

GRANTS/CONTINGENT AWARD REQUEST

CEC-270 (Revised 02/10)

CALIFORNIA ENERGY COMMISSION



To: Grants and Loans Office

Date: 4/2/2012

Project Manager: Misa Milliron

Phone Number: 916-327-1545

Office: Energy Generation Research Office

Division: Energy Research and Development

MS- 43

Improving Decision Support for Environmental Review and Planning of Proposed Solar Energy Projects

Project Title: Relative to Mojave Desert Tortoise

Environmental

Type of Request: (check one)

New Agreement: (include items A-F from below) Agreement Number: PIR-11-013
Program: PIER E / Environmental Area
Solicitation Name and/or Number: PON-11-502-08 (Solicitation to Address Environmental Issues Related to Clean Energy Systems)
Legal Name of Recipient: Redlands Institute, University of Redlands
Recipient's Full Mailing Address: PO Box 30801200 E Colton Ave, Redlands, CA 92373-0999
Recipient's Project Officer: Philip Murphy Phone Number: 909-748-8647
Agreement Start Date: 6/25/2012 Agreement End Date: 3/30/2015

Amendment: (Check all that apply) Agreement Number:
Term Extension - New End Date:
Work Statement Revision (include Item A from below)
Budget Revision (include Item B from below)
Change of Scope (include Items A - F as applicable from below)
Other:
RECEIVED APR 9 2012 CONTRACTS, GRANTS & LOANS

ITEMS TO ATTACH WITH REQUEST:

- A. Work Statement B. Budget C. Recipient Resolution, if applicable. (Resolution may be requested in Special Conditions if not currently available.) D. Special Conditions, if applicable. E. CEQA Compliance Form F. Other Documents as applicable: Copy of Score Sheets, Copy of Pre-Award Correspondence, Copy of All Other Relevant Documents

California Environmental Quality Act (CEQA)

CEC finds, based on recipient's documentation in compliance with CEQA:
Project exempt: NOE filed:
Environmental Document prepared: NOD filed:
Other:
CEC has made CEQA finding described in CEC-280, attached

Funding Information:

*Source #1: PIER-E Amount: \$ 563,776.00 Statute: 10- FY: 11-12 Budget List #: 501.0271
*Source #2: Amount: \$ Statute: FY: Budget List #:
*Source #3: Amount: \$ Statute: FY: Budget List #:

If federally funded, specify federal agreement number:

* Source Examples include ERPA, PIER-E, PIER-NG, FED, GRDA, ARFVT, OTHER.

Business Meeting Approval: (refer to Business Meeting Schedule)

Proposed Business Meeting Date: 5/9/2012 Consent Discussion
Business Meeting Participant: Misa Milliron Time Needed: 5 minutes

Agenda Notice Statement: (state purpose in layperson terms)

Possible approval of a Grant / Contingent Award to...

Possible approval of Agreement PIR-11-XXX for a grant of \$563,776.00 to Redlands Institute to improve a decision support technology to evaluate and mitigate impacts to the desert tortoise from solar developments in the Mojave desert. (PIER electricity funding) Contact: Misa Milliron. (5 minutes)

Signatures and dates: Project Manager (4/4/12), Office Manager L. Spiegel (4/4/12), Deputy Director (4/4/12)

Exhibit A WORK STATEMENT

TECHNICAL TASK LIST

Task #	CPR	Task Name
1		Administration
2		Data Development and Management
3		Process Optimization and Online Data Portal
4		Model Engine Testing
5		Review and Enhancement of Recovery Action Creation and Modeling
6	X	Modeling the Effects of Population Fragmentation
7		Incorporating Large and Long-Term Cumulative Effects of Impacts and Recovery Actions
8		Improving Sensitivity Analyses
9		Development of Enhanced Web Application

