Proposal Full View

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Applicant Information

Organization Name	Salton Sea Authority *
Tax ID	**330883611**
Proposal Name	Selenium Bioaccumulation and Ecological Risk Assessment at Four Wetlands Near the Salton Sea *
Proposal Objective	Because wetlands are a low-cost, low-energy and effective water treatment approach, their use to improve the water quality of influent waters must be carefully considered. The project will evaluate all available water quality data in the wetlands, collect tissue materials from various components of the food web in the wetlands, and characterize selenium concentrations. These data sets will be used to perform a formal ecological risk assessment in the wetlands to help understand the risks that are created by their construction. This information will help determine whether adding wetlands to the New and Alamo River watersheds are beneficial to the ecosystem, or whether alternative treatment options are more sustainable. *

Budget

Other Contribution	$0.00
Local Contribution	$0.00
Federal Contribution	$0.00
Inkind Contribution	$0.00
Amount Requested	$403,746.00 *
Total Project Cost	$403,746.00 *

Geographic Information

Latitude *	DD(+/-) 32	MM 57	SS 49		
Longitude *	DD(+/-) -115	MM 34	SS 12		
Longitude/Latitude Clarification	Coordinates for one of the 4 subject wetlands	Location	Brawley Wetland		
County		Imperial *			
Ground Water Basin		Imperial Valley			
Hydrologic Region		Colorado River			
Watershed	Imperial				

Legislative Information

Assembly District	80th Assembly District *
Senate District	40th Senate District *
US Congressional District	District 51 (CA) *

Project Information

Project Name: Selenium Bioaccumulation and E

Implementing Organization	Salton Sea Authority
Secondary Implementing Organization	Imperial Irrigation District
Proposed Start Date	1/1/2013

Proposed End Date	12/18/2015
Project Scope	Selenium bioaccumulation study and ecological risk assessment at constructed treatment wetlands on the New and Alamo Rivers.
Project Description	Riparian wetlands have been shown to be efficient and cost-effective at removing major pollutants such as suspended sediments, nutrients, and pathogens from the New and Alamo Rivers that flow into the Salton Sea. Future expansion of the wetland network is expected to make a significant improvement in the water quality flowing into the sea, as evaluated in the New and Alamo River Master Plan (Tetra Tech, 2007). However, concerns remain with selenium, which is present at generally elevated concentrations in the two rivers. The Salton Sea Authority (the Authority) proposes a research study on selenium bioaccumulation and potential ecological effects in constructed treatment wetlands along the New and Alamo Rivers. Four wetlands are proposed to be studied: existing wetlands at Brawley and Imperial on the New River and at Shank Road on the Alamo River, and new wetland at Holtville. The two New River wetlands have been in continuous operation for 12 years and have been regularly monitored over this time. For the new wetland at Holtville, funding is being sought through a separate application for its construction. The wetland locations are shown on Figure 1. The goals of the project are to: (A) Compile all existing monitoring data in the wetlands and their inflows. Since 2001, Imperial Irrigation District with support from the Bureau of Reclamation has collected the data. (B) Determine the extent and distribution of selenium transfer into the food webs at the four treatment wetlands through additional sediment, surface water and biota sampling and data analyses. (C) Develop site-specific or predicted selenium concentrations in tissues of plants and animals comprising key food sources for the species of concern in the wetlands. (D) Determine the potential for adverse effects on species of concern in the four wetlands, and develop information that would be needed to support decision-making on the expansion of these wetlands along the New and Alamo Rivers.
Project Objective	The objective of the project is to characterize the performance and selenium risks of the New and Alamo River wetlands, through data collection, modeling and risk assessment. This information will help determine whether adding wetlands to the New and Alamo River watersheds are beneficial to the ecosystem, or whether alternative treatment options are more sustainable.

Project Benefits Information

Project Benefit Type	Benefit Type	Measurement	Description
Primary	Modeling-Surface water models developed or improved	0	Fate and transport of nutrients and selenium
Primary	Modeling-Other	0	Ecological risk assessment

Project Objective

Budget

Other Contribution	0
Local Contribution	0
Federal Contribution	0

Inkind Contribution	0
Amount Requested	403746
Total Project Cost	403746

Geographic Information

Latitude DD(+/-)		32	MM 57	SS 49	
Longitude DD(+/-)		-115	MM 34	SS 12	
Longitude/Latitude Clarification	Coordinates for		Location		Brawley Wetlanc

County Imperial Ground Water Basin Imperial Valley Hydrologic Region Colorado River WaterShed
Imperial

Legislative Information

Assembly District	80th Assembly District
Senate District	40th Senate District
US Congressional District	District 51 (CA)

Section : Project General Information Questions

Q1 - Project Type

Select the project type from the dropdown list.

Research

Q2 - Project Description

Briefly summarize the proposed project (4,000 characters limit). Include the following information: project goals and objectives, project location, proposed work to be funded, proposed approach (overview of techniques and methods), anticipated timeframe, and anticipated benefits.

