

Burris Park, California, Site Long-Term Surveillance and Maintenance Plan

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U.S. DEPARTMENT OF
ENERGY

Legacy
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Abbreviations

AEC	U.S. Atomic Energy Commission
BPS	Burris Park site
CDPH	California Department of Public Health
DOE	U.S. Department of Energy
FIMS	Facilities Information Management System
FUSRAP	Formerly Utilized Sites Remedial Action Program
LM	Office of Legacy Management
LTS&M	long-term surveillance and maintenance
mCi	millicuries
MED	Manhattan Engineer District
mrem/yr	millirem per year
pCi/g	picocuries per gram
⁹⁰ Sr	strontium-90
UC Berkeley	University of California, Berkeley

1.0 Site Conditions

1.1 FUSRAP Background

In 1942, the U.S. Army established the Manhattan Engineer District (MED) of the U.S. Army Corps of Engineers to manage development of technology and production facilities for the first atomic weapons. In August 1946, following the end of World War II, President Harry Truman signed the Atomic Energy Act, which created the civilian U.S. Atomic Energy Commission (AEC). Congress abolished MED on January 1, 1947, and transferred responsibility for the atomic weapons program to the newly formed AEC. In 1974, the Energy Reorganization Act replaced the AEC with the Nuclear Regulatory Commission and the Energy Research and Development Administration (ERDA). The Department of Energy replaced ERDA in 1977, under the Department of Energy Reorganization Act.

The Formerly Utilized Sites Remedial Action Program (FUSRAP) was established in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early AEC operations. There are two main criteria for including a site in FUSRAP: (1) radioactive contamination remains at the site from MED- or AEC-related activities, and (2) the site is not being addressed by another restoration program, under an AEC license. By the end of 1996, the DOE had evaluated over 600 sites for FUSRAP eligibility; had determined that 46 sites were eligible for remedial action; and had completed remediation at 25 FUSRAP sites.

In 1987, DOE determined that the Burriss Park, California, Site (BPS), formerly the Burriss Park Field Station, was not eligible for remediation under FUSRAP because the University of California, Berkeley (UC Berkeley or UCB) had performed adequate remediation in 1963.

In 1997, Congress assigned responsibility for characterization, remediation, and verification of FUSRAP sites to the U.S. Army Corps of Engineers. The responsibility for FUSRAP eligibility determinations remained with DOE. In 2003, DOE established the Office of Legacy Management (LM) and transferred responsibility for long-term stewardship and maintenance (LTS&M) of the completed FUSRAP sites from the Office of Environmental Management to LM.

LM revisited the BPS eligibility determination again in 2014, when UC Berkeley brought the condition of the site to DOE's attention. LM again determined that the site was not eligible for further remedial action under FUSRAP as documented in the *Elimination Report and Determination of LTS&M Authority for the Burriss Park Field Station, Kings County, California* (June 2014). However, because there was no evidence that the AEC ever issued a radioactive materials license, LM agreed to address conditions at the site, which included providing necessary long-term surveillance and maintenance (DOE 2014). In August 2014, the DOE Office of General Counsel concurred that LM should manage the site as a maintenance only site under the LM program to ensure that the remedy remains protective and site knowledge is preserved. The State of California, the Kings County Parks Department, and UC Berkeley were notified of the decision, and on November 26, 2014, the BPS was formally added to the list of LM sites.

1.2 Operations

The BPS is located at 6500 Clinton Avenue, Kingsburg, California. Kingsburg is a rural agricultural community in the San Joaquin Valley, south of Fresno (Figure 1). The BPS is part of a 57-acre county park owned and maintained by the Kings County Parks and Recreation Department. The BPS consists of a 50-foot × 50-foot fenced area enclosing a 42-foot × 42-foot reinforced concrete slab and subsurface containment structure.

