of Operation. The Contracting Officer shall provide notice to MWD, SNWA, and CAWCD identifying the date of the first day of operation of the YDP under the Pilot Project.

7.6 Suspension of Operation. The Parties anticipate that during the course of the Pilot Project there may be periods in which the YDP is not operated due to necessary maintenance, repairs and replacements. The Contracting Officer may, in his or her sole discretion, suspend operation of the YDP during the Pilot Project due to safety or other operational concerns. The Contracting Officer shall consider suspension of the YDP Run upon receipt of a joint written request to do so by CAWCD, MWD, and SNWA.

7.7 Time Limitation on YDP Operation. To the extent the Contracting Officer suspends operation of the YDP for any reason set forth in Section 7.6, the Contracting Officer, with the consent of MWD, SNWA, and CAWCD if the suspension was at the request of these agencies, shall use his or her best efforts to restart the YDP to achieve three hundred sixty-five (365) days of YDP operation during the Pilot Project. In no event shall the Contracting

Officer operate the YDP under the Pilot Project beyond the date that is eighteen months from the date of first operation of the YDP under the Pilot Project.

7.8 Accounting for Pilot Project Augmentation Water. The Contracting Officer shall determine the quantity of Pilot Project Augmentation Water resulting from the operation of the YDP during the Pilot Project from the sum of the readings from the meter permanently installed in the YDP product water pipe plus readings from the Yuma Area Water Management System associated with water discharged from the MODE into the Gila River Pilot Channel via the MODE 1 Diversion/Return facility. The Contracting Officer shall ensure through regular inspection and calibration that data from these sources is accurate. The Contracting Officer shall determine the quantity of Pilot Project Augmentation Water resulting from the operation of the YDP during the Pilot Project on a monthly basis, within five (5) business days after the last day of each month during which the YDP is operational.

7.9 The Contracting Officer shall have no responsibility to perform under this Article 7 except to the extent capital contributions have been advanced to and remain available for use by Reclamation in accordance with the terms of Article 5, and to the extent the Contracting Officer in his or her sole discretion determines new or existing appropriations are to be applied to this purpose in addition to the Reclamation contribution identified in Exhibit A of this Agreement.

8. QUANTITY AND AVAILABILITY OF SYSTEM EFFICIENCY ICS TO MWD, SNWA, AND CAWCD:

8.1 Quantity of System Efficiency ICS Credited to MWD, SNWA, and CAWCD for capital contribution. The Pilot Project is anticipated to result in 29,000 acre-feet of Pilot Project Augmentation Water, which is a portion of the Conserved Water anticipated to result from the Pilot Project. The Contracting Officer shall calculate System Efficiency ICS credits on the basis of the actual amount of Pilot Project Augmentation Water produced by the Pilot Project, whether greater or lesser than 29,000 acre-feet, as follows. The Contracting Officer shall within five (5) business days after each determination of Pilot Project Augmentation

Water under Section 7.8 above, calculate the amount of System Efficiency ICS credits developed on the basis of one acre-foot of System Efficiency ICS per one acre-foot of Pilot Project Augmentation Water. The Contracting Officer shall credit MWD, SNWA, and CAWCD's individual ICS Accounts with each such Contractor's proportionate share of the available ICS credits determined in accordance with each such Contractor's proportionate share of the capital contribution for the applicable Funding Period.

8.2 Deliveries of System Efficiency ICS to MWD, SNWA, and CAWCD. The schedule for deliveries of System Efficiency ICS credited to MWD, SNWA, and CAWCD's individual ICS Account and thereafter available to each Contractor shall be as set forth in Exhibit P to the Forbearance Agreement and the YDP Pilot Project Delivery Agreements. All System Efficiency ICS available to MWD, SNWA, or CAWCD pursuant to this Agreement shall be delivered to each such Contractor under the terms and conditions of each such Contractor's respective YDP Pilot Project Delivery Agreement; provided, however, that System Efficiency ICS developed under the Pilot Project shall not be delivered to CAWCD prior to 2016.

9. SUMMARY REPORT: Upon completion or termination of the Pilot Project or notice of withdrawal of all non-federal Parties from this Agreement, the Contracting Officer shall prepare a summary report of the Pilot Project, hereinafter referred to as "Summary Report." Such Summary Report shall include, but is not limited to, a Total Project Cost Summary, including actual Plant Preparation Costs, OMR&R Costs, and other Federal costs, a summary of the performance of the YDP during the Pilot Project, and the total quantity of Pilot Project Augmentation Water. The Summary Report shall be made available to MWD, SNWA, and CAWCD for review as a draft. Following the issuance of the draft Summary Report, the Parties shall meet and consult regarding the cost of the Pilot Project, the performance of the YDP during the Pilot Project and the quantity of Pilot Project Augmentation Water. The Contracting Officer shall thereafter prepare the final Summary Report addressing the comments, if any, received from MWD, SNWA, and CAWCD on the draft Summary Report,

which final Summary Report shall be made available to MWD, SNWA, and CAWCD. The Contracting Officer shall have no responsibility under this Article 9 except to the extent capital contributions have been provided to and remain available for use by Reclamation in accordance with the terms of Article 5.

10. TERMINATION OF AGREEMENT:

10.1 Termination Date. This Agreement shall terminate on the earlier of: (i) the issuance of the Summary Report; or (ii) the date otherwise agreed upon in writing by all Parties.

10.2 Withdrawal and Early Termination. The Parties recognize that during implementation of the Pilot Project, the Contracting Officer may encounter unanticipated costs in addition to the estimated costs set forth in Exhibit A.

10.2.1 Upon notification by the Contracting Officer of any request for capital contributions as provided in Section 5.3, MWD, SNWA, and CAWCD may decide, individually or collectively, to withdraw from this Agreement by giving notice, in writing, to all other Parties of withdrawal from provision of further capital contributions to the Pilot Project. Withdrawal from the provision of further capital contributions to the Pilot Project shall not affect the quantity of System Efficiency ICS credited or to be credited to any withdrawing Party's ICS Account as a result of Pilot Project Augmentation Water developed prior to the date of withdrawal. Notice of withdrawal shall be given within fifteen (15) days of receipt of a notice of request for capital contribution. Withdrawal of all non-federal Parties from this Agreement shall terminate this Agreement following issuance of the final Summary Report.

10.2.2 In the event of a notice of withdrawal, the remaining non-federal Parties shall meet and may agree to alter the proportionate shares of capital that each would otherwise be required to advance in accordance with the provisions of Section 5.2 of this Agreement; provided, however that the modified proportionate shares shall total one hundred percent (100%) and further provided that the agreement shall be reduced to writing and provided to Reclamation. The remaining non-federal Parties shall thereafter advance capital contributions

in accordance with such proportionate shares. System Efficiency ICS to be credited to the remaining Parties' individual ICS Accounts as a result of Pilot Project Augmentation Water developed through the expenditure of the additional capital contributions shall reflect the modified proportionate shares. In the event of a notice of withdrawal of all but one non-federal Party, the remaining non-federal Party may agree to advance one hundred percent (100%) of the additional capital contributions. If agreement is not reached within sixty (60) days after the notice of request for capital contributions, the Contracting Officer may suspend YDP operations and, subject to the provisions of Section 5.6 of this Agreement, this Agreement shall terminate following issuance of the final Summary Report.

11. NON-WAIVER: No Party to this Agreement shall be considered to have waived any right hereunder except when such waiver of the right is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any of the provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or a relinquishment of any such rights for the future, but such provisions and rights shall continue and remain in full force and effect.

12. OWNERSHIP OF PROJECT FACILITIES: Title to the YDP, its appurtenant works, and all works constructed under this Agreement shall remain in and be held by the United States.

13. UNCONTROLLABLE FORCES: No Party shall be considered to be in default in the performance of any of its obligations under this Agreement when a failure of performance shall be due to any cause beyond the control of the Party affected, including but not limited to, facilities failure, flood, earthquake, storm, lightning, fire, epidemic, war, riot, civil disturbance, labor disturbance, sabotage, and restraint by court or public authority which by exercise of due diligence and foresight such Party could not have reasonably expected to avoid. A Party rendered unable to fulfill any of its obligations under this Agreement by reason of an Uncontrollable Force shall give prompt written notice of such act to the other Parties and shall exercise due diligence to remove such inability with all reasonable dispatch.

14. REPRESENTATIONS AND WARRANTIES:

14.1 Each Party has all legal power and authority to enter into this Agreement and to perform its obligations hereunder on the terms set forth in this Agreement, and the execution and delivery hereof by each Party and the performance by each Party of its obligations hereunder shall not violate or constitute an event of default under the terms or provisions of any agreement, document, or instrument to which each of the Parties is a Party or by which each Party is bound.

14.2 Each Party warrants and represents that the individual executing this Agreement on behalf of the Party has the full power and authority to bind the Party he or she represents to the terms of this Agreement.

14.3 This Agreement constitutes a valid and binding agreement of each Party, enforceable against each Party in accordance with its terms.

15. GOVERNING LAW: This Agreement shall be interpreted, governed by, and construed under any applicable Federal law. To the extent permissible under the Federal Rules of Civil Procedure and other applicable Federal authority, venue for adjudication of any disputes under this Agreement shall be in an appropriate Federal court.

16. BINDING EFFECT AND LIMITED ASSIGNMENT: The provisions of this Agreement shall apply to and bind the successors and assigns of the Parties upon receipt of written agreement to the terms of this Agreement, but no assignment or transfer of this Agreement or any right or interest therein shall be valid until approved in writing by all Parties. This Agreement is and shall be binding upon and shall inure to the benefit of the Parties and, upon dissolution, the legal successors and assigns of their assets and liabilities.

17. AMENDMENT, MODIFICATION, AND/OR SUPPLEMENT: This Agreement may be amended, modified, or supplemented only by the written agreement of the Parties. No amendment, modification, or supplement shall be binding unless it is in writing and signed by all Parties.

18. DRAFTING CONSIDERATIONS: Each Party and its counsel have participated fully in the drafting, review and revision of this Agreement, each of whom is sophisticated in the matters to which this Agreement pertains, and no one Party shall be considered to have drafted this Agreement.

19. NOTICES:

19.1 All notices, requests, demands, or other communications under this Agreement must be in writing and sent to the addresses of each Party set forth below. Notice shall be sufficiently given for all purposes as follows:

19.2 Personal Delivery. When delivered to the recipient, notice is effective upon delivery.

19.3 Certified Mail. When mailed certified mail, return receipt requested. Notice is effective on receipt, if a return receipt confirms delivery.

