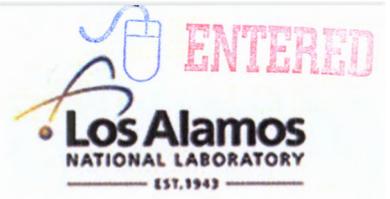


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November 2015

**Floodplain Assessment of the  
Chromium Plume Control Interim  
Measure and Plume-Center  
Characterization in Mortandad Canyon,  
Los Alamos National Laboratory**

Prepared by: Environmental Protection Division, Resources Management Team at  
Los Alamos National Laboratory.

Prepared for: U.S. Department of Energy, National Nuclear Security Administration,  
Los Alamos Field Office

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## **ACRONYMS**

CFR Code of Federal Regulations

DOE U.S. Department of Energy

gpm gallons per minute

LANL Los Alamos National Laboratory

NPDES National Pollutant Discharge Elimination System

ppb parts per billion

## **INTRODUCTION**

This floodplain assessment was prepared in accordance with 10 Code of Federal Regulation (CFR) 1022, Compliance with Floodplain and Wetland Environmental Review Requirements, which was promulgated to implement the requirements of the U.S. Department of Energy's (DOE's) responsibilities under Executive Order 11988, Floodplain Management, and Executive Order 11990, Wetlands Protection. According to 10 CFR 1022, a floodplain is defined as the lowlands adjoining inland and coastal waters and relatively flat areas and flood prone areas of offshore islands, including, at a minimum, that area inundated by a 1 percent or greater chance of flooding in any given year (the 100-year floodplain).

Groundwater sampling data from monitoring wells at the Los Alamos National Laboratory (LANL) indicate the presence of chromium contamination in the regional aquifer resulting from historical use of potassium dichromate, a corrosion inhibitor, in cooling-tower water that was discharged to an outfall as part of operational maintenance activities. Concentrations of chromium within the groundwater plume beneath Mortandad Canyon exceed the New Mexico groundwater standard of 50 parts per billion (ppb) near the property boundary between LANL and the Pueblo de San Ildefonso and are as high as 1,000 ppb in the plume center. Recent groundwater monitoring well sampling data show increasing chromium concentrations on the plume edge (sidegradient and downgradient), which is indicative of plume migration.

DOE is proposing to conduct an interim measure to control plume migration and maintain the 50 ppb and greater chromium concentration level within the LANL boundary. In addition, DOE is proposing to conduct field-scale studies to further characterize the plume center to evaluate the effectiveness and feasibility of implementing a final remedy for the chromium plume. Plume control would be implemented using a method of hydraulic capture that utilizes existing extraction well CrEX-1, possible future extraction wells, a configuration of injection wells to control migration of chromium-contaminated groundwater, and surface piping between the wells. The goal of hydraulic capture is to create and maintain a capture zone that will arrest plume migration. Existing modeling analyses suggest that the hydraulic capture of the contaminated groundwater at CrEX-1 will be substantially aided by siting the injection wells at the downgradient plume edge. Field-scale studies will include the installation and operation of an extraction well located towards the plume center that will support the study of chromium removal from the aquifer. A total of up to six injection and three extraction wells are proposed to support plume control and provide operational flexibility during maintenance downtime. Some of the wells and infrastructure will be located in the floodplain in the bottom of Mortandad Canyon. Until LANL receives a permit to operate injection wells, the primary mean of disposition of treated groundwater will be land application. Treated groundwater that meets clean water standards will be land applied using sprinkler systems and water trucks along roads in designated spray zones. Some of this land application will take place in the floodplain.

As part of plume-center characterization studies, shallow alluvial piezometers will be installed in Sandia Canyon to characterize lateral and vertical variability within the shallow alluvium in the canyon floor (Figure 1). The intent is to install the piezometers outside of the floodplain; however,

in the case that they cannot be installed outside the floodplain they are being included in this analysis.

Accordingly, DOE has prepared this floodplain assessment to evaluate the potential impacts of implementing the project within a floodplain, as required by 10 CFR 1022, Compliance with Floodplain and Wetland Environmental Review Requirements.

## **PROJECT DESCRIPTION**

DOE proposesto install two to six angled or vertical injection wells and up to three extraction wells that range in depth between 1,000 and 1,300 feet below ground surface screened within the regional aquifer (Figure 1) capable of pumping up to 150 gallons per minute (gpm) each.

