Fall 1998 200 East Area Biological Vector Contamination Report

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FLUOR DANIEL HANFORD, INC.
Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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Fall 1998 200 East Area Biological Vector Contamination Report

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ACKNOWLEDGEMENT

The U.S. Department of Energy, Richland Operations Office, and Fluor Daniel Hanford, Inc. (FDH), offer their sincere appreciation and gratitude to those who cooperated and assisted during the events of the Fall of 1998 that are documented in the following report. Specifically, we thank and commend the City of Richland, the personnel at the City of Richland Landfill, and the Washington State Department of Health. We also thank the Pacific Northwest National Laboratory, Bechtel Hanford, Inc., and Project Hanford Management Contract team members. They were instrumental in helping FDH and the Hanford Site respond to this incident and identify lessons learned relative to the discovery of a new biological vector for the spread of contamination.

The recognition extended to these organizations also encompasses their cooperation in reviewing and commenting on this document. The lessons learned from this event are intended for use not only by the Hanford Site, but also by other U.S. Department of Energy sites and other interested parties.

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PROLOGUE

On September 28 and 29, 1998, a biological vector (fruit flies) not previously identified with radioactive contamination within the U.S. Department of Energy complex spread contamination at the Hanford Site, Richland, Washington. The contamination was spread from a radioactive waste-transfer-piping diversion pit to clean refuse, which was then transported to the nearby municipal landfill for disposal. This report describes the events leading up to the discovery of the contamination release from the pit, the transfer of contamination by fruit flies, transfer to the landfill via normal refuse disposal activities, and the associated response activities. This response included the actions taken by the U.S. Department of Energy, Richland Operations Office, and the Project Hanford Management Contract team, working with regulators and City of Richland officials to track, investigate, mitigate, and eliminate the contamination spread. Workers and the public did not receive any radiation dose from this event.

The contamination spread was found to have originated in the 200 East Area, located in the center of the Hanford Site. It is believed that fruit flies were attracted to a sucrose-based fixative applied to the inside of a contaminated concrete diversion pit to control smearable radiological contamination before work was initiated inside the pit. After eggs were laid in the sweet mixture by the insects, they hatched, matured, and spread contamination in the pit to nearby mobile office lunchroom refuse and dumpsters. This contaminated refuse was picked up during normal disposal activities and hauled by compactor garbage truck to the City of Richland Landfill. On discovery of the contamination during daily surveys of the mobile office lunchroom, Hanford Site workers immediately implemented contamination-containment and vector-elimination activities. A strong focus was placed on protecting the health and safety of the workers, the public, and the environment. Equally important is that radioactive contamination subsequently discovered at the City of Richland Landfill was recovered with no radiation exposure impacts.

This type of biological vector-borne incident appeared to be unique, based on the circumstances. However, routine monitoring and strict controls must be applied to ensure that the health and safety of the workers, the public, and the environment are not jeopardized or compromised. Other sites should review existing practices to see if similar conditions exist, and they should incorporate monitoring and controls for this type of vector. Based on this recent incident, U.S. Department of Energy, Richland Operations Office, and Project Hanford Management Contract organizations are reconfirming the processes and resources used to identify, control, and recover from such a biological vector-borne radiological contamination event. The Hanford Site incident highlighted the following conclusions that may apply to other U.S. Department of Energy sites with the potential for such incidents.

- *Identification of possible new biological vectors needs to be integrated into work and survey planning.*
- *Biological vector surveillance and proactive control of waste-handling operations should be integrated with radiological, hazardous, and dangerous material control programs.*
- *A graded approach to handling refuse according to its point of generation may be warranted, based on the potential for radioactive contamination spread.*
- *When municipal landfills are used for refuse disposal, the primary line of defense to prevent the inadvertent release of radiological material is the existing radiological, hazardous, and dangerous material control programs. This includes both administrative and engineering controls at the point of generation of refuse.*

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EXECUTIVE SUMMARY

The purpose of this report is to document the investigation into the cause of the spread of radioactive contamination in September and October 1998 at the Hanford Site's 200 East Area and its subsequent spread to the City of Richland Landfill; identify the source of the contamination; and present corrective actions. The focus and thrust of managing the incident was based on the need to accomplish the following, listed in order of importance.

- Protect the health and safety of the Site workers and the public.
- Contain and control the spread of contamination.
- Identify the source of contamination and the pathways for its spread.
- Identify the causal factors enabling the contamination.

The activities, processes, and events described in this report involve personnel from the City of Richland; the Washington State Department of Health; the U.S. Department of Energy, Richland Operations Office (RL); Fluor Daniel Hanford, Inc. (FDH), the Management and Integration contractor for RL at the Hanford Site; and several of its major subcontractors. Additional support was provided by the Washington State Department of Ecology and the U.S. Environmental Protection Agency.

During the incident, the investigative team identified the contamination source and pathways, mitigated the spread of contamination, decontaminated and returned areas to normal conditions, and devised ways to prevent recurrence.

Observations

The investigation found the following elements to be positive and proactive.

- Project Hanford Management Contract (PHMC) surveillance programs provide effective monitoring of onsite (Hanford) workers, facilities, and locations. The surveillance programs' formal policies and strategies are supplemented by knowledgeable and experienced technicians and management.

- There was no impact to the health and safety of the workers, the general public, or the environment. Extensive radiological surveys and testing, including bioassays, showed that no personnel were exposed or contaminated, although in some cases their belongings were.

- Flying-insect traps were set up within and outside the Hanford Site boundaries. No contaminated fruit flies were caught in the traps outside the boundaries, which verified that no fruit flies carried contamination beyond the immediate vicinity of the 200 East Area. The U.S. Ecology facility is considered to be in the immediate vicinity; it is located approximately 400 m (1,300 ft) south of the 200 East Area immediately across the highway.

- Timely communications were provided to employees and the media concerning this event.
  - Frequent communications were provided to interested parties as the facts became available. Employees were notified by all-employee messages (Appendix F), a web page, and *Hanford Reach* articles (Appendix G).
  - Press releases were sent to numerous regional newspapers and radio and television stations and were provided to more distant media on request (Appendix G).
  - Initial communication about the contamination to DYN Solid Waste Management and to the City were delayed because of the unknown nature of the contamination vector. See further discussion in Section 3.1.
- The management structure and systems to identify the incident were in place and operating. The program for detecting biological vectors involved in transport of radioactive contamination has included monitoring of populations of vegetation, insects, amphibians, reptiles, birds, and mammals. Some larger flying insects have been found contaminated, but contaminated individuals were quickly eradicated. Smaller flying insects such as gnats and fruit flies have often been the targets of Hanford Site pest control operations (e.g., insecticide spraying and fogging), but previously never were observed to transport radioactivity.
- RL and the PHMC team are evaluating parallel improvements to integrate radiological control and biological-contamination vector-control responsibilities among contractors, with a focus on protecting the workers, the public, and the environment by preventing the uncontrolled movement of radioactive material.
- The RL-PHMC team is working to enhance the process for managing the Hanford Site's refuse operations on Site and off Site.[1]
  - The radiological control process to preclude the transfer of contamination by a biological vector inadvertently led to contamination in offsite locations. This is being rectified by instituting a graded approach to categorizing refuse.
  - An enhanced/improved system is being evaluated to preclude inappropriate items (e.g., hazardous and dangerous waste, recyclable items) from being transported to the offsite landfills from the Hanford Site waste disposal systems.

Incident Summary

Daily surveys by the radiological control technicians (RCT) began around the B Plant complex in the 200 East Area in August 1998, to support heightened awareness of possible

[1] Off Site and offsite refer to locations outside the boundaries of the Hanford Site. On Site and onsite refer to locations within the Hanford Site boundaries.

contamination after RCTs found contaminated mouse feces during routine surveys in August (maps are provided in Figures 1, 2, 3, 9, and 10 and Exhibits B, C, and D).

On September 15, 1998, maintenance work was performed on Diversion Pit 241-ER-152, which, in preparation for the work, had been sprayed with a glycerin/monosaccharide (simple sugar)-based contamination fixative on September 10, providing attractant conditions for fruit flies. The work was performed inside a partially roofed enclosure. An unanticipated 795 liters (210 gallons) of flush water drained into the pit from waste transfer lines. For a description of the work at the diversion pit and of the diversion pit itself, see Appendix H.

On Monday, September 28, 1998, during a routine survey in the 200 East Area, low levels of contamination were discovered by a PHMC RCT in the MO-967 Mobile Office, outside of radiological control areas. Most of the contamination was found around a construction yard adjacent to B Plant, a deactivated nuclear fuels processing facility. No contamination was detected when the same locations were surveyed on Friday, September 25. Multiple-contractor activities began immediately to determine the source and spread of the contamination.

A 2.5 hectare (6.2-acre) area encompassing the MO-967 Mobile Office, lay-down yard, other structures, and storage areas was cordoned off immediately; this area was believed to contain the source of the contamination.

Over the next several weeks, the identification of the 241-ER-152 Diversion Pit as the source of the contamination was confirmed. The pit was investigated because it contained high levels of accessible contamination (the contamination contained the same radionuclides already present in the pit [strontium-90]), an applied contamination fixative in the pit was a potential attractant to fruit flies, and contaminated fruit flies were isolated in the pit in an environment conducive to breeding. Other nearby sources of contamination considered were the B Plant filter housing, the 241-ER-151 Diversion Pit, and the 2247-B Ironworker's Shop, but these were all eventually eliminated because of lack of removable contamination and because contaminated fruit flies were not trapped in their immediate vicinity.

Additionally, several whole-body surveys and over 100 bioassays of workers who had been in the MO-967 Mobile Office were performed with negative results that indicated that no worker was involved in spreading this contamination.

The dumpster near the MO-967 Mobile Office was physically moved and in this process was emptied early on September 28; this refuse was hauled to the City of Richland Landfill. This was one day ahead of the regularly scheduled pick-up and before the routine survey occurred. Later that morning, contamination was found in the MO-967 Mobile Office and the dumpster outside. Because the contamination was discovered before the regularly scheduled Tuesday pick-up, the RCTs posted the area. The RCTs were unaware that the dumpster had been emptied early that morning. Consequently, neither DYN Transportation Operations nor the City landfill operators were notified.

On September 30, attendees at a fact-finding meeting identified that the dumpster was emptied one day early and that potentially contaminated refuse possibly had gone to the City landfill.

The City of Richland was immediately notified and solid-waste refuse shipments from the Hanford Site to the City landfill were stopped. Survey actions were immediately planned and initiated. Initial contamination at the City of Richland landfill was detected on October 7 on lunchroom refuse from the Hanford Site. Removal of the contaminated refuse from the City landfill to the Hanford Site began on October 9 and was completed on October 12 except for one contingency container that was removed on October 14, 1998. From 544,000 kilograms (600 tons) of refuse excavated, 191,000 kilograms (210 tons) were returned to the Hanford Site for burial at the low-level burial grounds in the 200 East Area. Only an estimated 23 kilograms (50 pounds) of refuse actually were contaminated. The estimate is based on the number of bags of refuse (11) containing contamination from lunchroom refuse. A summary timeline of the event is included as Figure ES-1. A complete chronological narrative is provided in Chapter 3. The overall timeline is included as Exhibit A.

Incident Management

An investigative team that included four subteams was organized to focus on protecting the health and safety of the workers and the public, containing and controlling the spread of the contamination, protecting the environment, ensuring that contaminated areas were identified, identifying the source of the contamination, returning areas to normal conditions, and establishing a process to prevent recurrence. A Situation Room was established to coordinate the response and communicate with Hanford Site workers, the City of Richland, the regulators, and the media. Personnel bioassays for Site personnel were conducted; survey activities were conducted on Site and at the City landfill. Flying insect traps were installed at the Site and insect spraying and fogging operations were increased.

Response and Prevention Strategy

A causal analysis was performed. FDH and PHMC contractor personnel were tasked with objectively determining the root, direct, and contributing causes for the contamination spread in the 200 East Area and subsequent contamination spread. The analysis identified the most significant weakness in the Site's control process (root cause) that failed to prevent the previously unknown biological vector (fruit flies) from spreading the contamination outside of radiological areas. The analysis then identified the direct cause and several contributing causes for the contamination spread and included judgments of need to help prevent recurrence of the event. The analysis considered several Site factors and event-specific issues in the causal analysis:

- Vectors and transport pathways for contamination
- Biological intrusion of contaminated facilities on Site
- Methods and conditions of using glycerin/monosaccharide-based contamination fixatives on the Hanford Site
- Radiological control surveillance of refuse before it is removed for disposal at a landfill.

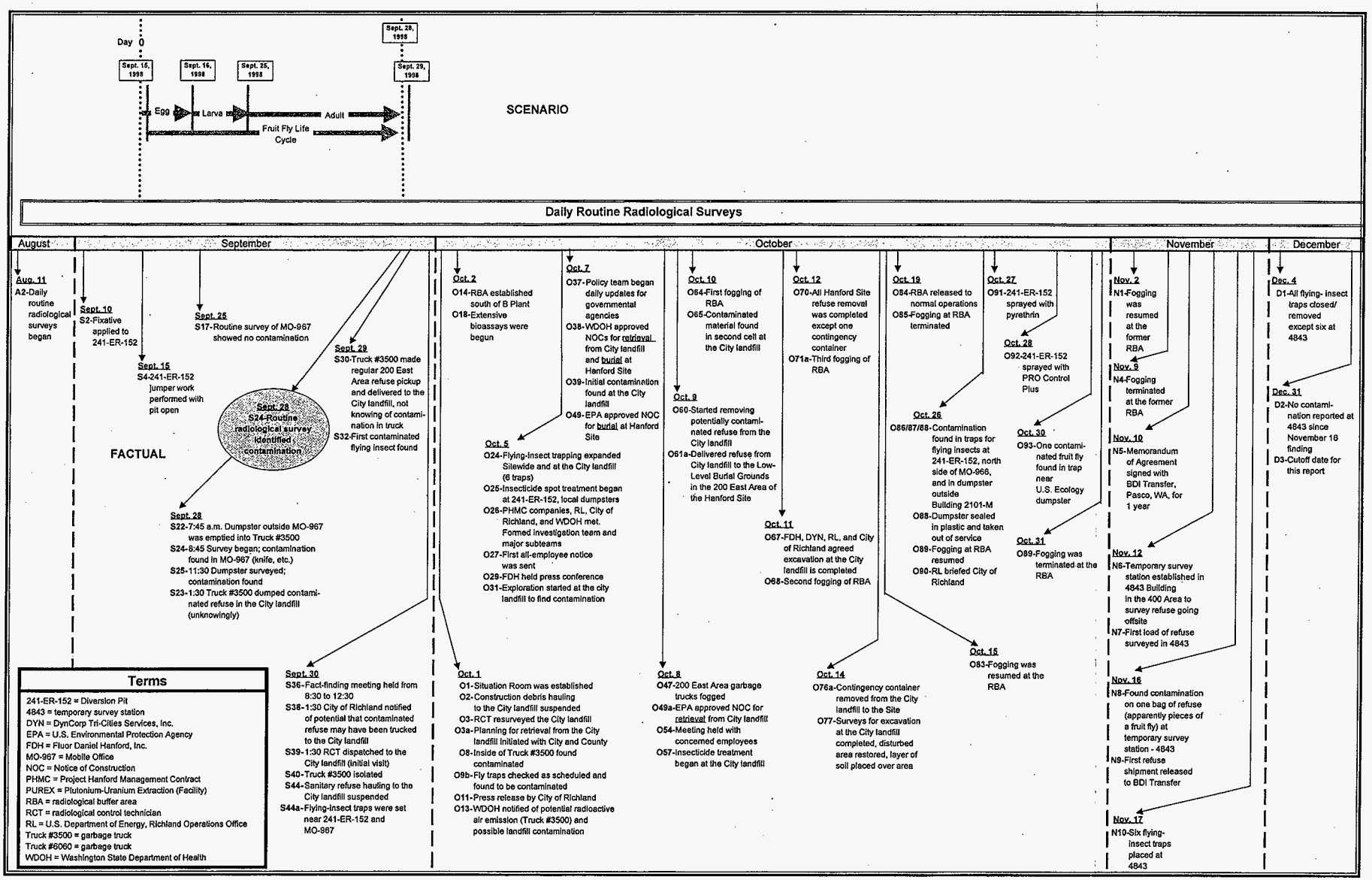

Figure ES-1. Summary Timeline.

Timelines3-16 3/16/99 7:48 AM

Chapter 4 is a synopsis of the causal analysis report; a more detailed report is included as Appendix D. Table ES-1 summarizes the causal factors and judgments of need associated with this incident.

The overall strategy for preventing the spread of contamination is source control at the point of origin. In addition, other actions are being taken to enhance the awareness of biological vectors for contamination spread and implement waste minimization programs at the Hanford Site. The basis for preventing radioactive and other nonconforming Hanford Site materials from being transported off Site consists of the administrative and engineered controls already in place, supplemented by those that will be created or enhanced to properly manage hazardous waste and control radioactive materials at their source.

Beginning November 12, 1998, Hanford Site refuse has been transported to the 4843 Storage Building, where it is dumped, spread out, and surveyed before transfer to an offsite landfill. Use of the 4843 Storage Building as a temporary survey station will continue until a permanent solution is implemented. After approval by RL, surveys of refuse will be continued on a graded approach based on survey results, a Site radiological work profile, and an assessment of risk.

Report Cutoff Date

The reporting cutoff date was chosen as December 31, 1998.

Table ES-1. Causal Factors and Judgments of Need.

Causes	Judgments of Need
ROOT CAUSE: Inadequate processes to prevent contamination via new biological vectors (fruit flies) from spreading contamination outside of radiological areas.	Step up vigilance of potential biological vectors that can spread contamination. Strengthen implementation of existing administrative and engineering radiological controls; establish new programs and processes to identify all potential vectors (including biological) and prevent the spread of contamination.
DIRECT CAUSE: Flying insects (fruit flies) spread contamination from the 241-ER-152 Diversion Pit to controlled and uncontrolled areas in or near the 200 East Area.	Prevent accessibility of flying insects to contaminated work locations (i.e., open containment) and prevent attractant conditions (i.e., moisture, nutrients).
CONTRIBUTING CAUSES: The contamination fixative used on the 241-ER-152 Diversion Pit is suspected of attracting fruit flies.	Use a fixative that is not an attractant; control its environment and condition.
No procedure exists to interdict refuse service when contamination is detected.	Establish a notification system; examine garbage before it leaves the Site.
No policy is in place establishing routine surveys of areas with past known contamination spreads by biological transport vectors.	Require routine surveys of areas known to have contamination spreads caused by biological transport vectors.
The current policy of protecting contaminated facilities from biological intrusion does not provide for a proactive review of potential intrusion points with preventive and corrective actions.	Routine surveillances of contaminated facilities and systems with intrusion potential should be incorporated into facility operations and maintenance.
The PHMC team has not adequately integrated Sitewide biological control.	Integrate biological control Sitewide; consider partnership with all Site contractors. Enhance the resources to control biological intrusion into waste sites.
No requirement is in place to prevent animal encroachment at refuse collection points.	Establish requirements to keep dumpsters closed when not in use and to install access guards or screens on the bottom drainage openings.
No requirement is in place to prevent food substances from being located near known contamination areas.	Establish requirements to control food substances, including refuse, entering areas near sites known to have contamination spread potential.

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TERMS

ACRONYMS, ABBREVIATIONS, AND INITIALISMS

ARA	airborne radioactivity area
BHI	Bechtel Hanford, Inc.
BWHC	B&W Hanford Company
CA	contamination area
Cs	cesium
d/min	disintegrations per minute
DCRT	double-contained receiver tank
DESH	DE&S Hanford, Inc.
DOE	U.S. Department of Energy
DYN	DynCorp Tri-Cities Services, Inc.
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
FDH	Fluor Daniel Hanford, Inc.
FDNW	Fluor Daniel Northwest, Inc.
HCA	high contamination area
K	potassium
LMHC	Lockheed Martin Hanford Corporation
NCN	not-classified notification
NCRP	National Council on Radiation Protection
NOC	Notice of Construction
ONC	Occurrence Notification Center
PAG	passive aerosol generator
PHMC	Project Hanford Management Contract
PNNL	Pacific Northwest National Laboratory
RadCon	Radiological Control
RBA	radiological buffer area
RCA	radiologically controlled area
RCT	radiological control technician
RL	U.S. Department of Energy, Richland Operations Office
RPCOE	Radiation Protection Center of Expertise
Sr	strontium
TWRS	Tank Waste Remediation System
WDOH	Washington State Department of Health
WMH	Waste Management Federal Services of Hanford, Inc.
WMNW	Waste Management Federal Services, Inc., Northwest Operations
Y	yttrium

FACILITIES AND EQUIPMENT

100-K	Spent Nuclear Fuels Counting Facility (laboratory)
218-B	Emergency Equipment Storage Shed
222-S	Analytical Services of Waste Management Laboratories
225-BB	K-3 Filter Pit Encapsulation Facility
225-BE	Encapsulation Maintenance Shop
241-ER-151	Diversion Pit
241-ER-152	Diversion Pit
241-ER-191	Diversion Pit
272-E	Fabrication, Mockup Shop Building
273-E	Material Storage Building
275-E	Carpenter Shop Building
2101-M	Spare Parts Warehouse, Office Building
2201-B	Construction Ice House
2245-B	Sheet Metal Shop
2247-B	Ironworker's Shop
2306-W	Bottle Storage (Skid Shack)
2707-E	Change House
2711-E	200 East Area Garage
2750-E	Waste Management Services and Operating Facility
4843	Storage Building (temporary survey station)
B Plant	221-B Process Building Canyon
CFF	construction forces facility
CSB	Canister Storage Building
MO-958	Office/Lunchroom Trailer
MO-964	Mobile Office
MO-966	Lunchroom Trailer
MO-967	Mobile Office
MO-996	Mobile Office
PUREX	Plutonium-Uranium Extraction (Facility)
truck #3500	garbage truck
truck #6060	garbage truck
WESF	Waste Encapsulation and Storage Facility (225-B)

DEFINITIONS

bioassay	The determination of kinds, quantities, or concentrations of radioactive material in the human body, whether by direct measurement of the radiation coming out of the body (whole body count) or by analysis and evaluation of radioactive materials excreted from the human body (urine analysis, fecal analysis).
City landfill	City of Richland Landfill.
contributing cause	A cause that contributed to an occurrence but, by itself, would not have caused the occurrence.
direct cause	The cause that directly resulted in the occurrence.
event	A real-time occurrence (e.g., pipe break, valve failure, spread of radioactive contamination).
fixative	A substance that is used to prevent radioactive contamination from coming loose from a surface and becoming transferable or airborne. Fixative is applied by two methods: fogging and spraying.
fogging, fixative	A method where the material is turned into a fog-like mist that is fed into an area by ductwork, providing an evenly distributed coating on surfaces that the fog comes into contact with. This provides uniform coverage.
fogging, insecticide	Application of a concentrated liquid insecticide throughout a target area by use of a nozzle. This creates an air blast that breaks up the liquid particles into small particles, which then are dispersed into the atmosphere to drift into insect-infested hiding places.
monosaccharide	Any of several simple sugars ($C_6 H_{12} 0_6$). The best known are glucose, fructose, and galactose.
off Site, offsite	Outside the boundaries of the Hanford Site.
on Site, onsite	Within the boundaries of the Hanford Site.
refuse	A term used for nondangerous solid waste. To the City of Richland, this constitutes noncontaminated refuse only.
root cause	The cause that, if corrected, would prevent recurrence of this and similar occurrences. The root cause does not apply to this occurrence only, but has generic implications to a broad group of possible occurrences.

Situation Room	The room set up for management of the contamination spread incident.
spraying, fixative	A method where a liquid is applied via a spray nozzle directly onto surfaces. Spraying provides a thicker, less even distribution (than fogging) that is more dependent on the direction of application for effective coverage.
spraying, insecticide	Application of liquid insecticides to a specific target by use of a spray tank and nozzle.
vector	An organism that carries and/or transmits a harmful substance.
waste	To the City of Richland, this constitutes contaminated material. On the Hanford Site it also is used to mean any refuse, garbage, trash, debris, etc.

1.0 INTRODUCTION

Fluor Daniel Hanford, Inc. (FDH) is the Management and Integration contractor for the U.S. Department of Energy (DOE), Richland Operations Office (RL) at the Hanford Site (Fig. 1). The activities, processes, and events described in this report involve personnel from the City of Richland, the Washington State Department of Health (WDOH), RL, FDH, and several subcontractors. Additional support was provided by the Washington State Department of Ecology and the U.S. Environmental Protection Agency.

The September 1998 radiological contamination spread that occurred at the Hanford Site primarily consisted of a single vector, fruit flies, spreading low levels of radioactive contamination from a suspected work site south of B Plant to numerous locations within and around the 200 East Area (Fig. 2), located on the central plateau, about 13 kilometers (8 miles) south of the Columbia River and 40 kilometers (25 miles) north of Richland, Washington. The incident occurred near a construction yard adjacent to B Plant (Fig. 3), which is a deactivated processing facility.

As a result of a small amount of contamination being spread outside the contamination areas, some radioactive contamination inadvertently was sent to the City of Richland Landfill on refuse from the Hanford Site. On September 30, shipments of Hanford Site solid-waste refuse to the City landfill were stopped, the City of Richland and the WDOH were notified of a suspected contaminated shipment, and immediate survey actions were planned and initiated. Contaminated Hanford Site refuse was found by October 12, 1998, and the last container was removed from the City landfill by October 14, 1998. Approximately 191,000 kilograms (210 tons) of refuse were returned to the Hanford Site, of which an estimated 23 kilograms (50 pounds) were contaminated. The estimate is based on the number of bags of refuse (11).

This report is structured as follows:

- Chapter 1 introduces the event and the scope, purpose, and methodology of the investigation.
- Chapter 2 summarizes the Hanford Site facilities and programs involved in the event. A more complete description is provided in Appendix H.
- Chapter 3 presents a detailed chronology of activities, which also are summarized on the overall timeline in Exhibit A.
- Chapter 4 is a synopsis of the causal analysis study that determined the root cause, the direct cause, and the contributing causes of the incident. A more detailed version of the report is provided in Appendix D.

Figure 1. Hanford Site, Washington.

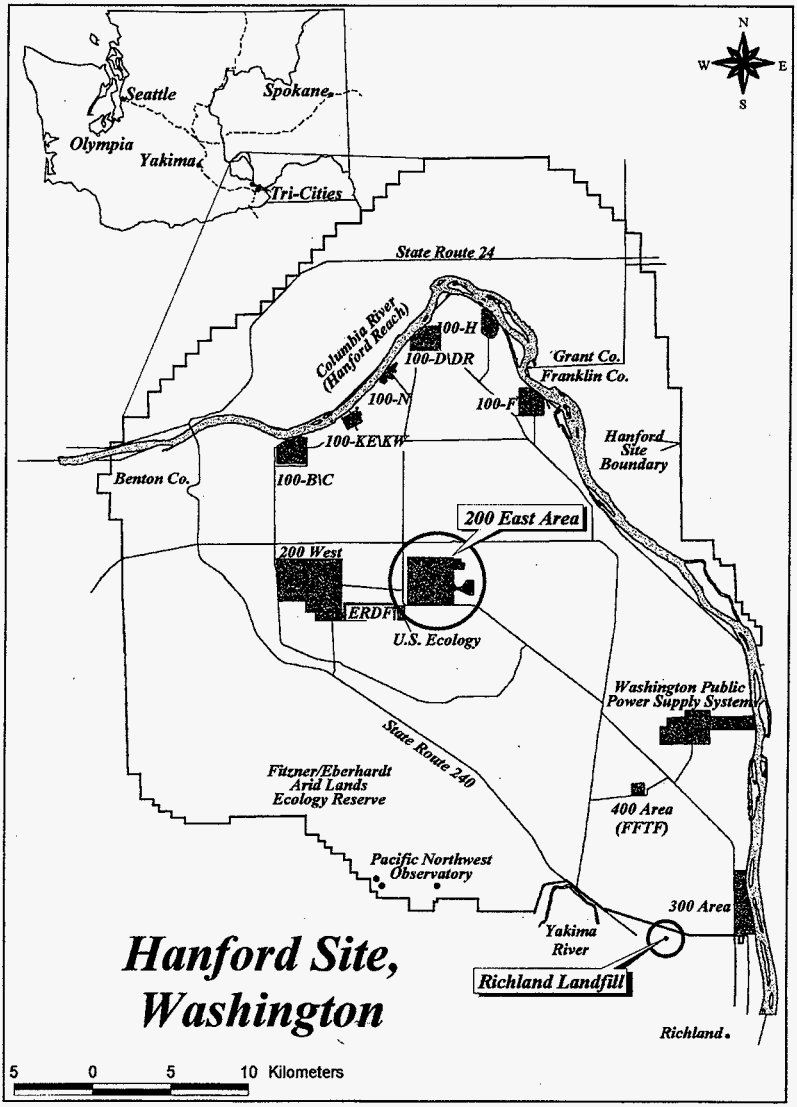


Figure 2. 200 East Area, Hanford Site.

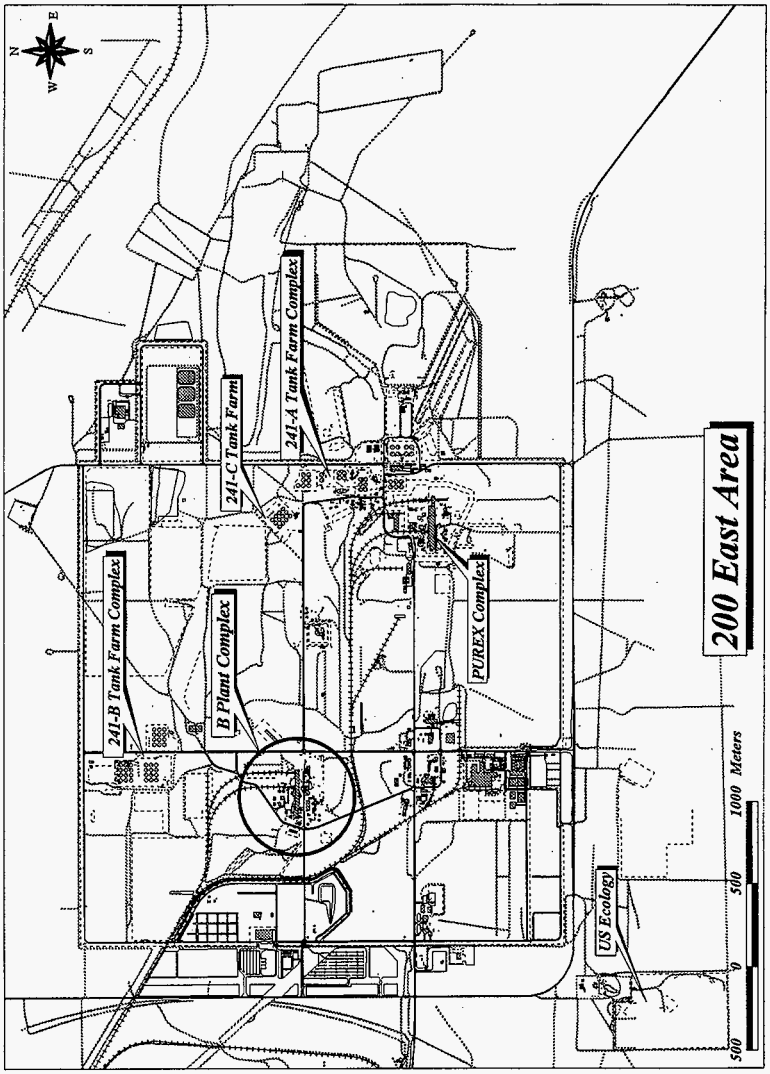
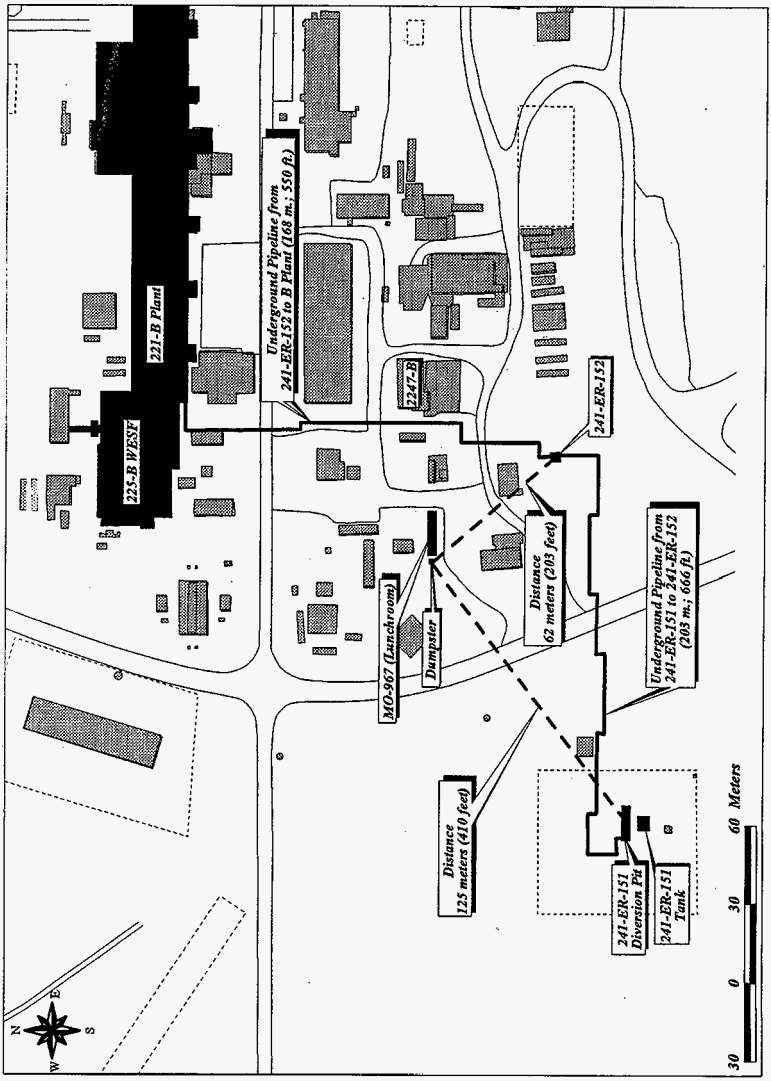


Figure 3. Relationship of Facilities Near B Plant.



- Chapter 5 describes issues that arose during the event and during the response to the event, and provides judgments of need so that if another such event occurs, the response will be even more effective. It also explains the new refuse disposal processes developed for the Hanford Site.

- Chapter 6 summarizes the report conclusions and the lessons learned during the event and provides recommended actions geared to specific judgments of need.

1.1 SCOPE OF THE REPORT

This report identifies the factors and activities leading up to the fall 1998 200 East Area radiological contamination; details the actions taken and facts assembled as the location of the contamination was discovered; *documents the paramount concerns and steps taken to protect the health and safety of the Site workers, the public, and the environment*; chronicles the contamination cleanup and return to normal activities and refuse collection and disposal; and identifies measures taken or planned to preclude any further such incidents.

1.2 INVESTIGATION SCOPE, PURPOSE, AND METHODOLOGY

The scope, purpose, and methodology of the investigation developed as the investigation and remedial actions proceeded. As new issues arose, they were incorporated into the investigation and response.

1.2.1 Scope

The scope of the investigation was to analyze, remediate, investigate, and review the spread of contamination at the Hanford Site and, eventually, the City landfill and to determine its root and contributing causes. During the incident, the team identified the suspected contamination source and pathways, mitigated the spread of contamination, implemented decontamination and returned areas to normal conditions, and devised ways to prevent recurrence.

1.2.2 Purpose

The purposes of the investigation were as follows.

- Determine the cause of the incident.

- Identify and control the contamination source.

- Prevent recurrence.

- Assist in improving Hanford Site policies, procedures, and practices to avoid future incidents.
- Establish a clear path forward to close out activities at the City landfill.
- Regain the confidence of the City of Richland and the public so that resumption of hauling to the City landfill could be allowed.
- Identify and understand the lessons learned to improve safety and reduce the potential for similar incidents at the Site and across the DOE complex.
- Resume Hanford Site refuse disposal operations.
- Improve capabilities to respond to similar incidents.
- Keep employees, the community, and other interested parties informed.

1.2.3 Methodology

The teams responded to the event by conducting an investigation and proceeding with remediation using a methodology consisting of the following actions.

- Identify potential source terms and transport mechanisms. (See Appendix B, Section B2.0, for discussion on source terms and transport mechanisms.)
- Implement and evaluate random and specific radiological sampling for contaminated fruit flies and other vectors in the 200 Areas.
- Interview the personnel who use the MO-967 Mobile Office and the surrounding area.
- Identify personnel and equipment associated with contamination spread.
- Survey possessions, vehicles (e.g., examine the exteriors of vehicles parked near B Plant and those of vendors and offsite[2] contractors that might have come in contact with contaminated material or vectors), offices, and homes of potentially affected personnel for contamination.
- Conduct bioassay analysis of all potentially affected individuals.
- Determine the location of past uses of glycerin/monosaccharide (simple sugar)-based fixatives.
- Establish a 2.5 hectare (6.2-acre) radiological buffer area (RBA) south of B Plant.

[2] Off Site and offsite refer to locations outside the boundaries of the Hanford Site. On Site and onsite refer to locations within the Hanford Site boundaries.

- Trap flying insects at multiple locations around the Hanford Site, both inside and outside the RBA.
- Survey all Hanford Site dumpsters for contamination.
- Plot maps of the Hanford Site and the City landfill to track the locations of contamination.
- Survey the City landfill cells known to contain Hanford Site refuse.
- Trace the movement of all potentially contaminated refuse, equipment, and material from its point of origin to its current location.
- Plan and implement recovery operations at the Hanford Site and the City landfill.
- Minimize refuse generation at the Hanford Site during the incident.

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2.0 FACILITY AND PROGRAM DESCRIPTION SYNOPSIS

This chapter briefly describes the Hanford Site facilities and programs as they existed up to the time of the incident. A more complete description is provided in Appendix H.

The approximately 1,450 km^2 (560-mi^2) Hanford Site (see Fig. 1), is a DOE facility managed by RL with 11,131 workers and an annual budget of $1.1 billion. Approximately 6 percent of the land area is actively used. The developed land is divided into the following operational areas: the 100 Areas, the 200 East and West Areas, the 300 Area, and the 400 Area. The 600 Area accounts for the land between the operational areas. The 200 East Area facilities, once used to extract plutonium from spent nuclear fuel, are now the focus of an extensive cleanup and waste management effort. Activities associated with this effort were the catalyst for this contamination event.

2.1 SITE FACILITIES

The following Site facilities and structures are associated with the contamination event.

- **B Plant** (see Fig. 2), which was constructed during World War II as a radiochemical processing facility, has been used for various operations, including separating strontium-90 (^{90}Sr) and cesium-137 (^{137}Cs) from underground tank waste. In 1995, B Plant began the formal deactivation and shutdown process completed in 1998.

- **The 241-ER-152 Diversion Pit** (Figs. 4, 5), a subsurface concrete-lined pit penetrated by underground waste transfer pipes ending in nozzles, was used to direct the flow of liquid waste by connecting short sections of pipe (jumpers) to the selected nozzles. The inside surfaces are contaminated with radioactive material deposited when waste liquids leaked through the pipe connections or installed valves. When not in use, the pit is covered with large concrete blocks to contain contamination and shield workers on the surface from direct radiation from the contamination. During work, an open-top windscreen is erected around the pit and fixative is sprayed on the inside to adhere smearable contamination to the pit surfaces before the cover blocks are removed. This process was under way on September 15, 1998, (when fruit flies may have entered the pit) to support B Plant shutdown.

- **The MO-967 Mobile Office, the 2247-B Ironworker's Shop**, and other auxiliary structures are located between the B Plant and the 241-ER-152 Diversion Pit.

- **The Canister Storage Building**, approximately 464 meters (0.3 mile) from the B Plant complex, is being constructed to provide dry staging and interim storage for spent nuclear fuel from water-filled basins in the 100 K Area. The Canister Storage Building is located 1.3 kilometers (0.8 mile) from the 241-ER-152 Diversion Pit.

Figure 4. Typical Diversion Pit.

