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Close-out Report Fitzner-Eberhardt Arid Lands Ecology Reserve Remedial Action, Hanford, Washington

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1.0 SUMMARY OF SITE CONDITIONS

1.1 SITE DESCRIPTION

The Fitzner-Eberhardt Arid Lands Ecology (ALE) Reserve consists of 312 km^2 (120 mi^2) of shrub-steppe land on the western edge of the Hanford Site. It is located south of Highway 240 and east of the point where the Yakima River borders the site (Figure 1). The land was set aside as a natural research area in 1967 by the Atomic Energy Commission.

Historically tribal land, the area was homesteaded by pioneers before it was taken by the federal government in 1943 as a security buffer to protect the Hanford Site defense production facilities. One antiaircraft artillery battery (latter converted to a Nike missile site) was located on this land; plutonium production plants or storage facilities were never built there. A more complete account can be found in the *Preliminary Assessment Screening (PAS) Report for the Arid Lands Ecology Reserve, Hanford* (DOE-RL 1994b).

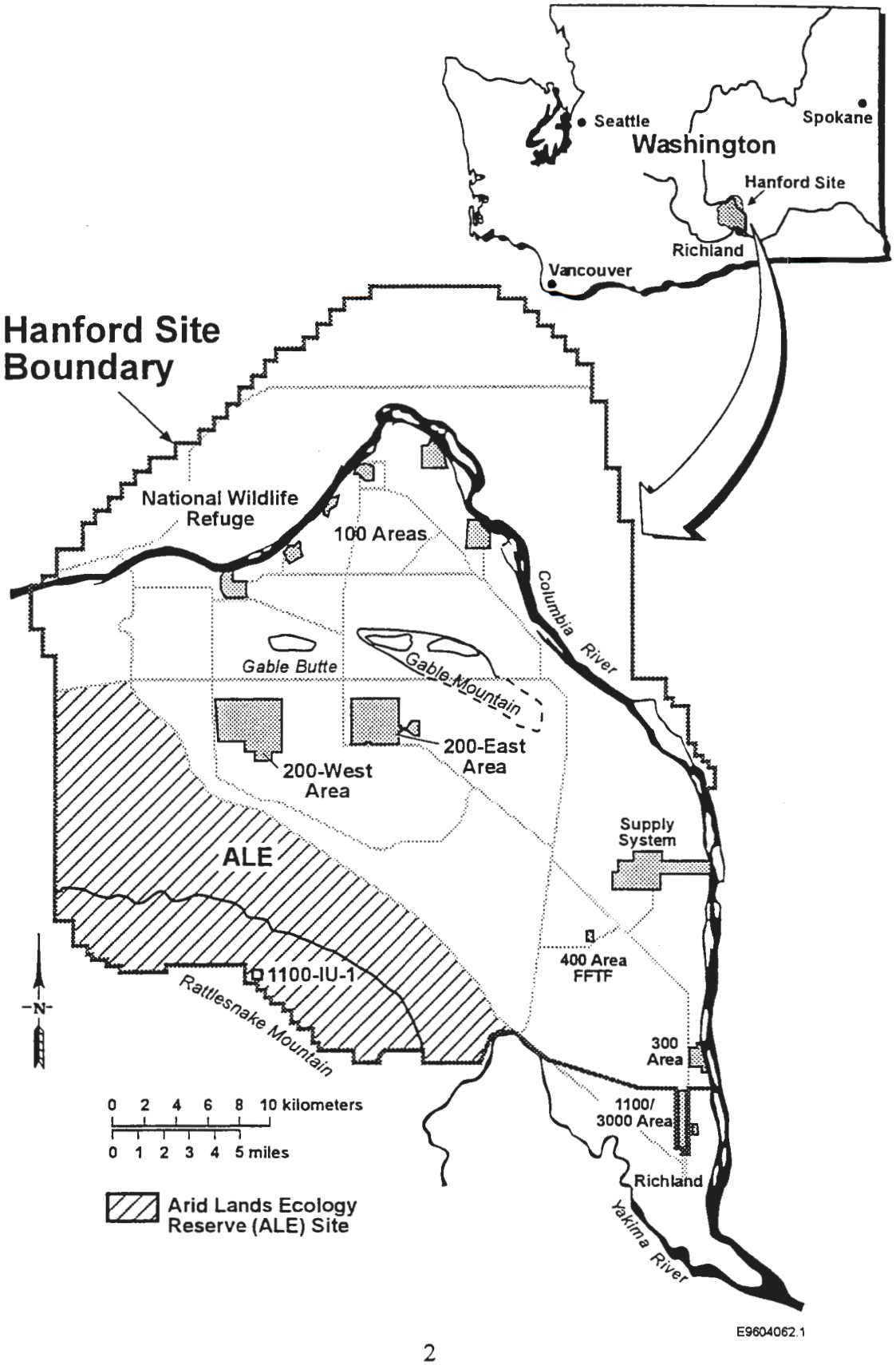
With the recent change in mission at the Hanford Site from plutonium production to environmental cleanup, much attention has been given to releasing clean tracts of land for other uses. The ALE Reserve is one such tract of land. The existing areas of contamination in the ALE Reserve were considered to be small. In March 1993, the U.S. Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) signed and Agreement in Principle in which they agreed to expedite cleanup of the ALE Reserve. Cleanup activities and a draft close-out report were to be completed by October 1994. Additionally, DOE proposed to mitigate hazards that may pose a physical threat to wildlife or humans.