19.4 Overnight Delivery. When delivered by an overnight delivery service such as Federal Express, charges prepaid or charged to the sender's account. Notice is effective on delivery, if delivery is confirmed by the delivery service.

19.5 Facsimile Transmission. Notice is effective on receipt, provided that the facsimile machine provides the sender a notice that indicates the transmission was successful and that a copy is mailed by first-class mail on the facsimile transmission date.

19.6 Addresses for purpose of giving notice are as follows:

If to Reclamation by personal service, overnight delivery, or by U.S. mail:	U.S. Bureau of Reclamation Yuma Area Office Attention: Area Manager 7301 Calle Agua Salada Yuma, Arizona 85364
cc:	Regional Director Lower Colorado Region Attention: LC-1000
by overnight delivery:	500 Fir Street Boulder City, NV 89005
by U.S. mail:	P. O. Box 61470 Boulder City, NV 89006-1470

If to MWD by personal service, overnight delivery, or by U.S. mail:	Metropolitan Water District of Southern California Attention: General Manager 700 North Alameda Street Los Angeles, CA 90012-3353 P.O. Box 54153 Los Angeles, CA 90054-0153
If to SNWA by personal service, overnight delivery or by U.S. mail:	Southern Nevada Water Authority Attention: General Manager 100 City Parkway Las Vegas, NV 89106-4610 P.O. Box 99956 Las Vegas, NV 89193-9956
If to CRCN by personal service, overnight delivery, or by U.S. mail:	Colorado River Commission of Nevada Attention: Executive Director 555 East Washington Avenue, Suite 3100 Las Vegas, NV 89101
If to CAWCD by personal service, overnight delivery, or by U.S. mail:	Central Arizona Water Conservation District Attention: General Manager 23636 North 7th Street Phoenix, AZ 85024-3801 P.O. Box 43020 Phoenix, AZ 85080-3020

19.7 A correctly addressed notice that is refused, unclaimed, or undeliverable because of an act or omission by the Party to be notified shall be deemed effective as of the first date that notice was refused, unclaimed, or deemed undeliverable by the postal authorities, messenger, or overnight delivery service.

19.8 A Party may change its address by giving the other Parties notice of the change in any manner permitted by this Agreement.

20. JUDICIAL REMEDIES NOT FORECLOSED: Nothing herein shall be construed (i) as in any manner abridging, limiting, or depriving any Party of any means of enforcing any remedy either at law or in equity for the breach of any of the provisions hereof, or of any other remedy which it would otherwise have, or (ii) as depriving any Party of any defense thereto which would otherwise be available.

21. AVAILABILITY OF INFORMATION: Subject to applicable Federal laws and regulations, each Party to this Agreement shall have the right during office hours to examine and make copies of the other Party's books and records relating to matters covered by this Agreement.

22. FEDERAL OBLIGATIONS CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FEDERAL FUNDS: The expenditure or advance of any money or the performance of any obligation of the United States under this Agreement, including the Reclamation contribution identified in Exhibit A to this Agreement, shall be contingent upon appropriation or allotment of funds. No liability shall accrue to the United States in case funds are not appropriated or allotted.

23. OFFICIALS NOT TO BENEFIT: No Member of or Delegate to the Congress, or Resident Commissioner, or official of MWD, SNWA, CRCN, CAWCD shall benefit from this Agreement other than as a water user or landowner in the same manner as other water users or landowners.

24. EQUAL OPPORTUNITY: Each Party shall comply with all applicable Federal and state laws relating to equal opportunity and non-discrimination.

25. EXHIBITS MADE PART OF THIS AGREEMENT: Exhibits A, B, and C are attached hereto and made a part hereof.

26. LIABILITY: Actions taken to prepare the YDP for the Pilot Project and to perform the OMR&R of the YDP under the Pilot Project are solely the responsibility of Reclamation. The liability of the United States for any claims arising out of the Pilot Project is limited to Reclamation's and the Contracting Officer's actions under this Agreement, and such coverage as may be provided under the Federal Tort Claims Act.

27. NO THIRD-PARTY BENEFICIARIES: This Agreement and any agreements made or actions taken pursuant hereto are made solely for the benefit of the Parties. No Party to this Agreement intends for this Agreement to confer any benefit upon any person or entity not a signatory upon a theory of third-party beneficiary or otherwise.

28. COUNTERPARTS: This Agreement may be executed in counterparts, each of which shall be an original and all of which, together, shall constitute only one Agreement.

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IN WITNESS WHEREOF, the Parties hereto have executed this Agreement No. 09-XX-30-W0541 on the day and year first written above.

Approved as to legal sufficiency:

By: Katherine Ott Verburg
Field Solicitor

THE UNITED STATES OF AMERICA

By: Lorri Gray-Lee
Lorri Gray-Lee, Regional Director
Bureau of Reclamation

Approved as to form:

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

By: _____
Karen L. Tachiki
General Counsel

By: _____
Jeffrey Kightlinger
General Manager

Approved as to form:

SOUTHERN NEVADA WATER AUTHORITY

By: _____
John J. Entsminger
Deputy General Counsel

By: _____
Patricia Mulroy
General Manager

Approved as to form:

COLORADO RIVER COMMISSION OF NEVADA

By: _____
Jennifer T. Crandell
Senior Deputy Attorney General

By: _____
George M. Caan, P.E.
Executive Director

Approved as to form:

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

By: _____
Secretary

By: _____
President

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement No. 09-XX-30-W0541 on the day and year first written above.

Approved as to legal sufficiency:

By: _____
Field Solicitor

THE UNITED STATES OF AMERICA

By: _____
Lorri Gray-Lee, Regional Director
Bureau of Reclamation

Approved as to form:

By: _____
Karen L. Tachiki
General Counsel

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

By: _____
Jeffrey Kightlinger
General Manager

Approved as to form:

By: _____
John J. Entsminger
Deputy General Counsel

SOUTHERN NEVADA WATER AUTHORITY

By: _____
Patricia Mulroy
General Manager

Approved as to form:

By: _____
Jennifer T. Crandell
Senior Deputy Attorney General

COLORADO RIVER COMMISSION OF NEVADA

By: _____
George M. Caan, P.E.
Executive Director

Approved as to form:

By: _____
Secretary

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

By: _____
President

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Approved as to legal sufficiency:

By: _____
Field Solicitor

THE UNITED STATES OF AMERICA

By: _____
Lorri Gray-Lee, Regional Director
Bureau of Reclamation

Approved as to form:

By: _____
Karen L. Tachiki
General Counsel

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

By: _____
Jeffrey Kightlinger
General Manager

Approved as to form:

By: _____
John J. Entsminger
Deputy General Counsel

SOUTHERN NEVADA WATER AUTHORITY

By: _____
Patricia Mulroy
General Manager

Approved as to form:

By: _____
Jennifer T. Crandell
Senior Deputy Attorney General

COLORADO RIVER COMMISSION OF NEVADA

By: _____
George M. Caan, P.E.
Executive Director

Approved as to form:

By: _____
Secretary

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

By: _____
President

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement No. 09-XX-30-W0541 on the day and year first written above.

Approved as to legal sufficiency:

By: _____
Field Solicitor

THE UNITED STATES OF AMERICA

By: _____
Lorri Gray-Lee, Regional Director
Bureau of Reclamation

Approved as to form:

By: _____
Karen L. Tachiki
General Counsel

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

By: _____
Jeffrey Kightlinger
General Manager

Approved as to form:

By: _____
John J. Entsminger
Deputy General Counsel

SOUTHERN NEVADA WATER AUTHORITY

By: _____
Patricia Mulroy
General Manager

Approved as to form:

By: _____
Jennifer T. Crandell
Senior Deputy Attorney General

COLORADO RIVER COMMISSION OF NEVADA

By: _____
George M. Caan, P.E.
Executive Director

Approved as to form:

By: _____
Secretary

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

By: _____
President

ESTIMATE OF ELIGIBLE PROJECT COSTS
YUMA DESALTING PLANT PILOT PROJECT

1. This Exhibit A, made this 29th day of October, 2009, to be effective under and as a part of Agreement No. 09-XX-30-W0541, hereinafter called "Agreement," shall become effective on the date of the Agreement's execution and shall remain in effect until amended as provided for in Section 4.2 of the Agreement; Provided, that this Exhibit A or any amended Exhibit A shall terminate with termination of the Agreement.

2. Following is the Estimate of Eligible Project Costs:

Category	Estimated Cost
Plant Preparation	
- One time construction projects	2,605,000
- Reclamation labor	2,751,853
- Contract labor and services	814,584
- Materials, supplies, and parts	130,500
Subtotal	$ 6,301,937
Operation, Maintenance, Repair, and Replacement	
- Reclamation labor	3,411,492
- Contract labor and services	2,662,752
- Power	3,304,516
- Chemicals	6,415,610
- Materials	349,200
- Contingency	414,500
Subtotal	$ 16,558,070
Total	$ 22,860,007
Reclamation contribution (projects, labor, contingency)	$ 9,182,845
Parties funding	$ 13,677,162

SCHEDULE FOR PROJECT COMPLETION
YUMA DESALTING PLANT PILOT PROJECT

1. This Exhibit B, made this 29th day of October, 2009, to be effective under and as a part of Agreement No. 09-XX-30-W0541, hereinafter called "Agreement," shall become effective on the date of the Agreement's execution and shall remain in effect until amended as provided for in Section 4.2 of the Agreement; Provided, that this Exhibit B or any amended Exhibit B shall terminate with termination of the Agreement.

2. Following is the Schedule for Project Completion:

Milestone	**Begins**
Pilot Project Preparation Phase	August, 2008
- Design and acquisition	
- Construction and equipment preparation	
- Regulatory requirements	
Add supplemental contractor labor	October, 2009
Start Yuma Desalting Plant and stabilize pretreatment for ~1 month	March, 2010
Begin 11% capacity operations for ~2 weeks	April, 2010
Begin 22% capacity operations for ~2 weeks	April, 2010
Begin 33% capacity operations for 10 months or more	May, 2010
Pilot Project concludes	
Pilot Project will conclude upon delivery of ~29,000 acre feet (combination of YDP product water to the Colorado River and untreated MODE water to the Gila River Pilot Channel). Total estimated duration of the pilot is 12 to 18 months.	

FUNDING PERIODS
YUMA DESALTING PLANT PILOT PROJECT

1. This Exhibit C, made this 29th day of October, 2009, to be effective under and as a part of Agreement No. 09-XX-30-W0541, hereinafter called "Agreement," shall become effective on the date of the Agreement's execution and shall remain in effect until amended as provided for in Section 4.2 of the Agreement; Provided, that this Exhibit C or any amended Exhibit C shall terminate with termination of the Agreement.