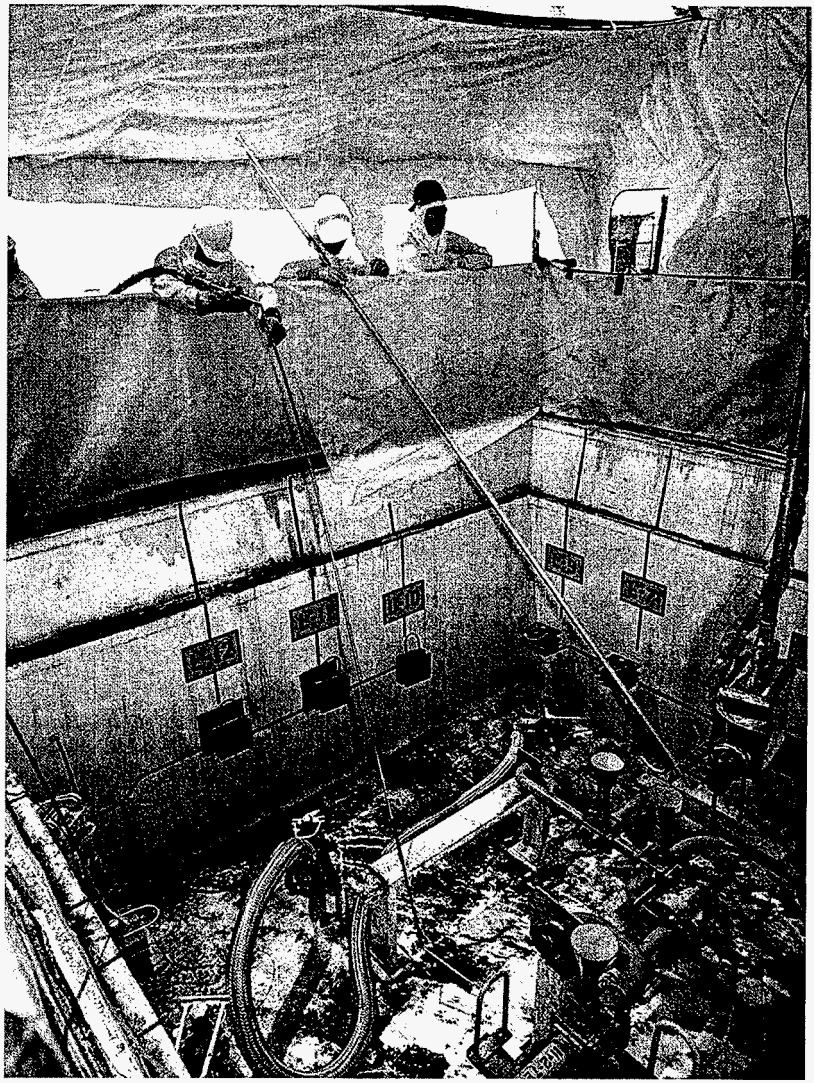
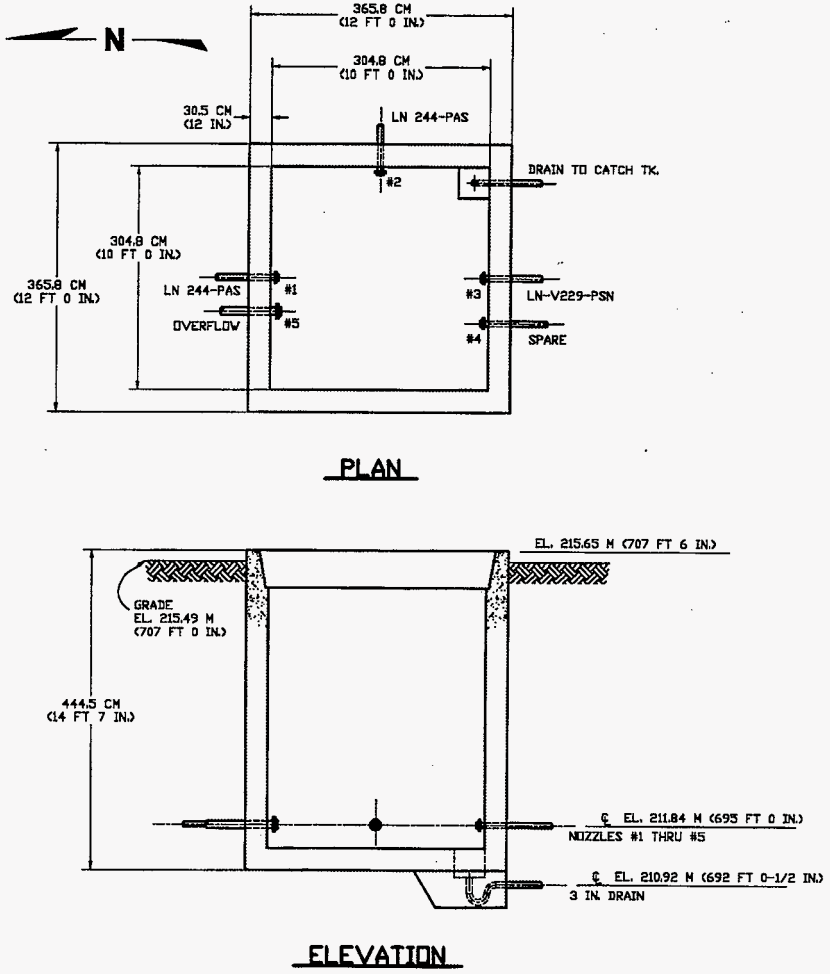


Figure 5. Drawing of the 241-ER-152 Diversion Pit.



2.2 WORK CONTROL

The Tank Waste Remediation System (TWRS) organization uses a planning and scheduling organization to control work such as the task performed at the 241-ER-152 Diversion Pit (work package 2E-98-01772/0). The organization reviews the task and, if necessary, develops a work package containing instructions for performing the work. Often work packages reference preapproved procedures for significant portions of the work and do not specify the type of fixative or other material to be used. Work packages are reviewed and approved before work is authorized.

2.3 RADIOLOGICAL CONTROL

The 1998 contamination event was identified initially through the operation of the routine radiological monitoring program. DynCorp Tri-Cities Services, Inc. (DYN) was performing routine radiological monitoring of the 200 East Area construction forces facilities (CFF) when the radioactive contamination was first discovered.

The Hanford Site has had a radiological control program since operations began in the early 1940s. The Program's goal is to evaluate how well Site operations anticipate, prevent, and control potential environmental and public impacts from radiological contamination. Primary emphasis on control and measurement of radioactive material is placed at individual facilities, with confirmatory measurements used for the balance of the Site.

Basic radiological control on the Hanford Site includes marking clearly defined areas controlled for radiation protection purposes. Access to these areas requires a minimal amount of training or escorting. To prevent radioactive contamination from spreading, radiological control technicians (RCT) use portable instruments sensitive to alpha radiation or beta and gamma radiation to scan all equipment and material leaving a controlled area to verify that it is free of contamination. Personnel leaving a controlled area also must be surveyed for contamination. Properly surveyed material released from a controlled area can be released unconditionally from any radiologically controlled area on the Hanford Site and released off Site.

Employees who work in contaminated areas or on contaminated equipment must wear protective clothing to protect their skin from contamination. The protective clothing is controlled after use to prevent contamination from being released. Respirators that filter airborne contaminants are required when other engineered controls are not available to prevent exposure to airborne contamination.

2.4 BIOLOGICAL VECTOR CONTROL PROGRAM

The Hanford Site has had an environmental monitoring program covering insects, animals, and vegetation since 1944. Since 1965 when DOE began issuing annual environmental status reports, approximately 2,000 incidents of biota-related radioactive contamination involving approximately 50 separate species have been reported. *This event is the first time that fruit flies*

(Drosophila spp.) *have been noted in the transfer of radioactive contamination.* As a result, monitoring of fruit flies has not been a routine activity.

Biological vector control under the Project Hanford Management Contract (PHMC) is a function of the FDH Office of Biological Control, contracted to Waste Management Federal Services, Inc., Northwest Operations (WMNW). The FDH Office of Biological Control is conducted by licensed professionals experienced in controlling pest animals and vegetation, particularly when associated with radioactive contamination. Pest control goals include limiting pest ingress and egress at facilities, creating a healthy work environment, training maintenance staff to control and prevent biologic intrusion, controlling plant- and animal-caused transport of contamination, and preventing pest damage to waste facilities.

Biological controls can be implemented at facility management's request in response to facility monitoring or as a result of Near-Facility Environmental Monitoring detecting radioactive contamination caused by biotic activity during routine surveillance. Discovery of biota-related contamination activates additional monitoring and surveillance in conjunction with increased animal control by the FDH Office of Biological Control (WMNW).

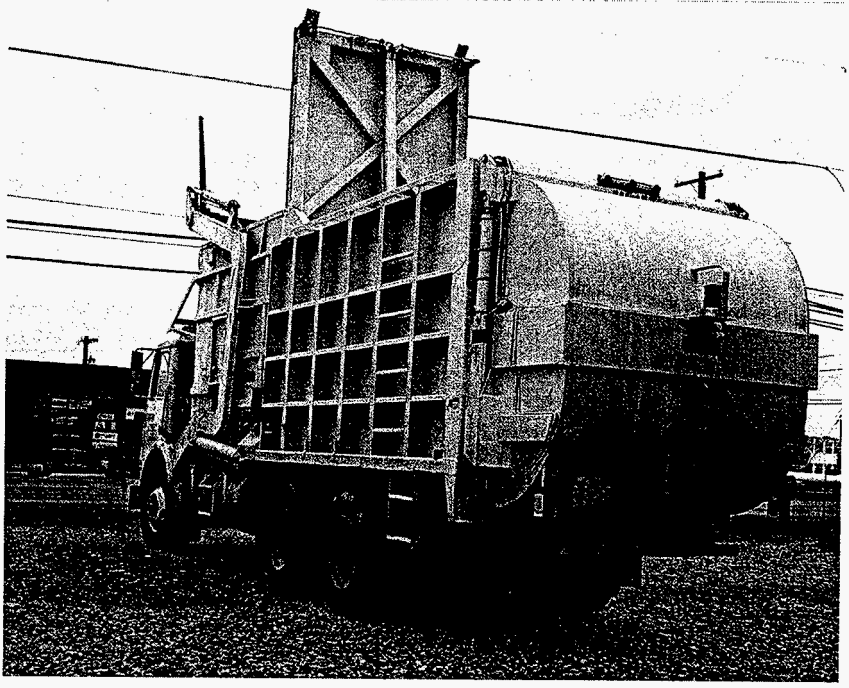
2.5 SOLID WASTE DISPOSAL PRACTICES

The U.S. Department of Energy, Richland Operations Office (RL), entered into a contract with the City of Richland to dispose of nonradioactive, nonhazardous solid refuse. The contract was signed in September 1995, effective October 1, 1995, through September 30, 2005, and on March 31, 1996, the Hanford Central Landfill was closed. DYN, a subcontractor to FDH, is responsible for collecting and transporting nonradioactive and nonhazardous solid waste (refuse) for offsite disposal. DYN operates two 27 cubic meter (35-cubic-yard) capacity compactor trucks that collect the refuse collected from approximately 300 dumpsters on the Hanford Site and transport it to the City landfill for disposal (Fig. 6). PHMC and contractor procedures identify the types of refuse that can be placed in the dumpsters.

Drivers of the collection vehicles receive training about the types of refuse that are prohibited; this serves as an additional mechanism to prevent nonconforming refuse from being taken to the City landfill. Up to the time of the contamination event, RCTs from the Hanford Site surveyed the landfill for radioactive contamination weekly. Some weekly surveys were missed in August and September.

In each of the past two years, DYN Transportation Operations has transported approximately 1450 metric tons (1,600 tons) of refuse to the City landfill. Major categories of refuse disposed of off Site are office and lunchroom refuse and construction debris. Refuse from areas where radioactive contamination could occur is surveyed for release before leaving the areas.

Figure 6. Compactor Refuse Truck.



3.0 THE INCIDENT CHRONOLOGY

This chapter summarizes the chain of reasoning and events that led to delays in discovering the actual contamination problem and in communicating that discovery to the City of Richland. It also explains the events summarized on the overall timeline (Exhibit A) of the incident. The chronology (Section 3.3) is arranged by date, with code numbers corresponding to the codes on the timeline identifying each event. The code numbers (A1, S1, O1, etc.) use a letter to indicate the month (A = August, S = September, O = October) in which the event occurred and a number to identify each individual event. The numbers are for reference purposes only and do not signify either the importance or chronological location of an event. Dates are omitted where no relevant event or action of significance occurred.

3.1 CHAIN OF REASONING

During the course of this investigation, its scope and importance grew, as did the number of parties interested in its outcome. What was investigated originally as an isolated event in which an individual might have tracked or carried contamination out of a radiation zone became a biological puzzle in which clues revealed over three days in September 1998 led the team down various investigative pathways. Finally, on September 30, the clues and the pathways taken came together, and the team recognized that contamination had indeed reached the City landfill.

In the days leading up to the event, the occupants of the trailer complex including the MO-967 Mobile Office were moving to a complex in the 200 West Area. This was done to remove personnel from an area of past rodent-borne contamination as well as to reduce costs. When the contamination was found, the facilities were, for practical purposes, vacant. However, individuals working over the weekend did go into the MO-967 Mobile Office to eat lunch.

Because the area around B Plant has a history of contaminated rodent droppings, the MO-967 Mobile Office was on a regular surveillance schedule. The surveys included searches in the places that mice typically frequent (e.g., along baseboards, cabinet edges). Through Friday, September 25, all the surveys had been negative. On Monday morning, September 28, contamination was discovered in the MO-967 Mobile Office. Because contamination was discovered on the light switch, a knife, and a cutting board, it was initially believed that an individual had a contaminated hand. As is typical with these investigations, the RCTs contacted the supervisor and secured the area to keep others from being inadvertently contaminated. The RCTs took action to locate the individual with the contamination and began an expanding search to detect either the source of the contamination or additional cross contamination.

Note: When a pair of contaminated boots and socks were discovered, the team thought they might have located the individual spreading the contamination. The team now believes that the individual with the contaminated boots and socks may have been cross-contaminated by the fruit fly-borne contamination that also contaminated the refuse.

As the investigation expanded, several secondary theories were considered because of the unusual pattern of contamination spread (e.g., contamination on the tip of a knife, not the

handle). The discovery of contaminated chewing tobacco in the refuse pail led the team to believe that an employee might have been internally contaminated. Because employee health and safety is extremely important at the Hanford Site, an investigation began to determine who was in the MO-967 Mobile Office over the weekend. The theory of a contaminated individual was proven false several weeks later when bioassay results for over 100 individuals all were negative.

As the RCTs expanded their search from the MO-967 Mobile Office refuse container to the dumpster outside, they discovered contaminated refuse and isolated the dumpster. This facility had had limited recent use, so the RCTs had no reason to believe that a large amount of refuse should have accumulated since the dumpster was last emptied. They did not know that this dumpster had been moved a short distance earlier that morning and that the compactor truck operator also emptied the dumpster to save himself a trip on Tuesday. Someone threw refuse in the dumpster after it was moved, further reinforcing the impression that it had not been emptied. Because this occurred on Monday, and refuse is normally picked up on Tuesday, the RCTs believed that the contamination had been caught before it went off Site.

As the investigation expanded, contamination was found in other locations, many of which did not match the typical pattern for rodent or individual cross contamination. On Tuesday, September 29, an RCT performing a radiological survey of moisture on a pipe observed the contamination "flying away." Because this seemed odd, the RCT had her partner repeat the survey, with the same results. This was the first known case in the DOE complex of fruit flies being a biological vector for contamination spread.

The confusing evidence, the increasing scope of the investigation, and the different investigative pathways led to a fact-finding meeting being convened on Wednesday, September 30. At this meeting, accumulated data on the contamination finds were discussed. As the facts were compared, it became evident that a large contamination event was still under way, the dumpster had been emptied on Monday morning, and the refuse had been hauled off the Hanford Site to the City landfill. When this was discovered, the City landfill manager was notified by telephone, orders were given to quarantine all refuse trucks, and an RCT was dispatched to perform surveys at the City landfill.

Hindsight allows one to wonder why no one realized until Wednesday that the dumpster had been emptied on Monday. The investigation team was hampered in identifying that contaminated refuse had been released from the Hanford Site by the following circumstances.

- The team was unaware of the unexpected emptying of the dumpster a day early.
- The dumpster contained refuse when it was surveyed.
- The low use of the facility was consistent with the small amount of refuse found in the dumpster.
- The team initially believed that a single individual was contaminated.

Actually, the FDH surveillance system worked as it should have. Routine surveys uncovered the new biological vector. The team reviewed all the apparently unrelated events to eventually reach the correct conclusion. The lessons learned from this event, as discussed in Chapters 5.0 and 6.0, will help preclude a similar occurrence in the future.

3.2 TIMELINES

Figure ES-1 presented a summary timeline of the major events that occurred during the contamination incident on the Hanford Site and at the City landfill. The overall timeline is presented in Exhibit A. The events on the overall timeline are alphanumerically coded for cross-referencing to the same events on the following chronology. It provides a detailed sequence of key events and interactions by various components during the incident.

3.3 DETAILED DATA

The chronology of key events is outlined under the corresponding days as follows.

Tuesday August 4

- A1-Contaminated mouse feces were found around B Plant (survey #001202).

Tuesday August 11

- A2-DYN began daily routine radiological surveys in the Fluor Daniel Northwest, Inc. (FDNW) construction facilities (the MO-958 Office/Lunchroom Trailer, the MO-964 Mobile Office, the MO-967 Mobile Office, and the 2201-B Construction Ice House) and weekly surveys of the FDNW construction site. The increased surveillance was in response to a request from B Plant/WESF (Waste Encapsulation and Storage Facility) Radiological Control, who had noted an increase in biological contamination around structures in the area. These surveys consisted of random direct beta/gamma spot checks of facility floors, direct beta/gamma checks of entryway door handles and walkways, and random beta/gamma surveys of tables and chairs inside the lunchroom trailer. The surveys included spot checks of tools, equipment, and stored materials, and random beta/gamma surveys of chairs, typewriters, computers, and telephones, if present in the facilities. These surveys did not routinely include dumpsters. Visual searches were performed for mouse feces and any found were surveyed for contamination. NOTE: Daily here means weekdays. Routine radiological surveys were not performed on Saturdays and Sundays.

Tuesday September 8

- S1-The FDH Office of Biological Control started receiving normal seasonal complaints about gnats and fruit flies.

Thursday September 10

- S2-Personnel prepared the 241-ER-152 Diversion Pit for work intended to isolate B Plant from the 200 East Area Tank Farm.

- S2-This work involved spraying a glycerin/monosaccharide (simple sugar)-based fixative material on the contaminated walls of the diversion pit to reduce the likelihood of contamination spread while work was conducted in the pit. The material had been used as an effective fixative on the Hanford Site for 2 years. The pit's concrete cover blocks were not removed for this activity; fixative was applied by spraying through engineered penetrations.

Friday September 11

- S3-A contaminated ant hill was found near the 241-ER-151 Diversion Pit.

Tuesday September 15

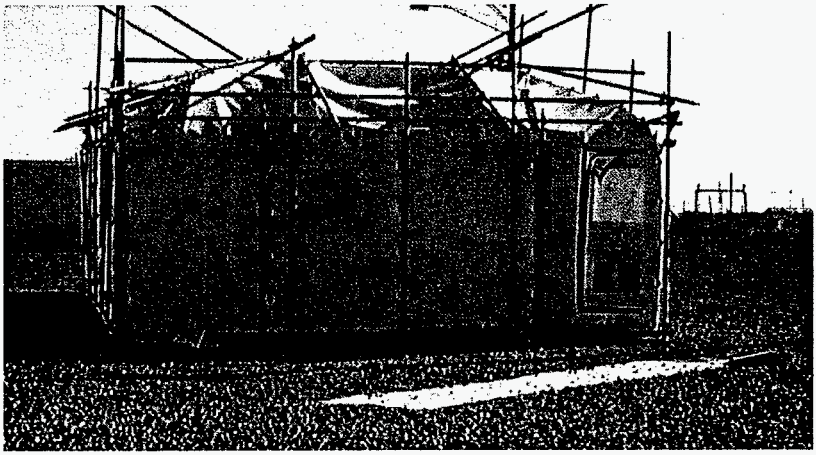
- S4-Work on the 241-ER-152 Diversion Pit began (Fig. 4). In accordance with work package 2E-98-01772/0, the planned work consisted of opening the pit, removing a solid jumper, installing a flexible jumper, and installing a process blank on the wall nozzle connection to B Plant. The concrete cover blocks were removed from the diversion pit at 3:30 a.m. to enable the B Plant isolation work to take place; they were reinstalled about 6:30 a.m.

- S4-Note: The work was performed inside a partially roofed plastic enclosure (a containment tent or greenhouse) located over the pit (Fig. 7). The area inside and around the enclosure was posted as a contamination area.

- S4-Note: The wind was from the south at less than 8 kilometers (5 miles) per hour. The work crew consisted of field crew personnel (operators), RCTs, a rigging crew with a crane, and industrial hygiene technicians. A qualified person in charge was overseeing the work.

- S5-At 3:30 a.m. the nozzle to the 241-ER-151 Diversion Pit was loosened, at 3:50 a.m. the nozzle to B Plant was loosened, and at 4:10 a.m. the nozzle to the 241-ER-153 Diversion Pit (approximately 1.5 kilometers [0.9 mile] east of B Plant) was loosened. The nozzle to B Plant drained approximately 45.5 liters (10 gallons) of liquid into the pit; the nozzle for the 241-ER-153 Diversion Pit drained approximately 909.2 liters (200 gallons) of liquid to the 241-ER-152 Diversion Pit. The liquid is water and process fluid residue that stayed in the lines after they were flushed following waste transfers. This contaminated water draining from the wall nozzles may have compromised the water-soluble glycerin/monosaccharide-based fixative used in the pit.

Figure 7. Diversion Pit 241-ER-152 with Tent.



- S6-*Airborne contamination escaped from the working tent that surrounded the 241-ER-152 Diversion Pit and settled on nearby equipment and grounds.* The levels and estimated activity were later discussed with WDOH on September 28, as noted in meeting minutes 013851, "Ten Day Report, 241-ER-152," by R. J. Swan, FDH.

- S7-Fruit flies in the area may have entered the pit and laid eggs. The cover blocks were replaced at approximately 6:30 that morning.

- S7-Follow-up surveys of the perimeter of the original contamination area showed contamination, primarily north of the tent, consistent with the wind direction. The crane used to support the work activity, located north of the tent, a light plant (portable lighting system) northwest of the original contamination area, a government-owned pickup truck located north of the area, and a forklift truck were found to be contaminated. Surveys continued into the day shift.

- S8-Note: Refuse was picked up in the 200 East Area and hauled to the City landfill. It is unlikely that any significant contamination from the incident could have reached this load because, in the fruit fly scenario, the eggs laid in or near the contaminated diversion pit would not have had time to mature into mobile adults (see Appendix J).

- S9-An air sample was taken in the 241-ER-152 work tent. Radiological analysis showed a high ratio of ^{90}Sr to ^{137}Cs in this sample.

Wednesday September 16

- S10-TWRS personnel began the cleanup of the contamination spread adjacent to the 241-ER-152 Diversion Pit from work performed the previous day. The light plant and the pickup truck were decontaminated and released. The crane was removed from the work area. Follow-up surveys of the perimeter of the now-expanded contamination area showed further contamination.

- S10a-The air sample taken in the 241-ER-152 work tent was counted.

Thursday September 17

- S10b-Note: Surveys were initiated to reduce the expanded contamination area to its original size. This process was completed on September 21.

- S11-Refuse was picked up in the 200 East Area.

Tuesday September 22

- S11-Note: Refuse was picked up in the 200 East Area and hauled to the City landfill. It is unlikely that any contamination from the incident could have reached this load, because fruit fly eggs laid in or near the contaminated diversion pit would not have had time to mature into adults.

Wednesday September 23

- S12-A piping leak check was performed in the 241-ER-152 Diversion Pit. Jumper leaks were found. The pit was not opened for this activity; the check was performed through engineered penetrations.

- S13-Debris arrived at the City landfill.

- S14-At a personnel contamination monitor, contaminated gloves were found in the pocket of an employee involved in work at the 241-ER-152 Diversion Pit. He had visited the 2247-B Ironworker's Shop after leaving the 241-ER-152 Diversion Pit.

Friday September 25

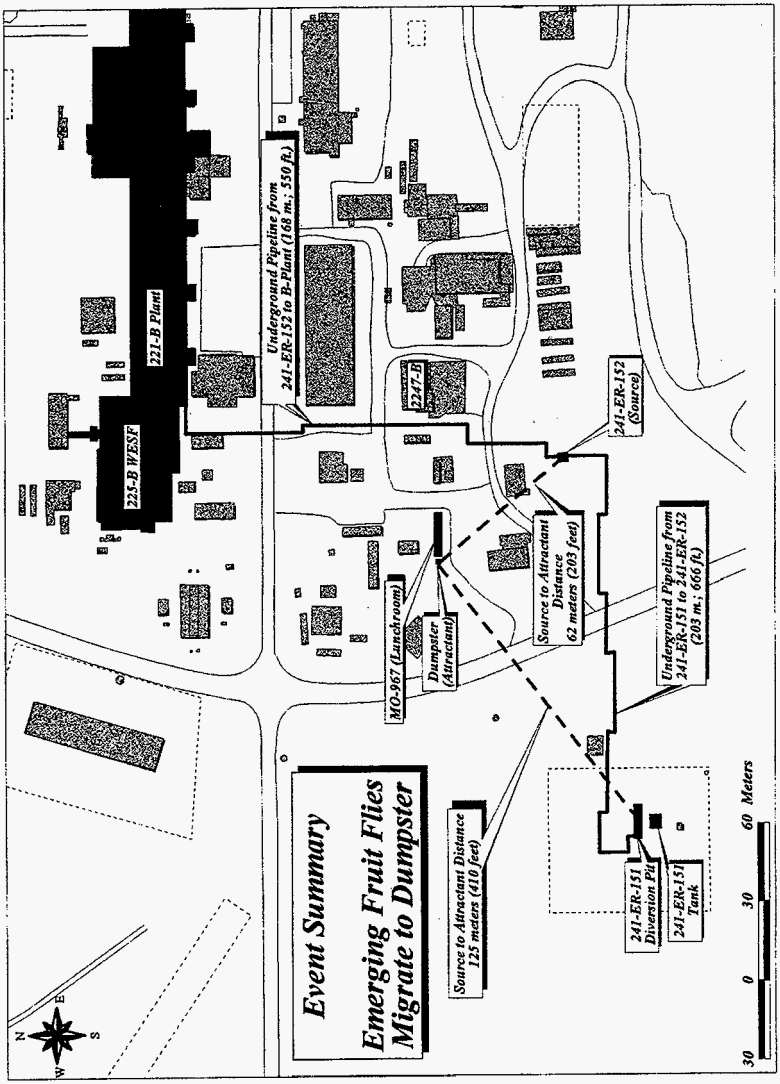
- S15-Garbage truck #6060 broke down. It was about 50 percent full of refuse from the 400 Area.

- S16-Garbage truck #3500 replaced #6060.

- S17-Routine survey of the MO-967 Mobile Office showed no contamination.

- S18-Northwest wind brought the scent of food and other refuse in the MO-967 Mobile Office to the 241-ER-152 Diversion Pit (Fig. 8).

Figure 8. Event Summary – Emerging Fruit Flies Migrate to Dumpster.



- S18a-B Plant, TWRS, WMNW Environmental Monitoring, and the FDH Office of Biological Control personnel met to discuss the contamination spread in the area southwest of B Plant.

Saturday and Sunday September 26 and 27

- S19-The wind shifted from east to southeast then northeast, carrying fruit flies toward the MO-967 Mobile Office.

- S20-Although the power and water had been shut off, employees entered the MO-967 Mobile Office over the weekend to use the kitchen.

- S21-Work in the 2247-B Ironworker's Shop continued for the full weekend, in support of the 222-S Analytical Services of Waste Management Laboratories, WESF, and TWRS activities. The 2247-B Ironworker's Shop received contamination.

Monday September 28

- S19-The wind continued to shift from east to southeast then northeast, carrying fruit flies toward the MO-967 Mobile Office.

- S22-The MO-967 dumpster was emptied at 7:45 a.m. The dumpster had been requested to be moved approximately 9 m (30 ft) so that clean-up could be performed around the area. The driver decided that as long as he was moving the dumpster, he would also empty it, because the dumpster was scheduled to be emptied the following morning anyway. The dumpster was later surveyed because of the contamination findings in the MO-967 Mobile Office, not because of the move.

- S24-At ~8:30 a.m., radiological surveys of the MO-967 Mobile Office began. Contamination was found in the lunchroom and the lunchroom refuse pails. At approximately 9:00 a.m., the DYN lead RCT notified DYN Radiological Control management that contamination found in refuse cans appeared to be sputum from chewing tobacco. DYN Radiological Control management requested that surveys of the MO-967 Mobile Office continue. At the same time, FDNW management was notified and was requested to have workers, particularly those who chew tobacco, report to an area outside the MO-967 Mobile Office for survey. On arrival at the MO-967 Mobile Office, DYN Radiological Control management requested the RCTs to extend surveys outside of the MO-967 Mobile Office, including the dumpster. The only material in the dumpster was one bag of kitchen refuse and a bag of insulation. The bag of kitchen refuse in the bottom of the dumpster was found to be contaminated. The dumpster was immediately controlled as containing radioactive material. The dumpster was surveyed at approximately 11:30 a.m.

  DYN Radiological Control management questioned FDNW management as to when the dumpster was last emptied. Because the 200 East Area FDNW complex was nearly vacated, it was thought that the dumpster was last emptied a week or two before. Consequently, it was believed that a worker had contaminated the MO-967 Mobile Office

over the weekend. It was also believed at this point that the bag of kitchen refuse was thrown into the dumpster over the weekend. FDNW management worked to locate the workers who may have used the MO-967 Mobile Office over the weekend, including any janitorial personnel who may have removed refuse from the MO-967 Mobile Office so that personnel surveys could be performed. Surveys also were extended to other facilities in the 200 East Area used by FDNW personnel, including an all-crafts lunchroom. DYN Radiological Control management notified LMHC Radiological Control and BWHC (B Plant) Radiological Control management of the contamination problem and requested that they check to see if workers from their companies had used the MO-967 Mobile Office over the weekend. It was communicated back that they had not. At this point, it was believed that a contaminated worker had caused the contamination spread over the weekend. There was no reason to immediately notify Hanford Site Transportation Management (garbage trucks) or the City landfill because it was not known that an unscheduled emptying of the dumpster had been performed earlier that morning.

- S24-Note: The MO-967 Mobile Office is about 62 meters (203 feet) northwest of the 241-ER-152 Diversion Pit and 125 meters (410 feet) from the 241-ER-151 Diversion Pit. (See Fig. 3 for the spatial relationship of these diversion pits and the MO-967 Mobile Office.)

- S25-The RCTs surveyed the dumpster outside the MO-967 Mobile Office at 11:30 a.m. and found reportable contamination. The RCTs found the contamination before the normal Tuesday refuse pickup. Therefore they believed that no contaminated refuse had been picked up and taken to the City landfill, which was incorrect. The RCTs isolated and radiologically posted the dumpster to prevent pickup.

- S23-The refuse was taken to the City landfill in truck #3500, arriving at 1:30 p.m.

- S27-The FDNW van used by crafts persons and the personnel using the van were surveyed; the personnel surveyed negative, but the van was found to be contaminated.

- S29-Initial information on contamination was provided to FDH Environmental Protection in accordance with *Washington Administrative Code* (WAC) 246-247, "Radiation Protection-Air Emissions." The RCT surveying the MO-967 Mobile Office attempted to contact the FDH Internal Dosimetry Site technical authority at approximately 9:30 a.m. because she believed that contaminated chewing tobacco found in a refuse can in the MO-967 Mobile Office possibly indicated that a worker who had used it over the weekend may have been internally contaminated. An RCT reached the FDH Radiation Protection Central Standards Group Manager and explained the contamination situation, and set up a bioassay of the worker (the bioassay indicated no contamination). This was the first notification to FDH Radiation Protection, and it was followed by an event status e-mail to several Site radiation control managers from the DYN Radiological Control manager at 3:28 p.m. FDH and PHMC radiation protection personnel investigated possible contamination sources and spread mechanisms (see Appendix B, Section B2.0, for further discussion).

Tuesday September 29

- S29-The initial notification of contamination was made to RL Environmental Assurance, Policy and Permits. The FDH Radiation Protection Director unofficially called the RL Radiological Control Manager the morning of September 29 concerning this incident. The official notification was made to the RL Assistant Manager, Facility Transition, at 11:30 a.m. on September 29.

- S30-More refuse from numerous locations on the Hanford Site was taken to the City landfill in garbage truck #3500 (the regular Tuesday pick-up). It was not known that the truck had been contaminated the previous day. The radiological control organizations believed that the contaminated dumpster had been isolated before it could be emptied (see S25 under Monday, September 28). Therefore, they did not contact the management of refuse pick-up and hauling operations (DYN Transportation Operations) to stop the delivery to the City landfill.

- S31-The contamination survey and the contamination-source investigation continued. When RCTs found contamination inside the MO-967 Mobile Office, they immediately tried to identify the source of the contamination (as they would on finding contamination in any area not posted for contamination). As a protective measure, they assumed that workers might have been involved in the contamination spread, but they also investigated transfer via other biological vectors. In this indoor situation, they specifically looked for mice as a contamination vector.

  The previous Friday's survey (September 25) of the MO-967 Mobile Office had not identified any contamination. The names of all the individuals who had been in the trailer over the weekend were collected and the individuals were contacted.

  NOTE: Over 100 employees eventually received whole-body counts for potential internal contamination. This process lasted over several weeks. No employees were found to have been contaminated.

  The RCTs continued searching the MO-967 Mobile Office for any indications of the presence of mice and found none. In addition, the pattern of contamination spread (e.g., near a light switch, in refuse cans, on walls) was not consistent with experience of contamination from mice. Thus, mice were eliminated as a biological vector for this contamination spread.

- S32-During surveys on Tuesday, September 29, RCTs were surveying a pipe covered with condensate in the restroom of the MO-967 Mobile Office. It was noted that the condensate was covered with fruit flies. The pipe appeared to be contaminated, but when the RCT put the meter detector close to the pipe, the contamination levels decreased as the fruit flies flew away. A second RCT was called to the room to investigate this strange observation. By then the fruit flies had returned to the pipe and again the source of the meter indication of contamination 'flew away' with the fruit flies.

Because contaminated flying insects were a new vector for contamination spread, it was not immediately accepted. Over the next few days, similar fruit fly encounters, including finding several contaminated dead fruit flies, convinced everyone that fruit flies were transferring the contamination.

- S33-DYN initiated a Not-Classified Notification of an off-normal occurrence and began survey efforts with other area contractors (B&W Hanford Company [BWHC], LMHC, and Bechtel Hanford, Inc. [BHI]). WDOH was notified at 10:05 p.m. and faxed at 10:53 p.m. about contaminated socks found in a worker's home.

- S34-High levels of contamination were discovered in the 2247-B Ironworker's Shop.

  - The TWRS contractor performed an investigative survey in response to contamination on a boot found on an ironworker exiting the C Tank Farm area. Contamination was found inside the 2247-B Ironworker's Shop on metal plates on the floor, the top of a work table, a piece of angle iron on a work table, on the floor under the table, and on soil north of the building.

  - DYN Radiological Control performed a survey in response to the contamination event. Contamination was found inside the building on a metal angle iron, a triangular piece of metal, floor areas, and other items (e.g., tool box tray).

  Some contamination discovered in the 2247-B Ironworker's Shop may have caused contamination spread by worker and/or material movements over the September 26-27 weekend. Subsequent investigations determined that fruit flies spread the majority of the contamination found in the area and the 2247-B Ironworker's Shop (see Appendix B, Section B2.5.3 for further discussion).

  However, any item with a film of liquid can be an attractant for fruit flies at any time (they have been known to be attracted to alcohol-based ink). Contaminated animal urine can contaminate structural (e.g., metal, cement) objects, even though this was not proved to be the source of the contamination in the 2247-B Ironworker's Shop.

- S26-Extended surveys were initiated on September 28 to identify the person or persons who may have come in contact with the contamination.

- S28-Lockheed Martin Hanford Corporation (LMHC) Radiological Control informed DYN of an ironworker's contaminated boot.

Wednesday September 30

- S36-A PHMC fact-finding meeting was held at Building 2723-2 from 8:30 a.m. to 12:30 p.m. to identify the contamination source and devise a plan to decontaminate it, return all areas to a normal condition, and prevent recurrence of the event. All known involved or interested persons were invited. The team compared data because further contamination had been identified in locations not consistent with previously identified vectors.

- S37-During this meeting, it was determined that the MO-967 dumpster had been emptied on the morning of September 28 and the refuse taken to the City landfill.

- S38-The DYN Transportation Operations manager and the DYN Director of ESH&Q notified the City landfill manager and the City engineer of potential contamination reaching the City landfill. The City landfill manager was called at 1:30 p.m. The City engineer was updated with further details by telephone at 4:00 p.m.

- S39-The RCT was dispatched to the City landfill on September 30 and was there from 1:30 p.m. to 3:30 p.m. No contamination was found during the survey of the site where Hanford Site refuse was believed to be placed, nor was any found on the compactor tractor.

- S40-The outside of garbage truck #3500, which had emptied the MO-967 dumpster on September 28, was found to be contaminated. The truck was shut and isolated inside a radioactive materials area inside the 273-E facility. The contents on the ground were loaded into a covered dump truck.

- S41-The Alternate Emergency Operations Center (EOC) was activated as the meeting place.

- S42-Precautionary isolation of about 2.5 hectares (6.2 acres) south of B Plant (later formalized on October 2 as the RBA [Fig. 9]) was completed while further investigations were conducted.

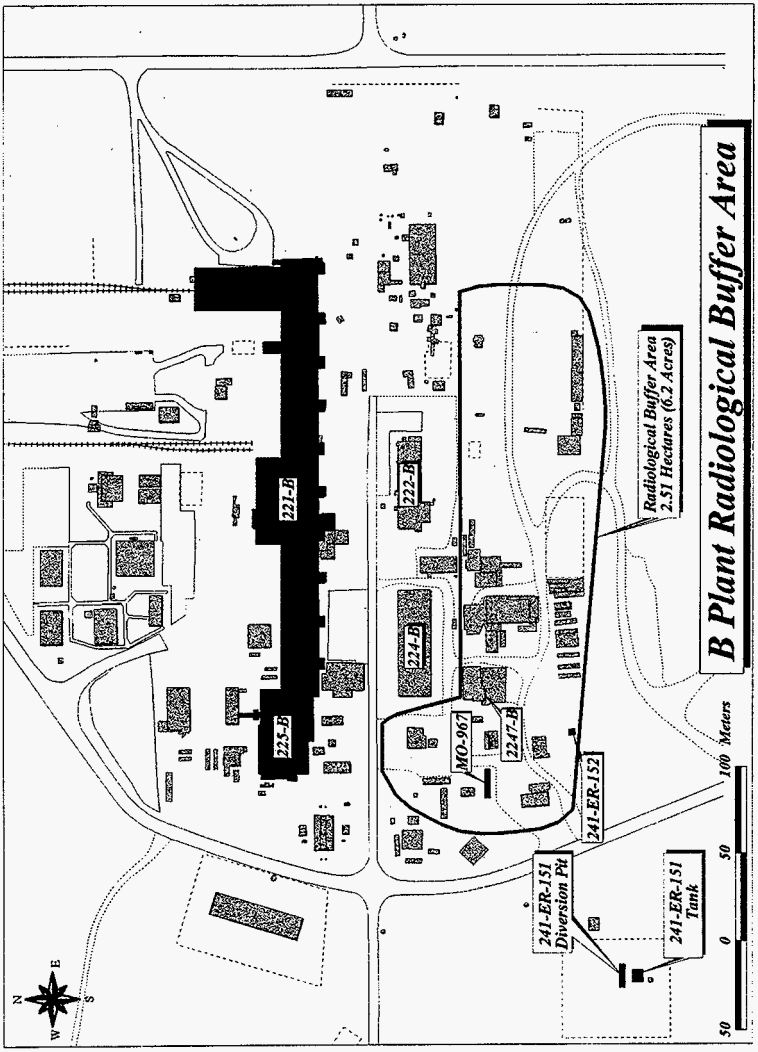
- S43-Planning was initiated with city management to retrieve the Hanford Site refuse from the City landfill.

