Proposal Full View

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Applicant Information

Organization Name	Sephton Water Technology, Inc. *
Tax ID	**710931128**
Proposal Name	Salton Seawater Marine Habitat Pilot Project *
Proposal Objective	The Salton Seawater Marine Habitat Pilot Project will investigate the reclamation of hyper-saline water from the Salton Sea to supply and maintain a shallow marine habitat pond on one section of recently exposed playa several miles from any river water source. The larger objective is to develop a cost effective method to provide long term contaminant free water supply by distillation to shallow marine habitat ponds at this or any location on the Salton Sea playa using only locally available Salton Seawater and renewable solar thermal or geothermal energy to remove all contaminants of concern. The method pilot tested will use a Salinity Gradient Solar Pond to capture and store thermal energy for distillation of Salton Seawater and recycling of marine habitat pond water. An existing Salton Seawater desalination test plant that uses low pressure geothermal steam as the energy source will be demonstrated to establish initial target salinity in both ponds. The Salinity Gradient Solar Pond will receive all brine from desalination by solar or geothermal energy thus controlling salinity in the system without using the Salton Sea as a salt dump. Non-toxic molecular monolayers will be tested to reduce evaporation losses in both habitat and solar ponds reducing costs and the need for make-up water from the Salton Sea. The primary objective of the Pilot Project is to evaluate cost, energy, and water treatment requirements that will enable Salinity Gradient Solar Ponds to provide all the energy and salt sink needs for the creation and maintenance of future shallow marine habitat ponds anywhere on the Salton Sea playa without the need for fresh or brackish water from canals, rivers, or drains. A second key objective is to eliminate fugitive dust emissions from the Project area by covering emissive playa with habitat and solar ponds and demonstrate the method for dust control on other playa locations. *

Budget

Other Contribution	$0.00

Local Contribution	$731,163.00
Federal Contribution	$0.00
Inkind Contribution	$77,995.00
Amount Requested	$2,003,004.00 *
Total Project Cost	$2,812,162.00 *

Geographic Information

Latitude *	DD(+/-)	33	MM	9	SS	8
Longitude *	DD(+/-)	115	MM	38	SS	57

Longitude/Latitude Clarification	Center of proposed Shallow Marine Habitat and Salinity Gradient Solar Ponds	Location	Northeast corner of playa on Salton Sea shoreline near intersection of Lack Road and Lindsey Road
County		Imperial *	
Ground Water Basin		Imperial Valley	
Hydrologic Region		Colorado River	
Watershed	Salton Sea Transboundary		

Legislative Information

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

Project Information

Project Name: Salton Seawater Marine Ha

Implementing Organization	Imperial Irrigation District
Secondary Implementing Organization	Sephton Water Technology, Inc.
Proposed Start Date	4/1/2013

Proposed End Date	4/1/2016
Project Scope	Build ¼ acre marine habitat pond and ¼ acre salinity gradient solar pond, maintain both with distilled Salton Sea water.
Project Description	The Salton Seawater Marine Habitat Pilot Project will develop a process for reclamation of hyper-saline water from the Salton Sea to supply and maintain a ¼ acre shallow marine habitat pond on recently exposed playa. A Vertical Tube Evaporation demonstration plant now under construction will use heat from low pressure geothermal steam to distill Salton Seawater to dilute the habitat pond to a target salinity of 35,000 ppm TDS with no accumulation of selenium or other critical contaminants. Fish and invertebrates currently in the Salton Sea will be introduced to the habitat pond. These can be desert pupfish, or any mix of local fish species. Piscivorous birds including brown and white pelicans already frequent the site and are likely to forage. The Project will construct a ¼ acre Salinity Gradient Solar Pond adjacent to the habitat pond to receive saturated brine derived from the Salton Seawater distillation and habitat pond water recycling. Evaporators and a condenser from an existing desalination pilot plant will be installed at the ponds with a new vacuum flash evaporator to maintain the salinity gradient that will trap heat from the sun to drive a long term on site thermal distillation process. The pond distillation plant will maintain both the shallow marine habitat pond and the salinity gradient solar pond with distilled water make-up. Evaporative losses will be controlled to the extent practicable with a non-toxic molecular monolayer and made-up from Salton Seawater. At least one year of operation will be needed to evaluate the solar energy, water, and salt balance of the operation in all seasons and observe and record wildlife usage of the habitat and any interaction that may or may not occur with the adjacent salinity gradient solar pond.
Project Objective	Develop a cost effective method to supply contaminant free water to shallow marine habitat ponds at any location on the Salton Sea playa by distillation of Salton Seawater using solar thermal or geothermal energy to remove all contaminants of concern. The Project will