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Philip Murphy, Nathan Strout – Redlands Institute (RI)	Catherine Darst – US Fish and Wildlife Service (USFWS)	
2	Philip Murphy, Nathan Strout - RI	Catherine Darst - USFWS	
3	Naicong Li, Nathan Strout - RI	Catherine Darst - USFWS	
4	Nathan Strout - RI	Catherine Darst - USFWS	
5	Philip Murphy - RI	Catherine Darst - USFWS	
6	Philip Murphy, Nathan Strout - RI	Catherine Darst - USFWS	
7	Philip Murphy, Nathan Strout - RI	Catherine Darst - USFWS	
8	Philip Murphy, Nathan Strout - RI	Catherine Darst - USFWS	
9	Nathan Strout - RI	Catherine Darst - USFWS	

GLOSSARY

Specific terms and acronyms used throughout this scope of work are defined as follows:

Term/ Acronym	Definition
BLM	Bureau of Land Management
CDFG	California Department of Fish and Game

Exhibit A WORK STATEMENT

Term/ Acronym	Definition
CPR	Critical Project Review
DoD	United States Department of Defense
DRECP	Desert Renewable Energy Conservation Plan
DTRO	USFWS Desert Tortoise Recovery Office
EMDS	Ecosystem Management Decision Support System
Energy Commission	California Energy Commission
GIS	Geographic Information System, Geographic Information Science
NPS	National Park Service
PIER	Public Interest Energy Research
RD&D	Research, Development and Demonstration
RI, Institute	Redlands Institute, University of Redlands
RIT, RITs	Desert Tortoise Recovery Implementation Teams
RPS	Renewables Portfolio Standard
SAC	Science Advisory Committee of the USFWS DTRO
SAN	Storage Area Network
SDS, SDSS	Spatial Decision Support, Spatial Decision Support System
STEP	Siting, Transmission, and Environmental Protection Division, Energy Commission
USFWS	US Fish and Wildlife Service

Problem Statement:

This project will help remove environmental barriers to the timely permitting and deployment of clean energy facilities through a targeted extension of the desert tortoise spatial decision support system (SDSS) currently in development with support from the California Energy Commission's (Energy Commission's) Public Interest Energy Research (PIER) Program and the US Fish and Wildlife Service (USFWS). The SDSS provides a structured framework for assessing the impacts of solar energy development projects on the tortoise and quantifying the benefits of proposed mitigation strategies, which can assist the Energy Commission in balancing environmental concerns with the need for renewable energy. Building on prior research, the project will strengthen the scientific basis of current data, models and analysis, improve system computation and reporting, and enhance the web-based user application. Specific desert tortoise information gaps will be addressed, including threat and recovery action information needed to assess impacts accurately for environmental review processes. As more demands are placed on land in the desert, the set of effective recovery actions is constantly changing and increasingly limited. New information on effective recovery actions, population fragmentation and land acquisition for specific regions can help agencies to better evaluate alternative mitigation scenarios and reduce risk and uncertainty in the permitting process.

Goals of the Agreement:

The goal of this Agreement is to reduce environmental conflict over renewable energy projects, by providing timely access to sound and transparent scientific information and

Exhibit A WORK STATEMENT

decision support technology on the potential threats, impacts, and recovery actions affecting desert tortoise in California. This research will allow the Energy Commission and other agencies to more rapidly and efficiently run calculations of potential impacts of solar energy development projects and evaluate alternative mitigation scenarios, reducing the possibility of future conflict and inefficiency in project review.

Objectives of the Agreement:

The objectives of this Agreement are to (1) improve system models to evaluate the direct and indirect effects of solar energy development projects on the Mojave desert tortoise, and better assess the relative value of recovery actions for mitigation, (2) provide scientifically-robust results with appropriate measures of uncertainty to help inform decision-making both at the project and landscape scale, and (3) develop tools to support efficient evaluation of proposed projects and recovery action portfolios. Measures of success for these objectives include (a) successful completion of up to 15 model runs for high-priority Energy Commission- evaluated solar energy development projects, (b) decrease in the average turn-around time for these model runs, with a goal of 2 weeks to deliver model offset reports, (c) delivery of new functionality including the ability to perform direct and indirect effects analyses and integrate new recovery action information, and (d) improved ability to report on spatial sensitivity analysis, and to generate error bars assigned to impact and mitigation calculations.

