

**Application for WaterSMART Feasibility Study Grant
Title XVI Water Reclamation and Reuse Program
for the
Feasibility Study of Industrial Water Management
and Reclamation for Permian Basin**



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Project Name: Feasibility Study of Industrial Water Management and Reclamation for Permian Basin

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1.0 TECHNICAL PROPOSAL

1.1 EXECUTIVE SUMMARY

This application is submitted in response to Funding Opportunity Announcement No. R14AS00030 from the Bureau of Reclamation by the Gulf Coast Waste Disposal Authority (GCWDA) on May 5, 2014. GCWDA is located in Houston, Harris County, Texas, and has authority to operate throughout the State of Texas.

The Permian Basin in West Texas is a major production area for oil and gas. It accounts for 14 percent of the total annual oil production in the United States (Texas Railroad Commission statistics). Providing water to support oil and gas field operations and disposing of the by-products of drilling and production are major challenges in this semi-arid region. Other industrial operations in the region face similar challenges. This project will explore the possibility of reducing the challenges of both supply and disposal by reclaiming industrial wastewaters including those from oil and gas exploration and production, and municipalities and providing those waters for reuse on a regional basis. Such a system could expand the volume of water available for industrial use by using a combination of treatment of industrial wastewaters and blending with brackish groundwater. Potentially, it may be possible to expand the supply further by recovering water from the injection well fields that are used to dispose of oil field wastewaters. An additional potential advantage of a regional system is that it may be possible to construct a distribution system that can provide water on a continuous basis. This would be more efficient than the current reclamation activities, wherein treatment and reuse are done at individual well sites with mobile units that have to be scheduled. The study will focus on water management and reclamation in Ector County and Midland County, Texas.

The study is anticipated to require 13 months (October 1, 2014 to November 1, 2015). However, it is structured so that the most feasible, proven reclamation alternatives are identified within nine months. The feasibility of the more complex alternatives will be evaluated during the final four months.

1.2 TECHNICAL STUDY DESCRIPTION

Following is a description of the tasks comprising the study.

1.2.1 Introductory Information

Task A. Describe Participants and Study Area

Activity 1 - Identify and describe the participating organizations and the study area.

Activity 2 - Describe existing reclaimed water systems.

1.2.2 Statement of Problems and Needs

Task B. Identify Water Needs. Water needs will be projected for 5, 10, and 20 years

Activity 1 - Summarize total water needs for study area based on projections in the Region F Regional Water Management Plan.

Activity 2 - Characterize water needs for oil and gas exploration and production, power plants, and industries. Characterize needs with respect to location, volume, quality, quality consistency, and reliability of quantity. Characterization will be based on

scientific literature, publically available governmental records, and information provided by project participants.

Activity 3 - Summarize existing management and treatment of wastewaters.

Task C. Identify Water Sources. Availability will be projected for 5, 10, and 20 years.

Activity 1 - Summarize total water sources for study area based on projections in the Region F Regional Water Plan.

Activity 2 - Characterize non-potable water resources associated with oil and gas activities, brackish groundwater, industries, and municipal wastewater treatment facilities.

- Water resources associated with oil and gas activities include, but may not be limited to, flowback from fracing, produced water, water recovered from injection well fields, rig washdown water, and evaporation ponds.
- Water resources will be characterized with respect to location, volume, quality, consistency of quality, and dependability.
- Characterization will be based on information available in the scientific literature, publically available governmental records, and information provided by participants. If field work is required to determine or confirm the quality of a source, a scope of work for the field testing will be developed, but the performance of the field studies will not be part of this study.
- Water sources subject to water rights, or other contractual or regulatory constraints, will be identified.

1.2.3 Water Reclamation and Reuse Opportunities

Task D. Describe Current Industrial Water Reuse.

Activity 1 - Describe uses, types, amounts, reclamation and reuse technologies currently in use, and provide a map of existing use sites and pipelines.

Activity 2 - Prepare report chapters summarizing Tasks A, B, C, and D.

Task E. Identify Areas of Water Shortage.

By geographic area, identify areas with water shortages for non-potable uses based on a comparison of needs and currently available resources. Identify volumes needed by subcategories based on quality requirements.

Task F. Identify Reuse Requirements.

Activity 1 - Identify treatment required in order to use reclaimed wastewaters.

- Identify available treatment technologies.
- Identify critical treatment components and where redundancy is recommended.
- Characterize technologies based on cost, proven effectiveness, time required for implementation, and general technical feasibility.

Activity 2 - Identify alternatives for transporting wastewater for treatment and for transporting reclaimed water.

