

AGREEMENT NO. 16-GI-32-0040  
BETWEEN THE  
BUREAU OF RECLAMATION  
AND THE  
CITY OF GOODYEAR (GOODYEAR)  
TO PROVIDE TECHNICAL SUPPORT AND IN-KIND SERVICES TO  
CONTINUE THE CONCENTRATE MANAGEMENT WETLANDS PILOT STUDY

1. THIS AGREEMENT is made and entered into this \_\_\_\_ day of \_\_\_\_\_, 2016, by and among the City of Goodyear, an Arizona Municipal Corporation ("City") and the U.S. Bureau of Reclamation, U.S. Department of the Interior, a Federal agency ("Reclamation;") both of which are at times collectively referred to as "Parties." This Agreement is pursuant to the Reclamation Act of 1902 (June 17, 1902); and acts amendatory thereof or supplementary thereto, all of which acts are commonly known and referred to as Reclamation Law; Public Law 102-575, Title XVI, as Amended, Reclamation Wastewater and Groundwater Study and Facilities Act; The Act of March 4 1921, referred to as the Contributed Funds Act; and various appropriation Acts which authorized the expenditure of funds to conduct the Wetlands Concentrate Management Study (Study) and A.R.S § 11-952.

WITNESSETH

2. EXPLANATORY RECITALS

2.1 WHEREAS, The City constructed the Bullard Water Campus ("Campus"), located at 1510 S. Bullard Ave, Goodyear, Arizona, to treat brackish groundwater using Reverse Osmosis ("RO"). The City produces up to 3.5 million gallons a day of high quality treated water (permeate) from the Campus, which results in approximately 0.5 million gallons of concentrate in the process. The concentrate currently is put into the sewer collection system and transported to the Water Reclamation Facility ("WRF"), located at 157<sup>th</sup> Avenue Goodyear, Arizona. The effluent produced at the WRF has a high concentration of total dissolved solids and takes up needed capacity for development growth within the City. An alternative concentrate management method is desirable.

2.2 WHEREAS, The Concentrate Management Pilot Wetland Study tests an innovative method to treat RO concentrate using a wetland to remove regulated constituents followed by blending to reduce the total dissolved solids (TDS) concentration and discharge to the Gila River.

2.3 WHEREAS, Reclamation in the above mentioned Acts has been authorized by Congress for said Study and the City in the above mentioned statute has been authorized to enter into an Agreement with Reclamation and has been authorized by the Goodyear City Council ("Council") for said Study.

2.4 WHEREAS, The Wetlands Concentrate Management Study ("Study") consists of five Phases; the Computer Modeling Phase (Phase 1), Wetland Design Phase (Phase 2), Wetland Pilot Phase (Phase 3), Wetland Demonstration Phase (Phase 4) and Wetland Full Scale Phase (Phase 5).

To date, Reclamation has completed the Computer Modeling Phase (Phase 1), the Wetland Design Phase (Phase 2), and the Wetland Pilot Phase (Phase 3). Reclamation continues to work with the City on the Wetland Demonstration Phase (Phase 4).

2.5 WHEREAS, Reclamation has allocated funds under the Lower Colorado River Operations Investigations Program to carry out the remainder of this Study.

2.6 WHEREAS, The City seeks to participate in and support the Study by providing direct funding and in-kind services as approved by Council.

2.7 WHEREAS, Reclamation will enter into a similar Agreement with any entity who would like to participate in and support the Study by providing in-kind services.

2.8 WHEREAS, The Study objectives and activities include those shown in the Plan of Study ("Attachment A") and are incorporated herein by reference.

2.9 WHEREAS, The Study will be overseen and directed by a "Project Management Team" (PMT). The PMT will consist of one participant from Reclamation, a Study Manager, and one participant from the City, a Study Coordinator, and participants from interested Stakeholders or City contracted consultants who may become involved with the Study.

2.10 WHEREAS, Reclamation seeks a 50 percent match-of-study costs by the City and its cooperating partners through direct funding or in-kind services.

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

### 3. ACTIVITIES TO BE PERFORMED

3.1 To the extent that direct funds and in-kind services are available, Reclamation and the City shall, with its staff or by contract, use direct funds and in-kind services to extend the Wetland Pilot Phase of the Study as set forth in Attachment A and as directed by the PMT.

3.2 Upon completion of the extended Wetland Pilot Phase, a Completion Report shall be written by the City in cooperation with Reclamation as described in Attachment A. The extended Wetland Pilot Phase Completion Report shall be transmitted to the City, Reclamation and other stakeholders.