2. Following are the anticipated Funding Periods:

Funding Periods

		Necessary non-Federal funding	Estimated Participant Share		
			MWD	SNWA	CAWCD
Pilot Preparation	Jul-09				
	Aug-09				
	Sep-09	$ 4,128,102	$ 3,302,482	$ 412,810	$ 412,810
	Oct-09				
	Nov-09				
	Dec-09				
	Jan-10	$ 3,183,020	$ 2,546,416	$ 318,302	$ 318,302
	Feb-10				
Pilot Project Operations	Mar-10				
	Apr-10				
	May-10	$ 3,183,020	$ 2,546,416	$ 318,302	$ 318,302
	Jun-10				
	Jul-10				
	Aug-10				
	Sep-10				
	Oct-10	$ 3,183,020	$ 2,546,416	$ 318,302	$ 318,302
	Nov-10				
	Dec-10				
	Jan-11				
Total		$ 13,677,162	$ 10,941,730	$ 1,367,716	$ 1,367,716

The purpose of this schedule is to provide the Pilot Project funding entities with Reclamation's best available estimate of the costs and timing of payments associated with the Pilot Project. This estimate including timing and amounts are subject to change and should only be used for informational purposes. This is also subject to the final terms and conditions set forth in the funding agreement.

Appendix 5.6

Delivery Agreement for the Pilot Run

ORIGINAL

Agreement No. 09-XX-30-W0545

YUMA DESALTING PLANT PILOT PROJECT DELIVERY AGREEMENT

This Yuma Desalting Plant Pilot Project Delivery Agreement (YDP Delivery Agreement) is entered into this 6th day of January 2010 between the UNITED STATES OF AMERICA and THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA (MWD), (each referred to individually as "Party" or, collectively, as "Parties"). The Parties hereby agree as follows:

I. Recitals

A. The Secretary of the Interior (Secretary) issued a Record of Decision (ROD) for the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead on December 13, 2007, which implements Interim Guidelines for the Operation of Lake Powell and Lake Mead (Guidelines).

B. The Guidelines establish criteria for the development and delivery of System Efficiency Intentionally Created Surplus (ICS).

C. MWD is a metropolitan water district created under the California Metropolitan Water District Act, codified at Section 109-1 et seq. of the Appendix to the West's Annotated California Water Code; and delivers Colorado River water to its service area in portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura Counties, California, pursuant to its contracts issued under Section 5 of the Boulder Canyon Project Act of 1928. MWD is a Contractor and holds an entitlement to the delivery of Colorado River water under Contract No. Ilr-645, dated April 24, 1930; Supplementary Contract No. Ilr-645, dated September 28, 1931; Contract Merging Rights No. Ilr-1483, dated October 4, 1946; and Contract for Delivery of Surplus Flows from the Colorado River, No. 7-07-30-W0171, dated September 9, 1987; ("Existing MWD Contracts").

D. MWD has secured the forbearance of certain Contractors to the delivery of System Efficiency ICS developed under the YDP Pilot Project through execution of Exhibit P to the Forbearance Agreement, attached hereto, as amended, as Attachment 1.

II. Authority

The Secretary is authorized under the Reclamation Act of 1902 and all acts amendatory thereof and supplementary thereto, including in particular Section 5 of the Boulder Canyon Project Act of 1928, to enter into contracts for the delivery of ICS.

III. Definitions

Defined terms appear in this YDP Delivery Agreement with initial capitalization and shall have the same meaning as in the Guidelines; provided, however:

A. "CRWDA" shall mean the Colorado River Water Delivery Agreement among the United States, IID, CVWD, MWD, and the San Diego County Water Authority, dated October 10, 2003.

B. "Forbearance Agreement" shall mean the Forbearance Agreement of December 13, 2007, as amended, in which under specific and limited circumstances the Contractors forbear the exercise of certain rights to Colorado River water otherwise available to them under the Consolidated Decree in Arizona v. California and under contracts entered into under Section 5 of the Boulder Canyon Project Act of 1928.

C. "Guidelines" shall mean the express language of the Interim Guidelines for Operation of Lake Powell and Lake Mead in the Record of Decision issued by the Secretary on December 13, 2007.

D. "YDP Pilot Project" shall have the same meaning as in the YDP Pilot Project Agreement.

E. "YDP Pilot Project Agreement" shall mean the Agreement Among the United States of America, through the Department of the Interior, Bureau of Reclamation, The Metropolitan Water District of Southern California, the Colorado River Commission of Nevada, the Southern Nevada Water Authority, and the Central Arizona Water Conservation District, for a Pilot Project for Operation of the Yuma Desalting Plant executed on October 29, 2009.

IV. Term

This YDP Delivery Agreement shall become effective upon execution by the Parties and shall remain in effect until such time as all deliveries of ICS permissible under the terms of the Guidelines, the YDP Pilot Project Agreement, and this YDP Delivery Agreement have occurred.

V. Relationship to Guidelines

The Parties to this YDP Delivery Agreement expressly acknowledge that this agreement will be administered in compliance with the terms of the Guidelines. Specific reference in this YDP Delivery Agreement to particular sections of the Guidelines shall not render inapplicable to the Parties those sections not specifically referred to herein.

VI. Approval and Verification of System Efficiency ICS

As set forth in Article 6 of the YDP Pilot Project Agreement, the Secretary has determined that the YDP Pilot Project Agreement constitutes:

A. A valid multi-year plan for creation of System Efficiency ICS under Sections 3.A.3 and 3.B.1 of the Guidelines; and

B. A verified Certification Report under Sections 3.D.1 and 3.D.2 of the Guidelines for System Efficiency ICS.

VII. Delivery of ICS

A. MWD shall neither order nor accept delivery of System Efficiency ICS created and credited to MWD's ICS account in accordance with the YDP Pilot Project Agreement except in accordance with the terms of the Guidelines, the Forbearance Agreement, the CRWDA, and this YDP Delivery Agreement.

B. MWD's existing entitlement to Colorado River water shall remain in full force and effect and with this YDP Delivery Agreement shall govern the delivery to MWD of System Efficiency ICS created under the YDP Pilot Project Agreement.

C. ICS. The Secretary shall deliver to MWD the System Efficiency ICS created and credited to MWD's ICS Account in accordance with the YDP Pilot Project Agreement, and requested by MWD, in accordance with Existing MWD Contracts, Section 3.C of the Guidelines, and the Forbearance Agreement; provided, however:

1. The Secretary must have determined an ICS Surplus Condition applicable to the Year of the delivery, in accordance with Sections 2.B.5 and 3.C.2 of the Guidelines;

2. The ICS delivery must be in accordance with 43 C.F.R. Part 417; and

3. Nothing in this YDP Delivery Agreement modifies, or is intended to modify, the rights of any person or entity that is not a party to the Forbearance Agreement.

VIII. Accounting for ICS.

The Secretary shall include creation and delivery of System Efficiency ICS under the YDP Pilot Project Agreement and this YDP Delivery Agreement in any Decree Accounting Reports as a subset of the ICS Account for MWD. The account shall further reflect any reductions for payback obligations, in accordance with Section 3.C.7 of the Guidelines, and shall reflect excess deliveries of ICS as an inadvertent overrun until repaid, in accordance with Section 3.C.8 of the Guidelines.

IX. IID Call Rights Under Allocation Agreement.

The creation under the YDP Pilot Project Agreement, the release, or delivery of System Efficiency ICS, or the declaration of an ICS Surplus Condition in a calendar year shall not constitute a determination by the Secretary of the existence of surplus Colorado River water in that calendar year for the purposes of Section 9.2.2 of the Allocation Agreement Among the United States of America, The Metropolitan Water District of Southern California, Coachella Valley Water District, Imperial Irrigation District, San Diego County Water Authority, the La Jolla, Pala, Pauma, Rincon and San Pasqual Bands of Mission Indians, the San Luis Rey River Indian Water Authority, the City of Escondido and Vista Irrigation District, dated October 10, 2003.

X. Other Terms.

A. Signatories to the Forbearance Agreement are intended third-party beneficiaries of this YDP Delivery Agreement solely for the purposes of ensuring compliance with the Guidelines and the Forbearance Agreement and enforcing the provisions of this agreement that require compliance or consistency with the Guidelines and the Forbearance Agreement. Notwithstanding anything to the contrary contained in this paragraph, no third-party shall accrue any right to System Efficiency ICS created under the YDP Pilot Project Agreement as a result of the third-party beneficiary status conferred in this paragraph.

B. In accordance with Section 3.C.10 of the Guidelines, the books and records of MWD relating to the creation of System Efficiency ICS under the YDP Pilot Project Agreement or this YDP Delivery Agreement shall be open to inspection by any Party, Contractor or Basin State.

C. This YDP Delivery Agreement is subject to and controlled by the Colorado River Compact of 1922.

D. No member of or Delegate to Congress, Resident Commissioner, or official of any Party shall benefit from this YDP Delivery Agreement other than as a water user or landowner in the same manner as other water users or landowners.

E. This YDP Delivery Agreement shall not be deemed to be a new or amended contract for the purpose of section 203(a) of the Reclamation Reform Act of 1982.

F. Each Party to this YDP Delivery Agreement represents that the person executing it on behalf of such Party has full power and authority to do so, and that his or her signature is legally sufficient to bind the Party on whose behalf he or she is signing.

G. The expenditure or advance of any money or the performance of any obligation of the United States under this YDP Delivery Agreement shall be contingent on appropriation or allotment of funds.

H. Each Party shall comply with all applicable federal or state laws relating to equal opportunity and non-discrimination.

IN WITNESS WHEREOF, the Parties hereto have executed this YDP Delivery Agreement No. 09-XX-30-W0545 the day and year first written above.

Approved as to legal sufficiency:

by: Katherine Ott Verburg
Field Solicitor

THE UNITED STATES OF AMERICA

by: Lorin Gray-Lee
Regional Director
Lower Colorado Region
Bureau of Reclamation

Approved as to form:

by: Karen L. Tachiki
Karen L. Tachiki
General Counsel

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

by:
Jeffrey Kightlinger
General Manager

E. This Delivery Agreement shall not be deemed to be a new or amended contract for the purpose of section 203(a) of the Reclamation Reform Act of 1982.

F. Each Party to this Delivery Agreement represents that the person executing it on behalf of such Party has full power and authority to do so, and that his or her signature is legally sufficient to bind the Party on whose behalf he or she is signing.

