DOE/EA-1752

FINAL ENVIRONMENTAL ASSESSMENT

FOR THE

PACIFIC GAS AND ELECTRIC COMPANY (PG&E) COMPRESSED AIR ENERGY STORAGE (CAES) COMPRESSION TESTING PHASE PROJECT, SAN JOAQUIN COUNTY, CALIFORNIA

U.S. Department of Energy
National Energy Technology Laboratory

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COVER SHEET

Responsible Agency: U.S. Department of Energy (DOE)

Title: *Final Environmental Assessment for the Pacific Gas and Electric Company (PG&E) Compressed Air Energy Storage (CAES) Compression Testing Phase Project, San Joaquin County, California (DOE/EA-1752*)

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Abstract: DOE prepared this EA to evaluate the potential environmental consequences of providing a financial assistance grant under the *American Recovery and Reinvestment Act of 2009* (Recovery Act; Public Law 111-5, 123 Stat.115) in a cooperative agreement with Pacific Gas and Electric Company (PG&E) as part of the Smart Grid Demonstrations Program. The project is co-funded by the federal DOE, California Public Utilities Commission, and the California Energy Commission. If PG&E receives the funding, the company proposes construction, operation, and closure of an injection and withdrawal well and associated temporary site facilities required to conduct compression testing of a depleted gas field. The geological formation to be tested is located on King Island, San Joaquin County, California. The project would consist of pressure testing a CAES reservoir to further examine and confirm the geological suitability of the site and provide more detailed information to provide a basis for engineering a possible future use of this site as a CAES facility. The permitting process includes the DOE serving as the lead federal agency for compliance with the National Environmental Policy Act of 1969, as amended (NEPA) and the U.S. Environmental Protection Agency for an Underground Injection Control Program Class V Injection & Withdrawal Well. This EA analyzes the potential environmental impacts of DOE's proposed action of providing Recovery Act funding for the PGE& CAES compression-testing project and of the No-Action Alternative.

The total cost of the compression-testing component of the project would be approximately $20 to $25 million.

In this EA, DOE evaluated the impacts to air quality; land resources/land use; biological resources; geology and soils; noise & vibration; cultural, historical and paleontological resources; socioeconomics and environmental justice; public and occupational health and safety; waste management; aesthetics and visual resources; utilities, energy and minerals; transportation; and water resources from PG&E's proposed Project.

Availability: DOE encourages public participation in the NEPA process. A Notice of Availability was placed in *The Record* (Stockton) and the *Lodi News-Sentinel* on November 26, 2013. *DOE made the draft EA* available for public review on *its* National Energy Technology Laboratory web site and at the San Joaquin County Public Library System beginning November 26, 2013. This EA is available on DOE's National Energy Technology Laboratory web site, http://www.netl.doe.gov/library/environmental-assessments, and DOE's NEPA web site at http://energy.gov/nepa/nepa-documents. *Additions and revisions to the text are presented in italics.*

ACRONYMS AND ABBREVIATIONS

AAQ	Ambient Air Quality
AFC	*Application for Certification*
AMM	Avoidance and Minimization Measure
APE	area of potential effects
ARB	California Air Resources Board
BMP	best management practices
BCA	biological constraints analysis
CAES	Compressed Air Energy Storage
CAISO	*California Independent System Operator*
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CH_4	methane
CFR	*Code of Federal Regulations*
CNDDB	California Natural Diversity Database
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
dB	decibel
dBA	A-weighted decibel
DOE	U.S. Department of Energy
DOGGR	Department of Oil, Gas, and Geothermal Resources
EA	*Environmental Assessment*
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	federal Endangered Species Act
FEMA	Federal Emergency Management Agency
FWS	U.S. Fish and Wildlife Service
gpm	gallon(s) per minute
HFCs	hydrofluorocarbons
Hz	Hertz
IPCC	Intergovernmental Panel on Climate Change
IW	injection and withdrawal
M	Richter Magnitude
MCE	maximum credible earthquake

MMscf	million standard cubic foot
MW	*Megawatt*
N_2O	nitrous oxide
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act of 1969, as amended
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NRC	National Academy of Sciences
NRHP	National Register of Historic Places
NSR	North State Resources
NWI	National Wetlands Inventory
PFC	perfluorocarbon
PG&E	Pacific Gas and Electric Company
PM_{10}	particulate matter with median aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$	particulate matter with median aerodynamic diameter of 2.5 micrometers or less
RFO	*Request for Offers*
ROG	reactive organic gas
RPR	California Rare Plant Rank
SF_6	sulfur hexafluoride
SHPO	California State Historic Preservation Officer
SJMSCP	San Joaquin County Multispecies Habitat Conservation and Open Space Plan
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide
Stat.	*United States Statutes at Large*
TDS	total dissolved solids
THPO	*Tribal Historic Preservation Officer*
tpy	tons per year
TSF	Temporary Site Facilities
U.S.C.	*United States Code*
UIC	Underground Injection Control
USDW	Underground Sources of Drinking Water
WRAP	Western Regional Air Partnership

Note: Numbers in this EA generally have been rounded to two or three significant figures. Therefore, some total values might not equal the actual sums of the values.

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SUMMARY

The U.S. Department of Energy (DOE) prepared this *final* environmental assessment (EA) to evaluate the potential environmental impacts of providing a financial assistance grant for up to $25 million under the *American Recovery and Reinvestment Act of 2009* in a cooperative agreement with Pacific Gas and Electric Company (PG&E) as part of the Smart Grid Demonstrations Program. The study is co-funded by the federal DOE, California Public Utilities Commission and the California Energy Commission. If PG&E receives the funding, the company proposes construction, operation, and decommissioning of an injection and withdrawal well, compression equipment, and associated temporary site facilities required to conduct pressure testing of a depleted gas field. PG&E proposes testing the gas field to confirm its geologic and engineering suitability for future use as the air storage reservoir for a compressed air energy storage (CAES) facility. PG&E proposes to conduct the testing program of a geological formation located below King Island, San Joaquin County, California. Testing would consist of the injection of air to build a subsurface bubble within the reservoir sands of the depleted King Island Gas Field, and then conducting a series of pressure tests to further confirm the geologic suitability of the site and provide more detailed information for the engineering of a future CAES facility. The permitting process for the CAES compression testing project includes the DOE's compliance with the *National Environmental Policy Act* (42 U.S.C. Section 4321 et seq.) and DOE's *National Environmental Policy Act* implementing regulations (10 CFR Part 1021) and procedures, and the federal Environmental Protection Agency Underground Injection Control Program Class V Injection & Withdrawal Well (Safe Drinking Water Act, 40 CFR Part 144, Sections 1421 and 1422).

The total cost of the compression-testing project would be approximately $20 to $25 million.

In this EA, DOE evaluated the potential environmental consequences of DOE's proposed action of providing financial assistance, and PG&E's proposed compression testing project. The EA also examined the No-Action Alternative, under which DOE assumes that because of its denial of financial assistance, PG&E would not proceed with the project.

DOE evaluated the environmental resource categories it commonly addresses in environmental assessments and identified no significant adverse effects from the proposed project. For the resource categories land use / land resources; waste management; aesthetics and visual resources; utilities, energy, and minerals; and transportation, DOE determined there would be no impacts or the potential impacts would be small, temporary, or both, and therefore did not carry those forward for additional analysis. DOE focused its analyses on those resources that could require new or amended permits, or have the potential for environmental impacts or controversy. These included air quality, biological resources, noise and vibration, public and occupational health and safety, and water resources as well as those resource areas that typically interest the public, such as socioeconomics and environmental justice and cultural, historic, and paleontological resources. The following paragraphs summarize the analyses.

During construction and operation, air emissions would include: (1) combustion emissions from vehicles, heavy-duty equipment, and *various* drilling rig *engines* used to construct the test facilities; (2) fugitive dust from site preparation activities; and (3) emissions of volatile organic compounds including greenhouse gases (GHG) from the injection and withdrawal well during test operations. These emissions would have minor but short-term impacts that are below the San Joaquin Valley Air Pollution Control District's recommended thresholds of significant impact or the General Conformity *de minimis* threshold values. Similarly, the GHG emissions associated with construction and operation activities are less than the Council on Environmental Quality significance threshold and would not have a significant impact on climate change.

Irrigation ditches along Eight Mile Road, dirt access roads, and near the development site provide marginal- to moderate-quality habitat for the giant garter snake (*Thamnophis gigas*), which is federal and state listed as threatened. The irrigation ditches and ponds also provide habitat for the western pond turtle (*Emys marmorata*), a California species of special concern. Trees within 0.5 mile of the study area provide nesting habitat for Swainson's hawk (*Buteo swainsoni*) and the white-tailed kite (*Elanus leucurus*), state listed as threatened. With the implementation of standard avoidance and minimization measures, DOE determined that the proposed project would not adversely affect these species. These measures include preconstruction surveys, exclusionary fencing, worker environmental training, burrow avoidance, road shoulder avoidance, speed limits, and biological monitoring. DOE consulted the U.S. Fish and Wildlife Service (FWS). The FWS responded and concurred with DOE's determination.

The project would involve the productive reuse of a depleted natural gas field, a geological resource. The potential of the project to induce seismicity is extremely low, based on recent studies of this phenomenon that involve thousands of oil and gas wells and analysis of the geologic setting.

Well drilling and construction equipment would create noise during the installation phase, and compressors, the withdrawal well air release vent, and choke manifold would create noise during test operation. Detailed modeling of project noise sources and noise attenuation with distance shows that, with the application of an air release stack silencer and other measures, the project would meet San Joaquin County's noise standards at the nearest sensitive receptor.

No previously recorded historic or cultural resources of significance occur in the project's area of potential effects. In addition, given that the project location is in a former marsh area of the Sacramento-San Joaquin Delta, the discovery of buried archaeological deposits during construction or operation is unlikely DOE consulted the California State Historic Preservation Officer and interested Native American Tribes. DOE determined there would be no impacts to federally listed or eligible historic properties. The California State Historic Preservation Officer responded and agreed with DOE's determination. The project site is in an area of recent alluvial deposits of low paleontological sensitivity and there are no previously recorded vertebrate paleontological finds near the project site. *In the event that cultural deposits are discovered during ground disturbance activities at the compression testing site, work would stop immediately and PG&E*

would notify the Tribes, the California State Historic Preservation Officer and others in accordance with the Unanticipated Discovery Plan.

The project would create indirect economic consequences because vendors and equipment suppliers would benefit from the orders for project components and support systems. The positive economic benefits would be small.

The evaluation of environmental justice impacts is dependent on determining if high and adverse effects from the proposed project would disproportionately affect low-income or minority populations. DOE determined that no high and adverse impacts would occur to any member of the community, including socioeconomic effects. Therefore, there would be no high and adverse impacts to any minority or low-income population.

Injected air would mix to some extent with residual natural gas contained in the reservoir sands. Work done to date suggests that the percentage of natural gas contained in air withdrawn from the reservoir should be relatively low; however, some uncertainty remains until preliminary findings can be verified through reservoir testing. It is thus possible that withdrawal air may contain methane in concentrations potentially posing a hazard for onsite workers. This potential hazard would be mitigated by modeling the reservoir behavior during injection and withdrawal testing to determine expected hydrocarbon concentrations, monitoring of the reservoir and withdrawal air for actual concentrations, operational controls to prevent hazardous mixtures from reaching the surface and, if needed, injection of air with a depleted molar oxygen concentration of five percent or less to reduce the hydrocarbon concentrations in the withdrawal air.

Site preparation and construction could result in stormwater runoff and soil erosion. To limit the potential for storm water runoff and prevent runoff from entering potential waters of the U.S., PG&E would use permeable materials to construct the drilling and operation pad. The pad design would direct runoff away from equipment. PG&E would prepare a Storm Water Pollution Prevention Plan in accordance with the National Pollutant Discharge Elimination System General Permit for Storm Water Discharges. The project would use an *air-cooled* closed-loop cooling system that would minimize the use of fresh water for project operation. Produced water from the compressed air withdrawal would be stripped from the air stream, captured, and trucked offsite along with other wastewater to be disposed of *properly* at a certified commercial *disposal facility*.

The project would not cause impacts cumulatively with other reasonably foreseeable projects. The project site is agricultural and no development projects are currently proposed for this area. In addition, project activity would take place over a period of only *12* months so that long-term and cumulative impacts are unlikely to occur when combined with projects currently under development in the region.

DOE assumed for the EA analyses that PG&E would not proceed with the project without DOE assistance. Therefore, there would be no impacts to any resource category from the No-Action Alternative. The small, positive socioeconomic impacts would also not occur under the No-

Action Alternative. In addition, DOE's ability to achieve its objectives under the Smart Grid Demonstrations Program and the Recovery Act would be impaired.

1. INTRODUCTION

As part of the American Recovery and Reinvestment Act of 2009 (the Recovery Act; Public Law 111-5, 123 Stat. 115), the U.S. Department of Energy (DOE) National Energy Technology Laboratory, on behalf of the Office of Electricity Delivery and Energy Reliability's Smart Grid Demonstrations Program, is providing up to $435 million in financial assistance through competitively awarded grants for the deployment of Smart Grid Demonstration projects. These projects verify technology viability, quantify costs, validate new business models at a scale that can be readily adapted and replicated around the country, and develop new and innovative forms of energy storage. The funding of the selected projects requires compliance with the National Environmental Policy Act of 1969 (NEPA; 42 United States Code [U.S.C.] 4321 et seq.), Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500 to 1508), and DOE NEPA implementing procedures (10 CFR Part 1021).

To comply with NEPA, DOE prepared this *final* environmental assessment (EA) for the Pacific Gas and Electric Company (PG&E) compressed air energy storage (CAES) compression testing project, in San Joaquin County, California. The DOE also examined the potential environmental consequences of DOE's proposed action, which is to provide federal financial assistance to the project. If PG&E receives the funding, the company proposes construction, operation and decommissioning of an injection and withdrawal (IW) well, air compression equipment, and associated temporary site facilities required to conduct compression testing of a depleted natural gas field. Its purpose is to simulate operation of a CAES facility to confirm geological and engineering suitability for this use.

The EA also examines the No-Action Alternative, under which DOE assumes that, because of its denial of financial assistance, PG&E would not proceed with the project.

This chapter explains NEPA and related regulations (Section 1.1), the background of the Smart Grid Demonstrations Program (Section 1.2), the EA's purpose and need for action (Section 1.3), the environmental resources DOE did not analyze in detail (Section 1.4), and the consultation and public comment process (Section 1.5). Chapter 2 discusses DOE's proposed action, PG&E's proposed project, the No-Action Alternative, and DOE's Alternative Actions. Chapter 3 details the affected environment and the potential environmental consequences of the proposed project and of the No-Action Alternative, and it considers resource commitments. Chapter 4 addresses cumulative impacts, and Chapter 5 provides DOE's conclusions from the analyses. Chapter 6 lists the references cited for this document. Appendix A contains the distribution list, and Appendix B contains correspondence between DOE, the California State Historic Preservation Officer (SHPO), tribal leaders of interested Native American Tribes, additional Native American individuals, the FWS, *and the San Joaquin County Environmental Health Department*. Appendix C contains a copy of a recent biological survey of areas in and around the proposed project site. Appendix D contains a copy of an environmental synopsis for proposals of this type that DOE used in the evaluation of potential impacts for Smart Grid Demonstrations Program Area of Interest 2 projects.

1.1 National Environmental Policy Act and Related Regulations

In accordance with DOE NEPA implementing procedures, DOE must evaluate the potential environmental effects of a proposed action that could have a significant impact on human health and the environment including decisions on whether to provide financial assistance to states and private entities. In compliance with these regulations and DOE's procedures, this EA:

- Examined the potential environmental impacts of the proposed action and the No-Action Alternative;
- Identified unavoidable adverse environmental impacts of the proposed action;
- Described the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- Characterized any irreversible and irretrievable commitments of resources that would be involved if DOE decides to implement its proposed action.

DOE must meet these requirements before it can make a final decision to proceed with a proposed federal action that could cause adverse impacts to human health or the environment. This EA fulfills DOE's obligations under NEPA and provides DOE with the information needed to make an informed decision about helping to finance the development of PG&E's proposed project in San Joaquin County, California. Note that California has an environmental review process under the California Environmental Quality Act (CEQA), which state or local agencies conduct for projects requiring a discretionary permit. The compression-testing project as currently proposed does not require any discretionary permits, so a CEQA review is not being conducted. However, certain issue areas typically addressed in the CEQA review process have been included in this NEPA document, as appropriate.

This EA evaluated the potential individual and cumulative impacts of the proposed project. No other action alternatives were analyzed. For purposes of comparison, this EA also evaluated the impacts that could occur if DOE did not provide funding (the No-Action Alternative), under which DOE assumed that PG&E would not proceed with the project. This assumption allowed DOE to compare the impacts of an alternative in which the project occurred with one in which it does not.

PG&E completed preliminary geological reservoir verification and analysis at the King Island and one other site in May 2013. These activities consisted of drilling test wells to conduct down-hole analysis and core sampling to determine viability for compression and pressure testing.

PG&E used standard skid-mounted well drilling equipment to collect core samples from the formation caprock and potential storage zone. Construction activities consisted of minor improvements to existing roads, construction of well pads, and drilling wells into the subsurface porous rock formation. Wells were constructed to meet local and state requirements thereby

ensuring that the groundwater was protected. Upon completion, surfaces were left as constructed at the request of the landowner. The two analysis sites were located in active agriculture areas. Biological Assessments prepared by North State Resources before the core drilling activities began documented that habitats and listed or sensitive species would not be affected. Cultural resource surveys conducted by SWCA Environmental Consultants prior to the analysis concluded no historic or prehistoric resources impacts.