Riparian wetlands have been shown to be efficient and cost-effective at removing major pollutants such as suspended sediments, nutrients, and pathogens from the New and Alamo Rivers that flow into the Salton Sea. Future expansion of the wetland network is expected to make a significant improvement in the water quality flowing into the sea, as evaluated in the New and Alamo River Master Plan (Tetra Tech, 2007). However, concerns remain with selenium, which is present at generally elevated concentrations in the two rivers. The Salton Sea Authority (the Authority) proposes a research study on selenium bioaccumulation and potential ecological effects in constructed treatment wetlands along the New and Alamo Rivers. Four wetlands are proposed to be studied: existing wetlands at Brawley and Imperial on the New River and at Shank Road on the Alamo River, and new wetland at Holtville. The two New River wetlands have been in continuous operation for 12 years and have been regularly monitored over this time. For the new wetland at Holtville, funding is being sought through a separate application for its construction. The wetland locations are shown on Figure 1 (attached). The goals of the project are to: (A) Compile all existing monitoring data in the wetlands and their inflows. Since 2001, Imperial Irrigation District with support from the Bureau of Reclamation has collected the data. (B) Determine the extent and distribution of selenium transfer into the food webs at the four treatment wetlands through additional sediment, surface water and biota sampling and data analyses. (C) Develop site-specific or predicted selenium concentrations in tissues of plants and animals comprising key food sources for the species of concern in the wetlands. (D) Determine the potential for adverse effects on species of concern in the four wetlands, and develop information that would be needed to support decision-making on the expansion of these wetlands along the New and Alamo Rivers. The field and analysis components of this work are proposed to be performed over a three year period beginning in January 2013. Should grant awards be made by early 2013, it is envisioned that the first major field data collection could occur in spring 2013. Field efforts would continue in 2013 and 2014, with the complete analysis to be performed in 2015.

Q3 - Applicant Contact Information

Provide contact information (name, organization, phone number, and address) for the individual who would be the primary contact regarding the grant proposal.

The consulting engineer and principal point of contact for the Salton Sea Authority on this project will be Dr. William Brownlie, PE. Dr. Brownlie's contact information is as follows: William R. Brownlie, PhD, PE Chief Engineer Tetra Tech, Inc. 3475 East Foothill Boulevard Pasadena, CA 91107; Direct Line: 626.470.2302; Cell: 626.429.0995; email: bill.brownlie@tetratech.com.

Q4 - Project Team Qualifications

Identify and describe your project team, including any partnerships with nonprofit groups, citizens' groups, non-governmental organizations, and public or governmental agencies. Identify the proposed Project Manager/Principal Investigator (PM/PI) and key staff as well as the corresponding roles of team members. Provide a brief biographical summary for the PM/PI and each of the key staff members. An organization chart and copies of resumes can be entered in subsequent fields.

Key participants in the project include: William Brownlie, PhD, PE, Program Manager Dr. Brownlie has more than 30 years of experience in water resource planning and analysis projects and engineering and program management for water resource projects. He has been working on projects related to Salton Sea restoration for the past 12 years. He was Program Manager for the New and Alamo River Wetlands Master Plan Project. Dr. Brownlie has familiarity with the issues and stakeholders through his regular attendance and participation in public meetings throughout the region related to the Salton Sea including Salton Sea Authority Board meetings. Sujoy Roy, PhD, Project Manager Dr. Roy has more than 15 years of experience in focused research on water quality restoration projects. Dr. Roy was the Project Manager of the master plan for treatment wetlands along the New and Alamo rivers and evaluated treatment removal efficiency and potential risk due to bioaccumulative substances. He managed an integrated study of Salton Sea water quality, including field monitoring, modeling, and pilot testing of ozonation to remove hydrogen sulfide. Philip Bachand, PhD, Principal Engineer Dr. Bachand has been involved in applied experimental research on water resources issues relating to agriculture, wetlands, stormwater and other similar environments since 1992. He focuses on developing designs and management practices to reduce nonpoint water quality impacts and to enhance water resources as related to these systems. He is currently a principal investigator on several key water resources projects in California: the local, regional and statewide impacts of growing rice in the Delta as related to drinking water quality, water conveyance, greenhouse gas emissions and carbon sequestration; and implementing on-farm flood flow capture management practices along the Kings River to reduce flood risks and offset chronic regional groundwater overdraft. Kevin Torres, M.S., Senior Scientist Specializing in ecotoxicology, ecological risk assessment, ecology, and wildlife biology, Mr. Torres has extensive experience in conducting risk assessments and bioaccumulation studies for wetland, aquatic, and terrestrial sites in California. He also conducted the selenium and pesticide ecological risk assessment for the Brawley and Imperial pilot treatment wetlands on the New River. Mr. Torres has conducted ecological risk assessments in support of site assessments and remedial investigations for numerous wetland, aquatic, and terrestrial sites in California. Mr. Torres has conducted uptake and bioaccumulation studies on plants, invertebrates, and small mammals in wetlands, aquatic habitats, and terrestrial habitats in California. Stephen Charlton, Senior Program Manager, Imperial Irrigation District Mr. Charlton has extensive recent experience in restoration design and monitoring at the Brawley, Imperial, Shank Road, and Holtville pilot and treatment wetlands. Mr. Charlton has been employed by the Imperial Irrigation District (IID) since 1997 and is a Senior Program Manager, supervising the Water Department's Water Quality, TMDL, and Vegetation Management Unit. Mr. Charlton is a member of the Citizen's Congressional Task Force on the New River, participating in a leading role which has included planning, design, and construction oversight of the Brawley and Imperial Pilot Wetland sites and is currently advising on the Shank Road and Holtville treatment wetlands. He has planned, managed, and implemented the monitoring and sampling programs at the two established pilot wetland sites since 2001. Supporting staff for the project include Ted Donn, Gary Wortham, Stuart Siegel, Karen Dikeman, and Colleena Perez, each of whom have specific experience related to field work in the Salton Sea wetlands and to ecological risk assessment. Resumes of all staff proposed for this grant application and an organization chart are included as an attachment.