- Identify transportation alternatives.

- Characterize alternatives based on cost, ownership, and time required for implementation.

Activity 3 - Identify alternatives for storage of wastewater and reclaimed water.

Task G. Describe Water Market

- Identify potential users. Determine potential volume, level of interest, and on-site costs associated with the use of reclaimed water. Obtain letters of intent and document consultations with prospective users.
- Describe market assessment procedures used.
- Identify any impediments to the use of reclaimed water: financial, physical, regulatory, or perceptual.
- Identify water and wastewater agencies that have jurisdiction in the potential service area or over the sources of reclaimed water.
- Determine if there are measures that can be taken to reduce any impediments.

1.2.4 Legal and Institutional Requirements

Task H. Identify Legal and Institutional Requirements or Barriers.

Activity 1 - Legal requirements will be documented with respect to the following:

- Water rights requirements and potential issues, if any;
- Coordination with Region F Water Resources Management Plan;
- Requirements for Federal, State, and local permits and approvals, including Texas regulations with respect to the use of reclaimed water. Potentially relevant agencies include, but are not limited to, U.S. Environmental Protection Agency, Texas Commission on Environmental Quality, Texas Railroad Commission, Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, Texas Historical Commission, cities, counties, and groundwater districts.

Activity 2 - Identify requirements/opportunities for contractual and/or interagency agreements, including public-private partnerships.

Activity 3 - Prepare report chapters summarizing Tasks E, F, G, and H.

1.2.5 Description of Alternatives

Task I. Identify and Rank Most Feasible Alternatives.

Activity 1 - Identify the objectives that the alternatives will need to meet and the evaluation criteria.

Activity 2 - Identify alternatives. Alternatives will be developed by geographical area. Appropriate treatment sites will be identified.

Activity 3 - Rank alternatives. Alternatives will be ranked based on feasibility considering cost, ability to provide sufficient quantity and quality of water, time required for implementation, regulatory requirements, availability of proven treatment technology, transportation and storage requirements, and residual wastes to be managed.

Activity 4 - Identify non-reclamation alternatives. Alternatives, other than reclamation, that meet water supply objectives will be identified and characterized with respect to benefits, total project cost, life-cycle cost, and cost per million gallons and per barrel.

Activity 5 - Identify alternative for Title XVI construction funding. Projects that could potentially be constructed with Title XVI funds will be identified. A detailed project cost estimate will be developed including annual cost for operation, maintenance, and replacement; life-cycle cost, including non-construction costs; and capital cost. The estimated costs will be summarized in terms of dollars per thousand gallons of water, per barrel, and per acre foot (ac-ft). References, design data, and assumptions will be identified. The cost estimates will be developed in accordance with RM D&S Cost Estimating (FAC 09-01).

Activity 6 - Identify alternatives not considered for Title XVI construction funding. Based on scheduling requirements, cost, or institutional arrangements, it may be desirable to pursue some alternatives without accessing Title XVI construction funds. These alternatives will be identified; and estimates of capital, operational, and life-cycle costs will be prepared. The alternatives that can be implemented most quickly will be identified. An implementation plan will be prepared for the alternatives that can be developed most quickly. These projects will move forward separately from the Title XVI project. Alternatives that require additional technical investigation, institutional arrangements, or regulatory development will also be identified.

1.2.6. Environmental Considerations and Potential Effects

Task J. Document Environmental Considerations. Alternatives will be evaluated with respect to the following:

- Identify potentially significant impacts on threatened or endangered species, public health or safety, natural resources, cultural resources, quality of surface or groundwater, or other potentially significant environmental effects.
- Identify required Federal, State, tribal or local environmental compliance measures; copies of relevant documents or studies will be provided.
- Identify potential effects on water supply.
- Identify potential effects on historic properties. If relevant, include potential mitigation measures, consideration of adaptive reuse, historical preservation costs, and potential for heritage education.

1.2.7 Selection of Proposed Title XVI Project

Task K. Document Justification of the Recommended Title XVI Project.

Activity 1 – Document the basis of the selection of the recommended Title XVI project. The following will be considered:

- Extent to which the project best meets project objectives with respect to meeting future water needs, cost-effectiveness, and other important decision criteria.
- Extent to which the proposed project will result in the reduction, postponement, or elimination of development of new or expanded water supplies, existing

diversions from natural watercourses or withdrawal from aquifers, demand on Federal water supply facilities, and new or expanded wastewater facilities.

Activity 2 – Prepare report chapters summarizing Tasks I, J, and K.

