U. S. DEPARTMENT OF ENERGY
OFFICE OF SCIENCE

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)
ENVIRONMENTAL EVALUATION NOTIFICATION FORM

To be completed by "financial assistance award" organization receiving Federal funding. For assistance (including a point of contact), see "Instructions for Preparing SC F-560, Environmental Evaluation Notification Form".

Solicitation/Award No. (if applicable):	
Organization Name:	Lawrence Berkeley National Laboratory
Title of Proposed Project/Research:	Conducting experiments in the Sanford Underground Research Facility, Lead, South Dakota.
Total DOE Funding/Total Project Funding:	LUX detector was funded with $1.5M in capital and receives approximately $1.6M per year in Research and Operations. MJD has a $20M project funding and approximately $4M per year in Research and Operations.

I. Project Description (use additional pages as necessary):

A. Proposed Project/Action (delineate Federally funded/Non-Federally funded portions)

Project Description:
The U.S. Department of Energy (DOE) proposes to complete installation of laboratories and to conduct research in the Sanford Underground Research Facility (SURF) in Lead, South Dakota. Two research programs are currently proposed: the MAJORANA DEMONSTRATOR (MJD) project and the Large Underground Xenon (LUX) Detector System.

The SURF is funded and operated by the state of South Dakota and is located within underground chambers of a former gold mine. The state of South Dakota has previously prepared the mine for research uses, including disposal of excavated material, dewatering of accumulated underground water, and providing access, utilities and ventilation systems. The DOE would occupy space within SURF to conduct the two experiments identified here. Solid and liquid wastes generated by the project would be disposed of by SURF waste disposal personnel; there would be no airborne emissions generated by project operation.

MAJORANA DEMONSTRATOR (MJD) Project

The MJD project would take place in a laboratory module approximately 4,850 feet underground. It would require approximately 3600 sq. ft. of laboratory space outfitted with a germanium detector array and its data acquisition system along with ancillary items such as desks, cabinets, and a small clean room. The project would also require installation and provision of typical laboratory utilities and systems, including cooling, water, electricity, and liquid nitrogen supply. Shielding would be provided by removable lead and copper bricks. Low intensity sealed radioactive sources would be used for detector calibration purposes. Approximately 25 workers would be employed in the MJD laboratory at one time. The project is expected to commence in 2012 and to last for approximately 6 years. To avoid cosmic ray activation and subsequent induced radioactivity, detector components would be fabricated in a SURF underground chamber and provided to the MJD laboratory.

Large Underground Xenon Detector System

The LUX Detector System project would take place in the Davis cavern, located near the proposed MJD laboratory module at 4,850 feet underground. It would include an eight-meter-diameter tank holding purified water and titanium pressure vessels containing liquid Xenon and detector equipment. Auxiliary systems would include Xenon storage and recovery, piping for liquid nitrogen, a data acquisition system, and monitors and controls for all operating systems. Associated laboratory accommodations such as desks, cabinets, and a clean room would also be installed. Approximately 25 workers would be employed in the LUX laboratory at one time. The project is expected to commence in 2012 and to last for approximately 4 years.

The tank and inner chambers would be designed and secured to withstand worst-case loads due to seismic activity. Chemical use by this experiment would be minimal; purified water and Xenon would be reused through closed loop cleaning and pumping systems. Other components may be washed with water and soap that can be discharged into the mine water system following permitted discharge rules. Solid and liquid wastes generated by the project would be disposed of by SURF waste disposal personnel; there would be no airborne emissions generated by project operation. At the conclusion of LUX operations, glass photomultiplier tubes may be re-used in future experiments while most other components are readily recyclable.

Purpose and need:

The MJD project seeks to demonstrate technical feasibility – including the achievable low background radiation level – for the construction of future research projects of tonne-scale neutrinoless double-beta-decay projects using the ^{76}Ge isotope. Detection of Majorana neutrinos or similar particles would have a profound impact on fundamental physics.

The purpose of the LUX Detector is to detect Weakly Interacting Massive Particles, which are the leading theoretical dark matter candidate. Direct detection of Dark Matter would have a profound impact on particle physics and cosmology. The LUX experiment would help develop and research technologies for other dark matter detectors.