In addition, the project would design and install a piping network capable of delivering 100 to 450 gpm of chromium-contaminated water from the extraction wells to the ion exchange treatment units and then from treatment to the injection wells for injection into the regional aquifer (Figure 1). The wells would be located in the canyon bottom and mesa top on the south side of Mortandad Canyon at LANL in Technical Area 5. Until the injection wells could be installed, treated groundwater that meets clean water standards would be land applied using sprinkler systems and water trucks along roads in designated spray zones (Figure 2).

Associated structures, such as well pads, settling ponds, sprinkler arrays, access roads, and staging areas, could be built in the 100-year floodplain between well R-15 and the eastern boundary of LANL. In addition to structures, application of treated groundwater, as permitted under the approved groundwater discharge permit (DP-1793) work plans for treatment and land application of treated groundwater, could occur within the floodplain. The nature and extent of the floodplain hazard caused by the proposed project is not expected to change.

To further characterize infiltration in Sandia Canyon, DOE proposes to install shallow alluvial piezometers varying in depth with the maximum depth down to 40 feet. They are currently planned to be installed on terraces on either side of the channel in lower Sandia Canyon. The piezometers would be installed with a concrete pad but would not require additional infrastructure. Figure 1 shows the proposed area for piezometer installation.

Inspections would be conducted according to requirements in the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction.

## **FLOODPLAIN IMPACTS**

The floodplain from the R-15 well downstream to LANL's eastern boundary in Mortandad Canyon is approximately 20 acres and the majority of this area will not be disturbed. Over the duration of the project, there will be negative short-term direct effects to the floodplain from the installation of well pads, underground and aboveground piping, access roads, water detention basins, and other related activities. These types of structures will not adversely affect future

flooding events because they are low to the ground and will not impede water flow. The short-term negative direct effects will be mitigated with required best management practices. Support structures such as personnel trailers, storage tanks, or permanent laydown yards will not be installed in the floodplain as they would impede flow during a flood event.

The treated groundwater that is land applied through sprinkler arrays and water truck spraying will impact the floodplain in a positive way by enhancing native plant growth which will stabilize the soils and improve natural floodplain processes.

Required best management practices for work in floodplains will be implemented during all project activities. These protection standards will minimize short-term negative impacts.

The best management practices are:

- Support structures such as personnel trailers, storage tanks, or permanent laydown yards will not be installed within the floodplain.
- Project will not locate permanent equipment staging areas within the floodplain.
- Project will refuel equipment at least 100 feet from any drainage, including dry arroyos.
- Project will not store hazardous materials, chemicals, fuels, and oils within the floodplain.
- Revegetation of areas following soil disturbances using an appropriate native seed mix or plants.
- Removal of all trash and debris (e.g., construction material) from the floodplain after completion.
- Implementation of erosion and sediment control measures during construction

This project has gone through an integrated environmental review to maintain compliance with all laws and regulations. All applicable requirements in the NPDES General Permit for Discharges from Construction and the land application discharge permit (DP-1793) will be followed. To comply with the Migratory Bird Treaty Act, vegetation will not be removed during the peak bird breeding season, May 15 through July 31, without a nest check to protect nesting birds. Future work will not extend west of R-15 (Figure 1) to avoid environmentally sensitive areas.

No long-term negative direct or indirect impacts to the beneficial values of the 100-year floodplain would be expected under the proposed project. No effects to lives and property associated with floodplain disturbance are anticipated.

## **ALTERNATIVES**

Alternatives to the proposed action that were considered, but not evaluated, included monitored natural attenuation and in situ treatment. However, these alternatives were eliminated from further consideration once it was determined they would not meet DOE's stated purpose and need. In addition, DOE considered a No Action Alternative, which was not selected because without this

action, the chromium plume would be left uncontrolled and the chromium groundwater plume would be expected to continue to migrate.

## **CONCLUSIONS**

It is anticipated that this project would not result in long-term adverse impacts to the 100-year floodplain. Temporary disturbance within the floodplain would cease following completion of construction activities associated with this proposed project. Best management practices, including proper erosion and sediment control measures would be utilized during construction. This proposed project would not significantly modify existing elevations and flow paths of the area within the floodplain from pre-project conditions to post-project conditions or result in other long-term negative impacts to the floodplain and its functionality. No effects to lives and property associated with floodplain disturbance are anticipated.