PG&E would extend the existing electrical distribution system over a distance of 4.25 miles from the Eight Mile Road Substation to the Temporary Site Facility (TSF) site starting in November 2013. Work on the distribution line would consist of the reconductoring of a portion of the existing line and the installation of new distribution line along approximately two miles of the route. PG&E would use standard construction techniques to install new conductor on existing supports and to install new supports and conductor where needed. A small portion of the line near the substation would be constructed underground. These construction methods would meet local and state requirements. Upon completion, the wells would be decommissioned and the site would be turned over to the owner of the subsurface rights. The distribution line route is located along existing roadways, including Eight Mile Road, King Island Road, and unnamed agricultural access roads. A Biological Assessment prepared by North State Resources has documented that habitats and listed or sensitive species would not be affected. Cultural resource surveys conducted by North State Resources have concluded that no historic or prehistoric resources impacts would occur.

In accordance with criteria established by the CEQ in its regulations implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508), DOE's NEPA implementing regulations (10 CFR Part 1021), which rely on those criteria, and DOE Order 451.1B, *National Environmental Policy Act Compliance Program*, DOE determined that, as interim actions, the subsurface geological exploration activities and distribution line construction would not have adverse environmental impacts and would not limit the choice of reasonable alternatives for the project. As a result, DOE allowed PG&E to proceed with the requisite subsurface investigation and distribution line upgrades. *PG&E completed preliminary geological reservoir verification and analysis at two sites in May 2013. Distribution line upgrades started in November of 2013 and are expected to be completed by June of 2014.*

1.2 Background of the Smart Grid Demonstrations Program

DOE's National Energy Technology Laboratory and the Office of Electricity Delivery and Energy Reliability manage the research and development portfolio of the Smart Grid Demonstrations Program. Its mission is to lead national efforts to modernize the electrical grid; enhance the security and reliability of the energy infrastructure; and improve recovery from disruptions to electricity supply. The Smart Grid Demonstrations Program will help verify the technological and business viability of new technologies and show how fully integrated smart grid systems can be readily adapted and copied around the country. Further, implementation of smart grid technologies could reduce electricity use by more than 4 percent by 2030. During that

time span, smart grid technologies can save U.S. businesses and consumers about $20.4 billion in electricity costs (DOE, 2009).

Congress appropriated funding for the Smart Grid Demonstrations Program in the Recovery Act to stimulate the economy and reduce unemployment, in addition to furthering the existing objectives of the program. DOE solicited applications for this funding by issuing a competitive Funding Opportunity Announcement (DE-FOA-0000036), "Recovery Act: Smart Grid Demonstrations," on June 25, 2009. The announcement invited applications in two areas of interest:

- Area of Interest 1, Smart Grid: Regionally unique demonstration projects to quantify smart grid costs, benefits, and cost-effectiveness; to verify smart grid technology viability; and to validate new smart grid business models at a scale that can be readily adapted and replicated around the county. Smart grid technologies of interest include advanced digital technologies for use in planning and operation of the electric power system and the electricity markets such as microprocessor-based measurement and control, communications, computing, and information.

- Area of Interest 2, Energy Storage: Demonstrations projects for major, utility-scale energy storage installations to help establish costs and benefits, to verify technical performance, and to validate system reliability and durability at scales that can be readily adapted and replicated across the United States. Energy storage systems include advanced battery systems (including flow batteries), ultra-capacitors, flywheels, and compressed air energy systems. Application areas include wind and photovoltaic integration with the grid, upgrade deferral of transmission and distribution assets, congestion relief, and system regulation.

DOE prepared an environmental synopsis to evaluate and provide a comparison of potential environmental impacts for each proposal it deemed to be within the competitive range. DOE used the synopsis to evaluate appreciable differences in the potential environmental impacts from those proposals. The synopsis included: (1) a brief description of background information for the Smart Grid Demonstration area of interest, (2) a general description of the proposals DOE received in response to the Funding Opportunity Announcement and deemed to be within the competitive range, (3) a summary of the assessment approach DOE used in the initial environmental review to evaluate the potential environmental impacts associated with the proposals, and (4) a summary of the environmental impacts that focused on potential differences among the proposals. Appendix D contains a copy of the environmental synopsis for Area of Interest 2.

On November 24, 2009, DOE announced its selections of 16 projects in Area of Interest 1 and 16 projects in Area of Interest 2 based on the evaluation criteria in the funding opportunity announcement and giving special consideration to projects that promoted the objectives of the Recovery Act—job preservation or creation and economic recovery—in an expeditious manner.

PG&E's proposed project, the installation and operation of a CAES facility, was one of the 16 projects DOE selected for funding under Area of Interest 2. The company would store energy by compressing air for storage in an underground storage reservoir, a depleted natural gas well field, during off-peak hours of electricity use. During the hours of peak use, the facility would withdraw the compressed air to power a turbine and generate electricity. Phase I of the project consists of site selection, geologic verification, permit filing preparation and engineering for the CAES plant. For this project's compression testing, PG&E would inject compressed air to build a test bubble in the subsurface reservoir. The test bubble would then be subjected to a battery of pressure tests to gather information regarding reservoir characteristics and support further refinement of computer models and conceptual engineering design of the CAES facility. If the test is successful, PG&E or other parties may move forward with full-scale development and permitting of a CAES facility. At the conclusion of the proposed compression testing project, all constructed facilities would be decommissioned and removed. DOE's proposed action is to provide PG&E with about $25 million in financial assistance in a cost-sharing arrangement with the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) for the compression-testing project. The total cost of the proposed project would be about $20 to $25 million.

1.3 Purpose and Need for DOE Action

In June 2009, DOE initiated a process to identify suitable projects to lead the way for deploying integrated smart grid systems by issuing Funding Opportunity Announcement DE-FOA-00000036, "*Recovery Act: Smart Grid Demonstrations*." This funding opportunity announcement was funded under the Recovery Act.

The purpose of the proposed action is to support the objectives of the Smart Grid Demonstrations Program—to demonstrate advanced smart grid technologies and integrated systems that would help build a smarter, more efficient, more resilient electrical grid—and the goals of the Recovery Act. The Program would help verify smart grid technology viability, quantify smart grid costs and benefits, and validate new smart grid business models at a scale that can be readily adapted and replicated around the country. DOE believes PG&E's proposed project can meet these objectives because it would: (1) increase power quality and reliability in its service area; (2) reduce impacts associated with carbon emissions; (3) increase energy security through reduced oil consumption; and (4) further national knowledge and technology of new renewable energy-generating and peak-shifting systems.

The Recovery Act seeks to create jobs, restore economic growth, and strengthen America's middle class through measures that modernize the nation's infrastructure, enhance America's energy independence, expand educational opportunities, preserve and improve affordable health care, provide tax relief, and protect those in greatest need. The Recovery Act provided DOE with the monies it is using for grants in the Smart Grid Demonstrations Program.

There has been chronic underinvestment and parochialism in getting energy where it needs to go through new transmission and distribution systems, further limiting grid efficiency and reliability. DOE's proposed action of providing this project with funding would help initiate modernization of a small portion of the nation's electrical grid system.

1.4 Environmental Resources Not Carried Forward

Chapter 3 of this EA describes the affected environment and examines the potential environmental impacts of the proposed project, associated actions, and the No-Action Alternative for the following resource areas:

- Air quality
- Biological resources
- Geological hazards and resources
- Noise
- Cultural, historic and paleontological resources
- Socioeconomics and environmental justice
- Public and occupational health and safety
- Water resources

The focus of the more detailed analyses in Chapter 3 is on those resources that could require new or amended permits, have the potential for significant impacts or controversy, or typically interest the public, such as socioeconomics and historical and cultural resources.

DOE EAs commonly address the environmental resource areas listed in Table 1-1. However, in an effort to streamline the NEPA process and enable a timely award to the project, DOE did not examine the resource areas in the table at the same level of detail as the above-mentioned areas. Table 1-1 describes DOE's evaluation of those resource areas. In each case, there would be no impacts or the potential impacts would be small or temporary in nature, or both. Therefore, DOE determined that further analysis is unnecessary. In terms of the No-Action Alternative, the potential impacts Table 1-1 lists would not occur because DOE assumes the proposed project would not proceed.

Table 1-1. Environmental Resource Areas with No, Small, or Temporary Impacts

Environmental Resource Area	Impact Consideration and Conclusions
Land Use, Land Resources	The project site is located in an area zoned agricultural (minimum 40-acre parcel) within which petroleum and gas extraction is a permitted use. The compression-testing project would not conflict with neighboring land uses, which are agricultural, and would not conflict with existing land use plans or policies, habitat conservation plans, or natural community conservation plans. It would not physically divide an established community.

Table 1-1. Environmental Resource Areas with No, Small, or Temporary Impacts

Environmental Resource Area	Impact Consideration and Conclusions
	The project site is classed as prime farmland by the California Department of Conservation and the project would involve conversion of approximately 1.7 acres from walnut orchard to energy research use as the TSF Pad. This conversion could be temporary. However, if the project does not move forward, the pad would be transferred to King Island Gas Storage, the owner of the subsurface rights, who may choose to return the pad to agricultural production. The project parcel is not under a Williamson Act agricultural preservation contract and so would not involve the conversion of an agricultural preserve to non-agricultural uses.
Waste, Hazardous Materials	Site preparation and construction would generate small amounts of construction-related wastes, primarily solid nonhazardous waste, such as such as packaging materials, sludge and earthen materials (drilling mud and drill cuttings). Construction would generate approximately 8 tons of waste. Temporary operations, followed by decommissioning, would generate small amounts of wastes (primarily solid nonhazardous waste) such as drilling mud, and building materials. The project would also generate some hazardous wastes, such as light bulbs and batteries. Operations and decommissioning would generate approximately 45 tons of waste. PG&E would send these wastes to a *commercial* disposal facility such as the San Joaquin County North County Recycling Center and Sanitary Landfill, Aqua Clear Farms in Rio Vista (for drilling mud), *or* a deep injection well operated by ASTA Construction in Rio Vista (for produced water). The amount of waste generated would not affect local landfill capacities. The project site is not located on or near a location on the Cortese list (CA Government Code Section 65962.5) of hazardous sites and would not create a hazard to the public in terms of its use or transportation of wastes.
Aesthetics and Visual Resources	The proposed project would not adversely affect aesthetics or visual resources, and the proposed project site is not located near sensitive visual resources receptors such as residential or recreational viewers. It would not block significant or scenic views and is not located on a designated scenic highway. The drilling equipment would be 120 feet tall and could be seen for a distance, but would not represent a visually intrusive element out of character with other utilitarian structures in this rural and agricultural area. In addition, the drilling equipment would be on site for less than two months. The compressors and other operation equipment would have a relatively low profile, would not be seen at a distance, and would be removed at the conclusion of the test. The visual character of this area is that of a highly engineered landscape devoted almost exclusively to large-scale, mechanized agriculture and gas wells. Few viewers would be likely to see the visual changes that would occur on the site. The closest residence is a ranch-related home located over one- half mile away.

Table 1-1. Environmental Resource Areas with No, Small, or Temporary Impacts

Environmental Resource Area	Impact Consideration and Conclusions
	Given the flat terrain and the intervening orchard trees, the changes to the project site would not be readily visible from this residence.
Utilities, energy, and materials	The proposed project would not affect community infrastructure or facilities. It would use up to 10 MW of power on a temporary basis for compression testing, but this would not result in energy shortages in the PG&E grid. The project would not involve the use of significant quantities of other materials that are in short supply. It would involve leakage of a small amount of water in the closed-loop cooling system, but this would not interfere with local agricultural irrigation or other activities.
Transportation	The proposed project would not affect local traffic and transportation. Construction worker traffic to and from the project would involve a maximum of 44 worker commute vehicles and 11 truck deliveries per day during the second month of construction, using Interstate 5, West Eight Mile Road, and agricultural roads that have little traffic on them and the use would be temporary. During operation, eight employees would travel to and from the site daily.

1.5 Consultations and Public Comments

1.5.1 Consultations

Prior to the release of the draft EA for public comment, DOE sent project information to the California SHPO, FWS, and twelve interested Native American Tribes and individuals for their consideration.

California State Historic Preservation Officer

On June 7, 2013, DOE sent a letter to the California SHPO in accordance with the review requirements of Section 106 of the National Historic Preservation Act, as amended (16 U.S.C. 470 et seq.), and implementing regulations at 36 CFR Part 800. The letter detailed DOE's investigation of nearby historic properties and concluded that no historic properties would be affected by the proposed project. The California State Historic Preservation Officer responded on June 26, 2013, with a letter indicating their agreement with DOE's determination that the project would not affect historic properties. On June 28, DOE notified the California SHPO of a minor change in the area of potential effect related to distribution line construction and the California SHPO responded on July 3, 2013, with a letter of concurrence that the area of potential effects, as amended, would not affect historic properties. Additionally, on August 1, 2013, DOE informed the California SHPO of an additional minor change involving additional expansion of

the distribution line construction work area. On August 7, 2013, the California SHPO responded with a letter of concurrence that, with the additional expansion of the area of potential effects the project also would not affect historic properties. Appendix B1 contains copies of this correspondence.

U.S. Fish and Wildlife Service

On May 31, 2013, DOE sent a formal consultation letter to the FWS in accordance with the review requirements of Section 7 of the Endangered Species Act. The FWS responded and concurred with DOE's determination that the proposed project is not likely to adversely affect threatened and endangered species. On June 28, DOE notified the FWS of a minor change in the affected area related to distribution line construction. Additionally, on July 24, 2013, DOE informed the FWS of a minor change involving additional expansion of the distribution line construction work area. On August 2, the FWS concurred with DOE's determination that the project, as amended, would not be likely to adversely affect listed species.

On April 28, 2014, DOE sent a follow-up consultation letter and an updated Biological Effects Assessment to the FWS in accordance with the review requirements of Section 7 of the Endangered Species Act. The updated information detailed the necessary revised avoidance and mitigation measures as required by FWS to ensure that the proposed project is not likely to adversely affect threatened and endangered species. PG&E cannot proceed with additional construction beyond the original authorization as noted in the FWS letter dated August 2, 2013, until FWS issues an updated concurrence review. Delays in completing the project's environmental review process resulted in changing the project construction schedule, which requires follow-up review by FWS. PG&E will comply with all avoidance and mitigation measures as required by FWS.

Native American Tribes

In June of 2013, PG&E contacted the Native American Heritage Commission (NAHC) to request a list of potentially interested Native American Tribes and organizations. PG&E received a response from Ms. Silvia Burley of the California Valley Miwok Tribe. Ms. Burley had no specific concerns regarding the project but did request that she be notified in the event that any Miwok-associated materials or human interments were discovered during the course of ground-disturbing project activities.

The Ione Band of Miwok Indians contacted DOE on or about December 20, 2013, requesting information related to cultural resources records searches, surveys and geo-technical testing, as well as an in-person consultation between DOE and the Tribe. In response, DOE contacted PG&E and asked that they provide the Tribe with the requested information. DOE then made arrangements to meet in-person with the Ione Band of Miwok Indians and the Buena Vista Rancheria of Me-Wuk Indians at their Tribal offices in California.

On January 28, 2014, DOE staff met in-person with tribal members of the Buena Vista Rancheria of Me-Wuk Indians Tribal Historic Preservation Office (THPO) Board at their office located on 4650 Coalmine Road in Ione, California. Those attending the meeting included THPO board members; tribal monitors; a THPO advisor; and DOE's Project Manager, Tribal Liaison and NEPA Document Manager. THPO board members provided DOE with information regarding their concerns about the consultation process and construction monitoring and asked questions about and made requests related to unanticipated discoveries, future project actions, comments on the draft EA, and distribution of the EA and other documents. THPO board members requested that an unanticipated discovery plan be included as part of the final EA. THPO board members also requested that the small abalone shell fragment discovered near the distribution line right-of-way be recorded and the Tribes be notified about the find. THPO board members also asked DOE to provide an explanation in the final EA as to how this project might proceed forward upon successful completion of the compression testing phase. A response to this request can be found in Section 2.2.3. DOE sent all participating Tribes copies of the discovery documentation form and location map regarding the abalone shell fragment discovery. A copy of the transmittal letter is included in Appendix B2.

On January 29, 2014, DOE and PG&E staff met in-person with cultural committee members of the Ione Band of Miwok Indians at their office located in Plymouth, California. Those attending the meeting included the Cultural Committee Chairman and one additional Cultural Committee member, along with PG&E's Project Manager; PG&E's Archeologist; and DOE's Project Manager, Tribal Liaison and NEPA Document Manager. Tribal Cultural Committee members provided DOE with a list of cultural and environmental resource areas for discussion at the meeting. Tribal members informed DOE and PG&E of their concerns about potential impacts regarding water quality controls as they relate to the floodplain, groundwater and surface water; wildlife and fisheries impacts as they relate to fish habitat, golden eagles, condors and endangered species habitat; greenhouse gas mitigation; sediment contamination and mitigation; native plant restoration; traditional cultural properties; burial sites; cultural sites; and noise. Analyses for each of these resource areas are provided in the final EA in the follow sections: water quality controls – Sections 3.2.2.1.1, 3.8.1.1, 3.8.1.2, 3.8.1.3, 3.8.2.1.2 and 3.8.2.2; wildlife and fisheries – Sections 3.2.1.2, 3.2.1.4 and 3.9.3; greenhouse gas mitigation – Sections 3.1.1.2, 4.1, 4.2 and 5; sediment contamination and mitigation – Sections 3.3.1 and 3.8.2.1.2; native plants – Sections 3.2.1; traditional cultural properties – Sections 1.5.1 and 3.5; ; and cultural sites – Sections 1.1, 1.4, 1.5.1, 3.5.1.1, 3.5.2.1.1, 3.5.2.1.2, 4.1, 4.2 and 5. Cultural Committee members also requested information related to site geology and the equivalent number of homes the proposed project would provide with electricity. DOE provided the Ione Band of Miwok Indians the requested information pertaining to site geology and the equivalent number of homes potentially served by a full-scale, commercial facility in a letter dated February 14, 2014, which is included in Appendix B2. In addition, Cultural Committee members requested that sub-surface pre-testing be completed at the compression testing site prior to performing any additional vegetation removal.