G. The expenditure or advance of any money or the performance of any obligation of the United States under this Delivery Agreement shall be contingent on appropriation or allotment of funds.

H. Each Party shall comply with all applicable federal or state laws relating to equal opportunity and non-discrimination.

IN WITNESS WHEREOF, the Parties hereto have executed this Delivery Agreement No. 09-XX-30-W0547 the day and year first written above.

Approved as to legal sufficiency:

by: _____
Field Solicitor

THE UNITED STATES OF AMERICA

by: _____
Regional Director
Lower Colorado Region
Bureau of Reclamation

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

by: _____
Secretary

by: _____
President

IN WITNESS WHEREOF, the Parties hereto have executed this YDP Delivery Agreement No. 09-XX-30-W0546 the day and year first written above.

Approved as to legal sufficiency:

by: _____
Field Solicitor

THE UNITED STATES OF AMERICA

by: _____
Regional Director
Lower Colorado Region
Bureau of Reclamation

Approved as to form:

by: _____
John J. Entsminger
Deputy General Counsel

THE SOUTHERN NEVADA WATER AUTHORITY

by: _____
Patricia Mulroy
General Manager

Approved as to form:

by: _____
Jennifer T. Crandell
Senior Deputy General Counsel

THE COLORADO RIVER COMMISSION OF NEVADA

by: _____
George M. Caan, P.E.
Executive Director

In Witness of this Exhibit P to the Forbearance Agreement executed on December 13, 2007, the Parties affix their official signatures below, acknowledging approval of this document on this 28th day of October, 2009.

Approved as to form:

By: _____
Nicole D. Klobas
Deputy Counsel

THE STATE OF ARIZONA acting through the ARIZONA DEPARTMENT OF WATER RESOURCES

By: _____
Herbert R. Guenther
Director

Attest:

By: _____
Edward W. Smith
General Manager

PALO VERDE IRRIGATION DISTRICT

By: _____
Charles H. Van Dyke
Chairman

Attest and Approved:

By: _____
John Penn Carter
Legal Counsel

IMPERIAL IRRIGATION DISTRICT

By: _____
James C. Hanks
President

Approved as to form:

By: _____
John Pinkney
City Attorney

THE CITY OF NEEDLES

By: _____
~~Jeff Williams~~ Patrick Murch
Mayor-Vice

Approved as to form:

By: _____
Steven B. Abbott
Legal Counsel

COACHELLA VALLEY WATER DISTRICT

By: _____
Steven B. Robbins
General Manager/Chief Engineer

Approved as to form:

By: _____
Karen L. Tachiki
General Counsel

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

By: _____
Jeffrey Kightlinger
General Manager

Approved as to form:

By: _____
John J. Entsminger
Deputy General Counsel

SOUTHERN NEVADA WATER AUTHORITY

By: _____
Patricia Mulroy
General Manager

Approved as to form:

By: _____
Jennifer T. Crandell
Senior Deputy Attorney General

COLORADO RIVER COMMISSION OF NEVADA

By: _____
George M. Caan
Executive Director

Appendix 5.7

Forbearance Agreement for the YDP Pilot Run

Exhibit P
Yuma Desalting Plant Pilot Run

In accordance with Paragraph 3.2 of the Lower Colorado River Basin Intentionally Created Surplus Forbearance Agreement (Forbearance Agreement) dated December 13, 2007, the State of Arizona, acting through the Arizona Department of Water Resources (ADWR); the Palo Verde Irrigation District (PVID); the Imperial Irrigation District (IID); the City of Needles; the Coachella Valley Water District (CVWD); The Metropolitan Water District of Southern California (MWD); the Southern Nevada Water Authority (SNWA); and the Colorado River Commission of Nevada (CRCN) (collectively, "the Parties") hereby agree to the addition of this Exhibit "P" to the Forbearance Agreement.

1. **Type:** System Efficiency Intentionally Created Surplus (ICS) project that will conserve water that would otherwise be delivered from lower Colorado River system storage to replace water conveyed through the bypass drain to the Ciénega de Santa Clara. Absent this System Efficiency ICS project, the water conveyed through the bypass drain is not counted as part of the U.S. treaty delivery to Mexico.

2. **Purpose:** Test operation of the Yuma Desalting Plant (YDP) and, among other things, evaluate maintenance and repair needs, replacement requirements, operational challenges and costs of potential future long-term YDP operation. Although not the purpose of test operation a benefit of test operation of the YDP is the production of desalinated Main Outlet Drain Extension (MODE) water to be released to the Colorado River with additional MODE water to be released to the Gila River Pilot Channel to then flow into the Colorado River for delivery to Mexico under the Mexican Water Treaty of 1944 (Treaty) in a Pilot Run. Any subsequent operation of the YDP will be the subject of a separate decision process. This Exhibit P provides forbearance solely for the Pilot Run.

3. **Project Description:** The YDP was built to desalt saline water to permit this water to be used in the United States or delivered to Mexico in accordance with International Boundary and Water Commission, United States and Mexico Minute 242. Currently, the United States does not operate the YDP and instead conveys saline water through the bypass drain to Mexico. An equivalent amount of water is released from lower Colorado River system storage to replace the water entering the bypass drain.

   Pilot Run operation of the YDP will provide cost and operational information that can only be obtained through actual YDP operation. Pilot Run operation of the YDP will occur for 365 operation days which may be non-continuous within 12 to 18 months from the first date of Pilot Run operation. MODE water from Wellton Mohawk Irrigation and Drainage District will be the source of water for desalting at the YDP during Pilot Run operation. Desalinated MODE water will be

released to the Colorado River approximately concurrent with releases of untreated MODE water to the Gila River Pilot Channel.

Proposed Pilot Run operation of the YDP, if approved, is expected to begin in 2010 and continue into 2011 and to produce approximately 29,000 acre-feet of desalinated and untreated MODE water.

4. **Capital Contribution:** As described in Contract No. _____ and Contract No. _____ among the U.S. Bureau of Reclamation, MWD, SNWA, CRCN and the Central Arizona Water Conservation District (CAWCD).

5. **Quantity of System Efficiency ICS:** A volume of ICS equivalent to: the total volume of treated MODE water released to the Colorado River during Pilot Run operation and untreated MODE water released to the Gila River Pilot Channel for delivery under the Treaty will be credited to MWD, SNWA and CAWCD's ICS Accounts in proportion to the capital contribution of each Contractor after MODE water has been desalinated, measured and released to the Colorado River with untreated MODE water. This constitutes a portion of the total water conserved under the Pilot Run in that the release of the desalinated water to the Colorado River during Pilot Run operation immediately upstream of the point of delivery for Treaty obligations and untreated water released to the Gila River Pilot Channel results in a savings in conveyance losses otherwise incurred by the release of water from lower Colorado River system storage for delivery to Mexico.

   ICS will be created for up to 365 YDP Pilot Run operation-days and must be created within 18 months of the first day of operation. Based on projections calculated from currently existing data, Reclamation anticipates that the total amount of System Efficiency ICS developed under the Pilot Run will be 29,000 acre-feet. This projection is subject to variable plant operating recovery rates during the course of the 365-day YDP operation and therefore Reclamation will calculate ICS credits on the basis of the total actual amount of treated and untreated water released for delivery to Mexico under Pilot Run operation. Because plant operating recovery rates cannot be predicted with precision based on existing data, and because of the necessity of certainty in determining the scope of forbearance, the forbearance provided for the Pilot Run under this Exhibit P is capped at 31,000 acre-feet.

6. **Schedule of Deliveries:** MWD, SNWA, and CAWCD may request delivery of any volume of ICS created pursuant to this Exhibit P at any time after the ICS is created.

7. **System Benefit:** It is expected that system benefits will be gained as the Pilot Run is anticipated to increase Colorado River system storage until CAWCD, SNWA, and MWD call on all of their accrued System Efficiency ICS credits. Also, making direct delivery of the water to Mexico in lieu of releasing the water

from lower Colorado River system storage reduces conveyance losses. Finally, the YDP Pilot Run is designed to gather benchmark performance and cost information and determine whether any additional corrective actions to plant design or equipment would be necessary for potential future long-term operation. This information will permit informed decisions to be made regarding potential future long-term operation of the YDP, potentially increasing Colorado River system storage over time. Any future ICS projects involving YDP operation may be subject to different assessments for system benefits.

8. **Reclamation Authority:** Reclamation Act of 1902, 32 Stat. 388, as amended and supplemented, including in particular, Boulder Canyon Project Act, 45 Stat. 1057, Act of March 4, 1921, 41 Stat. 1404, Act of January 21, 1927, 44 Stat. 1010, chapter 47, designated the Colorado River Front Work and Levee System, as amended and P.L. 109-432, 120 Stat. 2922 §396.

9. **Counterparts:** This Exhibit P to the Forbearance Agreement may be executed in counterparts, each of which shall be an original and all of which, together, shall constitute only one Exhibit P to the Forbearance Agreement.

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In Witness of this Exhibit P to the Forbearance Agreement executed on December 13, 2007, the Parties affix their official signatures below, acknowledging approval of this document on this 28th day of October, 2009.