1.2.8 Economic Analysis

Task L. Conduct Economic Analysis. The proposed Title XVI project will be compared to other water supply alternatives, including the “No Action” alternative. The analysis will include the following:

- Description of conditions that would exist in the area in the future with the project and the conditions that would exist in the area with the “No Action” alternative. Contributions that the project could make toward alleviating economic problems and meeting future water demands will be evaluated, as well as the avoided costs associated with extending the availability of the potable water supply.
- Cost comparison of the Title XVI project and other realistic alternatives that would meet the same water demand.
- Description of non-quantifiable benefits such as a drought-tolerant water supply and other social or environmental benefits.

1.2.9 Financial Capability of Sponsor

Task M. Document Schedule for Proposed Title XVI Project and Funding Plan. The following will be documented:

- Proposed schedule for implementation.
- Funding plan for construction, operation, maintenance, and replacement costs.
- Description of all Federal and non-Federal sources of funding.
- Willingness of non-Federal project sponsor to pay its share of capital costs and full operation, maintenance, and replacement costs.

1.2.10 Research Needs

Task N. Identify Research Needs.

Activity 1 - Areas for which research or further study may be needed include, but are not limited to, groundwater quality and/or availability, quality or quantity of flowback or produced water, treatment technology, or waste disposal technology. A scope of work will be provided for areas where further study is needed. If basic research is required with respect to the proposed Title XVI project, the following will be provided:

- Description of research needs and objectives.
- Basis for participation by the Bureau of Reclamation in the identified research
- Parties who will administer and conduct the research.
- Timeframe for completion of research.

1.2.11 Final Report

Task O. Prepare Final Report. A final report will be prepared which incorporates the results of all of the previous tasks and meets the applicable requirements of RM Directives & Standards WTR 11-01. A draft report will be prepared for

review by stakeholders and the public. Based on comments received, a revised draft will be prepared and submitted to the Bureau of Reclamation. Based on comments received from the Bureau of Reclamation, a final report will be prepared.

1.2.12 Meetings

Task P. Conduct Meetings.

Activity 1 - Meet with Consultant. Four meetings will be held with consultant. The purpose of these meetings will be to review the following documents:

- Chapter A, B, C, and D
- Chapters E, F, G, and H
- Chapters I, J, and K
- Draft Final Report

Activity 2 - Meet with Stakeholders. Four meetings will be held with stakeholders. The purpose of these meetings will be to review the following documents:

- Chapter A, B, C, and D
- Chapters E, F, G, and H
- Chapters I, J, and K
- Draft Final Report

Activity 3 - Conduct public meeting. When the draft final report is available, a public meeting will be held. Appropriate notice will be provided.

1.2.13 Project Management

Task Q. Manage Project. Staffing, budget, and schedule will be monitored. Applicable reports will be provided.

1.3 EVALUATION CRITERIA

1.3.1 Evaluation Criterion 1: Statement of Problems and Needs

Points will be awarded based on the presence of watershed-based water resource management problems and needs for which water reclamation and reuse may provide a solution. Describe in detail the water resource management problems and needs in the area and explain how water reclamation and reuse may address those problems and needs.

This project addresses one of the problems frequently found at the heart of the energy-water nexus. Major oil and gas energy resources are frequently found in arid and semi-arid regions. Developing these energy resources requires significant volumes of water — water that is already in short supply for municipal, domestic, agricultural, and other industrial uses — including power generation.

The Permian Basin in West Texas, extending into New Mexico, is a major production area for oil and gas. From 1921 to the present, it has produced approximately 29 billion barrels of oil and 75 trillion cubic feet of gas. Industry experts estimate that the recoverable oil and natural gas resources still in the formations of the Permian Basin exceed those amounts. Currently, the Permian Basin accounts for 14 percent of the total annual U.S. oil production. (Data from Texas Railroad Commission website).

Ector and Midland Counties in Texas are a major production area of the Permian Basin. They are also the location of two major metropolitan areas: Odessa and Midland with a combined metropolitan area population of approximately 275,000 and a major industrial area.

Ector and Midland Counties are in a semi-arid area that receives an average annual rainfall of less than 15 inches. The sources of water supply for these urban areas include Lake O.H. Ivie, Lake E.V. Spence, Lake J.B. Thomas, and groundwater from well fields.

The reservoirs supplying Midland and Odessa are susceptible to drought. At the present time, no water can be obtained from either Spence or Thomas reservoirs since they are at 2.5% and 1% of capacity, respectively. The continued ability to use waters from Lake Ivie is questionable, since it currently contains water in only 11% of its capacity. Therefore, both Midland and Odessa rely heavily on groundwater to meet municipal needs. In order to access groundwater of suitable quantity and quality, the cities have developed well fields located at significant distances from the cities. For example, water from a well field in Winkler County is transported 43 miles to Odessa. Midland has plans to develop a well field in Winkler County, which would be 70 miles from Midland.