On January 30, 2014, DOE and PG&E staff met in-person with Ione Band of Miwok Indians' cultural committee members at the King Island project site along and near Eight Mile Road. Those attending the site meeting included the Cultural Committee Chairman and one additional Cultural Committee member, along with PG&E's Project Manager, PG&E's Archeologist, and DOE's Project Manager, Tribal Liaison and NEPA Document Manager. PG&E lead a windshield tour of the project site beginning at the substation along Eight Mile Road and ending at the compression testing site. At the compression testing site all parties exited their vehicles and walked the project site. Cultural Committee members expressed concerns that the DEA had not properly assessed Traditional Cultural Properties and Native American cultural resources. They also requested that additional testing be conducted in the walnut orchard prior to tree removal to determine if cultural artifacts or burial sites exist within the immediate project area.

On February 7, 2014, DOE held a teleconference with the Wilton Rancheria Tribe to discuss the ongoing preparation of the final EA and to provide information on the status of the distribution line upgrade work and monitoring activities, and the timeline for future project activities. The Wilton Rancheria requested: (1) that they be provided copies of all daily monitoring logs completed to date along with copies of future monitoring logs; (2) that they be allowed to monitor the remaining distribution line upgrade work and walnut tree removal at the compression testing site and be compensated for their time; and (3) that DOE expand the cultural resource section of the final EA to incorporate more ethnographic information, including the results of interviews with tribal elders. DOE contacted PG&E and their cultural resource contractor, who in-turn provided the Tribe with the requested daily monitoring logs.

DOE received a letter dated March 18, 2014, signed by tribal chairpersons from the Buena Vista Rancheria of Me-Wuk Indians, the Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians, and Wilton Rancheria. The letter noted their collective concerns and requests relating to consultation, communication, protocols and procedures, cultural resource studies, agreements, subsurface testing, traditional cultural landscapes, unanticipated discoveries, and an ethnographic study. At the request of the Tribes, DOE prepared an Unanticipated Discovery Plan for buried cultural resources. On April 22, 2014, DOE provided the four participating Tribes with a draft of the plan for their review and comment. The Tribes' March 18, 2014, letter is included in Appendix B2.

DOE contacted the participating four Tribes by phone and followed with a teleconference on April 25, 2014. During the teleconference, the four participating Tribes and the Bureau of Indian Affairs discussed the ethnographic study, subsurface testing, tribal monitoring, self-determination, the Unanticipated Discovery Plan and issuance of a final EA.

As a direct result of the consultation process, DOE will require PG&E to prepare an ethnographic study and perform subsurface testing at the compression testing site. To determine the presence or absence of buried cultural resources, subsurface testing is to be conducted in the walnut orchard area adjacent to the existing well pad. Subsurface testing will be required prior

to construction. The ethnographic study will be conducted concurrently with the project activities. PG&E will select the subcontractor to perform the testing and study. PG&E shall require this work be performed by professionals meeting the requirements of completing such work in California. The subsurface testing will include up to 15 shovel pits (approximately 1.5'x3'x1.5-3' in depth). Material recovered from these test pits will be screened through one-quarter inch mesh, or suitable sized mesh acceptable for archeological investigation. The selected subcontractor is responsible for determining the details of the ethnographic study. Currently interested Tribes may participate in monitoring during the subsurface testing at the compression testing site. PG&E, or its representative, will cover the cost for one monitor from each participating Tribe. Compensation would be at the same hourly, per diem and mileage rates as provided for the temporary power monitoring effort. To protect cultural resources, PG&E shall maintain a copy of the Unanticipated Discovery Plan at the site and all parties will follow the plan during sub-surface testing and ground disturbance activities at the compression testing site. In the event that cultural deposits are discovered, work would stop immediately and PG&E would notify the Tribes, the California State Historic Preservation Officer and others in accordance with the Unanticipated Discovery Plan.

DOE also extended an offer to all of the consulting Tribes to include any special cultural resource language, data or related information that they may want to provide within the final EA. The Tribes were contacted on the following dates: The Buena Vista Rancheria of Me-Wuk Indians - December 30, 2013; Shingle Springs Band of Miwok Indians - December 30, 2013; the Ione Band of Miwok Indians - January 29, 2014; and the Wilton Rancheria Tribe - February 7, 2014.

1.5.2 Comment-Response Process

DOE issued the draft EA for comment on November 26, 2013 and advertised its release in *The Record* and the *Lodi News-Sentinel* on November 26, 2013. In addition, DOE sent a copy for public review to the San Joaquin County Public Library System. DOE established a 35-day public comment period beginning on November 26, 2013 and ending on December 31, 2013. DOE announced comments would be accepted by mail, email, or facsimile. The draft EA was also sent to the applicable Federal, state, and local agencies. *During the 35-day public comment period, which ended on December 31, 2013, DOE received one comment letter from the San Joaquin County Environmental Health Department. This letter indicated that this agency had reviewed the draft EA and has no substantive comments on the document. A copy of the letter is in Appendix B4. DOE also received and accepted comments on the draft EA on March 12, 2014, from the Buena Vista Rancheria of Me-Wuk Indians. The Tribe's comments and DOE's response are included in Appendix B4.*

2. DOE PROPOSED ACTION AND ALTERNATIVES

This chapter describes DOE's proposed action (Section 2.1), PG&E's proposed project (Section 2.2), the No-Action Alternative (Section 2.3), and DOE Alternative Actions (Section 2.4).

2.1 DOE's Proposed Action

DOE's proposed action is to provide up to $25 million in financial assistance to PG&E, who has also received approval from the CPUC to obtain equal matching funds. The cost of the pressure testing phase, which is the subject of this draft EA, is estimated to be approximately $20 to $25M. The total project cost of full development of a commercial-scale CAES facility (i.e. 300 MW nominal output) over the full period of performance may be up to $356 million. This amount includes subsequent phases of the project leading to full implementation of a CAES facility, which are not currently funded and may or may not be realized.

2.2 Pacific Gas and Electric Company's Proposed Compressed Air Energy Storage Compression Testing Project

2.2.1 Project Overview

Renewable energy resources, such as wind and solar power, have the potential to reduce dependence on fossil fuels and greenhouse gas emissions in the electric sector. Concerns regarding climate change have spurred state regulation encouraging the integration of renewable resources into the power generating fleet. For example, under California's existing Renewable Portfolio Standard, utilities must supply 33 percent of all electricity retail sales from eligible renewable resources by the year 2020. Much of this new generation is expected to be derived from the addition of new solar and wind power generation[1]. Because wind and solar resources are by nature variable (i.e., the sun does not always shine and wind does not always blow when power is actually needed), their addition to the power generating fleet poses challenges to the reliable operation of the power distribution grid and the cost of their integration. Energy storage has been identified as an important component of strategies to mitigate these effects and facilitate greater penetration of wind and solar power into the existing power generation and distribution system. CAES has been identified as a key enabling technology for expanding reliance on renewable resources for electricity production[2] and typically provides a larger energetic return on investment when compared to many other types of storage technologies[3].

[1] California ISO, 2010, Integration of Renewable Resources, Operational Requirements and Generation Fleet Capability at 20% RPS, August 31.

[2] Denholm, Paul, E. Ela, B. Kirby, and M. Milligan, 2010, The Role of Energy Storage with Renewable Power Generation, NREL Technical Report NREL/TP-6A2-47187, January.

PG&E is currently studying the feasibility of using a porous underground rock formation (depleted natural gas field) in its service territory for a CAES project. CAES technology involves two major processes: (a) air compression and underground injection for storage and (b) air release for electricity generation. During the air compression and storage process, electric motor-driven compressors inject air into a sealed and porous underground geological formation for storage under high pressure. During the air release phase, the high-pressure air is released from the underground reservoir, heated using natural gas (if necessary), and expanded through sequential turbines ("expanders"), which drive an electrical generator. The stored energy can be used during periods of higher electric demand, improving the efficiency of energy distribution through the power grid. Worldwide, two CAES plants using man-made caverns in salt formations—the McIntosh plant in Alabama and the Huntorf facility in Germany—have operated successfully for over 20 years.

The first phase of the feasibility study was completed in June 2013 and involved collection of core samples at depleted natural gas fields on King Island and East Island, San Joaquin County, California. The rock core samples were analyzed to determine whether the formation would support a CAES facility and King Island was selected for the second phase. The second phase, which is the subject of this EA, would be to conduct pressure testing of the formation. This would consist of injecting air to build a subsurface bubble within the reservoir sands of the depleted King Island Gas Field, and then conducting a series of pressure tests to further confirm the geologic suitability and provide more detailed information for project engineering. The permitting process includes the DOE's compliance with NEPA and the federal Environmental Protection Agency Underground Injection Program Class V Injection & Withdrawal Well. This study is co-funded by the DOE, CPUC, and CEC.

2.2.2 King Island Storage Reservoir Geology

The proposed compressed air storage reservoir consists of permeable sands of the Upper Cretaceous Mokelumne River Formation that occur at depths between approximately 4,675 feet and 4,800 feet below ground. The reservoir is an elliptically shaped erosional remnant of approximately 235 acres in horizontal area that is enclosed on all sides by shales of the Paleocene Meganos Gorge Fill and capped by the Eocene Capay Shale. This geological formation created an impermeable natural trap in which natural gas collected over geologic time and was stored under pressure for millions of years prior to extraction by natural gas production activities between 1980 and the present. As such, the reservoir may be suitable for storage and extraction of compressed air with its potential energy. Compressed air would be stored in the pores between particles of sand and the shale cap would hold the compressed air in place. The thickness of the storage reservoir is approximately 100 feet at this location.

[3] Barnhart, Charles, M. Dale, A. Brandt, and S. Benson, 2013, The Energetic Implications of Curtailing Versus Storing Solar- and Wind-Generated Electricity, Energy and Environmental Science, DOI: 10.1039/c3ee41973h, August 14.

2.2.3 King Island Temporary Site Facilities

The proposed location of the King Island Temporary Site Facilities (TSF) is approximately 1.8 miles northwest of the city of Stockton's northern boundary at Eight Mile Road in northwestern San Joaquin County, California (Figures 2-1 and 2-2). The TSF site would be situated about two miles north of West Eight Mile Road between White Slough and Bishop Cut, and can be accessed from Interstate 5 via West Eight Mile Road. The area surrounding the TSF site is generally level and ranges in elevation from approximately 5 to 10 feet below sea level. Water levels in White Slough and Bishop Cut are slightly above sea level and are separated from King Island by a series of levees topped by paved and unpaved roads.

The area surrounding the test site is crossed by a series of dirt and gravel ranch roads that provide access to the various ranch fields and to the test site. A ranch yard and a series of ranch houses are located approximately 0.5 to 0.75 mile south of the test site along the south side of an east-west-trending gravel road.

The TSF site pad would be approximately 650 feet by 165 feet, or 2.5 acres in size, of which 0.7 acre was created for the geological core-drilling task associated with this project. The pad would be constructed at the locations shown on the site plan (Figure 2-3). Construction activities associated with the project include access road improvements, work pad construction, and well drilling, and would take approximately five months to complete.

PG&E would expand the existing 0.7-acre pad by additional clearing, grubbing, scarifying, and compacting into an area that is currently planted with sapling-stage walnut trees, requiring the removal of approximately 90 small trees. Geotextile material would be placed over the compacted work area, then up to 18 inches of sub-base material and Class II aggregate base would be placed and compacted. The work area would be crowned and sloped so that stormwater sheet-flows off the pad. PG&E would limit all construction activities to the pad and a 10-foot buffer area.

Once the TSF pad is constructed, a drilling rig and associated equipment would be moved onto the work pad. The primary equipment includes the drill rig, mud and water tanks and pumps, shaker tanks, electric generators, diesel fuel tanks, drill pipe racks and support trailers. *A new* well would be drilled into the formation *and used* for injection and withdrawal of air. *A* second *existing* well *would be instrumented* to monitor field pressures and responses to the injection and withdrawal process. The construction contractor would place all wastes, cuttings and drilling mud associated with well drilling in proper storage receptacles and transported them offsite to an authorized disposal facility.

Water for pad construction and well drilling would be trucked to the project area from off-site municipal water supply sources. All drilling activities would comply with the *EPA underground injection control (UIC) permit*. Construction wastewater would be hauled offsite and disposed of at a permitted, commercial *disposal facility*.

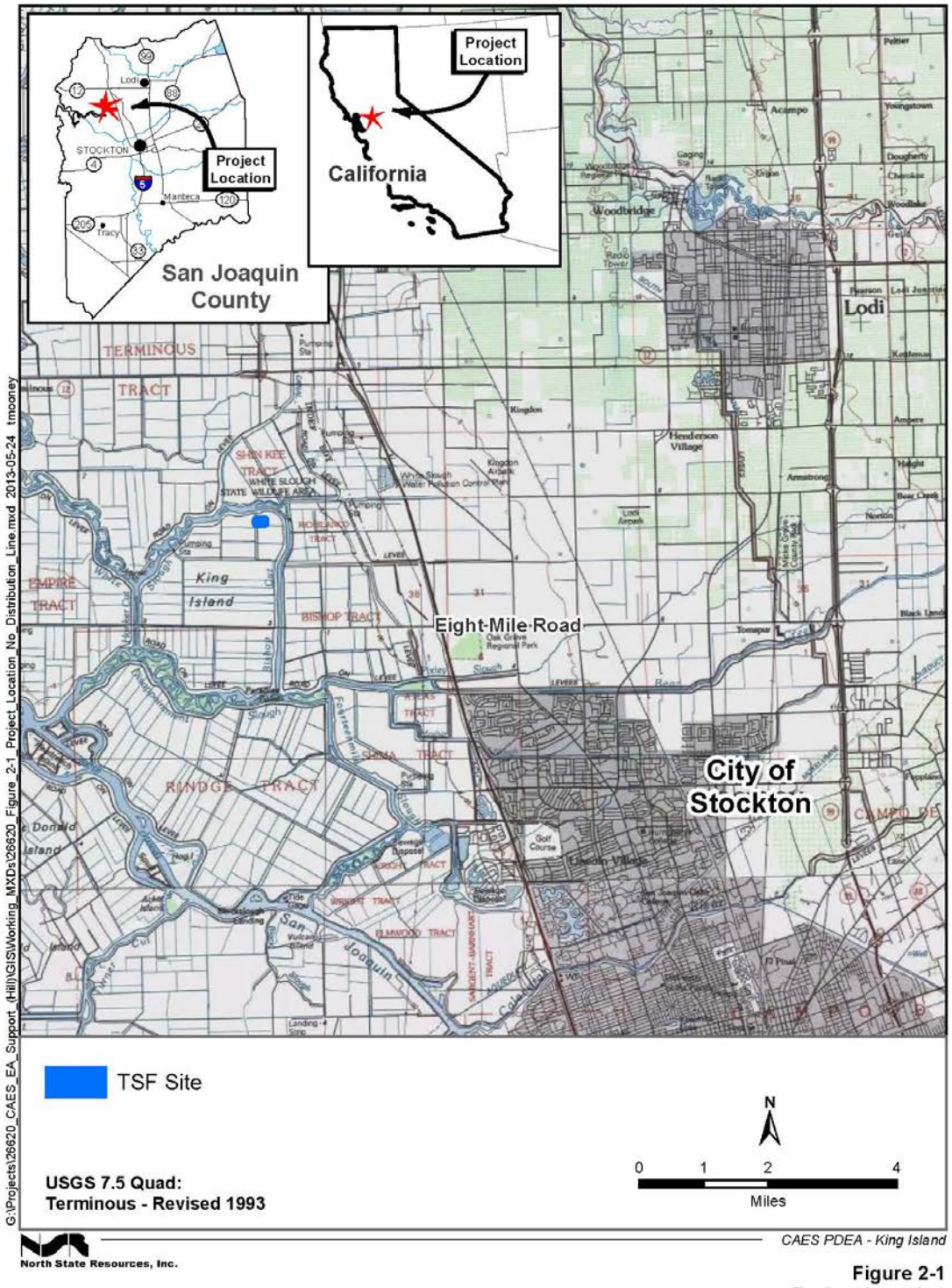
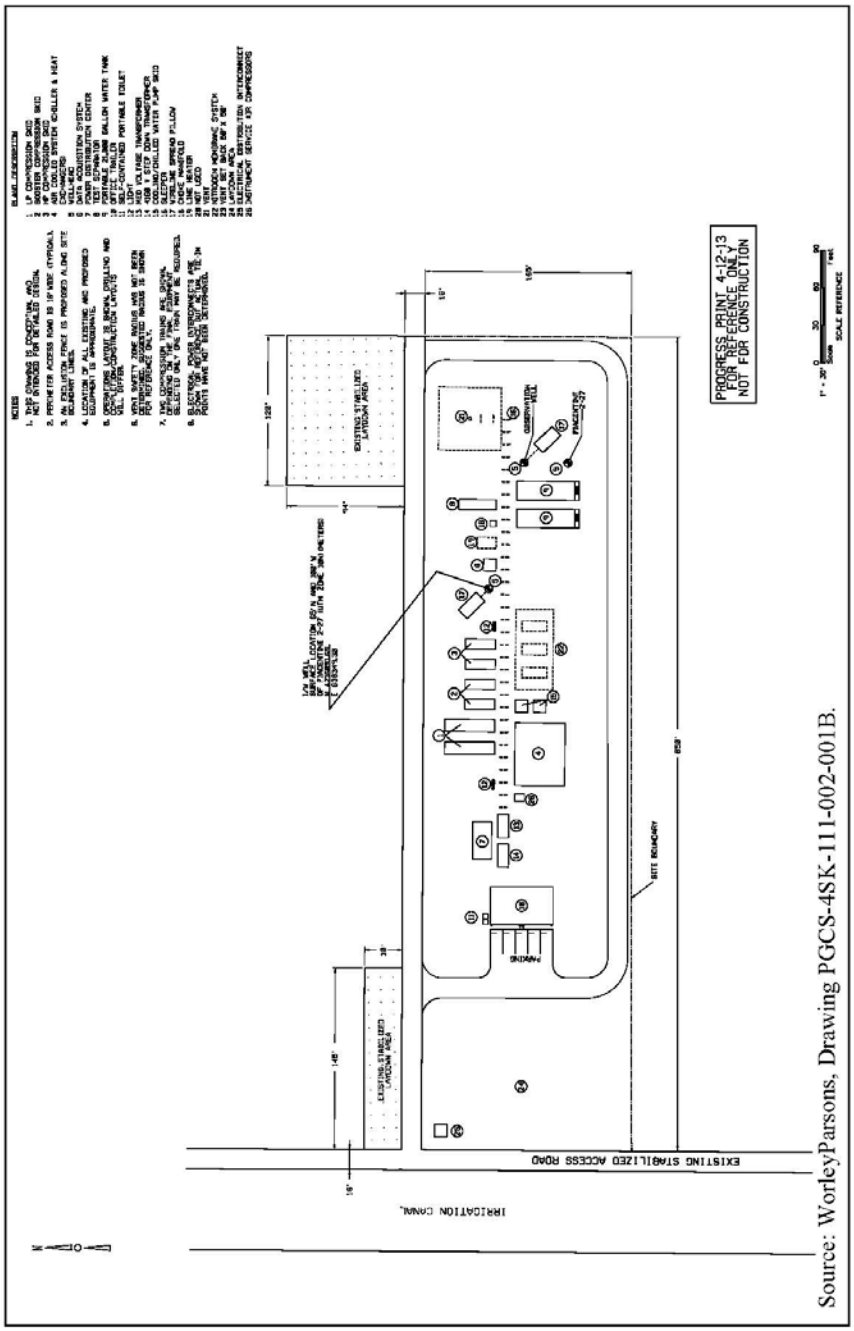