	work out cost, energy, and water treatment requirements for employing Salinity Gradient Solar Ponds to provide the energy and salt sink needed to reclaim Salton Seawater and maintain habitat ponds without harming the ecosystem.

Project Benefits Information

Project Benefit Type	Benefit Type	Measurement	Description
Primary	Water Quality Treatment Technology	0	Remove all contaminants of concern from habitat pond make-up water by distilling Salton Sea water using solar thermal or non-commercial geothermal energy.

Project Objective

Budget

Other Contribution	0
Local Contribution	0
Federal Contribution	0
Inkind Contribution	0
Amount Requested	0
Total Project Cost	0

Geographic Information

Latitude DD(+/-)		33	MM	9	SS	8
Longitude DD(+/-)		115	MM	38	SS	57
Longitude/Latitude Clarification	Center of prop	Location				Northeast cor

County Imperial Ground Water Basin Imperial Valley Hydrologic Region Colorado River WaterShed
Salton Sea Transboundary

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.

The Project goal is to develop an expandable, self sustaining saltwater recycling process that maintains a salinity of 35,000 ppm TDS with no accumulation of selenium in a shallow marine habitat pond by recycling pond water and Salton Seawater using distillation driven by the heat of the sun and the earth. The pilot test location on the south shore of the Salton Sea was chosen because it is recently exposed playa with excellent proximity to existing habitat, water sources, the electrical grid, and less than ? mile from a geothermal power plant with an existing desalination test plant. The Vertical Tube Evaporator (VTE) Salton Seawater desalination test plant is driven by free heat from low pressure geothermal steam. The location is roughly equidistant between the outflow of the New River and the Alamo River on several acres of IID owned playa. The Pilot Project will construct a ? acre shallow marine habitat test pond on recently exposed playa. The habitat pond will be filled with Salton Seawater then diluted to a target salinity of 35,000 ppm TDS and maintained with selenium free distilled seawater supplied by the existing desalination test plant. Fish and invertebrates introduced from the Salton Sea will be monitored and the water quality sustained to support forage by picivorous birds. The solar energy source will be a ? acre Salinity Gradient Solar Pond to be constructed just inshore of the habitat pond. The solar pond will receive the saturated brine byproduct from seawater distillation and use it to provide thermal energy for distilled water make-up to both ponds. Evaporative losses will be controlled with a non-toxic molecular monolayer and made up from seawater. A distillation pilot plant will be installed at the salinity gradient solar pond to access the solar thermal energy, maintain the salinity gradient, and supply make-up water to both ponds. Within the first year, the Project will test available non-toxic molecular monolayer products in evaporation pans, measure seasonal insolation, ambient, and subsurface temperatures at the location, contract a geotechnical evaluation of the local playa, and test methods to clarify and decolorize Salton Sea brine concentrate for the solar pond under existing permits. On completion

of new environmental and construction permitting (1 year) the two ponds will be built. The habitat pond can be in operation within 6 months of construction start. The salinity gradient solar pond and integrated distillation plant can be in operation about 1 ? years after construction start. One year of operation will be needed to quantify the solar energy, water quality, salt balance, nutrients, and selenium in all seasons and observe wildlife usage of the habitat. If successful and cost effective, the solar energy driven saltwater recycling process developed will make shallow marine habitat practical and sustainable in the many areas of expanding Salton Sea playa that lack abundant supplies of low selenium, moderate salinity water from rivers or irrigation drains.