In 1956, AEC entered into contract AT (11-1)-34 Project No. 23 with UC Berkeley to construct a grid of concrete plots in the ground and introduce 72 millicuries (mCi) of strontium-90 (⁹⁰Sr) into the soil to study the effectiveness of decontaminating the soil using either displacement by electrolytes and leaching or physical immobilization using asphalt materials. The experiments were designed to examine methods to remove radioactive strontium fallout from arable land. The test plots consisted of 49 6-foot × 6-foot squares separated by concrete barriers that extended 30 inches underground and 6 inches above the ground surface. The isotope ⁹⁰Sr was systematically applied to 14 test plots. These experiments were later published in a scientific periodical as “Some Experiments on the Decontamination of Soils Containing Strontium 90” (Schulz et al. 1959). AEC terminated the tests in 1963, and UC Berkeley decommissioned the site under the same contract. Decommissioning was accomplished by filling the unused plots with crushed rock and the test plots with 2 inches of sand, placing a 6-millimeter polyethylene liner over all of the plots, and constructing a 4-inch metal-mesh reinforced concrete slab over the entire gridded area. A bronze plaque identifying the ⁹⁰Sr total activity and the UC Berkeley contract was imbedded in the northeast corner of the slab.

The California Department of Public Health (CDPH) reviewed the decommissioning information and determined that the site posed no threat to human health or the environment in its existing configuration, but requested that UC Berkeley enclose the area with a 6-foot gated fence and post contact information on each side of the fence (CDPH 1963). No further cleanup work was required at that time, and UC Berkeley, Kings County, and the State have conducted periodic oversight and radiological surveys since its closure (DOE 1987). The site was later used by the County Park museum as a display for antique farm equipment.

In 2013, UC Berkeley staff contacted LM to discuss maintenance needs at the site. Representatives of LM visited the BPS on January 22, 2014, and observed that the fenced area was in disrepair. The protective concrete slab capping the ⁹⁰Sr test plots was covered with broken tree limbs and debris. Some pieces of the farm exhibit and a section of the chain-link fence surrounding the protective slab were crushed from fallen dead trees within the fenced area.

1.3 Contaminants

Radioactive contamination at the BPS is solely due to the application of 72 mCi of ⁹⁰Sr to the concrete-encased experimental plots. Radiological surveys conducted by UC Berkeley (UC Berkeley 1981, UC Berkeley 2013a, UC Berkeley 2014a, b), Kings County (KCDPW 1995), and the California Department of Health Services (CDHS 1995) over the last 34 years demonstrate that ⁹⁰Sr concentrations in soil between the edge of the concrete slab and the fence remain low. The total remaining activity of ⁹⁰Sr under the slab was calculated to be about 20 mCi as a result of radioactive decay. There are no other AEC contaminants at this site.

1.4 Site Conditions

In December 2014, LM issued the *Evaluation and Summary of Proposed Maintenance Activities, Burris Park, California, Site*. The document describes the condition of the site, including the presence of two fallen dead trees, containing very low concentrations of ⁹⁰Sr as a result of bio-uptake. Also, the document outlines the path forward to address needed site maintenance and long-term stewardship of the BPS. Attached to the evaluation is a detailed sampling history of the trees and soil surrounding the pad and a summary of ⁹⁰Sr analytical results.

In March 2015, a site visit was conducted by the Legacy Management Support contractor to determine the extent of the work to be conducted, scan the farm equipment, and confirm that no measurable contamination was on the surface of the pad.

In July 2015, LM conducted maintenance at the BPS, which included:

- Clearing the protective concrete pad of antique farm equipment and debris and inspecting it to confirm its integrity
- Continuing to restrict public access to the site by repairing the fence and updating the signage with LM contact information
- Removing undesired trees, associated dead tree limbs, and other perennial vegetation that may adversely impact the concrete containment structure in the future

The site contained four large maple trees: two were alive and two were dead and had fallen over. UC Berkeley collected over 100 grams of sample for each tree from 10 to 15 borings per tree. Samples were collected using multiple cores from different portions of the tree, at varying heights and perimeter locations to reduce errors associated with possible distributional heterogeneity of deposited ⁹⁰Sr. UC Berkeley analyzed composite core samples as well as samples of branches and bark from the live and dead trees to determine if they were contaminated as a result of fixed ⁹⁰Sr. UC Berkeley also selected a tree, distant from the research area and of an equivalent age and species, to collect background samples of core, bark, and branches using the same sampling and analytical methods. The sampling plans and analytical data resulted in a determination that at least two of the trees contained very low concentrations of ⁹⁰Sr from bio-uptake. LM subsequently removed the four trees in September 2014 and disposed of them at a facility licensed to receive ⁹⁰Sr. LM also repaired the fence, requested that the county remove the old farm equipment from the pad, and updated the signage to reflect LM's contact information (See Figures 2 and 3).