3.2.1 The PMT collectively determined that it would be beneficial to extend the Wetland Pilot Phase to test new and innovative aspects of wetland treatment and monitoring, and to assess scaling up of operations and maintenance for the Wetland Demonstration Phase and for the Wetland Full Scale Phase implementation planning, as described herein and in Attachment A.

#### 4. TERM OF AGREEMENT

4.1 This Agreement shall become effective upon the date first written above and shall remain in effect for three years until September 30, 2019. At that time, the PMT will assess the merits of extending the term of the agreement to continue research at the pilot wetland.

#### 5. COORDINATION AND PROGRESS REPORTS

5.1 Reclamation will chair a PMT for the study. The PMT will oversee research planning; water, soil, and vegetation sampling; data compilation and analysis; and reporting. The PMT will oversee the formulation of the project alternatives, level of detail of the Study, general format of documentation for the Study, and conformance with the Study goals, budget, and schedule. The PMT shall include one representative each from Reclamation and the City. The PMT member must be in a position to make commitments on behalf of the entity represented. Other entities may be added to the PMT with approval of representatives from both Reclamation and the City.

5.2 Coordination meetings will be held as needed. The Study Manager and Study Coordinator shall attend these meetings. Designated contractor representatives and other personnel deemed necessary by Reclamation and/or the City shall also attend. The Study Manager shall prepare an agenda for each Coordination meeting.

5.3 A Study Report shall be written by the City or designated representative and a draft provided to Reclamation sixty (60) days prior to the end of the extended Wetland Pilot Phase (Study Report) for review and approval. The final Study Report and copies of all reports prepared by the City or designated representative shall be provided to Reclamation thirty (30) days after expiration of the agreement.

5.4 As work progresses, all operations of either Reclamation or the City, pertaining to the Study shall be open to inspection by authorized representatives of the City or Reclamation, and if work is not being done in a mutually satisfactory manner, either Party may terminate this Agreement as specified in Article 13.

5.5 The City shall provide Reclamation with reasonable access, including ingress and egress, to the Campus and pilot site to comply with the terms of the Study as provided in Attachment A. All access shall be with the knowledge and prior approval of the Study Coordinator and scheduled with sufficient notice and at reasonable times.

#### 6. STUDY MANAGER

6.1 The Parties hereby agree that Reclamation shall provide the Study Manager, who shall perform and carry out the duties and responsibilities required under this Agreement. Reclamation's Study Manager shall pursue the work diligently, with an objective of meeting the

requirements described in Attachment A. The City shall appoint a Study Coordinator to coordinate the City's portion of the Study, provide input and direction and to support the City's interests.

6.2 Subject only to the express limitations of this Agreement, the Study Manager is authorized to incur costs, liabilities, and obligations up to the amounts approved and funded by the Parties to this Agreement and to perform or arrange for the performance of Study investigations.

## 7. STUDY FUNDING

7.1 Non-Federal funds provided to Reclamation, through direct funding or in-kind services by or through the City and its cooperating partners, will be a minimum of 50 percent of the actual costs of the work performed under this Agreement as provided in Articles 8 and 9. Reclamation will fund the balance of the Study costs as discussed in Article 7.2.

7.2 Reclamation estimates it will expend up to \$50,000.00, per year for three years, subject to annual appropriation by Congress of the United States, through its staff in each of the proposed fiscal years for the duration of the Study. These funds will be expended to conduct research, and to provide technical expertise and consultation services for the Wetland Pilot.

7.3 The City estimates it will annually expend \$50,000.00 per year, for three years, in direct funding and/or in-kind services subject to annual appropriation by the City and/or availability, through its staff or by contract in each of the proposed fiscal years for the duration of the Study.

7.4 Non-Federal funds expended by the City will be summarized in annual reports detailing the funding (direct or in-kind) provided during the calendar year. The Study Coordinator shall be responsible for submitting to Reclamation the City's yearly funding and/or in-kind cost-sharing reports with supporting data based on a calendar year. This first report is due January 31, 2017, and annually thereafter.

7.5 Reclamation funding is subject to annual appropriation by Congress of the United States. If funds available to Reclamation are interrupted, or if the City wishes to accelerate the pace of the Study, the City may expend additional funds for the Study purposes. Such additional expenditures, at the option of the City, may be counted as an increase in the City's cost share of the Study.

7.6 The total estimated cost of the study is approximately \$300,000. Except for any changes described in Articles 8 or 10, the total direct funding and in-kind services by the City under this agreement are not anticipated to exceed \$150,000.00.