TASK 1 ADMINISTRATION

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

- Attend a “Kick-Off” meeting with the Commission Project Manager, the Grants Officer, and a representative of the Accounting Office. The Recipient shall bring its Project Manager, Agreement Administrator, Accounting Officer, and others designated by the Commission Project Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Project Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Discussion of the terms and conditions of the Agreement
- Discussion of Critical Project Review (Task 1.2)
- Match fund documentation (Task 1.6). No work may be done until this documentation is in place.
- Permit documentation (Task 1.7)
- Discussion of subcontracts needed to carry out project (Task 1.8)

Exhibit A WORK STATEMENT

The technical portion of the meeting shall include, but not be limited to, the following:

- The Commission Project Manager's expectations for accomplishing tasks described in the Scope of Work
- An updated Schedule of Products
- Discussion of Progress Reports (Task 1.4)
- Discussion of Technical Products (Product Guidelines located in Section 5 of the Terms and Conditions)
- Discussion of the Final Report (Task 1.5)

The Commission Project Manager shall designate the date and location of this meeting.

Recipient Products:

- Updated Schedule of Products
- Updated List of Match Funds
- Updated List of Permits

Commission Project Manager Product:

- Kick-Off Meeting Agenda

Task 1.2 Critical Project Review (CPR) Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and to identify any needed modifications to the tasks, products, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Recipient. The Commission Project Manager may schedule CPRs as necessary, and CPR costs will be borne by the Recipient.

Participants include the Commission Project Manager and the Recipient and may include the Commission Grants Officer, the Division team lead, other Energy Commission staff and Management as well as other individuals selected by the Commission Project Manager to provide support to the Energy Commission.

The Commission Project Manager shall:

- Determine the location, date, and time of each CPR meeting with the Recipient. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.

Exhibit A WORK STATEMENT

- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. Modifications to the Agreement may require a formal amendment (please see section 8 of the Terms and Conditions).
- Provide the Recipient with a written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more product(s) that were included in the CPR.

The Recipient shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other products identified in this scope of work. The Recipient shall submit these documents to the Commission Project Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Commission Project Manager Products:

- Agenda and a list of expected participants
- Schedule for written determination
- Written determination

Recipient Product:

- CPR Report(s)

Task 1.3 Final Meeting

The goal of this task is to close out this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Recipient, the Commission Grants Office Officer, and the Commission Project Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Project Manager.

Exhibit A WORK STATEMENT

The technical portion of the meeting shall present an assessment of the degree to which project and task goals and objectives were achieved, findings, conclusions, recommended next steps (if any) for the Agreement, and recommendations for improvements. The Commission Project Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Commission Project Manager and the Grants Officer about the following Agreement closeout items:

- What to do with any equipment purchased with Energy Commission funds (Options)
- Energy Commission's request for specific "generated" data (not already provided in Agreement products)
- Need to document Recipient's disclosure of "subject inventions" developed under the Agreement
- "Surviving" Agreement provisions
- Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

Products:

- Written documentation of meeting agreements
- Schedule for completing closeout activities

Task 1.4 Quarterly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement on time and within budget.

The objectives of this task are to summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, and to form the basis for determining whether invoices are consistent with work performed.

The Recipient shall:

- Prepare a Quarterly Progress Report which summarizes all Agreement activities conducted by the Recipient for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Project Manager within 10 days of the end of the reporting period. The recommended specifications for each progress report are contained in Section 6 of the Terms and Conditions of this Agreement.