- S43a-DYN Transportation Operations was notified of contamination in a dumpster.

- S44-The hauling of sanitary refuse in compactor trucks to the City landfill was suspended on September 30 until new plans could be approved by the City.

- S44a-The first eight flying-insect traps were placed near the 241-ER-152 Diversion Pit and the MO-967 Mobile Office.

Figure 9. B Plant Radiological Buffer Area.



- S45-Radiological control personnel conducted intensive radiological surveys of all personnel and equipment exiting the area placed in precautionary isolation.

- S46-Radiological Control personnel conducted intensive radiological surveys of all real estate and equipment around WESF.

- S48-A press release was issued by FDH.

Thursday October 1

- O1-PHMC management determined that a Situation Room was needed to coordinate activities related to this event. The Alternate EOC, a spacious conference room and the associated small, dedicated storage and office area at 2420 Stevens, was established as the Situation Room.

- O2-One truck of Hanford Site construction debris was accepted at the City landfill on the morning of October 1. Later that morning, the City rejected two truckloads of construction debris, and subsequently all refuse generated at the Hanford Site was halted. The City notified FDH and RL that no refuse from the Hanford Site would be accepted at the City landfill until the incident was resolved to the City's satisfaction.

- O3-An RCT resurveyed the City landfill. No contamination was found during the survey of the area where the refuse from the Hanford Site was dumped on September 28 and 29.

- O3a-At 1:45 p.m. on October 1, a DYN Road Maintenance supervisor, and a DYN Transportation Operations manager met with the City landfill manager and a representative of the Benton County Health Department. A plan was developed to excavate designated areas to survey for potential contamination. It was agreed to stage DOE equipment and set up portable fencing on October 2.

- O4-DE&S Hanford, Inc. (DESH), informed DYN that contamination was found on the boot of a carpenter before he entered the K Basins.

- O5-The 275-E Carpenter Shop Building was surveyed and one spot of contamination was found.

- O6-The Canister Storage Building complex was posted as an RBA (exit survey required).

- O7-Beta-emitting radiation contamination levels, ranging from 2,000 to about 1 million disintegrations per minute (d/min), were found fixed on facilities and refuse. The contamination primarily comprised ^{90}Sr; the highest-level reading was approximately 12 millirads per hour on a direct survey.

- O8-Contamination was found on refuse at the rear of truck #3500 and on the back door (up to 50,000 d/min per 100 cm^2

- O9-Seasonal spraying and fumigating activities were ongoing to control pests such as ants, gnats, and fruit flies.
- O9a-Flying-insect traps were set in and around the precautionary isolation area (Fig. 10).
- O9b-Contaminated insects were found in traps that were set near the 241-ER-152 Diversion Pit on September 30, 1998.
- O10-Planning for retrieval from the City landfill continued with City of Richland management.
- O11-A press release was drafted by FDH and issued by the City of Richland. Media inquiries began. An interview was conducted with the *Tri-City Herald.*
- O12-A 19 liter (5-gallon) refuse can outside the 2247-B Ironworker's Shop was found to be contaminated. The refuse can contained cups with liquid, fruit flies, and other assorted refuse. The dose rate on the exterior of the galvanized refuse can was 3.0 mrad/h shallow dose and <0.5 mrad/h deep dose.

Figure 10. Flying-Insect Trap.

- O13a-The Occurrence Notification Center (ONC) officially notified the City of Richland of the possibility of landfill contamination.

- O13-The WDOH Air Emissions Section was notified of a potential unpermitted radioactive air emission after truck #3500 was opened and contaminated refuse fell to the ground. The agency also was informed that contaminated refuse might have been disposed of at the City landfill.

- O13c-The ONC initiated a follow-up not-classified notification [NCN] to offsite agencies as a result of finding contamination on the boot of a worker who was exiting a high-level waste tank farm on September 29 (see S34). The message indicated that the likelihood of contamination reaching the City landfill had increased because of the discovery of contamination on truck #3500.

Friday October 2

- O14-The 2.5 hectare (6.2-acre) RBA was formally established.

- O15-While garbage truck #6060 was in for repairs, refuse inside the front hatch was found to be contaminated; the truck was isolated in the 273-E facility.

- O16-Flying-insect traps and mouse traps were checked. The first contaminated fruit flies were found in traps on the porch at the MO-967 Mobile Office.

- O17-Contamination was found on pop cans (about 20,000 d/min per 100 cm^2) outside of the 2711-E 200 East Area Garage in the pop-can recycling area.

- O18-Extensive bioassays began.

- O19-Contaminated fruit flies were found in a dumpster in the 200 East Area FDNW complex.

- O19a-About 8:00 a.m., a bulldozer and a backhoe were staged at the City landfill. Portable fencing was set on the sides of the cells containing refuse from the Hanford Site to isolate them from landfill workers and the public.

Saturday October 3

- O13b-WDOH was notified of RL's intent to remove contaminated refuse from the City landfill and return it to the Hanford Site for disposal.

Sunday October 4

- O20-Dumpsters outside of the 272-E Mockup Shop and the 2707-E Change House were found to be contaminated.

- O21-A garbage can was found with contaminated refuse outside of the WESF Maintenance Shop (225-BE).

- O22-More contamination was found in the 2711-E 200 East Area Garage men's shower room (40,000 d/min on a rubber floor mat outside the shower; 20,000 d/min on carpet).

- O23-Contamination was found in a dumpster at the MO-996 Mobile Office at 350,000 d/min.

Monday October 5

- O24-Six traps were placed at the City landfill.

- O24a-Insect trapping was expanded Sitewide.

- O25-Spot treatments with insecticides began near the 241-ER-152 Diversion Pit and at local dumpsters and garbage cans.

- O26-At the request of the FDH Vice President, Environment, Safety, Health and Quality, the PHMC, RL, City of Richland, and WDOH met and formed an integration team and four subteams (Policy, Radiological Control and Investigation, Solid Waste, and Operations) to gather facts relevant to the contamination issues. Personnel from FDH and DYN led these teams, which consisted of personnel from PHMC companies and RL. (See Appendix C for details about the Situation Room and the teams.) Before the meeting, WDOH met with DYN Radiological Control and expressed a concern that the 241-ER-152 Diversion Pit was the source.

- O26-The teams met daily with RL, other Hanford Site contractors, and the WDOH to keep everyone apprised of the activities. WDOH requested a daily status report.

- O26-Note: Three basic operating premises that guided the entire incident were established at this first meeting.

    - Any contamination outside the Hanford Site, and any contamination outside a radiologically controlled area, is unacceptable. The Hanford Site has "zero tolerance" for contamination spreads outside known radiation areas.

    - Protecting the health and safety of the public and Hanford Site employees is the first priority of FDH.

    - Maintaining and fostering a partnership with the City of Richland is highly valuable to the Hanford Site. Hanford Site officials would not be satisfied with solutions to the problems until the City was satisfied.

- O27-The first all-employee General Delivery notice was sent.

- O28-Throughout the incident, the teams updated the media, Site personnel, and officials from the City of Richland and Washington State about the decontamination activities.

- O29-A press conference was held by FDH; a representative of the City of Richland participated.

- O29a-The PHMC received a call from the Oregon Office of Energy regarding food service information.

- O30-The investigative team posted updates on the Hanford Site Intranet, the Site radio station, and a DYN telephone hotline.

- O31- Actions were taken to investigate potential contamination in the City landfill. DYN made plans for removal of any contaminated material found at the City landfill.

- O32-Contaminated fruit flies were found in traps in and around the MO-967 and MO-966 Mobile Offices.

- O33-Contamination was found near the 218-B Emergency Equipment Storage Shed and on the roadway of Atlanta Avenue near the intersection with 7th Street by a TWRS RCT.

- O34-WDOH requested that Notices of Construction (NOC) be prepared for excavation (retrieval) of contaminated refuse at the City landfill and for disposing (burial) of any contaminated refuse at the Hanford Site Low-Level Burial Grounds. Preparation of NOCs began with priority given to the NOC for burial of contaminated refuse at the Hanford Site Low-Level Burial Grounds because at that point no contamination had been uncovered at the City landfill (see O38).

Tuesday October 6

- O35-The first Hanford Site refuse cell location was confirmed in the City landfill through receipts and waste characteristics found in the refuse.

- O36-At the Canister Storage Building and surrounding office buildings, contamination was found in garbage cans, a plastic tub, and specks on the floor.

Wednesday October 7

- O37-The Policy Team began daily updates for government agencies.

- O38-The NOC for burial in the Low-Level Burial Grounds was approved by WDOH in the morning and the NOC was faxed to EPA for approval. A concerted effort was initiated with the support of WDOH to complete the NOC for retrieval actions at the City landfill. The NOC was completed and approved by WDOH late that evening, then faxed to EPA.

- The retrieval NOC was for removing contaminated refuse from the City landfill and transporting it to the 200 Areas of the Hanford Site.

- The burial NOC was for sorting and surveying the removed refuse and burying it at the Low-Level Burial Grounds in the 200 East Area.

- O39-Radioactive contamination was detected at the City landfill, primarily on food refuse. The contaminated materials found were consistent with the types and levels of material contamination found in the 200 Areas, specifically from samples taken from the 241-ER-152 Diversion Pit.

- O40-A clear plastic bag found at the City landfill read 70,000 d/min, and a piece of cardboard read 25,000 d/min of measured radioactivity.

- O41-DYN Radiological Control was prepared to perform airborne radiological monitoring downwind of the landfill excavation site. In addition, WDOH requested monitoring on each of the four radiological boundary sides, including upwind. Airborne radiological monitoring continued with negative results throughout the excavation process.

- O42-Retrieval operations at the City landfill were curtailed because of high winds, and the exposed materials were covered with tarps.

- O43-Per mutual understanding, work activity was halted pending completion and approval of the radioactive air emissions (retrieval) NOC for the activity.

- O44-The PHMC and a representative from the City of Richland held a press conference.

- O45-Vendor food trucks were identified as a possible mechanism for transporting contamination off Site. Four food vendor trucks were surveyed for the first time (two each for BS Express and Riders Sausage Haus); all the results were negative. The Solid Waste Team continued contacting all vendors who were recently in the area. Personnel and vehicle surveys were offered to the nonfood vendors, but they declined the offer.

- O46-A facsimile was received, in which WDOH ordered that work at the 241-ER-152 Diversion Pit cease and that measures be taken to isolate any potential release through the cover blocks. The WDOH expressed concern that activities thus far to isolate the release of radioactive material to the atmosphere via the insect intrusion had been incomplete/ineffective. WDOH requested that they be kept current on the progress of the investigation and recovery activities.

- O48-B Plant/WESF employees requested more information. They requested that clear and appropriate terminology be used in onsite and offsite news releases.

- O49-The U.S. Environmental Protection Agency (EPA) approved the NOC for burial via facsimile.

Thursday October 8

- O47-The garbage trucks servicing the 200 East Area were fogged.
- O49a-The U.S. Environmental Protection Agency (EPA) approved the NOC for retrieval via facsimile.
- O50-The WDOH approved the Radiological Control Team installing two flying-insect traps in the 241-ER-152 Diversion Pit. This involved installing a glovebag over an access port into the 241-ER-152 Diversion Pit to permit sampling inside the pit to validate it as a significant source of contamination. The glovebag contained one trap; a second trap was suspended inside the pit.
- O51-During the installation of the glovebag, a dead contaminated fruit fly was found in the 241-ER-152 Diversion Pit. This confirmed the diversion pit as the source of the contamination.
- O52-The Solid Waste Team began a series of meetings with the City of Richland to discuss the requirements for resuming hauling solid refuse to the City landfill.
- O53-Normal work resumed at the Canister Storage Building construction site, where contamination had been removed from several locations in and around the building.
- O54-A meeting was held with concerned employees.
- O55-Personnel monitoring was offered to workers at the construction site.
- O56-The four food vendor trucks were surveyed for the second day; again the results were negative. Daily surveys continued.
- O57-Dursban 50W™ insecticide treatment was initiated at the City landfill.
- O58-Ninety-five flying-insect traps were set at locations on Site and off Site.
- O59-A new page was added to the Hanford web site, accessible at http://www.hanford.gov/safety/conspread/index.html.

Friday October 9

- O49-The approved NOC for retrieval was delivered to the City landfill by an environmental engineer for the WHC Environmental Services, Air and Water Services, to brief workers on the requirements of the NOC.

™Dursban 50W is a trademark of Dow Chemical Company.

- O60-Refuse removed was surveyed and packaged at the landfill. Removal of the potentially contaminated refuse from the City landfill began at 7:30 a.m.

- O61a-The potentially contaminated refuse from the City landfill was delivered to the 200 East Area Low-Level Burial Grounds.

- O61b-Refuse collected on Site was disposed of in the Low-Level Burial Grounds in the 200 West Area.

- O62-Contaminated fruit flies were discovered in traps in the 241-ER-152 Diversion Pit and in traps set in the glovebag the previous day. Analysis later proved that the radiological signature matched that of the contamination spread.

- O63-Work in the City landfill was planned for daylight hours over the weekend.

Saturday October 10

- O64-In an effort to control pests, malathion 50 was sprayed around the RBA at B Plant. This was the first fogging at the RBA.

- O65-Contaminated material was found in a second cell at the City landfill. Hot specks measured 1,000,000 d/min or 13 mrad/h. One truck was loaded at the City landfill and returned to the Site; a second truck was loaded.

Sunday October 11

- O66-The last contamination spot was found in the City landfill.

- O67-DYN, FDH, RL, the City of Richland, and WDOH agreed that (invasive) excavation of the landfill should be stopped after removal of identified contamination and that further exploration, if necessary, should be performed by geo-probe (remote core drilling).

- O68-The RBA was fogged a second time.

- O68a-One bag of refuse was found contaminated in a dumpster northeast of the 2750-E Building and another in the dumpster on the north side of the 2750-E Building.

Monday October 12

- O70-Activities to remove Hanford Site refuse from the City landfill were completed except for one contingency container that remained at the City landfill until October 14, in case any other contaminated refuse was found.

- O71-Insecticide treatments at the City landfill were terminated.

- O71a-The RBA was fogged a third time.

- O72-Surveying of Site dumpsters continued.

- O74-Contaminated refuse was found in a dumpster by the 2306-W Bottle Storage (Skid Shack) in the 200 West Area (20,000 d/min). This contamination was not related to the fruit fly incident.

Tuesday October 13

- O75-WDOH and the EPA approved a modification to the Low-Level Burial Grounds NOC to increase the number of loads from 10 to 50 and to allow for the use of vehicles other than standard compactor trucks in the 200 West Area.

- O76-No fogging occurred at the RBA because of high winds.

Wednesday October 14

- O69-In all, boxes containing 191,000 kilograms (210 tons) of material were taken from the City landfill to the 200 East Area low-level burial grounds. A total of 544,000 kilograms (600 tons) of refuse were excavated and 23 kilograms (50 pounds) of contaminated material were found.

- O76a-The contingency container, containing another 6,800 kilograms (7.5 tons) of material, was removed from the City landfill to the Site.

- O77-Surveys of the excavation at the City landfill were completed, the disturbed landfill area was restored, and a layer of cover soil was placed over the area.

- O78-The City of Richland agreed that activities at the landfill were complete relative to the retrieval of refuse from the September 28 and 29 Hanford Site deliveries.

- O79-Contaminated fruit flies were found in the traps in the 241-ER-152 Diversion Pit and the glovebag over the pit.

- O80-Contamination was found on refuse in a dumpster near the 2201-B Construction Ice House.

- O81-No fogging occurred at the RBA because of high winds.

Thursday October 15

- O82-All Hanford Site equipment and personnel involved in this event were demobilized, although the teams continued their investigations.

- O83-Spraying and fogging resumed at the RBA and continued until October 19.

Sunday October 18

- O83a-Surveys of the RBA were completed.

Monday October 19

- O84-A shoulder-to-shoulder survey was conducted at the RBA south of B Plant; the RBA was released and returned to normal operations.
- O85-Fogging was terminated at the RBA.

Tuesday October 20 - Sunday October 25

- O85a-No significant events occurred.
- O85b-Site surveys continued. Dumpster and vendor surveys were ongoing.

Wednesday October 21 - Wednesday October 28

- O85c-Pacific Northwest National Laboratory placed 10 flying-insect traps off Site. The insects trapped were found to be not contaminated.

Monday October 26

- O86-A flying-insect trap just outside the glovebag over the 241-ER-152 Diversion Pit was found to contain 100,000 d/min of beta/gamma-contaminated fruit flies.
- O87-A flying-insect trap on the north side of the MO-966 Mobile Office near B Plant was found to contain 500,000 d/min of beta/gamma contamination.
- O88-A plastic bag containing food garbage in a dumpster just outside the 2101-M Building (south of B Plant) was found to contain 30,000 d/min. The dumpster was sealed in plastic and taken out of service.
- O88a-The 241-ER-152 Diversion Pit was inspected at the request of WDOH, and some leaks in the seal were identified and corrected.
- O89-Fogging was resumed at the RBA and continued through October 31.
- O90-RL briefed the City of Richland.

Tuesday October 27

- O91-Site pest-control specialists sprayed the 241-ER-152 Diversion Pit and its glovebag cover with pyrethrin (PT-565).

Wednesday October 28

- O92-Site pest control specialists sprayed the area around the 241-ER-152 Diversion Pit with PRO Control Plus™ (a pyrethroid insecticide) and placed new insect traps inside the pit to determine if the pests had been controlled.

Friday October 30

- O93-One contaminated fruit fly (60,000 d/min) was found in a flying insect trap near a U.S. Ecology dumpster, which is located southwest of the 241-ER-152 Diversion Pit. The fruit fly contained the same contamination mix as did the previously found contaminated fruit flies. This turned out to be the last contaminated fruit fly captured during the incident. Review of wind patterns show that, for 2 days, wind speeds in excess of 13 km (8 mi/h) blew from the direction of the 241-ER-152 Diversion Pit.

- O94-To secure refuse disposal capability in addition to that of the City landfill, DYN and BDI Transfer prepared a memorandum of agreement for nonhazardous, nonradioactive refuse disposal services. The memorandum of agreement includes the requirements that the Site must meet (no radioactive materials, monthly surveys of dumpsters, random load inspections, etc.) to comply with the agreement. The end date of this memorandum of agreement is September 30, 1999.

- O94-The memorandum of agreement includes a graded survey approach in which the Site will inspect and spot survey all Site refuse for a 30-day baseline period. Factors to be considered in taking this graded approach include the following:

  - Availability of engineering and/or administrative controls
  - Proximity to sources of contamination
  - Nature of the process generating the refuse
  - History of past contamination
  - Frequency of activities involving the use of radioactive materials
  - Availability of biological vectors or other means of contamination spread
  - Detection capability for the type of radiation expected to be emitted.

Monday November 2 - Monday November 9

- N1-Fogging resumed at the former RBA and continued until November 9.

Monday November 2

- N2-In the Canister Storage Building area, a contamination count of 7,500 d/min direct was found on a trash can.

™PRO Control Plus is a trademark of Stein, Inc.

Friday November 6

- N3-A dead fruit fly, with a contamination count of 250,000 d/min., was found in the office of the 2247-B Ironworker's Shop.

Monday November 9

- N4-Fogging was terminated at the former RBA.

Tuesday November 10

- N5-The memorandum of agreement between DYN and BDI Transfer was signed. The nonexclusive agreement for the disposal of nonhazardous, nonradioactive refuse generated at the Hanford Site requires that refuse be sorted and surveyed before removal from the Site. (See Section 5.4.2.1 for details of this agreement.)

Thursday November 12

- N6-A temporary survey station was established in the 4843 Storage Building in the 400 Area. All Hanford Site refuse will be surveyed in the 4843 Storage Building before going off Site. This will continue until a permanent solution is implemented.

- N7-The first load of refuse was surveyed in the 4843 Storage Building.

Monday November 16

- N8-A contamination count of 100,000 d/min (apparently pieces of a fruit fly) was found on a bag of refuse at the 4843 Storage Building survey area (refuse monitoring station).

- N9-The first shipment of Hanford Site refuse was released to BDI Transfer.

Tuesday November 17

- N10-Six flying-insect traps were placed at the 4843 Storage Building and remained active through the period covered by this report (December 31).

Friday December 4

- D1-All flying-insect traps were removed and/or closed down by December 4 except the six in the 4843 Storage Building.

Thursday December 31

- D2-Between November 16 and December 31, no further contamination was reported at the 4843 temporary survey station.

D3-December 31 was determined to be the cutoff date for this report.

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4.0 SYNOPSIS OF CAUSAL ANALYSIS

A causal analysis was performed by the FDH Radiation Protection organization and PHMC contractor personnel to determine the root, direct, and contributing causes for the 200 East Area contamination event and determine judgments of need to prevent the conditions leading to each cause. (The complete causal analysis with further explanation is included as Appendix D.) The root cause is the cause that, if corrected, would prevent recurrence of this event condition and similar conditions. A contributing cause is one that facilitated or promoted an occurrence but, by itself, would not have caused the occurrence. Correction of any contributing cause would not necessarily prevent recurrence of the event.

The event was the spread of radioactive contamination outside the radiologically controlled area in the 200 East Area, which resulted in identification of minimal offsite contamination. The direct cause of the event was the spread of contamination from the 241-ER-152 Diversion Pit by flying insects to controlled and uncontrolled areas in or near the 200 East Area. The root cause was inadequate processes to prevent biological vectors (fruit flies) from spreading contamination outside radiologically controlled areas (contamination areas). Several contributing causes were involved, including the application of a glycerin/monosaccharide (simple sugar)-based contamination fixative and the Site processes and surveillance.

4.1 DISCUSSION

On the Hanford Site, radioactive material present in the facilities, tanks, process equipment, underground waste sites, and contaminated surfaces is contained in posted radiological areas. These posted radiological areas are located within areas of the Hanford Site that are further controlled for radiological purposes. It is the PHMC policy that all personnel, equipment, and material leaving any posted radiological area containing contamination or any airborne radioactivity area is surveyed for radiological contamination, to the limits that allow uncontrolled release to anywhere on or off the Hanford Site. Barriers, work processes, and surveillance, both routine and event generated, implement the PHMC policy that there will be no contamination spread outside of posted radiological areas.

On September 28, 1998, surface contamination was identified in and outside of an office/change trailer (the MO-967 Mobile Office) in the area immediately south of the B Plant/WESF facility. The finding of contamination outside a posted radiological area initiated vigorous investigations, surveys, and mitigation actions. In the next days and weeks, contamination was identified primarily in the area south of B Plant/WESF, but also in some locations outside the controlled areas of the Site. In addition, minimal amounts of contamination were identified off Site in the City landfill and on socks in the home of a Site ironworker.

On October 8, 9 days after it began, the investigation identified the primary source of the radioactive material to be the high contamination on the inside surfaces of the 241-ER-152 Diversion Pit in the underground waste transfer system. The pit is located several hundred meters south of the B Plant/WESF facility. Work had been performed in an open-top enclosure surrounding the pit in the middle of September. Fixatives had been applied to the contaminated

surfaces of the pit to help keep contamination from becoming airborne when work disturbed the surfaces. This particular fixative is a purchased product and consists of a monosaccharide (simple sugar) and glycerin in a water solution. This material has been used for 2 years at the Hanford Site without this problem being identified; however, during this application the material attracted or, at least, provided a food source for fruit flies. There are indications that the fixative may have fermented during storage and handling before it was applied and may have become more of a biological attractant. No indication has been found that the manufacturer or anyone using this fixative at the Hanford Site performed a formal study of the potential of the material to attract or support biota.

Flying insects were able to breed in the contaminated diversion pit; then they transferred contamination out of the posted radiological area surrounding the pit to the surfaces of the structures and materials in the surrounding areas within flying range. The flying range could be extended, depending on prevailing winds. Attracted to moisture or organic food substances in kitchen and eating areas or on windowsills, and to garbage in the dumpsters, the flying insects spread contamination directly to controlled and uncontrolled areas of the Site. As a contamination-spread vector, fruit flies had not been previously identified within the DOE complex.

Once contamination had spread undetected outside the posted radiological areas, Site movement of materials (examples: refuse and garbage delivery to the landfill, transport of work and personal objects) spread contamination to uncontrolled areas of the site and offsite. The mechanisms of contamination spread are discussed further in Appendix B, Section B2.5, and Appendix D, Section D3.3.

The process of delivering Site refuse to an offsite landfill and the radiological control surveillance of this process was examined.

The process of protecting contaminated Site facilities from biological intrusion and the radiological surveillance of contamination spreads caused by biological transport vectors was examined.

4.2 ROOT CAUSE

Inadequate processes to prevent contamination via biological vectors (fruit flies) from spreading contamination outside of radiological areas (contamination areas). Judgment of Need: Strengthen the implementation of existing administrative and engineering radiological controls, and establish new programs and processes to identify all potential vectors (including biological) and prevent the spread of contamination.

DIRECT CAUSE

Flying insects (fruit flies) spread contamination from the 241-ER-152 Diversion Pit to controlled and uncontrolled areas in or near the 200 East Area. Judgment of Need: Prevent accessibility of flying insects to contaminated work locations (i.e., open containment) and prevent attractant conditions (i.e., fermentation, moisture, nutrients).

4.3 CONTRIBUTING CAUSES

- The contamination fixative solution used on the 241-ER-152 Diversion Pit is suspected of attracting fruit flies. The fixative, in the conditions in which it is used in the field, has not been evaluated to see if it is an animal attractant. No analyses of the fixative solution are available in all the environmental conditions of its use on the Hanford Site. Without analyses, no procedures have been developed for its use and storage under field conditions. Judgment of Need: The use of monosaccharide-based fixatives was discontinued in October until it can be demonstrated that in anticipated use and storage, they are not an animal attractant.

- No procedure exists to interdict refuse service when contamination is detected in the refuse or in refuse-handling containers. The group that manages Transportation Operations was not promptly notified so that they could determine if the contents of other Site dumpsters might be contaminated. Judgment of Need: A system should be established to notify Transportation Operations of any suspect contamination that inadvertently may have been picked up. A method should be established for controlling or determining the contamination level of refuse in dumpsters before the refuse is moved off Site.

- No policy is in place establishing routine surveys of areas with past known contamination spreads caused by biological transport vectors. The early August 1998 communication from the B Plant/WESF radiological control organization to the Site services organization was informal and initiated the daily surveys of the MO-967 Mobile Office. Judgment of Need: A policy should be established requiring routine surveys of areas with past known contamination spreads caused by biological transport vectors.

- The current policy of protecting contaminated facilities from biological intrusion does not provide for a proactive review of potential intrusion points with preventive and corrective actions. Judgment of Need: Routine surveillance of contaminated facilities and systems with the potential for biological intrusion should be incorporated into facility operations and maintenance.

- The PHMC team has not adequately integrated Sitewide biological control since the change from a Sitewide management and operations-type contract. Judgment of Need: Biological control should be better integrated among contractors. The roles and responsibilities of biological control at the Hanford Site need to be clarified.

- No policy is in place to prevent animal encroachment at refuse collection points. Animals in search of food are attracted to dumpsters, gaining access through openings. Judgment of Need: Establish requirements to keep dumpsters closed when not in use and to install access guards or screens on the bottom drainage openings.

- No policy is in place to minimize the presence of food substances near known contamination areas. Judgment of Need: Evaluate the need for requirements to control food substances, including refuse, entering areas near known sites with contamination spread potential.

5.0 ASSESSMENT OF EVENT

This chapter describes the issues that arose during the event and the response to the event and provides judgments of need to ensure a prompt, even more effective response to any future event. The chapter also outlines a new process for improving disposal of Hanford Site refuse.

The Hanford Site (RL and PHMC team) programs and policies were evaluated to determine their effectiveness during this incident. Given that the incident—refuse (i.e., solid waste) being contaminated by a biological vector (fruit flies)—was never before identified within the nationwide DOE complex, the conclusions were positive. The programs and policies were found to have the following effects.

- They promoted vigilance and allowed the team to quickly identify the new vector.
- They effectively protected the health and safety of the Site workers, the public, and the environment.
- They promoted prompt and diligent communications with employees, the public, and the media.
- They were in place to allow the team to promptly contain the contamination, control its spread, and allow the team to identify its source.
- They allowed the team to promptly mobilize and integrate to work with the City of Richland, the State, the EPA, and RL to mitigate this incident.
- They were in place to allow an NOC to be written, reviewed, and approved within 48 hours; WDOH strongly supported this effort.
- They prevented an impact on the surrounding community and allowed for monitoring for offsite effects to show that the incident did not affect the community. In this event, flying-insect traps were set up outside the Site boundaries to verify that no fruit flies carried contamination off Site.

Programs and policies should be addressed to achieve the following:

- Increase monitoring of refuse for potential breakdowns in primary radiological, dangerous, and hazardous material control programs
- Specifically protect against new vectors
- Properly and effectively notify the ONC and others as appropriate
- Provide a closer working relationship between radiological control and biological vector control planning.

5.1 WORKER AND PUBLIC SAFETY

The primary focus for the RL and PHMC management team during this contamination event was to ensure the health and safety of the public and the Hanford Site employees and to protect the environment. Because the primary hazard of this event was the uncontrolled spread of radioactive contamination, the analysis of the response described in Section 5.2 considers the major actions of the PHMC Radiological Control Program during this event. This section considers the actions of the PHMC management team in controlling the spread of contamination outside the normal Radiological Control Program boundaries and mitigating any worker- or public-safety issues related to the event.

Employees on the Hanford Site who were not directly identified by the PHMC Radiological Control organization as affected by the contamination spread wanted to assure themselves and their families that the controls the PHMC team had in place were actually preventing them from being contaminated and unknowingly bringing contamination into their homes. The PHMC Radiological Control organization announced in all-employee communications that all employees desiring to have themselves, their vehicles, or their personal effects surveyed could request this from their management. Several employees requested and received surveys. No contamination was found on these individuals or on their belongings. RCT coverage for these surveys was provided, automatic personnel survey equipment (PCM-1B) was moved to areas conveniently available to these employees, and a list of survey locations on Site was published.

Efficient Actions.

- Workers who received whole-body counts were met at the whole-body counter by health physics professionals who discussed the bioassay results with the workers.

- RCT staff provided personnel contamination surveys and surveys of personal vehicles and belongings of any Site employee requesting surveys.

- B Plant management met routinely with BWHC and FDNW employees in the B Plant area to keep them informed and address potential concerns. The PHMC worker health advocate, FDH Internal Dosimetry, and the Pacific Northwest National Laboratory exposure evaluator met with the craft workers to discuss the bioassay process and answer questions. When worker bioassay results became available, the workers were notified of the bioassay results directly or through their management. At that time the workers were given a telephone number to call if they had questions, concerns, or complaints.

5.1.1 Safety of Workers and Public at the City of Richland Landfill

Issue: Contamination in the City landfill is a hazard to landfill workers and members of the public who deliver their refuse to the landfill.	
Discussion: The hazard of radioactive contamination in a public landfill comes not only from the radioactive material itself, but also from the actions needed in the landfill to control any found or suspected contamination. Physical (e.g., sharps [needles, broken glass, splintered wood]), chemical (e.g., residential containers with residue pesticides, cleaners, solvents) and biological (e.g., hospital refuse, molds, fungi, bacteria) hazards are always present in a municipal landfill. The close contact with these items that hand surveying refuse for radioactive material requires exposes workers to more potential hazards than low levels of radioactive contamination.	*Judgment of Need: Routine monitoring of landfill shipments from the Hanford Site should be conducted in the most effective and remote method to separate workers from routine shipments of refuse. In addition, workers in the landfill and the public should be separated from any inadvertent contamination that might reach the landfill.*

5.2 RADIOLOGICAL CONTROL PRACTICES

This event was discovered through the operation of the daily routine radiological surveillance program, which is a fundamental radiological control practice.

5.2.1 Recovery Actions

Progressive actions were implemented to identify the extent of the contamination, the transport vectors, and potential sources. However, because of the nonroutine early pick-up of the dumpster refuse, identifying contamination in the refuse stream did not preclude the transfer of radioactive contamination to the City landfill.

Efficient Actions.

- Field data during the event were handled well. Field radiological operations response to this event generated significant quantities of field radiological data.
- Management and control of the onsite (Hanford) response and the organization and operations in the Situation Room were effective. The focus was on the health and safety of the workers and the public and proper management of, and response to, the incident.
- The RCT, labor supervision, and City landfill supervisor worked together well to locate the contaminated refuse at the City landfill.

- Good Hanford Site teaming took place among the major contractors: the teams received exceptional cooperation from BHI in supplying containers and trucks for moving the contaminated refuse from the City landfill back to the Hanford Site; Pacific Northwest National Laboratory Site Surveillance set up and monitored flying-insect traps off Site.

- RL and the PHMC contractors and subcontractors worked together to resolve all the issues and mitigate the consequences of the offsite contamination event. This included Waste Management Federal Services of Hanford, Inc. (WMH), LMHC, DYN, WMNW, and FDH.

- The incident brought together onsite and offsite entities and provided experience in working as a team. However, in the interest of teamwork and accomplishment, improved protocol bridges need to be established.

- The Hanford Site contractors employed an appropriate mix of personnel on the response team. The team included members with field and technical expertise in diverse radiological operations.

- The Spent Nuclear Fuels Counting Facility (laboratory) in the 100 Areas was used extensively and provided great support in rapidly turning around samples, as did Pacific Northwest National Laboratory's 325 Radiochemical Processing Laboratory.

- The 222-S Analytical Services of Waste Management Laboratories analyses provided the final "fingerprint" data to isolate a previously unknown source.

5.2.2 Sample Management

Issue: Creation of current and concise radiological source term technical data packages facilitates timely correlation of sample unknowns to candidate sources. This supports accurate and timely mitigation response.	
Discussion: Sample management is essential in timely and accurate evaluation and identification whether single or multiple sources were involved. Availability of current and concise radiological source-term data is important in event diagnosis and mitigation response planning. It is important to coordinate radiological sample management (determining which samples are to be analyzed, the priority of sample analysis, and where samples are sent for analysis).	*Judgment of Need: PHMC procedures addressing contamination spreads across facility or subcontractor boundaries should identify the person in charge to coordinate and prioritize event radiological-sample analysis and should use the available laboratory resources. The procedures should direct the person in charge to determine the source terms of the affected facilities through communication with the facility radiological organization. In the development of the procedures, the Site laboratories should determine the standard sample geometries, sample identifications, and data report formats that are available or that need resources for development.*

5.3 BIOLOGICAL VECTOR CONTROL

Detection of biological vectors involved in transport of radioactive contamination has included surveillance and monitoring of vegetation (e.g., tumbleweeds), insects (e.g., termites, ants), amphibians (e.g., toads), reptiles (e.g., lizards, snakes), birds (e.g., pigeons, swallows), and mammals (e.g., bats, rabbits, mice). For example, in calendar year 1997, 74 incidents of contaminated biota occurred, involving four vegetation species (cheat grass, tumbleweed, rabbitbrush, and big sagebrush) and eight animal species (darkling beetle, sagebrush lizard, house mouse, deer mouse, Great Basin pocket mouse, Nuttall's cottontail, and coyote) near operation facilities (Perkins et al. 1998).

Before the current incident, 70 biota species (45 animal and 30 vegetation) had been identified in the Hanford Site's 200 Areas environs as being involved in uptake or transport of radioactivity (Johnson et al. 1994). Some flying insects, such as bees and wasps, previously had been found to be contaminated but were quickly eradicated in those few instances. Smaller flying insects such as fruit flies and gnats often had been the targets of Hanford Site pest control operations (i.e., insecticide spraying and fogging to protect employee safety and health), but had not before been observed to be contaminated with radioactivity. Based on these past observations, these flying insects were not routinely monitored to detect radioactivity.

5.3.1 Environmental Surveillance and Monitoring of Biological Species

Issue: Routine and special environmental surveillance and monitoring of biological species potentially coming in contact with radioactive materials identifies where administrative or physical barriers are necessary to protect employees, the public, and the environment.	
Discussion: Routine and special environmental surveillance and monitoring at the Hanford Site historically have targeted biological species at waste sites where the potential exists for contamination spread. Previous environmental monitoring near the 241-ER-152 Diversion Pit had identified contaminated vegetation, terrestrial insects, and rodents, but not flying insects.	*Judgment of Need: Small flying insects should be added to the list of biotic species routinely monitored for radioactive contamination. Flying-insect traps should be seasonally located at contaminated facilities or transfer stations that have the potential to attract these insects. Sanitary practices should be evaluated to eliminate fruit fly attraction (e.g., determine safe distances between contamination sources and food sources, refuse containment, etc.).*

Because biota-related spread of radioactive contamination has a history of recurrence in the approximately 2.5 hectare (6.2-acre) area southwest of B Plant in the 200 East Area, this area typically has been the focus of intense pest control and monitoring and surveillance. Activities and facilities in the area are under the direction of four different contractors (BWHC, LMHC/TWRS, DYN, and WMH), requiring additional integration and communication to keep biota from encroaching on neighboring facilities when control is initiated at a particular site.

Pest-control operations to control biota-caused transport of contamination were under way at several facilities in this area before the discovery of contaminated fruit flies. Contaminated deer mice have been found at the K-3 Filter Pit Encapsulation Facility (225-BB) near B Plant. Contaminated deer mice and ant hills were found between the 241-ER-151 Diversion Pit and the 216-B-64 Basin for more than a month before the September 28 contamination incident. Integrated (LMHC/TWRS, DYN, WMNW) surveillance, posting, and control efforts were extensive in this area.

Identification and control measures for this incident included placing flying-insect traps on and near the Hanford Site and applying chemical insecticides (i.e., spraying and fogging). Structures and areas treated included refuse-handling facilities (e.g., refuse cans, dumpsters, garbage trucks, buildings), suspected contamination sources (e.g., the 241-ER-152 Diversion Pit), and the primary affected area (i.e., the RBA).

In support of controlling the fruit fly problem, the FDH Office of Biological Control conducted the following types of insecticide applications:

- General and spot spray applications with wettable powder (Dursban 50W) and flowable microencapsulated (OPTEM™) insecticides
- Fogging with an emulsifable concentrate (malathion 57EC) insecticide. When fogging, the concentrated insecticide is metered to the discharge head, where it is sheared by a vortex air-blast blower (controlled air turbulence) into optimum size droplets by the nozzle apparatus and dispersed into the atmosphere. After dispersal, the droplets stay suspended in the air and drift with prevailing winds to insect-infested areas
- Space spray with aerosol pyrethrin (PT-565) and total-release pyrethrin with pyrethroid (Pro-Control Plus) insecticides.

5.3.2 Flying-Insect Trap Monitoring

Ninety-five flying-insect traps were placed at strategic locations on and off Site to monitor possible insect contamination. This total included 4 traps placed at the City landfill by WMNW, 10 placed at Hanford Site locations outside the 200 Areas and off Site by the Pacific Northwest National Laboratory, and 3 placed near the U.S. Ecology site near the 200 East Area by WDOH. Six traps were placed at the refuse transfer station in the 4843 Storage Building in the 400 Area. Trap locations and durations in operation are described in Appendix E and the locations are shown on the maps in Exhibits B, C, and D. Trapping was initiated on September 30 in the 241-ER-152 Diversion Pit and the MO-967 Mobile Office. As of December 4, all traps had been closed except six at the 4843 Storage Building refuse transfer site in the 400 Area.

No contaminated flies were captured at the remote locations (e.g., City landfill, Pacific Northwest National Laboratory's offsite locations, Vernita Bridge, along the Columbia River). One contaminated fruit fly was captured at U.S. Ecology, a leased site located approximately at the geographic center of the Hanford Site, about 2 kilometers (1.2 miles) south-southwest of the 241-ER-152 Diversion Pit; all others were captured within the RBA south of B Plant. Traps were monitored every day for the first 2 weeks, then every other day, but no contaminated fly has been captured since the October 30 capture at U.S. Ecology. A review of the wind patterns that occurred before the contaminated fly was captured at U.S. Ecology showed winds out of the north-northeast for durations of up to 8 hours and speeds from 10 to 24 kilometers per hour (6 to 15 miles per hour). The wind's north-northeast direction, duration, and speeds are consistent with expectations that the fly originated from the RBA south of B Plant.