The oil and gas industry has significant needs for water for both fracing (used when wells are developed) and water flooding (used to enhance production). Obtaining sufficient water for these purposes is becoming progressively more difficult.

The flowback water from fracing and the produced water recovered with the oil as a result of water flooding contain very high concentrations of dissolved salts [(total dissolved solids can be as high as 250,000 milligrams per liter (mg/L)] and other pollutants. These wastewaters have typically been disposed of in injection wells. However, many of the well fields used for injection are becoming saturated.

There are multiple sources of water in the region, including the flowback water, produced water, and brackish groundwaters that are not suitable for municipal or potable use but which could be used for industrial purposes, including oil and gas exploration and production, if properly treated and transported.

A regional system could access and collect these various waters, provide appropriate treatment, and redistribute the waters to users. A regional system may provide an opportunity to increase the use of pipelines for transport of water and wastewater. Currently, most of the transportation of water and wastewater is performed by trucks. Conversion to pipelines would have multiple environmental benefits.

1.3.2 Evaluation Criterion 2: Water Reclamation and Reuse Opportunities

Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will explore opportunities for water reclamation and reuse in the study area.

1.3.2.1 Describe how the feasibility study will investigate potential uses for reclaimed water (e.g., environmental restoration, fish and wildlife, groundwater recharge, municipal, domestic, industrial, agricultural, power generation, and recreation).

The proposed study will look specifically at reclaiming wastewaters for industrial uses, including oil and gas exploration and production, power generation, and other industrial uses. Most of the water that is reclaimed will come from the oil and gas industry. It is not practical to treat these waters sufficiently so that they can be used for environmental purposes.

However, there are potential benefits to municipal, domestic, and agricultural water users. At the present time, all of these users rely on groundwater to a significant degree. If the water needs of industrial users can be met with water sources other than high quality groundwater sources, the higher quality sources can be preserved for municipal, domestic, and agricultural users.

1.3.2.2 Describe the potential water market available to use any recycled water that might be produced upon completion of a Title XVI project, as well as methods to stimulate recycled water demand and methods to eliminate obstacles for use of reclaimed water.

If reclaimed water can be provided at a suitable price, a ready market will exist. The purchase price of water for oil and gas operations is rising rapidly due to the scarcity of water in the region. A stakeholder group has been created, which consists of organizations with a potential interest in purchasing reclaimed water. By involving this group throughout the study process, the requirements and objectives of future customers can be addressed by the study. These stakeholders have demonstrated their serious interest in the project by contributing toward the funding of the project.

1.3.2.3 Describe the sources of water that will be investigated for potential reclamation, including impaired surface and groundwaters.

The primary sources of water that will be investigated for reclamation are flowback and produced water from oil and gas exploration and production, brackish groundwater, municipal wastewater effluent, water recovered from injection well fields, rig washdown water, and water in evaporation ponds.

1.3.3 Evaluation Criterion 3: Description of Potential Alternatives

Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will develop descriptions of water supply alternatives, including a proposed Title XVI project and other water supply alternatives.

1.3.3.1 Describe the objectives all alternatives will be designed to meet. What other water supply alternatives will be investigated as part of the Title XVI feasibility study?

The objectives that all alternatives will be designed to meet are as follows:

- Develop an adequate water supply to meet industrial needs, including oil and gas exploration and production, through 2035
- Develop the water supply primarily using sources that are not suitable for domestic or municipal use.
- Develop alternatives that have a reasonable cost for treatment, transport, and storage.
- Develop alternatives that can be implemented in a timely fashion.

- Develop alternatives that are environmentally sound.
- Develop alternatives that are based on proven technology.
- Develop alternatives that provide a reliable water supply.

The alternatives that will be investigated, in addition to reclamation and reuse, are use of brackish groundwater and recovery of water from deep well injection fields.

1.3.3.2 Provide a general description of the proposed project that will be the subject of a Title XVI feasibility study.

The proposed project will identify one or more centralized locations that accept wastewater from multiple sources, provide treatment and/or blending that achieves sufficient quality so that the reclaimed water can be reused for industrial purposes and make that water available to industrial users. Potential components that will be explored so as to optimize the project include, but may not be limited to, the following:

- Blending the wastewater with brackish groundwater or water withdrawn from injection well fields used for disposal of water produced by oil and gas exploration and production.
- Use of existing or new pipelines to transport wastewaters for treatment and to deliver reclaimed waters to users.
- Storage for both wastewater and reclaimed water to provide more consistent flows and quality for treatment and more consistent availability and quality for users of reclaimed waters.
- Use of a public-private partnership to facilitate implementation.