Exhibit A WORK STATEMENT

Product:

- Quarterly Progress Reports

Task 1.5 Final Report

The goal of the Final Report is to assess the project's success in achieving its goals and objectives, advancing science and technology, and providing energy-related and other benefits to California.

The objectives of the Final Report are to clearly and completely describe the project's purpose, approach, activities performed, results, and advancements in science and technology; to present a public assessment of the success of the project as measured by the degree to which goals and objectives were achieved; to make insightful observations based on results obtained; to draw conclusions; and to make recommendations for further projects and improvements to the project management processes.

The Final Report shall be a public document. If the Recipient has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Recipient shall perform the following activities for both the public and confidential versions of the Final Report.

The Recipient shall:

- Prepare an Outline of the Final Report.
- Prepare a Final Report following the approved outline and the latest version of the Final Report guidelines which will be provided by the Commission Project Manager. The Commission Project Manager shall provide written comments on the Draft Final Report within fifteen (15) working days of receipt. The Final Report must be completed at least 60 days before the end of the Agreement Term.
- Submit one bound copy of the Final Report with the final invoice.

Products:

- Draft Outline of the Final Report
- Final Outline of the Final Report
- Draft Final Report
- Final Report

Task 1.6 Identify and Obtain Matching Funds

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. Although the Energy Commission budget for this task will be

Exhibit A WORK STATEMENT

zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of Energy Commission funds for each task during the term of this Agreement. Match funds must be identified in writing and the associated commitments obtained before the Recipient can incur any costs for which the Recipient

The Recipient shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter. If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter a list of the match funds that identifies the:
 - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
 - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- Provide a copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured. For match funds provided by a grant a copy of the executed grant shall be submitted in place of a letter of commitment.
- Discuss match funds and the implications to the Agreement if they are reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Commission Project Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Project Manager within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the Agreement and may trigger an additional CPR.

Products:

- A letter regarding match funds or stating that no match funds are provided
- Copy(ies) of each match fund commitment letter(s) (if applicable)
- Letter(s) for new match funds (if applicable)

Exhibit A WORK STATEMENT

- Letter that match funds were reduced (if applicable)

Task 1.7 Identify and Obtain Required Permits

The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. Although the Energy Commission budget for this task will be zero dollars, the Recipient shall budget match funds for any expected expenditures associated with obtaining permits. Permits must be identified in writing and obtained before the Recipient can make any expenditure for which a permit is required.

The Recipient shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting. If there are no permits required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies the:
 - Type of permit
 - Name, address and telephone number of the permitting jurisdictions or lead agencies
 - The schedule the Recipient will follow in applying for and obtaining these permits.
- Discuss the list of permits and the schedule for obtaining them at the kick-off meeting and develop a timetable for submitting the updated list, schedule and the copies of the permits. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the Progress Reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, provide the appropriate information on each permit and an updated schedule to the Commission Project Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Project Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Project Manager within 5 working days. Either of these events may trigger an additional CPR.

Products:

- Letter documenting the permits or stating that no permits are required
- A copy of each approved permit (if applicable)

Exhibit A WORK STATEMENT

- Updated list of permits as they change during the term of the Agreement (if applicable)
- Updated schedule for acquiring permits as changes occur during the term of the Agreement (if applicable)

Task 1.8 Obtain and Execute Subcontracts

The goal of this task is for Recipients to identify any subcontracts required to carry out the tasks under this Agreement and to procure them consistent with the terms and conditions of this Agreement and the Recipient's own procurement policies and procedures. It will also provide the Energy Commission an opportunity to review the subcontracts to ensure that the tasks are consistent with this Agreement, that the budgeted expenditures are reasonable and consistent with applicable cost principles.