1.2 LIMITED FIELD INVESTIGATION AND FOCUSED FEASIBILITY STUDY

The 1100 Area of the Hanford Site was placed on the *National Priorities List* (NPL) in November 1989, pursuant to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended, 42 U.S.C. 9601 et seq. Based on undocumented past practices, two ALE Reserve sites, the H-52-L Nike missile launch site and the H-52-C Nike missile control site, were identified as subunits within the 1100-IU-1 Operable Unit (OU) of the 1100 Area NPL site.

Possible contamination at the 1100-IU-1 OU was identified in the *Draft Limited Field Investigation/Focused Feasibility Study for the 1100-EM-2, 1100-EM-3, and 1100-IU-1 Operable Units Hanford* (LFI/FFS [DOE-RL 1992]). Proposed remedial actions were addressed as part of the Record of Decision (ROD) for the 1100 Area NPL site issued in September 1993.

Figure 1. Hanford Reservation Location Map.



1.3 PRELIMINARY ASSESSMENT SCREENING

The Preliminary Assessment Screening (PAS) was completed in April 1994. The PAS identified hazards or potential hazards, either environmental or physical, remaining on ALE Reserve lands. These hazards resulted from many varying activities that have occurred on these lands since settlement was begun in the 1890s. Possible areas of radiological contamination from research activities at several ALE Reserve lysimeter plots were identified. Other possible environmental concerns from poorly constructed water and monitoring wells, and abandoned natural gas wells at the Rattlesnake Hills Gas Field, were listed as having the potential to impact the groundwater aquifer.

Physical hazards identified included the open boreholes associated with the abandoned gas wells and two large concrete water cisterns. A possibility of the presence of unexploded ordnance resulting from past military use of the ALE Reserve lands also existed. A complete ordnance survey/cleanup was initiated by the U.S. Army Corps of Engineers (USACE).

1.4 PUBLIC COMMENT

The LFI/FFS and proposed plan were made available to the public on May 24, 1993. The public comment period was held from May 24, 1993, to July 9, 1993. A public meeting was held on June 30, 1993, at the city of Richland library. Very few comments were received on the LFI/FFS or the proposed plan.

The PAS report did not require formal regulatory or public review; however, EPA and Ecology were given the opportunity to informally review the findings and recommendations. Final decisions on actions to be taken were made by DOE.

1.5 RECORD OF DECISION

The LFI/FFS identified 32 areas within the OU that required further investigation and possible cleanup. The ROD specified that contamination found in these areas would be cleaned up to Washington's *Model Toxics Control Act* (MTCA) standards for unrestricted use. Because it was expected that only small amounts of contaminated soils would be found, the ROD called for the disposition of these soils at an offsite hazardous waste landfill.

1.6 REMEDIAL DESIGN AND REMEDIAL ACTION

In June 1994, the *Remediation Design and Remedial Action Plan for the 1100 Area Hanford Site* (DOE-RL 1994c) was submitted by DOE to EPA and Ecology. This plan outlined the field sampling requirements for characterization and the remedial activities that would take place at the 1100-IU-1 OU. The document was approved by EPA and Ecology, and characterization activities began in late June 1994.