1.3.3.3 Describe alternative measures or technologies for water reclamation, distribution, and reuse that will be investigated as part of the Title XVI feasibility study.

Technologies will be investigated in three areas: treatment, transport, and storage. Each is discussed below.

Treatment technologies to be evaluated will be determined based on the quality requirements of the industrial users. These quality requirements will be developed in consultation with project stakeholders, who will be the future users of reclaimed water. Technologies evaluated may include, but not be limited to, settling, filtration, membrane technology, pH adjustment, dissolved air floatation, coagulation, disinfection, and ion exchange. Alternatively, quality objectives may be achieved by blending with brackish groundwater or water recovered from injection wells. Only treatment technologies with proven effectiveness and reliability will be recommended for consideration. Future research needs may be identified that address emerging technologies that show promise.

In developing the components of the treatment system, consideration will be given to system reliability. Critical components will be identified, and redundancy will be provided for, when appropriate.

Trucks are the current method of transportation of water supplies to oil and gas fields and transportation of wastewaters that cannot be contained onsite to disposal locations. This

project will explore using pipelines to the extent feasible. The pipelines may be existing above-ground pipelines used through a sharing agreement, new above-ground pipelines dedicated to water, or dedicated below-ground pipelines. Requirements for pump stations also will be determined.

Storage may be in the form of surface impoundments with various types of liners or tankage. It is anticipated that storage will be provided at the centralized treatment location for both wastewater delivered for treatment and reclaimed water. Storage facilities may also be needed in well fields or at the well sites.

1.3.4 Evaluation Criterion 4: Stretching Water Supplies

Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address activities that will help to secure and stretch water supplies.

1.3.4.1 Describe the potential for the project to reduce, postpone, or eliminate the development of new or expanded waters supplies. Include description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.

The only potential source of new water supplies in this region is groundwater. There are no known feasible alternatives for developing additional supplies based on surface water.

Most groundwater sources that have not already been accessed by municipalities in the area are long distances from the point of use. There are few groundwater sources of suitable quality for municipal use near to the cities.

Developing a source of water for industrial users that does not use water from high quality groundwater supplies will extend the life of the current municipal supplies, and, possibly, reduce the cost of future supplies by maintaining the availability of high quality groundwater supplies closer to the municipal centers.

The project may also provide increased capacity for disposal of wastewaters that cannot be reclaimed. Reclaiming water from existing disposal well fields may not only provide a source of supply but may provide renewed capacity for disposal.

1.3.4.2 Describe the potential for the project to reduce or eliminate the use of existing diversions from natural watercourses or withdrawals from aquifers. Include description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.

In this semi-arid region, natural watercourses do not provide reliable water supply. However, as discussed in Section 1.3.4.1, the development of this project could reduce withdrawals of water by industries from aquifers suitable for domestic, municipal, and agricultural uses. The locations of suitable high quality aquifers are limited, as are the volumes available. It will be a benefit to the region to preserve these high quality waters for municipal, domestic, or agricultural uses.

Although there are no major springs in Ector and Midland Counties, there are major springs in other areas of the Permian Basin. Two of the most notable springs are the Diamond Y Springs in Pecos County and Balmorhea Springs in Reeves County. These springs create unique

ecosystems that support rare and endangered species. They also have major historical and cultural significance. If the project developed for Ector and Midland Counties is successful, it may be possible to reproduce it in other counties and avoid future impacts on unique spring resources.

When considering the potential reuse of wastewater treatment effluents, impacts on the current uses of those effluents will be evaluated. Some effluent currently is discharged to natural watercourses. The effects on those water bodies and the users of water in those water bodies of diverting effluent for reuse will be evaluated.

1.3.4.3 Describe the potential for the project to reduce the demand on existing Federal water supply facilities. Include description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.

There are currently no Federal water supply facilities in the study area. However, if the project in Ector and Midland Counties is successful, it may provide a model for supplying reclaimed water for industrial activities in regions with oil and gas exploration and production in other areas of the Permian Basin, other areas of Texas, and other areas of the United States. Applying this model in other areas would reduce demands on any Federal water supply facilities in those areas.

1.3.5 Evaluation Criterion 5: Environment and Water Quality

Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address the potential for a water reclamation and reuse project to improve surface, groundwater, or effluent discharge quality; restore or enhance habitat for non-listed species; or provide water or critical habitat for federally listed threatened or endangered species.