## 8. ADVANCEMENT OF FUNDS

8.1 After the Study has begun, if expense projections indicate that the combined available funds of the Parties will be exceeded, the Parties will be notified through their Study representatives. Should the City and Reclamation be unable to arrange for appropriate funding and/or in-kind

services, the Study activities will be suspended until the necessary funding and/or in-kind services are available, or other options acceptable to the Parties of this Agreement become available.

## 9. IN-KIND SERVICES

9.1 In-kind services provided by the City at the wetlands pilot facility will be comprised of monitoring, records management, oversight and operations, maintenance, pilot deconstruction and disposal, and other tasks as provided in Attachment A. Allowances of these costs will be determined in accordance with the Office of Management and Budget (OMB) Title 2 - Grants and Agreements of the Code of Federal Regulations (CFR) Part 200 Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, revised January 1, 2012. Allowances of costs for in-kind services provided by the City will be determined by 2 CFR part 215 "Cost Principles for State and Local, and Indian Tribal Governments" (OMB Circular A-87). Allowances of costs for in-kind services provided by others on behalf of the City will be determined by either 2 CFR part 220 "Cost Principles for Educational Institutions," (OMB Circular 21), or 2 CFR part 230 "Cost Principles for Non-Profit Organizations," (OMB Circular A-122), as appropriate. Copies of OMB Circulars are available on the Internet at: [www.whitehouse.gov/omb/circulars](http://www.whitehouse.gov/omb/circulars).

9.2 The value of in-kind services provided by the City shall be credited toward the City's share of the Study costs, as documentation is received that said in-kind services have been accomplished and upon completion of the Study. The value of those services will generally be compared to what it would have cost Reclamation to provide the same service.

9.3 Credit given for in-kind services performed prior to the date of enactment of this agreement will be limited to those costs incurred after September 30, 2014 for preparation of the scope of this study and the resulting cost-share agreement.

9.4 In-kind services not specifically detailed in Attachment A will be credited only if said services are approved in advance by Reclamation.

9.5 Source records supporting in-kind service credit will be retained for three years following completion of the study.

## 10. CHANGES AND DISPUTES

10.1 It is recognized that the schedule of activities and costs of conducting the Study are estimates based on perceived requirements prior to initiation, and that changes are likely to occur. It is also anticipated that Attachment A may be revised from time to time as changes occur in the study plan, alternatives, the technical effort required, and the cost of the Study. If and when the City and Reclamation agree that a change in the activities or costs described in Attachment A are necessary and feasible, Attachment A may be modified in writing to reflect the change(s) by having both parties sign as to the agreed upon changes.

10.2 Should disputes arise over the provisions of, or performance under this Agreement,

representatives of the City and Reclamation will attempt to resolve the situation. Should the situation be unresolvable, termination of this agreement would follow procedures as described under Article 13.

## 11. LIABILITY

11.1 Reclamation shall perform its obligations under this Agreement in the capacity of a Federal agency. It is neither a co-venturer, agent, employee, nor representative of the City. The City assumes no liability for claims or actions arising solely out the performance of such work by Reclamation's employees or agents.

11.2 Liability of the United States resulting from the negligence of its employees shall be governed by the Federal Tort Claims Act (28 U.S.C. 2671, et seq.). The City recognizes that the Federal Tort Claims Act operates to provide liability coverage for the United States Government and its employees in lieu of ordinary insurance coverage.

11.3 The City shall be liable for loss, damage, or expense to any other Party caused by intentional and wrongful act, action, neglect, omission, or default in connection with in-kind services provided by the City under this agreement.

## 12. CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FUNDS

12.1 The expenditure or advance of any money or the performance of any obligation by Reclamation under this Agreement shall be contingent upon appropriation or allotment of funds by Congress. Absence of appropriation or allotment of funds shall relieve Reclamation from any obligation under this Agreement. No liability shall accrue to Reclamation in case funds are not appropriated.

12.2 The expenditure or advance of any money or the performance of any obligation by the City under this Agreement shall be contingent upon appropriation or allotment of funds (direct funds, in-kind, and/or grant funds) by the City Council. Absence of the necessary funds shall relieve the City from any obligation under this Agreement. No liability shall accrue to the City in case funds are not available.

## 13. TERMINATION

13.1 The City or Reclamation may terminate work under this Agreement by giving 30 days written notice of termination to the other party.

13.2 In the event of termination, a concluding report, summarizing Study accomplishments at the time of termination will be prepared by Reclamation and made available to the City and other Federal and State agencies as agreed upon by the PMT.