The BPS is included under the long-term care of LM as a Category 2 site. LM will maintain the physical condition of the site to ensure that contamination presents no unacceptable risk to the public or the environment. LM's responsibilities at the site consist of managing site records, responding to stakeholder inquiries, managing institutional controls, performing an annual verification on the accuracy of site information, and performing a site inspection annually for 3 years, followed by site visits on a rolling 5-year schedule, thereafter. The next inspection is scheduled in 2016.

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2.0 Remedial Action

UC Berkeley remediated the ^{90}Sr experimental plots in 1963, while under contract with AEC. On the basis of intermittent surveys by UC Berkeley, Kings County, and the State of California, no further remediation has been required for over 50 years. In 2015, site maintenance was conducted to remove four large trees that posed a potential threat to the containment structure, repair the fencing, and clean the protective slab to facilitate inspections and radiological surveys as deemed necessary. Future actions may include a permanent ground cover between the protective slab and the fence to inhibit the growth of large deep-rooted vegetation that may adversely impact the protective slab or subsurface containment.

2.1 FUSRAP Eligibility Determination

This site did not meet the eligibility criteria for FUSRAP because it had been remediated in 1963 and no further remedial action was required. The Site was reevaluated in 2014 for FUSRAP eligibility and again was found not eligible. LM determined that it had responsibility for long-term stewardship of the site, because the radioactive material was related to contracted AEC work and had never been licensed.

2.2 Cleanup Criteria

There was no need for a cleanup standard for ^{90}Sr following the experimental studies because the radioisotope was already contained and simply needed to be adequately covered to minimize radioactive emanation. Remediation was accomplished by covering the plots with 2 inches of sand, a 6-millimeter plastic liner, and a 4-inch metal-mesh reinforced concrete slab over the entire 42 foot \times 42 foot area.

A bronze plaque was affixed to the concrete, and the area was enclosed with a chain link fence. The following information is inscribed on the plaque:

A TOTAL OF 72 MILLICURIES OF STRONTIUM 90
WAS PLACED ON THIS AREA DURING 1956 AND 1957.

THIS WORK WAS DONE UNDER CONTRACT AT(11-1)-34
PROJECT 23 BETWEEN THE UNIVERSITY OF CALIFORNIA AND
THE UNITED STATES ATOMIC ENERGY COMMISSION.

ROY OVERSTREET R. K. SCHULZ
UNIVERSITY OF CALIFORNIA, BERKELEY

Radiation surveys of the area performed in 1981 detected no radioactivity above background at the surface. At that time, the UC Berkeley radiation safety officer determined that the reinforced concrete cap constituted sufficient protection to terminate the project. Because the survey detected no radioactivity above background, the use of the protective slab for a display area in the park was acceptable.

2.3 Remedial Action

Remedial action included the placement of a protective barrier around and over the soil containing the 72 mCi of ⁹⁰Sr. Upon completion of the ⁹⁰Sr containment structure, UC Berkeley performed surveys and documented the closure of the site in a letter to the State. CDPH visited the site and reviewed applicable documentation for the remedial action. CDPH determined that the site was adequately protective of human health at that time and into the foreseeable future. This is documented in a letter from the state to UC Berkeley (CDPH 1963).

2.4 Independent Verification

Several surveys conducted by the State of California, UC Berkeley, and Kings County over the years and, more recently, by LM have resulted in findings similar to the original survey by UC Berkeley. However, no formal independent verification documentation has been identified.

2.5 Use Restrictions

Public access to the Site is restricted. The County currently uses the concrete pad as a staging area for historic farming equipment. All but one of the heavy pieces of farm equipment have been removed from the pad. The County will relocate the historical item to a neighboring facility within the next 3 years (prior to calendar year 2019).