1.3.5.1 Describe the potential for the project to improve the quality of surface or groundwater, including description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.

The development of an effective reclamation project will substantially reduce the volume of highly saline waters (up to 250,000 mg/L of total dissolved solids) that has to be disposed. At the present time, these waters are disposed of by injection into deep wells or evaporation in surface pits. When properly designed and managed, these disposal activities do not adversely affect the environment. However, the possibility exists that, due to unforeseen circumstances, oversight, or human error, these wastes could be improperly handled and, thus, contaminate surface water, groundwater, or soils. Reducing the volume of wastes to be managed will reduce the possibility of such an occurrence.

A large volume of oil and gas field wastewater is currently being disposed in deep wells. Many of the strata receiving these wastes are approaching saturation. This will create a challenge in the future with respect to identifying an alternative for disposal that is reliably protective of the environment.

There are concerns that deep well injection activity is responsible for the small earthquakes that periodically occur in some oil and gas production areas. If the volume of wastewater disposed in deep wells is decreased because it is recycled, this problem may be reduced.

The feasibility study will review existing information to determine the extent to which there have been instances of adverse impacts to surface or groundwater quality attributable to the types of wastewaters proposed for reclamation.

1.3.5.2 Describe the potential for the project to improve flow conditions in a natural stream channel, including description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.

The treatment quality objectives of this reclamation project will not produce quality suitable for discharge to natural waterways. In addition, there are no significant watercourses in Ector and Midland Counties that have naturally occurring perennial flows. However, as discussed previously, the success of the project in Ector and Midland Counties could provide a model for application in other areas of the state where there are natural watercourses supported by spring flow. Comparable reclamation projects in these areas may protect or enhance spring flow for the benefit of the receiving watercourse.

1.3.5.3 Describe the potential for the project to provide water or habitat for federally listed threatened or endangered species, including description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.

As with the discussion above regarding the potential to improve flow in a natural stream channel, there are no known aquatic resources or habitats for federally listed threatened or endangered species in Ector and Midland Counties. However, if the project developed for Ector and Midland Counties is successful, it can serve as a model which could be applied to protect aquatic resources associated with a number of important springs in the Permian Basin. These springs do provide habitat for rare and endangered species. The spring flow will be protected both by postponing the development of new municipal supplies and by providing an industrial alternative to high quality groundwater.

The implementation of the reclamation system should reduce reliance on the use of evaporation ponds as a wastewater disposal technique. The study will evaluate whether this will be beneficial to migratory birds. However, the Permian Basin is not a heavily used portion of the Central Flyway.

1.3.6 Evaluation Criterion 6: Legal and Institutional Requirements

Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address legal or institutional requirements or barriers to implementing a project, including water rights issues and any unresolved issues associated with implementation of a water reclamation and reuse project.

1.3.6.1 Legal Requirements

In-depth evaluations of both legal and institutional requirements will be a key component of the study. Adequately identifying and addressing these topics will be essential to developing a successful project.

The regulation of activities associated with oil and gas fields is split between the Texas Railroad Commission (TRRC) and the Texas Commission on Environmental Quality (TCEQ). Accurately identifying which activities fall under the purview of each agency and determining applicable rules will be essential to the successful and timely implementation of the project. Regulatory permits and approvals may be required in the areas of water quality, air, solid waste, and hazardous waste.

In addition, potential requirements with respect to water rights and groundwater district rules will be identified. The water supply aspects of the project should be coordinated with the Region F water supply planning activities.

Project components such as siting of treatment plants and storage facilities, as well as pipeline routing, will be evaluated with respect to Section 404 permitting requirements. This may involve identifying issues that are considered relevant by the U.S. Environmental Protection Agency, Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, and Texas Historical Commission.

In addition, cities, counties and special districts in the area may have requirements with respect to land use, drainage, or transportation.

1.3.6.2 Institutional Arrangements

A key institutional issue is the development of operating agreements for the reclamation system. GCWDA, a governmental agency, is uniquely suited to facilitate the development of these agreements and provide appropriate services.

GCWDA has long had the institutional and legal authority to provide wastewater management services to groups of industries — and, frequently, to systems incorporating both industrial and municipal entities — throughout the State of Texas. Such systems currently are operating successfully on the Houston Ship Channel, along the Gulf Coast, and in Odessa. They have a long history of developing and implementing agreements for various types for public/private partnerships. The existing partnership in Odessa wherein GCWDA provides wastewater management services for several industries and the city is an example of such a successful partnership. GCWDA now has the ability to provide water supply services, as well as wastewater management. Their long-standing relationships with the industrial community and their familiarity with alternative, effective agreements for public/private partnerships will contribute significantly to the implementation of the proposed Title XVI project.