13.3 Upon completion or termination of this Study for any reason, all enhancements and

improvements made to the campus and/or the WRF by the City shall be and remain the property of the City without further obligation by the City to compensate any party for the improvement or enhancement.

#### 14. AVAILABILITY OF INFORMATION

14.1 All information and data obtained or developed by Reclamation, in connection with development of the Study (exclusive of intra-governmental communications) shall be available upon request, except where prohibited by law, to the City without further charge. However, use of said reports, data, and information shall appropriately reference Reclamation as the source.

14.2 Data compiled and results of studies performed under this Agreement will become public domain upon the completion of the investigation and study report, or upon completion of a concluding report under the provisions of Article 13.

#### 15. DELAYS

15.1 To the extent that performance of an obligation under this Agreement is prevented or delayed by any cause which is beyond the reasonable control of either Party to the Agreement, the non-performing Party shall not be deemed to be in default.

15.2 Should the non-performing Party be deemed to be in default, the City and Reclamation will follow the procedures described under Article 10.

16. JURISDICTION Federal and State laws govern this Agreement. In case of conflict between Federal and State law, Federal law controls.

17. JUDICIAL REMEDIES NOT FORECLOSED Nothing herein shall be construed as: (a) depriving the City from pursuing and prosecuting any remedy in any appropriate court of the United States or appropriate State which would otherwise be available to the City, even though provisions herein may declare that determinations or decisions of Reclamation's authorized representative or other persons are conclusive, or (b) depriving the City of any defense thereto which would otherwise be available.

#### 18. NOTICES AND AUTHORIZED REPRESENTATIVES

18.1 Notice given pursuant to the provisions of this Agreement, or which are necessary to carry out its provisions, must be in writing and delivered personally to whom the notice is to be given, or mailed, postage prepaid addressed to that authorized representative. The Parties' authorized representatives and their addresses for this purpose are as follows:

City of Goodyear:

Mr. Mark Holmes  
Water Resources Manager  
Public Works  
P.O. BOX 5100  
Goodyear, AZ 85338

Mr. Ruben Veloz  
Water Superintendent  
Public Works  
P.O. BOX 5100  
Goodyear, AZ 85338

Bureau of Reclamation:

Ms. Deborah Tosline  
Reclamation Study Manager  
Bureau of Reclamation  
6150 West Thunderbird Road  
Glendale, AZ 85306

18.2 Any Party may change its authorized representative in the future by letter to the other Party signed by the agency's responsible authority.

## 19. INTEGRATIONS

19.1 No representations or promises are binding on Reclamation or the City, except those representations and promises contained in this Agreement or in some future written representations or promises signed by both Parties.

## 20. OFFICIALS NOT TO BENEFIT

20.1 No member of or delegate to Congress, or resident Commissioner, shall be admitted to any share of this Agreement, or to any benefit arising from it. However, this clause does not apply to this Agreement to the extent that this Agreement is made with the Parties for the Parties' general benefit.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement on the date and year written below.

**City of Goodyear**, a municipal corporation,

**Bureau of Reclamation**

By: \_\_\_\_\_  
Brian Dalke  
City Manager

By: \_\_\_\_\_  
Leslie A. Meyers  
Area Manager



City of Goodyear

Phoenix Area Office

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Attest: \_\_\_\_\_

City Clerk

City of Goodyear

Date: \_\_\_\_\_

Approved as to  
form: \_\_\_\_\_

City Attorney

City of Goodyear

Date: \_\_\_\_\_

**ATTACHMENT A**  
**PLAN OF STUDY**

**Concentrate Management**  
**Wetlands Project**

The City of Goodyear  
and the  
U.S. Bureau of Reclamation  
Phoenix Area Office

This page left blank

## Contents

1. INTRODUCTION.....	4
2. OBJECTIVES .....	4
3. PROJECT SCOPE .....	7
4. CONTINUATION OF THE WETLANDS PILOT PHASE.....	9
5. PROJECT ORGANIZATION .....	9
7. DELIVERABLES .....	10
8. BUDGET .....	11

## 1. INTRODUCTION

The City of Goodyear (the City) constructed the Bullard Water Campus (Campus) to treat brackish groundwater using Reverse Osmosis (RO). The City currently produces 3 million gallons per day (MGD) of high quality water from the Campus and a waste stream of about 0.5 MGD of RO brine concentrate. The concentrate is currently discharged into the sanitary sewer system and conveyed to the 157<sup>th</sup> Avenue Water Reclamation Facility (WRF) resulting in increased total dissolved solids concentrations and reducing options to reuse the treated effluent. The City is investigating an alternative disposal method for managing the concentrate.