2.6 Assessment of Risk

In 2013, UC Berkeley concluded that the site is protective in its present configuration. UC Berkeley performed a risk assessment, which determined that if a child at the site consumed 500 milligrams of soil a day or 183 grams of soil per year from the area between the concrete slab and the fence, assuming that all soil has a maximum activity of 2.8 picocuries per gram (pCi/g) (based on data provided in Eberline Laboratories Report ID 1309086 [Eberline Laboratories 2013]), the annual dose would be 0.1 millirem per year (mrem/yr). This scenario represents the maximally exposed receptor for this site without access controls (UC Berkeley 2013b).

DOE authorized a radiological evaluation in April 2014. The contractor health physicist who performed the evaluation used a question-and-answer format to describe various scenarios and their level of protectiveness to the public. Based on the original study parameters, the estimated soil concentration under the concrete slab as of 2015 is conservatively about 1000 pCi/g. At approximately the 90-year time frame, the ⁹⁰Sr under the slab will decay to less than a 25 mrem/yr dose rate to a rancher/farmer receptor (Stoller 2014). It is estimated that concentrations of ⁹⁰Sr in soil will decay to background levels in about 200 years (Stoller 2014).

2.7 Certification and Regulator Concurrence

CDPH determined that the site was adequately protective of human health at the time of their site visit and into the foreseeable future. This is documented in a letter from the CDPH to UC Berkeley (CDPH 1963).

2.8 Agreements and Permits

LM is in the process of obtaining a formal access agreement. Currently, Kings County Recreation Department allows LM access to inspect, and conduct maintenance upon request, to ensure the ⁹⁰Sr containment structure functions as designed and maintains protectiveness.

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3.0 Protective Measures

Long-term surveillance and maintenance requirements for the Burris Park, California, Site include and are summarized at the end of this section in Table 1:

- Managing site records
- Responding to stakeholder inquiries
- Managing institutional controls (ICs) as those defined by DOE; see Sections 3.1 and 3.6 for more details
- Performing an annual inspection for the first 3 years to ensure that site conditions remain stable; see Sections 3.1 and 3.6 for more details
- Performing a site visit on a 5-year rolling schedule, thereafter, to ensure that land use in the area remains the same as agreed upon by the CDPH (1963)

This site was determined to be ineligible for remediation under FUSRAP in 1987 and again in 2014. However, because LM has taken responsibility for long-term surveillance and maintenance, the BPS has been added to the list of LM sites. As such, measures that LM deems necessary to protect human health and the environment can be added to this LTS&M plan and implemented to enhance protections.

After remediation in 1963, UC Berkeley and Kings County continued some maintenance at the site and conducted several radiological surveys. In 2013, UC Berkeley collected samples of soil and vegetation within the fenced area. Very low strontium-90 concentrations were detected in a few soil and vegetation samples. Kings County and UC Berkeley representatives agreed that ⁹⁰Sr posed no unacceptable risk within the fenced site. In 2015, LM removed all vegetation from between the fence and the cement pad. During the 2016 inspection, LM will decide if additional measures to cover the soil are needed.

3.1 Institutional Controls

DOE Policy 454.1, *Use of Institutional Controls* (DOE Policy), applies the term “institutional controls” (ICs) to include legal instruments (e.g., land use restrictions), physical or engineering controls (e.g., fences and signs), and methods of providing information to people (fact sheets, interpretive displays) that help minimize the risk of human exposure to contaminants and maintain the remedies at a site. The Policy utilizes this broader application of the term ICs in order to encompass the diverse nature of institutional controls and measures used throughout DOE in a consistent yet flexible policy framework integrated into an overall site-wide program.

The following engineering and physical controls are currently associated with the site under the DOE’s broad application of ICs:

- A concrete containment structure, which entombs the radioactive isotope to prevent exposure to the remaining 20 mCi of ⁹⁰Sr.
- A chain-linked fence with a locked gate to prevent public access to the containment structure.
- Signage to provide information and a contact number in the event of an emergency.