Q5 - Related Experience

Describe your experience with completing this type of project or similar projects within the scheduled timeframe and within the allowable budget. Provide a description of recently completed or ongoing projects that support your team's ability to perform the proposed work.

Tetra Tech will provide the analysis and risk assessment services to the Salton Sea Authority for this project, with support from the Imperial Irrigation District. Tetra Tech is a full-service, multidisciplinary, environmental consulting A-E firm, specializing in water resources engineering and planning, environmental science, and the assessment and mitigation of impacts on human health and the environment. Tetra Tech, founded in 1966, is headquartered in Pasadena, California. The firm is publicly owned (NASDAQ:TTEK) and has over 250 branch offices, with over 13,000 scientists, engineers, technicians, and support personnel worldwide. Engineering News-Record (ENR) has consistently ranked Tetra Tech?s performance in the top of our field. Our current ENR national rankings are #1 in Water for the past 7 years. Additionally, Tetra Tech has been recognized by Forbes and Business Week for outstanding management capabilities. Tetra Tech staff are located in offices across the United States, with more than 1,525 professionals in California. In the Salton Sea region, Tetra Tech has been involved in the evaluation of performance and risk assessment of the riparian wetlands along the New River, the development of a master plan to expand the network of wetlands, and evaluate the changes in pollutant loading, water quality sampling, sediment sampling, and hydrodynamic modeling of the Salton Sea. Tetra Tech was also responsible for the construction and day-to-day management of the 100-acre shallow saline habitat near Niland, created for research purposes, over a six-year period. The participation of the Imperial Irrigation District (IID) in this project is vital. IID owns and led the construction of the two New River wetlands in 2000-2001, and has been responsible for management as well as water quality monitoring in these wetlands since the inception of these projects. The Tetra Tech project team also has extensive experience in conducting ecological risk assessments at aquatic and terrestrial sites in California. The team has also designed and executed uptake and bioaccumulation studies on selenium and other metals, perchlorate, and PCBs in support of ecological risk assessments at the Brawley and Imperial pilot wetlands, Vandenberg AFB, and former rocket motor testing sites in Beaumont, California.

Section : Habitat Creation And Enhancement Project

Project Specific - Habitat Creation And Enhancement Project

Q6 - Project Type

Is your Project a Habitat Creation and Enhancement type of project? If it is go to question #2 of this section. If not, go to the appropriate project type section to complete your application.

1) ☐ Yes
2) ☑ No

Q7 - Project Goals and Objectives

State the habitat restoration goals and objectives of the proposed project. These should be simple, objective statements about what the proposed project seeks to accomplish over the near and long term. The objectives should be measureable and consistent with the Program goals identified in the guidelines. Include a description of performance metrics that could be used to measure the effectiveness in achieving the stated goals and objectives.

Q8 - Proposed Habitat Creation or Enhancement

Describe the habitat proposed for creation or enhancement. Include a description of the anticipated features and characteristics of the created or enhanced habitat (such as acreage, water depth, salinity, vegetation cover) upon completion of project construction as well as the characteristics of the habitat when fully established. Indicate the timeframe for achieving full establishment of the habitat.

Q9 - Current Site Conditions

Describe the current conditions at the site proposed for habitat creation or enhancement and the immediate vicinity. Include information on land ownership and characteristics such as land use, topography, soils and sediments, vegetation, wildlife usage, drainage patterns, contaminants, and any other features pertinent to the proposed project. The description should be sufficient to demonstrate that the site is suitable for the proposed project. Indicate whether the site is occupied by State- or federally listed species or species of special concern. Attach a location map and any photos or figures that illustrate the current condition of the site on the "Site Map and Photos" section of the application under the tab labeled "General Information and Attachments."

Q10 - Proposed Approach

Generally describe the approach for implementation of the proposed work. Include information on grading, water conveyance, planting, invasive plant removal, erosion control methods, and other key features of the proposed work. Indicate whether the proposed techniques have been successfully implemented at the Salton Sea or in a similar environment. Demonstrate that the best available science has been incorporated into the design.
Attach design drawings and other graphical information related to the design on the "Design Drawings and Figures" section of the application under the tab labeled "General Information and Attachments." Also attach a Work Plan, Budget, and Schedule as described on the "General Information and Attachments" tab of this application.

Q11 - Project Benefits

Describe the anticipated benefits to be provided by the proposed project and explain how the project would further the goals of the Program. Indicate the species that the habitat is intended to support and describe the relative contribution the project would make in supporting the priority fish and wildlife described in the guidelines. If applicable, describe how the proposed project would benefit adjacent habitat or provide connectivity among existing habitats. Also, describe future actions, if any, needed beyond the scope of this project to fully address the overall project goals.

Q12 - Operations and Maintenance (O&M)

Generally describe how the project would be operated and maintained over time. Include a description of periodic maintenance activities that would be required, an estimate of projected costs, and a description of the frequency and timing of activities such as water management, vegetation management, sediment removal, and other O&M activities relevant to the proposed project. Indicate who would perform long-term maintenance and describe how the O&M would be funded.
The applicant will be expected to prepare a detailed O&M Plan for the project, which should be included as a task component of the Work Plan and Budget.