Figure 2-1
Project Location

Figure 2-2
TSF Facility



Source: WorleyParsons, Drawing PGCS-4SK-111-002-001B.

Figure 2-3. Site layout.

Access road and pad construction would involve approximately eight workers, five trucks, a road grader/maintainer, dozer (D-5 or equal), sheep's foot compactor, roller compactor, water truck, and similar construction equipment. Up to 5,000 cubic yards of road gravel and aggregate base would be required. Total duration of this task is approximately 6 weeks.

The drilling crew, engineers, temporary workers and site visitors would number an average of approximately 12 workers/people per shift, with three shifts per day during pad construction and drilling. A maximum of 20 workers may be present at one time during various operations. In addition to worker vehicles, service, equipment and material delivery vehicles would access the site during the drilling phase.

The well construction and installation would be followed by four to five months of compression and withdrawal cycling that simulates the operation of a CAES facility. During this period, approximately 12 workers would be onsite per day, staffing three eight-hour shifts. Before testing can begin, the compressors would create a subsurface air "bubble" of compressed air in the reservoir that is about one billion cubic feet in size. This would take approximately 14 days to complete.

After the bubble is created, a series of pressure tests would be conducted and data would be collected from the IW well, the observation well and possibly from additional existing nearby gas wells to assess the reservoir response. Testing protocols are still being developed and would include a series of sequential injection, pressure buildup, pressure fall-off and possibly flow tests. The test would include periods of injection, typically from several hours to several days in length, followed by shut in periods from several hours to several days in length. Flow testing, if conducted, would consist of a series of sequential flow tests at increasing rates over a period of about a day. In addition, cyclical injection, shut in and flow tests may be conducted to simulate daily reservoir cycling over a period several days to several weeks. The final compression testing plan would be developed to collect data that allows assessment of the reservoirs characteristics to support refinement of the computer reservoir model constructed for the project. Maximum pressures, injection rates and flow rates used during the testing would not exceed those used for evaluating potential environmental effects in this EA.

During each cycle, daily injection would take place for several hours, followed by a short shut-in period and five to *fifteen* hours of withdrawal. The length of the injection and flow periods would depend on the testing rates.

The CAES compression test project would take place at reservoir pressures up to several hundred pounds per square inch above the original reservoir pressure in order to allow sufficient flow to build the bubble. Pressures would be highest near the injection well during injection and would dissipate rapidly with distance from the well Injection pressures would be maintained consistently below the fracture pressure of the geological cap formation, as determined for other nearby projects and as would be confirmed in advance by geo-mechanical testing. Pressure in the well would be monitored and observed throughout the test period. Operational pressure is

expected to be somewhat below the original field pressure, under which natural gas was trapped in the reservoir for several million years.

Preliminary reservoir modeling indicates that air withdrawn from the reservoir is likely to produce some amount of residual natural gas in the extracted flow. The data suggest the concentrations of natural gas should be relatively low; however, model refinement is still in progress and the modeling entails some assumptions and uncertainties. Therefore, the possibility that using ambient air for the test could create a combustible withdrawal mixture cannot be ruled out for safety planning purposes. Engineering approaches to assure safety during the test include measures to automatically shut in the well before natural gas concentrations reach hazardous levels, injection of air with its oxygen content depleted to a molar concentration of approximately 5 percent, and/or limiting the extent and duration of any flow testing.

During the above tests, regular pressure, temperature, injection rate, flow rate, water production and gas chemistry measurements would be collected and recorded using an automated data acquisition system. Additional measurements would be made in the field and selected process gas samples would be submitted for laboratory analysis.

Because compressing air generates heat, PG&E would use an air-cooled closed-loop cooling system that consists of pumps, heat exchangers and air-cooled radiators. The cooling water system would have two circulating water pumps each capable of 1,500 gallons per minute (gpm). The closed-loop water systems would require about 4,200 gallons for the compressor-cooling portion. Nominal water loss is conservatively expected to be 25 gallons per day from *seal, flange, or tube leakage*. The initial water requirements and this small quantity of loss would be supplied by a municipal source and hauled to the site in a water truck. After compression testing is complete, the *closed-loop* cooling *system* water would be hauled offsite in trucks and disposed of in a permitted, commercial *disposal facility*.

Other than the IW well itself, the primary equipment used during the compression test would include the following:

- High-pressure compressor train capable of injecting the compressed air at flow rates up to 17 million standard cubic feet per day and compressor outlet pressures up to a maximum of 2,700 pounds per square inch

- After-cooler to cool the compressed air to a temperature no higher than approximately 140 degrees Fahrenheit before injection

- If necessary for safety purposes, the air supply stream may include oxygen-depleted air generated using a portable membrane filtration system or similar equipment.

- Appurtenant equipment including a temporary electrical supply, a step-down transformer, a power distribution system, a compressor cooling system, high-pressure piping, and control circuitry

- Equipment to support withdrawal testing including high-pressure piping, a choke valve, an electric line heater, a phase separator, one or more produced water storage tanks, and an air discharge vent

- Monitoring and measurement equipment including:

  – Wellhead pressure and temperature sensors at the wells

  – A sensor array along the discharge piping to measure flow, pressure, temperature, combustible gas concentrations, oxygen concentrations and relative humidity

  – A sensor array along the injection piping to measure flow, pressure, temperature, oxygen concentrations, and relative humidity

Pressure and temperature readings may be taken during compression testing using wire-line gauges that are lowered into the IW well and observation well. In addition, wire logs (e.g., gamma and pulsed neutron spectrometry) of the observation well may be conducted to assess the size of the air bubble over time. Sampling ports would be provided along the injection and discharge lines near the wellhead so that gas samples can be collected for field testing and laboratory analysis.

Following completion of the compression testing, all of the drilling, compression, and other equipment would be removed from the site. If compression testing indicates that the reservoir and site demonstrate the appropriate characteristics to support a commercial, utility-scale compressed air energy project, the pads and wells could be utilized in the development and operation of the full-scale CAES project.

Prior to making a decision on whether to move forward with the development and operation of the full scale CAES project, PG&E would issue a Request for Offers (RFO). The RFO would seek qualified bidders (engineer-procure-construct contractors, equipment vendors, independent power producers and storage facility operators are examples of potential participants) who are interested in constructing, owning and/or operating the full-scale scale CAES project. Based on the technical and economic results of the RFO, PG&E would make a determination on whether to move forward with commercial scale development.

If a decision were made to move forward, multiple approvals must be secured before construction can commence. First, PG&E must file an application with the CPUC, seeking their approval for the project. Additionally, the project developer would need to file an Application for Certification (AFC) with the CEC and a UIC application with the EPA. Both the CEC and UIC permits must be obtained prior to starting construction. The AFC process acts as a clearinghouse for all state and local permitting activities. It includes a public review process that reaches out to all Tribes identified by the Native American Heritage Commission (NAHC). Additional information on the AFC process is available at: http://www.energy.ca.gov/sitingcases/.

The following table provides a high-level forecast/timeline of milestones beginning upon issuance of the RFO:

Milestone	***Forecasted Date***
Issue RFO	*2015*
Go/No-Go Decision	*2016*
File CPUC Application	*2016*
File AFC with the CEC	*2017*
File UIC with the EPA	*2017*
Construction Begins	*2019*
Plant Operation Commences	*2021*

The project site, located in the Northern California service territory of PG&E, would be connected to the electric transmission grid, which is operated by the California Independent System Operator (CAISO). The CAISO manages the flow of electricity for approximately 80% of California; the project would provide capacity, energy, ancillary services (such as spinning and non-spinning reserve), and voltage support, as well as assist with integrating intermittent renewable resources on the CAISO grid. The current feasibility study is investigating a project of up to 300 megawatts (MWs) with up to 10 hours of storage capacity; this is enough power to supply approximately 225,000 homes when the plant is operating at full load.

If the testing demonstrates otherwise, the wells would be plugged and abandoned per California Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOGGR) regulations and the requirements of the UIC permit issued by the EPA for the project. If the project does not move forward, the well pad and associated wells would be transferred to the King Island Gas Storage as the owner of the subsurface rights.

Figure 2-4. Views of and around the site.

2.2.4 Access Roads

The preferred site access route during project construction and operation would be via the levee road extending northward along the west side of Bishop Cut from Eight Mile Road (King Island Road), and from there via improved, gravel agricultural access roads to the site. Passage across the levee road would take place under conditions required under an encroachment permit from the local reclamation district responsible for maintenance of the levee (RD2044).

The gravel-surfaced roads are graded and well maintained and no new road construction or improvements would be necessary for the proposed project activities. The access roadways would be maintained as necessary during project construction and operation, and the following preventative measures would be implemented to protect the roadways from damage:

- Periodic dust control may be necessary and would be provided by wetting the road surface using a water truck. It is assumed that one daily application of water would be needed for the duration of the project.

- Steel plates may be placed over the irrigation siphons that penetrate beneath the levee road as a preventative measure to protect them from potential wheel loading.

- Potholes or cracks in the levee road may be filled with aggregate base, cold patch asphalt, or hot patch asphalt as needed to facilitate passage and prevent damage.

- Sections of gravel road may be re-leveled and re-compacted or resurfaced with imported aggregate base as needed for proper draining.

- Improvements to the existing access roads would be limited to light graveling if determined to be necessary (e.g., if work were scheduled to occur during the wet season) with the assumption that no additional grading would be required. If grading were required, it would be limited to the existing road and not extend beyond the compacted surface.

- Equipment used for road maintenance may include dump trucks, front-end loaders, water trucks, graders, smooth drum rollers and other equipment as needed.

The project would obtain coverage under the General Construction Stormwater National Pollutant Discharge Elimination System permit, Best Management Practices (BMP) would be deployed to prevent the potential release of sediment into adjacent waterways, including the placement of biodegradable fiber rolls, silt fences, sand bags, and other appropriate BMPs.

2.3 No-Action Alternative

Under the No-Action Alternative, DOE would not provide financial assistance for the proposed project. As a result, the project might be delayed as PG&E sought other funding sources to meet its needs or be completely abandoned if other funding sources could not be obtained. As a result, DOE's ability to achieve its objectives under the Smart Grid Demonstrations Program and the Recovery Act would be impaired.

Although this and other selected projects might proceed if DOE decided not to provide financial assistance, DOE assumes for purposes of this EA that the project would not proceed without their assistance. If PG&E did proceed without DOE's financial assistance, the potential impacts would be essentially identical to those if DOE provided the funding. To allow a comparison between the potential impacts of a project as implemented and the impacts of not proceeding with a project, DOE assumes that, if it were to decide to withhold assistance from a project, the project would not proceed

2.4 Alternatives

DOE's alternatives to this proposed project consist of the 31 other technically acceptable applications it received in response to Funding Opportunity Announcement DE-FOA-0000036, "*Recovery Act: Smart Grid Demonstrations*." Before selection, DOE made preliminary determinations about the level of review under NEPA based on potentially significant impacts it identified during review of the technically acceptable applications. DOE conducted these preliminary reviews pursuant to 10 CFR 1021.216 and prepared environmental critiques and

synopses for projects under the Funding Opportunity Announcement. These preliminary NEPA determinations and environmental reviews were provided to the selecting official, who considered them during the selection process. Appendix D contains a copy of the environmental synopsis for Area of Interest 2.

Because DOE's proposed action under the Smart Grid Demonstrations Program is limited to providing financial assistance in cost-sharing arrangements to selected applicants in response to a competitive funding opportunity, DOE's decision is limited to either accepting or rejecting the project as proposed by the proponent, including its proposed technology and selected sites. DOE's consideration of reasonable alternatives is therefore limited to the technically acceptable applications and the No-Action Alternative for each selected project.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Sections 3.1 to 3.8 detail the affected environment and potential environmental consequences for the proposed project and the No-Action Alternative. The sections discuss air quality; biological resources; geology and soils; noise and vibration; cultural, historical and paleontological resources; socioeconomics and environmental justice; public and occupational safety and health; and water resources. Section 3.9 discusses resource commitments.

3.1 Air Quality

Section 3.1.1 discusses regional air quality, and Section 3.1.2 provides estimates of emissions from PG&E's proposed project.

3.1.1 Affected Environment

3.1.1.1 Criteria Pollutants

The ambient air quality in an area can be characterized in terms of whether it complies with the primary and secondary National Ambient Air Quality (AAQ) Standards. The Clean Air Act (42 U.S.C. 7401 et seq.) requires the EPA to set national standards for pollutants that are considered harmful to public health and the environment. The EPA established standards for six criteria pollutants: carbon monoxide (CO), lead, nitrogen dioxide (NO_2), ozone, particulate matter [both with median aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}) and less than or equal to 2.5 micrometers ($PM_{2.5}$)], and sulfur dioxide (SO_2). Primary standards define levels of air quality for each of the six criteria pollutants that would provide an adequate margin of safety to protect public health, including the health of sensitive populations such as children and the elderly. Secondary standards define levels of air quality that are deemed necessary to protect the public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. EPA designates regions that do not meet the standards as nonattainment areas.

EPA has designated San Joaquin County as an extreme non-attainment area for ozone, a non-attainment area for $PM_{2.5}$, a maintenance area for PM_{10}, and an attainment area for lead, NO_2, and SO_2 (EPA, 2013a). Additionally, EPA has designated the urban area of Stockton as a moderate maintenance area for CO. EPA has designated all other areas within San Joaquin County as attainment areas for CO (EPA, 2013a). Table 3-1 lists the primary National Ambient Air Quality Standards for each criteria pollutant and 2011 AAQ monitoring data for San Joaquin County, as measured at the Stockton-Hazelton monitoring station, unless otherwise noted.

The proposed project would emit measurable quantities of ozone precursors (reactive organic gas [ROG] and nitrogen oxides [NOx]), CO, SO_2, PM_{10}, and $PM_{2.5}$ from the burning of fossil fuels in vehicles and heavy-duty equipment. ROG emissions are also expected from air[3] released during compression testing. Fugitive PM_{10} and $PM_{2.5}$ emissions are expected from site preparation, including soil disturbance, onsite cut / fill activities, and wind-blown erosion of stockpiles, as well as from vehicle travel on paved and unpaved roads. Lead emissions from the burning of fossil fuels were not estimated as they are expected to be negligible.