- To check whether these controls are intact and operating as intended, annual inspections are being conducted to assess that these protective measures are adequate and are in place. To assure unencumbered access to the site, there is an access agreement in place between LM and the County to conduct inspections and maintenance as necessary.
- To assure unencumbered access to the site, there will be an access agreement in place between LM and the County to conduct inspections and maintenance as necessary.

3.2 Annual Review and Data Verification

The site records are maintained and managed by LM. Updates to the site records are conducted as necessary to keep the records current. The accuracy of site information will be verified on an annual basis. This verification includes but is not limited to site ownership, site conditions, current use, adjacent property use, and developmental property goals of the owner and the Kingsburg area (both near-term and long-term).

3.3 Site Visit Report

A site visit to assess any changed conditions and to conduct a Facilities Information Management System (FIMS) inspection will be performed on a 5-year rolling schedule. The verified information and results of the 5-year site inspection will be reflected in the FIMS inspection report and in the site's LTS&M plan update.

3.4 Site Fact Sheets

Protective measures for sites transitioning to LM can be identified to fulfill DOE's post-closure responsibilities and to ensure the future protection of human health and the environment. The LM protective measures identified in this plan include:

- Maintenance of an LM public site fact sheet
- Maintenance of an LM webpage

The public fact sheet and the LM website will be reviewed, and updated as necessary annually.

3.5 Beneficial Reuse Reviews

Beneficial reuse is not applicable to the BPS.

3.6 Site Inspections

Annual site inspections will be conducted for the first 3 years, beginning in 2016, to ensure that the following conditions are maintained:

- The area surrounding the protective slab has not degraded or become overgrown with unwanted vegetation
- The area just outside the fence is not cluttered with surplus construction materials, and the fence is not used to hold heavy materials
- The fence is in good condition
- The gate opens and closes easily and is not tilted or bent

- The signs are in good condition, legible, and all eight signs are present and secured to the fence in a level manner
- Vegetation is not overgrown, and no deep-rooted trees or shrubs have become established within the fenced area
- Rodent holes under the containment are not present
- The information plaque in the pad is present, secure, and legible
- The pad does not contain deep cracks or concrete fragments
- The corners of the pad are intact, with no new indications of heavy equipment within the fenced area

A maintenance schedule, coordinated with Kings County, will be developed to ensure that LM consistently meets its maintenance obligations at the BPS. The Kings County Government Center address and contact information are provided below.

Burris Park
 County Government Center
 1400 W. Lacey Blvd.
 Hanford, CA 94720-1154
 (559) 584-1411

3.7 Field Operations

There are no field operations required at the BPS.

3.8 Environmental Monitoring

There are no environmental monitoring requirements at the BPS.

Table 1. Summary of LTS&M Requirements at the BPS

Site Name	DOE LTS&M Requirements	Comments
Burris Park, California, Site	Managing site records	The site records are maintained and managed by LM. Updates to the site records are conducted as necessary to keep the records current.
	Responding to stakeholder inquiries	All stakeholder inquiries are posed to LM. The Contractor assists LM in responding to stakeholders, as requested.
	Managing protective measures	The public fact sheet and the DOE LM website will be reviewed, and updated as necessary annually .
	Performing an annual verification on the accuracy of the site information	The site information (e.g., site ownership, site conditions, current and adjacent property use, and near-term and long-term developmental property goals of the site and the surrounding area) is reviewed annually to ensure that future use of the property is understood.
	Performing a site visit on a 5-year rolling schedule to evaluate any changed conditions	Site is visited on a 5-year rolling schedule will begin in 2019.
	Performing necessary site maintenance during annual site inspections, such as removing deep-rooted vegetation, covering soil, etc.	Site is inspected annually for the first 3 years beginning in 2016 to ensure that ICs are functioning properly. Verbal contact with Kings County will be made prior to the inspection in accordance with the pending Access Agreement.
	Performing a FIMS inspection during site visits	Site is visited on a 5-year rolling schedule with the last visit in 2015.



Figure 1. Location of Burris Park Site



Figure 2. Burris Park, California, Site (Interior Fence), July 2014



Figure 3. Southwest Corner of Site After Maintenance Activities, Looking Northeast, April 2015

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