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.

Bruce Wilcox Environmental Manager Water Transfer Imperial Irrigation District Tel: 760-339-9735 Fax: 760-339-9009 Operation Headquarters J15 333 E. Barioni Boulevard Imperial, CA 92251

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.

The Imperial Irrigation District (IID) will manage the Project, hire expert consultants for design and contractors for construction. IID will partner with VTE technology developer, Sephton Water Technology, and partner with geothermal leaseholder and steam provider CalEnergy Operating Company. IID, Project Manager / Principal Investigator - Bruce Wilcox Mr. Wilcox, an ecologist, is IID?s Program Manager for the QSA water transfer mitigation program. In that capacity he is responsible for coordination with the wildlife agencies and implementation of the various mitigation measures associated with the water transfer. These measures include the development and implementation of various habitat and air quality mitigation projects around the Salton Sea. He is also the IID lead for coordination on Salton Sea mitigation and restoration efforts. Sephton Water Technology, Desalination Researcher ? Tom Sephton Tom Sephton is President of Sephton Water Technology, Inc. He currently works at the Salton Sea as lead investigator on the VTE desalination project under contract with the U.S. Bureau of Reclamation. He has 6 years experience desalinating Salton Sea water including the design, construction, and operation of the VTE test plants. Consulting Desalination Engineer ? Dieter Emmermann Dieter Emmermann is an independent engineering consultant specializing in the design and construction of seawater desalination plants. Mr. Emmermann?s expertise comes from over 30 years working in the Middle East and China designing and overseeing the construction of desalination plants. Mr. Emmermann received a Diploma in Mechanical Engineering from Karlsruhe Institute of Technology in Germany. Mr. Emmermann is the principal consulting engineer for the VTE plant. Consulting Salinity Gradient Solar Pond Scientist ? Dr. Huanmin Lu Dr. Huanmin Lu, recently retired from the University of Texas at El Paso (UTEP), was a Research Specialist and Lecturer in the College of Engineering, where he taught courses in dynamics, thermodynamics, fluid mechanics, and heat transfer. Dr. Lu received an M.S. degree in Physics from Capital Normal University in Beijing, China, and an M.S. in Mechanical Engineering and PhD. in Environmental Engineering and Science from the

University of Texas at El Paso. Dr. Lu has a deep theoretical knowledge and experience with Salinity Gradient Solar Ponds including running the UTEP pond project for 16 years. Consulting Salinity Gradient Solar Pond Scientist ? Dr. John Walton PE Dr. John Walton is a Professor in the Department of Civil Engineering at the University of Texas at El Paso, where he does teaching and research in environmental engineering, hydraulics, ground water, and materials degradation. Dr. Walton was a researcher in the El Paso Salinity Gradient Solar Pond Project. Consulting Salinity Gradient Solar Pond Operation Expert ? Herbert Hein Mr. Hein was the El Paso Salinity Gradient Solar Pond Site Manager from 1990 to 2000, responsible for development of operating procedures, design and construction of ponds, liners, wave suppression, diffusers, sampling equipment, data acquisition, and injection control. Mr. Hein operated the pond and tested multi-effect thermal distillation and brine concentration. Mr. Hein was the Site Manager for the Salton Sea Navy Test Base from 2000 to 2004 where he tested enhanced evaporation equipment to remove salts from the Salton Sea. Consulting Environmental Scientist ? Dr. Timothy Krantz Dr. Krantz brings over thirty years of professional experience in environmental assessment and land use planning to the project, combining experience in both the private and public sector, academia and environmental engineering. At the University of Redlands, Dr. Krantz is Chair of the Environmental Studies Program, and is the Salton Sea Database Program Director. Ph.D., Geography, U.C,. Berkeley. 1994. M.A., Latin American Studies, Stanford University. 1991.

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.