Approved as to form:

THE STATE OF ARIZONA acting through the ARIZONA DEPARTMENT OF WATER RESOURCES

By: _____
Nicole D. Klobas
Deputy Counsel

By: _____
Herbert R. Guenther
Director

Attest:

PALO VERDE IRRIGATION DISTRICT

By: _____
Edward W. Smith
General Manager

By: _____
Charles H. Van Dyke
Chairman

Attest and Approved:

IMPERIAL IRRIGATION DISTRICT

By: _____
John Penn Carter
Legal Counsel

By: _____
James C. Hanks
President

Approved as to form:

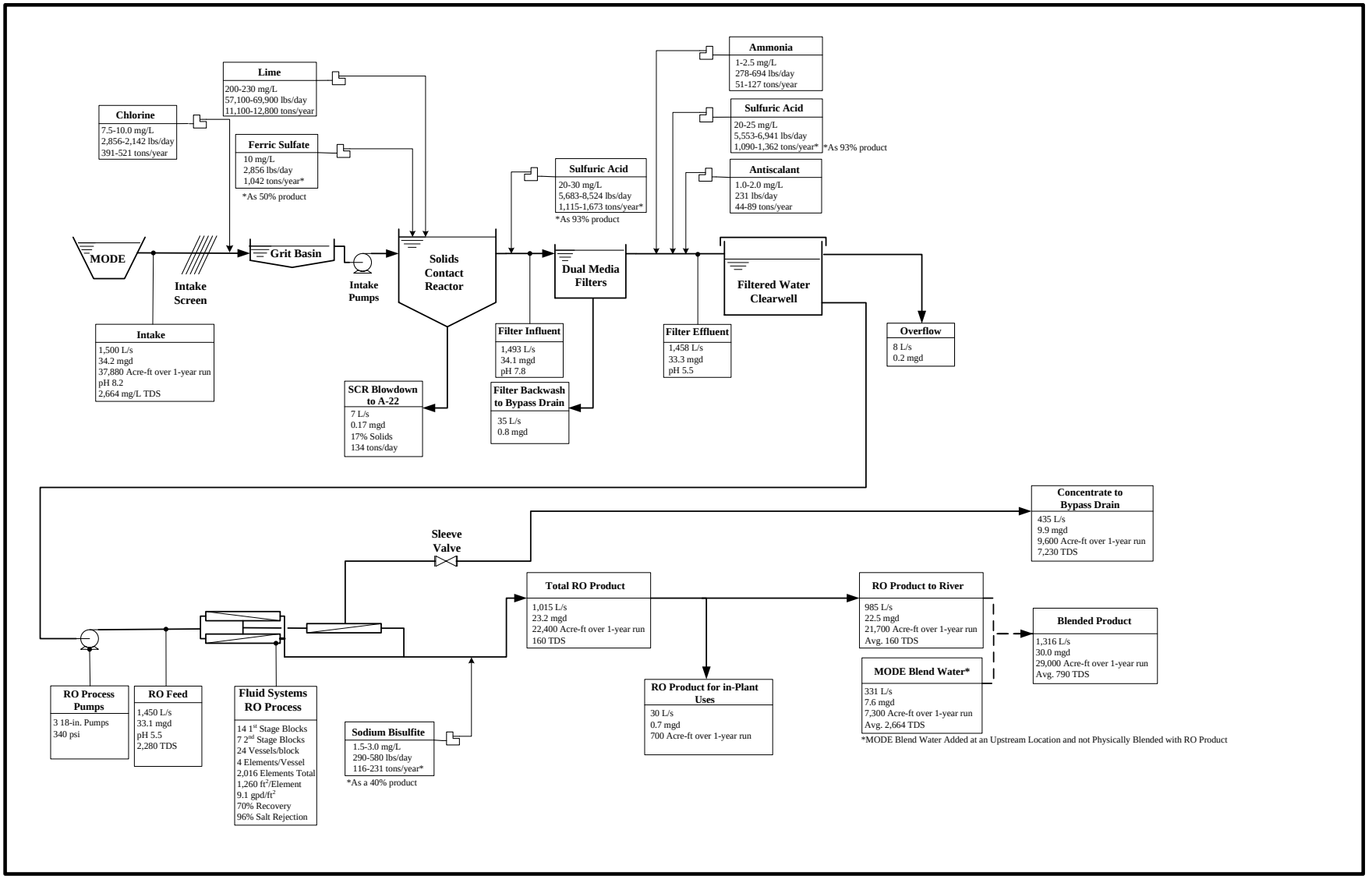
THE CITY OF NEEDLES

By: _____
John Pinkney
City Attorney

By: _____
~~Jeff Williams~~ Patrick Murch
Mayor-Vice

Appendix 5.8

Process Flow Diagram for the YDP Pilot Run


Lime
200-230 mg/L
57,100-69,900 lbs/day
11,100-12,800 tons/year
Chlorine
7.5-10.0 mg/L
2,856-2,142 lbs/day
391-521 tons/year
Ferric Sulfate
10 mg/L
2,856 lbs/day
1,042 tons/year*
*As 50% product
Ammonia
1-2.5 mg/L
278-694 lbs/day
51-127 tons/year
Sulfuric Acid
20-25 mg/L
5,553-6,941 lbs/day
1,090-1,362 tons/year*
*As 93% product
Sulfuric Acid
20-30 mg/L
5,683-8,524 lbs/day
1,115-1,673 tons/year*
*As 93% product
Antiscalant
1.0-2.0 mg/L
231 lbs/day
44-89 tons/year
MODE
Intake Screen
Grit Basin
Intake Pumps
Solids Contact Reactor
Dual Media Filters
Filtered Water Clearwell
Intake
1,500 L/s
34.2 mgd
37,880 Acre-ft over 1-year run
pH 8.2
2,664 mg/L TDS
Filter Influent
1,493 L/s
34.1 mgd
pH 7.8
Filter Effluent
1,458 L/s
33.3 mgd
pH 5.5
Overflow
8 L/s
0.2 mgd
SCR Blowdown to A-22
7 L/s
0.17 mgd
17% Solids
134 tons/day
Filter Backwash to Bypass Drain
35 L/s
0.8 mgd
Concentrate to Bypass Drain
435 L/s
9.9 mgd
9,600 Acre-ft over 1-year run
7,230 TDS
Sleeve Valve
Total RO Product
1,015 L/s
23.2 mgd
22,400 Acre-ft over 1-year run
160 TDS
RO Product to River
985 L/s
22.5 mgd
21,700 Acre-ft over 1-year run
Avg. 160 TDS
Blended Product
1,316 L/s
30.0 mgd
29,000 Acre-ft over 1-year run
Avg. 790 TDS
MODE Blend Water*
331 L/s
7.6 mgd
7,300 Acre-ft over 1-year run
Avg. 2,664 TDS
*MODE Blend Water Added at an Upstream Location and not Physically Blended with RO Product
RO Product for in-Plant Uses
30 L/s
0.7 mgd
700 Acre-ft over 1-year run
RO Process Pumps
3 18-in. Pumps
340 psi
RO Feed
1,450 L/s
33.1 mgd
pH 5.5
2,280 TDS
Fluid Systems RO Process
14 1st Stage Blocks
7 2nd Stage Blocks
24 Vessels/block
4 Elements/Vessel
2,016 Elements Total
1,260 ft2/Element
9.1 gpd/ft2
70% Recovery
96% Salt Rejection
Sodium Bisulfite
1.5-3.0 mg/L
290-580 lbs/day
116-231 tons/year*
*As a 40% product

Appendix 5.9

Summary of Risk Mitigation Plan for the Pilot Run

YDP Aluminum Bronze Piping
Summary - Pilot Run Risk Assessment and Mitigation Plan

❖ Background:

- The YDP contains over 11,000 linear feet of aluminum bronze (al-br) piping. It varies from 2 to 78 inches in diameter. About 83% of this piping is considered high pressure piping.

- In December, 2007 CH2MHill released its assessment of the YDP's al-br piping. The assessment included specialized metallurgical tests, ultrasonic thickness gauging, shear-wave flaw detection, x-rays, and physical inspections.

- CH2MHill (Hill) recommended that the high pressure al-br piping be replaced prior to operating the plant again or, if the piping is not replaced the plant be operated again using low pressure membranes.

- The YDP is presently configured to operate using high pressure membranes. Replacing the piping would require several years and an estimated $16 million (2007 estimate). Utilizing low pressure membranes would require major plant retrofitting. While this has not been analyzed such plant retrofitting would cost considerably more than $16 million; also require several years.

- Either recommendation provided by Hill could not be accomplished in time for the Pilot Run.

- Specific pressure related information:
  - During the Demonstration Run of 2007 the YDP operated at a pressure of about 300 to 340 psi.
  - We expect for the Pilot Run, the YDP will also operate at a pressure of about 300 to 340 psi.
  - The original design pressure of the al-br piping was 425 to 450 psi.

❖ 2007 Demonstration Run:

- The 3 month Demonstration Run of the YDP utilized high pressure membranes and the existing al-br piping. During the Demonstration Run nine pipe leaks occurred. Six of the leaks were successfully repaired. Repeated attempts to repair the other three leaks were unsuccessful and these were allowed to leak while the Demonstration Run continued.

- While some al-br pipes leaked during the Demonstration Run, no pipes burst.

❖ Pilot Run:

- For the Pilot Run high pressure membranes will be utilized. The condition of the al-br piping does create safety and reliability issues. Reclamation will use the following measures to mitigate these risks:
  - The segments of high pressure al-br piping most susceptible to leaks or failure are portions of the concentrate lines. These segments were replaced prior to the Pilot Run; 316 stainless steel was used, the recommended alloy for the YDP and the most widely used alloy for piping in desalination plants today. The 316 stainless steel recommendation is set forth in Hill's al-br piping assessment of December, 2007.
  - The al-br piping that serves the YDP's Energy Recovery Unit (ERU) has been severed and flanged off for the Pilot Run. The cost to replace this piping exceeds the estimated savings in energy costs for the run.
  - Al-br piping pressure tests on the YDP were conducted. During the Pilot Run the high pressure piping is expected to be subjected to between 300 and 340 psi. Pressure testing was conducted up to 400 psi to include a safety factor.
  - Contract labor for the Pilot Run includes experienced welders to assist in rapid and quality piping repairs. This will minimize down time and help to ensure all leaks are properly repaired. Piping repairs will be performed only when the YDP is not operating and piping is clean and dry.
  - As a result of transient pressure increases the al-br piping is most vulnerable to leaking or failure during plant start-ups. To counter this, the high pressure reverse osmosis feed water pumps will be started against closed valves. Valves will be opened slowly to minimize transient pressure increases. The procedure was also utilized during the Demonstration Run.
  - In addition, plant start-ups and shut downs will be minimized during the Pilot Run.
  - During the Pilot Run all areas containing high pressure al-br piping will be cordoned off, appropriate signage utilized, and access strictly limited to O&M personnel who will be present only in these areas only when necessary for plant performance. All personnel at the Yuma Area Office will be notified of this restriction prior to the Pilot Run.
  - Existing YDP on-site safety procedures have been supplemented included training that addresses al-br piping safety and other precautions necessary within the Controlled Access Zone. Personnel allowed in the Zone are identified by a specialized hard hat decal.