Geophysical methods were used to identify tank locations at underground storage tank (UST) sites. Any USTs discovered were to be closed in accordance with published guidance from Ecology. Two 7,600-L (2,000-gal) fuel tanks associated with Buildings 6652-G and 6652-H were discovered and removed. Soils from beneath these tanks were sampled and sent off site for analysis. Laboratory results indicated that these soils were clean and that no further actions were required. Six cubic yards (4.6 m^3) of soil was discovered within the 6652-G tank. Analysis of this soil indicated the presence of petroleum hydrocarbons above regulatory limits. This soil was disposed of at the DOE petroleum contaminated soil (PCS) landfarm in the 100 Areas. Final UST site closure assessment reports will be submitted to Ecology upon completion.

Geophysical methods were also used to identify old drainfields and landfill cells. Once located, soil gas probes were placed and samples were taken to screen for the presence of volatile organic compounds. Soil gas analyses were negative in all cases.

Based on findings from similar landfills on the North Slope of the Hanford Site, EPA and Ecology required that limited characterization of the Horse Shoe landfill be carried out. This would require excavation at each identified geophysical anomaly; however, full excavation of the anomaly was not required. Instead, a 1.5 to 3-m (5 to 10-ft) trench would be excavated through the long axis of any anomalous feature. Full excavations would only be required when field screening indicated the possible presence of contaminants. Activities conducted consisted of geophysical investigations, excavation and field screening of buried waste, sampling and analysis of suspect waste, and segregation of confirmed hazardous or contaminated materials. Geophysical investigations employed electromagnetic profiling and magnetic techniques, as well as ground-penetrating radar to locate buried metallic and nonmetallic waste materials. Areas exhibiting anomalous geophysical response were marked in the field for subsequent excavation. A bulldozer and trackhoe were used to uncover and excavate landfill cells and other buried waste. Waste was field screened using several criteria, including visual observation, direct-reading instruments, and analyte-specific field analytical kits. Suspect waste was sampled for characterization by an offsite laboratory under a quick turnaround schedule. Materials confirmed as hazardous or contaminated by nonregulated substances (i.e., petroleum hydrocarbons) were segregated pending determination of proper waste designation and disposition. Excavations were backfilled and compacted using nonhazardous materials and clean fill and graded to original conditions.

At the Horse Shoe landfill, approximately 1,912 m^3 (2,500 yd^3) of soil contaminated with the pesticide DDT and its breakdown products were discovered. No other contaminants were detected above regulatory cleanup levels. Because of the presence of DDT contaminated soil, EPA and Ecology then required that limited characterization be performed at the H-52-L Nike Base landfill. Field screening did not detect any contaminated materials at this site. This was later confirmed by samples sent off site for analysis.

Approximately 2,601 m^3 (3,400 yd^3) of suspected waste materials was excavated and evaluated from the two landfill sites. Removal of the 1,912 m^3 (2,500 yd^3) of DDT contaminated soil was completed on September 30, 1994. These soils were shipped to the Chemical Waste Management hazardous waste landfill in Arlington, Oregon.

Soil sampling and analysis at other potential waste sites was conducted in accordance with the approved field sampling plan. Results showed only two sites where contaminants above the prescribed MTCA levels were released to the environment. Both sites were on top of Rattlesnake Mountain and were associated with the Nike Missile Control Center. One site was the location of five burn pits that were excavated into the basalt formation. Soil analyses indicated the presence of lead above regulatory limits in two of the burn pits. Because of concern for cultural and ecological resources at this site, DOE proposed that a concrete cap (approximately 1.2 m [4 ft] in diameter) be placed over the two burn pits that contained lead. Ecology and EPA concurred with this proposal.

The second area of contamination was discovered at the former location of an aboveground fuel storage tank. Diesel contaminated soil above regulatory limits was discovered within an approximate 1-m (3-ft) radius circle to a depth of 0.427 m (1.4 ft) (bedrock interface). Approximately 0.382 m^3 (0.5 yd^3) of contaminated material was excavated and disposed of at the 100 Areas PCS landfarm. Excavation was guided by field screening methods specific to petroleum hydrocarbons and was stopped when field screening indicated that regulatory levels were met. Because soil was removed down to bedrock, offsite confirmatory sampling was not performed.