5.3.3 Chemical Insecticide Control

Both spot- and general-area treatments were used to control the fruit flies. Spot treatment locations included the City landfill, storage and maintenance facilities, garbage trucks, refuse

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cans, dumpsters, and the 216-W-3-AE Burial Ground Trench 13. The products for spot treatments included Dursban 50W, PT 565, OPTEM, PRO-Control Plus, and ULD BP-300™. Product selection was based on target-facility conditions, customer concerns about compatibility with facility surfaces, and label instructions.

The 241-ER-152 Diversion Pit was initially surrounded by a tent structure open at the top to accommodate crane operations. This pit was later sealed, leaving access only through a gloveport. The enclosure received a general-area treatment with PT 565, first on October 27 and again on November 4, with PRO-Control Plus. Trapping inside the pit indicated that the first treatment was not completely effective; however, no flies were captured following the second treatment. Spot treatments were initiated October 3 and terminated November 5.

The City landfill received precautionary spot treatments of Dursban 50W during the excavation and retrieval of Hanford Site refuse. Treatments occurred from October 8 to 12.

The product used for area treatments (i.e., fogging) was malathion 57EC, dispersed via a truck-mounted fogger in accordance with label instructions. The RBA was fogged on October 10 to 12 (excessive wind speeds precluded spraying on the 13th and 14th), 15 to 19, and 25 to 31 and November 2 to 9. Low temperatures and/or high winds limited insect activity and chemical treatment. Malathion is a common insecticide for flying insects (e.g., mosquitoes). Area fogging began on October 10 following an emergency purchase of a truck-mounted fogger, was conducted as needed at the RBA, and was terminated November 5.

5.4 SOLID WASTE DISPOSAL PRACTICES

5.4.1 Landfill Practices

This event was unusual in that radiological contamination was spread off Site through refuse collection and disposal. The only "readiness response" to this type of situation is to dispatch RCTs to the landfill to try to detect contamination. This was done immediately after the potential for contamination was identified. However, the initial visit to the City landfill on September 30 by an RCT was not properly coordinated. No formal criteria were in place to suspend shipping all types of refuse when contamination is found or suspected.

As concerns escalated and a decision was made to excavate recently deposited refuse at the landfill, plans were prepared for a radiation work permit, job safety analysis, and work package. Required personnel and equipment resources were identified and obtained. This effort was initially coordinated through the team members at the Situation Room. Communication problems surfaced between the City of Richland and the PHMC, thus driving the need for the Hanford Site to station a project manager at the landfill.

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5.4.2 New Refuse Disposal Process

5.4.2.1 Agreement With BDI Transfer. The agreement with BDI Transfer of Pasco, Washington, which is retroactive to October 30, was put in place to obtain additional refuse disposal capabilities. The new agreement with BDI Transfer requires that refuse be sorted and surveyed before removal from the Site. This is a nonexclusive contract for the disposal of nonhazardous, nonradioactive refuse generated by the Hanford Site

Except as otherwise provided, the refuse contractor shall supply adequate and competent labor, supervision, equipment, transportation, transfer station facilities, licenses and permits, record keeping, and other actions necessary to provide for delivery of empty drop boxes, transportation of loaded drop boxes, and final disposal of the nonradioactive, nonhazardous, nondangerous refuse.

RL requires the Hanford Site contractors to prevent radioactive and other nonconforming refuse from being released off Site. Accordingly, *RL and the PHMC management team have implemented an enhanced business practice* to screen the refuse intended to be released to a refuse contractor for disposal. Comprehensive management systems implementing administrative controls are now in place at the Site. In addition to the administrative controls, sophisticated engineering controls are in place to manage and monitor radioactive waste, (e.g., negative pressure enclosures, ventilation systems, remote handling, encapsulation). These supplemental protective measures include surveys of refuse containers (i.e., dumpsters) and accumulated refuse to detect radioactive contamination and other nonconforming refuse.

When shipments of Hanford Site refuse to the City landfill were halted, a temporary survey station was set up in the 4843 Storage Building in the 400 Area. Beginning November 12, Hanford Site refuse has been hauled to the 4843 Storage Building, where it is dumped, sorted, and surveyed before BDI Transfer hauls it away. This activity will continue until a permanent solution is implemented.

5.4.2.2 Transfer Station

Issue: Solid refuse can be radiologically contaminated at the Hanford Site and transported offsite to a municipal landfill for final disposal.	
Discussion: The basic radiological control program is designed and implemented to ensure that radioactive material is managed to prevent loss of control resulting in the compromise of public, employee, and environmental safety. Biological transport vectors have radiologically compromised the solid refuse identified for offsite disposal. A graded-approach radiological verification survey program should be permanently implemented as a final verification before shipment off Site.	*Judgment of Need: Ensure the continued operation of an onsite solid refuse transfer station. Radiological surveys should continue to be conducted using a graded approach to verify the absence of contamination and should continue to be based on the potential source term and history of radioactive material from the generator.*

5.4.2.3 Graded Approach to Preventing Future Releases. A graded approach has been implemented in case the primary barriers fail and a potential release of radioactive contamination occurs. Factors considered in this graded approach include the following:

- Availability of engineering and/or administrative controls
- Proximity to sources of contamination
- The nature of the process generating the refuse
- History of past contamination
- Frequency of activities involving the use of radioactive materials
- Presence of biological vectors or other means to spread contamination
- Detection capability for the type of radioactivity expected to be emitted.

Using these factors, Site facilities or processes were grouped into four categories. Activities within each category will use protective measures commensurate with the probability of radioactive contamination spreading to refuse.[1]

Category 1: No radioactive material use.

Category 2: No ongoing use of radioactive materials. Types of contamination are readily detectable. No alpha radiation.

Category 3: Routine handling or processing of radioactive materials or Radiological Control Areas present in the vicinity. Barriers are in place to control radiological materials, and types of contamination are easily detectable.

Category 4: Same as Category 3, except alpha radiation is present with little or no beta or gamma.

5.4.2.4 Waste Reduction/Minimization

Waste reduction/minimization and pollution prevention has been a continuing goal of the Hanford Site for many years. These activities are promoted throughout RL and PHMC programs and facilities. The purpose of this goal is to reduce the amount of solid refuse generated so as to reduce costs by minimizing the quantity of material that must be handled, surveyed, and disposed of and to promote and support environmental/ecological needs. The Waste Minimization and Recycling Program is functioning and continues to reduce Hanford Site refuse quantities.

However, even though Site refuse quantities are decreasing, the increased visual surveillance of the refuse stream resulting from this incident has revealed some program weaknesses. It appears that excess, usable material from the lay-down yards that should be sent to the recycling facility is, instead, being sent to the offsite landfill. The system that precludes inappropriate items (e.g., hazardous and dangerous waste, recyclable items) from being transported to landfills from the

[1] It is important to heighten the awareness of all Hanford Site workers to the proper handling and disposal of all personal as well as Site-related refuse.

Hanford Site should be improved by enhancing Hanford Site workers' awareness of existing programs to recycle or dispose of material.

5.5 MANAGEMENT SYSTEMS

This section describes the incident response process and highlights those aspects that worked well and those that need to be improved. It also describes our communications process with employees and the media to ensure that Site workers and the public were well informed throughout the incident.

5.5.1 Incident Response Processes

5.5.1.1 Incident Management. This event started as a minor contamination incident and escalated quickly. Every piece of data gathered expanded the scope of the event. As the extent of the contamination spread was discovered with its potential for transport off Site, PHMC management quickly recognized the significance of the event. FDH Management also recognized the need to keep Site employees and the public up to date on the progress of the investigation.

During the event, RL, its contractors, the regulators, and the City of Richland demonstrated excellent teamwork in providing both material and personnel resources to mitigate this situation. Offsite stakeholders were invited to attend working sessions and received daily progress briefings.

The Alternate EOC was the location used during this event. Because the event was not an "emergency," the room was referred to as the Situation Room.

NOTE: This event was not an emergency as defined in the *Hanford Emergency Response Plan*, DOE/RL-94-02 (greater than 100 mrem total effective-dose equivalent). Rather, it met criteria as an "unusual occurrence" per DOE M 232.1-1A, Criteria: Group 2.E, "Any occurrence under any agreement or compliance area that requires notification of an outside regulatory agency within 4 hours or less, or triggers any outside regulatory agency action level."

Roles and responsibilities for responders were established early, communication paths were identified, and response processes were monitored carefully. A large number of government and contractor senior managers demonstrated their commitment to resolving this issue by dedicating their own time to this event and by immediately providing resources wherever necessary. Management responders to the situation were organized into four separate teams. The teams were the Policy Team, the Radiological Coordination Team, the Solid Waste Team, and the Operations Team.

Having an Alternate EOC available for use as a Situation Room is not required. That the Hanford Site has an Alternate EOC is a "good practice" and is above and beyond DOE emergency management order requirements. However, this incident identified a need for some additional level of preparedness for these types of events.

Efficient Actions.

- Established an effective response management and infrastructure in the Situation Room for onsite activities.
- Established and maintained excellent communications with Hanford Site employees and the media.
- Brought in both City of Richland officials and WDOH to provide consultation in responding to this event.
- Communicated well with other teams. The Situation Room was well staffed, contributing to a coordinated effort among the teams.
- Provided access to computer experts, which was highly beneficial to the setup and operation of the Situation Room.

5.5.1.2 Incident Management

Issue 1: The level of preparedness for similar events can be improved if found to be a worthwhile expenditure of resources.	
Discussion: Current emergency procedures, organizations, training, and facilities have been established to deal with high-impact and time-urgent events. However, a more informal process called an "event coordination team" is available. It is intended to deal with less urgent emergency incidents. The event coordination team process could be used for events such as this, if procedures were enhanced to address the flexibility, command, location, and organization of the specific working task groups.	*Judgment of Need: FDH Emergency Preparedness should evaluate the need to enhance event-coordination-team procedures. These procedures should be broadened to include the conduct of operations to deal with similar incidents. Depending on the issue at hand, responsibilities, location, and organization structure should be flexible.*
Issue 2: Some enhancements to the Alternate EOC are needed if it is to serve as a Situation Room for future events.	
Discussion: On activation of the Alternate EOC as the Situation Room, difficulties were encountered when trying to set up computers. The computers were outdated and no pre-established electronic mail boxes were available. Access to computerized mapping capabilities was nonexistent from the Situation Room. Status boards were minimally acceptable.	*Judgment of Need: FDH should enhance the Alternate EOC, including updating the computer equipment, enhancing the status-display process, and reestablishing electronic mail boxes for emergencies and similar situations.*
Issue 3: Several processes went well during this incident. These should be considered for enhancements to emergency response processes.	
Discussion: Communications with Site employees were excellent. Daily messages (as many as three in one day) were transmitted during the peak of the event. Employee "hotline" numbers were useful in helping communicators determine the information that was useful and desirable to employees. Action tracking also was effective.	*Judgment of Need: FDH Emergency Preparedness should evaluate the processes used for this response and determine enhancements that can be integrated into a formal emergency response procedure. Suggested areas include communications with employees, staffing the EOCs with computer experts, and enhancing action tracking and status.*

5.5.1.3 Project Management

Issue: City officials perceived that FDH could have improved their response to the biological vector incident at the landfill in the following areas.

- **FDH should assign a project manager with environmental investigations experience and knowledge of associated Hanford Site work procedures to manage the field activities.**
- **Use field protocols including use of a field logbook, RSR forms, and other documentation to record field activities daily.**

Discussion: The Hanford Site contractors employed a response team that included field managers and radiological control technicians. The PHMC team is accustomed to working on the Hanford Site; however, in this situation the team was working on a site owned by another agency, the City of Richland. Establishing protocols and expectations at the onset will help clarify the roles, responsibilities, and functions of each party. Areas that need improvement include the following. • *Providing project management having environmental investigation experience at the onset.* • *Establishing, with the City, a set of protocols for governing this type of offsite event.* • *Improving field record keeping to capture, as a permanent record, actual events at the site to ensure traceability. Improving communications with landfill management including sharing of field notes and records.*	*Judgment of Need: In the interest of teamwork and accomplishment, improved protocol bridges need to be established. RL and PHMC personnel will review the processes and protocol necessary for responding to offsite events like this with the intent of identifying improvements regarding command and control, communication, work planning functions, and record keeping at the location of the event (particularly off Site).*

5.5.1.4 Notifications

Issue: Definition of notification expectations and interface responsibilities between discovery of a radiological event and formal classification of radiological events minimizes the time for effective intervention for control of offsite delivery of nonradioactive solid waste (refuse).	
Discussion: Overall, notification requirements were satisfied during the initiation of this event and as the event escalated in severity. On three occasions personnel not familiar with notification requirements caused minor delays in occurrence reporting requirements that have been established by DOE and RL. This occurred during initial discovery of contamination outside a radiologically controlled area, discovery of the radiological contamination off Site that was believed to be caused by the operation of a DOE facility, and the immediate reporting of an event or condition to another federal agency. In each of these cases, these errors were promptly identified and rectified.	*Judgment of Need: FDH should develop an ongoing process to identify specific managers and employees who will be required to recognize, categorize, and report occurrences as described in HNF-PRO-060. These individuals are required to attend an Introduction to Occurrence Reporting class. Those individuals who are to be assigned to develop occurrence reports are required to attend the Occurrence Report Writing class.*

5.5.1.5 Reporting Systems. The Hanford Site has several systems used to recognize, respond to, and report adverse conditions.

- The occurrence reporting process (DOE O 232.1A) is used to identify, report, analyze, and track adverse conditions or events in the DOE complex. The occurrence reporting process provides common reporting thresholds across the entire DOE complex. It requires the use of written reports prepared on a computer system. It establishes requirements for discovery, notification, investigation, causal analysis, and tracking of corrective actions. Three levels of occurrence have been identified: off-normal occurrence, unusual occurrence, and emergency. The off-normal occurrence and the unusual occurrence have established reporting thresholds. Emergency criteria are defined by each site's emergency plan.

- The "not classified notification" process is a working agreement regarding nonemergency events, stating that RL and the PHMC team will notify Washington State, Oregon State, the EPA, area tribes, and local emergency planning jurisdictions. After the May 1997 Plutonium Reclamation Facility event, RL and the PHMC team recognized the need to communicate nonemergency events to offsite jurisdictions in a timely manner. A process was developed called "not classified notifications." This process was based on occurrence reporting criteria, but with an increased sensitivity to providing timely notification. Explicit criteria were established, agreed to, and implemented to disseminate not classified notifications in a timely manner.

5.5.2 Employee Communications

The FDH employee communications activities were based on the principles of risk communication. Among these is the understanding that public outcry results when people think that information is being withheld or the information is presented so technically that it is inaccessible. RL and FDH Communications believed that the only way to maintain trust was to communicate openly, specifically, and in lay terms about the contamination spreads. At a meeting on October 4, RL and the FDH Communications personnel agreed that timely and clear information was more important than highly technical information. The deputy manager of RL approved an abbreviated review process that was agreed to on October 6. This process allowed FDH Communications personnel to release messages on only the signature authority of (1) the Vice President of FDH Environment, Safety, Health and Quality, who was the Policy Team lead, and (2) FDH Legal Services.

Eleven all-employee messages were issued between October 5 and 15, three on October 7; another all-employee message was issued on October 29. All messages were distributed via the electronic mail system and included a request that they be printed and posted in all work locations to ensure the widest possible dissemination. Between midnight and 6 p.m. on October 7, one of these all-employee messages was broadcast continuously on the Hanford Site radio station (AM 530). The all-employee messages are included in Appendix F.

A web site was established by October 9. The web site contains maps, information on fruit fly biology and habits, general information on radiation, locations where employees could obtain personal and vehicle surveys, and the text of the all-employee messages. The web site address is http://www.hanford.gov/ safety/conspread/index.html. Fruit fly biology and habits are covered in Appendix J.

Stories were written for the *Hanford REACH* newspaper, appearing as the headline stories on October 19 and 26, with follow-up stories on November 9 and 16 and a summary article on January 4. The *Hanford REACH* articles are included in Appendix G.

Efficient Actions.

- Communication was open, frequent, and thorough. This benefited the Site by limiting rumors and fears, demonstrating proficiency and competency of management, and showing openness and trustworthiness. Proactive communication with workers appears to have had a positive effect. Routine bulletins kept workers informed of the status of the event. The streamlined review process for all-employee messages and *Hanford REACH* news stories was essential to providing timely information. Accessibility of key reviewers also was essential and worked well.

5.5.3 Media Relations

FDH Communications conducted and facilitated extensive media briefings and personal and telephone interviews with regional and national media. The guiding premises were based on risk communication, including the belief that openness builds trust and quells rumors and exaggerated speculation. Work at the Site can proceed effectively only if RL and the PHMC team maintain public trust.

The local newspaper, the *Tri-City Herald*, received anonymous tips about the contamination incident. In all known cases, the newspaper called FDH Communications to ask for comment. These calls allowed the team to ensure that accurate information was printed.

Senior PHMC management delivered timely and factual information to the public through media briefings, an Internet web site, and broadcasts on the Hanford radio station. These briefings gave the public the information they needed to understand the event and its associated hazards.

FDH Communications organized two large media briefings, one on October 5 and one on October 7, with staff from FDH, DYN, and the City of Richland as the principal spokespersons. FDH Communications also facilitated at least 28 other interviews, some face to face and some by telephone. The RL Office of External Affairs provided assistance and guidance in many of these interviews. The following media were included:

- Associated Press, Yakima
- *Defense Cleanup* Magazine
- *Harper's* Magazine, New York City
- KDKA Radio, Pittsburgh
- KEPR-TV, Tri-Cities
- KIRO-TV, Seattle
- KNDU-TV, Tri-Cities
- KOMO Radio, Seattle
- KONA Radio, Tri-Cities
- KVEW-TV, Tri-Cities
- KXLY Radio, Spokane
- *New Scientist* Magazine, Great Britain
- Northwest Cable News
- *Nucleonics Week* Magazine (McGraw Hill)
- *RADWASTE* Magazine
- *Tri-City Herald.*

A compilation of news stories written about the contamination incident is included in Appendix G.

5.5.4 City and Regulatory Interface

On September 30, 1998, where the investigation team determined that contaminated refuse might inadvertently have been shipped to the City landfill, DYN and FDH notified RL and City of Richland officials of possible contamination at the City landfill. Refuse shipments to the City landfill were immediately suspended. RL immediately notified the Washington State Department of Ecology and WDOH of the potential contamination issue, and an RL representative was identified as the WDOH point of contact.

In the initial meeting about the event on September 30, it was determined that the contractors would take the lead in establishing the pathway for resolving the issue. Further, it was determined that the issue was more complicated than contaminated refuse and that actions to resolve the issue raised contractual questions. As a result, four investigation teams were established and included RL representatives as well as contractors. The teams formed were a Policy Team responsible for management direction and overall issue coordination including outreach and public relations; an Operations Team responsible for meeting coordination, records, minutes, information flow, and Situation Room coordination; a Solid Waste Team responsible for coordinating all physical actions necessary to carry out (especially) immediately required actions (e.g., removal and transport of solid refuse); and a Radiological Coordination Team, to support the Solid Waste Team as well as provide insight and investigative expertise into the root cause of the event. Negotiations with the City of Richland were left to the RL representatives.

The discussions with the City of Richland involved issues related to removing radioactive contaminated refuse from the City landfill as the investigation progressed and dealing with any subsequent problems identified in that cleanup effort. One such issue was the need to obtain an NOC from the WDOH and EPA to remove identified radiologically contaminated refuse from the City landfill. The preparation and regulator approval of the NOC were completed within 48 hours through a collaborative effort by RL, contractors, WDOH, and EPA. At the same time, the breadth and scope of the cleanup were discussed. With participation from the Washington State Department of Ecology and the WDOH, the extent of the area to be uncovered and surveyed and the amount of material to be removed were defined. On completion of the landfill survey and removal effort, a report was submitted to the Richland City Council on December 8. The Council accepted the City engineering report that RL indeed had met its commitment regarding the cleanup.

Concurrently, RL held a number of meetings with city engineering staff and management to determine the conditions under which the Site could resume shipments of refuse to the City landfill. As the contractors and RL reviewed refuse pickup practices on the Site, they realized that refuse picked up from the various locations posed different levels of risk of radiological contamination and that verification surveys were needed to confirm that radiological controls at the source were still effective. A related issue arose concerning the surveys at the City landfill, the frequency of the surveys, and the need for an operating transfer station.

Taking into consideration that refuse pickup locations have different levels of risk, a draft memorandum of agreement was arrived at with the City that contains a table defining the extent of radiological surveillance and control for all locations on the Hanford Site and, in essence, defines a new policy under which the Site would transfer or transport solid refuse to the City

landfill. During the December 8 City Council meeting at which the Council agreed that the landfill cleanup was complete, the Council provided the City Manager with the authority to negotiate and sign a memorandum of agreement with RL that would permit sending Hanford Site refuse to the City landfill. The City Manager's authorization included the provision that a radiological consultant be secured, at a cost not to exceed $100,000 to be paid for by RL, to assist in reviewing and establishing the City's program for refuse acceptance. RL requested that the contract be renegotiated or amended before transport of Hanford Site refuse to the City landfill is resumed. A draft contract modification subsequently was submitted to the City for review and consideration on December 22, 1998.

Refuse on Site began accumulating beyond capacity. Negotiations with the City were protracted, and treating normal refuse as though it were contaminated and burying it in low-level trenches is unduly expensive. Accordingly, other disposal options were pursued concurrently. RL opened negotiations with other service entities, to ensure that a disposal service is always available. On November 10, 1998, DYN signed a basic ordering agreement with BDI Transfer of Pasco, Washington, for the disposal of nonhazardous, nonradioactive refuse generated at the Hanford Site.

The graded-approach process was developed to verify that the refuse is not contaminated, consistent with the memorandum of agreement with the City. The process will verify that the refuse to be handled by BDI Transfer is uncontaminated. RL is continuing negotiations with the City of Richland. Meanwhile, RL and its contractors are evaluating longer term options for refuse disposal.

5.6 OPPORTUNITIES FOR ENHANCED OPERATIONS

Radiological Control	• Radiological monitoring of PHMC waste streams (liquid, gaseous, and solid) should be consistent in approach and application among contractors, subcontractors, and facilities (e.g., consolidate/exchange data, integrate biological vector control, integrate surveys). • Testing and evaluation of products, equipment, and techniques should consider special-handling requirements and potential impacts to the environment, including possible pathways for loss of control.
Integration	• Interface between radiological and biological experts should take place during the planning of operations to ensure protective measures. • During loss-of-contamination-control recovery efforts, a project or work manager should be assigned immediately to that location.
Laboratory Capabilities	Onsite laboratory capabilities need to be funded at such a level that they can quickly respond to analysis needs for onsite events. This includes, in particular, quick-turnaround laboratory analysis in support of emergency response to onsite radiological contamination events. Recommended enhancements include the following. • Obtain contingency funding to support unexpected operational requirements. • Establish clear priorities for all laboratory work, giving precedence to event support. • Maintain staffing levels and equipment that can support reasonable laboratory workloads, allowing nonpriority work to be backlogged when necessary, so that unacceptable programmatic impacts are avoided when emergency work is being performed. • Explore feasibilities, needs, and benefits of including a mobile field laboratory. • Maintain a list of resources, capabilities, and their locations. • Explore the feasibility of a standby arrangement with an offsite laboratory to handle increased sample-analysis requirements during an event. The implementation of these enhancements will ensure a timely response to emergency needs.

6.0 CONCLUSIONS

This chapter summarizes the report conclusions and the lessons learned during the event and provides recommended actions geared to specific judgments of need.

6.1 LESSONS LEARNED

The following information is from *Project Hanford Lessons Learned: Contamination Spread Outside of Radiation Control Areas by Fruit Flies*, 1999-RL-HNF-0001, presented in Appendix I, and accessible online at http://www.hanford.gov/lessons/sitell/ll99/199901.htm.

An effective radiological control program is vigilant in protecting the workers, the public, and the environment and recognizes the possibility of identifying new vectors for spreading contamination. Glycerin/monosaccharide-based fixatives used to hold radioactive contamination in place may attract insects that subsequently can spread contamination. The biological vector, fruit flies, had not been identified previously within the DOE complex and, therefore, was not considered by operations personnel.

Radioactive contamination can be spread by multiple mechanisms, including vegetation and animals. Operations must be monitored and controlled to preclude as many of those transport pathways as possible. Monitoring must be thorough enough to detect unexpected contamination spread. Response systems must be able to contain and control contamination until the spreading mechanism is identified and controlled.

Public reaction to the spread of contamination off Site can be minimized by proactively addressing public health and safety concerns and perceptions through the following:

- Releasing frequent timely status reports to all employees, local news media, and government officials on containment and cleanup efforts
- Monitoring for offsite effects to show that the community is not at risk. In this event, flying-insect traps were set up outside site boundaries to verify that no fruit flies carried contamination beyond the Hanford Site
- Conducting bioassays on request
- Conducting surveys of personal effects on request.

6.2 RECOMMENDATIONS

Judgments of Need	Corrective Actions
Management • Commitment is needed for evaluating and implementing report recommendations	• Prepare an action plan for analyzing, ranking, and implementing judgments of need and report recommendations. Complete and successful implementation of the action plan will ensure the following: - Hanford Site programs and policies produce an integrated approach to safeguarding against new vectors. - The Hanford Site is systematically prepared to respond to similar events and protect Site workers, the public, and the environment.
Project Management Protocol bridges need to be established between RL and the PHMC team and the municipalities and regulators who will be involved in responding to events such as this. When working with an offsite agency on the agency's property, RL and the PHMC team need to be sensitive to the agency's work practices and protocols.	• Evaluate the need for procedures to establish the following, both onsite and offsite: - Command and control - Assigning project managers with the proper skills for the task - Establishing and maintaining adequate communication with offsite organizations - Creating and maintaining field records - Establishing a work planning process that ensures work proceeds safely and quickly.

Judgments of Need	Corrective Actions
Strategic Planning	
• An integrated long-term strategy is needed for the control of biological encroachment and subsequent contamination transport.	• Implement routine inspections of all Category 2, 3, and 4 facilities to ensure containment integrity. • Implement the findings for contamination control in DOE/RL-98-77, *Control of the Spread of Radioactive Contamination Due to Biological Transport on the Hanford Site.* • Improve integration of biological vector control by assigning responsibility for coordinating appropriate and necessary control of biota-related contamination spread to a single office within FDH to cut across contractor boundaries. • Integrate uniformity in mitigation and cleanup scope and timeliness. • Maintain biological vector control through planned operation phases.
• The potential for other biological vectors (e.g., tumbleweeds, moths, birds, snakes, pocket gophers) to encroach on waste sites and transport contamination needs to be evaluated.	• Review the literature for indications that organisms, other than those identified at the Hanford Site, have been involved in contamination transport. • Review the effectiveness of current notification and information exchanges among Hanford Site contractors to identify actual and potential contamination pathways, and improve where necessary. • Exchange "lessons learned" from other DOE sites relating to contamination spread by biological vectors.

Judgments of Need	Corrective Actions
Training	
• Staff acting as spokespersons for PHMC need to be better trained in Site and operations geography.	• Provide extensive Site tours and training for such staff so they can orient themselves quickly to the surrounding conditions and hazards in emergency and near-emergency situations. • Train these people in media relations and risk communications.
• Hanford Site workers need an enhanced awareness of the importance of keeping refuse quantities as low as reasonably achievable, precluding nonconforming material from entering the refuse disposal (landfill) process, recycling equipment and material, and using recycled products more consistently.	• Initiate an action that emphasizes educating refuse generators (workers) to reduce the amount of refuse generated, to dispose of all refuse appropriately, and to eliminate nonconforming material from refuse collection.
• Media relations training of senior managers needs to be enhanced.	• Provide training in media relations and risk communications principles to the staff potentially involved as PHMC spokespersons, including managers and leads.
• Managers and others need training in occurrence reporting and occurrence report writing.	• Develop a process to identify those who may report occurrences or write occurrence reports and require them to attend appropriate training classes.
• Food substances and refuse need to be kept from areas near potential contamination.	• Promote worker awareness concerning inappropriate areas for eating and discarding food substances.
Barriers	
• Routine refuse monitoring methods need to be established to verify continued integrity of primary protective measures at facilities.	• Establish a permanent refuse-monitoring and transfer facility or provide comparable statistical verification that monitoring is working.
• Biological vector control and maintenance procedures need to be reviewed to ensure that they provide means to prevent pest incursions into inactive facilities.	• Expand the Site pest control program to include routine surveillance of all facilities to evaluate and recommend the need for control measures so that an inactive facility does not act as a reservoir for potential pest species. • Evaluate all refuse containers and install screens and guards wherever animal encroachment is possible.

Judgments of Need	Corrective Actions
• Fixatives and other products need to be evaluated for their potential to act as a biological attractant.	• Prepare procedures for the testing and use of fixatives, and other products, in and on contaminated areas (approval by the FDH Office of Biological Control, Fire, Safety, Security, etc.) • Cease using food-based products (e.g., glycerin/monosaccharide) or ensure adequate barriers to access by biota.
• Procedures for removing covers and barriers or otherwise exposing contaminated surfaces need to be reviewed.	• Revise procedures to ensure that adequate barriers to access by biota are in place before exposing contaminated surfaces. • Assess the need, coordinate with the FDH Office of Biological Control, and implement where necessary, to provide biological vector control before, during, and after exposure of contamination.
• Routine and frequent inspection is needed of contaminated areas and facilities with intrusion potential to assess continued barrier integrity.	• Assign responsibility for barrier inspection to the FDH Office of Biological Control. • Integrate corrections of noted deficiencies through the "Integration Office." • Ensure that intrusion potential is examined in routine facility operations and maintenance.
Detection • The environmental monitoring activities need to be enhanced to ensure early detection of contamination spread.	• Review frequency and scope of radiation surveys at all Hanford sites and facilities, increase coverage of monitoring potential biological vectors (such as flying insects) to determine where increased frequency and scope are warranted, including locations of past contamination spread.
• Contractors need to share routine radiation surveillance data.	• Establish a "clearing house" for sharing radiation surveys among neighboring contractors and with Site Environmental Monitoring.

Judgments of Need	Corrective Actions
Sample Management	
• Procedures are needed to identify staff to coordinate and prioritize radiological-sample analysis, determine source terms of facilities, and determine standard sample geometries.	• Develop current and concise radiological source-term technical data packages.
Prompt Response	
• Response teams need to be established for situations that are not true emergencies.	• Identify staff who may be likely to serve as PHMC spokespersons. • Evaluate and designate emergency and near-emergency procedures and levels of activation. • Identify staff needed to lead and participate on ad hoc teams. • Revise procedures to grant injunctive powers to those conducting situation investigations so that essential operations are not disturbed. • Teach people assigned to response teams how to develop effective communication channels, how to run effective meetings, how to limit extraneous input, and how to control agendas.
• Procedures are needed for team and event coordination; facilities and resources need upgrading.	• Prepare proposal on evaluating cost effectiveness of upgrading procedures and facilities to manage near-emergency events.
Cleanup	
• Prompt and adequate cleanup of identified contamination spread is needed.	• Assign priority to the immediate mitigation of contamination spread. • Assign necessary cleanup equipment (e.g., tumbleweed or garbage compactors) and personnel to ensure timely mitigation of contamination spread. • Integrate cleanup and mitigation with surveillance.

7.0 REFERENCES

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APPENDIX A

BIOASSAY AND INTERNAL DOSIMETRY

To determine if a worker or a member of the public has inhaled or ingested any radioactive contamination, a test or bioassay can be performed to quantify the amount of radioactive material inside the body. If the radioactive material decays with the emission of a gamma ray, as does cesium-137 (^{137}Cs), an array of sensitive gamma detectors or a whole-body counter can measure the amount of radioactive material in the body. If the radioactive material such as strontium-90 (^{90}Sr) in the body does not emit a gamma ray during decay, the urine or feces of the individual can be collected for a time period, then analyzed in a laboratory by beta counting to determine the amount of radioactive material in the bodily wastes. The body always eliminates some of the radioactive material, and the elimination is at a known rate. If radioactive material is detected, the dose to the individual can be calculated. The whole-body count and urinalysis are two of the bioassay tests used as part of the internal dosimetry performed at the Hanford Site.

The Hanford Radiation Protection Program routinely performs bioassays on workers to ensure that the programs and equipment to prevent intakes of loose surface contamination and airborne contamination in the workplace are performing properly. During an incident where contamination may have been inhaled or ingested, special bioassays of the individuals are performed. Negative results of these special bioassay procedures constitute determinations that no radioactive material has been taken into the individual's body.

During this event, 106 workers have received special bioassays. To date, 105 bioassay results have been received, and none of the test results have detected indications of intakes. (One person who is on short-term disability did not turn in a bioassay kit.)

On September 29, beta/gamma contamination was discovered on an ironworker's boot and personal belongings (e.g., lunch sack, vehicle door handle). Special bioassay was triggered because of the potential for the worker to receive an intake of radioactive material. A whole-body count that evening showed no indication of an intake of ^{137}Cs. Because no characterization data were yet available for the worker, a combination plutonium and ^{90}Sr urinalysis also was ordered for the worker. (On October 10, that bioassay result was reported as negative, i.e., there was no indication of an intake of plutonium or ^{90}Sr.)

DynCorp Tri-Cities Services, Inc., personnel who accompanied the worker to the whole-body counter performed a home radiation contamination survey that evening (September 29). During the survey of the ironworker's home, contamination was detected on five socks (two socks measured 5,500 disintegrations per minute [d/min] per 100 cm^2; two socks measured 3,500 d/min per 100 cm^2; one sock measured 250 d/min per 100 cm^2). At the worker's request, the worker's spouse received a whole-body count and urinalysis on October 5. Both bioassays failed to detect indications of an intake.

Because contamination was found behind B Plant, a meeting was held September 30, 1998, with personnel who had worked in that area. Because that area was not radiologically controlled, it

was not possible to determine from radiological work permits who had worked there. At the meeting, the internal dosimetry technical authority asked the management and craft personnel who were present to identify workers who had been in the contaminated area for follow-up whole-body counts and ^{90}Sr urinalysis. As a follow-up to that meeting, 40 personnel were scheduled to receive special whole-body counts and ^{90}Sr urinalyses to determine if they had received intakes of ^{137}Cs or ^{90}Sr. All whole-body counts and ^{90}Sr urinalyses for these workers were negative, i.e., gave no indication of intakes.

Early in October, the source of the contamination was suspected as having originated in the 241-ER-152 Diversion Pit behind B Plant. The tank farm internal dosimetry technical authority was asked to review radiation work permits for work at that location and to identify those workers who had the highest potential for intakes of radioactive material. Twenty-nine additional workers were identified for special bioassay follow-up. Characterization data for the work area around the 241-ER-152 Diversion Pit and the area behind B Plant show that the contamination consisted primarily of ^{90}Sr with smaller amounts of ^{137}Cs. Based on these characterization data, ^{90}Sr bioassay was determined to be the best special bioassay for these and all subsequent workers who were connected with this incident. Those bioassays were scheduled for delivery to the workers on October 14, 1998.

That list of tank farm workers was expanded to include all 29 workers who had performed work in the 241-ER-152 Diversion Pit. Bioassay results have been received for 28 of these workers and those results were negative.

An additional 6 workers were placed on special bioassay, based on their concerns regarding the spread of contamination and potential for inhaling or ingesting contamination. The results for these workers were negative.

APPENDIX B

CONTAMINATION RISK AND LABORATORY ANALYSIS

B1.0 RISK ASSOCIATED WITH CONTAMINATION

The workers, general public, and environment were never at significant risk for health and safety effects from this incident. The very small amount of contamination carried by each insect resulted in low, dispersed levels of contamination that presented no significant health risk.

Radiological contamination is radioactive material, in any chemical or physical form, that is outside the controlled containment of a capsule, tank, or other device designed to confine it. The Hanford Site contains large amounts of radioactive material left over as waste from the weapons production mission of the last five decades. The Project Hanford Management Contract (PHMC) team is stabilizing and cleaning up this waste in all its forms and placing it in secure storage. Many processes, including natural chemical and biological forces, can release the waste from containment, enabling it to enter the environment. The policies and procedures of the PHMC team have a primary goal of providing effective surveillance programs and equipment to prevent contamination spread and of detecting and immediately containing any unexpected release.

The spread of contamination by fruit flies had not been seen in the 200 East Area to this time. Fruit flies (like other animals) can pick up radioactive material in the form of a light powder or dust or a liquid that would dry into a powder or dust on their bodies if the place where the flies eat, lay their eggs, or develop as larvae is contaminated with radioactive material. When the fly lands, the contamination will come off on whatever it touches, and if the radioactive material is in the food or drink of the animal, the radioactive material will be excreted though normal body processes. The contamination is then left on the surface of a material that can be transported to another location or picked up by a person. This small amount of material can be eaten or inhaled if blown into the air, or can stick to a person's clothing or skin. If the contamination is ingested or inhaled, the radioactive material intake will expose the individual from the inside and is called internal exposure. If the contamination ends up on the skin, it will produce external exposure. These exposures are the hazards, and the risks from the radioactive contamination are proportional to the type of radiation and its exposure.

B1.1 INTERNAL CONTAMINATION EXPOSURE IMPLICATIONS OF THE INCIDENT

During the extensive bioassay monitoring performed on Site employees who worked in the vicinity of the event, no instances were identified where onsite personnel received measurable radiation exposure from this spread of contamination. Conservative bounding calculations indicate that the potential radiation exposures from this spread of contamination are not significant to either workers or members of the public.

Strontium urinalyses were performed for workers who worked in the 241-ER-152 Diversion Pit and the area behind B Plant during and preceding the time of the spread of contamination by fruit flies. Worker internal exposure was a concern initially because some of these workers spent most of their workday in facilities in this area working and even eating their lunches. In the workers tested who were most at risk for inhaling or ingesting contamination, no indication of any intake of radioactive materials has been found in cesium-detecting whole-body counts or strontium urinalysis bioassays. These bioassays are extremely sensitive, capable of detecting radioactive material with a resulting dose of far less than 1 millirem.

Elevated contamination levels were found in some fruit flies. In one extreme instance approximately 260 nanocuries of strontium-90 (^{90}Sr) were found on 9 contaminated fruit flies that were captured in the same flying-insect trap. Ingestion of all 9 fruit flies would result in a 50-year committed-effective-dose equivalent of approximately 34 millirem. By comparison, the average member of the public receives 360 millirem of background radiation exposure each year, of which 39 millirem come from naturally occurring radioactive potassium-40 (^{40}K) in the body.

An evaluation of impact was performed for recovering radioactive contamination that was transported to the City landfill as a result of this incident[1]. This evaluation concluded that the unabated offsite dose to the maximum exposed individual from removing this contamination from the City landfill and transporting it back to the Hanford Site was 3.33×10^{-3} millirem per year (0.003 millirem per year). It was postulated that if the contamination in the landfill were to spread, it would be transported as blown dust.

B1.2 EXTERNAL SKIN DOSE IMPLICATIONS OF THE INCIDENT

No case is known of fruit flies transferring any radioactive material to the skin of a person at the Hanford Site. However, a conservative scenario for such an occurrence would consist of a fly landing on a person's skin and being crushed such that all the radioactive material from the fly would be transferred to the person's skin. Based on the analysis measurements of the quantity of radioactive material on the nine trapped fruit flies mentioned above, a single fruit fly would contribute about 0.03 microcuries of radioactive material (^{90}Sr) to the skin of the person. If that material stayed on that spot on the skin for a week, the total dose to a small area of skin would not be sufficient to produce any noticeable effect to the skin (National Council on Radiation Protection (NCRP) Report No. 106, pages 10-11[2]). A more plausible scenario for contamination exposure to the skin would be for a small percentage (5 to 10 percent) to be left by the fly on a surface from which it would be spread over some area of skin, which again would not produce a noticeable effect to the skin.

Any loss of control of contamination is considered unacceptable and results in every reasonable effort to prevent and control any contamination spread.

[1] Letter, Anita J. Frankel, U.S. Environmental Protection Agency, to J. E. Rasmussen, RL, "Notification of Approval for Construction in Recovery of Radioactive Material from the Richland Landfill at the 200 Areas of the Hanford Site," WMH-9858724, dated October 8, 1998.

[2] National Council on Radiation Protection (NCRP) Report No. 106.