Appendix 5.10

Controlled Access Zone for the Pilot Run

RECLAMATION

Managing Water in the West

Yuma Desalting Plant "Controlled Access Zone" Awareness Training

U.S. Department of the Interior
Bureau of Reclamation

Key Personnel

Mr. Mike Norris – Desalting Group

Mr. Henry Cabrera – YDP/Quality Assurance

Mr. Jeremy Buck – KTS Corp/Contract Mgr

Mr. Bobby Northrup – KTS Plant Superintendent

Mr. David Greene – YAO Safety Office

Mr. Curtis Conner – KTS, QA/Safety Manager

Pilot Run of the YDP

- The YDP was constructed to recover (desalinate) agricultural return flow water from the Wellton-Mohawk Irrigation and Drainage District
- Desalinated product water from the plant is discharged into the Colorado River and included in water deliveries to Mexico
- For the upcoming Pilot Run the YDP will operate for 12 to 18 months at up to one-third of full capacity

Hazards

The YDP is a large water treatment plant. Hazards include, but are not limited to:

- Chemicals
- Confined spaces
- Equipment which operates automatically
- High pressure piping
- Tripping and falling
- Vehicular traffic

Safety Precautions

- Material Safety Data Sheets have been provided and are kept current to address all chemical hazards
- Reclamation and KTS safety programs and policies remain in force
- Risk Management Plan and Process Safety Hazard Program have been reviewed and updated
- Just as was the case for Demonstration Run of the YDP a Controlled Access Zone will established for the Pilot Run

Pilot Run “Controlled Access Zone”

RECLAMATION

Purpose of the Zone

The Controlled Access Zone has been established to:

- Increase the safety awareness of all personnel that work at or visit the YAO
- Protect personnel that do not work in the Zone from hazards associated with an operating industrial process plant
- Ensure those that work in the Zone receive appropriate refresher and supplemental training

How the Zone Works

- Zone will include the installation of barricades and safety netting/tape. **For your own safety, do not disregard these**
- Only authorized personnel are allowed within the Zone. A list of authorized personnel has been prepared and will be kept updated
- Driving through the Zone is allowed, subject to existing safety requirements such as the speed limit. Deliveries will be through the Warehouse (southwest) gate
- CR-100 will not be available during the Pilot Run. Exceptions may be considered on a case-by-case basis by the Safety Office and Area Manager
- Within the Controlled Access Zone certain parts of the plant require additional precautions

RECLAMATION

Additional Precaution Areas

These are the parts of the plant that are subject to additional work place safety measures, based on the nature of the hazard present. Additional Precaution Areas are:

- Ammonia storage
- Chlorine delivery, storage and processing
- High pressure piping
- High noise areas (compressor bldg, RO pumps)
- Switchyard
- Temporary work areas where cutting, welding or heavy equipment is in use
- Anywhere personal protection equipment is required

Personnel who work in these Additional Precaution Areas will receive refresher and supplemental training based on the Areas they work inside of the Controlled Access Zone

Hard hat stickers will be used to identify those personnel that have successfully completed this training and are allowed in Additional Precaution Areas

High Pressure Piping

- One Additional Precaution Area will require some new signage
- High pressure piping is located at the high pressure RO pumps and inside of the RO process area

RECLAMATION

New Signage

These signs will be installed in parts of the plant where high pressure piping is located

Recap

- A Controlled Access Zone is being established for the Pilot Run of the YDP
- **For your own safety, do not disregard the Controlled Access Zone**
- Driving through the Zone is allowed, subject to existing safety requirements such as the speed limit. Deliveries will be through the Warehouse (southwest) gate
- Within the Controlled Access Zone certain parts of the plant require additional precautions. Personnel who work in these Additional Precaution Areas will receive refresher and supplemental training

Any questions?

Appendix 5.11

MODE Water Chemistry Analysis Results

3/15/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	150
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.011
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.002	0.0045
Selenium	Dissolved Metals	ppm	E200.8	0.002	0.0036
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300	0.2	3.7
Nitrite-N	Inorganics	ppm	EPA 300	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	3.7
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300	20	770
Total Dissolved Solids	Inorganics	ppm	SM2540C	40	2100
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	8
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		19.8
pH	Field attributes	pH	probe		7.98
Conductivity	Field attributes	uS/cm	probe		3420
ORP	Field attributes	milli volts	probe		193
Dissolved oxygen	Field attributes	ppm	probe		8.61

4/13/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	150
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.0095
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.002	0.0037
Selenium	Dissolved Metals	ppm	E200.8	0.002	0.0029
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300	0.2	3.7
Nitrite-N	Inorganics	ppm	EPA 300	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	3.7
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300	20	820
Total Dissolved Solids	Inorganics	ppm	SM2540C	40	2200
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	13
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	500
Temperature	Field attributes	degree C	probe		19
pH	Field attributes	pH	probe		7.9
Conductivity	Field attributes	uS/cm	probe		3546
ORP	Field attributes	milli volts	probe		181
Dissolved oxygen	Field attributes	ppm	probe		9.38

5/10/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	180
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.002	0.0025
Selenium	Dissolved Metals	ppm	E200.8	0.002	0.011
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300	0.2	5.3
Nitrite-N	Inorganics	ppm	EPA 300	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	5.3
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300	20	1200
Total Dissolved Solids	Inorganics	ppm	SM2540C	40	3100
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	30
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	300
Temperature	Field attributes	degree C	probe		19.7
pH	Field attributes	pH	probe		8.1
Conductivity	Field attributes	uS/cm	probe		4340
ORP	Field attributes	milli volts	probe		196
Dissolved oxygen	Field attributes	ppm	probe		10.88

6/14/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	170
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	ND
Selenium	Dissolved Metals	ppm	E200.8	0.01	ND
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	4.1
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	0.94
Nitrogen, Total	Inorganics	ppm	Calc	1.7	4.1
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	1300
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	3500
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	9
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	1600
Temperature	Field attributes	degree C	probe		23.6
pH	Field attributes	pH	probe		7.7
Conductivity	Field attributes	uS/cm	probe		5193
ORP	Field attributes	milli volts	probe		219
Dissolved oxygen	Field attributes	ppm	probe		6.08

7/12/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	170
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.01
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.0062
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.005
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	0.5
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	5.2
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	1.1
Nitrogen, Total	Inorganics	ppm	Calc	1.7	7.9
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	1300
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	3300
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	1.6
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	30
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	1600
Temperature	Field attributes	degree C	probe		28.9
pH	Field attributes	pH	probe		7.73
Conductivity	Field attributes	uS/cm	probe		4697
ORP	Field attributes	milli volts	probe		116
Dissolved oxygen	Field attributes	ppm	probe		6.99

8/16/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	200
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	ND
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0065
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	0.81
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	3.9
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	1.7
Nitrogen, Total	Inorganics	ppm	Calc	1.7	8.4
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.42
Sulfate	Inorganics	ppm	EPA 300.0	40	1500
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	3800
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	2.8
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	2
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		28.8
pH	Field attributes	pH	probe		7.55
Conductivity	Field attributes	uS/cm	probe		5356
ORP	Field attributes	milli volts	probe		234
Dissolved oxygen	Field attributes	ppm	probe		5.87

9/13/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	160
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.015
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.0085
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0055
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	4.5
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	0.54
Nitrogen, Total	Inorganics	ppm	Calc	1.7	6.7
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	910
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2600
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	1.7
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	1600
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	1600
Temperature	Field attributes	degree C	probe		27.7
pH	Field attributes	pH	probe		7.9
Conductivity	Field attributes	uS/cm	probe		3819
ORP	Field attributes	milli volts	probe		206
Dissolved oxygen	Field attributes	ppm	probe		7.64

10/12/2010 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	150
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	ND
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.012
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	4.6
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	4.6
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.21
Sulfate	Inorganics	ppm	EPA 300.0	40	880
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2700
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	30
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		23.8
pH	Field attributes	pH	probe		7.8
Conductivity	Field attributes	uS/cm	probe		3965
ORP	Field attributes	milli volts	probe		225
Dissolved oxygen	Field attributes	ppm	probe		7.76

11/15/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	160
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.0052
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.012
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	4.5
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	5.6
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	1000
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2800
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	1
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	2
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	300
Temperature	Field attributes	degree C	probe		17.7
pH	Field attributes	pH	probe		7.9
Conductivity	Field attributes	uS/cm	probe		4157
ORP	Field attributes	milli volts	probe		262
Dissolved oxygen	Field attributes	ppm	probe		8.78

12/13/10 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	150
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.0068
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0072
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	3.9
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	3.9
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	860
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2600
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	8
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		19.7
pH	Field attributes	pH	probe		7.9
Conductivity	Field attributes	uS/cm	probe		3736
ORP	Field attributes	milli volts	probe		246
Dissolved oxygen	Field attributes	ppm	probe		8.42

1/10/2011 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	0.0021
Calcium	Total Metals	ppm	E200.7	2.0	220
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.012
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	ND
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0038
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	0.76
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	3.9
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	4.9
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.21
Sulfate	Inorganics	ppm	EPA 300.0	40	1300
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	3600
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	1
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	ND
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		16.8
pH	Field attributes	pH	probe		7.9
Conductivity	Field attributes	uS/cm	probe		5122
ORP	Field attributes	milli volts	probe		262
Dissolved oxygen	Field attributes	ppm	probe		8.54

2/14/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	130
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.007
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	ND
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.014
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	0.91
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	2.2
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	1.1
Nitrogen, Total	Inorganics	ppm	Calc	1.7	4.5
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.28
Sulfate	Inorganics	ppm	EPA 300.0	40	860
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2300
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	1.2
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	ND
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		17.8
pH	Field attributes	pH	probe		7.5
Conductivity	Field attributes	uS/cm	probe		3442
ORP	Field attributes	milli volts	probe		246
Dissolved oxygen	Field attributes	ppm	probe		7

3/14/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	240
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	ND
Selenium	Dissolved Metals	ppm	E200.8	0.01	ND
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	0.65
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	4.4
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	1.3
Nitrogen, Total	Inorganics	ppm	Calc	1.7	7.1
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.3
Sulfate	Inorganics	ppm	EPA 300.0	40	1600
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	4000
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	1.4
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	2
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	1600
Temperature	Field attributes	degree C	probe		22.7
pH	Field attributes	pH	probe		8.04
Conductivity	Field attributes	uS/cm	probe		5805
ORP	Field attributes	milli volts	probe		302
Dissolved oxygen	Field attributes	ppm	probe		6.78

4/11/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	160
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.013
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.0026
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0023
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	3.7
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	3.7
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.15
Sulfate	Inorganics	ppm	EPA 300.0	40	840
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2600
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	30
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		21.6
pH	Field attributes	pH	probe		7.7
Conductivity	Field attributes	uS/cm	probe		3943
ORP	Field attributes	milli volts	probe		253
Dissolved oxygen	Field attributes	ppm	probe		9.01

5/16/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	170
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.015
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.011
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.011
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	4.8
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	4.8
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.25
Sulfate	Inorganics	ppm	EPA 300.0	40	810
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2500
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	130
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	1600
Temperature	Field attributes	degree C	probe		19.9
pH	Field attributes	pH	probe		7.48
Conductivity	Field attributes	uS/cm	probe		3780
ORP	Field attributes	milli volts	probe		302
Dissolved oxygen	Field attributes	ppm	probe		8.58