IID recently successfully completed Phase I of the Managed Marsh complex. Phase I is an approximately 360 acre aquatic habitat complex built as part of the mitigation program for the water transfer project. The project included the design and construction of the complex within the time frame established in the water transfer and within the JPA budget projections. IID, under Wilcox?s direction, has also successfully implemented several air quality pilot projects that evaluate various emission control technologies and has successfully designed or implemented numerous mitigation measures related to the water transfer or Salton Sea restoration. Project partner Sephton Water Technology has an ongoing project under contract with the U.S Bureau of Reclamation employing the VTE technology to distill Salton Sea water with heat from low pressure geothermal steam. Pilot scale testing is nearing completion. Assembly of a larger capacity VTE Demonstration Plant is underway at the Salton Sea. That work has substantial funding from DWR under a Proposition 50 grant. The equipment assembled and tested under that project will be made available to the proposed Project. Thermal efficiency data and chemical analysis of treated Salton Sea water have met expected targets. Sample data is included in the appendices. Sephton Water Technology also installed a VTE and vacuum flash evaporator at the DWR salinity gradient solar pond test site at Los Banos in 1988 and operated the system for about a year on solar pond heat, under DWR Contract B-56560, to help maintain the salinity gradient and desalt wastewater.

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 overall goal is to develop an expandable, self sustaining saltwater recycling system that maintains a shallow marine habitat pond at a salinity of 35,000 ppm TDS with no accumulation of selenium by replenishing pond water with Salton Seawater using distillation driven by the heat of the sun. The Project will employ the VTE distillation technology already tested with Salton Seawater. Three new objectives for this Project are: 1. To pilot test an alternative sustainable terminal lake shallow marine habitat pond model with minimal inflow and outflow of salts, nutrients, and contaminants and evaporative losses made up with distilled water. This model would use an initial charge of Salton Sea water diluted to a target salinity (i.e.35,000 ppm TDS) and maintained with distilled water sourced from the Salton Sea. 2. To develop an integrated energy system for distillation using solar thermal energy captured in a salinity gradient solar pond supplied by the brine concentrate byproduct from distilling Salton Sea water. 3. To reduce evaporative losses from the ponds with a non-toxic molecular monolayer on the surface of both habitat and solar ponds. If successful, this Salton Seawater recycling system can make shallow marine habitat practical and sustainable in the many areas of the expanding Salton Sea playa that lack abundant supplies of low selenium brackish water from rivers or irrigation drains.

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.

This Project will develop and pilot test an alternative model for creating expandable, sustainable shallow marine habitat ponds at the Salton Sea. The marine habitat aspect of the concept is modeled on holding a microcosm of the existing Salton Sea terminal lake ecosystem at a water quality suitable for the current wildlife population. The Salton Sea has minimal outflow from seepage and suffers a high rate of water loss to evaporation causing gradual concentration of salts and contaminants in the brackish inflow. A marine habitat pond filled with Salton Sea water could be maintained indefinitely at a target salinity without accumulation of selenium or other contaminants by replacing water lost to evaporation and seepage with distilled water. A limited inflow may be needed to supply essential nutrients to support biota, offset by a limited outflow or by seepage alone. The cost of replacing evaporation losses with distilled water is generally assumed to be prohibitive due to high energy costs. However, these costs can be substantially reduced by using available products to reduce evaporation losses and by taking advantage of the uniquely rich renewable energy resources the Salton Sea region offers. This Project will test the use of non-toxic monomolecular layer products to reduce evaporative losses. Pilot tests of both non-commercial geothermal steam and a salinity gradient solar pond will demonstrate low cost heat energy to drive a distillation process. Distilled Salton Sea water will maintain a shallow marine habitat pond. Several questions need to be answered 1. How effective are the available products for evaporative control when applied to Salton Seawater? The products on the market are designed for pools and reservoirs and may perform differently with marine water. 2. Is geo-cooling in the playa adjacent to the ponds a viable option to cool the thermal desalination process? Thermal desalination and electric generation from salinity gradient solar ponds have been cooled by an evaporative loop through the pond surface. Evaporative cooling would increase water use. Geo-cooling would be more beneficial if cost effective. 3. How much seawater or brackish inflow, if any, is needed to supply essential nutrients to a shallow marine habitat pond? The Salton Sea is eutrophic, often suffering from excessive nutrient inflows. A lower level of nutrients is probably healthy for a pond ecosystem. An optimum needs to be determined. 4. Is outflow over and above seepage needed and, if so, how much? 5. How well will a salinity gradient solar pond perform on the Salton Sea playa? Extensive data is available on these ponds in other locations. But, the thermal efficiency depends on local insolation, seasonal temperatures, heat loss through soils under the pond, wind disturbance of the salinity gradient, and impacts of airborne algae and dust on light transmission into the pond. Only local testing can provide data on these factors. 6. Will there be negative impacts from co-locating shallow marine habitat and salinity gradient solar ponds? These could include algae, fish, birds, etc. from the habitat pond interfering with the clarity or gradient stability of the solar pond, or heat impacting the shallow saline habitat pond. 7. What special pond construction methods will be needed on the Salton Sea playa? Few construction projects have been carried out there. Those who've done it warn of heavy equipment sinking rapidly into the muck. 8. What is the cost per acre of an integrated shallow marine habitat and salinity gradient solar pond system? This can be crudely estimated from other locations, but the climate, hydrologic, and environmental conditions at the Salton Sea are unique. Both pond systems are very sensitive to these conditions. Pilot testing will quantify the amount of make-up water needed and the cost to distill it, as well as other construction, water management, and wildlife management costs.