B2.0 DATA ANALYSIS REPORT

B2.1 INTRODUCTION

From late September through early November 1998, an approximately 2.5 hectare (6.2-acre) area at the Hanford Site's 200 East Area came under intense scrutiny to determine the source of an unexpectedly high number of radioactive contamination discoveries. The area is immediately southwest of B Plant and contains facilities and areas under the supervision of five different Hanford Site contractors or major subcontractors (Bechtel Hanford, Inc.; B&W Hanford Company; Lockheed Martin Hanford Corporation; DynCorp Tri-Cities Services, Inc.; and Waste Management Federal Services of Hanford, Inc.), four of whom, in addition to Fluor Daniel Hanford, Inc. (FDH), and the U.S. Department of Energy, Richland Operations Office, would have some involvement in the incident.

Biota-related transport of radioactive contamination had been observed and tracked in this area since at least 1982. Past monitoring records indicate that Russian thistle (*Salsola kali*), also known as tumbleweed, harvester ants (*Pogonomyrmex owyheei*), and deer mice (*Peromyscus maniculatus*) had been observed to be frequent contributors to contamination transport (i.e., vectors), often with significant loss of equipment and the need for expensive cleanup actions. The most recent (summer 1998) significant contamination spreads had been caused by deer mice at the 241-ER-151 Diversion Pit and at B Plant's K-3 Filter Pit Encapsulation Facility. Discovery of additional contamination at the nearby MO-967 Mobile Office, used as a lunchroom, was first thought to be related to these incidents.

Increased surveys found contamination in places not typical of mouse- or ant-caused contamination. The contamination was found to be associated with discarded food and food containers in places such as refuse cans, on walls, and in dumpsters. A radiological control technician (RCT) conducting a radiation survey at the lunchroom observed a speck of contamination fly away, alerting environmental monitoring personnel that a new vector for contamination spread had to be considered and new methods for survey had to be adopted. Fruit flies of the genus *Drosophila* were observed to be prevalent in the lunch trailer and throughout the area. Flying-insect traps baited with fruit were placed at each facility in the immediate area and near potential contamination sources in the 200 West Area. The traps at the southwest of B Plant in the 200 East Area quickly collected contaminated fruit flies, while those at the 200 West Area or at other 200 East Area locations did not. Only one contaminated fruit fly was discovered outside the immediate 2.5 hectare (6.2-acre) area. It was found at the U.S. Ecology site.

B2.2 PURPOSE

The Data Analysis team was formed to evaluate the radiological contamination data being collected as a result of the contamination event in and around the affected area and to determine the likely vectors for the spread of contamination and potential sources of contamination. The team also coordinated field-generated data and transmission of samples to, and reception of analytical results from the three laboratories conducting the analyses (the 100-K Spent Nuclear

Fuels Counting Facility, the 222-S Analytical Services of Waste Management Laboratories, and the 325 Radiochemical Processing Laboratory).

B2.3 BACKGROUND AND DESCRIPTION OF THE EVENT AND AFFECTED AREA

On September 28, 1998, numerous cases of low levels of radioactive contamination were found outside areas established for contamination control. The discovery, on September 28, of contamination in and around the MO-967 Mobile Office was the product of increased surveillances being performed in response to numerous discoveries of contamination in the area over the previous 60 days. These discoveries included contaminated ant mounds, a contaminated beetle, mouse droppings in a lunchroom in B Plant, a high-contamination area caused by contaminated mouse feces discovered under the hood of a government truck, and contaminated deer mice at several locations.

The affected area totaled approximately 2.5 hectares (6 acres) and is located just south of B Plant in the 200 East Area. Facilities in the area include the B Plant K-3 Filter Pit Encapsulation Facility; several offices and change and lunchroom facilities such as the MO-967 Mobile Office; the 241-ER-151 and 241-ER-152 Diversion Pits; the 2245-B Sheet Metal Shop; and the 2247-B Ironworker's Shop.

Contamination also was discovered off Site during a survey of an employee's home, where socks worn at work were discovered with very low levels of contamination. This survey was initiated after the employee's work boots were found to be contaminated during a routine exit survey.

Subsequent investigations resulted in the discovery that contaminated refuse had been delivered to the City of Richland Landfill. Preliminary investigations, based on the nature of the waste and the isotopic mix of the contamination, suggested that the contamination found in the City landfill likely originated from the 241-ER-152 Diversion Pit and was spread to foodstuff, refuse, and other locations directly by fruit flies and secondarily by cross contamination. While isotopic analyses of fruit flies found only strontium and cesium, two mice captured in the contaminated area at this time showed a 1:1 strontium-to-cesium ratio and included other radionuclides including europium, plutonium, and uranium.

B2.4 ISOTOPIC FINGERPRINT AS A TOOL TO IDENTIFY SOURCES OF CONTAMINATION

It is a reasonable practice to attempt to use isotopic fingerprints (the qualitative identification of the isotopic species in combination with their quantitative ratios) to help identify where and/or when contamination has occurred and to determine if the suspect material is from a specific event or location. In this incident the only radioactive isotopic species identified in significant-enough quantities to obtain reliable counting statistics were cesium-137 (^{137}Cs) and ^{90}Sr/yttrium-90 (^{90}Y). Some samples showed trace amounts of alpha contamination (<10 disintegrations per minute). The ratios of strontium and cesium differed widely in the affected areas (from approximately 3:1 to 184:1). Because of this broad range, the

contamination has no readily identifiable fingerprint that allows the material to be verified as being from a common source. However, because many of the samples had ratios well in excess of what is "normal" (1:1 to 1:5) for the 200 Areas, it was suspected that something unusual had occurred in the area at or around the time of discovery.

B2.5 VECTOR DESCRIPTIONS AND EXAMPLES

The team identified several vectors that could have caused the findings of radioactive contamination in and around the affected area. These include human- and work-related events and activities, deep-rooted vegetation, rodents, ants and other burrowing insects, and flying insects (fruit flies). Each of these vectors has had an effect on the contamination status of the affected area.

B2.5.1 Human- and Work-Related Events.

Operations in the area over the last 55 years clearly have affected the contamination status. Recently a contamination spread occurred as a result of ongoing work at the 241-ER-152 Diversion Pit. Contamination resulting from releases originating from the B Plant stack and filter change-outs also is well documented. These events have resulted in the direct spread of contamination in the affected area. These spreads that occurred in the last decade all are well documented and were remediated when they were first discovered.

B2.5.2 Vegetation.

The spread of contamination resulting from vegetation growing into underground contamination and raising it to the surface is well documented at the Hanford Site. Tumbleweeds and other vegetation have contributed to the contamination in the affected area. Some limited discoveries of contaminated vegetation occurred in the area, but no evidence has been found of contaminated vegetation contributing directly to contamination spreads in the immediate area in this case.

B2.5.3 Mammals.

The role of mice and other rodents as vectors of contamination spreads is well documented. The most prevalent mammals involved in spreading radioactive contamination are house mice, deer mice, and cottontail rabbits. Mammal-caused contamination spread can be in two forms. The first is the direct contamination spread via transfer of contamination from the skin surface to the surroundings if the mammal is externally contaminated from direct contact with loose contamination. The second can be the result of the animal ingesting contaminated foodstuffs and depositing contaminated excreta throughout an area.

Mammal-caused contamination spread in and around the affected area has a long history. The contamination spread at the B Plant K-3 Filter Pit Encapsulation Facility was the result of

rodents entering the filter box and ingesting contaminated materials, as well as receiving external contamination. Mice and their feces were identified as the causative agents during the heightened awareness of the affected area before the primary contamination event. It has been reported that the individuals whose boots were contaminated stated that they had to "dump" mouse feces out of their boots that had been stored in the 2247-B Ironworker's Shop. While contaminated rodents clearly have infested this area recently, no conclusive evidence has been found of current contaminated-rodent infestation in this area beyond residual contamination left by mouse feces.

B2.5.4 Ants and Other Burrowing Insects.

Another prevalent biological vector for contamination spread in and around the affected area is burrowing insects such as harvester ants. The contamination can result from the insects bringing back to their nest or consuming contaminated food materials or burrowing into contaminated soils.

The affected area has had numerous identified contamination spreads as a result of ant and burrowing-insect activities. During the time in question, this vector was evaluated and several contaminated anthills were identified in the affected area. Because of differences in isotopic ratios, it appears that the majority of the contamination was the result of ants bringing contaminated soil or mouse feces to their mounds.

B2.5.5 Fruit Flies.

The fruit fly is a new biological vector of radioactive contamination. Inspections after the incident indicated that fruit flies had access through small holes to the 241-ER-152 Diversion Pit. Fruit flies could have had access to the pit during work activities that took place on September 15. The fruit flies probably emerged and contaminated the MO-967 Mobile Office and nearby garbage dumpsters and other facilities sometime after September 25, 1998. The flies continued to be a contamination source in the area for several weeks.

B2.5.6 Human Vectors and Cross Contamination.

The human vector and subsequent cross contaminations are not an independent source of contamination, but rather a secondary contamination of items and locations that likely resulted from human contact. Examples of this include the September 29 discovery of a contaminated door on a van (G41-40356) used by ironworkers, a hard hat found contaminated in the same room with a worker's contaminated lunch bag (RSRSS249379), a contaminated boot and accompanying socks discovered on September 29, and a contaminated floor mat discovered in front of a hand and foot monitor on October 4.

B2.6 CORROBORATING AND CIRCUMSTANTIAL DATA.

Discussions with some of the RCTs who performed the surveys of the MO-967 Mobile Office and dumpsters, the affected area release survey, and surveys at the City landfill, revealed that they felt that the bulk of the contamination should be attributed to the fruit flies. They described the contamination as very spotty, small localized areas of contamination, normally associated with where foodstuffs were present or where transfer of food and juices occurred. They reiterated that other avenues for contamination were present in and around the affected area and that they had identified contaminated gloves, mouse feces, and anthills.

The boot and sock contamination incidents cannot confidently be associated with any specific contamination pathway. The owners of the boots, who leave the boots in the 2247-B Ironworker's Shop during nonworking hours, stated that they have found mouse feces in their boots. However, no recently discovered contaminated mouse feces have been identified as coming from the 2247-B Ironworker's Shop. The boots had not been worn in contaminated areas for several weeks before the event. However, the boots may have been contaminated by a fruit fly as they hung on the wall of the 2247-B Ironworker's Shop.

B2.7 CONCLUSION

Although several biotic vectors of radioactive contamination in the area southwest of B Plant have been identified (e.g., tumbleweeds, ants, beetles, mice, rabbits), both current field observations and sample analysis data indicate that fruit flies contacting contamination in the 241-ER-152 Diversion Pit were the primary vector involved in the radioactive contamination that reached the City landfill in September 1998. Even so, the historical data and the recent event indicate the need to better understand the biological vectors and to better control the spread of contamination from these sources.

B2.8 RECOMMENDATIONS

- Create an integrated program that cuts across contractor boundaries for monitoring and cleaning up contamination under the control of FDH. The goal is to prevent recontamination of areas that have been cleaned and prevent the contamination of currently clean areas.
- Integrate contaminated pest (vegetation and animal) control into a proactive program rather than responding to problems on a facility-by-facility "budget-available" basis.
- Better coordinate and use existing surveillance and monitoring resources.
- Implement communication between contractor monitoring groups and overall PHMC environmental monitoring groups.

- Create a clearinghouse for sharing existing sources (e.g., annual environmental reports, historical contamination documents) of contamination incident status to include FDH, all major subcontractors, and other Site contractors.

- Establish procedures for timely resolution of contamination spread problems.

- Develop an integrated approach to handling all environmental contamination data using standard terminology, reporting format, and expectations.

- Develop a mechanism to ensure complete and timely isotopic analysis of environmental contamination data.

APPENDIX C

INVESTIGATIVE TEAM CHARTERS AND MEMBERS

To deal with this incident effectively and expeditiously, the Project Hanford Management Contract (PHMC) investigative team formed four specific subteams (Policy, Radiological Coordination, Solid Waste, and Operations) to gather facts relevant to the contamination issues. Personnel from Fluor Daniel Hanford, Inc., (FDH) and DynCorp Tri-Cities Services, Inc. (DYN) led these teams, which consisted of personnel from PHMC companies and the U.S. Department of Energy, Richland Operations Office (RL). These teams were formed to gather facts relevant to the contamination issues and respond to all situations as dictated by the unfolding events.

C1.0 POLICY TEAM CENTER

C1.1 CHARTER

The Policy Team was chartered to provide overall management direction and oversight. This included communications to employees, communications with regulators, communication to the City of Richland, and communication to the media. In addition, this team maintained an infrastructure to support the conduct of operations, record keeping, and communications within the Situation Room and the task teams. This team comprised senior PHMC and RL management.

C1.2 TEAM MEMBERS

Name	Organization	
R. L. Shoup – Lead	FDH	Vice President, ESH&Q
M. D. Dallas	DYN	Senior Vice President and Deputy General Manager, Operations
C. R. DeLannoy	DYN	Senior Director, ESH&Q
R. S. Frix	DYN	President and General Manager, Infrastructure Services
M. S. Gerber	FDH	Senior Communications Specialist
T. J. Harper	FDH	Director, Infrastructure
J. E. Mecca	RL	Deputy Assistant Manager, Facility Transition
N. D. Moorer	RL	Team Leader, Assistant Manager for Facility Transition Business Management Team
D. J. Ortiz	RL	General Engineer, Site Infrastructure

C2.0 RADIOLOGICAL COORDINATION TEAM

C2.1 CHARTER

The Radiological Coordination Team was chartered to implement radiological control and logistical requirements in addition to conducting an investigative process aimed at identifying the source of the contamination. General biological-vector-control management needs were included in this scope. Specific assigned team activities include the following:

- Execute random radiological sampling of vehicles in and out of the 200 East Area
- Determine the location of past use of sucrose/glycerin-based contamination fixing materials
- Assign resources to study the biological contamination transfer theories
- Control the fruit fly problem, for both the short and long terms
- Identify all potential contamination-linked activities in the vicinity of the 200 East Area
- Review past and present employee database for information.

The team comprised predominately PHMC radiological managers and waste management employees involved in the Biological Vector Control Program.

C2.2 TEAM MEMBERS

Name	Organization	
G. D. Perkins-Lead	FDH	Director, Radiation Protection
E. J. Adams	WMH	Manager, Radiation Control
S. L. Bump	BWHC	300 Area Radiological Control Manager
G. J. Funk	FDNW	Manager, Construction Site Services
W. M. Glines	RL	Senior Technical Radiological Controls Advisor (Facility Transition)
S. M. Henry	LMHC	Tank Farm Support Manager (Radiological Control)
J. R. Holladay	FDNW	Manager, Construction Operations
A. R. Johnson	WMNW	Manager, Integrated Biological Control (Environmental Monitoring and Investigations)
R. Ni	FDH	Acting Director, Conduct of Operations
W. E. Ross	LMHC	Acting Director, Characterization and Stabilization Projects
R. A. Schieffer	DYN	Radiological Control Manager
J. A. Sneed	DYN	Senior Safety Engineer
P. J. Townsend	FDH	Project Manager
R. L. Watts	FDH	Radiation Protection

C3.0 SOLID WASTE TEAM

C3.1 CHARTER

The Solid Waste Team was chartered to work issues concerned with the removal and transport of solid refuse within the Hanford Site and to the City landfill. DYN management made up the majority of this team. Their focus was to investigate and document waste removal from potentially contaminated areas. This team also conducted operations within the City landfill to identify, isolate, recover, and dispose of potentially contaminated material. They worked with the other teams to establish the protocol for screening refuse, so that refuse-hauling operations could be restarted after the event was concluded.

C3.2 TEAM MEMBERS

Name	Organization	
W. A. Ferree-Lead	DYN	Senior Director, Logistics
J. A. Bates	FDH	Senior Environmental Engineer
L. T. Blackford	WMH	Manager Technical Operations
B. J. Dixon	DYN	Manager, Environmental Programs & Compliance
K. A. Hadley	BWHC	Manager, Environmental & Regulatory Compliance
D. S. Kelly	FDH	Principle Engineer (Infrastructure)
D. S. Merry	WMH	Lead, Pollution Prevention/Waste Minimization
D. J. Ortiz	RL	General Engineer (Site Infrastructure)
W. E. Ross	LMHC	Acting Director, Characterization and Stabilization Projects
T. C. Savage	DYN	Transportation Operations Manager

C4.0 OPERATIONS TEAM

C4.1 CHARTER

The Operations Team was chartered to maintain an infrastructure to support the conduct of operations, record keeping, and communications for the situation room and the task teams. This team comprised FDH Emergency Preparedness management and staff.

C4.2 TEAM MEMBERS

Name	Organization	
R. E. DeBusk-Lead	FDH	Director (Emergency Preparedness)
M. E. Armstrong	FDH	Secretary (Facility Emergency Preparedness)
R. W. Bechtol	FDH	Emergency Preparedness Specialist
M. E. Brown	FDH	Manager, DOE-EP Support
D. J. Connell	FDH	Manager, Occurrence Reporting & EOC Operations
A. L. Dazo	FDH	Emergency Preparedness Specialist
C. D. Donley	DYN	Clerk (Planning & Integration)
S. M. Faulk	FDH	Manager, Facility EP Support
J. M. Hammons	FDH	Principle Scientist (DOE Emergency Preparedness)
G. A. Lovejoy	FDH	Emergency Preparedness Specialist
D. A. Marsh	DYN	Emergency Preparedness Advisor
S. K. Meyer	FDH	Emergency Preparedness Specialist
S. L. Pederson	FDH	Secretary (Emergency Preparedness)

APPENDIX D

CAUSAL ANALYSIS

D1.0 INTRODUCTION

A causal analysis was performed by the Fluor Daniel Hanford, Inc.(FDH) Radiation Protection Department and Project Hanford Management Contract (PHMC) contractor personnel to determine the root, direct, and contributing causes for the 200 East Area contamination event and determine judgments of need to prevent the conditions leading to each cause.

The event was the spread of radioactive contamination outside of a posted radiological area in the 200 East Area. The spread resulted in identification of contamination in uncontrolled areas of the Hanford Site and minimal offsite contamination including contamination identified in the City landfill. The root cause of the event was inadequate processes to prevent contamination via biological vectors (fruit flies) from spreading contamination outside of radiological areas (contamination areas). The direct cause of the event was the flying insects (fruit flies) that spread contamination from the 241-ER-152 Diversion Pit to controlled and uncontrolled areas in or near the 200 East Area. Fruit flies had never before been identified as a contamination spread vector in the U.S. Department of Energy complex Several contributing causes, including the application of a glycerin/monosaccharide (simple sugar)-based contamination, and the site processes and surveillance are explained.

This appendix explains the event root-cause analysis and the process used to determine the root cause, the direct cause, and the contributing causes of the incident. It identifies the causes and discusses the factors considered in determining the causes:

- Operations in the 241-ER-152 Diversion Pit
- Use of simple sugar-based contamination fixatives
- Vectors and transport pathways for the contamination spread
- Pick-up and delivery of refuse to the landfill
- Use of an offsite landfill.

Sections D.4 through D.6 describe the findings of the analysis and provide suggested remedial actions that can be taken to prevent another similar event.

D2.0 DEFINITIONS

Event. A real-time occurrence (e.g., pipe break, valve failure, spread of radioactive contamination).

Root Cause. The cause that, if corrected, would prevent recurrence of this and similar occurrences. The root cause does not apply to this occurrence only, but has generic implications to a broad group of possible occurrences.

Direct Cause. The cause that directly resulted in the occurrence.

Contributing Cause. A cause that contributed to an occurrence but, by itself, would not have caused the occurrence.

D3.0 DISCUSSION

On the Hanford Site, radioactive material that is present in the facilities, tanks, process equipment, underground waste sites, and contaminated surfaces is contained in posted radiological areas. These posted radiological areas are located within areas of the Hanford Site that are further controlled for radiological purposes. It is the PHMC policy that all personnel, equipment, and material that leaves any posted radiological area containing contamination or airborne radioactivity areas is surveyed for radiological contamination, to the limits that allow uncontrolled release to anywhere on or off the Hanford Site. Barriers, work processes, and surveillance, both routine and event generated, implement the PHMC policy that there will be no contamination spread outside of posted radiological areas.

On September 28, 1998, surface contamination was identified in and outside of an office/change trailer (the MO-967 Mobile Office) in the area immediately south of the B Plant/WESF facility. The finding of contamination outside of a posted radiological area initiated vigorous investigations, surveys, and mitigation actions. In the next days and weeks, contamination was identified primarily in the area south of B Plant/WESF, but also in some locations outside the controlled areas of the Site. In addition, minimal amounts of contamination were identified offsite in the City landfill and on socks in the home of a Site ironworker.

This causal analysis report compiles investigations and analyses of the FDH Radiation Protection Department into the contamination spread event. Included are the results and conclusions from a team of FDH and PHMC contractor personnel, activated during the event, that analyzed and reported on the radiological contamination data that had been collected in and around the affected areas. This team analyzed the likely vectors for the spread of the contamination and the potential sources of the contamination. In addition, this report includes results of an investigative committee of FDH and PHMC contractor personnel that was focused on the events and processes that led to the contamination of the City of Richland Landfill. This committee used the REASON™ event process model, software developed by Decisions Systems, Inc., to assist in explaining why and how the landfill contamination occurred.

™REASON is a trademark of Decision Systems, Inc.

D3.1 OPERATIONS IN THE 241-ER-152 DIVERSION PIT

The work at the 241-ER-152 Diversion Pit on September 15, 1998, consisted of opening the pit and disconnecting flexible jumpers. The pit had been sprayed with fixative on September 10, 1998, in preparation for this work. The fixative application during this work activity was performed with a sprayer that was not long enough to reach the bottom of the pit. This contributed to the contamination spread during the work activity and may have compounded the amount of contamination spread by the fruit flies. A large amount of water was introduced into the pit during the work activity; this rinsed away some of the fixative and contributed to the localized spread of contamination. This is relevant to the fruit fly scenario only because water can serve as an attractant to fruit flies. This was not the only source of water in the area.

A contamination spread occurred during jumper work and was investigated as a potential cause of the contamination spread to the City landfill. This contamination spread associated with the work activity was determined not to be a factor in the spread of contamination to offsite locations. During the preparation and work process, fruit flies may have been attracted to or were isolated in the pit, where they were able to breed in the residual water and fixative in the pit. These contaminated fruit flies have been identified as a major contributor to contaminated refuse later transported to the City landfill. Some discussion centered on the application of fixative during the work activity and the presence of large quantities of water.

D3.2 USE OF GLYCERIN/MONOSACCHARIDE (SIMPLE SUGAR)-BASED FIXATIVE

A contamination fixative was used in the 241-ER-152 Diversion Pit on September 10, 1998. A good radiological practice is to use fixatives to help keep contamination from becoming airborne when work disturbs surfaces. This particular fixative was obtained from a contractor and consisted of a monosaccharide and glycerin in a water solution. The contractor either applies this fixative for clients as a fog, using an ultrasonic aerosol generator, or sells the solution directly to companies for their own application. This thin coating fixes radiation only temporarily because it washes away easily. This material has been used at the Hanford Site for the past 2 years without any problems (Table D-1). During this application, however, the material attracted or, at least provided a food source for, fruit flies. There is no indication that the manufacturer or anyone using this fixative at the Hanford Site performed a formal study of the potential of the material to attract or support biota. The levels of contamination in the 241-ER-152 Diversion Pit were sufficient to result in the contamination subsequently found on the fruit flies.

The fixative is sold by the manufacturer with an expiration date. Controls are in place to prevent the fixative from being issued in its original container after the expiration date, but no controls are in place to prevent its use once the fixative is issued or transferred to secondary containers. In the field, the fixative is stored in its original containers and sprayers, without any controls. This includes being stored in outside temperatures during the hot summer that immediately preceded this event. Sprayers are not cleaned between uses. Fixative in a sealed bottle has been reported to build up gas pressure after prolonged storage. When this gas is released, an odor similar to rotting fruit occasionally has been noted. This odor could enhance the attractiveness of the fixative to fruit flies.

Table D1. Selected Examples of the History and Use of Glycerin/Monosaccharide (Simple Sugar)-Based Fixatives at the Hanford Site.

Company	Date of Fixative Use	Facility Structure ID #	Sub-ID #	Fixative Applier	Fixative Type	Application Method	References (e.g., Technical Work Document #)	Comments
LMHC	Unknown	244-A						10/96? 1st use at 244-A, per LMHC
LMHC	Unknown	244-A						Per LMHC list
LMHC	Unknown	244-A						Per LMHC list
LMHC	Unknown	244-A						Per LMHC list
LMHC	03/01/97	244-A						Per LMHC list
LMHC	03/01/97	241-A	A-A pit					Per LMHC list
LMHC	04/01/97	241-A	A-A pit					Per LMHC list
BWHC	12/01/97	Tk-100	Vault	Vendor	Sugar	PAG	WESF work package #2B-97-01258/w	Per Vendor; confirmed by WESF
LMHC	02/01/98	241-AN	AN-B pit					Per LMHC list
LMHC	02/01/98	241-AW	02E pit					Per LMHC list
LMHC	02/01/98	241-A	A-A pit					Per LMHC list
LMHC	03/01/98	241-AN	AN-A pit					Per LMHC list
LMHC	03/01/98	241-A	A-A pit					Per LMHC list
LMHC	05/01/98	241-A	A-A pit					Per LMHC list
LMHC	06/01/98	241-ER	ER-153					Per LMHC list
LMHC	06/01/98	241-AW	02E pit					Per LMHC list
LMHC	06/01/98	241-A	A-A pit					Per LMHC list
LMHC	07/01/98	241-AY	02A pit					Per LMHC list
LMHC	07/01/98	241-AY	02D pit					Per LMHC list
LMHC	07/01/98	241-A	A-A pit					Per LMHC list
LMHC	08/01/98	241-A	A-A pit					Per LMHC list
LMHC	09/01/98	241-ER	ER-152	LMHC				Per LMHC list
LMHC	Unknown	244-A	Pit	Vendor	Sugar	PAG		Per Vendor list
LMHC	Unknown	244-A	filter pit	Vendor	Sugar	PAG		Per Vendor list
LMHC	Unknown	241-AY	102-A process pit	Vendor	Sugar	PAG		Per Vendor list
LMHC	Mar-98	241-AN	AN-A valve pit	Vendor	Sugar	PAG		Per Vendor list
LMHC	Feb-98	241-AN	AN-B valve pit	Vendor	Sugar	PAG		Per Vendor list
	Unknown	233-S	pipe trench	Vendor	Sugar	PAG		Per Vendor list
LMHC	Unknown	244-TX	DCRT pit	Vendor	Sugar	PAG		Per Vendor list

BWHC = B&W Hanford Company.
DCRT = double-contained receiver tank.
LMHC = Lockheed Martin Hanford Corporation.
PAG = passive aerosol generator.
WESF = Waste Encapsulation and Storage Facility.

D3.3 VECTORS AND TRANSPORT PATHWAYS FOR THE CONTAMINATION SPREAD

During the contamination event, the PHMC Radiological Coordination Team identified a Data Analysis team, consisting of Site radiation protection professionals. Their task was to evaluate the radiological contamination data being collected as a result of the contamination event in and around the affected area and to determine the likely vectors for the spread of contamination and potential sources of contamination. The Data Analysis team was formed to aid in the immediate control and ensuing investigations of the contamination event. The team also was to provide conclusions and recommendations to management for the continuing radiological control programs.

The Data Analysis team's conclusions supplement the causal analysis efforts. The team identified several vectors and pathways that could have resulted in the radioactive contamination found in and around the affected area:

- Human- and work-related events and activities
- Deep-rooted vegetation
- Rodents
- Ants and other burrowing insects
- Flying insects (fruit flies)
- Human vectors and cross contamination where personnel contacted the contamination.

Each of these vectors and pathways has had an effect on the contamination status of the affected area. They are discussed more thoroughly in Appendix B.

The team concluded that fruit flies contacting contamination in the 241-ER-152 Diversion Pit were the primary vector involved in the contamination spread that resulted in identification of contamination outside of controlled areas of the Site and offsite in the landfill.

D3.4 PICK-UP AND DELIVERY OF REFUSE TO THE CITY LANDFILL

The dumpster at the MO-967 Mobile Office was emptied at approximately 7:45 a.m., September 28, 1998. Refuse inside the MO-967 Mobile Office was discovered to be contaminated at approximately 8:45 a.m. that day. This resulted in more surveys, including one performed at 11:30 a.m., of the nearly empty dumpster outside the MO-967 Mobile Office, which also was found to be contaminated. The garbage truck containing the contents of the dumpster from the 7:45 pick-up dumped its load at the City landfill at approximately 1:30 p.m. If the group that manages the refuse pickup service (Transportation Operations) had been promptly notified that the contents of the dumpster might be contaminated, the material might not have been dumped at the City landfill. Two additional loads of contaminated waste were dumped at the City landfill before Transportation Operations finally was notified at a meeting on September 30. At that time, refuse dumping ceased.

D3.5 USE OF AN OFFSITE LANDFILL

A potential for inadvertent transfer of radiological contamination to an offsite landfill had been recognized at the Hanford Site for some time. To address that issue, early in fiscal year 1992 the Site developed Project L-063, Solid Waste Transfer Station, to build an onsite transfer station where refuse could be surveyed before release for offsite disposal. However, the project was not funded and was canceled in January 1992. In October 1995, the U.S. Department of Energy, Richland Operations Office (RL) entered into a contract with the City of Richland to use the City landfill for disposal of nonradioactive, nonhazardous solid refuse. The Hanford Central Landfill was closed down on March 31, 1996.

The City of Richland Landfill Contract, Section B-2, states:

> *"The City of Richland will construct a facility to review wastes received under this contract. This facility will be amortized by all revenues received by all users of the facility during the life of this contract. If revenues received by all wastes using this facility during any federal fiscal year are less than $432,900 DOE shall pay the city the difference between the actual amount received and $432,900. This payment shall be made in the first quarter of the federal fiscal year after billing to DOE by the City of Richland."*

D4.0 ROOT CAUSE

ROOT CAUSE:

Inadequate processes to prevent contamination via biological vectors (fruit flies) from spreading contamination outside of radiological areas (contamination areas).

JUDGMENT OF NEED:

Strengthen the implementation of existing administrative and engineering radiological controls, and establish new programs and processes to identify all potential vectors (including biological) and prevent the spread of contamination.

D5.0 DIRECT CAUSE

DIRECT CAUSE:

Flying insects (fruit flies) spread contamination from the 241-ER-152 Diversion Pit to controlled and uncontrolled areas in or near the 200 East Area.

JUDGMENT OF NEED:

Prevent accessible conditions (e.g., open containment) to contaminated work locations and attractant conditions (e.g., moisture, nutrients) for flying insects.

D6.0 CONTRIBUTING CAUSES (CC-#)

CC-1 The contamination fixative used on the 241-ER-152 Diversion Pit is suspected of attracting fruit flies.	
Investigation Findings:	*Judgments of Need*:
• *The fixative has not been evaluated to see if it is an animal attractant.* • *No system is in place to ensure that fixative issued from the stockroom is not used beyond the manufacturer's expiration date and that secondary containers are controlled.* • *No assessment has been performed to determine appropriate conditions for storing fixative after it is issued from the stockroom.* • *Formal processes have not been established for cleaning containers, including sprayers, before introducing fixative from a new batch*	• *The use of glycerin/monosaccharide-based fixatives should be stopped until it can be demonstrated that they are not an animal attractant.* • *All fixatives, including those currently used at the Hanford Site, should be studied to determine if they have the potential to act as an animal attractant.* • *A system should be established to ensure that fixative is not used beyond the manufacturer's expiration date and that secondary containers are controlled.* • *Temperature effects should be studied before fixatives are allowed to be stored at elevated temperatures.* • *Fixative processes should be modified to include provisions for containers, including sprayers, to be emptied and cleaned following each application.* • *Containers of fixatives in the field should be stored consistent with their contents.*

CC-2 No procedure exists to interdict refuse service when contamination is detected.	
Investigation Findings: The group that manages the refuse pickup service was not promptly notified that the contents of dumpsters might be contaminated. If the garbage truck drivers had been promptly notified, the volume of potentially contaminated waste dumped at the City landfill would have been significantly reduced or might have been eliminated. *No requirement is in place for surveying refuse before it is picked up. An intermittent survey of dumpsters is conducted.*	*Judgments of Need:* • *Establish a system to notify Transportation Operations of any suspect contamination that inadvertently may have been picked up.* • *Establish a method for controlling or determining the contamination level of refuse in dumpsters before the refuse is moved off site.*

CC-3 No policy is in place establishing routine surveys of areas with past known contamination spreads caused by biological transport vectors.	
Investigation Findings: The August 4, 1998, discovery of a contamination spread via a biological transport vector (rodents) at the B Plant K-3 Filter Pit Encapsulation Facility resulted in an alert to surrounding facilities to increase their radiological surveillances. This communication was informal.	*Judgments of Need: Establish a policy requiring routine surveys of areas with past known contamination spreads caused by biological transport vectors.*

CC-4 The current policy of protecting contaminated facilities from biological intrusion does not provide for a proactive review of potential intrusion points with preventive corrective actions.	
Investigation Findings: Potential sources of intrusion are not readily apparent until a contamination event has occurred. The detection of intrusion opportunities is not currently part of required surveillances of contaminated systems.	*Judgments of Need:* Incorporate *routine surveillances of contaminated facilities and systems with biological intrusion potential into facility operations and maintenance.*

CC-5 The Project Hanford Management Contract (PHMC) team has not adequately integrated Sitewide biological control.	
Probable Cause: The change from a Management and Operating contract to the current PHMC resulted in a fractured organization. DynCorp Tri-Cities Services, Inc., has been tasked with resolving this issue. This new program is in its infancy and was not established at the time of the fall 1998 contamination.	*Judgments of Need:* • *Biological control should be integrated. A review of Sitewide services should be performed to determine if needs could be met better by integrating all biological control efforts among contractors.* • *The roles and responsibilities of biological control at the Hanford Site need to be clarified.*

CC-6 No policy is in place to prevent animal encroachment at refuse collection points.	
Investigation Findings: Animals in search of food are attracted to dumpsters, gaining access through openings. This is especially true of mice entering through bung openings on the bottom of dumpsters that allow for water drainage.	*Judgment of Need: Establish requirements to keep dumpsters closed when not in use and to install access guards or screens on the bottom drainage openings.*

CC-7 No policy is in place to minimize food substances from being located near known contamination areas.	
Investigation Findings: Mice, flying insects, and other animals are attracted to food.	*Judgment of Need: Evaluate the need for requirements to control food substances, including refuse, from entering areas near known sites with contamination spread potential.*

APPENDIX E

FLYING-INSECT MONITORING TRAP LOCATIONS

Flying-Insect Monitoring Trap Locations				
Area	Facility	Description	Date Placed	Date Removed
100-B	MO-474	Entry Gate	10/08/98	11/25/98
100-D	Main Gate	Entry Gate	10/08/98	11/25/98
100-F	Main Gate	Route 1 Turnoff	10/08/98	11/25/98
100-H	Main Gate	Route 1 Turnoff	10/08/98	11/25/98
100-K	MO-382	Dumpster	10/08/98	11/25/98
100-N	1515-N	Dumpster	10/08/98	11/25/98
200 East	241-ER-152	Southeast Corner *	10/08/98	12/02/98
200 East	241-ER-152	Southwest Corner *	10/08/98	12/02/98
200 East	241-ER-152	Northeast Corner *	10/08/98	12/02/98
200 East	241-ER-152	Northwest Corner *	10/08/98	12/02/98
200 East	MO-967	Inside *	10/08/98	11/30/98
200 East	MO-967	Inside *	10/08/98	11/30/98
200 East	MO-958	North Side *	10/08/98	11/30/98
200 East	225-B	Dumpster	10/08/98	12/02/98
200 East	MO-410	Dumpster	10/08/98	12/02/98
200 East	2704-HV	Dumpster	10/08/98	11/30/98
200 East	2711-E	Dumpster	10/08/98	12/02/98
200 East	2707-E	Dumpster	10/08/98	12/02/89
200 East	273-E	Dumpster	10/08/98	11/25/98
200 East	MO-388	Dumpster	10/08/98	12/02/98
200 East	7th & Baltimore	Fence Line	10/08/98	11/25/98
200 East	241-BX	Dumpster	10/08/98	12/02/98
200 East	241-BY	Dumpster	10/08/98	11/25/98
200 East	241-B	Dumpster	10/08/98	11/25/98
200 East	Gate 811	Outside Perimeter	10/08/98	11/25/98
200 East	Gate 810	Outside Perimeter	10/08/98	11/25/98
200 East	2025-EA	Dumpster	10/08/98	12/02/98
200 East	241-AN	Dumpster	10/08/98	12/02/98
200 East	241-AZ	Dumpster	10/08/98	12/02/98
200 East	MO-953	Dumpster	10/08/98	12/02/98
200 East	272-AW	Dumpster	10/08/98	12/02/98
200 East	241-AX	East Fence	10/08/98	12/02/98
200 East	Gate 808	Outside Perimeter	10/08/98	11/25/98
200 East	2750-E	Dumpster	10/08/98	12/02/98
200 East	2101-M	Court Yard Dumpster	10/08/98	12/02/98

Flying-Insect Monitoring Trap Locations				
200 East	Canister Storage Construction Site	Ice Machine	10/08/98	12/02/98
200 East	2701-HV	Gate	10/08/98	11/25/98
200 East	244-A	North Fence	10/08/98	12/02/98
200 East	244-A	East Fence	10/08/98	11/30/98
200 East	MO-966	North Porch *	10/08/98	12/02/98
200 East	242-A	Back Side Fence Line	10/08/98	12/02/98
200 East	MO-273	West Side	10/08/98	12/02/98
200 East	MO-386	West Side	10/08/98	11/25/98
200 East	216-B-10B	Dumpster	10/08/98	11/30/98
200 East	2750-E	Northwest of Building	10/12/98	11/25/98
200 East	218-E-12B	North of Trench 42	10/13/98	11/25/98
200 East	218-E-12B	North of Trench 42	10/13/98	11/25/98
200 East	241-AN B Pit	North of Pit	11/03/98	11/17/98
200 East	241-AN B Pit	South of Pit	11/03/98	11/17/98
200 West	MO-956	Inside Lunch Room	10/08/98	11/25/98
200 West	2723-W	North Side	10/08/98	11/25/98
200 West	MO-409	Dumpster by 233-S	10/08/98	11/25/98
200 West	MO-556	Dumpster	10/13/98	11/25/98
200 West	218-W-3A	Trench 13	10/13/98	11/25/98
200 West	218-W-3A	Trench 13	10/13/98	11/25/98
200 West	218-W-3A	Trench 13	10/13/98	11/25/98
200 West	218-W-3A	Trench 13	10/13/98	11/25/98
300	305	Dumpster	10/12/98	12/04/98
300	331	Dumpster	10/12/98	12/04/98
300	337	Dumpster	10/12/98	12/04/98
300	350	Dumpster	10/12/98	12/04/98
300	3709-A	Dumpster	10/12/98	12/04/98
400	4843	Inside Garbage Transfer Facility	11/17/98	
400	4843	Inside Garbage Transfer Facility	11/17/98	
400	4843	Inside Garbage Transfer Facility	11/17/98	
400	4843	Inside Garbage Transfer Facility	11/17/98	
400	4843	Outside Garbage Transfer Facility	11/17/98	
400	4843	Outside Garbage Transfer Facility	11/17/98	
600	Cross-Site Transfer Line	241-EW-151 East Fence	11/04/98	12/02/98
600	Cross-Site Transfer Line	241-EW-151 West Fence	11/04/98	12/02/98

Flying-Insect Monitoring Trap Locations				
600	609	Fire Station Dumpster	10/08/98	11/25/98
600	609-A	Fire Station Dumpster	10/08/98	11/25/98
600	Hanford Town Site	School	10/08/98	11/25/98
600	White Bluffs	Bank	10/08/98	11/25/98
600	U.S. Ecology	Dumpster *	10/08/98	12/02/98
600	U.S. Ecology	Shop Lunch Room	10/30/98	12/02/98
600	U.S. Ecology	Office Lunch Room	10/30/98	11/30/98
600	U.S. Ecology	WA Department Of Health	10/30/98	12/04/98
600	U.S. Ecology	WA Department Of Health	10/30/98	12/04/98
600	U.S. Ecology	WA Department Of Health	10/30/98	12/04/98
600	South of B Pond	Air Sampler (PNNL)	10/21/98	10/28/98
600	West Lake	West Side of Lake (PNNL)	10/21/98	10/28/98
600	Northeast 100-D	Apricot Orchard (PNNL)	10/21/98	10/28/98
600	White Bluffs Landing	Boat Launch (PNNL)	10/21/98	10/28/98
600	Hanford School	NE Corner on Fence (PNNL)	10/21/98	10/28/98
Off Site	Ringold	Fir Road (PNNL)	10/21/98	10/28/98
Off Site	Basin City	Elementary School (PNNL COESP)	10/21/98	10/28/98
Off Site	North of Pasco	Edwin Markham Elementary School (PNNL COESP)	10/21/98	10/28/98
Off Site	North Richland	Air Sampling Station (PNNL)	10/21/98	10/28/98
Off Site	Horn Rapids Road & Highway 240	Air Sampling Station (PNNL)	10/21/98	10/28/98
Off Site	Highway 240	Vernita Bridge Rest Stop	10/08/98	11/25/98
Off Site	Richland Landfill	East of Radiation Buffer Area	10/10/98	12/04/98
Off Site	Richland Landfill	East of Radiation Buffer Area	10/10/98	12/04/98
Off Site	Richland Landfill	East of Radiation Buffer Area	10/10/98	12/04/98
Off Site	Richland Landfill	East of Radiation Buffer Area	10/10/98	12/04/98
*Flying-insect traps where contaminated fruit flies were collected.				

