1.0 NEAR-FACILITY ENVIRONMENTAL MONITORING AT HANFORD

Near-facility environmental monitoring is defined as monitoring near facilities that have the potential to discharge or have discharged, stored, or disposed of radioactive or hazardous materials. Monitoring locations are associated with nuclear facilities such as the Plutonium Finishing Plant (PFP), Canister Storage Building (CSB), and the K Basins; inactive nuclear facilities such as N Reactor and the Plutonium-Uranium Extraction (PUREX) Facility; and waste storage or disposal facilities such as burial grounds, cribs, ditches, ponds, tank farms, and trenches.

Much of the monitoring consists of collecting and analyzing environmental samples and methodically surveying areas near facilities. The program is also designed to evaluate acquired analytical data, determine the effectiveness of facility effluent monitoring and controls, assess the adequacy of containment at waste disposal units, and detect and monitor unusual conditions. The program implements applicable portions of U.S. Department of Energy (DOE) Orders 435.1, 450.1 (replaced DOE Order 5400.1 in January 2003), and 5400.5 (DOE 1993); DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting Manual*; *Washington Administrative Code* (WAC) 246-247; Title 40, *Code of Federal Regulations* (CFR) Part 61 (40 CFR 61), Subpart H; and 10 CFR 835.

Several types of environmental media are sampled near facilities to monitor waste management and restoration activities, and to evaluate the effectiveness of effluent treatment and control practices. Routine sampling and monitoring includes ambient air, water, external radiation, soil, and vegetation. The parameters typically monitored are radionuclide concentrations and radiation fields. Sampling methods are discussed in detail in the Duratek Technical Services, *Operational Environmental Monitoring*, DTS-OEM-001.

Samples are collected from known or expected effluent pathways. These pathways are generally downwind of potential or actual airborne releases and down gradient of liquid discharges. Table 1-1 shows the type, quantity, and location of routine near-facility monitoring samples collected in 2003.

Table 1-1. Near-Facility Routine Environmental Monitoring Samples and Locations, 2003.

	Number of sample	Operational area								
Sample Type	**locations**	100-B/C	100-D/DR	100-K	100-F	100-H	100-N	ERDF[a]	200/600	300/400
Air	82	6	3	11	6	2	5	3	41[b]	5
Soil	82	5	0	2	2	0	1	1	57	14
Vegetation	65	0	0	0	0	0	4	0	48	13
External radiation	134	4	0	20	5	0	14	3	67	21
Water	10	0	0	0	0	0	10	0	0	0

[a]Environmental Restoration Disposal Facility in the 200 West Area.

[b]Includes 1 station at the Wye Barricade, 19 in the 200 East Area, and 21 in the 200 West Area.

Strontium-90 results for this report period show overall lower values compared to historical trends. This was primarily due to changes in laboratory background correction calculations that were implemented in 2003. Both historical and current values are within accepted statistical ranges as evidenced by laboratory quality assurance (QA) and performance evaluation programs.

Waste disposal sites and the surrounding terrain are surveyed to detect and characterize radioactive surface contamination. Routine radiological surveys are conducted across the surfaces of underground radioactive material areas and along the perimeters of contamination areas. Locations include cribs, trenches, retention basins, ponds, ditches, solid waste disposal sites, unplanned release sites, tank farms, stabilized waste disposal sites, roads, and firebreaks in and around the Site operational areas.

Nonroutine, investigative samples are also collected as part of the Near-Facility Environmental Monitoring Program to confirm the absence or presence of radioactive and/or hazardous contaminants.

A Noxious Weed Control Program has been developed on the Hanford Site in response to Federal, State, and local laws requiring eradication or control of noxious weeds. A general discussion of the program and of control measures is provided in Section 8.0 of this Appendix.

This Appendix contains brief discussions, specific sampling location information, and complete analytical data results for the various near-facility environmental monitoring efforts for 2003. Detailed discussions and summarized analytical results are provided in Section 3.2 ("Near-Facility Environmental Monitoring") of the *Hanford Site Environmental Report for Calendar Year 2003* (PNNL-14687).

1.1 AIR MONITORING

Near-facility air sampling monitors the effectiveness of waste management and environmental remediation controls, and effluent treatment systems in reducing effluents and emissions. These air samplers also monitor diffuse source emissions.

Ambient air monitoring is conducted to determine baseline concentrations of radionuclides in the operations areas, assess the impact of operations on the local environment, and monitor diffuse and fugitive emissions from sources located within the operations area. These measurements also provide an indication of the Project Hanford Management Contract (PHMC), River Protection Project (RPP), and Environmental Restoration Contractor (ERC) managed facilities' performance and are used to demonstrate compliance with environmental protection criteria.

In 2003, air radioactivity was sampled by a network of continuously operating samplers at 82 locations. Location-specific maps and monitoring results are provided in Section 2.0.