In accordance with 10 CFR Part 1022, a Statement of Findings based on the information in this document will be published. The Statement of Findings will include a brief description of the proposed project, an explanation of why it is located in a floodplain, the alternatives considered, a statement indicating if the action conforms to state and local floodplain requirements, and a brief description of the steps to be taken to minimize potential harm within the floodplain.

Chromium Plume Floodplain Assessment

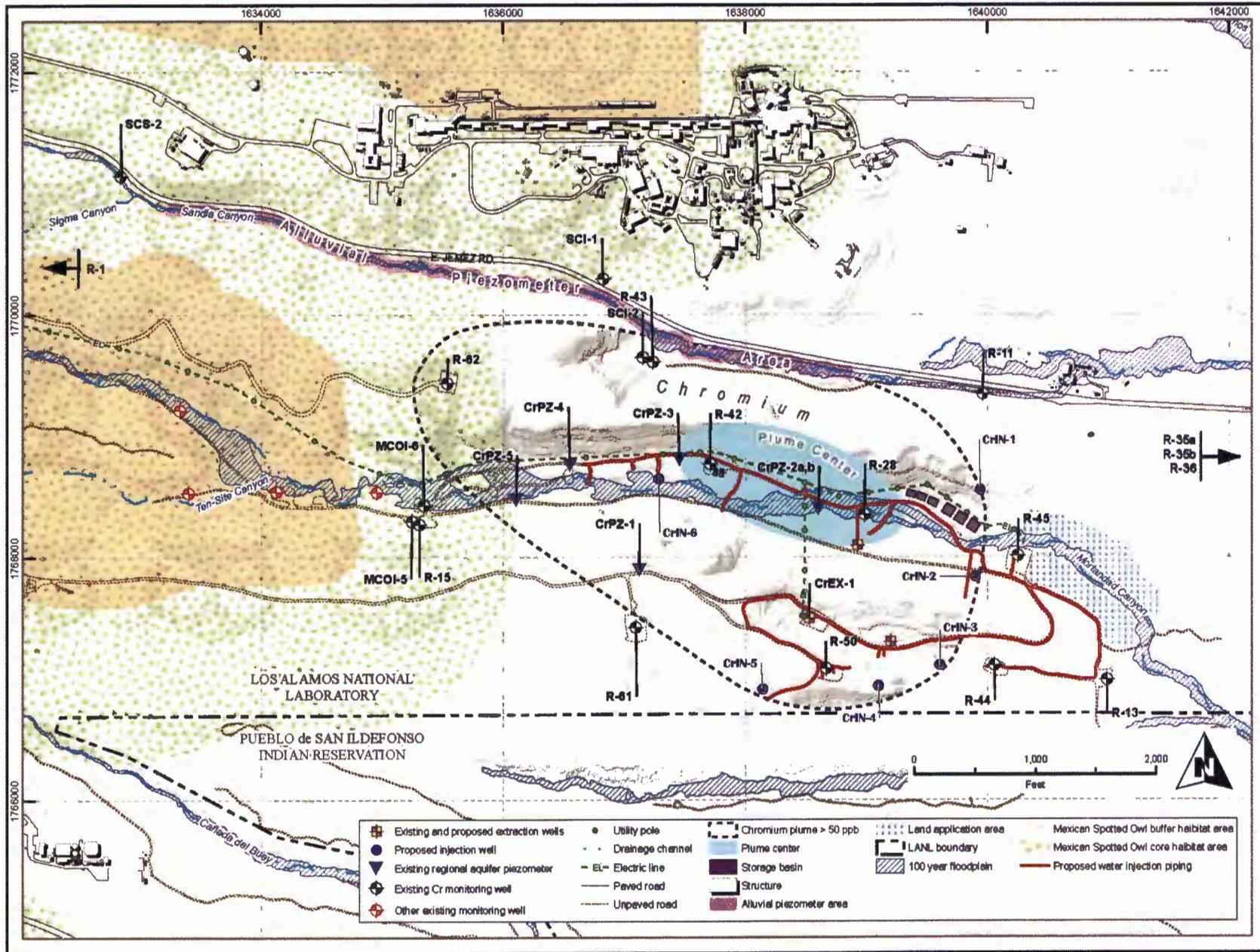


Figure 1. Locations of current and proposed project activity in Mortandad Canyon.