The Recipient shall:

- Prepare a letter documenting the subcontracts required to conduct this Agreement, and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting. If there are no subcontracts required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that subcontracts will be required during the course of the Agreement, provide in the letter:
 - A list of the subcontracts that describes the anticipated maximum budget and general scope of work for each,
 - A description of the procurement process to be used, and
 - The schedule the Recipient will follow in applying for and obtaining these subcontracts
- Submit a draft of the subcontract that will include a budget with the information required in the budget details to the Commission Project Manager for review and approval, and incorporate any changes recommended by the Commission Project Manager.
- Submit a final copy of the executed subcontract.

Products:

- Letter describing the subcontracts needed, or stating that no subcontracts are required
- Draft subcontracts
- Final subcontracts

Task 1.9 Desert Tortoise Recovery Office Science Advisory Committee Workshop

The goal of this task is to host a workshop with the Desert Tortoise Recovery Office (DTRO) Science Advisory Committee (SAC) who are already engaged in providing guidance to this research. The workshop, to take place in spring 2013 in Southern CA, will solicit input regarding our research direction and ensure alignment with current science related to desert tortoise recovery.

Exhibit A WORK STATEMENT

The Recipient shall:

- Conduct a 2-day workshop with DTRO SAC. This includes:
 - Preparing invitations and managing meeting logistics;
 - Facilitating presentations and discussion during the meeting; and
 - Summarizing meeting results.

Products:

- Workshop agenda and presentation(s) (no draft)
- Summary of meeting attendees and discussions (no draft)

TECHNICAL TASKS

TASK 2 DATA DEVELOPMENT AND MANAGEMENT

The goal of this task is to develop, acquire, upgrade, and manage relevant Geographic Information System (GIS) and scientific data to support research and model improvements (performed in Tasks 5, 6 and 7). This includes collaboration with agencies and stakeholder groups on the integration of data on proposed solar project footprints and access to prioritized, site-specific recovery actions developed under a separate USFWS grant by desert tortoise recovery implementation teams (RITs).

The Recipient shall:

- Work with data providers to develop and acquire relevant datasets.
- Upgrade, manage, and perform quality control to integrate new datasets with existing data in the geodatabase and with SDSS models and analyses.
- Document data researched through a written inventory, and document data selected for the system in the online Desert Tortoise Data Explorer.
- Provide access instructions for expanded datasets and metadata through the Desert Tortoise Threats Data Explorer (http://www.mojavedata.gov/deserttortoise_gov/tools/data.html)

Products:

- Written inventory of datasets in the SDSS indicating which datasets have been newly integrated into the geodatabase and system models and analyses in this Agreement (no draft)
- Access instructions for the Desert Tortoise Threats Data Explorer datasets and metadata (no draft)

TASK 3 PROCESS OPTIMIZATION AND ONLINE DATA PORTAL

The goal of this task is to improve the process for agencies or industry to provide project footprints and spatially-explicit descriptions of recovery and mitigation actions, which currently requires manual data manipulation and modeling. This will enhance workflows

Exhibit A WORK STATEMENT

and system performance, and decrease the turnaround time for full project-based calculations and reports.

The Recipient shall:

- Create workflows and automated processes, as well as an online data portal that will more efficiently support the transfer of specific spatial datasets for analysis by agency, regulatory, and industry personnel.
- Prepare written documentation on the workflows and automated processes.
- Capture Salafsky's standard lexicon for biodiversity threats and conservation actions in the Spatial Decision Support (SDS) Knowledge Portal Ontology hosted by the Redlands Institute. The Salafsky lexicon provides a peer-reviewed, well-established set of standard definition of threats, recovery actions, stresses and population demographic factors for species recovery (Salafsky, N. et. al., 2008 in Conservation Biology 22: 897-911).
- Link the SDSS modeling engine to run off the extended ontology so that agency personnel may directly access the definitions and concepts in this comprehensive, publicly available, peer-generated source (<http://www.spatial.redlands.edu/sds/>).
- Prepare formal documentation about linkage from the SDSS modeling engine to the SDS Ontology as a decision process workflow.