The City investigated several conventional methods to manage the concentrate but each method has disadvantages. The City and the U.S. Bureau of Reclamation (Reclamation) constructed a pilot wetland treatment facility at the Campus to test an unconventional method to treat the concentrate for ultimate discharge to the Gila River. Data collected from the pilot wetland study showed that the combination of wetland treatment to reduce regulated constituent concentrations and subsequent blending of the treated concentrate with another water source to reduce the total dissolved solids (TDS) concentration produces a waste stream that could meet Arizona Department of Environmental Quality (ADEQ) water quality standards for discharge to the Gila River. The results of the study show that wetland treatment of the concentrate for ultimate discharge to the Gila River provides benefits including: reduction of regulated constituent concentrations; improved WRF effluent quality, subsequently increasing reuse options; and providing a new water source to the Gila River to create or support habitat. Using a wetland and blending treatment is less expensive than high tech solutions and the method has low energy requirements. Discharging a new water source to the Gila River may improve its water quality. The wetland treated brine would require blending with another water source to reduce the total dissolved solids concentration for discharge to the Gila River under an Aquifer Protection Permit (APP) and an Arizona Pollution Discharge Elimination System (AZPDES) permit.

## 2. OBJECTIVES

The Concentrate Management Wetlands Pilot Project was constructed in 2010 and continues to operate. The initial goal of the pilot was to develop and test a cost effective, environmentally friendly treatment method to manage and dispose of RO concentrate. The original concept included the: Wetland Pilot Phase, Wetland Demonstration Phase and Wetland Full Scale Phase. The Wetland Pilot Phase produced sufficient data and information for the City to proceed with a feasibility study of the Wetland Demonstration Phase, which began in 2013. To assist with this effort, the City has determined that continuation of the Wetland Pilot Phase is necessary to extend data collection over a longer period of time.

Continuation of the Wetland Pilot Phase would be beneficial if future testing provides data that

could be used to develop guidance for at least appraisal level cost/performance estimates that could be used to evaluate wetland treatment relative to other concentrate management options. Some of these include the following:

- media/plant replacement frequency and cost
- hazardous waste disposal requirements for media and/or plant matter
- design guidelines on wetland sizing
- water processing volume relative to wetland sizing - how many acres are required to treat X gallons per day of concentrate

Objectives for continuation of the Wetland Pilot Phase and of this Plan of Study include:

- 2.1 Collect media and vegetation samples for laboratory analysis to: refine the wetland design; optimize operation and maintenance requirements; and to evaluate wetland media loading rates, plant life cycles, and media and plant replacement and disposal requirements.
- 2.2 Test varying media substrate thicknesses and/or new media blends to assess methods to optimize removal of regulated constituents and potentially reduce the wetland treatment facility footprint.
- 2.3 Continue to assess varieties of salt tolerant vegetation, including hyperaccumulators, for survival rates and potential uptake of regulated constituents to provide design flexibility.
- 2.4 Conduct toxicology testing on media, plants, and invertebrates for environmental assessment.
- 2.5 Develop and test alternative infrastructure designs to maximize flow rates through the wetland treatment system and optimize maintenance protocol for maintaining higher flow rates.
- 2.6 Identify the maximum flow rate and minimum treatment retention times required to reduce regulated constituent concentrations in the minimum amount of time.
- 2.7 Conduct blending tests using potential water sources to determine the volume of water required to reduce TDS concentrations in the treated concentrate to meet ADEQ regulatory requirements for discharge to the Gila River and to determine the maximum size requirements of the blending facility.
- 2.8 Continue to collect water quality samples from wetland bin effluent for laboratory analysis and conduct Whole Effluent Toxicity (WET) testing on blended water for each potential blending source in support of obtaining an APP and an AZPDES permit.
- 2.9 Collect additional data beneficial to establishing optimum operation and maintenance protocols for the Wetland Demonstration Phase.

The following recommendations and objectives in support of continuation of the Wetland Pilot Phase are based on the results and conclusions developed from operation of the pilot from 2010 to 2014. During conduct of the initial Wetland Pilot Phase, the most effective systems were Bins 2, 4, and 6. It is recommended that operations continue using these bins, as constructed, to evaluate long term treatment results. The least effective systems, Bins 1, 3, 5, and 7 may be modified and used to test improvements to optimize wetland performance, configuration, and

design criteria for larger scale wetland treatment systems.