Q13 - Monitoring and Adaptive Management

Generally identify the areas of scientific uncertainty associated with the project and describe the plan to adaptively manage the habitat to achieve the project goals and objectives. Describe the monitoring that would be conducted to measure performance and inform adaptive management adjustments in the future.
The applicant will be expected to prepare a detailed Monitoring and Adaptive Management Plan for the project, which should be included as a task component of the Work Plan and Budget. The plan will be for a minimum of 5 years. Monitoring reports are to be submitted annually to DFG. Funding for implementation of the first 2 years of monitoring under the plan can be included in the applicant's budget. Indicate the funding source for the monitoring and adaptive management beyond the initial 2 years.

Q14 - Phasing

Indicate whether and how the proposed work might be phased or reduced if the project is funded at a reduced level. Explain how project benefits and total cost of the project would be affected if portions were deferred to later years. Also, describe the extent to which the proposed habitat could be expanded in the future and the cost effectiveness of those additions.
If the proposed work is a continuation of previously completed work, describe the extent to which the continued success of the prior work is dependent upon the proposed work. If the previous work was funded by a State agency, list the project name and year the grant was awarded.

Q15 - Availability of Water

If the proposed project requires water, describe the water requirements (volume and quality) and identify the source(s). Explain the reliability of the water source and describe how the proposed habitat would be influenced by a temporary reduction or interruption of water supply or changes in water quality. Identify the sources of funding for the water supply.

Q16 - Adjacent Property Impacts

Describe how the proposed project might affect adjacent property and landowners. Disclose any known concerns or opposition to the project or land access issues.

Q17 - Sustainability and Climate Change

Describe the resilience of the proposed habitat to changing conditions, such as higher average temperatures, decrease in the surface elevation of the Salton Sea, and increased salinity in the Salton Sea. Indicate the period of time that the proposed habitat would be functional.

Section : Water Quality Improvement Project

Water Quality Improvement Project

Q6 - Project Type

Is your project a Water Quality Improvement type of project? If it is go to question #2 of this section. If not, go to the appropriate project type section to complete your application.

1) ☐ Yes
2) ☑ No

Q7 - Project Goals and Objectives

State the goals and objectives of the proposed project. These should be simple, objective statements about what the proposed project seeks to accomplish over the near and long term. The goals should be measureable and consistent with the Program goals identified in the guidelines. Include a description of performance metrics that could be used to measure the effectiveness in achieving the stated goals and objectives.

Q8 - Proposed Water Quality Improvements

Describe the proposed water quality improvement project, including physical features of the project, the source and quality of the water to be improved, the water quality issue to be addressed (for example, selenium, nutrients), the anticipated level of improvement, the location of any proposed facilities, the anticipated volume of water with improved quality, the anticipated use of improved water, the amounts and disposition of contaminants removed, and other relevant characteristics of the proposed project. Indicate the timeframe for the project to become fully functional.

Q9 - Current Site Conditions

If the project requires the construction or installation of facilities, describe the current conditions at the location(s) where the facilities would be installed. Include information on characteristics such as land use, topography, soils, vegetation, wildlife usage, drainage patterns, contaminants, and any other features pertinent to the proposed project location. If the proposed project involves changes in land use practices in the watershed, describe the characteristics of the area affected. Indicate whether the site is occupied by State- or federally listed species or species of special concern.
Attach a location map and any photos or figures that illustrate the current condition of the site or area on the "Site Map and Photos" section of the application under the tab labeled "General Information and Attachments."

Q10 - Proposed Approach

Generally describe the approach for implementation of the proposed work. As relevant, include information on construction, water conveyance, planting, and other key features of the proposed work. Indicate whether the proposed techniques have been successfully implemented at the Salton Sea or in a similar environment. Demonstrate that the best available science has been incorporated into the approach.
If relevant, attach design drawings and other graphical information related to the design on the "Design Drawings and Figures" section of the application under the tab labeled "General Information and Attachments."
Also attach a Work Plan, Budget, and Schedule as described on the "General Information and Attachment" tab of this application.

Q11 - Project Benefits

Describe the anticipated benefits to be provided by the proposed project and explain how the project would further the goals of the Program. Identify the species or habitats that would benefit from the water quality improvement and describe the relative contribution the project would make in supporting the priority fish and wildlife described in the guidelines.

Q12 - Operations and Maintenance (O&M)

Generally describe how the project would be operated and maintained over time. Include a description of periodic maintenance activities that would be required, an estimate of projected costs, and a description of the frequency and timing of activities such as water management, vegetation management, sediment removal, and other O&M activities relevant to the proposed project. Indicate who would perform long-term maintenance and describe how the O&M would be funded.
The applicant will be expected to prepare a detailed O&M Plan for the project, which should be included as a task component of the Work Plan and Budget.

Q13 - Monitoring and Adaptive Management

Generally identify the areas of scientific uncertainty associated with the project and describe the plan to adaptively manage the project to help ensure that the project goals and objectives are achieved. Describe the monitoring that would be conducted to measure performance and inform adaptive management adjustments in the future.
The applicant will be expected to prepare a detailed Monitoring and Adaptive Management Plan for the project, which should be included as a task component of the Work Plan and Budget. Monitoring reports are to be submitted annually to DFG. Funding for implementation of the first two years of monitoring under the plan can be included in the applicant's budget. Indicate the funding source for the monitoring and adaptive management beyond the initial two years.

Q14 - Phasing

Indicate whether and how the proposed work might be phased or reduced if the project is funded at a reduced level. Explain how project benefits and total cost of the project would be affected if portions were deferred to later years. Describe the extent to which the proposed project could be expanded in the future and the cost effectiveness of those additions.
If the proposed work is a continuation of previously completed work, describe the extent to which the continued success of the prior work is dependent upon the proposed work. If the previous work was funded by a State agency, list the project name and year the grant was awarded.