An ordnance and explosive waste (OEW) record search was initiated in November 1993. The search consisted of a records review and site visit, ordnance and explosive waste contamination analysis, and an archives search. The search concluded that there is a very small potential for the presence of OEW. Given the expanse of the ALE Reserve, the likelihood of finding any ordnance through a field search would be minimal, and the costs would be great. Therefore, no further action was recommended.

Decommissioning of the Rattlesnake Hills Gas Field wells, ALE Reserve water supply wells, and monitoring wells commenced in May 1994 and was completed by July 1994. In all, 12 gas wells, 2 water wells, and 3 monitoring wells were decommissioned. The water wells and monitoring wells were closed in accordance with requirements set forth by Ecology. Gas wells were decommissioned in accordance from guidance provided by the Washington Department of Natural Resources in consultation with Ecology. In all but one case, gas well decommissioning consisted of backfilling the well with bentonite chips and placing a 1-m (3-ft) concrete plug at the surface. For well 699-S9-63B (Walla Walla 6A), which was the deepest gas well drilled and had the potential for cross aquifer contamination with saline waters, the casing was perforated from a depth of 152 m (498 ft) (where a immovable plug existed) to 18 m (60 ft). The casing was cut at the 18-m (60-ft) depth and removed. The well was then pressure grouted from the plug to the ground surface.

In July 1994, sampling at two ALE Reserve lysimeter plots previously used by the Pacific Northwest National Laboratory (PNNL) for radiological experiments was initiated. At the conclusion of the experiments, the radioactive materials were removed and the areas in question were sampled by PNNL. The results of the PNNL sampling indicated that no residual contamination remained. However, the Washington State Department of Health (WDH) raised concerns with the analytical methods used by PNNL (i.e., gross alpha and beta counting) and

suggested that these methods might not adequately detect all of the types or quantity of radiation expected due to matrix effects and shielding in the soil being analyzed. DOE also wanted to conduct an independent verification of PNNL's claimed clean closure in preparation of excessing these lands.

To address these concerns, a sampling plan was devised in close consultation with WDH. The plan called for the sampling of more than 20% of the 500 locations that had contained lysimeters. These samples were analyzed for the specific radioisotopes associated with the individual lysimeters. In addition, split samples were analyzed by the WDH laboratory to provide additional quality assurance; independent verification was coordinated with the Oak Ridge National Laboratory to provide the DOE-required independent analysis. The results from the contract laboratory essentially substantiated that clean closure was accomplished by PNNL. All but one sample had activities of less than 1.2 pCi/g. The one exception was a sample that had 53 pCi/g of the Pu-238 isotope. This sample was taken from an area within the lysimeter plot where insects may have compromised certain lysimeters and may have brought small amounts of contamination to the surface. A qualitative radiological risk analysis was completed. At this activity level and volume of material, associated exposure risks are extremely small (on the order of 0.25 mrem/yr). DOE, in consultation with EPA, elected to excavate approximately 0.19 m^3 (0.25 yd^3) of material to further mitigate any exposure risks. The material was taken to the low level radioactive burial grounds in the 200 Areas.

Detailed field reports on specific activities conducted on the ALE Reserve are contained in *A Compendium of Field Reports for the Fitzner-Eberhardt Arid Lands Ecology Reserve Remedial Action, Hanford, Washington* (DOE-RL 1994a).

2.0 DEMONSTRATION OF QA/QC FROM CLEANUP ACTIVITIES

Work plans for remedial actions were carefully reviewed by Ecology, EPA, DOE, and USACE for compliance with all EPA, DOE, and USACE quality assurance/quality control (QA/QC) procedures and protocol. Field procedures followed standard operating procedures and were thoroughly documented. Samples were collected, shipped, and analyzed under strict chain-of-custody requirements and according to approved EPA analytical methods. A portion of all samples were provided to the USACE QA laboratory for independent analytical verification. For radiological sampling, QA was provided by independent analysis through the WDH laboratory and DOE's Oak Ridge Laboratory. At the conclusion of the field efforts, QC data were compared to preestablished data quality objectives. This evaluation verified the usability of the data for assuring the satisfactory execution of the remedial actions consistent with the ROD.