1.3.7 Evaluation Criterion 7: Renewable Energy and Energy Efficiency

Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address methods to incorporate the use of renewable energy or will otherwise address energy efficiency aspect of the water reclamation and reuse project being investigated.

An important aspect of the study will be the development and assessment of alternative methods to convey wastewater to treatment facility locations and to convey treated water to the locations of use. Both sunshine and wind are abundant in West Texas. Opportunities to use solar and/or wind power will be explored. It is anticipated that energy use efficiency will be a major factor in the selection of a proposed method(s) for conveying water.

A key consideration of the assessments will be the energy used by pipeline systems when compared to the trucking operations currently used. In addition to decreasing energy use, transport by pipelines will reduce the discharge of air pollutants, increase highway safety, and reduce road maintenance costs.

Also, the study will evaluate the energy requirements associated with water and wastewater treatment processes. Energy-use efficiency will be a major factor in the selection of proposed treatment technologies.

Finally, the development of a Title XVI reclamation project to provide a dependable water supply will support the continued exploration for, and production of, natural gas. Natural gas is an energy source with substantially fewer adverse impacts on the environment than most other widely used energy sources. The recent development of techniques for accessing and capturing large quantities of natural gas has contributed substantially to the progress of the United States towards energy dependence.

1.3.8 Evaluation Criterion 8: Watershed Perspective

Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address alternatives that promote and apply a regional or watershed perspective to water resource management.

There are currently a number of oil and gas exploration and production operations and other industrial activities within the study area. These various operations are currently working independently to develop water sources and provide wastewater treatment and disposal. The proposed feasibility study will investigate and develop a regional Title XVI reclamation and reuse project that will provide an efficient and effective water resource management approach. The study will investigate the development of a water supply and wastewater management system based on accepting wastewaters from a variety of sources; treating and blending those waters to meet specified water quality requirements; and distributing the reclaimed waters to multiple users.

The region will also benefit in other ways by the implementation of regional wastewater management. This project will support the future availability of public water supplies. Additionally, the Title XVI feasibility study will address the conveyance of water and wastewater in an energy-efficient manner. It is anticipated that pipeline systems will probably be an important component of a regional conveyance system; this will reduce the amount of truck traffic within the study area, which is a major public concern.

2.0 PERMITS AND APPROVALS

No permits or regulatory approvals are required for development of the proposed feasibility study. Depending on the specific components chosen for implementation, a number of Federal, State, and/or local permits and approvals may be required. The permits and approvals required for project implementation may relate to air, water, natural resources, cultural resources, and/or solid waste.

3.0 FUNDING PLAN

A summary of Federal and non-Federal funding sources is presented in Table 1. Letters of Commitment from non-Federal organizations providing funding and a resolution from the Gulf Coast Waste Disposal Authority Board of Directors will be submitted later.

Table 1
Feasibility Study of Industrial Water Management and Reclamation
for the Permian Basin
Federal and non-Federal Funding Sources

Funding Sources	Funding Amount
Non-Federal Entities	
1. Odessa Development Corporation	\$150,000
2. Gulf Coast Waste Disposal Authority	\$ 41,721*
3. Other Local Contributions	\$ 92,100
Non-Federal Subtotal:	\$283,821
Other Federal Entities	\$ 0
Other Federal Subtotal:	\$ 0
Requested Reclamation Funding	\$150,000
Total Project Funding	\$433,821

*In-Kind Contributions

No in-kind costs incurred before the anticipated study start date have been included in study costs.

4.0 BUDGET NARRATIVE

4.1 PROJECT MANAGEMENT

The Program Manager will be Gordon Pederson, Manager Facility Services, Gulf Coast Waste Disposal Authority (GCWDA). Mr. Pederson is expected to commit 150 hours to the project. The fringe benefit rate for the GCWDA staff is \$33.15/hr.

4.2 BUDGET PROPOSAL

A summary of project costs by major category is presented in Table 2.