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.

This Project is directly relevant to the creation of habitat both immediately on a small scale and on completion can provide a model for sustainable habitat creation on a much larger scale at many locations on the expanding Salton Sea playa. The project will create a ? acre pilot shallow marine habitat pond on recently exposed Salton Sea playa. Selected invertebrate and fish species will be introduced to the shallow marine habitat pond and sustained over time. These can be desert pupfish, or any mix of species selected by a Project ecologist. Piscivorous birds including brown and white pelicans, cormorants, blue herons, egrets, and one osprey already frequent the locality and can be expected to forage in the habitat pond. This pond will be operated for the duration of the Project, close to two years. The infrastructure and equipment to maintain the pond can be made available indefinitely if continued operation of the proposed concept model is desired. Alternatively, the habitat pond can be supplied with outflow from an existing brackish habitat pond nearby and a few feet upgrade, which is in turn fed from the Vail 6 Drain at Lack and Lindsey Roads. The Project can be expanded quickly at the proposed pilot test location to five acres or more. The equipment now being installed for the VTE Demonstration plant has the capacity to fill a 5 acre salinity gradient solar pond with concentrated brine and to sustain a 5 acre habitat pond expansion with distilled make-up water. More significantly, on completion in three years, the concept pilot tested can be applied to many thousands of acres of playa in other locations as the Salton Sea recedes. The Project will serve as a minimum scale proof of concept for the Solar Sustained Marine Habitat model proposed. If successful and cost effective, this model can be applied to any location on the playa with reasonable proximity to Salton Sea water. No other water supply is required. The energy needs are also self contained, with integration of thermal distillation driven by the salinity gradient solar ponds. Electrical energy for pumping can also be self contained because salinity gradient solar ponds of one acre or larger can achieve thermal efficiencies sufficient to drive an organic rankine cycle generating unit in addition to the distillation plant. If implemented on a large scale, this offers an opportunity for cost recovery benefiting habitat projects in locations where excess electrical generation can be sold to the grid (see attachment ?IID_LargeSolarPondCosts?). In addition to supplying high quality distilled water to the shallow marine habitat pond, the Project will also benefit water quality in the Salton Sea by withdrawing seawater and retuning distilled water to the Sea while the salinity gradient solar pond is being filled. The salts, excess nutrients, and contaminants in the seawater withdrawn will be permanently sequestered in the salinity gradient solar pond. At 30 acre-ft/year of highly saline seawater withdrawn and 22 to 23 acre-ft/year of distilled water returned, the benefit of the pilot project to the Sea will literally be a drop in the bucket. However, an expansion to several thousands of acres could provide a significant benefit to Salton Sea water quality.