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APPENDIX F

ALL-EMPLOYEE MESSAGES

The establishment of an employee communications system early in the fall 1998 200 East Area biological vector contamination event, coupled with frequent and regular updates thereafter, proved to be a successful implementation of "risk communication theory" in practice.

It was decided early on that Hanford Site employees should be kept informed of unfolding events either simultaneous to, or immediately following, notification of management. The adage that if one is not given information, one will speculate (usually negatively) was the principle on which the communicators operated. Therefore, every attempt was made to inform employees of the latest findings and developments *as soon as* they became available, with no detail spared. Successful execution of this function can be attributed to U.S. Department of Energy, Richland Operations Office management giving full responsibility to Fluor Daniel Hanford, Inc., as the single point of contact. Had this responsibility not been under a single point of contact, the messages would not have been as prompt or as effective.

The operating principle of early, frequent, easily accessible, and detailed employee communication proved to be successful, based on the feedback that the communications team received. Several employees and their family members expressed appreciation of the efforts of the communications team to keep speculation to a minimum.

The following pages are exact copies of the all-employee General Delivery e-mail messages that were sent out via the Hanford Local Area Network to every computer on Site.

GENERAL DELIVERY MESSAGES ON HANFORD INTRANET:

10-05-98	Contamination Spread Outside of Controlled Areas
10-07-98	Update on Contamination Spreads
10-07-98	Additional Update on Contamination Spreads
10-07-98	Waste Minimization to Prevent contamination Spreads
10-08-98	Thursday Update on Contamination Spreads
10-09-98	Thank You!
10-09-98	Friday Update on Contamination Spread
10-12-98	Contamination Spread Questions and Answers
10-12-98	Trash Collection
10-13-98	Tuesday Update on Contamination Spreads
10-15-98	Update on Contamination Spreads
10-29-98	Update on Contamination Spreads

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GENERAL DELIVERY MESSAGE
OCTOBER 5, 1998

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TO: All FDH and Subcontractor Company Employees

FROM: Robert Shoup, vice-president, FDH Environment, Safety and Health, and Robert Frix, president, DynCorp Tri-Cities Services, Inc.

SUBJECT: CONTAMINATION SPREAD OUTSIDE OF CONTROLLED AREAS

This message is to provide you with updated information as we work to resolve this issue.

Low levels of radioactive contamination were found outside of Hanford Site radiation control areas in eleven separate locations *last week, prompting the formation of a Project Hanford Management* Contract (PHMC) investigative team and the isolation of an area just south of B-Plant in the 200-East Area.

Contamination was detected in a dumpster, two Site garbage trucks, two mobile office trailers, five other buildings, a government van, and on the personal belongings of one worker. The contamination has now been isolated in the area near B-Plant in the 200-East Area. Intensive radiological surveys were started last Wednesday in the affected area, which measures about 500 yards by 200 yards. Radiological control personnel have posted and roped off the area, they are controlling access, and conducting surveys of all personnel and equipment that leave the area. Although two contaminated spots were found in the 200-West Area, those areas have been decontaminated and released to normal operations.

All employees known to work in the affected area have been contacted and surveyed. Four contaminated socks were discovered at *the home of one Hanford worker, but no other contamination* has been detected off-Site. Whole-body counts were conducted at the Pacific Northwest National Laboratoryps in vitro assay facility on any persons requesting them. Thus far, approximately 40 people have undergone the assay with no contamination found. Radiological surveys will continue to safeguard any other employees who may have been in the contaminated vicinity last week.

Any contamination outside of radiation zones on the Hanford Site or elsewhere is unacceptable. We take any contamination spreads very seriously, and we are committed to making sure that such events don't happen again.

Before the contamination was found on the garbage trucks, one of them transported a load to the Richland City landfill. Although it is not known that any contaminated solid waste reached the

Richland landfill, DynCorp Tri-Cities Services, Inc. and Fluor Daniel Hanford, Inc, (FDH) officials notified city officials soon after discovering the first contaminated spot on a garbage truck. They then began a series of joint planning discussions between PHMC investigative team members and city officials. An initial radiological survey of the city landfill found no contamination.

Weather permitting, excavation of potentially affected areas of the landfill is beginning today, under the joint supervision of personnel from the Washington Department of Health, the city, FDH and DynCorp. Deliveries of Hanford solid waste to the Richland landfill have been halted temporarily.

The contamination was discovered during routine radiological surveys last Monday in a trailer used by craftspeople just south of B-Plant in the 200-East Area. Immediately, surveys were extended to facilities and dumpsters in the 200-East Area, to vehicles and facilities Site-wide that are used by these crafts, and to many additional locations. An occurrence was declared, and notifications were made to city, county, and state officials, the Department of Energy (DOE), Richland Operations Office and to DOE headquarters.

Worker safety is our highest priority. We are open and ready to provide information or surveys to anyone concerned. The PHMC investigative team will continue to meet daily until the contamination source has been identified, decontaminated and all areas returned to normal. A lessons learned critique will be performed to identify future protective measures.

Site employees wanting additional information can tune to radio AM530 (the Hanford Site broadcast channel), or can call the DynCorp information line at 373-1212. Employees who wish to have questions answered may leave a recorded message on the DynCorp hotline at 376-4055. As new information is discovered, it will be disseminated through additional employee communications. □

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GENERAL DELIVERY MESSAGE
October 7, 1998

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TO: All FDH and Subcontractor Company Employees

FROM: Bob Shoup, vice president, Environment, Safety and Health, FDH, AND Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: UPDATE ON CONTAMINATION SPREADS

We promised to update you with more information, as it becomes available, regarding contamination spreads outside of radiation control zones on the Hanford Site.

We have now found contamination on fruit flies, gnats and other pests on wet garbage in three areas, two of which are in the area that was roped off last week just south of B-Plant in 200-East Area. Contaminated fruit flies also have been trapped on pest strips in other locations in the specified area.

Additionally, we found contaminated fruit flies on garbage in a trash can just outside of the Canister Storage Building, about 1/4 to 1/3 mile west of the roped off area in 200-East Area. The Spent Nuclear Fuel Project, which is constructing the Canister Storage Building, has suspended work in that facility as a precautionary measure until such time as the pests are eradicated there. We are conducting an extensive health physics survey in the facility to confirm that it is free of contamination before we allow activities to resume there. Managers of the Spent Nuclear fuel project will communicate with the 8-10 affected employees regarding their return to work.

Pests such as ants, gnats, fruit flies, and rodents occur naturally both on and off the Hanford Site. On the Hanford Site, we conduct general periodic sprayings to control these pests, and we have now stepped up spraying and fumigating activities in areas where the flies have been found.

The pests may be related to the contamination spreads outside of radiation control zones that we reported to you on Monday. It is possible that they constitute a transport method for the spread of contamination, which was first detected in a mobile office trailer and which now has spread to the locations reported Monday, to two additional facilities just south of B-Plant, and to three garbage cans.

The Canister Storage Facility is the only areas outside of the roped-off area near B-Plant where new contamination has been found this week. The other facilities where contamination has been found (or has been found on garbage nearby) is limited to the roped-off area near B-Plant, including the 212B, 225BE, 272BC, 274E, 275E, 2245B, 2707E, 2711E, 2719E, 2721EA, MO958, MO959 and MO967 facilities. In the 200-West Area, contamination was found and decontaminated last week in two facilities. No further contamination has been detected in the 200-West Area.

None of the contamination is of the alpha type, which means that none of it is associated with plutonium. We have confirmed that

the contamination is composed principally of strontium-90.

All information on this situation will be conveyed to you as soon as we learn it, and we will provide frequent updates as warranted. The employees on the Hanford Site, and the citizens of the Tri-Cities, have a right to know that they are living and working in a safe and healthful environment. We pledge to answer your questions and to persevere in finding, containing and controlling all sources of contamination that could spread outside of controlled areas.

To keep track of information in a single clearing house, we have established a situation room in the 2420 Stevens Center Building. For more information, or to provide new facts, send a cc:mail to David Marsh or call him at 376-9573 or 376-9596.

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GENERAL DELIVERY MESSAGE
October 7, 1998

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TO: All FDH and Subcontractor Company Employees

FROM: Bob Shoup, vice president, Environment, Safety Health, and Quality, FDH, AND Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: ADDITIONAL UPDATE ON CONTAMINATION SPREADS

We would like to provide you with more information about the steps being taken to address the recent contamination spreads outside of controlled radiation areas. On Monday, representatives of the Project Management Hanford Contract (PHMC) companies, the City of Richland, the Washington Department of Health, and the Department of Energy (RL) met for mutual discussion of the situation. Later that day, the PHMC Company and City representatives briefed the public media and answered their questions. Additionally, they formed an integrated action team with three major sub-teams. The teams are meeting daily, with RL, other Hanford contractors, the Washington Department of Health, and others.

The integrated team is headed by Dr. Bob Shoup, FDH vice president for Environment, Safety, Health and Quality, and by Bob DeLannoy, DynCorp senior director for Environment, Safety, Health and Quality. Other key members include Tom Harper, director of Infrastructure for FDH, Bob Frix, president and general manager of DynCorp, and Mike Dallas, operations director for DynCorp.

The Radiological Control sub-team is headed by Greg Perkins, radiological control manager for FDH. This team is working actively to survey for contamination in the area that has been posted and roped off just south of B-Plant in the 200-East Area and in any other areas where contamination is reported or suspected; and to search for the cause(s) and source(s) of the contamination. This team also is working with pest control personnel from Waste Management Services Northwest (WMNW), to trap, investigate and develop plans to eradicate pests that may be causing contamination spreads. A decision is expected within the next 24 hours as to spraying methods, pesticides, and methods and times of application.

Thus far, beta-emitting radiation contamination has been found at levels ranging from 2,000 disintegrations per minute (dpm) to about one million dpm, fixed on facilities and garbage. The contamination is composed primarily of strontium 90, and the highest level reading would give about 8-12 millirads on a direct survey. If a person were exposed to this level of radiation, it would be equivalent to a dental X-Ray. To date, no employee is known to have received a radiation dose from this contamination.

The Solid Waste sub-team is headed by Bill Ferree, logistics director for DynCorp. This team is working on several actions, including emptying, cleaning and fumigating the Site's garbage trucks; obtaining state permits to work in the Richland city landfill and the Site burial grounds; covering and cleaning up trash on the Hanford Site; developing a contingency plan to deal with Hanford's sanitary refuse in the near term before city landfill arrangements return to normal; and developing criteria for the resumption of off-Site garbage shipments in the future.

The Solid Waste sub-team is also working closely with the City of Richland on landfill excavation, which began Monday about 2 PM. Contamination has been discovered in the landfill and actions are underway to remove that material and to continue excavation of all other potentially affected areas.

The Policy sub-team is headed by Bob Shoup, and focuses on information, communications, employee health, planning, notifications and critical paths forward.

The integrated team and all of the sub-teams are committed to working together, communicating openly, and finding and controlling sources of radioactivity. The specific cause of the contamination spreads experienced this past week at Hanford has not yet been identified. However, any spread of contamination outside of controlled areas, even small amounts, is unacceptable. Employees and citizens of this region should have confidence that their environment is safe and healthy.

Actions planned by the teams in the near future include continuing to survey potentially affected employees, and working with the PHMC employee health advocate and the PHMC safety office to provide information and assistance to employees. In addition, intensified radiological surveys are continuing in the 200-East Area, with confirming surveys in other Site areas to ensure that there is no further spread.

Health physics experts from the Pacific Northwest National Laboratory have been called in to consult with the teams and to provide information to employees. They confirm that adequate bio-assay tools exist. Because the principal contaminant has been identified as strontium-90, whole body counts and lung counts do not provide useful information.

We have confirmed that pests are transporting and causing the spread of contamination in the immediate area south of B-Plant in the 200-East Area. We encourage all persons on the Hanford Site to carry their food in closed containers, to wrap all garbage in plastic and cover trash cans with lids. Do not leave fruit, cookies, or other unwrapped food out in bowls or on tables. These precautions can help to provide good hygiene at all times, and especially in seasons when pests are abundant. There have been no incidents of personnel contamination from fruit flies or other pests.
To keep track of information in a single clearing house, we have established a situation room in the 2420 Stevens Center Building. For more information, or to provide new facts, send a cc:mail to David Marsh or call him at 376-9573 or 376-9596.
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GENERAL DELIVERY MESSAGE
October 7, 1998

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TO: All FDH and Subcontractor Company Employees

FROM: Bob Shoup, vice president, Environment, Safety Health, and Quality, FDH, AND Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: WASTE MINIMIZATION TO PREVENT CONTAMINATION SPREADS

Preventing pollution or reducing waste requires everyone to take an active role--especially with the deliveries of Hanford's solid waste to the Richland City Landfill temporarily halted. The following are some tips to REDUCE the amount of trash discarded, REUSE containers and products, and RECYCLE materials through existing Site programs.

There are a number of ways we can reduce, at the source, the amount of waste generated. Some examples of ways to reduce paper waste include: utilizing electronic distribution of correspondence, documents, and presentations, editing on the computer before printing; eliminating cover sheets when faxing; posting notices and information through e-mail instead of using handouts; sharing newspapers and magazines with others to extend the lives of these items, and requesting to be removed from junk mail lists by writing "return to sender" on the envelope or calling the company's 800 ordering number and requesting to be removed from the mailing list.

Some inventory management techniques are to encourage shippers to use minimal packaging and reusable shipping containers, avoid over-purchasing, practice inventory controls with "first in, first out" policy to prevent unnecessary waste generation from retaining materials past their expiration dates, exercise careful storage practices.

If it's not possible to reduce the waste source, consider reusable products. For example, bring mugs to work, meetings and conferences, rather than using disposable cups. Use sturdy and washable utensils and tableware. Before discarding bags, containers, and other items, consider if it is hygienic and practical to reuse them. Reuse scrap paper and envelopes. Use both sides of a piece of paper for writing notes before recycling. Reuse newspaper, boxes, packaging "peanuts" and "bubble wrap" to ship packages. Wash and reuse empty glass and plastic jars, milk jugs, coffee cans, dairy tubs, and other similar containers. (Do not reuse containers that originally held products such as motor oils or pesticides). Use cloth napkins, sponges, or dishcloths that can be washed and reused. Use rechargeable batteries.

Choose recyclable products and containers and recycle them through the Site's extensive recycling programs. Some materials recycled include: paper, toner cartridges, cardboard, software, scrap metal, chemicals, batteries, DOP ballasts, and lamps. Recycle flowcharts by commodity and point of contact are available on the Hanford Pollution Prevention Homepage at Uniform Resource Locator: http://apsql05rl.gov/polprev/sanitary/sanitary.htm. Utilize facility recycling containers for glass, plastic, tin, magazines and newsprint. If containers are not available at your facility, for the PHMC and BHI contact Kathleen Hinkelman at 376-7631 or PNNL contact Elizabeth Raney at 376-7632.

Recycle your transparencies by sending them to Waste Management Hanford Pollution Prevention at H6-06 (attention: Dionetta Freeman) or send directly to 3M Recycle Program, c/o Gemmark, 99 Stevens Lane, Exeter, PA 18643. Outdated telephone books can be collected in a central location for pickup by USWest.

By reconsidering waste producing activities and by making environmentally conscious decisions about everyday work, we can reduce the amount of solid waste generated.

If you need more information, please Donna Merry of Waste Management Hanford Pollution Prevention Program at 376-9773.

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GENERAL DELIVERY MESSAGE
OCTOBER 8, 1998

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TO: All FDH and Subcontractor Employees

FROM: Bob Shoup, vice president, Environment, Safety, Health, and Quality, FDH, and Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: THURSDAY UPDATE ON CONTAMINATION SPREADS

We promised you that we would provide updates on the resolution of the contamination spreads experienced during the past few days. In the past 48 hours, we have not found any further areas of contamination on the Hanford Site.

RICHLAND CITY LANDFILL UPDATE
However, contamination has been found on two pieces of garbage from the Hanford Site in the Richland City landfill, halting the excavation of the landfill until environmental permits can be obtained to move the contaminated waste back onto the Hanford Site. One piece of solid waste found at the city landfill read 70,000 disintegrations per minute (dpm), and one piece read 660,000 dpm of measured radioactivity. The highest reading is still indicative of material that could deliver an extremely low dose of radiation, equivalent to about 1/2 of a chest X-Ray, if it were ingested. The radioactive material found on the solid waste continues to be principally strontium-90, a beta-emitter that is not related to plutonium. Continuous air monitors set up at the Richland landfill in the excavation area show no spread of the contamination, indicating that any insects in the area are not contaminated.

As of 10 AM today, two important permits have been signed by the Washington Department of Health. One permit allows removal of the contaminated waste from the Richland city landfill back to the Hanford Site. The waste removal was due to begin almost immediately after the permit was issued. However, due to windy conditions at the landfill, city and Site officials made a joint decision not to begin the removal operation until the wind diminishes. The other permit will allow the contaminated waste to be buried at Hanford. We are very pleased that the permitting actions were accomplished quickly, so that we could begin waste removal. Any contamination off of the Hanford Site is unacceptable, and we want to retrieve the contaminated material from the city landfill as soon as possible.

COMMUNICATIONS ACTIVITIES
Other important activities that have occurred in the past 48 hours included a media availability/briefing on Wednesday by Bob Shoup, vice president, Environment, Safety, Health and Quality for FDH,

and Bob DeLannoy, senior director, Environment, Safety, Health and Quality for DynCorp. The briefing was attended by five officials of the City of Richland, including Mayor Larry Haler and new city manager Ron Rabun. FDH president Ron Hanson reiterated at the briefing that the city will have full access to the resources of the Project Hanford Management Contract (PHMC) companies to resolve the current situation.

Hanson also stressed the need for open and frequent communication with the city, and with Site employees and the public. Three all-employee messages were issued yesterday, in addition to the one issued Monday. Hanson also issued two messages to the presidents of the PHMC companies, stressing the value of open communications. It is important to Ron Hanson and to us that communications be factual and timely, and that managers and employees take time to read and understand the facts presented.

A special meeting was held yesterday by B&W Hanford Co. management with B-Plant employees, and both the Spent Fuel Project and Lockheed Martin Hanford Co. prepared messages to their employees.

PHMC EMPLOYEE HEALTH ADVOCATE
The PHMC employee health advocate, along with a health physicist from the Pacific Northwest National Laboratory and FDH Safety Director Dave Jackson met with a group of employees identified as potentially interested due to their work locations near the affected area south of B-Plant. It was a positive meeting, with several matters raised by employees. The PHMC employee health advocate pledged to take several actions that were requested by employees, including installing portal control monitors in some additional locations on the Hanford Site, locating some additional employees who may want bio-assay surveys, contacting appropriate persons to correct a rainwater leak in one building, and other actions.

NEW TEAM FORMED
In another important development yesterday, an Operations Team was formed to manage activities in the situation room that has been established in the 2420 Stevens Center Building. The Operations Team is headed by Richard DeBusk of FDH emergency preparedness.

RADIOLOGICAL CONTROL TEAM
The Radiological Control team that we described to you yesterday continues to look for the source(s) of the radioactivity in the roped-off area just south of B-Plant in Hanford's 200-East Area. We have not yet isolated the source. However, we are paying close attention to a sucrose-based contamination fixative spray that has been used in the area when enclosed, contaminated piping and equipment has been opened up in order to perform work. There are indications that the sugar-based spray may be attractive to pests such as flies and gnats, and these insects could serve as the transport mechanism to spread contamination. Nonetheless, we continue a concerted effort to identify other sources of contamination.

We have increased spraying in the roped-off area in order to eradicate the insects. Waste Management Services Northwest (WMNW) has purchased a new "fogger" truck that will be delivered tonight, so that more extensive spraying can be conducted beginning tomorrow. We are surveying virtually everything in the affected area, which measures about 10 acres, and we are covering and taping over any contamination we find. Some employees have asked

why we cannot proceed faster to "shrink" the perimeter of the affected area, but we believe it is prudent to work slowly, thoroughly and carefully in order to be sure we contain any contamination and protect employee health and safety by preventing contamination spread.

Additional measures being taken by the Radiological Control team include trapping insects on new traps being placed at multiple locations around the Site, both inside and outside of the 10-acre area south of B-Plant, examining the exteriors of vehicles parked in the area; and sealing, taping and spraying garbage dumpsters and the Site's garbage trucks. The 152-ER diversion box, located in the affected area and considered to be a potential contamination source, is sealed. Today, Atlanta Avenue will be blocked from just north of MO414 to just north of the B-Plant north parking lot, in order to prevent private vehicles from passing through the affected area while survey teams continue their work.

SOLID WASTE TEAM
The Solid Waste team is working closely with Richland City officials at the city landfill site. We plan to remove the Hanford waste that was disposed in the city landfill during the final days of September. We expect that our waste removal activities at the city landfill can be finished in about a week.

Other activities of the Solid Waste team include formulating contingency plans for disposal of the approximately 5.5 tons of Hanford garbage generated by ordinary housekeeping and personal activities each day, and readying a staging area to survey the refuse currently in the Hanford garbage trucks.

We will continue to communicate with you often until the contamination spreads and sources are identified, contained and controlled. As citizens and employees, you have a right to a safe and healthy environment, and you have a right to know the actions we are taking to provide such an environment. You also have a right to know what we are finding, in terms of contamination locations, types and levels.

HANFORD WEED AND PEST CONTROL PROGRAM
While the Hanford Site periodically finds contaminated rodents, ants and beetles, contaminated flying insects have not been detected for many years. In an integration effort planned since last summer, the PHMC Weed and Pest Management Program soon will integrate under DynCorp. This integration will improve the efficiency of spraying and other pest control activities, and is one of the long-term solutions to improve environmental protection.

The Hanford Site has maintained weed and pest control programs since World War II in order to exterminate intrusive and nuisance pests; prevent disease; control vegetation along roadways, power lines and fire breaks; protect property, and provide a clean work environment. Additionally,through an agreement with local counties, the Site program controls noxious weeds so that Hanford does not become a seedbed for weeds that are destructive to farming.

For more information on the contamination spreads, the search for the source(s), the removal of trash from the city landfill, or to provide new facts, send a cc:mail to David Marsh or call him at

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GENERAL DELIVERY MESSAGE
October 9, 1998

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TO: All FDH and Subcontractor Company Employees

FROM: Ron Hanson, FDH President & CEO

SUBJECT: THANK YOU!

With the weekend almost here I want to express my thanks to everyone who has worked so hard for the past two weeks to respond to the contamination problem we have experienced. While no one wants this kind of problem to occur, it is gratifying to know we have the capable and dedicated people on this site to respond to such situations. It is also important to note that discovery of this problem shows our surveillance program works. The problem was discovered quickly, allowing us to respond immediately, preventing a far worse situation from occurring.

Our highest priority since the problem was discovered on September 28 has been the protection of our employees, the public and the environment. But you are on the front lines. Your health and safety are paramount. I want to reiterate that our policy is no tolerance for contamination outside of controlled radiation areas. Such situations are simply unacceptable. That is why we are working so hard to locate any contamination that may have reached the Richland landfill and return it to the site. Excavation at the landfill resumed at 7:30 this morning and will continue through the weekend until the work is finished.

We have tried very hard to provide you with frequent updates on our situation so that you have the very latest information. Our teams responding to the problem have approached the situation in an orderly manner to identify and contain the spread of contamination. Others are trying very hard to pinpoint the source of the contamination. This kind of problem is extremely rare at Hanford and we need to learn as much as we can to ensure it never happens again. Lessons learned will be shared with you as soon as they are available and with the rest of the DOE complex.

We have also added a new page to the Hanford web site under What's New. Or, you can go directly to the page at:
http://www.hanford.gov/safety/conspread/index.html
The page will include all of the employee messages that have been sent out on this subject, maps and other information, plus points of contact and telephone numbers, should you have questions or comments.

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GENERAL DELIVERY MESSAGE
October 9, 1998

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MANAGERS - PLEASE POST!!! PLEASE POST!!! PLEASE POST!!!

TO: All Site Employees

FROM: James Mecca, RL Deputy Assistant Manager, Facilities Transition, Bob Chap, vice president, Environment, Safety Health, and Quality, FDH, and Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: FRIDAY UPDATE ON CONTAMINATION SPREAD

We continue to be committed to keeping you informed of steps being taken to address the recent contamination spreads outside of controlled radiation areas.

On Thursday, one spot of new contamination was found inside the posted and roped-off area south of B Plant. As of this morning, no new contamination had been found outside of that area.

Normal work has resumed at the Spent Nuclear Fuel Canister Storage Building construction site, where contamination was removed from several locations in and around the building. Personnel monitoring is being offered to workers at that site.

If you wish to have access to personnel monitoring but do not have that service available at your workplace, several additional locations are now available to you. The list of locations is at the bottom of this message. Monitoring of personal vehicles is ongoing upon request at the monitoring stations listed below. No contamination was found on any of the vehicles surveyed since last weekend.

RICHLAND CITY LANDFILL UPDATE

We are acting to retrieve contaminated material from the city landfill as soon as possible. We also are establishing procedures to prevent such contamination from occurring in the future.

Representatives from the Solid Waste Team, including the Department of Energy, met with the City of Richland engineer yesterday and presented a plan for the site to resume shipments of refuse to the Richland landfill. Plan was well receive. The final decision will rest with obtaining concurrence from the city. The team also presented a plan outlining a new policy under which the site will transport solid waste to the landfill. That plan includes extensive verification surveys to ensure that no

contaminated material is sent to the landfill. Any contamination outside of designated radiation zones on the Hanford Site is unacceptable.

At 7:30 this morning we began removing contaminated solid waste from the landfill. (High wind conditions prevented the start of operations yesterday.) That work will continue through the weekend and until the job is finished. Approximately 35 tons of material will be returned to Hanford. The material will be delivered to a building in the Central Waste Complex, surveyed, packaged, and disposed of in the Hanford low level waste burial grounds.

PEST CONTROL

Waste Management Northwest continues to spray onsite dumpsters with insecticide and to cover dumpsters. A new insecticide sprayer truck is onsite, as is the insecticide material. If weather conditions permit, spraying will begin tomorrow, Saturday, within the roped-off area south of B Plant. Additional sprayings are planned for Sunday and possibly on following days, as operational activities allow.

During spraying and for approximately 12 hours after the spraying employees will need to remain clear of the boundary area. The spraying is limited to the 10-acre roped-off area. The chemical to be applied is "Clean Crop Malathion 57EC." The MSDS number is 016235A. The employee health advocate's office 373-1289 or 628-0697 has been provided with information on this chemical, as has the contamination control team at 376-9573 or 376-9596.

If it becomes necessary for you to enter the boundary area, please contact Tom Nemzek of Waste Management Northwest at pager number 85-3218.

Removing food sources as breeding areas is key to controlling pests; these pests appear to be the significant source of the contamination spread. Two hundred new insect traps are being set today in the contaminated area and other locations around the site.

EMPLOYEE MEETINGS

We continue to hold your health and safety as our highest priority. Your concerns are our concerns. Later today we will be distributing a list of frequently asked questions and responses. We also have instituted an Internet site that is available to you, your families and the public. The site will include all employee messages. You can access it at:
http://www.hanford.gov/safety/conspread/index.html

LOCATIONS WHERE PERSONNEL MONITORING IS AVAILABLE

200 EAST

LOCATION	TYPE OF MONITORING	ACCESSIBILITY	ACCESS HOURS
272AW	PCM-1B	Easy Access - Near Lunch room - located in a non-rad area	Contact Shift Mgr. 24 hrs

	RCT Survey	Easy Access - located in a non-rad area	HPT Office Mgr.	Contact Shift 24 hrs
209E	PCM-1B	Easy Access - located in a non-rad area	Sign in at Front desk	7am-3pm
2704HV rm H104	RCT Survey	Easy Access - located in a non-rad area	HPT Office Office rm H104	Contact HPT 7am-3:30
M0-048	PCM-1B	Easy Access - located in non-rad area	Contact DynCorp HPT office as needed	7am-3:30
2025E (200 LERF)	RCT Survey	HPT Office - located in a non-rad area		Contact Shift Mgr 7am -3:30
200 E Garage	Hand & Foot Monitor	Easy Access - Maint. Area located in a non-rad area		7am - 3:30

200 West

LOCATION	TYPE OF MONITORING	ACCESSIBILITY	ACCESS HOURS
272WA	PCM-1B	Easy Access - Near lunch room-located in a non-rad area	Contact Shift Mgr. 24 hour
	RCT Survey	Easy Access - HPT Office located in a non-rad area	Contact Shift Mgr. 24 hour
M0-438	RCT Survey	Easy Access - HPT Office located in a non-rad area	7am - 3:30pm
271T	RCT Survey	Easy Access - HPT Office located in a non-rad area	Contact HPT Office 7am-3:30pm
222S Lab.	RCT Survey	HPT Office - located in a	Go to front

		non-rad area within facility	desk and contact HPT Office 7am-3:30p
M0-556	PCM-1B	Easy access - located in a non-rad area	7am - 3:30pm Contact DynCorp HPT office as needed

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GENERAL DELIVERY MESSAGE
October 12, 1998

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TO: All Site Employees

FROM: James Mecca, RL Deputy Assistant Manager, Facilities Transition; Bob Shoup, FDH vice president, Environment, Safety Health, and Quality; and Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: CONTAMINATION SPREAD QUESTIONS AND ANSWERS

The following are questions Hanford employees and others have most frequently asked about the contamination spread. Responses have been provided by members of the Project Hanford Management Contract team that is responding to the issue.

1. How can I be sure I am not transporting contamination home?

The contamination has been confined principally to an area within a radius of approximately 1/4 mile from the border of the 10-acre radiological buffer area just south of B Plant. Intensive radiological surveillance continues to take place around this area and the site.

Other than the craftsperson with contamination found in his boot, no other personnel contamination has been detected over the past two weeks. All individuals known to have been in or around the affected area of 200 East Area have been surveyed. No contamination was found on the individuals or on any personal vehicles. More than half of the bioassays taken, including that of the craftsperson, have been returned. They show no evidence of contamination.

Most of the contamination has been found on damp kitchen waste,

apparently deposited and spread by contaminated gnats and fruit flies. The source of the insect contamination is still being investigated. Intensive fogging with insecticide took place in the buffer area this weekend. Traps were set in the buffer area and around the site, and no contaminated insects have been found for several days.

2. There is no way to monitor individuals outside of controlled areas.

Worker and public safety continues to be our number one priority. For workers who would like to have continued assurance, voluntary monitoring stations are being installed in several locations. A complete list of those locations was distributed with the 10/9/98 all-employee message and also is included at the end of this message and on the Internet at www.hanford.gov/safety/conspread/index.html

NOTE: The current distribution program for all-employee messages is not designed to send tables. The Internet chart may be easier for you to read.

SUPERVISORS: Please post the Internet table of monitoring stations and make it accessible to your employees.

3. There was enough contamination to shut down Canister Storage Building on Wednesday. Why are we not concerned about working there today (Thursday)?

When surveys detected contamination in and around the CSB, management stopped construction activities as a precautionary measure until safe work conditions could be verified. The contamination was cleaned up, and new surveys showed that it is safe to return to work. These surveys are continuing. A survey station is available in the CSB area for those workers.

4. If they surveyed my work area yesterday, how do I know this is going to be followed up?

Our radiological control teams routinely survey all areas of the site where contamination may be found, such as dumpsters and garbage cans. Increased surveillance is taking place in areas where contamination is more likely to occur or has already occurred.

5. Can we get access to portal monitors in B Plant?

Because several new monitoring stations have been set up, it is not necessary for anyone to use the B Plant monitors, other than individuals who normally use that equipment. For example, monitoring is being provided on-site at the Canister Storage Building.

6. Can portal monitors be installed in our work areas?

In some cases, radiation monitoring has been expanded to include specific work areas. The Canister Storage Building construction

site is an example. For other employees, monitors are being installed at locations that are convenient to most work areas. Check the list at the end of this message. If you have difficulty obtaining personal or equipment monitoring, contact the Radiological Investigation Task Team at 376-7718.

7. If the contamination is not a big concern, why are there so many news stories (i.e., newspaper articles and TV news)?

Any contamination outside of a control zone is of concern because it isn't supposed to happen. We have increased the all-employee messages to keep our work force informed.

The fact that Hanford contamination was identified off site in the City of Richland landfill is of significant interest to our community. We are maintaining contact with the local news media to ensure that residents receive full and accurate information on this issue.

Even though the level of contamination was very small, any contamination outside of controlled radiation areas is unacceptable. The site is working with the City of Richland and the Washington Department of Health to ensure that this type of incident does not happen again.

8. I don't understand the risk to me when I hear that the contamination is so-and-so disintegrations per minute (e.g., 20,000 dpm)

Any unanticipated risk is unacceptable, regardless of its significance or alleged insignificance. A rate of 20,000 dpm from contamination is a small fraction of a millirad dose that could occur if a person were in contact with such contamination for one hour. Although not precisely equivalent, a 10-millirad dose is much less than a dental x-ray. The highest dose rate we have measured during this incident is about 15 millirads. It was found on a piece of rotting fruit in a dumpster.

Also, a 20,000-dpm rate is so small that it wouldn't be recorded on the dosimeters we use on site to measure potential exposures to employees working in radiation control areas. As of this time, surveys and bioassays show that no worker who has been near the 10-acre controlled buffer area has received any radiation exposure from this contamination incident.

9. How are we establishing the perimeter of the controlled area?

A very conservative controlled area was established and posted based on the identification of contaminated areas. The established area included the most probable source of contamination.

10. Can we have our personal vehicles surveyed?

Yes. Vehicle surveys are available upon request from your Radiation Protection organization or at any of the locations listed at the end of this message. If you have difficulty obtaining personal vehicle monitoring, contact the Radiological

Investigation Task Team at 376-7718.

11. Are we sure the fixative is a contributing factor to the contamination?

The sugar based contamination fixative may be a contributing factor to pests spreading contamination, but it is not a contributing factor to the contamination itself. We are working aggressively to determine the contamination source.

12. Are we sure that 241-ER-152 is a source of the contamination?

We are continuing to investigate all possible sources of contamination within the 10-acre buffer area south of B Plant, including 241-ER-152.

13. The contaminated fruit flies have been detected in the 200 Area. How far can a fruit fly fly?

Independent fruit fly movement is limited to the immediate surroundings. Weather factors or relocation of food sources can expand the fruit fly range. A short description of fruit flies and their habits is on our web page at www.hanford.gov/safety/conspread/index.html

To date, contaminants spread by flying pests have been found only within a radius of approximately 1/4 mile from the 10-acre buffer area. On Saturday, Oct. 10, and Sunday, Oct. 12, Waste Management Northwest fogged the posted area south of B Plant with insecticide.

Traps were placed in the buffer area, as well as other locations around the site. No contamination has been detected on trapped insects outside the buffer area for several days, and none was found on insects inside the buffer area on Saturday or Sunday.

LOCATIONS WHERE PERSONNEL MONITORING IS AVAILABLE

NOTE: The current distribution program for all-employee messages is not designed to send tables. The Internet chart may be easier for you to read.

SUPERVISORS: Please post the Internet table of monitoring stations and make it accessible to your employees.

200 EAST

LOCATION	TYPE OF MONITORING	ACCESSIBILITY	ACCESS HOURS
272AW	PCM-1B	Easy Access - Near Lunch room - located in a non-rad area	Contact Shift Mgr. 24 hrs
	RCT Survey	Easy Access - HPT Office located in a non-rad area	Contact Shift Mgr. 24 hrs

209E	PCM-1B	Easy Access - located in a non-rad area	Sign in at Front desk 7am-3pm
2704HV rm H104	RCT Survey	Easy Access - HPT Office located in a non-rad area	Contact HPT Office rm H104 7am-3:30
M0-048	PCM-1B	Easy Access - located in non-rad area	Contact DynCorp HPT office as needed 7am-3:30
2025E (200 LERF)	RCT Survey	HPT Office - located in a non-rad area	Contact Shift Mgr 7am -3:30
200 E Garage	Hand & Foot Monitor	Easy Access - Maint. Area located in a non-rad area	7am - 3:30

200 West

LOCATION	TYPE OF MONITORING	ACCESSIBILITY	ACCESS HOURS
272WA	PCM-1B	Easy Access - Near lunch room-located in a non-rad area	Contact Shift Mgr. 24 hour
	RCT Survey	Easy Access - HPT Office located in a non-rad area	Contact Shift Mgr. 24 hour
M0-438	RCT Survey	Easy Access - HPT Office located in a non-rad area	7am - 3:30pm
271T	RCT Survey	Easy Access - HPT Office located in a non-rad area	Contact HPT Office 7am-3:30pm
222S Lab.	RCT Survey	HPT Office - located in a non-rad area within facility	Go to front desk and contact HPT Office 7am-3:30p
M0-556	PCM-1B	Easy access - located in a non-rad area	7am - 3:30pm Contact DynCorp HPT office as needed

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GENERAL DELIVERY MESSAGE
OCTOBER 12, 1998

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MANAGERS - PLEASE POST!! PLEASE POST!! PLEASE POST!!

TO: All Site Employees

FROM: James Mecca, RL Deputy Assistant Manager, Facilities Transition; Bob Shoup, FDH vice president, Environment, Safety Health, and Quality; and Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: TRASH COLLECTION

Your help is needed. Over the weekend trash was collected from dumpsters in the 300 area, 400 area, 200 West area and in some portions of the 200 East area. Dumpsters in other areas are being collected today. These dumpsters must be surveyed to verify that they are free from radioactive contamination before they are put back into service. The dumpsters are being marked when the survey is completed.

Please do not place anything in a trash dumpster unless it has a marking indicating that HPTs have completed the survey. We expect these surveys to be complete by Wednesday or Thursday of this week.

If you have questions, contact Brian Dixon of DynCorp at 376-7053.

Thank you for your cooperation.

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GENERAL DELIVERY MESSAGE
October 13, 1998

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TO: All Site Employees

FROM: James Mecca, RL Deputy Assistant Manager, Facilities Transition; Bob Shoup, FDH vice president, Environment, Safety Health, and Quality; and Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: TUESDAY UPDATE ON CONTAMINATION SPREADS

PLEASE POST!! PLEASE POST!! PLEASE POST!! PLEASE POST!!

We want to continue our efforts to keep you informed regarding what we are learning about the contamination spreads outside of radiation control zones on the Hanford Site, and in the Richland city landfill.

RICHLAND LANDFILL
Today we can report the very welcome news that our excavation at the Richland city landfill was completed late yesterday, after we boxed and removed about 200 tons of Hanford Site solid waste. We have brought that solid waste back to Hanford, and placed it in low level waste burial grounds in the 200-West Area. Yesterday morning, we found additional contamination in food waste in Hanford's trash at the city landfill. Once again, the contamination was low level, beta-emitting, and consisted principally of strontium-90.

Today, we will push back into place and cap off the solid waste in the city landfill that was disturbed in our excavation of Hanford trash. If further study shows any potential for further contamination, we will -- with city concurrence -- use a "geo-

probe" to test any other areas in the landfill that may be of concern to the city.

A geo-probe is an hydraulic-powered instrument that is mounted on the back of a pickup truck. The probe carries a variety of monitoring devices and can be driven 50-60 feet below the surface to take readings. Use of the probe will prevent potential worker exposure in handling additional refuse. Today we also will have a very important meeting with city officials, to try to establish a path forward for resuming garbage disposal in the city landfill.