	Yes	No
B. Would the project proceed without Federal funding?	☐	☒

If "yes", describe the impact to the scope:

II. Description of Affected Environment:

The proposed experiments would take place within the SURF portion of the former Homestake Gold Mine in Lead, South Dakota. The surrounding area is mostly forested and rural. The town of Lead, population less than 3,000, is adjacent to the Homestake site. Existing ongoing mine maintenance operations include dewatering of the underground facility; maintenance of the surface and underground site facility infrastructure necessary to provide safe access for both operation and science activities, including maintenance of the shafts, hoists, shaft conveyances, ventilation systems, dewatering pumping systems, water treatment capabilities, power distribution, life safety systems, and communications systems; and maintenance of supporting surface facilities that facilitate daily operation activities and all required utilities, materials, and supplies.

III. Preliminary Questions:

	Yes	No
A. Is the DOE-funded work *entirely* a "paper study"?	☐	☒

If "Yes", ensure that the description in Section I reflects this and go directly to Section V.

	B.	Would the work to be performed include work that would take place *outside* an existing building? It would be located in a former underground gold mine.		☒	☐
		And:			
		1.	Threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health?	☐	☒
		2.	Require the siting, construction or major expansion of waste treatment, storage, or disposal facilities?	☐	☒
		3.	Disturb hazardous substances, pollutants, or contaminants preexisting in the environment? Lead based paint and asbestos would be encountered during demolition	☐	☒
		4.	Adversely affect environmentally-sensitive resources identified in Section IV.A.?	☐	☒
		5.	Be connected to another existing/proposed activity that could potentially create a cumulatively significant impact?	☐	☒
		6.	Have an inherent *possibility* for high consequence impacts to human health or the environment (e.g., Biosafety Level 3-4 laboratories, activities involving high levels of radiation)?	☐	☒
		If "No" to Question III.B. and ALL six subsequent questions, ensure the descriptions in Sections I and II reflect this and go directly to Section V.			

IV.	Potential Environmental Effects: **Attach/insert an explanation for each "Yes" response.**				
	A.	Sensitive Resources: Would the proposed action result in changes and/or disturbances to any of the following resources?			
				Yes	No
		1.	Threatened/Endangered Species and/or Critical Habitats	☐	☒
		2.	Other Protected Species (e.g., Burros, Migratory Birds)	☐	☒
		3.	Sensitive Environments (e.g., Tundra/Coral Reefs/Rain Forests)	☐	☒
		4.	Archaeological/Historic Resources	☐	☒
		5.	Important Farmland	☐	☒
		6.	Non-Attainment Areas for Ambient Air Quality Standards	☐	☒
		7.	Class I Air Quality Control Region	☐	☒
		8.	Special Sources of Groundwater (e.g. Sole Source Aquifer)	☐	☒
		9.	Navigable Air Space	☐	☒
		10.	Coastal Zones	☐	☒
		11.	Areas with Special National Designation (e.g. National Forests, Parks, Trails)	☐	☒
		12.	Floodplains and Wetlands	☐	☒
	B.	Regulated Substances/Activities: Would the proposed action involve any of the following regulated items or activities?			
				Yes	No
		13.	Natural Resource Damage Assessments	☐	☒
		14.	Exotic Organisms	☐	☒
		15.	Noxious Weeds	☐	☒
		16.	Clearing or Excavation (indicate if greater than one acre)	☐	☒
		17.	Dredge or Fill (under Clean Water Act, Section 404, indicate if greater than ten acres)	☐	☒
		18.	Noise (in excess of regulations)	☐	☒