Products:

- Access instructions for online data portal (no draft)
- Written documentation on workflows and data formats
- Written documentation about linkage from SDSS modeling engine to SDS Ontology

TASK 4 MODEL ENGINE TESTING

The goal of this task is to test the effectiveness of the SDSS modeling engine and system performance through quantitative runs of the system for up to 15 high-priority Energy Commission identified solar energy projects, to be determined by consultation with the Energy Commission. As with Task 3, this will improve system performance and decrease turnaround time for calculations and reports.

The Recipient shall:

- Organize, hold, and summarize meetings with Siting, Transmission, and Environmental Protection Division staff to select projects for testing
- Run calculations for up to 15 Energy Commission selected projects on (1) known project footprints for which calculations have already been performed, in order to better understand changes in outputs, and (2) new project footprints, to test how the system handles new sub-models in order

Exhibit A WORK STATEMENT

to test, validate, and refine the system's performance, calculations, and products.

- Prepare PDF reports of the performed calculations.
- Create a reporting module template for generating the standard project-based report developed manually under the previous Energy Commission grant, PIR-10-048.
- Prepare written documentation on system output improvements made over the course of this task.

Products:

- STEP Division meeting summaries (no draft)
- PDF reports of system calculations (no draft)
- Reporting module template
- Written documentation of system output improvements from this task

TASK 5 REVIEW AND ENHANCEMENT OF RECOVERY ACTION CREATION AND MODELING

The goal of this task is to enhance system models for the population effects of recovery actions. The recipient will add and prioritize information on where recovery actions are most needed (areas most appropriate for mitigation) by (a) leveraging concurrent efforts of desert tortoise RITs on site-specific 5-year recovery action plans, and (b) revising the land acquisition model.

The Recipient shall:

- Integrate region-specific lists of prioritized recovery actions from the RITs, to improve model calculations and identify potential effects of recovery actions.
- Prepare database of prioritized regional recovery actions created through the RIT process.
- Develop a methodology and toolset to facilitate design and storage of additional spatially-explicit recovery actions for analysis, approval, and integration.
- Review and improve the system's land acquisition model.
- Enable head-to-head comparison of both project impact and recovery value of mitigation actions pairs.
- Provide the improved system models for generating recovery actions and mitigation options to the Commission Agreement Manager.

Products:

- Database of prioritized regional recovery actions created through the RIT process (no draft)
- Toolset to facilitate the design of site-specific recovery actions
- Written documentation describing system models with new improvements specified

Exhibit A WORK STATEMENT

TASK 6 MODELING THE EFFECTS OF POPULATION FRAGMENTATION

The goal of this task is to research alternative approaches to estimating the effects of habitat fragmentation and how these may be integrated in the SDSS calculations, in order to improve current modeling of population-level effects of solar energy development and of those recovery actions which are predicted to restore population connectivity.

The Recipient shall:

- Host up to 3 workshops to engage groups undertaking related research (USFWS DTRO; University of Nevada-Reno; NatureServe; US Geological Survey (USGS)). This includes:
 - Sending invitations and meeting information, and arranging logistics;
 - Facilitating presentations and discussion during the meetings; and
 - Summarizing meeting results.
- Develop a strategy for using these groups' research outputs in the SDSS framework to better model connectivity needs and effects of population fragmentation.
- Make refinements to the SDSS models for handling effects of population fragmentation.
- Participate in a CPR per Task 1.2.
- Prepare a CPR Report per Task 1.2.

Products:

- Workshop agenda(s) and presentation(s) (no draft)
- Summary of meeting attendees and discussions (no draft)
- Written documentation describing refined SDSS models for handling effects of population fragmentation
- CPR Report (no draft)

TASK 7 INCORPORATING LARGE AND LONG-TERM CUMULATIVE EFFECTS OF IMPACTS AND RECOVERY ACTIONS

The goal of this task is to investigate methods and revise system models for addressing long-term effects of impacts and recovery actions, as well as the potential effects of stochastic processes like climate change, a critical issue for all resource management agencies.