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 Project will investigate the hypothesis that habitat for critical fish and piscivorous bird species at the Salton Sea can be conserved by creating a microcosm of the near zero outflow Salton Sea aquatic environment in a shallow marine habitat pond that can be sustained over time at a desired salinity by replacing evaporative and seepage losses with distilled water recycled from the Salton Sea. Evaporative Loss Control Investigate the efficacy of available molecular monolayer products to reduce evaporative losses by dosing selected products into seawater in an evaporation pan. Measure evaporation rate and temperatures while holding salinity steady with distilled water make-up over time versus a non-dosed control pan. Solar Pond Brine Treatment Develop a protocol for concentrating, clarifying, and decolorizing saturated Salton Sea brine. Concentration has been tested with the VTE Pilot Plant. The brine needs to be clear and a yellow color from organic matter needs to be removed. For clarifying brine, settling and filtration will be tested. Activated charcoal can remove the color from organic matter and will be tested. Insolation Measurement Measure insolation at the project location over four seasons by installing and monitoring a pyranometer at the site. Estimate available solar energy for thermal desalination and possible future electrical generation. Playa Soil Study Drill core samples at the pond location for a geotechnical study of soils under the playa. Install temperature probes and heated fluid loops into the drill holes. Record temperature at various depths under the playa over four seasons. Obtain sub-surface thermal conduction data by injecting hot fluid into a borehole pipe loop and measuring temperature rise in an array of adjacent boreholes. Estimate heat loss from the bottom of a salinity gradient solar pond and evaluate thermal conductivity of soil for geo-cooling. Soft Playa Construction Methods Work with contractors experienced in local dike construction to develop construction methods for heavy equipment on soft playa. Try moveable work platforms, progressive berm fill and compaction, and extra low ground pressure per square inch tires and tread extensions. Habitat Pond Water Treatment Fill habitat with Salton Seawater, dilute to 35,000 ppm TDS with distilled seawater from the existing VTE plant. Measure the shallow marine habitat pond water at key intervals for selenium, salinity, nutrients, and any other constituents that may impact wildlife. Introduce selected invertebrate and fish species to the shallow marine habitat pond and monitor population. These can be desert pupfish, or any mix of species selected by a Project ecologist. Develop a system to automatically dose both ponds with a selected molecular monolayer product in response to seasonal evaporation rate changes and high winds. Solar Pond Water Treatment Adapt the solar pond water and salt recycling process used in a 1989 Los Banos VTE test to work with Salton Sea source water. Monitoring During Operation Monitor the salinity gradient, thermal profile, evaporative losses, optical clarity, and any leakage of brine from the salinity gradient solar pond over four seasons of operation. Monitor the shallow saline habitat pond for water quality including salinity, selenium, and nutrients. Monitor biological activity in water and sediment, fish population and use by birds. The monitoring program can be a modest expansion of the existing IID monitoring done as part of the QSA mitigation. Develop methods to correct for any imbalance in the desired water quality and biota by adjusting the inflow and outflow rate to the Sea, filtration, or other methods. Identify and correct any negative interaction of the co-located ponds by measuring the clarity

and gradient stability of the solar pond, observing wildlife use, and measuring any leakage of heat or brine impacting the habitat pond.