Primary tasks for future testing include:

1. Test and evaluate different types of bin treatment train configurations. Adding bins that do not reduce Se, As, and Cr to a treatment train unnecessarily increase the concentration of salts in the concentrate, making disposal via blending more difficult. Suggested bin treatment train combinations include:
  - Two Bin 2's in series
  - Two Bin 4's in series
  - Bins 2 and 4
2. Identify the characteristics of bins 2 and 4 that contribute to high removal percentages.
3. Conduct longer term testing of media and plants to evaluate:
  - a. nutrient and metals accumulation
  - b. the life cycle of the media and identify if spent media would be disposed of as hazardous waste or in a landfill
  - c. plant uptake of regulated constituents and identify if spent vegetation would be disposed of as hazardous waste or in a landfill
4. Mass Balance to determine the fate of As, Se, and Cr in media and plant matter (to aid with disposal cost calculations.)
5. Water quality sampling for laboratory analyses

Additional testing may include:

- Specific improvements to optimize wetland performance and configuration and design criteria for larger scale wetland treatment systems including:
  - Partially excavate and increase the media thickness.
  - Partially excavate and test modified media blends.
  - Reconfigure isolated Bin 7 to facilitate blending tests.
- Lithium-Chloride tracer tests to evaluate residence times and estimate removal rates.
- Designs to improve existing infrastructure and increase flows through the system.
- Increased flow rates to evaluate the impact on regulated constituent removal rates, and refine the understanding of microbial process rates and plant community development. The design wetland pilot inflow rates were 0.25 gallons per minute, however inflow rates had to be reduced to 0.10 gpm due to clogging of the infrastructure and resulting overflows. The slower rates increased the retention time of the concentrate in the treatment bins. Assess removal rates of the system using higher flow rates and shorter retention times.
- New plant varieties to optimize landscaping design capabilities for integration of treatment wetlands with public venues.
- Conduct additional blending tests to determine:
  - sizing criteria for a blending wetland or feature and,
  - the volume of water required for blending with the treated concentrate to achieve sufficient dilution to meet surface water discharge requirements and confirm required blending ratios for different types of blending water sources.
- Continue to develop a permitting approach to obtain approval from ADEQ for surface

water discharge of treated wetland concentrate to the Gila River and provide a net ecological benefit.

- Continue Whole Effluent Toxicity (WET) testing to support discussions with ADEQ and permit acquisition.
- Continue to use the wetland pilot facility to develop partnerships and funding opportunities to implement a demonstration scale and full scale wetland treatment facility.
- Use the wetland pilot facility to focus and sustain industry outreach to key organizations to deepen technical support.
- Assess necessary changes in operation, maintenance, and monitoring to refine design criteria for a demonstration size and full scale wetland treatment system.

In addition to the work being done under this Plan of Study, Reclamation's Study Manager submitted the proposal: Goodyear Pilot Wetlands: Developing Hydraulic Loading Rates, Hazardous Waste Disposal Requirements, and Optimum Operations for an Inland Concentrate Management Alternative (ID 2922), to Reclamation's Science and Technology Program (S&T) to conduct further research at the Wetlands Pilot. The proposal was awarded and funded for fiscal years 2016, 2017, and 2018. The research will augment work being done for the Wetlands Pilot Phase and the Wetland Demonstration Phase.

### **3. PROJECT SCOPE**

The Project Scope identifies potential investigations that may be conducted during continuation of the Concentrate Management Wetlands Pilot Phase.

- 3.1. Maintain High Performance Treatment Trains and Design New Treatment Trains
  - 3.1.1. Identify the highest flow rates and shortest retention times that result in the highest constituent removal rates.
  - 3.1.2. Assess the impact of seasonal effects on fluctuations in treatment performance and identify optimum seasonal treatment train modifications.
  - 3.1.3. Develop protocols for revising treatment trains as required.
  - 3.1.4. Track retention times and removal rates over time to assess long-term performance and requirements.
  - 3.1.5. Document protocols, results, and recommendations.
- 3.2. Assess Pipe Infrastructure, Test New Infrastructure and Configuration to Increase Flow Rates Through Wetland Treatment Train
  - 3.2.1. Excavate a poor performing wetland bin and document all observations.
  - 3.2.2. Dismantle upper and lower manifolds, observe and record pipe conditions at inflow, corners, perforations, and outflow for clogging conditions and identify clogging sources such as live roots, organic matter, sediments, etc.
  - 3.2.3. Design and construct new manifold system to address clogging and test new designs; include designs for built-in cleanout access points at the inflow, outflow, and any other configuration based on observations during dismantling of old system.