Q15 - Availability of Water

Describe the water requirements (volume and quality) and identify the source(s). Explain the reliability of the water source and describe how the proposed project would be influenced by a temporary reduction or interruption of water supply or changes in water quality.

Q16 - Adjacent Property Impacts

Describe how the proposed project might affect adjacent property and landowners. Disclose any known concerns or opposition to the project or land access issues.

Q17 - Sustainability and Climate Change

Describe the sustainability of the proposed project and its resilience to change.

Section : Research Project

Research Project

Q6 - Project Type

Is your project a Research type of project? If it is go to question #2 of this section. If not, go to the appropriate project type section to complete your application.

1) ☑ Yes
2) ☐ No

Q7 - Research Goals and Objectives

State the goals and objectives of the proposed research project.

The Salton Sea Authority (the Authority) proposes to conduct a research study on selenium bioaccumulation and potential ecological effects in constructed treatment wetlands along the New and Alamo Rivers south of the Salton Sea. Four wetlands are proposed to be studied for this purpose: existing wetlands at Brawley and Imperial on the New River, and at Shank Road on the Alamo River. Funding is being sought, through a separate application, for the construction of a wetland at Holtville, and should this grant be successful, selenium bioaccumulation at the Holtville wetland will also be studied. The wetland locations are shown on Figure 1. The goals of the project are to: (A) Characterize selenium concentrations in sediment and surface water and determine the extent and distribution of selenium transfer into the food webs at the four treatment wetlands. (B) Develop site-specific or predicted selenium concentrations in tissues of plants and animals comprising key food sources for the species of concern in the wetlands. (C) Determine the potential for adverse effects on species of concern in the four wetlands. The associated objectives of the project are to: (A) Measure the magnitudes of selenium concentrations in sediment, surface water, and dominant plants, invertebrates, and fish resulting from bioaccumulation (i.e., uptake and trophic transfer). (B) Calculate representative site-specific media and tissue concentrations and develop bioaccumulation models of potential relationships between selenium concentrations in sediment or surface water and those in multiple types of co-located plants, invertebrates, and fish from site-specific data. (C) Calculate a selenium mass balance for each wetland depicting the partitioning of selenium among distinct abiotic and biotic wetland compartments. (D) Conduct ecological risk assessments to evaluate potential effects of selenium on species of ecological and regulatory concern in each wetland.

Q8 - Proposed Research

Describe the proposed research, the scientific basis, and the questions that the research would investigate. Include any conceptual models that may help clarify the areas of uncertainty. Attach any relevant conceptual models on the "Design Drawings and Figures" section under the "General Information and Attachments" tab.

Treatment wetlands have been shown to effectively remove many constituents of concern in the Salton Sea watershed, notably nutrients, sediments, and pathogens. For example, at the Brawley and Imperial wetlands, where the performance was assessed after 5 years of operation, it was found that the removal for sediments was >90 percent, for nitrogen, 60-80%, and for phosphorus, 60-70% (Tetra Tech, 2006). When a network of wetlands (totaling more than 1,000 acres) is modeled over the length of the New and Alamo Rivers, there are major load

reductions of nitrogen, phosphorus, and suspended sediments to the Salton Sea (Tetra Tech, 2007). However, the widespread acceptance of treatment wetlands is limited by concerns regarding selenium accumulation in the ecosystem and associated effects on birds and other wildlife. This proposal is focused of improved characterization of selenium behavior in three existing wetlands and potentially one new wetland. The proposed research includes compilation and analysis of previously collected data, new data collection on water quality, sediments, and in plant and animal tissues in the wetlands and surrounding habitats. The data will allow assessment of the performance of the wetlands after 12 years of operation, and will be used to conduct a formal ecological risk assessment to support decision-making on the future use of these wetlands for water quality improvement. Potential pathways of selenium uptake and transfer through the food web in shallow freshwater aquatic habitats, such as the proposed wetlands, are shown in Figure 2. Selenium in water bioconcentrates to higher levels through the food-web, with the highest concentrations and adverse impacts occurring in the top species. Receptor species to be considered in this work will include plants, benthic and aquatic invertebrates, amphibians, fish, and wetland-associated birds and mammals. These two New River wetlands which have continually operated for 12 years with inflow selenium concentrations at times exceeding 10 micrograms/liter offer unique opportunities to evaluate potential wildlife risks that might occur if more wetlands in the Salton Sea watershed were used for habitat restoration or water treatment. The recently constructed Shank Road wetland and proposed Holtville wetland on the Alamo River are similarly suitable study sites, for a total of four sites. This study will expand on the selenium investigation and ecological risk assessment previously conducted at the Brawley and Imperial pilot wetlands on the New River (Tetra Tech, 2007) and will consist of the following elements: 1) Evaluation of water quality and inflow data on nutrients, suspended sediments, and pathogens collected in the New River wetlands and surrounding regions from 2001 to 2012, computing mass balances, infiltration and pollutant removal rates. A portion of these data (up to 2005) have been analyzed in previous work. This effort will build on the past work and evaluate process changes over the 12-year period of operation. 2) Evaluation of selenium mass balances over 2001-2012 at the New River wetlands, and new data from the Alamo River wetlands. 3) Collection of tissue samples from all four wetlands, and characterization of selenium concentrations in them. 4) Development of a formal ecological risk assessment for the wetlands, including exposure assessment, toxicity assessment, and risk characterization. In the proposed work, the focus on the two New River wetlands is especially important because of their relative maturity: this helps to better understand the long-term performance efficiency, and also full evaluate the impacts of selenium bioaccumulation after more than a decade of loadings. Additional details on the research approach are provided in response to Question 10 and in the attached Work Plan.