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 project will be executed over a three and one half year time frame: Year 1 Studies, before Pond Construction: 1. Investigate molecular monolayer products to reduce evaporative losses over several products and dosing levels. 2. Develop a protocol for concentrating, clarifying, and decolorizing Salton Sea brine. 3. Measure insolation at the project location over four seasons. 4. Drill out core samples of the playa at the pond location for a geotechnical study. Install temperature probes and heated fluid loops into drill holes. Record temperatures for a year and sub-surface thermal conduction data. 5. Create CEQA documentation and NEPA documentation if there is continued Federal involvement. 6. Apply for permits to construct and operate a ? acre shallow marine habitat pond and a ? acre salinity gradient solar pond on the Salton Sea playa. Year 2 Pond Construction and Methods Development Studies: 7. Develop methods to use heavy equipment on soft playa. Construct a ? acre shallow marine habitat pond on playa at the current edge of the Salton Sea south shore with 8 ft berms of local borrow material and rip rap on the sea side. Construct a ? acre salinity gradient solar pond immediately inshore with 12 ft berms and a graded bottom. Install and seal a plastic liner. 8. Fill habitat pond with Salton Seawater, dilute to selected salinity target with distilled seawater from the existing VTE plant. Estimated dilution time is 2 weeks for 24/7 VTE Demonstration plant operation, see 'Water Treatment Process Phase I' diagram, 'Time to Fill Ponds' chart and 'Water Treatment Process Calculations' in attachments. 9. Devise and test a system to automatically dose ponds with a molecular monolayer. 10. Measure the shallow marine habitat pond water at key intervals for selenium, salinity, nutrients, and any other constituents that may impact wildlife. 11. Introduce selected invertebrate and fish species to the shallow marine habitat pond and monitor population. 12. Fill the salinity gradient solar pond to operating depth (4ft) with clear, decolorized, brine concentrated from Salton Seawater. Estimated fill time is 2.5 months for 24/7 VTE Demonstration plant operation, see 'Water Treatment Process Phase II' diagram, 'Time to Fill Ponds' chart and calculations in attachments. 13. Establish a salinity gradient layer (1.5ft thick) above the saturated brine layer in the salinity gradient solar pond and a surface convective layer (1ft thick). Monitor salinity, temperature, and light transmission with depth as the lower saturated brine layer rises in temperature over several weeks. 14. Install the pond site distillation plant using two VTE evaporators and a condenser relocated from the current VTE Pilot Plant. See attached photo 'VTE Pilot Plant'. Connect piping and instrumentation to ponds. Install electrical service for pumps. Year 3+, Operation on Solar, Monitoring, and Adjustments 15. When the salinity gradient solar pond reaches 160?F or more, about two months based on experience at the El Paso pond, operate the pond site distillation plant to maintain the gradient and supply distilled make-up water to both ponds. See 'Water Treatment Process Phase III' diagram and calculations in attachments for estimates of water flows based on prior data. 16. Monitor the salinity gradient, thermal profile, evaporative losses, optical clarity, and any leakage of brine from the salinity gradient solar pond over one year of operation. 17. Monitor the shallow saline habitat pond for water quality. Monitor biological activity in the water and sediment and monitor use of the ponds by birds. Develop methods to correct for any imbalance in the desired water quality and biota. 18. Identify and correct any negative interaction of the co-located ponds.

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.

Phasing is reasonable for this Project if the delays are not more than a year or two. Three options for phasing are obvious: 1. The beginning of the Project can be phased by executing year 1 pre-construction studies while delaying pond construction. This would not impact total costs outside of inflation, but it will delay evaluation of whether the proposed concept can be implemented on a large scale closer to 2017 when the conditions the concept seeks to alleviate will accelerate. 2. The pond construction work can be phased by building the salinity gradient solar pond in advance of the shallow marine habitat pond. The solar pond needs to be available when the habitat pond is ready for dilution so there's a place to put the concentrated brine from distilling Salton Seawater. This will cause a modest increase in costs as one construction project becomes two smaller projects and because the site will have to be secured while waiting for construction to continue. This will delay large scale implementation. 3. Installation of the pond site distillation plant could be delayed because the larger geothermal steam VTE Demonstration Plant could supply make-up water for the habitat pond for an extended period of time if necessary. This will increase costs as the larger VTE desalination plant will have to be operated for a longer period of time with crew. The distilled make-up water and brine concentrate will also have to be pumped ? mile to the ponds for a longer time. This will delay large scale implementation, but useful operation and monitoring of the habitat pond can be accomplished during the construction delay.

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.