1.2 GROUNDWATER MONITORING

The Near-Facility Environmental Monitoring Program did not conduct groundwater monitoring in 2002. Detailed discussion of groundwater monitoring management strategies and the 2003 monitoring results can be found in PNNL-14687 (Section 6.0, "Groundwater Monitoring") and in the *Hanford Site Groundwater Monitoring for Fiscal Year 2003*, PNNL-14548 (Hartman et al. 2004).

1.3 SOIL AND VEGETATION SAMPLING

Soil and vegetation samples were collected on or adjacent to waste disposal units, and from locations downwind and near or within the boundaries of the operating facilities. Samples were collected to detect potential migration and deposition of facility effluents. Migration of radionuclides can occur as the result of resuspension from radioactively contaminated surface areas, absorption by the roots of vegetation growing on or near underground and surface water disposal units, or intrusion by animals.

Radiological analyses of soil and vegetation samples included strontium-90, plutonium-239/240, isotopic uranium, and gamma-emitting radionuclides. Location-specific maps and the analytical results are presented in Section 3.0.

1.4 EXTERNAL RADIATION

External radiation levels were monitored near facilities and waste handling, storage, and disposal sites to measure, assess, and control the impacts of operations. Thermoluminescent dosimeters (TLDs) are used at numerous fixed locations to gather dose rate information over extended periods of time. TLD results can be used individually or averaged to determine dose rates in a given area for a particular sampling period.

Environmental dosimeters measure dose rates from all types of external radiation sources, including cosmic radiation, naturally occurring radioactivity in air and soil, and fallout from nuclear weapons testing, as well as any contribution from Hanford Site activities. During any year, changes in soil moisture and snow cover can cause external radiation levels to vary from 15% to 25% at any given location. The results are reported in units of millirems per year (mrem/yr). Individual TLD results and their locations are provided in Section 4.0.

1.5 RIVERBANK SPRINGS MONITORING

The springs along the 100-N Area Columbia River shoreline (N-Springs) were sampled in 2003 to assess the effectiveness of effluent and contamination controls. Ten water samples were collected. The radiological analyses were performed onsite at the Waste Sampling and Characterization Facility (WSCF), and the analyses included tritium, strontium-90, and

gamma-emitting radionuclides. A location-specific map and the analytical results of the sampling are presented in Section 5.0.

1.6 RADIOLOGICAL SURVEYS

In 2003, the Hanford Site had approximately 3,651 ha (9,022 acres) of posted outdoor surface contamination, and 666 ha (1,646 acres) of posted underground radioactive material, not including the production facilities (e.g., PUREX, T-Plant, etc.). The total area of surface contamination was approximately six times larger than the area of underground radioactive material.

Since 1996, a global positioning system (GPS) has been utilized to accurately measure the surface area of these radiologically controlled sites. This collected information was entered into the Hanford Geographical Information System (HGIS), a computer database maintained by Fluor Hanford, Inc (FH). Survey location maps are provided in Section 6.0.

1.7 INVESTIGATIVE SAMPLING

Investigative sampling was conducted in the operations areas to confirm the absence or presence of radioactive and/or hazardous contaminants. Investigative sampling took place near facilities, such as storage and disposal sites, for at least one of the following reasons:

- To follow up radiological surface surveys that had indicated radioactive contamination was present.
- To conduct preoperational surveys to characterize the radiological/hazardous conditions at a site prior to facility construction, operation, or ultimate remediation.
- To determine if biotic intrusion (e.g., animal burrows or deep-rooted vegetation) has created a potential for contaminants to spread.
- To determine the integrity of waste containment systems.

Generally, the predominant radionuclides detected during these efforts were activation and fission products in the 100 Areas, fission products in the 200 Areas, and uranium in the 300 Area. Hazardous chemicals generally have not been identified above background levels in preoperational environmental monitoring samples. Special characterization samples collected in 2003 included soil and a cottontail rabbit from the 200 West Area, mice from the 100-K East Area, and a starling from the 300 Area. Complete results, including counting errors and field instrument and dose rate readings, where appropriate, are provided in Section 7.0.

1.8 NOXIOUS WEED CONTROL PROGRAM

The Noxious Weed Control Program on the Hanford Site has been developed in response to Federal, State, and local laws requiring eradication or control of noxious weeds. A noxious weed is defined as "any plant which when established is highly destructive, competitive, or difficult to control by cultural or chemical practices." Typically, noxious weeds are non-native (alien) species that invade and displace native species, reduce habitat for fish and wildlife, and contribute to the extinction of sensitive species.

Ten plant species are on a high priority list for control at Hanford. These species are Yellow Starthistle (*Centaurea solstitialis*), Rush Skeletonweed (*Chondrilla juncea*), Babysbreath (*Gypsophila paniculata*), Medusa Head (*Taeniatherum asperum*), Dalmatian Toadflax (*Linaria genistifolia ssp. Dalmatica*), Spotted Knapweed (*Centaurea maculosa*), Diffuse Knapweed (*Centaurea diffusa*), Russian Knapweed (*Acroptilon repens*), Saltcedar (*Tamarix spp.),* and Purple Loosestrife (*Lythrum salicaria).*

Maps generally depicting the spatial distribution of these species across the Hanford Site can be found in Section 8.0.

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