Q9 - Relevance to Program Goals

Describe how the proposed research directly relates to the successful creation and maintenance of habitat at the Salton Sea in the near term. Within the context of previous attempts to collect similar information, describe how the proposed research would fill a data gap or provide new information useful to improving existing and future habitat values.

The Salton Sea has been plagued by serious water quality problems over several decades, many of which can be traced to the quality of water in its major inflows from the New and Alamo Rivers. Indeed the frequent occurrence of anoxia in the sea, with extensive fish kills and release of hydrogen sulfide from deeper layers, is related to the elevated nutrient loading from the rivers and resulting eutrophication. The rivers, especially the New River, are themselves highly degraded. A network of wetlands can substantially reduce these nutrient loads to the Sea (Tetra Tech, 2007), reducing eutrophication and leading to improved water quality in the Sea and creating a more sustainable environment, a crucial long term goal for the region. If designed as gravity-flowing systems, these wetlands require no energy and minimal O&M to function, and are therefore very cost-effective compared to other treatment alternatives. As discussed elsewhere in this application, the use of wetlands in this region raises concerns related to the potential for selenium bioaccumulation and resulting ecotoxicity. Perhaps for this reason, the construction of treatment wetlands in the region has occurred very slowly over the past decade. The current project will provide decision makers with robust information to evaluate the wetland selenium risks through a formal ecological risk assessment approach typically used to determine actions at contaminated locations. This approach will importantly use 1) water quality data collected over 12 years and 2) newly collected biological data in the New River wetlands for conducting ecological risk assessment. The New River wetlands and the continuous monitoring performed in them by IID over a 12-year period (with grant support from the Bureau of Reclamation) represents a major investment of public funds that have not been fully leveraged or utilized. Data were last evaluated in 2005 (Tetra Tech, 2006), and subsequent data has not been similarly evaluated. The evaluation of existing water quality data, new data collection in biota, and the ecological risk assessment for wetlands operating under relatively steady state conditions for over a decade will fill important data gaps relating to a key restoration and treatment alternative for the Salton Sea.

Q10 - Research Methods

Describe the approach and design of the proposed research. Include the initial hypotheses to be tested, anticipated experimental methods, and likely statistical analyses. For research conducted in the field, indicate the locations where work would occur.
Attach maps and other graphical information related to the research on the "Design Drawings and Figures" section of the application under the tab labeled "General Information and Attachments."
Also, attach a Work Plan, Budget, and Schedule as described on the "General Information and Attachment" tab of this application.

The proposed research will include compilation of existing data, evaluation of mass balances of key pollutants, collection of new water quality and tissue data, and the development of an ecological risk assessment for the wetlands. A key hypothesis of the proposed work is that the full evaluation of the performance and selenium risk across multiple operational wetlands as described below will provide a basis for future decision-making relating to their greater use in the Imperial Valley. Task 1 of the study will be to review and evaluate both (1) previous

selenium data from surface water, sediment, and tissue samples from the Brawley and Imperial pilot wetlands that were evaluated in the initial investigation (Tetra Tech, 2007) and (2) subsequent surface water and sediment monitoring data collected regularly at these two wetlands. Task 2 will involve collection of field data at four wetland sites. A field sampling plan will be prepared to guide the collection of samples at each wetland. A reconnaissance-level biological inventory of plants and animals present at the wetlands may be conducted to help identify species of concern for the risk assessment and to focus the tissue sampling effort. Field sampling and laboratory analyses will be conducted to measure concentrations of selenium in sediment, surface water, and tissues of biota of relevance to higher trophic level species including birds (particularly shorebirds, seabirds, waterfowl), wetland-associated mammals, and predatory fish. Sediment, water, and tissue data will be collected over two seasonal sampling events, if feasible, and will be used to evaluate the extent of selenium uptake from abiotic media and trophic transfer to organisms in distinct ecological and taxonomic groups present at each wetland. The biota to be sampled for tissue concentrations will be selected based on the dominant species composition at each site and relevant exposure pathways (i.e., prey species) for species of concern. Preliminary target sample sizes were estimated based on the reasonable minimum numbers of samples required for site-specific statistics and regressions, tissue biomass observed to be available during the 2007 sampling at Brawley and Imperial wetlands, and overall cost. Task 3 will involve the water quality modeling of all monitored contaminants, to estimate influent loads, effluent loads, infiltration and other losses, following the approach previously used in Tetra Tech (2006) and Kadlec et al. (2009). This will allow assessment of pollutant removal efficiency in each wetland over time. Task 4 will develop models of selenium bioaccumulation through the food web for each wetland studied. This is of particular importance in the two older wetlands that have received more than a decade of elevated selenium loadings in their inflows. Task 5 is the performance of an ecological risk assessment to evaluate the potential for adverse impacts of selenium on species of concern (i.e., ecological receptors), including plants, aquatic organisms, birds, and other animals at the two existing pilot wetlands on the New River, Shank Road wetland on the Alamo River, and proposed Holtville wetland on the Alamo River. The ecological risk assessments will be conducted in a four-step process: (A) Problem Formulation (B) Exposure Assessment (C) Toxicity assessment (D) Risk characterization The scope and general methodology of the risk assessment will be consistent with a predictive (i.e, baseline or Phase I) ecological risk assessment as described in guidance by the U.S. EPA (1992, 1998) and California DTSC (DTSC 1996). Key products of this research will include compiled databases of water quality and tissue concentrations, quantification of long-term wetland performance efficiency, and the risk assessment for the New and Alamo River wetlands, each treated as a group. The research approach is described in greater detail in the attached Work Plan.