The Recipient shall:

- Investigate (1) how to incorporate new climate change scenario data including USGS predicted shifts in desert tortoise habitat composition, (2) how the Leslie matrix (a matrix of demographic rates from which population trajectories can be estimated) of the improved demographic

Exhibit A WORK STATEMENT

model, supported by the previous Energy Commission grant (PIR-10-048), can be used in the context of solar energy calculations to help account for temporal change in the set of priority recovery actions, (3) how to interpret some of relationships in the model as time lags, and (4) improve the integration of changes in carrying capacity with those in demographics.

- Research ways to improve the systems' ability to handle changes in threats to the desert tortoise where the spatial magnitude of the change is so large that assumptions of linearity may no longer hold true. The current model assumes that new changes in threats are small compared to the overall current threat. If all of the proposed solar energy plants were approved, this would no longer be the case.
- Refine the SDSS models addressing the focal temporal and large-scale effects.
- Provide written documentation of the revisions to the system models, including the refined SDSS models that address the temporal and large-scale effects, to the Commission Agreement Manager.

Products:

- Written documentation of revisions to system models to address large and long-term effects

TASK 8 IMPROVING SENSITIVITY ANALYSES (ongoing)

The goal of this task is to continue to develop sensitivity and uncertainty analyses started under Energy Commission grant PIR-10-048, by applying the tools created for the new modeling described above in Tasks 3 - 7. These analyses address how risk estimates vary with changes in the parameters of the model; for example, the relative contribution of a given threat to a given stress. When combined with characterization of uncertainty in the input data (e.g., threat distribution), this analysis can provide us with an estimate of the uncertainty in the system outputs. In this project we will provide more defensible and transparent results by documenting levels of uncertainty around outputs, and helps users understand the variation in uncertainty around the SDSS calculations so that system results may be correctly interpreted and evaluated. We will leverage ongoing work funded through FWS DTRO that incorporates research by our collaborator Dr. Arika Ligmann-Zielinska and others on variance-based sensitivity analysis. This new work will focus on improving our ability to report on sensitivity analysis in a spatial manner, and to generate error bars assigned to impact and mitigation calculations.

The Recipient shall:

- Continue research on appropriate methods for spatial sensitivity analysis.
- Prepare written documentation of the sensitivity analysis.
- Extend current approach to revised SDSS sub-models emerging from Tasks 3-7. Changes made to data and models in these tasks will be incorporated to provide new estimates of sensitivity. This will test how well

Exhibit A WORK STATEMENT

our sensitivity approach responds to these changes, and as mentioned above, will generate error bars for impact and mitigation calculations.

- Prepare written documentation of the refined SDSS outputs with sensitivity analyses and measures of uncertainty.

Products:

- Written documentation of sensitivity analysis research findings
- Written documentation of refined SDSS outputs

TASK 9 DEVELOPMENT OF ENHANCED WEB APPLICATION

The goal of this task is to integrate new capabilities developed in Tasks 2-8 in the web-based SDSS application, to improve the user experience through extended functionality and user interface. These capabilities will not be available to all users of the system and the project team will work with the Energy Commission, USFWS, and other agencies to define roles, responsibilities, and access to the system.

The Recipient shall:

- Collaboratively design and extend the current web application for new capabilities developed in Tasks 2-8.
- Implement enhancements to the web application interface once the underlying functionality is complete, which may include but is not limited to:
 - map-based design tools for sketching and describing projects to be submitted for analysis,
 - map-based design tools for sketching and describing recovery actions to be submitted for analysis,
 - enhanced methods for recovery action prioritization and recommendation from the RIT-designed actions, and
 - enhanced query and reporting of expected project-related and recovery action-related impacts.
- Provide written documentation of the enhancements made to the web application and user interface.

Products:

- Written documentation of enhancements to web application and user interface
- Access instructions to extended web application, user interface, and enhanced security/access model