6/13/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	160
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.018
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.0095
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.008
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	5.5
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	5.5
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	0.1
Sulfate	Inorganics	ppm	EPA 300.0	40	770
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2300
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	50
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		24.3
pH	Field attributes	pH	probe		7.59
Conductivity	Field attributes	uS/cm	probe		3600
ORP	Field attributes	milli volts	probe		294
Dissolved oxygen	Field attributes	ppm	probe		8.09

7/11/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	160
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.014
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.006
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0062
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	3.7
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	3.7
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	1000
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2700
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	80
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	900
Temperature	Field attributes	degree C	probe		28
pH	Field attributes	pH	probe		7.9
Conductivity	Field attributes	uS/cm	probe		4056
ORP	Field attributes	milli volts	probe		190
Dissolved oxygen	Field attributes	ppm	probe		7.49

8/15/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	180
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.015
Lead	Total Metals	ppm	E200.8	0.005	ND
Selenium	Total Metals	ppm	E200.8	0.01	0.0041
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0044
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	4.2
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	4.2
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	1000
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2800
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	50
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	2400
Temperature	Field attributes	degree C	probe		27.2
pH	Field attributes	pH	probe		7.2
Conductivity	Field attributes	uS/cm	probe		4286
ORP	Field attributes	milli volts	probe		215
Dissolved oxygen	Field attributes	ppm	probe		7.07

9/12/11 Sample Results

Analyte		Units	Method	Reporting Limit	MODE @ SIB
4,4'-DDD	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDE	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
4,4'-DDT	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Aldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
alpha-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
beta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Chlordane	Organochlorine Pesticides	ppb	SW8081A	0.5	ND
delta-BHC	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Dieldrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan I	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan II	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endosulfan sulfate	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Endrin aldehyde	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
gamma-BHC (Lindane)	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Hepachlor	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Heptachlor expoxide	Organochlorine Pesticides	ppb	SW8081A	0.05	ND
Methoxychlor	Organochlorine Pesticides	ppb	SW8081A	0.1	ND
Toxaphene	Organochlorine Pesticides	ppb	SW8081A	1	ND
Aroclor 1016	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1221	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1232	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1242	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1248	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1254	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Aroclor 1260	Polychlorinated Biphenyls	ppb	SW8082	1	ND
Chlorpyrifos	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Demeton, Total	Organophosphorous Pesticides	ppb	SW8141A	5	ND
Diazinon	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Disulfoton	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Ethion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Fenthion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Malathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Methyl parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Parathion	Organophosphorous Pesticides	ppb	SW8141A	2.5	ND
Cadmium	Total Metals	ppm	E200.7	0.001	ND
Calcium	Total Metals	ppm	E200.7	2.0	190
Mercury	Total Metals	ppm	E245.1	0.0002	ND
Arsenic	Total Metals	ppm	E200.8	0.005	0.014
Lead	Total Metals	ppm	E200.8	0.005	0.0013
Selenium	Total Metals	ppm	E200.8	0.01	0.0048
Selenium	Dissolved Metals	ppm	E200.8	0.01	0.0025
Ammonia-N	Inorganics	ppm	SM4500-NH3D	0.5	ND
Nitrate-N	Inorganics	ppm	EPA 300.0	0.2	3.6
Nitrite-N	Inorganics	ppm	EPA 300.0	0.2	ND
Nitrogen, Total	Inorganics	ppm	Calc	1.7	3.6
Phosphorous, Total-P	Inorganics	ppm	M4500-P B,E	0.1	ND
Sulfate	Inorganics	ppm	EPA 300.0	40	920
Total Dissolved Solids	Inorganics	ppm	SM2540C	100	2700
Total Kjeldahl Nitrogen	Inorganics	ppm	M 4500 N ORG C	1	ND
E. Coli	Microbiologicals	MPN/100 ml	M9221F	2	170
Total Coliform	Microbiologicals	MPN/100 ml	M9221B	2	2400
Temperature	Field attributes	degree C	probe		26.7
pH	Field attributes	pH	probe		7.8
Conductivity	Field attributes	uS/cm	probe		4032
ORP	Field attributes	milli volts	probe		248
Dissolved oxygen	Field attributes	ppm	probe		7.65

Appendix 5.12

Reclamation Pilot Run Press Releases

Lower Colorado Region
Boulder City, Nev.

Media Contact: Bob Walsh (702) 293 8421 Ed Virden (928) 343-8109

Released On: May 01, 2009

Reclamation Seeks Public Comment on Draft Environmental Assessment for Yuma Desalting Plant Pilot Run

The Bureau of Reclamation, in accordance with the National Environmental Policy Act, has developed a draft environmental assessment (EA) for a proposed pilot run of the Yuma Desalting Plant (YDP).

The proposed pilot run would commence in early 2010, and the plant would be run for 365 days at one-third capacity over a 12 to 18 month period. During this pilot run, the plant will produce an average of 61 acre-feet, or approximately 19.8 million gallons, of desalinated water per day. This water will be blended with untreated water and discharged to the Colorado River near the U.S. -- Mexico international border for inclusion in Treaty-required water deliveries to Mexico.

Over the course of the pilot run, approximately 29,000 acre feet of water (about 9.5 billion gallons) will be discharged to the river. This will consist of about 22,400 acre-feet of desalted water, and approximately 7,000 acre-feet of untreated water. (There are 325,851 gallons of water in an acre foot, which is enough to meet the annual needs of a family of four to six people.)

Reclamation is seeking public comment on the draft EA. The public comment period is open for 30 calendar days, until close of business on June 1. A copy of the draft EA can be downloaded from Reclamation's Yuma Area Office website, at: http://www.usbr.gov/lc/yuma/environmental_docs/environ_docs.html.

Comments should be provided to Mr. Sean Torpey, Environmental Planning and Compliance Group Manager at the Yuma Area Office. Mr. Torpey's contact information is: Yuma Area Office, 7301 Calle Agua Salada, Yuma, AZ 85364; email: storpey@usbr.gov; and Office fax: 928 343 8320. Comments must be submitted in writing via U.S. mail, e-mail, or fax, and must include personal identifying information of the submitter.

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Lower Colorado Region
Boulder City, Nev.

Media Contact: Ed Virden (928) 343-8109 Bob Walsh (702) 293 8421

Released On: August 26, 2009

Reclamation invites public review of draft FONSI for the Yuma Desalting Plant pilot run

The Bureau of Reclamation, in accordance with the National Environmental Policy Act, has developed a draft Finding of No Significant Impact (FONSI) for a proposed pilot run of the Yuma Desalting Plant (YDP).

The proposed pilot run would commence in early 2010, and the plant would be run for 365 days at one-third capacity over a 12 to 18 month period. During this pilot run, the plant will produce an average of about 19.8 million gallons (61 acre-feet) of desalinated water per day. This water will be discharged to the Colorado River near the U.S./Mexico international border for inclusion in Treaty-required water deliveries to Mexico.

Over the course of the pilot run, approximately 29,000 acre feet of water (about 9.5 billion gallons) will be discharged to the river. This will consist of about 22,400 acre-feet of desalted water, and approximately 7,000 acre-feet of untreated irrigation drainage water. (There are 325,851 gallons of water in an acre foot, which is enough to meet the annual needs of a family of four to six people.)

Reclamation invites public review and consideration on the draft FONSI. The public review period is open for 30 calendar days, until close of business on September 28. A copy of the final environmental assessment and draft FONSI can be downloaded from Reclamation's Yuma Area Office website, at: http://www.usbr.gov/lc/yuma/environmental_docs/environ_docs.html.

Questions should be directed to Mr. Ed Virden, Assistant Area Manager at the Yuma Area Office. Mr. Virden's contact information is: Yuma Area Office, 7301 Calle Agua Salada, Yuma, AZ 85364; email: evirden@usbr.gov; and Office fax: 928 343 8320. Comments must be submitted in writing via U.S. mail, e-mail, or fax, and must include personal identifying information of the submitter.

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Lower Colorado Region
Boulder City, Nev.

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Released On: November 09, 2009

Reclamation to conduct Yuma Desalting Plant Pilot Run

Collaborative effort with Lower Basin entities will test plant /- s capabilities, conserve Colorado River water

Lorri Gray-Lee, Regional Director of the Bureau of Reclamation's Lower Colorado Region, today announced Reclamation's decision to conduct a pilot run of the Yuma Desalting Plant in collaboration with three water agencies from California, Nevada, and Arizona. A May 2010 start date is planned.

"Drought, population growth, and the continuing need for water in the Southwest have increased the demand on the Colorado River," said Gray-Lee. "This collaborative undertaking is one more example of the on-going State-Federal partnership effort to address the drought's impacts, conserve and stretch the river's water supply, and identify and secure additional supplies."

The Metropolitan Water District of Southern California, the Southern Nevada Water Authority, and the Central Arizona Project will provide about $14 million of the pilot run's estimated $23.2 million cost.

"It would be very difficult for Reclamation to do a pilot run of the desalting plant without the funding and other support provided by these agencies," Gray-Lee said. "That support allows Reclamation to operate the plant under the real-time conditions that are critical to obtaining the information necessary to help determine its operational readiness and long-term capabilities."

The pilot run will provide information about the plant's capability to reliably produce water that could be used for a multitude of purposes. About 21,700 acre-feet of desalted water will be produced. This water will be combined with 7,300 acre-feet of untreated irrigation drainage water and the total amount - 29,000 acre-feet - will be discharged into the Colorado River and included in Treaty deliveries to Mexico. This will reduce water releases from Lake Mead to help meet the Treaty obligations by an equal amount, conserving water in Lake Mead and augmenting the river's overall water supply.

The state agencies will receive a water storage credit of one acre-foot of water in Lake Mead for each acre-foot of water conserved by the pilot run. The amount of storage credits each agency receives will be proportionate to its funding contribution.

As a result of bi-national consultations conducted with Mexico through the International Boundary and Water Commission regarding the pilot run, the United States, Mexico and a bi-national coalition of non-governmental organizations have each committed to arrange for the conveyance of 10,000 acre-feet of water to the Cienega de Santa Clara wetlands in Mexico. The MWD, SNWA and CAP also will contribute funding for a comprehensive environmental

monitoring program for the wetland that will begin prior to and conclude following the pilot run.

Construction of the YDP was authorized by the Colorado River Basin Salinity Control Act of 1974. Its purpose was to desalt irrigation drainage water flows from the Wellton-Mohawk Irrigation and Drainage District so a portion of that water could be included in Treaty-required deliveries of Colorado River water to Mexico. Since 1977, this drainage water has been conveyed from the District to the Cienega, bypassing the desalting plant.