Table 3-1. Primary AAQ Standards and 2011 San Joaquin County AAQ Monitoring Data

Pollutant	Averaging period	Primary standard	2011 San Joaquin County AAQ Monitoring Data
Carbon monoxide	1-hour	35 ppm	3.2 ppm
	8-hour	9 ppm	2.1 ppm
Lead	Rolling 3-month Average	0.15 µg/m^3	NA [a]
Nitrogen dioxide	1-hour	0.100 ppm	0.062 ppm
	Annual Arithmetic Mean	0.053 ppm	0.015 ppm [b]
Ozone	8-hour	0.075 ppm	0.068 ppm
PM_{10}	24-hour	150 µg/m^3	66 µg/m^3
$PM_{2.5}$	24-hour	35 µg/m^3	65.5 µg/m^3
	Annual Arithmetic Mean	12 µg/m^3	13.9 µg/m^3
Sulfur dioxide	1-hour	75 ppb	16 ppb [c]

[a] Lead data for the 3-month averaging period were not available for any monitoring station.

[b] NO_2 data for the annual averaging period were not available from the EPA and were instead obtained from the ARB.

[c] SO_2 is not monitored in San Joaquin County; as a result, ambient SO_2 data were obtained from the monitoring station located at 3425 N First Street in Fresno, assuming that Fresno County would have ambient air conditions similar to San Joaquin County.

Source: California Air Resources Board (ARB), 2013a; ARB, 2013b; EPA, 2013b

µg/m^3 = micrograms per cubic meter
ppm = parts per million
ppb = parts per billion
NA = not available

[3] The air released from gas wells during compression testing is expected to contain low amounts of natural gas with estimates ranging from less than 0.5 percent to as much as 2 percent. According to laboratory analytical reports, 2.09 pounds of ROG are contained in each million standard cubic foot (MMscf) of King Island natural gas.

3.1.1.2 Greenhouse Gases

The burning of fossil fuels, such as diesel and gasoline, emits carbon dioxide (CO_2), which is a GHG. In addition, the withdrawal well test may result in the release of small amounts of methane, another GHG, from the air storage reservoir. GHGs can trap heat in the atmosphere and have been associated with global climate change. The Intergovernmental Panel on Climate Change (IPCC) 2007 Fourth Assessment Report stated that the earth's climate system is warming and that most of the observed increase in globally averaged temperatures since the mid- twentieth century is due to the observed increase in concentrations of GHGs from human activities (IPCC, 2007). GHGs are well mixed throughout the lower atmosphere, such that any emissions would add to cumulative regional and global concentrations of CO_2. The six key GHGs include CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The proposed project is expected to emit CO_2 and CH_4 from burning of fossil fuels in vehicles and heavy-duty equipment as well as from air[4] released during compression testing. N_2O emissions from the burning of fossil fuels were not estimated because they are expected to be negligible.

Projects requiring approval of funding from federal agencies that are in areas designated as nonattainment or maintenance for the National Ambient Air Quality Standards are subject to the EPA General Conformity Rule. Therefore, the emissions associated with the proposed project were compared to the General Conformity *de minimis* threshold values applicable to the proposed project site. The results of this comparison are included in the following section.

Additionally, the San Joaquin Valley Air Pollution Control District (SJVAPCD) has provided recommended thresholds of significant impact to be used in CEQA evaluations. Although this project does not require state or local discretionary permits and is therefore not subject to CEQA, these recommended thresholds would be used to further evaluate the potential impacts of the proposed project. The results of this comparison are also included in the following section.

The CEQ has provided draft guidance suggesting that quantities of direct GHG emissions equal to or greater than 25,000 metric tons of carbon dioxide equivalent (CO_2e) on an annual basis are meaningful and should be quantified and disclosed for project evaluations within the NEPA framework (CEQ, 2010). This threshold would be used as a guide for assessing whether GHG emissions from construction activities are meaningful.

[4] The air released from gas wells during compression testing is expected to contain trace amounts (approximately 2 percent) of natural gas, of which 92 percent is expected to be CH_4.

3.1.2 Environmental Consequences

3.1.2.1 Proposed Project

3.1.2.1.1 Construction Emissions

Air emissions from construction activities at the proposed site would include fugitive dust from site preparation and combustion emissions from vehicles and heavy-duty equipment for construction of new *temporary* facilities. *A* summary of the calculation methodology and results is presented below.

Construction emissions were estimated using construction equipment emission factors from the *California Emissions Estimator Model (CalEEMod) User's Guide* (Environ, 2011) or manufacturer guarantees and vehicle emission factors from EMFAC2007 (version 2.3). PM_{10} and $PM_{2.5}$ emissions from vehicle travel on paved and unpaved roads were estimated using emission factors from EPA's compilation of air pollutant emission factors, known as *AP-42* (EPA, 2011; EPA, 2006). PM_{10} emissions from soil disturbance and onsite cut / fill activities were quantified using emission factors from the *Software User's Guide: URBEMIS2007 for Windows* (JSA, 2007). $PM_{2.5}$ emissions from soil disturbance and onsite cut / fill activities were assumed to be 20.8 percent of the PM_{10} emissions per the *Final – Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds* (SCAQMD, 2006). PM_{10} and $PM_{2.5}$ emissions from wind-blown erosion of stockpiles were quantified using emission factors from the *Western Regional Air Partnership (WRAP) Fugitive Dust Handbook* (Countess Environmental, 2006). *Estimates for applicable construction equipment quantities, sizes, and utilization were based on contractor/engineering schedules and plans for all site work associated with the compression testing project (mobilization, civil improvements, well construction/work-over, infrastructure/equipment installation, testing and demobilization).*

The project's estimated construction emissions, summarized in Table 3-2, would be short-term as the construction period is only *four to six* months in duration. As shown in Table 3-2, construction emissions would not exceed either the SJVAPCD's recommended thresholds of significant impact or the General Conformity *de minimis* threshold values. Because the potential emissions from construction activities would be below these thresholds and short-term, these emissions would have a less-than-significant impact on air quality.

Table 3-2. Proposed Project Emissions

Criteria Pollutant Summary	Annual Emissions (tpy)					
	ROG	**CO**	**NOx**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Construction Emissions	*0.11*	*0.63*	*1.97*	*0.004*	*5.27*	*0.67*
Operation Emissions	*0.04*	*0.20*	*0.79*	*0.002*	*1.25*	*0.15*
SJVAPCD Significance Thresholds	10	NA	10	NA	NA	NA
Project Exceeds Thresholds?	No	No	No	No	No	No
General Conformity *de minimis* Thresholds	10	N/A	10	N/A	100	100
Project Exceeds Thresholds?	No	No	No	No	No	No

Source: SJVAPCD, 2002; EPA, 2010

tpy = tons per year
NA = threshold of significance not available

Similarly, the GHG emissions associated with construction activities, presented in Table 3-3, are less than the CEQ significance threshold of 25,000 metric tons of CO_2e per year (CEQ, 2010). As such, these emissions would have a less-than-significant impact on climate change.

Table 3-3. Proposed Project GHG Emissions

GHG Summary	Annual Emissions (metric tons/year)		
	CO_2	**CH_4***	**CO_2e**
Construction Emissions	*326.59*	*0.01*	*326.87*
Operation Emissions	*140.44*	*104.08*	*2,742.45*
CEQ Significance Threshold			25,000
Project Exceeds Threshold?			No

*Operation CH_4 emissions based on a worst-case estimate of 317 MMscfd total air withdrawn with a natural gas concentration of 2 percent.

Source: CEQ, 2010

3.1.2.2 Operations Emissions

Air emissions from operation activities at the proposed site would include combustion emissions from vehicles and ROG and CH_4 emissions contained in the air released during compression testing. The project's estimated operation emissions, also summarized in Table 3-2, would be short-term as the proposed operation period is only five months in duration. These emissions were estimated using based on analysis of native gas analysis and modeling of the reservoir to

determine the relatively small amounts of VOCs and GHG expected to be in the air during withdrawal. *The worst-case scenario of blowing down (venting) 200 MMSCF of air after flow testing in order to meet EPA reservoir pressure requirements was assumed.*

As shown in Table 3-2, operation emissions would not exceed either the SJVAPCD's recommended thresholds of significant impact or the General Conformity *de minimis* threshold values. Because the potential emissions from operation activities would be below these thresholds and would be short-term emissions, they would have a less-than-significant impact on air quality.

Similarly, the GHG emissions associated with operation activities, presented in Table 3-3, are less than the CEQ significance threshold of 25,000 metric tons of CO_2e per year (CEQ, 2010). As such, these emissions would have a less-than-significant impact on climate change.

3.1.2.3 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to PG&E for the proposed project, and DOE assumed for this EA that the project would not proceed without DOE assistance. Under the No-Action Alternative, therefore, air emissions from project operation activities at the proposed site would not occur. However, there would also be no potential for a beneficial increase in electrical grid operation efficiency and decrease in regional emissions of pollutants from the development of the energy storage system.

3.2 Biological Resources and Soils

Section 3.2.1 describes biological resources in and near the proposed project site. Section 3.2.2 discusses the potential impacts. DOE sent a consultation letter to FWS with a copy of the survey to comply with Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), and received a reply. The FWS concurred on August 2, 2013 with the determination (Section 3.4.2) that the project may affect, but is not likely to adversely affect listed species. Appendix C *contains* a biological resources constraints analysis *(BCA) and survey report* for the project. *This appendix also contains an addendum to the BCA, dated April 2014, that takes into consideration changes in the construction schedule made since the BCA was initially prepared in July 2013.*

3.2.1 Affected Environment

PG&E conducted *the* BCA of the proposed project area during 2012 and 2013. The BCA included a desktop review of biological resources and field surveys of the project area. For the purpose of this environmental assessment, the 'project area' includes a 200-foot buffer around the proposed TSF pad, a 20-foot buffer around all dirt access roads.

The purpose of the BCA was to: (1) characterize the habitats and vegetation communities present; (2) evaluate the potential for the occurrence of special-status plant and animal species; (3) determine the presence or absence of waters of the United States; (4) determine the presence

or absence of other sensitive biological resources (e.g., riparian habitats, nesting raptors); (5) determine potential impacts on biological resources resulting from project construction and operation; and (6) identify practicable avoidance and minimization measures to reduce the potential for adverse effects. A discussion of the methodology for the desktop review and field surveys is provided below.

The desktop review of biological resources included the use of the following information resources:

- Available baseline data, including National Agricultural Imagery Program aerial imagery, National Resources Conservation Service soil maps, and National Wetlands Inventory maps

- Resource database records, including California Natural Diversity Database (CNDDB) records, California Native Plant Society Inventory, and FWS species lists.

A field reconnaissance of the project area was conducted on April 3, 2103, by biologist Brandon Amrhein. The reconnaissance consisted of vehicle and pedestrian surveys of the project area to document the existing conditions and evaluate the presence of habitat for special status species, their potential to occur in the project area, and the potential of the project to affect these species.

This section provides the required wetland and floodplain assessment and this environmental assessment provides an opportunity for public review in compliance with regulations promulgated at 10 CFR 1022, "Compliance with Floodplain and Wetland Environmental Review Requirements." These regulations provide a guide for DOE compliance with Executive Order (EO) 11988, "Floodplain Management," and EO 11990, "Protection of Wetlands." EO 11988 requires federal agencies, while planning their actions, to avoid to the extent possible adverse impacts associated with the modification of floodplains and to avoid support for development in a floodplain when there is a better practicable alternative. EO 11990 requires that federal agencies, while planning their actions, consider alternatives to affecting wetlands, if applicable, and limit adverse impacts to the extent practicable if impacts cannot be avoided.

3.2.1.1 General Habitat

The proposed location of the King Island TSF is in the Delta Islands of San Joaquin County, in a landscape that currently supports active agricultural operations and an existing natural gas well site. The Delta Islands are areas of former marshlands of the Sacramento–San Joaquin Delta that were historically reclaimed for agricultural use by the construction of levees/dikes and draining.

The TSF site is located in an orchard of walnut tree saplings with surrounding dirt access roads. Vegetation communities occurring in the project area include annual grassland, cropland/ orchard, fresh emergent wetland, riverine, and ruderal communities. Project areas on either side of Bishop Cut support annual grassland. Cropland/orchard is the dominant vegetation community within the TSF site. The TSF site is entirely within the walnut orchard and the strips between tree

rows are regularly mowed or disked. All agricultural fields in the area are actively farmed, annually disked, and harvested and/or disturbed up to the edge of existing roads. Fresh emergent wetlands occur in portions of the irrigation ditches that are located adjacent to the TSF site and gravel access roads.

No seasonal wetlands, vernal pools, elderberry shrubs (*Sambucus nigra*), riparian habitats, or other sensitive natural communities (e.g., CNDDB ranked rare natural communities) are present in the project area.

3.2.1.2 Special-Status Species

As a result of the biological desktop review, it was determined that sixteen special-status plant and animal species could occur within the proposed project area and surrounding vicinity. Special-status plants include species that are: (1) listed as threatened or endangered under the California Endangered Species Act (CESA) or the federal Endangered Species Act (ESA); (2) proposed for federal listing as threatened or endangered; (3) state or federal candidate species; (4) designated as rare by the California Department of Fish and Wildlife (CDFW); and (5) have a California Rare Plant Rank (RPR) of 1A, 1B, or 2 species. Special-status animal species include species that are: (1) listed as threatened or endangered under the CESA or ESA; (2) proposed for federal listing as threatened or endangered; (3) state or federal candidate species; and (4) identified by the CDFW as species of special concern or fully protected species.

Special-status species that could occur in the project area and surrounding vicinity are discussed below.

Plants. Irrigation ditches along the gravel access road and TSF site provide habitat for special-status plant species. No habitat for federal-listed plant species is present in the project area. Seven California Rare Plant Rank (RPR) 1B species potentially occur including slough thistle (*Cirsium crassicaule*), woolly rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*), Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), Mason's lilaeopsis (*Lilaeopsis masonii*), Sanford's arrowhead (*Sagittaria sanfordii*), and Suisun marsh aster (*Symphyotrichum lentum*). Five RPR 2 species potentially occur and include watershield (*Brasenia schreberi*), bristly sedge (*Carex comosa*), Delta mudwort (*Limosella subulata*), eel-grass pondweed (*Potamogeton zosteriformis*), marsh skullcap (*Scutellaria galericulata*), and side-flowering skullcap (*Scutellaria lateriflora*). The CNDDB contains reported occurrences of watershield, woolly rose-mallow, Delta tule pea, Mason's Lilaeopsis, Delta mudwort, side-flowering skullcap, and Suisun marsh aster within five miles of the project area.

Reptiles. Irrigation ditches and adjacent uplands near the TSF pad area provide low-quality habitat for the giant garter snake (*Thamnophis gigas*), which is federal- and state-listed as threatened. An extant population of giant garter snakes occurs approximately 0.6 mile east of the project area. The irrigation ditches also provide habitat for the western pond turtle (*Emys marmorata*), a California species of special concern. Western pond turtles are reported by the CNDDB to occur 0.9 miles southeast of the TSF site.

Birds. Trees within 0.5 mile of the project area provide nesting habitat for the Swainson's hawk (*Buteo swainsoni*) and white-tailed kite (*Elanus leucurus*). The Swainson's hawk is state-listed as threatened and reported by the CNDDB to nest at several locations within two miles of the project area. The white-tailed kite is a California Fully Protected species and is reported by the CNDDB to nest within three miles northeast of the project area. Additionally, trees and shrubs provide habitat for loggerhead shrikes (*Lanius ludovicianus*) and may provide nesting habitat for northern harriers (*Circus cyaneus*). Both the loggerhead shrike and northern harrier are California species of special concern.

Burrows and other structures (e.g., culverts) in annual grasslands and ruderal habitats along road shoulders, open areas, and levee berms, provide habitat for burrowing owls (*Athene cunicularia*). The burrowing owl is a California species of special concern and is reported by the CNDDB to occur within 3.8 miles southeast of the project area.

3.2.1.3 Waters of the United States

Irrigation ditches occur immediately adjacent west of the TSF site and along the access roads. The ditches may qualify as waters of the United States.

3.2.1.4 Other Sensitive Biological Resources

Migratory birds and raptors (i.e., birds of prey) protected under the federal Migratory Bird Treaty Act and California Fish and Game Code may nest on open ground, vegetation, or structures within the project area or surrounding vicinity.

Wildlife corridors connect habitat separated by human activities. Wildlife corridors are important as they increase available habitat by providing protective passage between suitable habitat areas. Nursery habitat provides habitat elements necessary to raise young to maturity (e.g., caves, rookeries, wetland, rivers). Bishop Cut provides migratory, spawning, and rearing habitat for several fish species. Project activities would not occur within Bishop Cut and would not interfere with the movement of any native resident or migratory fish or wildlife species, with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery habitat.

Tree removal required for the project is limited to removal of approximately 90 sapling-sized walnut trees located at the TSF site. The walnut orchard is not considered a sensitive biological resource. Tree removal would not require authorization under, or conflict with, a tree ordinance.

The project area occurs within the San Joaquin County Multispecies Habitat Conservation and Open Space Plan (SJMSCP) planning area. The proposed project is not subject to discretionary approval by San Joaquin County, and as such, would not conflict with the SJMSCP.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Project

3.2.2.1.1 Construction Impacts

Irrigation ditches provide potential habitat for special-status plant species. The proposed project would not include work or disturbance within the irrigation ditches. Therefore, no effects on special-status plant that reside in this habitat would occur.

Construction of the TSF site could affect seven special-status animal species including the giant garter snake, western pond turtle, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, and loggerhead shrike. Within the project area there is a low potential for giant garter snakes and western pond turtles to occur in aquatic habitats near the TSF site and gravel access road. Swainson's hawks, white-tailed kites, northern harriers, and loggerhead shrikes have a low potential to occur near the TSF site. The western burrowing owl has a low potential to occur along the roadways and irrigation ditches.