		19.	Asbestos Removal	☐	☒
		20.	PCBs	☐	☒
		21.	Import, Manufacture, or Processing of Toxic Substances	☐	☒
		22.	Chemical Storage/Use: *Xenon would be stored and reused in a closed-loop system. Ordinary laboratory chemicals would be used in small quantities under controlled conditions as per SURF oversight and operating rules.*	☒	☐
		23.	Pesticide Use	☐	☒
		24.	Hazardous, Toxic, or Criteria Pollutant Air Emissions	☐	☒
		25.	Liquid Effluents: *Small amounts of soapy water may be discharged under permit.*	☒	☐
		26.	Underground Injection	☐	☒
		27.	Hazardous Waste	☐	☒
		28.	Underground Storage Tanks	☐	☒
		29.	Radioactive Mixed Waste	☐	☒
		30.	Radioactive Waste	☐	☒
		31.	Radiation Exposure: *Sealed sources with small quantities of very low-level radioactive materials would be used on both sites for calibration purposes. These would be closely monitored and used in accordance with all applicable regulations and procedures, including those identified in the University of South Dakota's NRC license.*	☒	☐
		32.	Surface Water Protection	☐	☒
		33.	Pollution Prevention Act	☐	☒
		34.	Ozone Depleting Substances	☐	☒
		35.	Off-Road Vehicles	☐	☒
		36.	Biosafety Level 3-4 Laboratory	☐	☒
	C.	Other Relevant Information: Would the proposed action involve the following?			
				Yes	No
			Potential Violation of Environment, Safety, or Health Regulations/Permits	☐	☒
		37.	Siting/Construction/Major Modification of Waste Recovery, or Waste Treatment, Storage, or Disposal Facilities	☐	☒
		38.	Disturbance of Pre-existing Contamination	☐	☒
		39.	New or Modified Federal/State Permits	☐	☒
		40.	Public Controversy	☐	☒
		41	Environmental Justice	☐	☒
		42.	Action/Involvement of Another Federal Agency (e.g. license, funding, approval): *See response to question 31, above.*	☒	☐
		43.	Action of a State Agency in a State with NEPA-type law: *Operations at the SUL are supported and overseen by the State of South Dakota.*	☒	☐
		44.	Public Utilities/Services	☐	☒
		45.	Depletion of a Non-Renewable Resource	☐	☒
		46.	Extraordinary Circumstances	☐	☒
		47.	Connected Actions	☐	☒
		48.	Exclusively Bench-top Research	☐	☒

V.	Financial Assistance Award Organization Concurrence:		
	A.	Organization Official (Name and Title):	Jeff Philliber, LBNL Environmental Planner

		Signature:	/s/		
				Date:	11-30-11
		e-mail:	JGPhilliber@lbl.gov		
	B.	Optional Concurrence (Name and Title):			
		Signature:			
				Date:	
		e-mail:		Phone:	

Remainder to be completed by SC

VI.	SC Concurrence/Recommendation/Determination:				
	A.	SC Berkeley Site Office:			
		Name and Title:	Barry Savnik, Federal Project Director		
		Signature:	/s/		
				Date:	11/30/11
		e-mail:	barry.savnik@bso.science.doe.gov		
	B.	SC NEPA Team Review:			

Is the project/activity appropriate for a determination or a recommendation to the Head of the Field Organization by the NEPA Compliance Officer (NCO) under Subpart D of the DOE NEPA Regulations and complies with the requirements stated in 10 CFR 1021.410 ?

Yes ☒ No ☐

Specific class(es) of action from Appendices A-D to Subpart D (10 CFR 1021):

B2.1 Workplace enhancements

Modifications within or contiguous to an existing structure, in a previously disturbed or developed area, to enhance workplace habitability (including, but not limited to, installation or improvements to lighting, radiation shielding, or heating/ventilating/air conditioning and its instrumentation, and noise reduction).

B3.6 Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

		Name and Title:	Kim Abbott, NEPA Program Manager		
		Signature:	/s/		
				Date:	11/30/11
		e-mail:	kim.abbott@bso.science.doe.gov		

	C.	SC ISC Counsel (if necessary):			
		Name and Title:			
		Signature:			
				Date:	
		e-mail:			
	D.	SC ISC Field Office NEPA Compliance Officer:			

The preceding pages are a record of documentation required under DOE Final NEPA Regulation, 10 CFR 1021.400.

☑ Action may be categorically excluded from further NEPA review. I have determined that the proposed action meets the requirements for Categorical Exclusion referenced above.

☐ Action requires approval by Head of the Field Organization. Recommend preparation of an Environmental Assessment.

☐ Action requires approval by Head of the Field Organization or a Secretarial Officer. Recommend preparation of an Environmental Impact Statement.

Comments/Limitations if necessary:

Print Name: Gary S. Hartman

Signature: /s/ Date: 12/1/2011

ORO NEPA Compliance Officer