While we believe that the contaminated solid waste episode that we have just experienced is winding down to a successful conclusion, we will not be satisfied until the city of Richland tells us that it is satisfied. The city is engaged in many active and farsighted pursuits on behalf of citizens. It is deeply committed to selective industrial recruitment and business development. We support and applaud the city of Richland in those efforts, and we are committed to doing everything we can to preserve a civic image that is conducive to economic growth.

CONTAMINATED FLIES CONFINED TO ONE AREA
In perhaps the most positive discovery of recent days, we have confirmed that no contaminated flies or gnats have been found outside of the 10-acre area south of B-Plant where the contamination spots were first discovered. This finding reinforces our belief that no fruit crops in the region have been affected by contaminated insects. The contaminated insects are limited to a relatively small area that is isolated 25 miles north of the Tri-Cities.

Over the past week, we have set out approximately 75 new traps for flying insects. At the present time, there are 12 sets of traps around various border areas of the Hanford Site, as well as a cluster of six traps at the Richland city landfill. We also currently have 11 traps set out in and around the 10-acre area that is roped off south of B-Plant. Only four traps in the 10-acre area demonstrated contaminated flies, and no traps outside of that area showed any contaminated flies. No contaminated flies have been found in any locations during the past five days.

The fly traps, shaped like large mayonnaise jars, are baited with pieces of fruit and are taken out of service as soon as they capture a significant number of insects. The levels of contamination found in the traps varied from less than 5,000 to 400,000 disintegrations per minute (dpm).

RADIOLOGICAL CONTROL ACTIVITIES
The directed fogging activities with malathion in the 10-acre area south of B-Plant that we described to you in previous messages continued last evening after the day shift ended. The same fogging treatment was applied Saturday, Sunday, and will be applied again tonight.

Surveying of Site dumpsters continues. Two additional contaminated dumpsters were found yesterday near the PUREX plant, just southeast of the 10-acre area south of B-Plant. These dumpsters had contaminated spots reading 10,000 dpm and 40,000 dpm respectively.

Thus far, 21 contaminated spots, many on dumpsters, have been found on the Hanford Site and taken to burial grounds. Within the

dumpsters, the contamination was found mostly on food waste, while a few spots were fixed contamination. Levels of radioactivity on the food, dumpsters, and some locations in and near trailers just south of B-Plant varied from 10,000 to 700,000 dpm, and consisted of beta-emitting radioactivity mostly comprised of strontium-90.

We also are working to reduce the size of the roped-off area of interest south of B Plant. Radiological control technicians are conducting shoulder-to-shoulder surveys across the 10-acre site. As these intense surveys show that specific areas are free of contamination, we will be able to reduce the size of the buffer zone and hone in on the source of the contamination.

Bioassays have been extended to include nuclear operators and radiological control technicians who worked in the 241-ER-152 diversion box in late September, about 29 people. Thus far, bioassays done on these workers and on workers given the tests last week have shown no uptake of radioactivity. An additional personnel monitoring station where workers can go to obtain personal surveys, besides the locations reported to you in earlier messages, has been set up in MO841 in the 200-West Area.

SOLID WASTE TEAM
The Solid Waste team continues in its efforts to contact any vendors or other persons who may have been in the 10-acre area south of B-Plant in the past two weeks. Personnel and vehicle surveys will be offered to these vendors. During the past weekend, the Solid Waste Team collected trash from all Site areas except the 100 Areas, 1100 Area and the HAMMER facility. This trash (about eight truck loads) was disposed of in the 200 West Area low level burial grounds.

Surveys of all site dumpsters are nearly complete. PLEASE REMEMBER TO DEPOSIT WASTE ONLY IN DUMPSTERS MARKED WITH THE WORDS "HPT SURVEY" AND A DATE.

The team has obtained the state permit needed for disposal of garbage in the low level burial grounds. The modification allows 50 loads of trash to be disposed in these Site burial grounds. However, disposal in burial grounds is not an ideal solution long-term, because it is expensive and it takes up valuable space needed for Hanford's cleanup mission. For this reason, the team continues to plan for trash surveying methods that will be acceptable to the city of Richland, so that we can resume Site solid waste disposal in the city landfill.

MEDIA AVAILABILITY
Bob Shoup, Bob DeLannoy, and city officials will make themselves available to the media later this week, in order to answer any questions that may have arisen. While we anticipate that this appearance will be the final major press conference concerning this event, policy team members will be available for individual questions from reporters until all issues are resolved and all inquiries answered.

In conclusion, we want to state that we remain committed to the principles with which we began this investigation. Foremost among those commitments is the fact that the health and safety of our employees, and of the citizens of the region surrounding the Hanford Site comes first. No contamination outside of radiation control areas is acceptable, and we have zero tolerance for any contamination spreads. We will continue to investigate the

source(s) of contamination, and we will work until the contamination is controlled and confined.

We value our partnership with the city of Richland, and we want to be sure that this event concludes in a manner that satisfies the city and allows us to share a positive future. We will continue to keep you informed, although daily messages most likely will not be necessary. We will send you periodic messages as needed as long-term plans for disposal of Hanford solid waste are finalized and as the radiological control team shrinks and finally releases the 10-acre area south of B-Plant to normal operations.

Many of you have told us that you have appreciated being kept informed. We consider it to be our job and duty to keep you, the citizens, employees and tax-payers of this area, informed about the issues that affect you. We appreciate your confidence and trust.

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GENERAL DELIVERY MESSAGE
October 15, 1998

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TO: All Site Employees

FROM: James Mecca, RL Deputy Assistant Manager, Facilities Transition; Bob Shoup, FDH vice president, Environment, Safety Health, and Quality; and Bob Frix, president and general manager, DynCorp Tri-Cities Services

SUBJECT: UPDATE ON CONTAMINATION SPREADS

PLEASE POST!! PLEASE POST!! PLEASE POST!! PLEASE POST!!

We want to continue our efforts to keep you informed regarding what we are learning about the contamination spreads outside of radiation control zones on the Hanford Site, and in the Richland city landfill.

RICHLAND LANDFILL
The excavated areas at the Richland city landfill have been capped off, and our demobilization there is nearly complete. The total amount of Hanford trash removed was about 210 tons, or 168 cubic meters (220 cubic yards). We are now holding discussions with the city concerning whether any additional surveys for potential contamination are necessary in the landfill. We are constructing a detailed time line to help make this determination. The time line is expected to tell us whether there could have been a potential for contaminated trash to reach the landfill between September 24 and 28. Our efforts thus far have looked at trash disposed in the city landfill September 28-30. If we and the city decide that further surveying is necessary, it will be done with a "geo-probe" in order to prevent potential worker exposure in handling additional refuse.

We also continue to hold frequent meetings with city officials on the long-term path forward to resume solid waste disposal. We are working out the details of various trash handling methods, and considering alternatives to discuss with the city. It remains extremely important to us that the City of Richland be satisfied, that its civic image be preserved, and that we emerge from this incident as partners.

CONTAMINATED FLIES ISOLATED
Fortunately, the good news that no contaminated flies or gnats have been found outside of the 10-acre area south of B-Plant where the contamination spots were first discovered. In fact, no contaminated flies have been found in any locations at all since October 7. Nevertheless, trapping will continue for at least another week.

RADIOLOGICAL CONTROL ACTIVITIES
The directed fogging activities with malathion in the 10-acre area south of B-Plant that we described to you in previous messages could not be applied either Tuesday or Wednesday evenings, due to high winds. However, another application is planned for this coming weekend.

Surveying of Site dumpsters continues. Two more contaminated trash cans have been found, bringing to 23 the total number of contaminated spots found. The additional contaminated cans were found yesterday, one inside of the 10-acre area south of B-Plant, and one just west of that area near the 200-East Area shops. As before, the spots demonstrated low levels of beta-emitting contamination, principally strontium-90.

The 10-acre area south of B Plant is still roped off as a radiological buffer area, but portions of the area could be released as early as tonight. Unless any unforseen contamination is detected, we expect to release most of that area, except for some mobile offices, by the time most employees return to work Monday.

Bioassays have been extended to include approximately 13 more persons who might have worked in or passed through the 10-acre area south of B-Plant during the time period of interest in late September and early October. This brings the total number of persons taking bio-assay tests to 55. Thus far, 32 results have been returned, with one person testing marginally positive. This test result may be a false positive due to its extremely low level. The individual is now taking a re-test to clarify the results. All bioassay results are expected by October 20.

SOLID WASTE TEAM
The Solid Waste team continues in its efforts to contact any vendors or other persons who may have been in the 10-acre area south of B-Plant in the past two weeks. Personnel and vehicle surveys will be offered to these vendors. Trash collected from the Hanford Site each day continues to be disposed of in the 200 West Area low level burial grounds. We thus far have disposed about 10 loads, with a total of 50 loads allowed by our state permit. Therefore, we have a few weeks to reach agreement with the City of Richland, and resume Site solid waste disposal in the city landfill. Our preference is to reach agreement as soon as possible.

COMMUNICATIONS
With the city's concurrence, we have decided not to hold a news conference this week. Happily, this decision was reached because there have been no significant new discoveries. We may hold a news conference jointly with the City of Richland when we reach agreement on a path forward.

We are glad that we have been able to maintain the trust and confidence of the region throughout this episode, and that we have policies and procedures that continue to make the Hanford Site a good neighbor to surrounding citizens. We will continue to keep you informed as developments warrant.

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GENERAL DELIVERY MESSAGE
October 29, 1998

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TO: ALL SITE EMPLOYEES

FROM: JAMES MECCA, RL Deputy Assistant Manager, Facilities Transition; BOB SHOUP, FDH Vice President, Environment, Safety, Health and Quality; BOB FRIX, President and General Manager, DynCorp Tri-Cities Services

SUBJECT: UPDATE ON CONTAMINATION SPREADS

It has been a week since we last provided you with information concerning the contamination spreads that occupied so much of the Site's time and attention during October. We wanted you to have an update before the weekend.

Three spots of contamination were found this past week, all near B-Plant in the 200-East Area, and all on Monday, October 26. A trap for flying insects just outside of the glove bag cover over Diversion Box 241-ER-152 was found to contain 100,000 disintegrations per minute (dpm) of beta/gamma contamination. Another such trap on the north side of MO-966 near B-Plant was found to contain 500,000 dpm, also beta/gamma. Additionally, a plastic bag containing food garbage in a dumpster just outside of the 2101-M Building (south of B-Plant) was found to contain 30,000 dpm. The dumpster was sealed in plastic and taken out of service.

Site pest control specialists sprayed the area around the 241-ER-152 Diversion Box with malathion on Wednesday, and sprayed the 152 pit and its glove bag cover with pyrethrin (PT-565) on Tuesday. They have placed new insect traps inside the pit to confirm that the pests have been eradicated. At this time, a comprehensive investigation of the source of the contamination is underway, with a report expected in late November. Multiple sources, including the 241-ER-152 Diversion Box, are still being considered for the contamination that we experienced during late September and October. Experts from several contractors will be involved in the investigation.

Once the source of the contamination is identified, procedures governing work involving the source will be revised to provide assurance against future contamination events. As Hanford's waste cleanup moves forward into active operations that disturb legacy wastes in order to move them or better confine them, we must be sure that we control these substances and continue to protect the health and safety of employees and the public.

DynCorp Tri-Cities Services is continuing to dispose of everyday Site solid waste in the 200-West Area low level waste burial grounds. Thus far, we have disposed of 19 loads of solid waste,

while our state permit allows us to dispose up to 50 loads. Therefore, we still have several more weeks during which we can continue this disposal method while the Department of Energy negotiates with offsite disposal services and locations for a long-term disposal agreement.

The DOE is negotiating with the City of Richland, to determine solid waste survey standards that are acceptable to both the City and to DOE. Negotiations are cordial, as all share the same ultimate goal of assuring that the landfill, a valuable city resource, remains free of radioactivity. We also share the goal of maintaining a positive civic and regional image that is conducive to growth.

DOE has proposed to the City a graded survey approach, in which we would survey all Site trash for a 30-day baseline period. Following that, and based on the baseline results, it is proposed to separate Site trash into three different categories, based on the types and locations of facilities in which it is generated.

We hope that this graded approach, or another compromise position, will provide the assurances the City needs to reach agreement with DOE. DOE is also pursuing negotiations with another commercial refuse contractor as a back-up service for future needs.

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APPENDIX G

NEWS STORIES

The majority of media coverage surrounding the fall 1998 200 East Area biological vector contamination event was local, although there was considerable interest and coverage from regional and national media as well.

The issue received a great deal of attention locally, because of the offsite contamination of refuse at the City of Richland Landfill and because of the worker bringing home contamination on his socks. The finding of contamination outside the Hanford Site boundary was obviously of interest to the surrounding communities, as was the phenomenon of radioactive insects and the possibility that they could carry radiation off Site.

The regional and national exposure given this event focused almost exclusively on the insects. The media began to take notice via the Associated Press, in part because of some science fiction references in some of the early local print stories.

Although the science fiction references may have been a bit misleading, the overwhelming majority of local, regional, and national media coverage was accurate and fair. Nearly every piece published on the subject contained statements regarding the lack of a serious health threat and the attempts that the Site was making to correct the problem.

The following pages are copies of all the news stories that the Hanford Site is aware of from both the public, commercial media and the Hanford Site plant newspaper.

NEWSPAPER ARTICLES:

Radioactive ants no work of science fiction	Tri-City Herald	09-29-98
Radioactive socks found in Hanford worker's home	Tri-City Herald	10-01-98
Hanford puzzled by radioactive garbage bin	Tri-City Herald	10-02-98
Hanford digs for more off-site radiation	Tri-City Herald	10-06-98
Fruit flies suspects in Hanford contamination	Tri-City Herald	10-07-98
Hanford trash being removed from Richland	Tri-City Herald	10-08-98
Radiation bugging Hanford	Spokesman Review (Spokane)	10-08-98
Hanford hot spots blamed on radioactive bugs	Seattle Post-Intelligencer	10-08-98
Richland wants transfer station built at Hanford	Tri-City Herald	10-10-98
Hanford works to trap contaminated bugs	Tri-City Herald	10-13-98
Insects spread radiation on nuclear reservation	Arizona Republic	(no date)
Radioactive Bugs Found at Nuke Site	Washington Post (Internet)	10-21-98
More Hanford workers tested for exposure to radioactivity carried by fruit flies, gnats	Tri-City Herald	10-22-98
Two more contaminated flies found miles from suspected Hanford origin	Tri-City Herald	11-03-98
Contaminated fly found near trash bin came from B Plant	Tri-City Herald	11-05-98

Hanford digs up backup landfill, collector	Tri-City Herald	11-13-98
Radioactive reading in trash tied to potassium 40 in bag	Tri-City Herald	11-14-98
Richland, DOE reach deal on dumping	Tri-City Herald	12-06-98
Hanford to resume dumping in Richland	Tri-City Herald	12-09-98

HANFORD REACH ARTICLES (WEEKLY PLANT NEWSPAPER):

10-19-98	All-out effort stems spread of contamination
10-26-98	Contamination spread episode winding down
11-09-98	Another contaminated fruit fly
11-16-98	Contract signed for trash disposal services
01-04-99	200 Area contamination spread contained

TRI-CITY HERALD
Tri-Cities, WA
SEP 29 1998

Radioactive ants no work of science fiction

By John Stang
Herald staff writer

They lurk below.

Coming to the surface to hunt for food, to carry it back to their radioactive subterranean lairs.

The fear is there: They might escape from inner Hanford.

They're ants.

Radioactive ones.

And Hanford workers decimated them at their favorite gathering spot a couple of weeks ago. Eight mounds' worth of ants were poisoned.

That spot — maybe a fourth the size of a football field — is west of B Plant in the 200 Area.

Pest control workers have counted 157 anthills in the spot — Hanford's most ant-infested site, said Ray Johnson, an environmental scientist with Waste Management Federal Services Northwest Operations. "There's certainly something out there that attracts them," he said.

Somewhere from 10 to 20 feet below the surface in that spot is a junction box for old underground radioactive waste pipes, which leak.

Red harvester ants burrow down to 20 feet deep. Johnson speculated 10 percent — maybe more — of the mounds in that area end up contaminated, along with the ants.

The problem of radioactive ants isn't new — and it's well documented.

The 1954 sci-fi film *Them* — available on video cassette — chronicled how James Arness and James Whitmore resolved the Army's troubles with ants that grew as big as houses after being exposed to atomic bomb radiation.

The latest documentation of the smaller, less fictional Hanford ants is filed in the inner recesses of the Department of Energy's Reading Room in Richland — where the Sept. 10 discovery of eight contaminated anthills is classified as an "off-normal" incident.

Johnson claimed Hanford's ants — unlike the stars of *Them* — haven't mutated into giants headed for Los Angeles.

Could it be because they only were mildly contaminated?

Johnson shrugged off suggestions of any major danger. "We're not missing any HPTs," he said, referring to health physics technicians who monitor Hanford and its workers for contamination.

But a threat does exist.

The wind can blow ants and dirt from the mounds out of the radiological buffer zones and onto clothes or cars, where they could hitch a ride out of Hanford.

The same threat exists with other insects, critters and snakes. Hanford is filled with contaminated nooks and crannies for animals and insects to crawl into.

"It's kind of a menagerie out here. When the engineers design things, they don't think about ants and mice getting into them," Johnson said.

In 1996, a contaminated mouse hitched a ride on some canned food gathered in the 200 Area to end up at the Tri-Cities Food Bank in northern Richland — the farthest anyone knows that a contaminated critter has made it into the city.

The threat has led to technicians methodically surveying Hanford's sagebrush. When a technician finds an contaminated anthill, "he then goes on an ant mound hunt" in the area on the theory hives usually are bunched together.

Dealing with radioactive ants takes patience. Subtlety. Poison.

Digging out a mound just scatters the ants, who then will quit eating until they rebuild.

So poison is scattered around. The ants carry the poison granules inside. And pest control workers wait until the ants eat the poison and die.

Then, the workers shovel out the mounds and deposit ants and dirt at a low-level radioactive waste burial site.

But this is the threat that won't die.

Contaminated ants were first found on this spot and poisoned in 1988. And the process has repeated every few years.

Johnson said: "We'll get by for a few years, and eventually, the ants will be back."

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TRI-CITY HERALD A4
Tri-Cities, WA OCT 01 1998

Radioactive socks found in Hanford worker's home

By the Herald staff

Four socks with low levels of radioactive contamination were found in a laundry hamper in a Hanford worker's home this week.

The discovery ended a search that began late Tuesday morning when a Fluor Daniel Northwest worker was leaving one of Hanford's tank farms, where routine radiation checks found some contaminated particles on his boot.

As the worker was checked out further, one of his socks was found to be slightly contaminated with some particles.

It appeared he picked up the contamination on his boots prior to Tuesday, said Fluor Daniel Hanford spokesman Mike Berriochoa.

The worker, who was not identified, was leaving his boots at the site each day but wearing his socks home. So the worker's laundry hamper and the rest of his home were checked for contamination, Berriochoa said.

Four socks were found to be slightly contaminated. The rest of the clothes and house were free of contamination. The worker was checked out on a whole body counter, and was found to be clean of contamination.

The source of the particles was not determined, but Hanford officials speculated that the worker might have stepped in contaminated animal feces.

TRI-CITY HERALD A3
Tri-Cities, WA OCT 02 1998

Hanford puzzled by radioactive garbage bin

By John Stang
Herald staff writer

Officials are scratching their heads over spots of contamination that showed up in a Hanford garbage bin and in a truck that took a load of Hanford trash to Richland's landfill.

But so far, no radioactive contamination has shown up at the city dump, Hanford officials said Thursday afternoon.

The amounts of contamination involved in this week's incident are too small to give a dose of radioactivity to a human, said Bob DeLannoy, environmental safety, health and quality director for DynCorp Tri-Cities Services Inc.

DynCorp is the subcontractor that handles utility matters at Hanford, including trash pickup.

"It's very rare when something like this happens. And when it happens, we take it very seriously," said Fluor Daniel spokesman Mike Berriochoa.

Small amounts of Hanford hazardous wastes have shown up a few times at Richland's landfill in the last couple of years, said Stan Arlt, the city' engineering and utility services director. He was unsure of the number of times.

"We're not seeing a definitive pattern," Arlt said.

Here is what happened, according to DeLannoy:

At 8 a.m. Monday, a health physics technician did a routine survey of an office trailer at central Hanford's B Plant to check for contamination.

The technician found some contamination at the trailer, which led to additional checks that found a spot of contamination inside a nearby garbage bin.

The trash bin was cordoned off. People who recently used the trailer were checked and found free of contamination.

And Hanford officials and technicians huddled Wednesday to gather facts on where the contamination in the trash bin could have come from.

They then learned the bin was emptied into a Hanford garbage truck at 7:45 a.m. Monday—shortly before the technician checked the trash bin.

Hanford contacted Richland about 1:30 p.m. Wednesday to say the truck with possibly contaminated trash had gone to the landfill. Hanford technicians went to the dump that afternoon and checked an area for contamination.

Officials then speculated they may have checked the wrong spot, so on Thursday they tested another part of the landfill. No contamination was found then, either, DeLannoy said.

The suspected landfill areas are isolated, and people have been kept out, said DeLannoy and Arlt.

The truck and the trash found in it also have been kept isolated. A 6-inch-square patch of contamination was found near the rear of the truck.

Also, a box was found with a spot of lesser contamination that likely came from the bed of the truck, DeLannoy said.

Investigators still were puzzled Thursday by where the contamination originally came from. The investigation is continuing.

Meanwhile, Hanford and Richland officials are considering whether any further tests are needed at the landfill.

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TRI-CITY HERALD A1
Tri-Cities, WA OCT 06 1998

Hanford digs for more off-site radiation

By Annette Cary
Herald staff writer

Hanford officials are looking for the source of radioactive contamination found at 11 places on the nuclear reservation, a worker's laundry hamper and possibly the Richland landfill.

On Monday, workers started to dig up a section of the city landfill where trash was dumped from a Hanford garbage bin and a garbage truck that were found to be contaminated.

An initial check of the city landfill found no contamination, but workers began digging up much of the residential and industrial trash dumped the previous Monday for a more thorough check. The Hanford truckload is believed to be buried up to 4 feet deep.

"Any contamination outside of radiation zones on the Hanford site or elsewhere is unacceptable," said Robert Shoup, vice president for environment, safety and health at Fluor Daniel Hanford. "We take any contamination spreads very seriously, and we are committed to making sure that such events don't happen again."

At Hanford, about 10 acres have been roped off for a more thorough search south of the B Plant in the 200 East Area — the likely source of the contamination. Officials are looking for any more contamination and any clues to the source of the contamination.

Most of the contamination was found in that area south of B Plant where mostly union craftworkers, such as carpenters and electricians, are based.

However, a small amount of contamination was found in the 200 West Area five miles away. Shops and equipment from the 200 East Area are being moved to the 200 West Area, since B Plant has been shut down. The two small contaminated spots found there have been cleaned up.

The 11 contaminated spots found ranged from one on the floor of an office trailer about the size of a salad plate to what Hanford officials called a speck on the door of a vehicle.

The largest spot gave off 10 to 12 millirads of radiation an hour. A worker sitting nearby for an hour would receive about the same dose as in a dental X-ray, said Bob DeLannoy, environmental safety, health and quality director for Dyncorp Tri-Cities Services Inc. The company is the subcontractor that handles trash pickup.

Reports of radioactive contamination in areas of Hanford that were supposed to be clean started popping up last week.

Monday, Flour Daniel officials announced the cases appeared linked. All had pure strontium 90 — a radioactive waste that usually is found mixed with cesium 137.

Officials believe they'll eventually trace the waste back to the B Plant, one of the few places likely to have pure strontium. It's closed except for an adjoining storage pool that holds cesium and strontium. But for 17 years, the plant was used to separate the most radioactive waste from overheated underground nuclear waste storage tanks.

The first of the 11 contaminated spots was found Sept. 28 in an office trailer near Hanford's B Plant. A routine check for radiation turned up nothing Sept. 25, but after the weekend, a similar check found contamination in the office.

From there, contamination was found in a trash bin and a Hanford garbage truck. A second garbage truck also was contaminated, but it had not gone to the landfill when the radiation was detected.

In all, radioactive contamination was detected at Hanford in two office trailers, five buildings, a government van, the garbage bin and the two Hanford garbage trucks.

Hanford officials also started checking workers in the 200 East Area. Some 40 workers were given "full-body" checks along with a check of their cars. They came up clean. An additional 60 workers have been given less thorough checks for radiation on their skin or clothes.

The checks turned up contaminated particles on one worker's boots last week. He had been leaving his boots at the site each day but wearing his socks home. When his laundry hamper was checked at home, low levels of radioactive contamination were found on four socks.

That and possibly garbage from the contaminated truck are the only radioactive contamination believed to have left Hanford.

Any contamination in the landfill would not be at a high level, but it still is a concern to the city, DeLannoy said.

It is one of a few incidents in recent years of contamination reaching the city landfill, said Stan Arlt, Richland's engineering and utility services director. But this incident could be more serious than past incidents, he said.

In January 1996, 7 kilograms of nonradioactive hazardous waste was accidentally sent to the city landfill from Hanford. A few months later, two missing 55-gallon drums for low-level radioactive waste turned up at the landfill. No radiation was detected on them.

In a third incident a year ago, protective booties were found at the landfill with slight contamination — about the same radioactive level as the mantle of a camping lantern. The Department of Energy has said they did not come from Hanford.

Since the radioactive waste was found last week, no Hanford waste has been sent to the city landfill. Instead, it's piling up in containers on site.

Richland usually charges $25 a ton for out-of-town commercial waste dumped at its landfill but charges Hanford $46 a ton. Hanford officials survey the landfill once a week for radiation.

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Fruit flies suspects in Hanford contamination

TRI-CITY HERALD A1
Tri-Cities, WA OCT 07 1998

By Annette Cary
Herald staff writer

Fruit flies, possibly attracted to a sugary substance used to seal potentially radioactive areas, appear to be spreading contamination around offices and shops at Hanford.

Fluor Daniel Hanford officials had not yet figured out Tuesday how several spots in the 200 East Area had become contaminated, but believed flies, gnats and ants were making the problem worse.

"We're very concerned about this," said Ron Hanson, Fluor Daniel Hanford president. Finding the source of the radiation is going much slower than officials thought, he said.

"We will give it our full attention until we find the source."

About 10 acres with office buildings and trailers just south of B Plant have been roped off and closed to workers, Hanford officials announced Monday after spots of radioactive contamination were found there.

Nine spots were discovered in the roped-off area, and two more were found and cleaned up about five miles away in the 200 West Area.

Tuesday, the count rose to at least 13 contaminated spots after two more were found at the 200 East Area. One spot was inside a building and the other was just outside a second building.

In addition, wet garbage in bins and garbage cans tested positive for radiation Tuesday. Most were inside the closed-off 200 East Area, but at least one spot was in a trash can outside the boundaries.

Work on construction on a storage building for nuclear wastes at the site has been stopped temporarily because contamination was found in a trash can there. It measured roughly 1 millirad per hour, said Robert Shoup, vice president of environment, safety and health for Fluor Daniel Hanford Inc.

The worst spot found Tuesday was inside the roped-off area in wet garbage where flies and gnats had been. It measured 10 to 12 millirads per hour — about the same dose of radiation in a dental X-ray. It's also about the same as the potential radiation dose of the largest contaminated spot found in the closed-off area before Tuesday, a spot about the size of a salad plate.

Some of the other contaminated spots were described by Hanford officials as specks. They could have been spread by insects, Shoup said.

Hanford officials are investigating whether part of the problem is that insects are attracted to a fixative. The mix is sprayed on areas that might be contaminated so no radioactive material gets in the air while workers are checking it.

Until two or three years ago, a fixative with an organic base was commonly used. But because it is not healthy to breathe, Hanford has begun using another fixative with a sugar base.

Hanford garbage trucks, garbage bins and other areas were being fumigated Tuesday to kill insects. Broader spraying is planned.

"We don't need Mother Nature helping" spread contamination, Shoup said.

Workers also are being told to wrap their trash before they throw it away and to keep lids on garbage cans.

Hanford officials have known since last week that there's a possibility contaminated trash may have been sent to the Richland landfill in a garbage truck that later was found to be contaminated. Since then, trash is kept at Hanford, where it's beginning to pile up.

The search for the potentially contaminated trash buried at the landfill continued Tuesday. Hanford workers slowly were shoveling layers of garbage, then sweeping the area for radioactivity throughout the day.

Hanford officials were concerned that in addition to contaminated trash, contaminated flies and gnats might have hitched a ride on the truck to the landfill. However, workers found no contamination Tuesday, but had not unearthed the bulk of the Hanford trash by evening.

Some 50 to 60 tons of trash has been moved, so far. The load dumped last week from the contaminated Hanford truck is believed to be an an area about 200 feet by 200 feet.

Hanford workers have a good idea where most of the waste should be in the landfill, because city workers knew the load dumped on top of it was waste from a food processor. It's not all in tidy layers, however. The waste had been pushed together and compacted, mixing some of it together.

At Hanford, no workers are known to have received a dose of radiation from the contamination found in the 200 East Area. Forty have been given full-body checks to determine if they have ingested any radiation. Those checks came up clean, but all have requested bioassays. Those tests, done on body waste, can find exposure missed in the full-body checks.

An ironworker earlier found to have radiation on one boot and on four socks in his laundry hamper at home also has asked for the bioassay. Results will not be back for at least two weeks.

Fluor officials said Tuesday that small amounts of contamination were found not just on the worker's boot and socks, but also on the outside of his lunch bag and its contents. A tiny amount of radiation was detected on the lid of a plastic food container and the handle of a toothbrush, both of which were inside the plastic grocery store bag he used to carry his lunch.

Hanford officials had not confirmed what radioactive material was found in contaminated spots discovered Tuesday, but the 11 spots found by Monday all contained pure strontium 90, which gives a clue to its source.

Typically, strontium would be found mixed with cesium. The B Plant, where strontium and cesium were separated from tank wastes, is one of the places on site where pure strontium could be found.

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Hanford trash being removed from Richland

TRI-CITY HERALD A1
Tri-Cities, WA OCT 08 1998

By Annette Cary
Herald staff writer

Radioactive apple cores and banana peels found Wednesday in the Richland city landfill are among 35 tons of Hanford trash scheduled to make a return trip to the nuclear site.

The trash is part of radioactive contamination Hanford officials believe is being spread around office and shop buildings on the nuclear reservation by flies dining on a sugary substance sprayed on areas contaminated by radiation years ago.

A continuing search of the landfill Wednesday morning turned up 10 items contaminated with radiation. Hanford officials said they were mostly wet garbage, such as apple cores, that would have attracted contaminated flies and gnats to garbage bins at Hanford.

All 35 tons — about three truckloads — are going to be taken back to Hanford.

Workers from the nuclear reservation have stopped digging at the city landfill and covered the trash with tarps to keep the gulls that flock to the garbage from becoming contaminated.

Hanford officials are waiting for a state Department of Health radiological construction permit that's required to do work when contaminated material is found. They expect it to be issued today or Friday.

Hanford employees have been going over a 40,000-square-foot area at the landfill since Monday with Geiger counters after radioactive contamination was found on a garbage truck.

Workers uncovered the bulk of the trash from that load by Wednesday, but Hanford officials are looking for trash dumped as long ago as Sept. 21, because contaminated apple peels turned up in a Hanford lunch room Sept. 22.

The most radioactive item found at the landfill had low-level contamination, giving off 2.5 millirads an hour. A chest X-ray gives a dose of 10 to 12 millirads.

But Hanford officials are taking the issue seriously. "Any contamination outside a controlled radiation area is unacceptable," said Robert Shoup, vice president of environment, safety and health for Fluor Daniel Hanford.

Hanford officials are concerned about contamination not just in the landfill, but also on the nuclear site, where radioactive materials have turned up in unexpected places and still may be being spread by insects.

However, no more contaminated places were found Wednesday at Hanford.

"We're starting to see some progress," said Ron Hanson, Fluor president. Hanford officials were spraying for flies Wednesday and planned to bring in fogging equipment today that can kill insects in larger areas.

Although no possible source for the contamination is being ruled out yet, officials are leaning toward the theory that more than a dozen spots of radioactive contamination around offices, shops and equipment were carried there by insects.

Most, if not all of the spots, are contaminated with strontium, which is usually found in radioactive waste mixed with cesium. However, the B Plant, just north of where most of the contamination was found was used to separate strontium and cesium from underground waste tanks.

The 10-acre area with most of the contamination has closed-off pipes that used to carry waste from the strontium and the cesium separation process. When workers need to get into those places for maintenance, they spray on a fixative that's made up mostly of the sugar glucose. It dries to a hard finish, keeping any radioactive contamination in place.

But before it dries — or if it gets wet again — it may be attracting flies and gnats that eat not just the sugar but also the contamination.

Hanford officials are trying to trace any recent work that may have required use of the sugary substance or that would have gotten wet the 200 East Area, where most of the contamination has been found.

In the meantime, Hanford has stopped using the fixative, said Jim Mecca, deputy assistant manager for facilities transition for the Richland DOE office. Before any work is done that requires waste to be fixed in place, another mixture will have to be found, he said.

The sugary mixture has only been used in the last few years at Hanford — replacing another fixative that was not as healthy for workers.

Contamination has been found in the 200 East Area in spots as small as a speck and as large as a salad plate. Much of it has been in wet garbage and the cans, bins and trucks that have held garbage. A 10-acre buffer zone has been roped off and closed to routine work.

The two largest spots of contamination found in the 200 East Area would have given a worker who sat close by for an hour about the same dose as a chest X-ray.

"We're fairly confident workers have not had their safety unduly compromised," Shoup said.

In Richland, parts of the landfill that don't contain recent Hanford waste remain open to the public. "No one is in danger," said Richland Mayor Larry Haler.

When the waste is removed, city officials will discuss changes in landfill procedures with Hanford officials, Haler said. The city is interested in more safeguards and oversight to prevent more contamination of the landfill.

This is the most serious of several incidents of potential landfill contamination in recent years. In one case, very slightly contaminated protective booties were found at the landfill, but Department of Energy officials said they did not come from Hanford.

■ Reporter Annette Cary can be reached at 582-1533 or via e-mail at acary@tri-cityherald.com

SPOKESMAN REVIEW
Spokane, WA OCT 08 1998

B4

Radiation bugging Hanford

Safety officials think insects may be contamination source

Associated Press

RICHLAND — Insects ranging from fruit flies to gnats and ants may be spreading radioactive contamination among offices and shops at the Hanford Nuclear Reservation.

Eleven spots in the 200 East Area and two in the 200 West Area five miles away have been contaminated. The source has not been determined, but bugs are believed to be part of the problem.

"We're very concerned about this," Ron Hanson, Fluor Daniel Hanford president, said Tuesday.

Finding the source of the radiation has taken longer than expected, he said, adding, "we will give it our full attention until we find the source."

No workers are believed to have received a dose of radiation from the contamination found in the 200 East Area. Forty have been given full-body checks, which came up clean.

All of them also requested bioassays — tests on body waste — which can find exposure missed in the full-body checks.

An ironworker earlier found to have radiation on one boot and on four socks in his laundry hamper at home also has asked for the bioassay. Results will not be back for at least two weeks.

About 10 acres with office buildings and trailers have been closed to workers because of spot contamination.

Additionally, wet garbage in bins and garbage cans tested positive for radiation Tuesday. Most were inside the closed-off 200 East Area, but at least one spot was in a trash can outside the boundaries.

The worst spot found Tuesday was inside the roped-off area in wet garbage where flies and gnats had been. It measured 10 to 12 millirads per hour — about the same dose of radiation in a dental X-ray.

Construction of a storage building for nuclear waste at the site has been stopped temporarily because contamination was found in a trash can there. It measured roughly 1 millirad per hour, said Robert Shoup, vice president of environment, safety and health for Fluor Daniel Hanford, the reservation's prime contractor.

Some of the contaminated spots are just specks and could have been spread by insects, Shoup said.

Hanford officials have not confirmed what radioactive material was found in contaminated spots discovered Tuesday, but at least 11 spots so far have contained pure strontium 90.

Also under investigation is whether part of the problem is that insects are attracted to a fixative with a sugar base that is being sprayed in some places to prevent radioactive material from getting into the air.

Until two or three years ago, a fixative with a different chemical base was commonly used, but it was not healthy to breathe, so Hanford switched to the sugar-based fixative.

Hanford garbage trucks, garbage bins and other areas are being fumigated to kill insects. Broader spraying is planned.

SEATTLE POST-INTELLIGENCER
Seattle, WA
OCT 08 1998

Hanford hot spots blamed on radioactive bugs

P-I STAFF and NEWS SERVICES

RICHLAND – Hollywood might call it "The Invasion of the Atomic Fruit Flies."

Hot spots of radioactive contamination have turned up in unexpected places on the Hanford Nuclear Reservation in Eastern Washington. And experts theorize that fruit flies, gnats and ants may be the culprits – spreading radioactive contamination in offices and shops.

Radioactive material has turned up in garbage – perhaps spread by grazing bugs. Some of the garbage ended up in the Richland city landfill.

And an ironworker at the reservation found radioactive socks in his home laundry hamper.

So far, 11 hot spots in an area in the middle of the reservation have been found. Two other radioactive spots were found five miles away at another area. Both spots are in the areas of the greatest concentration of nuclear waste.

State health officials said the bugs pose no health threat to the general public. "They're not that radioactive," said Al Conklin, manager of air emissions and defense wastes for the state Health Department. "There are some hot little bugs, but it shouldn't be an off-site problem."

A gooey substance used at the reservation may be attracting the bugs. The substance, a fixative used to keep radioactive dust from being blown in the area, is sugar-based. Gnats and fruit flies seem to enjoy snacking on it.

The company in charge of cleaning up Hanford's nuclear waste is taking the possibility of hot bugs seriously.

"We're very concerned about this," Ron Hanson, Fluor Daniel Hanford president, said Tuesday.

"We will give it our full attention until we find the source."

Forty employees have been given full-body checks, which came up clean.

All of them also requested bioassays – tests on body waste – which can find exposure missed in the full-body checks.

The ironworker who was found to have radiation on one boot and on four socks in his laundry hamper at home also has asked for the bioassay. Results will not be back for at least two weeks.

About 10 acres with office buildings and trailers have been closed to workers because of spot contamination.

Additionally, wet garbage in bins and garbage cans tested positive for radiation Tuesday. Most were inside a closed-off area, but at least one spot was in a trash can outside the boundaries.

The worst spot found Tuesday was inside the roped-off area in wet garbage where flies and gnats had been. It measured 10 to 12 millirads per hour – about the same dose of radiation in a dental X-ray.

Construction of a storage building for nuclear waste at the site has been stopped temporarily because contamination was found in a trash can there. It measured roughly 1 millirad per hour, said Robert Shoup, vice president of environment, safety and health for Fluor Daniel Hanford.

Some of the contaminated spots are just specks and could have been spread by insects, Shoup said.

State health officials told contractors to find possible sources of radioactivity that may be contaminating bugs and eliminate them.

One such area is a pit containing high-level waste lines. Health officials ordered the pit cover to be sealed with tape yesterday so that bugs could not get into it, Conklin said.

Hanford garbage trucks, garbage bins and other areas are being fumigated to kill insects. Broader spraying is planned.

Workers also have been told to wrap their trash before they throw it away and to keep lids on garbage cans.

Some contaminated trash was sent to the Richland landfill. The garbage, mostly paper and food waste, was only slightly contaminated, said Stan Arit, Richland's director of engineering and utility services.

"The amount of radiation is so slight," he said. "It's no threat to the public."

Bugs at the landfill should not be a problem, Arit said, since garbage is regularly covered with dirt.

Richland wants transfer station built at Hanford

TRI-CITY HERALD
Tri-Cities, WA OCT 10 1998

By Chris Mullick
Herald staff writer

The radioactive contamination discovered in Hanford garbage might have been detected before the refuse was dumped had a transfer station been built at the Richland landfill.

But Richland, which has been collecting money to build the facility for three years, now wants its contract with the Department of Energy changed so the $500,000 building can be constructed at Hanford — at more expense to DOE.

The 1995 contract between DOE and the city for garbage dumping required the city to build a transfer facility at the landfill where waste would be monitored. DOE has been paying $43.29 per ton of garbage — 2½ times what commercial customers in Richland pay — to cover the cost of the building.