Construction of the TSF site may affect giant garter snakes and western pond turtles during project activities (e.g., traffic, noise, lighting, ground disturbance, pole placement, or road improvement activities). Refueling or other fluid or chemical applications could result in impacts on water quality in irrigation ditches, which could affect these species or their prey base. Due to the low likelihood of giant garter snakes to occur in the project area, project avoidance of aquatic habitat, and the implementation of avoidance and minimization measures, the proposed project is not likely to adversely affect the giant garter snake. Although there is a low potential for western pond turtles to occur in the project area, no effects are expected because they are generally restricted to aquatic habitat and work would not occur in such habitats.

Vegetation removal, and noise and lighting generated during construction activities could affect Swainson's hawks, white-tailed kites, northern harriers, loggerhead shrikes, western burrowing owls and other nesting migratory birds or raptors if nests are physically removed or noise affects nest success. Nesting substrates are limited within the TSF site area. By implementing nesting bird surveys *and other avoidance and minimization measures*, adverse effects on nesting birds would be avoided.

Construction activities would be short term (approximately *five* months) and implementation of avoidance and minimization measures (AMMs) described in the *BCA* (Appendix C) would reduce effects on special-status species. These measures include preconstruction surveys, exclusionary fencing, worker environmental training, burrow avoidance, road shoulder avoidance, limiting speed, and an onsite biological monitor.

Based on the above information, DOE determined that the project should not adversely affect the giant garter snake, which is federally threatened. No effects are expected on any other, endangered, threatened or candidate species.

The project would not result in any physical disturbance of irrigation ditches nor result in direct impacts on waters of the United States during construction. AMMs have also been incorporated into the project activities to preclude the potential for indirect impacts on these habitats.

3.2.2.1.2 Operations Impacts

Operational impacts would be short-term, with operation of the project being limited to approximately *seven* months from approximately *December, 2014* to *June, 2015*. Because such impacts are limited to the pressure testing at the TSF site and light vehicular traffic on the gravel access road, potential effects on special-status species would be limited to four species. These species include the giant garter snake, Swainson's hawk, white-tailed kite, and loggerhead shrike.

Traffic to the TSF site would be limited to light vehicles and the occasional service trucks. Adverse effects *to special-status species* are not expected because: (1) the potential for giant garter snakes to occur in the project area is low, (2) work would not occur in aquatic habitat, and (3) vehicular traffic would be light.

Project construction, operation and decommissioning would produce noise that could affect nesting birds in the immediate vicinity of the TSF site. *If work starts during the nesting season, AMMs have been incorporated into the project to preclude the potential for impacts to nesting birds.*

The project would not result in any physical disturbance of irrigation ditches. AMMs have been incorporated into the project to preclude the potential for indirect impacts.

Implementation of AMMs presented in the Biological Constraints Analysis (Appendix C) would reduce the potential for effects on these species further. PG&E's standard BMPs would also be in place for equipment refueling and maintenance, and no adverse effects on aquatic species are expected.

3.2.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to PG&E and, consequently, PG&E would not implement the proposed project. Since there would be no site preparation or operations, there would be no effects on biological resources.

3.3 Geological Hazards and Resources

3.3.1 Affected Environment

The project site is in an area of relatively flat topography typical of the California Central Valley. Near-surface sediments close to the site have been deposited primarily from the Sacramento, Mokelumne, and San Joaquin river systems. Surficial geology at the project site consists of

Quaternary Modesto Formation deposits of undifferentiated alluvium, forming a toe of Mokelumne alluvial fan, generally covered by Holocene intertidal deposits.

Active faults within 30 miles of the project site include segments of the Great Valley and Greenville faults. These faults run along the eastern margins of the Coast Ranges approximately 20 miles from the project site and are capable of generating maximum credible earthquake (MCE) moment magnitudes up to 7.3 (Blake, 2004). No major surface faults have been mapped near or crossing the project site and the site is not within an Alquist-Priolo Special Studies Zone.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Project

The proposed project would not expose members of the public or property to geological hazards and would not prevent the use of geological resources. The project would make use of a natural gas field that has been depleted and therefore would involve the re-use and renewal of an existing geological resource. Because the surrounding topography is flat, the public would not be exposed to landslide hazards.

Recently, there have been public concerns about induced seismicity that could result from deep injection and from the use of hydraulic fracturing (fracking) techniques that involve the deep injection of fluids to enable withdrawal of natural gas from shale deposits. Comprehensive studies have concluded, however, that earthquakes due to deep injection are rare events. A study prepared in 2012 by the National Academy of Sciences (NRC, 2012) for example, found that injection/withdrawal projects that maintain a balance between the amount of fluid injected and the amount withdrawn were found to induce fewer felt seismic events than projects that do not maintain fluid balance. Consistent with this observation, the study reported that wastewater disposal was suspected or determined to be a likely cause of earthquakes felt by people (Richter Magnitude over 2.0) at eight locations in the central United States, but these events occurred in proximity to the injection points. To place this in perspective, these eight locations represent a tiny percentage (less than 0.03 percent) of the approximately 30,000 wastewater disposal wells in the United States. Interestingly, no seismic events were reported to be associated with any gas storage projects. This would be expected, because these projects tend to maintain a balance within the original gas content of a depleted reservoir.

Furthermore, an induced seismic event is much more likely in an area of active faults and high seismic activity, as these are indicative of accumulated tectonic stress that could be released by changes in pore pressures. The King Island site is located in a part of California's Central Valley that is not seismically active. The nearest reported faults in the United States Quaternary Fault and Fold Database (U.S. Geological Survey, 2013) are the Antioch Fault, which is located approximately 20 miles west of the TSF site, two unnamed faults located approximately 15 miles west of the site and one unnamed fault located approximately 19 miles north of the site. None of these faults show any evidence of activity over the past 1.5 million years. The nearest historically active fault is the Greenville Fault, which is located near the City of Livermore approximately 28

miles southwest of the site. The Concord Fault, which is believed to have been active within the last 15,000 years, is located approximately 27 miles southwest of the site.

Evaluation of the subsurface geology near the site did not identify any evidence of major inactive or potentially active faults. A small west-northwest trending normal fault has been interpreted to be located approximately 0.75 mile southwest of the proposed I/W Well and outside the boundaries of the target injection reservoir in the Mokelumne River Formation. This fault terminates in the Eocene Markley Formation, and thus has not been active for over 30 million years.

Induced seismicity is relatively rare and most prevalent in wastewater injection wells near seismically active areas. The project proposes to inject an air bubble that is smaller in volume than the original gas in place in the reservoirs, and would result in a temporary pressure increase within the target injection reservoir. Based on the nature of the project and the absence of potentially active faults near the site, there is very little likelihood that the project would induce significant seismic events.

The project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving the rupture of a known earthquake fault, seismic-related ground failure, including liquefaction, result in landslides, or result in substantial soil erosion or the loss of topsoil. The project would have minimal and temporary impacts to geology and soil resources.

3.3.2.2 No-Action Alternative

Under the No-Action Alternative, PG&E would not implement the proposed project. Therefore, the benefits of the reuse of the existing depleted gas well would not occur.

3.4 Noise and Vibration

3.4.1 Affected Environment

The project site is located in a rural and agricultural area. Sources of ambient noise include mostly agricultural vehicles and machinery. Traffic noise from the City of Stockton and Interstate Highway 5 located approximately 2.2 miles to the east is audible at a low level.

The nearest sensitive noise receptors to the project site are rural ranch residences located to the south of the project site, which include the Foppiano and Solari properties. These are approximately 2,900 and 3,200 feet south of the well pad, respectively. The nearest residential receptor to the north is approximately 4,800 feet from the proposed pad. To the east and west, there are no residential receptors within two miles.

Sources of project noise would be notably different during well pad construction as well as the well drilling and operations phases. During construction drilling, project noise would come from

large vehicles transporting the equipment to the site, heavy equipment preparing the pad (spreading and compacting aggregate), and vehicles transporting the drill rig and associated equipment. The drill rig, when in operation, would also generate noise.

During operation, the major noise sources would be the injection equipment, which includes the compressors; and the extraction equipment, which includes the choke manifold, piping, air release stack, and transformers. While the injection equipment may operate at any time of day, the extraction equipment, including the loudest noise sources in the choke manifold and the air release stack, would operate only during the daytime hours (as defined by the County noise ordinance). Table 3-4 lists the major noise-producing equipment.

Table 3-4. Operational Noise Sources, Without Attenuation

Equipment, Without Attenuation	Estimated Sound Pressure Level, dBA, 3 feet
Injection:	
Primary Compressor/Motor	109.4
Mid Pressure Compressor/Motor	107.4
High Pressure Compressor/Motor	107.4
Cooling Water Pumps/Motors	Pump 106.4 Motor 99.0
Extraction:	
Choke Manifold	118.2
Air Release Vent	134.0

dBA = A-weighted decibel

3.4.2 Environmental Consequences

The San Joaquin County noise ordinance designates noise limits that a project can generate in terms of average hourly (L_{eq}) and maximum noise, in decibels (dB) during the daytime and nighttime hours, respectively, in an outdoor location, regardless of the zoning district (Title 9, Section 9-1025.9 Development Title of San Joaquin County, California). Table 9-1025.9 in the County noise ordinance is summarized as Table 3-5.

Table 3-5. San Joaquin County Noise Ordinance Noise Standards for Outdoor Activity Areas

Noise Specification	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly Equivalent Sound Level (L_{eq}), dB	50	45
Maximum Sound Level (L_{max}), dB	70	65

Applied to the CAES compression test project, the noise ordinance requires that noise attributable to the proposed project not exceed 50 dBA during the daytime or 45 dBA during the nighttime in outdoor activity areas during at the nearest residence, the Foppiano property. It is assumed that "dB" means the A-weighted sound pressure level (commonly abbreviated as dBA), which is the unit commonly used for environmental noise limits.

3.4.2.1 Proposed Project

3.4.2.1.1 Construction Impacts

Construction-related noise from vehicles and the well drilling rig would be temporary (*five* months) and, given the distance to the nearest residential receptors, would not contribute significantly to ambient noise or cause adverse noise impacts.

3.4.2.1.2 Operations Impacts

Noise that the project would generate at the nearest receptors was modeled using the computer software noise model, CADNA/A® by DataKustik GmbH of Munich, Germany. This is a sophisticated program capable of fully modeling very complex facilities. The sound propagation algorithms and factors used in the model have been adopted from ISO 9613-2 *Acoustics - Sound Attenuation During Propagation Outdoors* and VDI 2714 *Outdoor Sound Propagation*.

The noise sources were modeled as point sources at their expected locations (as determined from the General Arrangement drawing) and heights. A-weighted sound power levels were assigned at 500 Hertz (Hz), and full octave band sound power level data were assigned, when available. The model then calculated sound pressure levels that would occur at each receptor from the noise sources after losses from distance, air absorption, ground effects, and the barrier effect of noise walls, buildings, and terrain (if any). Similar calculations were made for points located on a systematic grid placed over the area surrounding the project site. Noise level isolines for mapping were generated by the model based on the grid calculations.

The attenuation calculations for those sources for which only A-weighted sound levels are available are based on the assumption that all of the sound was at 500 Hz. This is consistent with guidance in ISO 9613 (Acoustics – attenuation of sound during propagation outdoors – Part 2: General method of calculation).

Figure 3-1 shows the model results for daytime operation of the withdrawal equipment only, with a silencer providing a 35 dBA insertion loss for the air release stack. This results in a maximum estimated noise level to 50 dBA at the nearest receptor, the Foppiano property, which would comply with the San Joaquin County daytime limit.

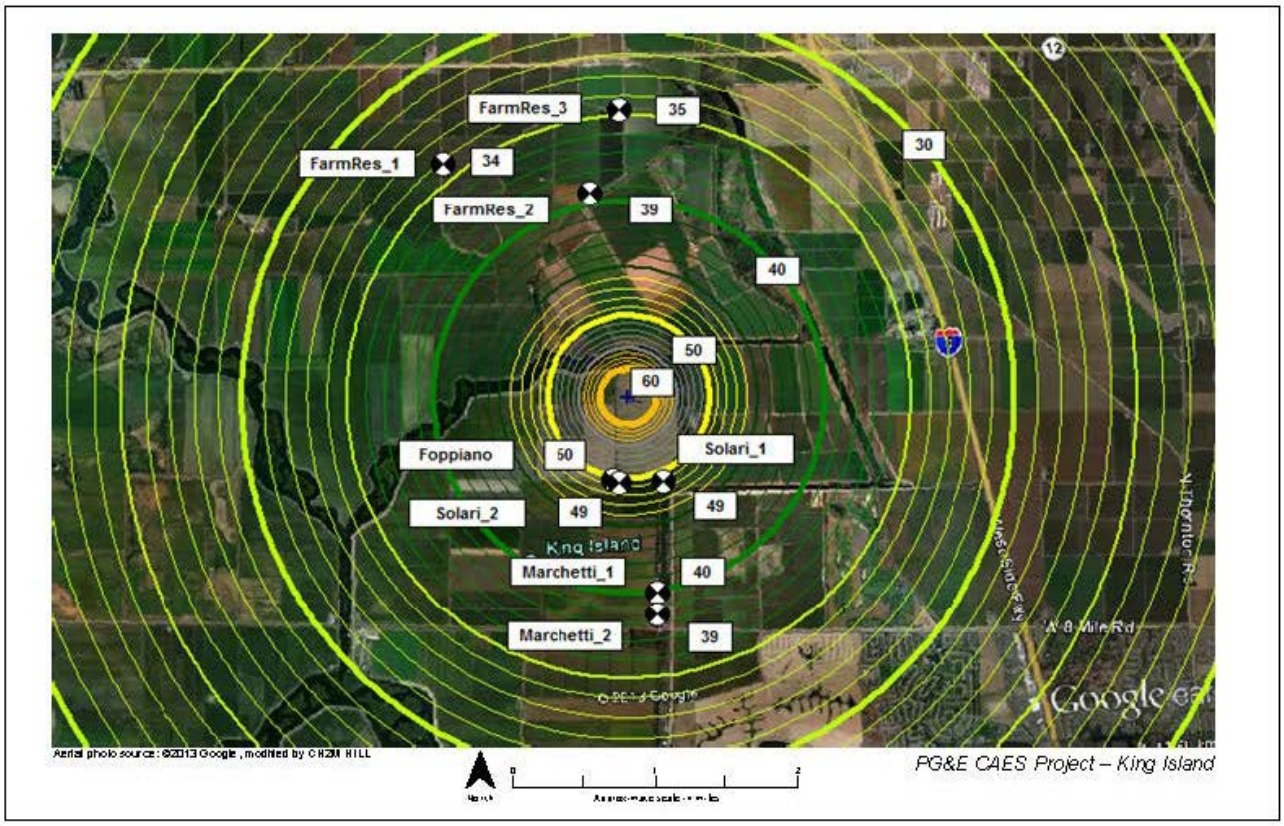


Figure 3-1. Noise Contours (dBA) for Daytime Operation of the Withdrawal Equipment, with Noise Attenuation.

Figure 3-2 shows the results for nighttime operation when the compression equipment is operating and the withdrawal equipment is not in operation. This figure also includes the effect of noise barrier walls on the south sides of the compressors. This results in reducing the maximum estimated receptor noise level to 44 dBA, which would comply with the San Joaquin County nighttime limit.

The preliminary noise modeling evaluation indicates that it is feasible to mitigate the CAES compression testing equipment sufficiently to comply with the San Joaquin County noise limits. Although this modeling effort applied specific noise attenuation methods (stack silencer and barrier wall), there are a number of additional attenuation methods that could be used for the equipment to achieve compliance with the noise ordinance.

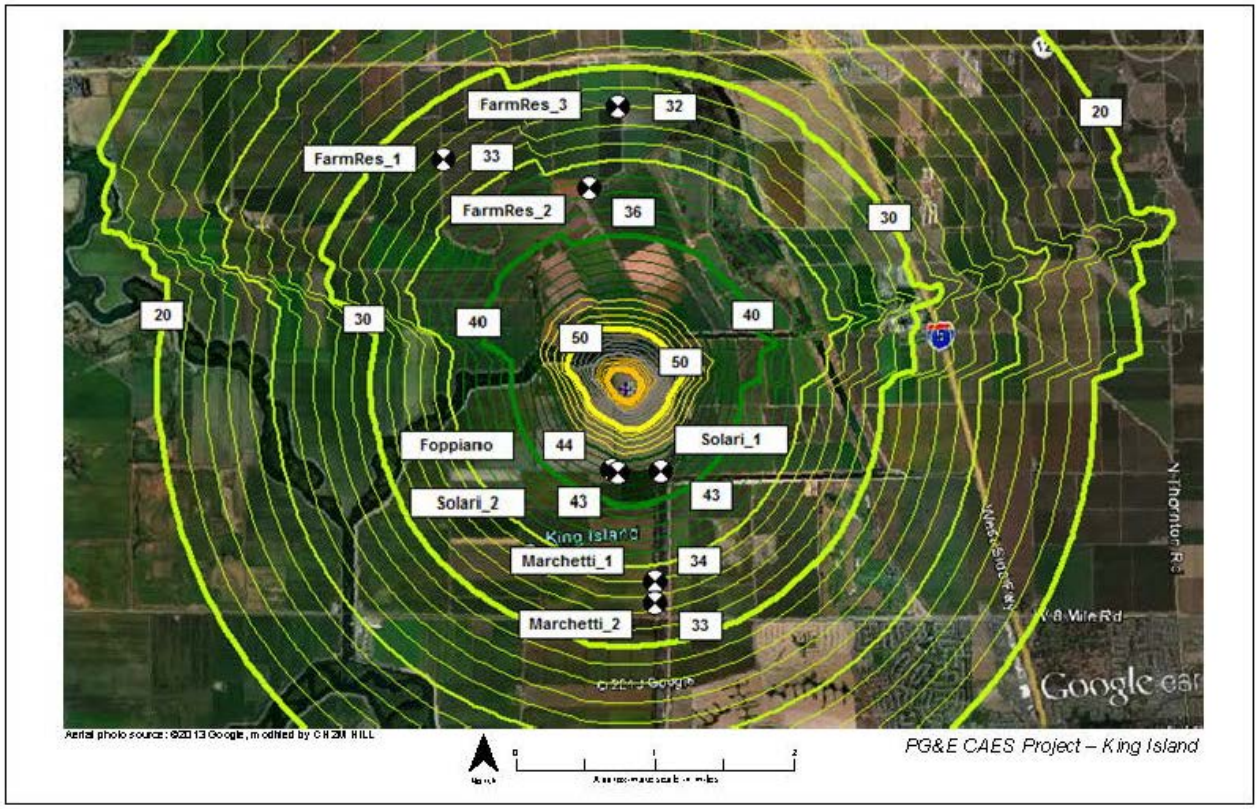


Figure 3-2. Noise Contours (dBA) for Nighttime Operation of the Injection Equipment ,with Noise Attenuation.