The plant, five miles west of Yuma, Ariz., was essentially completed in 1992. Initial operational testing was conducted at about one-third capacity until early 1993, when it was stopped after flooding on the Gila River damaged a portion of the irrigation drainage canal. Since then, the plant has only operated for a three month demonstration run in 2007 at about ten percent of capacity.

Reclamation is not at this time proposing to operate the plant beyond the pilot run. "Any decision about the plant's future will be made after the pilot run is completed or terminated, and will be subject to and based upon appropriate compliance with Federal law," Gray-Lee said.

Note: An Environmental Assessment, Funding Agreement, Joint Report concerning U.S.-Mexico joint cooperative actions, and other documentation related to this action is available on Reclamation's web site at http://www.usbr.gov/lc/yuma/environmental_docs/environ_docs.html

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Lower Colorado Region
Boulder City, Nev.

Media Contact: Doug Hendrix
928-343-8145

Released On: April 28, 2010

Reclamation, Municipal Agencies launch Yuma Desalting Plant Pilot Run, celebrate Drop 2 Storage Reservoir Project

Collaborative efforts will improve management, conservation of Colorado River water

YUMA, AZ— With the Colorado River still struggling with record drought, U.S. Department of the Interior officials today joined representatives from three municipal water agencies from California, Nevada, and Arizona to launch a one-year pilot run of the Bureau of Reclamation's Yuma Desalting Plant. The ceremony also celebrated the construction of the Drop 2 Storage Reservoir Project about 30 miles west of Yuma, which is about 97 percent complete.

"Drought, population growth, and the impacts of climate change on water in the Southwest have increased the stress on the Colorado River," said Anne Castle, Assistant Interior Secretary for Water and Science. "These collaborative undertakings with The Metropolitan Water District of Southern California, Central Arizona Water Conservation District, and Southern Nevada Water Authority exemplify the types of partnerships needed to stretch available supplies to meet both current and future water needs." Southern Nevada Water Authority (SNWA) General Manager Patricia Mulroy echoed Castle's comments. "As the Southwest continues to grapple with water resource challenges, these two projects represent paths to increased certainty and reliability of supply," said Mulroy. "Beyond their benefits to Nevada as a participant, these projects are good for the Colorado River system as a whole and demonstrate the power of cooperation among individual agencies, states and the federal government."

Desalting Plant Pilot Run The Yuma Desalting Plant (YDP) pilot run is scheduled to begin May 3. The purpose of the pilot run is to operate the plant at one-third capacity for a period of one year to gather critical information about its capability to be used in the future to reliably produce water that could be used for a multitude of purposes.

Under the partnership, The Metropolitan Water District of Southern California (MWD), Central Arizona Water Conservation District (CAWCD), and SNWA are funding nearly $14 million of the pilot run's estimated $23.2 million cost. In return, each agency will receive credit in Lake Mead through a water conservation mechanism known as "Intentionally Created Surplus" (ICS). The amount of storage credits each agency receives will be proportionate to its funding contribution.

In total, about 21,700 acre-feet of desalted water will be produced during the pilot run. This water will be combined with 7,300 acre-feet of untreated irrigation drainage water and the total amount - 29,000 acre-feet - will be discharged into the Colorado River and included in Treaty deliveries to Mexico. The pilot run will allow retention of about 30,000 acre-feet of

water in Lake Mead that otherwise would have been released as part of required deliveries to Mexico.

"As the Colorado River Basin drought continues, these projects will be critical in conserving supplies for future use, while helping urban Southern California effectively manage its Colorado River deliveries," said Angel Santiago, a vice chairman of board of directors of the MWD. "The partnership that has developed among SNWA, CAWCD, and MWD, along with support from Reclamation to fund projects like these, will also be key in meeting the region's long-term water needs."

Drop 2 Storage Reservoir Project

The Drop 2 Storage Reservoir Storage Project, located just north of the All-American Canal in southern California about 30 miles west of Yuma, will store Colorado River water that has been released from Parker Dam. The reservoir – which stands at about 97 percent complete – will allow capture of water supplies that have been released from Lake Mead but are no longer needed because of changed weather conditions, high runoff into the river, or other factors. An average of about 70,000 acre-feet of this formerly non-storable water will be conserved each year by the Drop 2 Storage Project for use in the United States, resulting in a similar reduction in necessary water releases from Lake Mead. "By dedicating ourselves to using water in the most efficient ways possible, we can help ensure that we have water supplies for future generations, and that we're fostering a conservation ethic that will make our communities both more resilient and sustainable," said Susan Bitter-Smith, President of the Board of Directors of the Central Arizona Water Conservation District.

Like the YDP, the $172 million Drop 2 project is being constructed by Reclamation with funding provided by SNWA, CAWCD, and MWD. In return, these entities will share 600,000 acre-feet of ICS water credits in Lake Mead. SNWA will receive 400,000 acre-feet of ICS water, at a maximum of 40,000 acre-feet a year, until 2036, and CAWCD and MWD will each receive 100,000 acre-feet of ICS water, at maximum of 65,000 acre-feet a year, from 2016 through 2036. After 2036, all water conserved by the Drop 2 project will become system water and available to any lower Colorado River water contractors.

# # #

Reclamation is the largest wholesale water supplier and the second largest producer of hydroelectric power in the United States, with operations and facilities in the 17 Western States. Its facilities also provide substantial flood control, recreation, and fish and wildlife benefits. Visit our website at www.usbr.gov.

Lower Colorado Region
Boulder City, Nev.

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Released On: March 31, 2011

Reclamation Completes Successful Pilot Run of the Yuma Desalting Plant

Yuma, AZ – An idled desalination plant demonstrated the potential to augment Lower Colorado River supplies during a pilot run over the past year, officials with the Bureau of Reclamation and cooperating water agencies announced today. Concluding ahead of schedule and under budget, Reclamation's Yuma Area Office successfully implemented the pilot run of the Yuma Desalting Plant (YDP).

In collaboration with The Metropolitan Water District of Southern California, Central Arizona Water Conservation District and Southern Nevada Water Authority, Reclamation's Lower Colorado River Region this month completed a year-long operation of the YDP. In return for co-funding, the agencies received water credits in proportion to the water produced during the pilot run and each of their funding contributions.

Last spring Reclamation began operating the plant to gather cost and performance data needed to consider potential future operation of the plant. Reclamation and the sponsoring water agencies will review the results from the pilot run to evaluate the potential for long-term and sustained operation of the desalting plant.

"Throughout the operation, the YDP performed above expectations," said Lorri Gray-Lee, Regional Director of Reclamation's Lower Colorado Region. "The YDP recycled about 30,000 acre-feet of irrigation return flow water which was included in Colorado River water deliveries to Mexico. This resulted in the same amount of water conserved in Lake Mead and available to the sponsoring water agencies when needed in the future."

Over the entire pilot run, the plant operated effectively and efficiently with no substantial equipment problems or any accidents. With an acre-foot of water measuring 325,851 gallons of water, the pilot run produced approximately the amount of water used by about 116,000 people in a year.

"We're proud to have partnered with Reclamation in making this pilot run a reality," said Jeffrey Kightlinger, Metropolitan Water District general manager. "The run demonstrates innovative ways to increase water supplies as we and other Colorado River water users thoughtfully consider how to meet our long-term water supply needs."

With the Lower Colorado River Basin in the midst of an 11-year drought, David Modeer, general manager of the Central Arizona Water Conservation District said the agency was pleased with the outcome of the pilot run. "We are hopeful that Reclamation, in cooperation with interested water users and stakeholders, will use the cost and performance data gathered, along with the research and environmental monitoring information, to prepare plans for the long-term operation of the plant," said Mr. Modeer. "As demonstrated by the pilot operations,

water recycling and conservation are important tools to stretch our precious Colorado River water supplies."

Patricia Mulroy, general manager of the Southern Nevada Water Authority, said, "Beyond what we've learned about the Yuma Desalting Plant, the pilot run also demonstrated how the federal government, water users, environmental groups, and our neighbors to the south in Mexico can find common ground and collectively craft solutions."

The pilot run was part of an international agreement between the U.S. and Mexico governments as well as environmental groups on both sides of the border. In addition to the pilot run, the pact calls for actions to monitor the Cienega de Santa Clara, a wetland in Mexico maintained by agricultural drainage.

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Appendix 5.13

Major YDP Milestones (1944 to Current)

MAJOR YDP MILESTONES

DATE	MILESTONE
1944	Treaty of 1944 guarantees delivery of 1.5 million acre-feet of Colorado River water to Mexico (did not address water quality)
Nov 1961	Mexico files formal protest regarding water salinity
May 1965	IBWC Minute 218 authorizes MODE construction and use to bypass WMIDD irrigation drainage water to below Morelos dam
Aug 1972	Nixon creates Brownell task force and charges them to find a "permanent" solution
Aug 1973	IBWC Minute 242 defines acceptable salinity differential at the Northerly International Boundary
Jun 1974	Colorado River Basin Salinity Control Act authorizes actions to control salinity including construction of Desalting Plant
Jun 1977	Desalting Plant design started
Apr 1980	Plant construction ground breaking
Dec 1991	Plant shake down testing and operation begins
May 1992	Plant begins production operations at 1/3 capacity
Jan 1993	Plant stops operating as a result of damage from Gila River floods to intake canals and continuation of the "interim period"
Aug 1993	USBR Commissioner informs Colorado River Salinity Control Forum there is significant rationale for placing the YDP is ready reserve status
Apr 1994	Public reviews conducted on the Title I and II Programs
Sep 1994	Reclamation concludes YDP will be placed in ready reserve status
Aug 1995	WQIC expansion begins
Jan 1997	WQIC/YAO designated as a National Center for Water Treatment Technologies
Dec 1999	WQIC expansion completed
Oct 2002	First independent YDP Readiness Assessment published
Apr 2004	Update to YDP Readiness Assessment published
May 2004	Central Arizona Project sponsors workgroup of major water users and environmentalists to find common ground regarding the YDP and the Cienega
May 2005	YDP/Cienega Workgroup releases proposed plan "to operate the YDP without causing harm or keeping water from the Cienega"
Jun 2005	USBR initiates public process to explore alternatives to the YDP for replacing or recovering the bypass flow
Jan 2006	USBR Commissioner announces at bi-national meeting of the IBWC the U.S. commitment to demonstrate operation of the YDP
May 2007	YDP completes demonstration run at over 10% of full capacity operating from 3/1/07 through 5/31/07
Mar 2011	YDP completes Pilot Run largely at one-third of full capacity operation from 5/3/10 through 3/26/11