Q11 - Timeframe

Indicate how soon after project initiation the proposed research could provide managers with preliminary interpretations of data that may lead to insight into creation and management of habitats.

The anticipated timeframe of this project will consist of approximately three years. During the first year, beginning after the grant award, previously collected selenium monitoring data will be reviewed. In addition, field samples will be collected and analyzed from the existing Brawley and Imperial pilot wetlands on the New River and at the recently constructed Shank Road wetland on the Alamo River. This sampling can occur in spring 2013 if the notice to proceed is received by January 1, 2013. The attached schedule assumes a start date of January 1, 2013. During the first year, selenium results and the selenium mass balances will be evaluated for the three sampled wetlands. To the extent feasible, data analyses will also be initiated in early 2013 in support of the selenium bioaccumulation evaluation and ecological risk assessments. During the second year, field samples will be collected and analyzed from the proposed Holtville wetland on the Alamo River, and the associated selenium results and selenium mass balance will be evaluated. The bioaccumulation modeling and ecological risk assessments will also be conducted. During the third year, it is anticipated that the draft and final reports will be submitted and all study tasks will be finalized.

Q12 - Phasing

Indicate whether and how the proposed work might be phased or reduced if the project is funded at a reduced level. Explain how project benefits and total cost of the project would be affected if portions were deferred to later years.

If the funding is reduced from the current level proposed, we may need to reduce the quantity and frequency of field sampling and reduce the number of wetlands where the work is performed. Under reduced funding conditions, we may choose to focus on a single wetland on the New River (Imperial) and on a single wetland on the Alamo River (Shank Road). If the funding is reduced, and sampling is only conducted during one year, we would also decrease the overall period of performance of the project from three years to two years.

Q13 - Benefits of the Research

Describe the anticipated benefits to be provided by the proposed research and explain how the results would further the goals of the Program. Indicate the species that would ultimately benefit from the work and describe the relative contribution the project could make in supporting the priority fish and wildlife described in the guidelines.

The study will develop a robust assessment of the benefits and risks of wetlands in the Salton Sea, especially for the New River wetlands that have been operated for 12 years. The ecological risk assessments will evaluate the potential for adverse effects on wetland systems and species of concern that may occur if treatment wetlands are used more widely for habitat restoration or water treatment in the Salton Sea region. This project will thus enhance the capability of regulators to decide whether the benefits of wetlands and water quality improvements (i.e., reduced levels of nutrients, coliforms, and suspended solids) can be effectively managed with their potential

selenium risks in the Imperial Valley ecosystem. If the selenium risks in wetlands can be better understood and managed, the wetlands constitute an important mechanism to enhance the sustainability of agriculture in the Imperial Valley, and to enhance the ecological and human sustainability of the Salton Sea region. In addition to site -specific findings, the study will contribute to the regional data sets on selenium bioaccumulation and trophic transfer in wetland, aquatic, and agricultural systems in the vicinity of the Salton Sea and lower Colorado River. The combined bioaccumulation models from the four wetlands may be applied to predict selenium tissue concentrations for other research studies and risk assessments in the region. The study will also provide a broadly applicable estimate of risks to populations of birds and other wildlife due to selenium in treatment wetlands and other shallow water/wetland habitats in the vicinity of the Salton Sea. The project report will be made available to state and federal agencies and other stakeholders. The anticipated key benefits of the study are both site specific and applicable to the Salton Sea region.

Section : Adaptive Management Experimentation Project

Adaptive Management Experimentation Project

Q6 - Project Type

Is your project an Adaptive Management Experimentation type of project? If it is go to question #2 of this section. If not, go to the appropriate project type section to complete your application.

1) ☐ Yes
2) ☑ No

Q7 - Adaptive Management Goals

State the goals and objectives of the proposed adaptive management experiment. These should be simple, objective statements about what the proposed work seeks to accomplish over the near and long term. The goals should be measureable and consistent with the Program goals identified in the guidelines. Include a description of performance metrics that would be used to measure the effectiveness in achieving the stated goals and objectives.

Q8 - Proposed Experiment

Describe the proposed adaptive management experiment. Include a description of the habitat or management practices that would be manipulated for the purposes of the experiment and the timeframe over which the experiment would be conducted. Describe the rationale for the proposed experiment, including the scientific basis and any conceptual models that help clarify the areas of uncertainty.
Attach any relevant conceptual models on the "Design Drawings and Figures" section under the "General Information and Attachments" tab. Indicate the timeframe for the project to become fully functional.

Q9 - Current Site Conditions and Management

Identify the owners and land managers of the site where the proposed work would be conducted. Describe the current conditions at the site proposed for the experiment, including information on the physical characteristics pertinent to the proposed project. Describe how the site is managed, with particular attention to management actions that may be modified as a result of the experiment. Indicate whether the site is occupied by State- or federally listed species or species of special concern.
Attach a location map and any photos or figures that illustrate the current condition of the site on the "Site Map and Photos" section of the application under the tab labeled "General Information and Attachments."