Table 2
Feasibility Study of Industrial Water Management
and Reclamation for the Permian Basin
Budget Proposal

Budget Item Description	\$/Unit	Quantity	Quantity Type (Hours/Days)	Total Cost
Salaries and Wages				
Gordon Pederson	\$67.22/hr	150	Hours	\$ 10,083
Charles Harris	\$46.84/hr	200	Hours	\$ 9,368
Fringe Benefits				
Full-time Employees	\$33.15/hr	410	Hours	\$ 13,592
Travel				
Trips to Odessa	\$1,000/trip	5	Trips	\$ 5,000
Equipment	\$ 0			\$ 0
Supplies/Materials	\$ 0			\$ 0
Contractual/Construction				
Alan Plummer Associates, Inc.	\$ 323,000	1	Contract	\$ 323,000
Tischler/Kocurek	\$ 44,100	1	Contract	\$ 44,100
LBG Guyton	\$ 25,000	1	Contract	\$ 25,000
Other				
Reporting	\$61.30/hr	60	Hours	\$ 3,678
Total Direct Costs	\$ 0			\$ 433,821
Indirect Costs 0%	\$ 0			
Total Study Costs				\$ 433,821

4.3 SALARIES AND WAGES

Table 2 presents salaries and wages for GCWDA staff. The salary costs and other expenses for each task for the three consultants, Alan Plummer Associates, Inc., (APAI) Tischler/Kocurek (TK), and LBG Guyton (LBG) are presented in Table 3.

4.4 FRINGE BENEFITS

Fringe benefits are fixed rates used for billing purposes to coordinate with Stakeholders.

4.5 TRAVEL

GCWDA travel costs are based on the assumption that the staff will make five trips to Odessa during the project, and one staff member will go on each trip. Travel will be by air and rental car. It is assumed each trip will require one overnight stay. Per diem cost for meals for each trip for each person is estimated to be \$25.00.

Consultant travel costs provide for four trips to GCWDA offices by three consultant staff members to develop project recommendation. Trips will be by air and rental car. No overnight stays are anticipated. Meals will be reimbursed at actual cost and are estimated to be \$25 per day per person. In addition, there will be four trips to Odessa by three consultant staff members to coordinate with Stakeholders. These trips will be by air and rental car. No overnight stays are anticipated. Meals will be reimbursed at actual cost and are estimated to be \$25 per person per day.

4.6 EQUIPMENT

No equipment purchases are proposed as part of this project.

4.7 SUPPLIES/MATERIALS

No budget is allocated for supplies and materials.

4.8 CONTRACTUAL/CONSTRUCTION

The engineering firms of APAI, TK, and LBG will provide consulting and engineering support for the project. Costs for the three firms, by task, are included in Table 3.

4.9 OTHER

There are no other applicable costs.

4.10 REPORTING

Quarterly and final reports will be the responsibility of project manager, Gordon Pederson. The costs of report preparation are included in Table 2.

Table 3
Feasibility Study of Industrial Water Management
and Reclamation for the Permian Basin
Consultant Budget

Task	APAI		T/K		LBG	
	Hours	Cost (\$)	Hours	Cost (\$)	Hours	Cost (\$)
A. Describe Participants and Study Area	22	3,190	16	2,940		
B. Identify Water Needs	208	29,240	4	735		
C. Identify Water Sources	209	29,080	4	735	20	4,000
D. Describe Existing Reuse	140	18,668				
E. Identify Water Shortages	18	2,320				
F. Identify Reuse Requirements	242	34,468	56	10,290		
G. Describe Water Market	86	13,315			8	1,600
H. Identify Legal and Institutional Requirements	204	30,680	24	4,410		
I. Identify and Rank Alternatives	309	43,824	24	4,410	36	7,200
J. Document Environmental Considerations	30	3,640				
K. Document Title XVI Project Justification	148	21,012	8	1,470		
L. Provide Economic Analyses	68	8,840				
M. Document Schedule and Funding for Title XVI Project	22	3,900				
N. Identify Research Needs	31	4,500	8	1,470	8	1,600
O. Prepare Final Report	111	16,130	8	1,470	8	1,600
P. Conduct Meetings	180	30,640	64	11,760	32	6,400
Q. Project Management	96	20,928				
Subtotal Labor	2,124	314,375	216	39,690	112	22,400
Subtotal Travel		8,625		4,500		2,600
TOTAL		\$ 323,000		\$ 44,190		\$ 25,000

4.11 TOTAL COST

Total project cost is summarized in Table 4. Table 4 identifies the total dollars and the percent of total project cost provided by Federal and non-Federal sources. Form SF-424A follows.

Table 4
Feasibility Study of Industrial Water Management
and Reclamation for the Permian Basin
Funding Sources

Funding Source	Percent of Total Study Cost	Total Cost by Source
Recipient Funding	9.6	\$ 41,721
Stakeholder Funding	55.8	\$ 42,100
Reclamation Funding	34.6	\$ 150,000
Other Federal Funding	0	\$ 0
TOTALS	100%	\$ 433,821