- 3.2.4 Rebuild wetland, vegetate, operate and note changes in flow rates, clogging, and maintenance.
- 3.2.5 Document protocols, results, and recommendations.
- 3.3 Test Wetland Media Thickness and Identify New Media Mixes
  - 3.3.1 Partially excavate a poor performing wetland bin and rebuild to test a thicker media layer.
  - 3.3.2 Vegetate the new wetland bin, test new salt tolerant plant types, and allow time for plant maturation.
  - 3.3.3 After the wetland bin is operational, collect water quality samples from the bin effluent for laboratory analysis.
  - 3.3.4 Calculate removal rates and retention times.
  - 3.3.5 Calculate wetland treatment acreage requirements based on use of a thicker media bed.
  - 3.3.6 Document protocols, results, and recommendations.
- 3.4 Develop On-Site Blending System Including Storage for Blending Sources and Blending Bin
  - 3.4.1 Excavate a poor performing bin completely.
  - 3.4.2 Plumb blending bin to receive and measure treated concentrate volume from a high performing treatment train.
  - 3.4.3 Develop storage for blending source and conveyance system to deliver and measure known volumes of blending source water to blending bin.
  - 3.4.4 Establish protocols for pick-up and delivery of blending water sources.
  - 3.4.5 Compile existing water quality data or collect samples for analytical analysis of the blending source water.
  - 3.4.6 Using water quality data for the blending source and for the treated concentrate to calculate mixing volumes.
  - 3.4.7 Mix blending water with treated concentrate and collect water samples for laboratory analysis of regulated constituents and for WET testing.
  - 3.4.8 Document protocols, results, and recommendations.
- 3.5 Prepare Report Documenting all Work Completed Including Observations, Test Results, and Recommendations for Future Wetland Pilot Studies and Operations and Maintenance of the Wetland Demonstration Phase
  - 3.5.1 Submit annual summary reports by January 31.
  - 3.5.2 Submit final report thirty (30) days following the expiration of the extended Wetland Pilot Phase.
  - 3.5.3 Develop recommendations for discontinuing or continuing the Wetland Pilot Phase.

## **4. CONTINUATION OF THE WETLANDS PILOT PHASE**

- 4.1 The Pilot was constructed in 2010 at the City of Goodyear Bullard Water Campus (Campus). The Pilot was constructed as a temporary wetland treatment facility but has operated continuously to present. The first water quality samples for laboratory analysis of the treated concentrate were collected in December 2010. Results from the pilot show that regulated constituents can be reduced with wetland treatment and the Demonstration Wetland Phase planning is underway.
- 4.2 Seven wetland bins were pre-constructed from fiberglass and leak tested prior to installation. After almost five years of operation, the bins continue functioning however they require regular observation to identify maintenance needs to ensure that they function safely, indefinitely. Some bins have begun to bulge from the weight of the organic media, water load, and plant growth and should be inspected for cracks and other signs of degradation. Bins may require reinforcement and patching with time. Long-term maintenance of fiberglass structures should be researched, and plans developed to address issues that may arise as a result of cracks, holes, and leaks.
- 4.3 Reclamation purchased the Wetlands Pilot equipment and infrastructure. Reclamation and Goodyear staff constructed the Pilot under the guidance of a wetlands specialist from consultant CH2M Hill to oversee specific details and ensure proper construction in regards to the wetland environment. The equipment and infrastructure will be inventoried, Reclamation will take back any unused equipment and the remaining equipment and infrastructure will be turned over to Goodyear. Goodyear is responsible for dismantling and proper disposal of all Wetland Pilot equipment, infrastructure, organic media and vegetation when the pilot wetland treatment facility is no longer functional or needed.
- 4.4 Goodyear will operate, maintain, and monitor the Wetland Pilot and Reclamation will provide technical oversight. All effluent, concentrate or blending waters will continue to be discharged to the sanitary sewer system for conveyance to the WRF.
- 4.5 The report titled, "Regulating Wetlands Pilot Study for Concentrate Management, Science and Technology Program Report No. 3699", is designated as an attachment to this Plan of Study. The report summarizes details for construction, operation, costs, and monitoring results during the first year of operation of the Wetlands Pilot Phase.
- 4.6 Design drawings for the Wetlands Pilot Phase are designated as attachments to this Plan of Study. Final construction drawings are not available. Note that some features indicated on the design drawings were not constructed at the Wetlands Pilot Phase.