Q10 - Proposed Approach

Describe the approach for implementation of the proposed work. Include information on the study design, monitoring requirements, and a description of how management would be adapted as a result of project outcomes. Also, describe the extent of any additional activities at the site needed to accommodate the experiment, such as earthwork, installation of water conveyance structures, planting, invasive plant removal, erosion control, and other key actions of the proposed work. Indicate whether the proposed techniques have been successfully implemented at the Salton Sea or in a similar environment.
Attach design drawings and other graphical information related to the experiment on the "Design Drawings and Figures" section of the application under the tab labeled "General Information and Attachments."
Also attach a Work Plan, Budget, and Schedule as described on the "General Information and Attachment" tab of this application.

Q11 - Project Benefits

Describe the anticipated benefits to be provided by the proposed project and explain how the project would further the goals of the Program.

Q13 - Phasing

Indicate whether and how the proposed work might be phased or reduced if the project is funded at a reduced level. Explain how project benefits and total cost of the project would be affected if portions were deferred to later years.

Q13 - Availability of Water

If the proposed project requires additional water, describe the water requirements (volume and quality) and identify the source(s). Explain the reliability of the water source and describe how the proposed project would be influenced by a temporary reduction or interruption of water supply or changes in water quality.

Q14 - Adjacent Property Impacts

Describe how the proposed project might affect adjacent property and landowners. Disclose any known concerns or opposition to the project or land access issues.

Section : Attachments Section

Attachments Section

A1 - Authorizing Resolution

Attach a scanned copy of a signed resolution or equivalent document from the applicant's governing board or officer authorizing the submittal of this application.
Last Uploaded Attachments: Salton Sea Authority Signed Resolution.pdf

A2 - Applicant Team Organization: Chart

Attach an organization chart indicating key staff and their roles relative to the proposed work.
Last Uploaded Attachments: SSA Wetlands ERA Org Chart_A2.pdf

A3 - Resumes/CVs

Attach resumes/CVs for the PM/PI and key staff proposed for the project. You can combine all the CVs in one document as long as the individuals are identified.
Last Uploaded Attachments: SSA Wetlands ERA_Resumes_A3.pdf

A3 - Continued

Upload additional CVs and Resumes here if needed.

A3 - Continued

Upload additional CVs and Resumes here if needed.

A4 - Work Plan

Attach a work plan with a task-by-task description of how the proposed work would be conducted and identify the deliverables for each task. The work plan must also identify which costs are being directly funded by the Program.
Last Uploaded Attachments: SSA Application_Work Plan.pdf

A4 - Continued

Upload here any additional documents describing the work plan if needed.

A4 - Continued

Upload here any additional documents describing the work plan if needed.

A4 - Continued

Upload here any additional documents describing the work plan if needed.

A5 - Budget

Attach a budget for the requested funding showing the breakdown of estimated costs of the proposed work by task, including a list of equipment to be purchased as part of the project. The budget should also indicate the total cost of the project and the source of additional funding, if any, including any cash contributions, in-kind services, volunteer effort, maintenance and operation costs, and other grant funding. Please differentiate the grant request from the total project budget and demonstrate how the grant award would be tracked separately. Also, describe the basis for the cost estimates and the methods used to calculate them.

Last Uploaded Attachments: SSA Wetland ERA Budget_A5.pdf

A5 - Continued

Upload any additional documents describing the Budget if needed.

A5 - Continued

Upload any additional documents describing the Budget if needed.

A5 - Continued

Upload any additional documents describing the Budget if needed.

A6 - Schedule

Attach a schedule for completing the proposed work by task, and indicate significant milestones. This can be submitted in Microsoft Word, Excel, or Project file formats.

Last Uploaded Attachments: Selenium Wetlands ERA Schedule_A6.pdf

A6 - Continued

Upload here any additional documents describing the Schedule if needed.

A6 - Continued

Upload here any additional documents describing the Schedule if needed.

A6 - Continued

Upload here any additional documents describing the Schedule if needed.

A7 - Site Maps and Photos

Attach a location map indicating the proposed project and vicinity, and any photos and diagrams that would help illustrate the current condition of the proposed site. Please include a legal description of the project site, if available.

Last Uploaded Attachments: Figure 1 Location of 4 wetlands.pdf,Figure 3_Brawley Photo.pdf,Figure 4_Imperial Photo.pdf

A7 - Continued

Upload any supplemental maps or photos related to the project if needed.

A7 - Continued

Upload any supplemental maps or photos related to the project if needed.

A7 - Continued

Upload any maps or photos rlated to the project if needed.

A8 - Design Drawings and Figures

Attach design drawings that depict the proposed habitat creation or enhancement as well as any diagrams or figures that would help illustrate project features and assist in the review of the proposal.
Last Uploaded Attachments: Figure 2 Wetland Food Web.pdf

A8 - Continued

Upload here any supplemental drawings and figures related to the project if needed.

A8 - Continued

Upload here any supplemental drawings and figures related to the project if needed.

A8 - Continued

Upload here any supplemental drawings and figures related to the project if needed.

A9 - Letters of Support

Attach any letters or other evidence from local entities indicating support for the proposed project.
Last Uploaded Attachments: IID letter of support.pdf

A9 - Continued

Upload any letters of support you may have received.

A10 - Operation and Maintenance Plan

Upload your Operation and Maintenance plan if needed.
Last Uploaded Attachments: BLANK.pdf