3.0 MONITORING RESULTS

The protocol for sampling and analysis was detailed in the work plans. For personnel safety, random and instantaneous onsite and perimeter air sampling for total particulates was conducted, as well as random radiation screening of soils and debris. Surface radiation scans were performed at the lysimeter plots, and no contamination was detected.

Field screening for hazardous constituents involved the use of a photo- or flame-ionization detector for volatile organic compounds, and the use of field test kits for chlorinated compounds, DDT, and petroleum hydrocarbons. Materials that tested positive using these methods were segregated, sampled, and analyzed off site. To expedite field activities, excavation was largely based on the results of field screening tests. Soil was excavated until the established MTCA cleanup criteria was met, as determined by the field screening.

Analysis by an offsite laboratory was used to confirm that contaminants were removed to below the MTCA cleanup levels at the Horse Shoe landfill. Also, all backfill material brought in from offsite sources was tested for all EPA priority pollutants. Documentation of the confirmatory sampling program for the various field activities is provided in *A Compendium of Field Reports for the Fitzner-Eberhardt Arid Lands Ecology Reserve Remedial Action, Hanford, Washington* (DOE-RL 1994a).

4.0 SUMMARY OF REVEGETATION ACTIVITIES

The distributed soils on the surface of these two sites were revegetated in the fall of 1995. Work began on November 29, 1995, and was completed on December 7, 1995. The revegetated area of the Horse Shoe landfill measures approximately 35 by 70 m (114 by 229 ft). The revegetated area on the Nike Base landfill consists of three small sites measuring approximately 6 by 9 m (9 by 29 ft), 4 by 9 m (13 by 29 ft), and 4 by 23 m (13 by 75 ft). Because of the ecological sensitivity of the ALE site and the high-quality habitats that exist, an intensive revegetation effort was conducted with a high probability of early success. All four sites were revegetated by transplanting bunchgrasses. Mature bunchgrasses were taken from the shoulder of the 1200-Foot Road (which runs adjacent to the Horse Shoe landfill), divided into clumps approximately 7.6 cm (3 in.) in diameter, and planted onto the landfills at roughly 1-m (3-ft) spacing. Care was taken to remove bunchgrasses selectively to reduce the impact on the population living on the shoulder of the road. The abundance of plants made it possible to thin the population without creating visual impacts. The dominant species taken was blue-bunch wheatgrass (*Agropyron spicatum*) with an occasional Indian ricegrass (*Oryzopsis hymenoides*). The Horse Shoe landfill had a large number of sagebrush seedlings growing on it that were inadvertently planted during the backfilling (i.e., the seeds were in the soil used to cover the surface). The exceptionally wet year of 1995 allowed the seeds to grow and become established. Therefore, the prospects for this site returning to a sagebrush bunchgrass-dominated community in the near future are very good.

The three small Nike landfill sites varied in vegetative cover from nearly bare to having some small sagebrush, cheatgrass, and Sandberg's bluegrass. These sites were planted with the same mix of bunchgrasses from the shoulder of the 1200-Foot Road, with the addition of 6 to 12 sagebrush seedlings each.

5.0 PROTECTIVENESS

Consistent with the ROD and PAS, sites identified as having the potential for contamination on the ALE Reserve have been investigated, characterized, and remediated, where necessary, to comply with MTCA cleanup levels. Hazardous substances released to the environment have either been removed from the site or, in one case when removal was not practical, capped in place. Removal of all of the contaminated soil is supported by the confirmatory sampling results. Consequently, the ALE Reserve, including the 1100-IU-1 OU, will not be subject to a 5-year review. Reports and work plans relevant to the completion of the Fitzner-Eberhardt Arid Lands Ecology Reserve Remedial Action are available in the Administrative Record.

Monitoring the success of the revegetation efforts at these sites will be conducted annually in the spring to measure the effectiveness of the transplanting effort. The ultimate measure of success or failure can only be measured after several growing seasons (perhaps 3 to 5). Monitoring will consist of a variety of measurements, including survival rate, stem or bunch count, percent canopy cover of all species present, and reproductive success.

6.0 REFERENCES

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