## **5. PROJECT ORGANIZATION**

The Goodyear and Reclamation Project Management Team are responsible for the final outcome

of the study. Reclamation and Goodyear will monitor and maintain all contract requirements. Goodyear will lead efforts associated with continuation of the Wetland Pilot Phase operation, maintenance, and monitoring. Goodyear will coordinate with Reclamation and make modifications to the Plan of Study as necessary. Goodyear will delegate operation, maintenance, and monitoring to the appropriate personnel. Reclamation Study Manager will coordinate efforts between the Wetlands Pilot and the S&T Study.

The Project Team consists of the following personnel.

Reclamation	Deborah Tosline, Study Manager Katie Guerra
City of Goodyear	Mark Holmes, Study Coordinator Ruben Veloz

## 7. DELIVERABLES

7.1. The primary goal for continuation of the Wetlands Pilot Phase is to build on data and information that were obtained during construction, establishment, and initial monitoring of the Pilot. Deliverables include: analysis and assessment of water quality results, media soil sample results, plant tissue analytical results, an optimized design, and operations and maintenance protocols for the Wetland Demonstration Phase. Duration of continuation of the Wetland Pilot Phase will be 3 years.

7.2. Primary deliverables from continuation of the Wetland Pilot Phase include:

- Media/plant replacement frequency and costs
- Hazardous waste disposal requirements for media and/or plant matter
- Design guidelines for wetland sizing
- Water processing volume relative to wetland sizing – how many acres are required to treat X gallons per day of concentrate.
- Source and treated concentrate water, soil, and vegetation laboratory analytical results
- Blended water laboratory analytical water quality and WET testing results
- Soil, vegetation, and invertebrate toxicology results
- Conclusions and recommendations for continuation of the Wetland Pilot Phase and for planning of the Wetland Demonstration Phase

Additional deliverables from continuation of the Wetland Pilot Phase may include:

- Revised or new designs for bins, infrastructure, and treatment trains
- Revised or new operation and maintenance protocols

- 7.3. A Study Report summarizing all activities conducted during continuation of the Wetland Pilot Phase and addressing items described in this Plan of Study.

## 8. BUDGET

- 8.1. The following table shows the budget for the Wetland Pilot Phase.

Task Description	Task Cost	City of Goodyear	Reclamation
<b>Project Management</b>			
Stakeholder Coordination and Meetings	\$ 45,000.00	\$ 10,000.00	\$ 35,000.00
Study Team Coordination and Meetings	\$ 40,000.00	\$ 5,000.00	\$ 35,000.00
Study Administration	\$ 25,000.00	\$ 5,000.00	\$ 20,000.00
<b>Subtotal</b>	<b>\$ 110,000.00</b>	<b>\$ 20,000.00</b>	<b>\$ 90,000.00</b>
<b>Goodyear Pilot Operations &amp; Management</b>			
Concentrate Influent and Effluent Management	\$ 25,000.00	\$ 20,000.00	\$ 5,000.00
Bin Operation & Maintenance	\$ 25,000.00	\$ 15,000.00	\$ 10,000.00
Reporting	\$ 5,000.00	\$ 5,000.00	\$ -
<b>Subtotal</b>	<b>\$ 55,000.00</b>	<b>\$ 40,000.00</b>	<b>\$ 15,000.00</b>
<b>Goodyear Pilot Sampling &amp; Analyses</b>			
Field Observations	\$ 25,000.00	\$ 20,000.00	\$ 5,000.00
Water Quality Sampling & Analyses	\$ 30,000.00	\$ 20,000.00	\$ 10,000.00
Reporting	\$ 5,000.00	\$ 5,000.00	\$ -
<b>Subtotal</b>	<b>\$ 60,000.00</b>	<b>\$ 45,000.00</b>	<b>\$ 15,000.00</b>
<b>Reporting</b>			
Interim Reporting	\$ 30,000.00	\$ 20,000.00	\$ 10,000.00
Draft Final Report	\$ 30,000.00	\$ 15,000.00	\$ 15,000.00
Final Report	\$ 15,000.00	\$ 10,000.00	\$ 5,000.00
<b>Subtotal</b>	<b>\$ 75,000.00</b>	<b>\$ 45,000.00</b>	<b>\$ 30,000.00</b>
<b>STUDY TOTAL</b>	<b>\$ 300,000.00</b>	<b>\$ 150,000.00</b>	<b>\$ 150,000.00</b>