3.4.2.2 No-Action Alternative

Under the No-Action Alternative, PG&E would not implement the proposed project. Therefore, the noise generated by construction and operation would not occur.

3.5 Cultural Historical and Paleontological Resources

DOE must comply with Section 106 of the National Historic Preservation Act (16 U.S.C. 470 et seq.). As such, the DOE often consults with SHPOs and interested Native American Tribes. In the case of this proposed action and PG&E's proposed project, DOE consulted with the California SHPO. The California State Historic Preservation Officer responded on June 26, 2013, with a letter indicating their agreement with DOE's determination that the project would not affect historic properties. On June 28, DOE notified the California SHPO of a minor change in the area of potential effect related to distribution line construction and the California SHPO responded on July 3, 2013, with a letter of concurrence that the area of potential effects, as amended, would not affect historic properties. Additionally, on August 1, 2013, DOE informed the California SHPO of an additional minor change involving additional expansion of the distribution line construction work area. On August 7, 2013, the California SHPO responded with a letter of concurrence that, with the additional expansion of the area of potential effects the

project also would not affect historic properties. Appendix B contains copies of this correspondence.

On June 20, 2013, DOE sent letters to Native American Tribes to inform them of the project. DOE also requested any comments or concerns the Tribes might have on the potential for the proposed project to affect cultural or archaeological resources. On June 28, DOE sent letters to the Tribes to notify them of a minor change in the area of potential effects resulting from expansion of the distribution line construction work area. DOE sent letters to the Tribes on August 1, 2013, to notify them of a minor change in the area of potential effects resulting from an additional expansion of the distribution line construction work area. The California Valley Miwok Tribe responded and requested that DOE notify them if Miwok artifacts or human remains were discovered at the project locations. The Shingle Springs Rancheria/Shingle Springs Band of Miwok Indians requested that the DOE consult with them on this project regarding traditional cultural properties and requested that construction monitoring be conducted in sensitive areas. DOE held several teleconferences and PG&E sponsored a site visit with the Shingle Springs Rancheria leading to an agreement between PG&E and the Tribe regarding the monitoring of construction. The Buena Vista Rancheria of Me-Wuk Indians also requested that the DOE consult with them regarding the project's potential effects on Native American cultural heritage. DOE held teleconferences and PG&E also conducted a site visit with the Buena Vista Rancheria of Me-Wuk Indians leading to an agreement between PG&E and the Tribe regarding the monitoring of construction. Appendix B contains copies of the letters and responses DOE received.

Section 3.5.1 describes historic and cultural resources in and near the proposed project site, and Section 3.5.2 discusses the potential impacts. Appendix B contains copies of the correspondence between DOE, the California SHPO, and the interested Native American Tribes.

3.5.1 Affected Environment

3.5.1.1 Cultural and Historical Resources

The cultural resources APE included: (1) the 2.8-acre TSF site and its 200-foot-wide buffer, and (2) the dirt access roads and their 20-foot-wide buffer. The desktop review of cultural resources included the following information sources:

- Cultural Resource Survey for the PG&E CAES – King Island Project, San Joaquin County, California. SWCA Environmental Consultants, October 2012 (Treffers and Dietler, 2012)
- National Historical Topographic Map Collection (U.S. Geological Survey)
- National Register of Historic Places (NRHP)
- California Register of Historical Resources (CRHR)

- A field review of the proposed development site and access roads was conducted on April 3, 2103, by North State Resources (NSR) archaeologists Kristina Crawford and Mim Roeder. Archeologists walked pedestrian transects over the study area at intervals of approximately 15 meters or less as conditions warranted. Subsurface investigations were not conducted.

A previous investigation by SWCA (Treffers and Dietler, 2012) identified four potentially historic buildings and structures within and immediately adjacent to the APE. These consisted of three buildings dating to between approximately 1939 and 1952, and an irrigation canal built in 1939, known as Bishop Cut. NSR also noted the presence of these resources in the April 3, 2013, survey and visually confirmed their condition and potential age as noted by Treffers and Dietler in 2012. In addition, NSR archaeologists noted the presence of a sparse scatter of mid-late twentieth century debris. This debris consisted of several glass and porcelain fragments located along the margin of an unpaved access road and adjacent agricultural field at the westernmost extent of the project area in the vicinity of the King Island TSF pad. However, this debris probably dates to the 1960s or 1970s, is highly fragmented, and exhibits no potential historic association or integrity. Consequently, it was not documented in the field due to its probable recent age and ephemeral nature.

Neither the SWCA 2012 study, input from the Native American Heritage Commission and suggested contacts, nor the NSR investigation identified any additional cultural resources or potentially sensitive properties within or near the APE. In order to determine if cultural resources or properties of significance to the present-day Native American community exist within or near the APE, Treffers and Dietler (2012) contacted the Native American Heritage Commission (NAHC) and requested a search of the Sacred Lands File. They also requested a list of appropriate Native American representatives and tribal organizations that might have an interest in consulting regarding the proposed project. The NAHC search did not note any culturally significant locations within the current proposed project's APE or in the general area. *In addition, consultations with the Native American representatives and tribal organizations on the NAHC's list have not identified culturally significant locations (see discussion in Section 1.5.1, above).*

3.5.1.2 Paleontological Resources

Surficial geological deposits of the project area consist of the Quaternary Modesto Formation and consist of alluvium of the Mokelumne River alluvial fan; chiefly sand with minor gravel and silt deposited as glacial outwash during the late Pleistocene. A search of the University of California Museum of Paleontology database conducted on April 2, 2013, yielded records of eight fossil localities from the Modesto Formation. Two of these are finds of fossil plants only. One of these is from Fresno and the other from Sutter County. The remaining six localities yielded vertebrate fossils: three from Stanislaus, two from Fresno, and one from Yolo County.

3.5.2 Environmental Consequences

3.5.2.1 Proposed Project

3.5.2.1.1 Construction and Operation Impacts

Cultural and Historical Resources

None of the three mid-twentieth century vernacular buildings associated with agricultural activities on King Island meet the criteria for listing in the NRHP or CRHR. None of these buildings is associated with any historically significant individual or event and, as such, would not be eligible for NRHP listing under criteria A or B or for CRHR listing under criteria 1 or 2. In addition, farm buildings such as these are commonly encountered in the Central Valley and Delta and these examples are not particularly early or unusual examples of their kind or the work of a master architect. As a result, they are not eligible for NRHP/CRHR listing under Criterion C/3. Lastly, it is unlikely that further investigation would reveal information regarding these buildings that would render any of them significant and suitable for NRHP/CRHR listing. The data potential for these buildings has been realized through the existing documentation and, as a result, none of them is eligible for NRHP/CRHR listing under Criterion D/4 (data potential).

The large irrigation and navigation canal referred to as Bishop Cut was not constructed during the most significant periods of Delta land reclamation (circa 1870-1880, 1910-1920) and is not associated with any other historically significant individual, event, or series of events. As such, is not eligible for NRHP listing under criteria A or B or for CRHR listing under criteria 1 or 2. In addition, features such as Bishop Cut essentially define the character of the Delta and are commonly encountered in this area. Bishop Cut is not a particularly unusual example of its kind, it is not one of the earliest, nor is there any evidence to suggest its design or construction were accomplished by a noted engineer or builder. As a result, it is not eligible for NRHP/CRHR listing under Criterion C/3. Lastly, it is unlikely that further investigation would reveal information regarding this canal that would render it significant and suitable for NRHP/CRHR listing. The data potential for this canal has been realized through the previous documentation and, as a result, is not eligible for NRHP/CRHR listing under Criterion D/4 (data potential).

Paleontological Resources

Although the Modesto Formation has yielded vertebrate and plant fossil remains, very few records appear to come from the Great Valley at these low elevations immediately adjacent to the Delta. All identifiable paleontological localities are more than one mile distant from the proposed project sites. No known paleontological sites occur within one mile of the proposed project sites including the associated access routes. It is therefore unlikely that the proposed project would encounter paleontological resources, given the low sensitivity for significant fossils and the fact that little to no excavation is planned.

3.5.2.1.2 Sensitivity for Buried Archaeological Sites

Given the former natural character of the landscape (marsh or otherwise frequently flooded land in the Sacramento-San Joaquin River Delta) prior to early twentieth century reclamation, it is unlikely that extensive prehistoric Native American occupation occurred on King Island. In addition, it does not appear that any landforms conducive to prehistoric settlement exist within the proposed APE or in the general area. The proposed project area is of low sensitivity for prehistoric Native American sites, features, artifacts, or human interments in surface or subsurface contexts.

Historic-era developments within and near the APE and on King Island appears to consist solely of those associated with twentieth century land reclamation, agriculture, and transportation. Levees, ditches, and roadways within and adjacent to the APE have been well-documented through previous cultural resources investigations, Caltrans bridge assessments, or coincidental mapping and aerial photography since the land was reclaimed and initially tilled in the early-middle decades of the 1900s. As a result, it is unlikely that any previously undiscovered and potentially significant archaeological deposits of the historic era would be encountered during construction and operation.

If any new cultural resources are located during project activities, all ground-disturbing work near the find would cease and a qualified professional archaeologist would be consulted regarding their management. If human remains were encountered during any project-related activity, all work would halt in that vicinity immediately. A qualified cultural resources specialist would be contacted to evaluate the find before the San Joaquin County sheriff/coroner is contacted. If the human remains are of Native American origin, the coroner must notify the Native American Heritage Commission within 24 hours of such identification, per Section 7050 of the California Health and Safety Code.

3.5.2.2 No-Action Alternative

Under the No-Action Alternative PG&E would not proceed with the proposed project, so there would be no activities that might cause impacts to either previously recorded or unknown resources that are either listed on, nominated to, or eligible for listing on the NRHP or CRHR.

3.6 Socioeconomics and Environmental Justice

Section 3.10.1 describes the socioeconomic environment in San Joaquin County, Section 3.10.2 discusses the potential impacts, and Section 3.10.3 addresses environmental justice concerns.

3.6.1 Affected Environment

The proposed project site is in San Joaquin County, California, near Stockton and Lodi. San Joaquin County's estimated population of about 702,612 persons in 2012 reflects growth of 2.5 percent since 2010. The county hosted about 269,072 jobs in 2010, of which 30,919 jobs

(11 percent) were in retail trade and 55,506 (20.5 percent) were in health care and social assistance. Unemployment rates fell in all San Joaquin area counties from December 2010 to December 2012. The largest decreases occurred in San Joaquin County, down 3.6 percentage points, followed by Kings County, down 2.9 points. San Joaquin has cultivated extensive transportation facilities including the Port of Stockton, interstate highways throughout the county, five railroads, and an airport.

The per capita income over 12 months (2011 dollars), in San Joaquin County of $22,857 was about 23 percent less than the State of California per capita income of $29,634. In 2007-2011, about 16.7 percent of county residents and 14.4 percent of California residents were living in poverty. Section 3.6.3 discusses racial and ethnic populations and the low-income population in more details in relation to environmental justice.

3.6.2 Environmental Consequences

3.6.2.1 Proposed Project

The proposed project would create direct jobs during the three-month construction phase and five-month operation phase. Direct socioeconomic changes, as a result of the proposed project, would not be likely, however, and there would be no changes to population, infrastructure, or the level of social services. In addition, vendors and equipment suppliers would benefit from lease or capital orders for the drilling rig, compressors, motors, and other equipment.

3.6.2.1.1 Construction Impacts

Construction and equipment installation would take about five months. PG&E estimates the cost of procurement, installation, and startup would be approximately $20 to $25 million for the proposed compression-testing project. Of this amount, the CPUC would pay 50 percent and the Recovery Act funding would cover the remaining 50 percent balance of $25 million. DOE used standard multipliers to estimate the indirect economic effects of the proposed project. The estimated total earnings effect in the region due to the expected $25 million expenditure would be about $53.8 million. Much of the construction-related spending would directly benefit the suppliers of the equipment and the vendors who would provide materials and services for manufacture of the equipment.

3.6.2.1.2 Operations Impacts

The operation and maintenance of the proposed compressed air testing system would not have noticeable direct or indirect socioeconomic impacts.

3.6.3 Environmental Justice

Executive Order 12898, “Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations,” directs federal agencies to address environmental and human health conditions in minority and low-income communities. The evaluation of

impacts to environmental justice is dependent on determining if high and adverse impacts from the proposed project would disproportionately affect low-income or minority populations in the affected community.

DOE determined that direct socioeconomic impacts from the proposed project are unlikely. The proposed project would not result in workers moving to the area, so there would be no impact to infrastructure including housing and the level of social services in the area. However, there would be small and positive economic impacts from indirect employment opportunities in the region.

Table 3-6 lists racial and ethnic data about persons in San Joaquin County and, for comparison, the state of California. San Joaquin County has a large ethnic minority population; persons of Hispanic or Latino origin made up about 39.4 percent of county residents in 2011. This is similar to the statewide average of about 38.1 percent. The aggregate percent of all racial minorities (Black, American Indian or Alaskan Native, Asian, or of two or more races) was15.8 percent in San Joaquin County and 26 percent in California. Hispanics may be of any race, so are included in applicable race categories. Neither racial nor ethnic minority persons would experience adverse socioeconomic impacts from the proposed project. There would be no direct socioeconomic impacts to any population, and the indirect impacts would be small and positive. The indirect economic impacts from the project would include indirect employment opportunities in the region and enhanced final output because of the infusion of project-related spending.

Table 3-6. 2010 Racial and Ethnic Characteristics, San Joaquin County and California.

Racial and Ethnic Characteristics	San Joaquin County (percent)	California (percent)
White	68.7	74.0
Black	8.2	6.6
American Indian and Alaska Native	2.0	1.7
Asian persons	15.5	13.6
Persons reporting two or more races	4.9	3.6
Persons of Hispanic or Latino Origin	39.4	38.1
White but not Hispanic	35.4	39.7

Source: U.S. Department of Commerce, Census Bureau, 2013

DOE also determined that there would be no high and adverse impact to low-income populations. In 2010, about 13 percent of the residents in San Joaquin County lived below the poverty level, and the statewide rate was about 10.8 percent. There would be no direct socioeconomic impacts to any population, and the indirect impacts would be small and positive. The indirect economic impacts from the project would include indirect employment opportunities in the region and enhanced final output because of the infusion of project-related spending.

In summary, DOE determined that no high or adverse impacts would occur to any member of the community. Therefore, there would be no adverse or disproportionate impacts to minority or low-income populations.

3.6.3.1 No-Action Alternative

Under the No-Action Alternative PG&E would not proceed with the project and would not buy the major project components, and associated equipment. Therefore, the potential positive benefits of the proposed project, including the indirect total earnings effect and the final output effect, would not occur.

3.7 Public and Occupational Health and Safety

3.7.1 Affected Environment

The construction of the facility would require a small work force for the short three-month construction phase. DOE expects that potential worker accidents would remain within the national averages for construction activities. During operations, there would be approximately eight full-time workers on the site. PG&E would construct and operate the facility in accordance with its existing company occupational health and safety plans.

Preliminary reservoir modeling indicates that withdrawal testing is likely to produce some amount of natural gas in the extracted flow, but that the concentrations of natural gas would be relatively low. The quantity of the natural gas and how it would be mixed with the withdrawal stream cannot be predicted conclusively until the test program is conducted. For this reason, it is possible mixing reservoir release air with ambient air could create a combustible mixture. The presence of a combustible mixture significantly increases the risk of ignition leading to a risk of detonation and loss of containment.

3.7.2 Environmental Consequences

DOE estimated health and safety impacts to workers from industrial hazards by using 2011 incidence rates for both nonfatal occupational injuries and occupational fatalities from the BLS data. The construction of the facility would require a small work force (approximately 40 workers) for the short 3-month construction phase. DOE expects that potential worker accidents would remain within the national averages for construction activities. During operations, there would be eight full-time workers on the site. PG&E would construct and operate the facility in accordance with its existing company occupational health and safety plans.

The use and storage of hazardous materials and waste at the project area during construction would also increase health and safety risks. The temporary presence and use of hazardous materials at the project area increase the risk of accidents that could affect the health and safety of workers and other persons in the vicinity.