Chromium Plume Floodplain Assessment

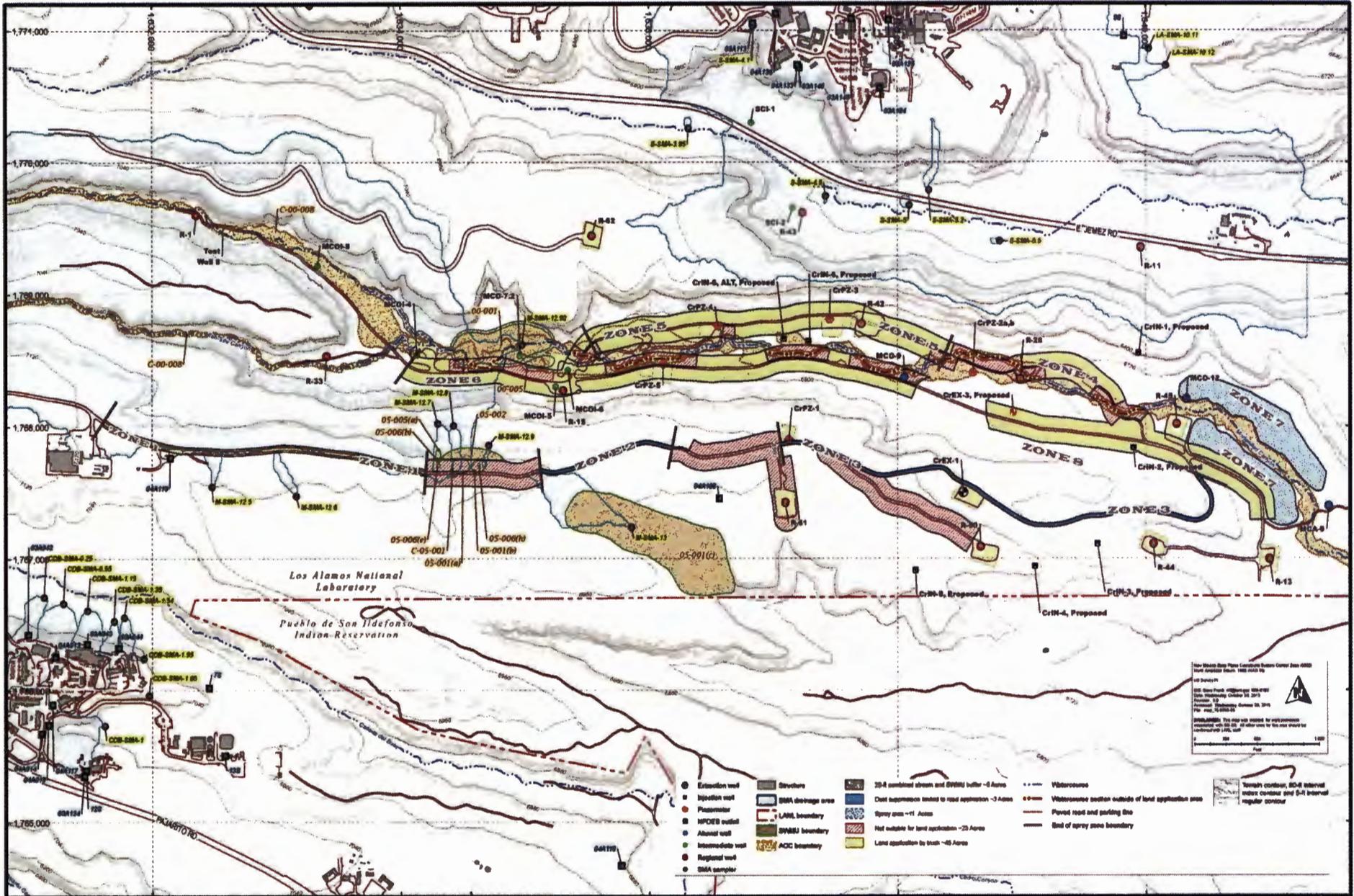


Figure 2. Designated spray zones for land application of treated water.