If successful and cost effective, the solar energy driven saltwater recycling process developed will make shallow marine habitat practical and sustainable in the many areas of expanding Salton Sea playa that lack abundant supplies of low selenium, moderate salinity water from rivers or irrigation drains. Another benefit is the elimination of fugitive dust emissions by covering emissive playa with habitat and solar ponds for the life of any project. If the ponds are decommissioned after several decades of operation, habitat ponds can be flushed and converted to agriculture while the solar ponds can be evaporated to dryness and the salts wrapped in the pond liners and removed then converted to agriculture or to other solar energy uses. A salinity gradient solar pond will serve as a salt sink for the Salton Sea during the time it's being filled with concentrated brine. If the monomolecular layer products can provide a substantial reduction in evaporation from the habitat and solar ponds, then when a large acreage of ponds and the greater Salton Sea is viewed as a system, there's a net benefit from reducing the rate of increase in salinity in the Salton Sea and reducing the rate at which playa is exposed.

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 govern authorizing the submittal of this application.

Last Uploaded Attachments: IID_SignedAuthorization.pdf

A2 - Applicant Team Organization: Chart

Attach an organization chart indicating key staff and their roles relative to the proposed work.
Last Uploaded Attachments: OrganizationChart_ver01.ppt

A3 - Resumes/CVs

Attach resumes/CVs for the PM/PI and key staff proposed for the project. You can combine all tl long as the individuals are identified.
Last Uploaded Attachments: IID_Krantz_resume_Salton Sea_2011.pdf,IID_SephtonResume2012_SWT.doc,IID_Walton_CV.pdf,IID_Wilcox_Bio.docx,IID_Tc

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 conducte for each task. The work plan must also identify which costs are being directly funded by the Prog
Last Uploaded Attachments: IID_WorkPlan_01.doc

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.
Last Uploaded Attachments: IID_CEQA_MEMO_DCM_IS.pdf,IID_LargeSolarPondCosts_v08.xls,IID 02.doc,IID_VTE_CEQA_ADDENDUM_8-18-04.DOC,IID_VTE_CEQA_NEPA_2008.pdf

A4 - Continued

Upload here any additional documents describing the work plan if needed.
Last Uploaded Attachments: IID_VTE_NEPA_YAO-CEC-08-017.pdf

A5 - Budget

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

Last Uploaded Attachments: IID_Budget_02.docx,IID_LineItemBudget_02.docx

A5 - Continued

Upload any additional documents describing the Budget if needed.

Last Uploaded Attachments:
IID_VTE_DonatedEquipment.xls,IID_LineItemBudget_ExcelResources_ver05.xls,IID_TaskCosts_Ex

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. Microsoft Word, Excel, or Project file formats.

Last Uploaded Attachments: IID_Schedule_MSP2010_ver06.mpp,IID_Schedule_MSP2010_ver06.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 current condition of the proposed site. Please include a legal description of the project site, if avai

Last Uploaded Attachments:
IID_SiteMap_Ponds.pdf,IID_SiteMap_VTE_Ponds.pdf,IID_SiteAreaMap_topo.pdf,IID_SiteA_Photo_

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
help illustrate project features and assist in the review of the proposal.

A8 - Continued

Upload here any supplemental drawings and figures related to the project if needed.
Last Uploaded Attachments: IID_WaterTreatmentProcessDiagrams_01.pdf,IID_TimeToFill
PondsChart_01.pdf,IID_WaterTreatmentProcessCalculations_02.xls

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 proje
Last Uploaded Attachments: IID_CalEnergy_SolarPondPilot_
2011.pdf,IID_CalEnergy_SaltGradientSola_2012.odt,IID_Salton_Sea_Letter_2.pdf

A9 - Continued

Upload any letters of support you may have received.
Last Uploaded Attachments: IID_CalEnergy_VTE_SupportLetter_2008.pdf,IID_CalEnergy_VTE_Sup

A10 - Operation and Maintenance Plan

Upload your Operation and Maintenance plan if needed.