The following BMPs would be used to reduce these risks to less than significant:

- Workers would be notified of any potential health hazards associated with hazardous materials at the project area
- Material safety data sheets would be available on-site for workers to review
- A site-specific health and safety plan would be developed and would include detailed information on safe work practices, proper health and safety procedures, and emergency procedures
- Workers performing activities that could expose them to hazardous substances would be trained and certified by the Occupational Safety and Health Administration
- Fences and signs would be used at the project area as necessary to control access and to make workers and the public aware of potential hazards.

Standard process safety engineering protocols dictate that the potential for a combustible mixture to occur must be decreased as low as reasonably practical. To achieve proposed testing objectives in a safe and practical manner, PG&E is considering different alternatives for decreasing the potential for a combustible mixture in the withdrawal stream. Measures under consideration include the use of nitrogen or carbon dioxide prior to and/or after the injection of compressed air or filtering the pressurized air through a membrane to remove some of the oxygen in the air before further compressing it and injecting it into the reservoir. In addition to these depletion strategies, PG&E would employ various sensors and monitoring equipment, with the appropriate amount of redundancy, to continually monitor the percentage of methane in the withdrawal stream. Operating procedures would clearly articulate that, if the amount of methane in the withdrawal stream reaches a certain percentage (the percentage would be below the Lower Explosive Limit), PG&E would immediately take action to shut-in the well and to displace the mixture in the wellbore into the reservoir.

The presence of hazardous materials on the project site would have small and temporary impacts based on the DOE's evaluation and the implementation of the BMPs identified in this section.

3.7.2.1 No-Action Alternative

Under the No-Action Alternative, PG&E would not implement the proposed project. Therefore, the potential for the project to create an occupational safety hazard would not occur.

3.8 Water Resources

Section 3.2.1 describes current conditions for surface water, groundwater, and floodplains and wetlands. Section 3.2.2 discusses the potential impacts of the proposed project to these water resources.

3.8.1 Affected Environment

3.8.1.1 Surface Water

Surface waters in the project area include Sacramento-San Joaquin waterway remnants White Slough to the north and Disappointment Slough to the south. Bishop Cut is an artificial canal that connects these waterways on the east side of King Island; Honker Cut connects them on the west side. The area surrounding the proposed project site ranges in elevation from approximately five to ten feet below sea level, whereas water levels in White Slough and Bishop Cut are slightly above sea level and separated from King Island by levees. Farmers on the island obtain water to irrigate crops from these waterways. There are no streams, rivers, ponds, or lakes on the island.

3.8.1.2 Groundwater

Groundwater at the proposed project site is maintained at a level of approximately six to eight feet below surface by a system of drains. The freshwater aquifer zone, defined by California State Water Resources Control Board Resolution 88-63 as containing less than 3000 milligrams per liter of total dissolved solids (TDS), extends for up to 600 feet below the ground surface.

Underground Sources of Drinking Water (USDW) are defined in the UIC regulations as being groundwater resources with TDS concentrations less than 10,000 mg/L (40 CFR 144.3). As such, they include water that is more saline than California-defined fresh water resources and they typically underlie these fresh water resources to a greater depth. An evaluation of electrical logs from gas exploration and production wells located in and near the King Island Gas Field indicates that the base of USDW occurs at about 3,500 to 3,700 feet below the ground surface and is separated from the target injection reservoir by about 1,000 feet of sedimentary rocks, including two competent shale formations (the Nortonville Shale and the Capay Shale).

3.8.1.3 Floodplains and Wetlands

The proposed project site is located within a Special Flood Hazard Area and subject to a 100-year flood (one percent chance flood), according to Federal Emergency Management Agency (FEMA) floodplain insurance maps (FEMA, 2012). King Island is protected from flooding by levees that surround the island on all sides, but is mostly below sea level and subject to floods that could occur if the protecting levees were to breach.

3.8.2 Environmental Consequences

3.8.2.1 Proposed Project

3.8.2.1.1 Construction Impacts

Site preparation and construction could result in stormwater runoff and soil erosion. Runoff during construction would be regulated and controlled under a National Pollutant Discharge Elimination System stormwater construction permit and a stormwater pollution prevention plan.

PG&E would implement a soil erosion management plan that would also help to control runoff. The company would spray disturbed soils with water to suppress dust as necessary; the water would be hauled by truck from municipal water sources. All wastewater from drilling would be stored in portable tanks located at the proposed testing site and then trucked to a commercial injection well for disposal.

3.8.2.1.2 Operations Impacts

Surface Water

The compressors would use a closed-loop water system that would not involve the use of well or irrigation water from surface water supplies. The closed-loop water systems would require about 4,200 gallons for compressor cooling, which would be supplied by local municipal water source and trucked to the site. Nominal water loss is conservatively expected to be 25 gallons per day from *seal, flange, or tube leakage*. This small quantity of leak loss would be made up periodically from a water truck. After the test phase is complete, the cooling water would be hauled off-site in trucks and disposed of in a permitted, commercial *disposal facility*. Therefore, project operations would have little or no effect on surface water or water supplies.

Groundwater

The project would not use groundwater for construction or operation. The proposed injection/withdrawal well would be cased in cement for the upper 600 feet or so in order to prevent contamination to local aquifers from drilling operations. *The well will then be cased to its total depth prior to testing, which will prevent contamination of the shallower formation* from produced water. The *existing* observation wells *have been completed in as similar fashion as the I/W well.*

The target injection reservoir is separated from the nearest overlying aquifer by more than 1,000 feet, including two shale layers of sufficient impermeability, thickness, and horizontal extent to protect the aquifer. The Eocene-age Capay shale provides a geological seal on top of the King Island Gas Field and its thickness mostly ranges from 90 to 120 feet in the vicinity of King Island. The Eocene-age Nortonville Shale, also overlies the King Island Gas Field and deepest overlying aquifer and reaches a thickness of approximately 100 feet in the vicinity of King Island. There are no faults that cut the King Island Field that could serve as potential conduit for upward movement of saline formation brines into the nearest overlying aquifer. Similarly, the review of data for active, plugged, and abandoned gas wells near the King Island Gas Field indicates that these wells would not act as conduits for the upward migration of formation brines to the aquifer. The proposed IW well would be constructed and operated in accordance with the requirements of the EPA issued in the UIC permit for the project to assure that the water quality of the aquifers is protected.

Produced water would be mechanically separated from the withdrawal air and contained at the withdrawal well in one or more storage tanks. The amount of produced water is estimated to be

no more than 1,000 barrels. The produced water would be disposed of in a *certified* commercial *disposal facility*.

Floodplains and Wetlands

The project would have no effect on floodplains or wetlands (see Section 3.2, Biological Resources). The use of standard BMPs would prevent contamination of water bodies during construction and operation phases.

3.8.2.2 No-Action Alternative

Under the No-Action Alternative, there would be no water use and no activity to affect water resources from potential erosion, runoff, or spills. Therefore, there would be no impacts to surface water, groundwater, floodplains, or wetlands.

3.9 Resource Commitments

3.9.1 Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

PG&E's proposed project to install equipment to support and conduct a compression testing program to examine the feasibility of installing a compressed air energy storage project at the King Island site in San Joaquin County, California, would result in a short-term use of land. In this context, *short-term use* of resources means the ten-month-long construction and operating life of the testing program, and *long-term productivity* refers to the period after the facility has ceased operation and undergone decommissioning and demolition. At that time, the land could be occupied and used for other activities, or it could be reclaimed and used for agricultural purposes.

3.9.2 Irreversible and Irretrievable Commitments of Resources

The use of land as a resource to support the construction and operation of the proposed project would be irretrievable in the short-term. Although the compression testing equipment would be removed after completion of the compression testing, the operations pad may remain. If the proposed project is constructed and operated and later decommissioned, or if after the testing phase is over the proposed project does not move forward, the pad, at the discretion of the owner, could easily be removed and the land returned to agricultural use. Some limited unrecyclable construction materials, energy, and the fuel for facility construction and maintenance would be irreversible and irretrievable commitments of resources. DOE would also have expended funding on the proposed project that would also be irretrievable.

3.9.3 Unavoidable Adverse Impacts

The proposed project would result in the unavoidable small and adverse impacts of construction noise, fugitive dust, vehicle emissions, and possible loss of wildlife due to onsite traffic and construction equipment. These small unavoidable impacts would be offset by the positive effects

of developing an innovative new technology for storing electricity that would, in turn, improve voltage regulation and load shifting from the use of intermittent renewable power sources. This could result in reduced emissions from conventional fossil-fuel power plants.

4. CUMULATIVE IMPACTS

Cumulative impacts result from the incremental effects the proposed project could have in combination with the impacts of other past, present, and reasonably foreseeable actions. The proposed project would install a temporary facility for air compression testing and well equipment.

As Figure 2-1 shows, the proposed project site is in an agricultural area northwest of Stockton, California. The environmental impacts of past actions including the development of agriculture and natural gas resources in the area have already passed through the environment or been captured as part of the current baseline conditions. DOE considered nearby present actions (Section 4.1) and reasonably foreseeable actions (Section 4.2) in combination with the potential impacts of the proposed project (Table 1-1 and Chapter 3) to assess potential cumulative impacts.

4.1 Present Actions

PG&E has ongoing actions to reduce use of carbon-based fuels and greenhouse gas emissions, to increase the use of renewable energy sources such as solar and wind energy and biogas power, and to increase energy efficiency. These initiatives would have net beneficial cumulative impacts. The proposed project would be part of and consistent with those initiatives and would therefore contribute in a small way to those positive benefits.

There are two major development projects in the general vicinity of the proposed CAES compression testing project that are undergoing permitting through either the San Joaquin County Planning and Development Services Division or the City of Stockton Community Development Department. These are:

- Love's Travel Stops freeway service (gas and food) development along Interstate 5 at State Route 12, approximately 3.3 miles from the project site in unincorporated San Joaquin County (San Joaquin County Community Development Department, 2012)

- Bear Creek East Specific Plan residential development, along Eight Mile Road in northeast Stockton, approximately seven miles east the project site (City of Stockton Community Development Department, 2011).

Construction schedules for these developments depend on project approval processes and market conditions, and are uncertain at this time. There is some potential, however, for construction of one or both of these developments to begin during the time that the proposed CAES compression-testing project would be under construction or in operation.

The contribution of PG&E's proposed project to potential cumulative effects in relation to the Bear Creek East master-planned community and the Love's Travel Stops facilities would be small and temporary. The nominal short-term increase in traffic during the construction and

operation of the proposed project may or may not coincide with construction traffic to and from these projects. Noise from the proposed compression-testing project would not be noticed at the Bear Creek East development, given the distance, if the timing of the two projects were to coincide. The monetary investment in the proposed CAES compression-testing project would result in indirect beneficial impacts to the region. Given the size of the regional economy compared to the proposed project, however, the impacts would be small. There would be no contributions to operational air or water impacts and no adverse effects on threatened or endangered species, or cultural resources of importance. The proposed project would have no or a negligible long-term effect on agricultural land availability.

4.2 Reasonably Foreseeable Actions

DOE authorized as an interim action upgrading the electrical distribution system in the vicinity of the proposed CAES compression testing project so that it can provide electricity to the project. This action consists of reconductoring some segments of the 4.3-mile-long route and new distribution lines along other segments. PG&E determined through field studies that biological and cultural resources would not be affected significantly by the upgrading of the distribution line. The impacts of this action would be minor and temporary and would not combine with the later effects of the compression-testing project to cause impacts that would be cumulatively significant.

PG&E presently serves 5.1 million electricity customer and 4.3 million natural gas customer accounts in central and northern California. PG&E's electric grid network consists of 141,215 circuit miles of electric distribution lines and 18,616 circuit miles of interconnected transmission lines, The natural gas system includes over 42,141 miles of natural gas distribution pipelines and 6,438 miles of transportation pipelines. On average, approximately half of the electricity PG&E delivers to its customers comes from a combination of renewable and GHG-free resources.

PG&E's reasonably foreseeable actions would continue the company's initiatives to reduce use of carbon-based fuels and greenhouse gas emissions by increasing the use of renewable energy sources such as solar and wind energy and biogas power and to increase energy efficiency. These include aggressively adding more renewable energy to its power mix under California's renewable portfolio standard of delivering 33 percent renewables by the end of 2020. PG&E is also investing in a range of clean energy resources such as solar, wind, geothermal, biomass and small community and industrial-based hydroelectric power generation facilities.

5. CONCLUSIONS

PG&E proposes to install *temporary* compression *equipment* and injection/*withdrawal* and observation wells for the compressed air energy storage compression-testing project. In this EA, DOE considered: (1) the proposed action of providing a financial assistance grant under the Recovery Act in a cost-sharing arrangement with PG&E, (2) PG&E's proposed project, and (3) the No-Action Alternative.

DOE evaluated the environmental resource categories it commonly addresses in environmental assessments and identified no significant adverse impacts from the proposed project. For the resource categories of land use and land resources; geology and soils; waste; aesthetics and visual resources; utilities, energy and minerals; and transportation, DOE determined there would be no impacts or the potential impacts would be small, temporary, or both, and therefore did not carry those forward for additional analysis. DOE focused its analyses on those resources that could require new or amended permits, have the potential for significant impacts or controversy, or typically interest the public, such as socioeconomics and historic and cultural resources. In total, DOE performed more detailed analyses of potential impacts on eight resource categories.

During construction *and operation*, air emissions would include: (1) combustion emissions from vehicles, heavy-duty equipment, and *various* drilling rig *engines,* (2) fugitive dust from site preparation activities, and (3) emissions of VOCs including GHGs from the IW well. These emissions would have minor but short-term impacts and are below the SJVAPCD's recommended thresholds of significant impact or the General Conformity *de minimis* threshold values. Similarly, the GHG emissions associated with construction activities are less than the CEQ significance threshold and would not have a significant impact on climate change.

Irrigation ditches along dirt access roads, and near the TSF site provide low- to moderate-quality habitat for the giant garter snake (*Thamnophis gigas*), which is federal and state listed as threatened. The irrigation ditches and ponds also provide habitat for the western pond turtle (*Emys marmorata*), a California species of special concern. Trees within 0.5 mile of the project area provide nesting habitat for the Swainson's hawk (*Buteo swainsoni*) and the white-tailed kite (*Elanus leucurus*), state listed as threatened. With the implementation of standard avoidance and minimization measures that include preconstruction surveys, exclusionary fencing, worker environmental training, burrow avoidance, road shoulder avoidance, speed limits, and biological monitoring, the proposed project would not adversely affect these species.

The proposed project would involve the productive reuse of a depleted natural gas well field, a geological resource. The potential of the proposed project to induce seismicity is extremely low, based on recent studies of this phenomenon that involve thousands of injection wells.

Well drilling and construction equipment would create noise during the installation phase. Compressors and the IW well air release stack and choke manifold would also create noise during compression testing. Detailed modeling of project noise sources and noise attenuation

with distance shows that, with the application of an air release stack silencer and other measures, the project would meet San Joaquin County's noise standards at the nearest sensitive receptor- a residence approximately 3,000 feet from the project site- and would not cause adverse noise impacts to wildlife.

No previously recorded historic or cultural resources of significance occur in the proposed project area of potential effects. In addition, given that the proposed project would be located in a former marsh area, the discovery of buried archaeological deposits during construction or operation is unlikely. If PG&E were to find cultural deposits during project activities, it would stop work immediately and notify the California SHPO and its own cultural resource specialists. DOE consulted the California SHPO and interested Native American Tribes. DOE determined there would be no impacts to federally listed or eligible historic properties. The proposed project site is in an area of recent alluvial deposits of low paleontological sensitivity and there are no previously recorded vertebrate paleontological finds near the project site.

The project would create indirect economic consequences because vendors and equipment suppliers would benefit from the orders for the project components and support systems. The positive economic benefits would be small.

The evaluation of impacts to environmental justice is dependent on determining if major or adverse impacts from the proposed project would disproportionately affect low-income or minority populations. DOE determined that no major or adverse impacts would occur to any member of the community, including socioeconomic impacts, so there would be no major or adverse impacts to any minority or low-income population.

If withdrawal testing is conducted, withdrawal air may contain methane in concentrations potentially posing a hazard for onsite workers. This potential hazard would be mitigated by modeling the reservoir behavior during injection and withdrawal to determine expected outcomes, careful monitoring of concentrations of withdrawal air for hydrocarbons, control of withdrawal rates and durations, operational controls to prevent hazardous mixtures from reaching the surface, and, if required, injection of oxygen-depleted air.

Site preparation and construction could result in stormwater runoff and soil erosion. The drilling and operation pad is pervious to stormwater and PG&E would design the slope of the pad to direct any runoff away from equipment as well as implement a soil erosion management plan. The project would use an *air-cooled* closed-loop cooling system that minimizes the use of fresh water for project operation. Wastewater, including produced water stripped from the withdrawal air stream, would be disposed of at a certified commercial *disposal facility*. Fresh water resources and USDW would be protected by implementation of IW well completion and operating requirements under the UIC permit issued for the project and are separated from the injection reservoir by over 1000 feet of sediments, including two competent and aerially extensive shale-confining zones.

The proposed project would not cause impacts cumulatively with other reasonably foreseeable projects. The proposed project site is agricultural and no development projects are currently planned for this area. In addition, project activity would take place over a period of only *12* months, so that long-term and cumulative impacts are unlikely to occur, when combined with other projects under development in the region.

DOE assumed for the EA analyses that PG&E would not proceed with the project without DOE assistance. Therefore, there would be no impacts to any resource category from the No-Action Alternative. The small, positive socioeconomics impacts, the potential to reduce new conventional power plant construction, and the potential reduction in greenhouse gases would also not occur under the No-Action Alternative. In addition, DOE's ability to achieve its objectives under the Smart Grid Demonstrations Program and the Recovery Act would be impaired.

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