In the first three years of the 10-year contract, DOE has paid Richland at least $1.3 million to dump its garbage. The transfer station, had construction plans not been stopped, would have been completed sometime last year, said Stan Arlt, Richland's engineering and utility services director.

Arlt said there is a new sense of urgency to build the facility after last week's discovery that 35 tons of Hanford garbage containing low-level contamination had been dumped in the landfill. After being mixed with other garbage, as much as 100 tons may now be contaminated and will be removed from the landfill.

But Arlt said the city now feels the transfer station should be at Hanford, rather than at the landfill. And he says the city wouldn't foot the bill.

Instead of building the transfer station with money collected so far, the city has used the money to buy a larger trash compactor and a new front loader that were needed partly because of the Hanford trash, Arlt said.

The city also used some of the money to have city workers examine Hanford's garbage more closely.

Arlt said the contract with DOE doesn't specify how the money should be spent to better handle Hanford's garbage. The design phase of the project already has been completed at a cost of $50,000.

If the contract was left unchanged, it eventually would generate enough money to build the station, he said. However, it now appears DOE and the city will amend the contract.

DOE had been wondering about the progress of the transfer station.

"If the transfer station were not to be built, we would be seeking (a new rate)," said Jim Mecca, DOE's assistant manager for facility transition. "Why the facility hasn't been built is a question that has to be answered by the city."

Mecca agreed it's likely the station will be built at Hanford because it is a better location.

Once the facility is built, it would mark a big change in how Hanford's garbage is dealt with.

"We have not dumped garbage on a concrete pad and looked at every apple core and banana peel, which is probably the way we're going to have to go in the future," Mecca said.

Mecca said it isn't known yet how much it will cost to inspect Hanford's garbage so thoroughly. He envisions garbage being placed on a conveyor belt that would run past radiation detectors.

"It can be made to be efficient," he said.

He hopes a new agreement can be reached in time to resume garbage dumping in Richland as soon as the week of Oct. 19. Garbage will stack up at Hanford until then.

Hanford workers began moving Hanford garbage from the landfill back to the nuclear site on Friday. All the garbage could be back at Hanford early next week, Arlt said.

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Contaminated waste exhumed at landfill

By the Herald staff

Hanford workers dug up 35 tons of waste contaminated with low-level radiation Friday at the Richland city landfill.

They may have to take out 100 tons to make sure no contaminated trash from the nuclear reservation remains at the landfill, Hanford officials said Friday. The trash was dumped there after Sept. 21 and before officials knew flies and gnats were spreading radioactive contamination around offices and shops in the 200 East Area.

A total of 35 tons of trash with spots of contamination — such as banana peels and apple cores — was taken to the city landfill. But because it had already been compacted and covered, it's become mixed with other waste that will also be dug up.

The trash will be taken back to the Hanford low-level waste burial grounds.

No new contamination was found Friday at Hanford, except in a 10-acre area south of B Plant that's been roped off and closed to routine work.

"There's no evidence contamination is spreading," said Robert Shoup, vice president of environment, safety and health for Fluor Daniel Hanford. "We think we have things contained."

The only worker known to have come in direct contact with the waste has received results of a bioassay, which were negative for radiation. After spots of radiation turned up on the ironworker's boot and the handle of a toothbrush in his lunch sack, a search of his home laundry hamper turned up four socks contaminated with small amounts of radiation.

Hanford officials are not sure where flies and gnats were picking up the radiation, but they've been looking at a valve box that controlled an underground piping system carrying waste from B Plant years ago. The box is usually sealed up but was reopened several weeks ago for maintenance.

A check of the box has shown it is contaminated with strontium — the same type of waste that's been spread by flies. Flies trapped there were contaminated with radiation.

TRI-CITY HERALD A3
Tri-Cities, OCT 13 1998

Hanford works to trap contaminated bugs

By John Stang
Herald staff writer

Hanford's contaminated trash has been removed from Richland's landfill.

And now, efforts are increasing to lure and trap the tiny contaminated bugs that are flying around a 10-acre area near central Hanford's B Plant.

"We believe this episode is winding down to a successful conclusion," Bob Shoup, Fluor Daniel Hanford's vice president for environment, safety and health, said Monday.

Stan Arlt, Richland's engineering and utility services director, said, "It looks like all the contaminated garbage that we are aware of should be out by close of business today."

In the past few days, Hanford has taken 14 truckloads of contaminated and suspected contaminated trash — a total of 168 to 210 tons — from the Richland landfill to a low-level radioactive waste site in central Hanford.

The work is in response to numerous, slightly contaminated spots found near B Plant, including in a trash bin, in a garbage truck and in trash found at the landfill.

Hanford officials believe fruit flies, gnats and other "flying pests" are spreading the strontium contamination from the B Plant area.

Hanford believes one source of the contamination is a valve box for an underground pipe system that carried wastes from B Plant years ago, Shoup said. But he said other potential sources have not been ruled out.

The Department of Energy and the city likely will begin discussing today whether DOE should build a transfer station at Hanford to screen waste for contamination before it goes to the landfill, Arlt said.

Arlt hopes those talks will be completed by the end of the week.

Meanwhile, Hanford is stepping up efforts to catch the contaminated insects.

About 200 other traps are being scattered around Hanford outside of the 10-acre site. The only contaminated insects have been found within the 10-acre site, Shoup said.

And since last week, technicians have been going through the 10-acre site shoulder-to-shoulder with radiation counters to hunt for contaminated spots and insects. That surveying will be increased this week, Shoup said.

Until now, the top priorities were to tackle the landfill and to check workers for contamination, he said.

One worker who came in contact with the waste was checked by urinalysis, which showed no contamination.

Hanford checked 32 employees who work in the area with a whole body counter, which scanned their bodies for contamination, but found no contamination.

Also, 34 workers were given urinalysis kits, which were negative, Shoup said.

Another group of employees who worked around the valve box will be asked to undergo urinalysis. This is a voluntary procedure, but Shoup said no one has refused to be tested.

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ARIZONA
REPUBLIC

Insects spread radiation on nuclear reservation

Associated Press

RICHLAND, Wash. — Insects ranging from fruit flies to gnats and ants may be spreading radioactive contamination among offices and shops at the Hanford nuclear reservation.

Thirteen spots on the reservation have been contaminated. The source has not been determined, but bugs are believed to be part of the problem.

"We're very concerned about this," Ron Hanson, Fluor Daniel Hanford president, said last week. He said finding the source of the radiation has taken longer than expected.

No workers are believed to have received a dose of radiation from the contamination. An ironworker was found to have radiation on a boot and socks in his laundry hamper at home.

About 10 acres with office buildings and trailers have been closed to workers because of spot contamination.

Additionally, wet garbage in bins and garbage cans tested positive for radiation last week. The worst spot found was in wet garbage where flies and gnats had been. It measured 10 to 12 millirads per hour — about the same dose of radiation in a dental X-ray.

Hanford for more than 40 years made plutonium for nuclear weapons. The 560-square-mile reservation now contains the nation's largest volume of radioactive waste from nuclear weapons.

Radioactive Bugs Found at Nuke Site

By Linda Ashton
Associated Press Writer
Wednesday, October 21, 1998; 4:30 p.m. EDT

RICHLAND, Wash. (AP) -- Radioactive ants, flies and gnats have been found at the Hanford nuclear complex, bringing to mind those Cold War-era B horror movies in which giant, mutant insects are the awful price paid for mankind's entry into the Atomic Age.

Officials at the nation's most contaminated nuclear site insist there is no danger of Hanford becoming the setting for a '90s version of ``Them!,'' the 1954 movie starring James Arness and James Whitmore in which huge, marauding ants are spawned by nuclear experiments in the desert.

Although Hanford is working to eradicate its ``hot'' insects, officials said the radioactivity the pests carry is slight and no threat to neighboring communities.

``We're not dealing with an insect that would leave and all of a sudden start to give birth to these malformed, horrible insects,'' said a chuckling Richard Zack, an entomologist at Washington State University in Pullman.

The situation came to light in September when red harvester ants found underground near some old waste pipes were discovered to be radioactive. Then, earlier this month, workers discovered radioactive flying insects around cans where the staff's day-to-day nonradioactive garbage is thrown away.

That led Fluor Daniel Hanford, the company that manages Hanford for the Energy Department, to check the town dump where Hanford garbage is taken. Workers found trash that had apparently become radioactive from contact with the bugs, and sent 210 tons of it back to Hanford for burial.

Still, a person would have had to stand next to a spot contaminated by radioactive bugs for an hour to get the level of exposure equal to a dental X-ray, said Mike Berriochoa, spokesman for Fluor Daniel Hanford.

And the house-size ants of ``Them!'' are ``physical impossibilities'' and just the stuff of science fiction, Zack said.

Zack and Berriochoa said they are not aware of any pattern of genetic mutation in the insects around Hanford. And if the insects were to develop mutations, the abnormalities would be along the lines of a short antenna or an extra leg, Zack said.

And because the insects' range is short -- for fruit flies, it's a few hundred yards to a half-mile -- the chances of their leaving the 560-square-mile complex are slim, he said.

Hanford said radioactive pests are to be expected at a place that produced 40 years' worth of plutonium for the nation's nuclear weapons, including the bomb dropped on Nagasaki, Japan, in 1945.

With all manner of burrowing creatures in the desert, including mice, rabbits and snakes, there's always the potential something will get contaminated, Berriochoa said. When contaminated mouse or rabbit droppings are found at Hanford, traps are set for the animal, and it is destroyed.

Hanford stopped producing plutonium at Hanford in the 1980s, but some areas remain highly radioactive. Billions of dollars are being spent to clean up the site along the Columbia River.

Julie Petersen, 22, who works at Sunburst Video in Richland, does not spend a lot of time worrying about mutant bugs.

"I'm sure I get more radioactivity from my microwave," said Ms. Petersen, whose friends outside the area still ask her if she glows. "It's just something we deal with every day. It's the way most people live."

TRI-CITY HERALD A8
Tri-Cities, WA OCT 22 1998

More Hanford workers tested for exposure to radioactivity carried by fruit flies, gnats

By John Stang
Herald staff writer

Hanford has checked 104 people for possible exposure to specks of radioactive contaminants believed to be spread by fruit flies and gnats.

That is almost double the 55 that had taken urinalysis tests as of last week.

"They decided to go for every person who could have been exposed," said Fluor Daniel spokeswoman Michele Gerber.

Most of the new people tested were truck drivers.

So far, test results on 62 people have been returned. One person showed a borderline positive reading and has been retested. The result of the new test has not been returned yet, Gerber said.

Meanwhile, Hanford recently opened up a previously roped-off 10-acre area by B Plant that was the main focus for hunting for contaminated insects.

Several trailers and "Conex" buildings — metal storage boxes big enough to walk into — in that area still are off limits awaiting checks by Hanford workers.

Starting in late September, insects apparently have left small spots of strontium contamination — no more than the dose from a dental X-ray — in trash cans and Dumpsters, in at least one garbage truck and in Richland's landfill.

One source of the contamination is likely a valve box for an underground pipe system that carried wastes from B Plant years ago.

But other sources have not been ruled out. The flies and gnats are believed to have been attracted to a sugary substance used as a sealant in that area.

The suspected areas have been sprayed heavily with insecticides.

The last contaminated fly was found in the valve box Oct. 15, with the last contaminated fly found elsewhere Oct. 8.

Meanwhile, the Department of Energy and the city of Richland still are discussing how Hanford's trash should be inspected before it leaves the site for Richland's landfill, said Gerber and Stan Arit, the city's engineering and utility services director.

Until those talks are done, Hanford is burying its trash on site.

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TRI-CITY HERALD A3
Tri-Cities, WNOV 03 1998

Two more contaminated flies found miles from suspected Hanford origin

By John Stang
Herald staff writer

Two contaminated flies were found Friday in a trap next to a US Ecology trash bin at central Hanford.

The Dumpster is two to three miles from Hanford's B Plant area — making the trap site the farthest contaminated insects have been found from the suspected origin of the site's other contaminated flies and gnats.

It also puts the flies next to a Dumpster whose contents go to a waste transfer station in Pasco and then to the Rabanco regional landfill in Roosevelt.

However, the Dumpster has been surveyed, and no contamination has been found in it so far, said Debra McBaugh, manager of the environmental radiation section for the Washington Department of Health.

The amount of contamination found on the two flies poses no health risk, she said.

The incident is the latest development as Hanford tries to keep flies and gnats from spreading spots of slightly radioactive contamination.

The problem began in late September. Trash from the B Plant area was routinely sent to Richland's landfill — then it was found to contain small spots of radioactive contamination.

Followup searches found spots of strontium contamination scattered in the B Plant area. Insects are the suspected carriers.

One suspected origin of the contamination is a valve box near B Plant.

The federal site's lead contractor, Fluor Daniel Hanford, is trying to determine if other potential sources exist.

Numerous insect traps are scattered in central Hanford. And until Friday, the last contaminated fly was trapped Oct. 8.

But three new contaminated spots were found last week in two insect traps and one Dumpster near B Plant, according to a Hanford memo to all employees.

Then 50 flies were found Friday in a trap about two feet from the US Ecology Dumpster. Two of those 50 were contaminated, McBaugh said.

Much of Hanford's trash normally is shipped to the Richland landfill.

But that trash now is kept and buried at Hanford until Richland and the Department of Energy work out procedures for reopening the city landfill to the site.

But Pasco-based Basin Disposal Inc. hauls some Hanford-area trash, including US Ecology's, to its waste transfer station before sending it Roosevelt. Information on the size of Basin Disposal's portion was unavailable Monday.

When the contamination first showed up in Richland's landfill, Hanford contacted Basin Disposal, said Darrick Dietrich, a company official.

Hanford technicians began routinely surveying Basin Disposal's Dumpsters — and other items on a "case-by-case basis," he said. No contamination had been found on Basin Disposal items. The one US Ecology site Dumpster had been surveyed twice before Friday, Dietrich said.

Meanwhile, Hanford technicians checked the trap next to US Ecology's Dumpster last Wednesday and found no contaminated flies, McBaugh said.

Basin Disposal picked up trash from that Dumpster Thursday. The contaminated flies were found near the Dumpster on Friday.

Fluor Daniel is not sure if B Plant or other Hanford operations are the source of contamination for the two flies — or if the source is US Ecology's site, said Fluor spokeswoman Michele Gerber. US Ecology is a commercial operation with no link to anything managed by Fluor.

The flies are being analyzed to determine where they picked up the contamination. If it's from strontium, it would be linked to the B Plant area.

"If it's determined it's our problem, we'll get more involved," Gerber said.

Tom Hayes, manager of US Ecology's site, believes the flies did not pick up the contamination at the commercial site. All of its radioactive materials are sealed in barrels and buried.

"We've got years and years of surveys that show there's no loose radioactivity here. We're confident it came from elsewhere," Hayes said.

McBaugh said the state suspects the contamination is connected to the B Plant area.

Meanwhile, Hanford continues to analyze urinalysis samples from 106 people who may have been exposed to the contamination. Results from 65 tests have been returned, and all showed no exposure, Gerber said.

The 65 negative test results include one person who tested borderline positive on an earlier test — and was rechecked.

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TRI-CITY HERALD A4
Tri-Cities, WA NOV 05 1998

Contaminated fly found near trash bin came from B Plant

By the Herald staff

Hanford experts have confirmed that a contaminated fruit fly found last week next to a US Ecology trash bin came from the B Plant area.

Only one fly — not two as earlier thought — was contaminated out of 50 found Friday in a trap a couple of feet from the Dumpster, said Bob Shoup, Fluor Daniel Hanford's vice president for environment, safety and health.

The trash bin is 1¼ miles from central Hanford's B Plant area — making this the farthest that contaminated insects have been found from the other contaminated flies and gnats.

Fruit flies usually stick in one area, but a good wind apparently wafted this fly to the US Ecology area, Shoup said.

The fly was tainted with strontium and cesium, which links it to the B Plant area where those radioactive substances are stored.

No evidence has been found that the bin or the Basin Disposal Inc. truck serving it were contaminated, Shoup said.

One more contaminated spot was found Tuesday in a garbage can near the Canister Storage Building — Hanford's new underground spent fuel vault. But the contamination was so slight the spot appears to be an old one, Shoup said.

Meanwhile, Hanford continues to analyze urinalysis samples from 106 people who may have been exposed to the contamination. Results from 65 tests have been returned — and all showed no exposure.

Hanford digs up backup landfill, collector

TRI-CITY HERALD
Tri-Cities, WA NOV 13 1998

By John Stang
Herald staff writer

Hanford now has a backup trash collector and alternative landfill to use in case Richland permanently stops taking Hanford waste.

Richland has refused to accept any more Hanford garbage until Hanford officials figure out how to deal with small amounts of radioactivity showing up in its trash.

The suspected cause is slightly radioactive insects buzzing around part of the Hanford site.

Pasco-based Basin Disposal Inc., which hauls trash from the Tri-Cities to the regional landfill at Roosevelt, signed a one-year agreement Wednesday to begin hauling Hanford's garbage.

Hanford officials hope to work out an agreement with Richland too so the site has two garbage haulers, but the matter is still unresolved.

"It's going to need more massaging," said Roger Wright, the city's environmental engineer.

Much of Hanford's trash normally is shipped to the Richland landfill. But that trash now is kept and buried in a low-level radioactive waste trench at Hanford until Richland and the Department of Energy resolve the concerns.

Also this week:

- While conducting its first random survey of trash at the site Thursday, Hanford workers found a mysterious and slightly radioactive plastic bag of dry granules. It is not known what the granules are.
- Two more dead contaminated flies were discovered in an ironworkers' shop in the 200 East Area near B Plant.
- Hanford continued to analyze urine samples from 106 people who may have been exposed to the contamination. Results from 95 tests have been returned, and all showed no exposure.

The problem began in late September, when trash routinely sent to the Richland landfill from the B Plant area was found to contain small spots of radioactive contamination.

Officials suspected the contamination was being spread around office and shop buildings by flies and gnats dining on a sugary substance sprayed to prevent the spread of radiation from contaminated areas.

Then, radioactive apple cores and banana peels were found in the landfill among 35 tons of Hanford trash sent there since Sept. 21. However, the most radioactive item at the landfill had low-level contamination, giving off 2.5 millirads an hour. A chest X-ray gives a dose of 10 to 12 millirads.

Still, city officials closed the dump to Hanford garbage until the contamination problems were investigated further.

But until the issue is resolved, it's costing 10 to 50 times as much to bury the waste at Hanford as in a regular landfill, Mecca said.

That's because normal office trash has to be handled and buried like it's low-level radioactive waste. Hanford produces five to six tons of trash a day.

The agreement with Basin Disposal has DOE paying $33 to $35 a ton to take the wastes to a Pasco transfer station and then to a regional landfill in Roosevelt. The fee at Richland's landfill is $43.29 a ton.

The current situation shows that "good business practices" call for having two trash hauling systems at Hanford, said Jim Mecca, DOE's deputy assistant manager for facilities transition.

Mecca said Basin Disposal's exact long-term role will be re-evaluated after talks are done with Richland. DynCorp Tri-Cities Services is the subcontractor in charge of Hanford's utilities.

Leonard Dietrich, owner of Basin Disposals, said DOE needs to look at its past practice of hauling trash to Richland's landfill. The Roosevelt facility has extra safeguards, including an underground protective barrier of two plastic liners with a layer of impermeable clay between them — protections that are absent in Richland.

Any leaks leading to environmental cleanup could leave DOE as a potentially liable party, Dietrich said.

Still, Wright said Richland's unlined landfill complies with all the appropriate laws because it is in an arid area with less than 12 inches of annual rainfall.

Meanwhile, Fluor is setting up a system of dividing its trash into four categories to be checked for different levels of contamination. For example, trash from office buildings would be in the least risky category. Trash from the Plutonium Finishing Plant would be in the category of highest risk of being tainted.

The new system includes spreading out random loads of trash in a metal building and checking for contamination, said Bob Shoup, Fluor's vice president for environmental safety and health.

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TRI-CITY HERALD A4
Tri-Cities, WA NOV 14 1998

Radioactive reading in trash tied to potassium 40 in bag

By the Herald staff

Naturally occurring potassium 40 triggered the radioactive readings discovered Thursday in a bag of granules at a Hanford trash survey station.

The potassium 40 isotope was part of a salt mixture used to de-ice sidewalks, Bob Shoup, Fluor Daniel Hanford vice president for environmental safety and health, said Friday.

The granules were in a load of trash sent to a new survey station in Hanford's 400 Area.

Thursday was the first day Hanford began doing random surveys of trash going off site to make sure nothing contaminated is leaving the reservation.

That survey found a half-gallon of slightly radioactive dry granules in a plastic bag—later determined to be potassium 40 in a deicing mixture.

The average Mid-Columbia resident absorbs a radiation dose of about 360 millirem a year. The rough breakdown is 200 millirem from naturally occurring radon, 100 millirem from cosmic sources, 40 millirem from dental and medical x-rays and 20 millirem from naturally occurring potassium 40, Shoup said.

The amount of potassium 40 discovered in the bag would translate to significantly less than the naturally occurring annual dose of 20 millirem, he said.

TRI-CITY HERALD A2
Tri-Cities, WA DEC 06 1998

Richland, DOE reach deal on dumping

By Chris Mullick
Herald staff writer

Hanford's garbage could be back on its way to the Richland landfill as soon as Dec. 14.

In late September, city officials were notified that some Hanford garbage sent to Richland's landfill had been tainted with radioactive contamination. Since then, some of Hanford's garbage has been dumped on the nuclear reservation and some has been hauled to a site in Roosevelt.

But the Department of Energy and the city have reached an agreement that could resume dumping at the Richland landfill for the first time in more than two months.

If the Richland City Council approves the memorandum of agreement Monday night, dumping will resume Dec. 14, said Richland Deputy City Manager Don Carter.

The agreement contains several elements.

- All Hanford garbage will be inspected for 30 days to help devise a plan to categorize different types of refuse.
- After 30 days, garbage from areas more likely to be tainted with radioactive contamination will be inspected at a transfer station at the Hanford site. Garbage less likely to be contaminated will be inspected at random.
- Richland retains rights to monitor the inspection process and will have to approve any cleanup plans should more contaminated garbage be dumped into its landfill.

To further its oversight, Richland also will hire radiological experts to watch over the inspection activities. That will cost DOE $100,000 next year in garbage rates.

The agreement will require the DOE contract with Richland to be changed. Originally, a $500,000 transfer station was set to be built in Richland. DOE has been paying $43.29 per ton of garbage — 2½ times what commercial customers pay — in part to cover the costs of the building.

But Richland has used the money to buy a larger trash compactor and a new front loader that were needed partly because of the Hanford trash, said Stan Arit, the city's director of Engineering and Utility Services.

Had the 10-year contract remain unchanged, it would have eventually produced enough money to build the station. The city and DOE hope to amend that contract by Dec. 28. The problem began when flies and gnats began spreading contamination from a radioactive pit to food items and waste bins. Then, radioactive apple cores and banana peels began to turn up among 35 tons of garbage dumped at the Richland landfill.

Last month, DOE signed an agreement with Pasco-based Basin Disposal Inc., which hauls garbage from the Tri-Cities to the regional landfill at Roosevelt, as an interim solution before garbage could once again be dumped in Richland.

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TRI-CITY HERALD
Tri-Cities, WA
DEC 09 1998

Hanford to resume dumping in Richland

By Chris Mulick
Herald staff writer

Hanford garbage again will be dumped in Richland, but probably not until January.

That's because the Department of Energy and the city still have to hammer out changes to their contract in the wake of the 35 tons of garbage contaminated with radiation that was dumped in the Richland landfill in September.

The low-level radiation — less than a chest X-ray — was spread from contaminated areas by gnats and flies to food trash items and waste bins.

Since then, Hanford garbage has been dumped either in low-level waste trenches or trucked to a landfill in Roosevelt.

Late Monday, the Richland City Council approved an agreement to allow dumping to resume. The agreement requires DOE to build a transfer station on the nuclear reservation to inspect garbage at highest risk of being contaminated.

"We really shouldn't let anything leave Hanford that is contaminated," Jim Mecca, the DOE's assistant manager for facility transition.

All of Hanford's garbage now is being checked inside an empty warehouse at the Fuel Materials Examination Facility.

That includes all of Hanford's garbage, even from facilities that don't generate radiation such as the Hazardous Materials Management and Emergency Response training center, also known as HAMMER.

"For the moment, it fits the bill," Mecca said of the makeshift transfer station.

The DOE is developing guidelines to classify different types of garbage. After two more weeks of inspecting all Hanford refuse, garbage from lower risk sites will be checked only periodically.

All of Hanford's trash bins from lower risk areas will be checked about once a year, Mecca said.

Richland also plans to spend $100,000 next year to hire a contractor to oversee the inspection process.

"We'll provide oversight to make sure it fits our needs," said Stan Arlt, the city's director of Engineering and Utility Services.

One thing DOE doesn't plan to do is pay the same garbage rate. Their contract calls for them to pay $43.29 per ton — 2.5 times the commercial rate. That was supposed to cover the costs of building a transfer station at the landfill.

Instead, the city spent the money on a new front-loader and a larger trash compactor, partly because of the Hanford garbage.

The contract also guaranteed the city would be paid for at least 10,000 tons of garbage a year. Instead, Hanford has averaged about 2,000 tons and has been paying for garbage it hasn't dumped.

"We have not come anywhere close to 10,000 tons," Mecca said. "I can't justify giving them that kind of money."

DOE and Richland hope to renegotiate their contract by Dec. 28.

Though the new plan may cut down on contaminated garbage dumped in the landfill, no one is promising tainted refuse will never be brought there again.

"You can never guarantee 100 percent there will never be a risk," Arlt said. "We'll lower the risk as low as we possibly can."

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HANFORD REACH

A publication of the U.S. Department of Energy's Richland Operations Office for all site employees

Environmental Excellence HANFORD WORKS!

OCTOBER 19, 1998

THIS WEEK

What to do with your gently used books 5

Hanford prepares for severe winter 6

Try your hand at the fire protection puzzle 8

All-out effort stems spread of contamination

Michele Gerber

Fluor Daniel Hanford

Dan Brush, left, and Dave Phipps, Fluor Daniel Hanford health physics technicians assigned to DynCorp Tri-Cities Services, survey and remove contaminated waste from the Richland City Landfill.

The spread of low-level contamination outside radiation control zones on the Hanford Site and in the Richland City Landfill continued to make news last week, but a massive effort to understand and control the spread began to pay off.

Additional contamination was found in food waste in Hanford's trash at the city landfill. Once again, the contamination was low-level, beta-emitting, and principally from strontium-90. Excavation at the landfill was completed late Monday, and more than 200 tons of solid waste was boxed, returned to the Hanford Site and placed in low-level waste burial grounds in the 200 West Area.

On Tuesday, Hanford workers replaced and capped the solid waste in the city landfill that was disturbed in the excavation of Hanford trash. If city and site officials determine there is any possibility that more contamination could exist in the landfill, a "geo-probe" will be used to test areas before they are disturbed. Meetings are being held with city officials to establish a path forward for resuming garbage disposal in the city landfill.

"While we believe the contaminated solid waste episode we have just experienced is winding down to a successful conclusion, we will not be satisfied until the City of Richland tells us that it is satisfied," said Jim Mecca of DOE Richland, Bob Shoup of Fluor Daniel Hanford and Bob Frix of DynCorp Tri-Cities Services in a joint message to Hanford employees.

"The city is engaged in many active and farsighted pursuits on behalf of citizens. It is deeply committed to selective industrial recruitment and business development," the message stated. "We support and applaud the City of Richland in those efforts, and we are committed to doing everything we can to preserve a civic image that is conducive to economic growth."

Mecca is deputy assistant manager for Transition Projects with the DOE Richland Operations Office. Shoup is vice president for Environment, Safety, Health and Quality for FDH, and Bob Frix is president and general manager of DynCorp Tri-Cities Services.

Flies contained

In perhaps the most positive discovery of the week, Hanford's integrated action team confirmed that no contaminated flies or gnats had been found outside the 10-acre area south of B Plant where they were first discovered. The finding reinforced the belief that the insects were confined to a relatively small, isolated area 40 kilometers (25 miles) north of the Tri-Cities, and that no fruit crops in the region had been affected.

About a hundred fly traps shaped like large mayonnaise jars were baited with pieces of fruit and taken out of service as soon as they captured a significant number of insects. They consisted of 12 sets of traps around various border and interior areas of the Hanford Site, as well as a cluster of six traps at the Richland City Landfill. The levels of contamination found on the traps varied from less than 5,000 to about 400,000 disintegrations per minute (dpm).

Of the 11 traps in the 10-acre area that is roped off south of B Plant, only four captured contaminated flies, and no traps outside that area yielded contaminated flies.

Radiological control

Fogging with malathion in the affected area continued after hours and on weekends, and surveying of site dumpsters continues. Two additional contaminated dumpsters were found Oct. 12 near the PUREX plant and the AW Tank Farm just southeast of the closed-off area. Those dumpsters had contaminated spots reading 10,000 dpm and 40,000 dpm.

At press time Thursday, 23 contaminated spots had been found—many on dumpsters—and the waste was taken to site burial grounds. Within the dumpsters, the contamination was found mostly on food waste, while a few spots were fixed contamination.

Levels of radioactivity on the food, the dumpsters and some locations in and near trailers just south of B Plant varied from 10,000 to 700,000 dpm, and consisted of beta-emitting radioactivity mostly comprising strontium-90. Shoulder-to-shoulder surveys by radiological control technicians also were conducted across the 10-acre affected area in an effort to shrink the area and hone in on the contamination source.

Bioassays have been extended to nuclear operators and radiological control technicians who worked in the 241-ER-152 diversion box in late September. Bioassays on workers have shown no uptake of radioactivity. Stations where workers can obtain personal surveys were reported in electronic messages to employees, and are listed below.

Solid waste team

The Solid Waste sub-team of the integrated action team continued efforts last week to contact any vendors or other persons who may have been in the affected area south of B Plant in recent weeks. On-site trash is being collected and taken to the low-level burial grounds in 200 West. A new state permit allows a total of 50 loads of trash to be taken there.

"Disposal in burial grounds is not an ideal solution long-term, because it is expensive and it takes up valuable space needed for Hanford's cleanup mission," said Mecca, Shoup and Frix in an all-employee message. "For this reason, the team continues to plan for trash-surveying methods that will be acceptable to the City of Richland, so that we can resume site solid waste disposal in the city landfill."

Health and safety

The three Hanford officials directing the action team emphasized that they "remain committed to the principles with which we began this investigation. Foremost among those commitments is the fact that the health and safety of our employees, and of the citizens of the region surrounding the Hanford Site, come first.

"No contamination outside of radiation control zones is acceptable, and we have zero tolerance for any contamination spreads. We will continue to investigate the source or sources of contamination, and we will work until all contamination is controlled and confined.

"We value our partnership with the city of Richland, and we want to be sure that this episode concludes in a manner that satisfies the city and allows us to share a positive future." ■

HANFORD REACH

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HANFORD WORKS!

OCTOBER 26, 1998
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Feathering your nest egg 3

Stir up a safe Halloween 4

Contamination spread episode winding down

Michele Gerber
Fluor Daniel Hanford

Hanford Site officials closely monitoring the recent contamination spreads outside radiation control areas are optimistic that the situation is under control.

"Our main concern has always been providing a safe and healthy environment for workers, site visitors and vendors, and the public," said Bob Shoup, vice president of Environment, Safety, Health and Quality with Fluor Daniel Hanford. Shoup led the integrated team that directed the activities of three teams specially formed to respond when the contamination spreads were first detected in late September. A special "situation room" dedicated to the response effort was deactivated as of Oct. 15, although the teams continue to function.

While multiple traps for flying insects remain in place throughout the site, the traps in areas around the site have demonstrated no contaminated flies or gnats since Oct. 8. Contaminated flies were found only in the 10-acre radiological buffer area just south of B Plant. But contaminated flies have been found as recently as Oct. 15 inside an underground valve box near B Plant. This concrete structure, 241-ER-152, remains sealed, but was opened under controlled conditions to allow access to pest-control specialists.

The 10-acre radiological buffer area that had been posted and barricaded south of B Plant in the 200 East Area was released to normal operations as of Oct. 19. That area was sprayed with malathion during the weekend of Oct. 17-18 before it was reopened.

Approximately 18 mobile offices and metal storage boxes within the 10-acre area remain posted under radiological control regulations, pending detailed surveying. As a precaution, the number of workers taking bioassay tests to check for possible contamination uptake was expanded to 104. As of press time last Thursday, 62 results of these tests had been returned. All of the results were negative, except for those of one individual who tested positive at an extremely low level for strontium-90 early in the bioassay program. This may be a "false positive," and the individual is being retested.

Trash diverted

Disposal of the ordinary trash generated daily across the Hanford Site continued in low-level burial grounds in the 200 West Area. Deliveries of such solid waste to the Richland City Landfill were stopped as of Sept. 30.

98100151-2

Health physics technicians, from left, Eric Alberty, Patricia Perkins and Loris Heller perform a shoulder-to-shoulder survey in the area that was closed off south of B Plant.

City and Department of Energy officials are meeting daily to try to reach agreement on conditions that could allow resumption of solid waste deliveries to the city. Under the current permit obtained from state health officials, site trash can continue to go to Hanford burial grounds until a volume limit of 50 loads is reached. DOE expects to reach that limit sometime in late fall, but hopes to have a plan for off-site disposal before that time.

Dumpsters on site have been surveyed by health physics technicians and marked with the survey dates. Employees can feel free to dispose of trash in all marked dumpsters. Contaminated dumpsters have been staged at burial grounds in 200 West.

According to Jim Mecca, DOE Richland's deputy assistant manager for Facility Transition Programs, issues under discussion with the City of Richland include surveying methods and duration for site trash, and other terms and conditions of the waste disposal contract.

"The DOE has a commitment to be a good neighbor in the Hanford region, and we intend to live up to that," Mecca said. "We value our partnership with the City of Richland, and we know that, fundamentally, we all want the same things—a positive future that includes economic growth and a positive regional image."

Already, pickup of paper waste and scrap metal for recycling has restarted across the site, and the pickup of cardboard for recycling has resumed everywhere except on the 200 Area plateau (in and between 200 East and 200 West). Pickups of wood scraps and other construction debris remain on hold.

Mecca, who has spent 14 years at Hanford, took a few minutes to reflect on the uniqueness of the contamination spreads experienced in recent weeks. "We've never had anything like this before," he said, "but I'm extremely proud of the response capabilities demonstrated by everyone involved. First of all, I'm proud of our radiological control people who detected the spots of contamination. In my opinion, that quick detection ought to give ample reassurance to everyone that we *do* control contamination every day, and that any spread outside of a controlled area is extremely rare."

Proud of teams

Bob Frix, president and general manager of DynCorp Tri-Cities Services, the FDH subcontractor tasked with refuse disposal and management, is likewise proud of the teams involved in the response to the contamination anomalies. "I've had many messages from people saying that they felt reassured by the frequent and open communication," Frix said. "The fact that we were willing to publish the exact locations and levels of contamination allowed people to have confidence that we knew what we were dealing with and that we didn't have a site-wide problem."

Shoup, whose marathon days and nights managing the overall response earned him a reputation for credibility and accessibility, said, "This episode had the potential to cause a widespread loss of trust for the Hanford Site with workers and the public. We recognized that, and made an all-out effort to respond in such a way as to earn back that trust. Nothing less would have been acceptable, and I think we met the high standard to which the people of this site and this region have a right to hold us."

Tasks remaining before the entire event can close include finding a path forward for Hanford's everyday solid waste, surveying and releasing the facilities still posted as contaminated, determining the source or sources of the contamination, and developing lessons learned useful to other situations.

Determining the source is expected to take several weeks because of the need for careful, thorough and fair investigation. Calls have been received from around the world, inquiring about the successful handling of this event. ■

HANDI 2000 DEBUTS

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Environmental Excellence HANFORD

NOVEMBER 16, 1998

THIS WEEK

Portable heaters can cause home, office fires 4

Flammable gas monitoring makes Tank Farms safer 5

United Way gets a big boost from Hanford 7

Contract signed for trash disposal services

Michele Gerber
Fluor Daniel Hanford

DynCorp Tri-Cities Services, acting for the Department of Energy's Richland Operations Office, signed a contract last week with Basin Disposal of Pasco to remove and dispose of Hanford solid waste in an off-site location. The firm will be an "alternate source" to remove and dispose of wastes generated when the landfill maintained by the City of Richland is inaccessible to DOE and its contractors.

The contract applies to non-hazardous, non-radioactive wastes generated as everyday refuse at the Hanford Site. Delivery of such wastes to the Richland City Landfill was stopped Sept. 30, when radioactive contamination was discovered on some food wastes and garbage dumpsters in Hanford's 200 East Area. Since that time, about 25 loads of solid waste have been disposed of in low-level burial grounds in the 200 West Area. About 210 tons of garbage were removed from the Richland landfill and brought back to Hanford in early October.

As part of the new contract, DynCorp has agreed to take "all reasonable measures" to prevent nonconforming wastes from reaching Basin Disposal's transfer station in Pasco or disposal sites in the region. Principal among those measures is a supplementary waste monitoring program that began last Wednesday. All everyday solid waste generated at the site, about 5-7 tons per day, is being spread out and surveyed by health physics technicians working in the 4843 Building in the northwest corner of the 400 Area. Site dumpsters and garbage trucks also are being surveyed.

After an initial 30-day period in which all solid waste will be surveyed, a graded approach will be applied. Site facilities have been grouped into four categories based on locations and processes. The determining factor is the likelihood or probability of radioactive contamination of refuse.

About 13 percent of site facilities — including the Volpentest HAMMER training facility, for example — were grouped in Category 1. These facilities use no radioactive materials and are thought to have the lowest risk of generating any contaminated refuse. After the initial 30-day survey period, the solid waste from these facilities will be surveyed just once a year. Dumpsters from facilities in Category 2, comprising about 60 percent of the site, will be surveyed quarterly, and about 10 percent of the refuse loads from this category will be inspected on an ongoing basis. Dumpsters from facilities in Categories 3 and 4, about 27 percent of the site, will be surveyed monthly on an ongoing basis. Dumpsters from the Plutonium Finishing Plant will be inspected each time they are emptied.

Negotiations between the City of Richland and DOE-RL continue in an effort to reach agreement that will allow resumption of regular solid waste deliveries from the Hanford Site to the city landfill. A graded approach and other compromise measures are being discussed in those negotiations.

Fruit flies and gnats are believed to have transported contamination from sources near B Plant in the 200 East Area to at least 26 locations in late September and October. Most of the contamination was found on food waste and dumpsters and in flying-insect traps, mobile offices and some construction shops in a 10-acre area just south of B Plant. However, two spots of contamination were detected in the 200 West Area, and one was found at the U.S. Ecology site just over two miles from B Plant.

Most recently, two dead flies with beta/gamma contamination were found last week in the 2247-B ironworkers shop in 200 East. Two dead contaminated flies were found in the same location on Nov. 6. The office area of 2247-B has been posted as a radiological buffer area.

Bioassay tests were conducted on 106 employees. Of those, results have come back on 95 and all show negative exposure.

More information can be found on the Hanford Web site at **http://www.hanford.gov/safety/conspread/index.html.** ■

TWO JOBS WELL DONE

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Environmental Excellence HANFORD WORKS!

NOVEMBER 9, 1998

THIS WEEK

WATS happening in the 300 Area 4

Wagoner talks about Integrated Safety Management 5

Hanford assets go to work in the community 6

Another contaminated fruit fly found

A single contaminated fruit fly found among 50 in a trap next to a U.S. Ecology trash bin has been traced to the area near B Plant where the low-level containment problem was first discovered. The trap is a little more than a mile from the 10-acre radiological buffer area.

Traces of cesium and strontium were found on the fly, linking it to the Hanford contamination problem rather than to any operations at U.S. Ecology.

Another speck of contamination was found near the Canister Storage Building, according to Bob Shoup, Fluor Daniel Hanford vice president for Environment, Safety, Health and Quality. The contamination was so slight it appears the spot is an old one, Shoup said.

Out of 106 tests of Hanford personnel who may have been exposed to the low-level contamination, 65 analyses have been completed — all of which showed no exposure. ■

Page 6 HANFORD REACH January 4, 1999

the year in review 1998

200 Area contamination spread contained

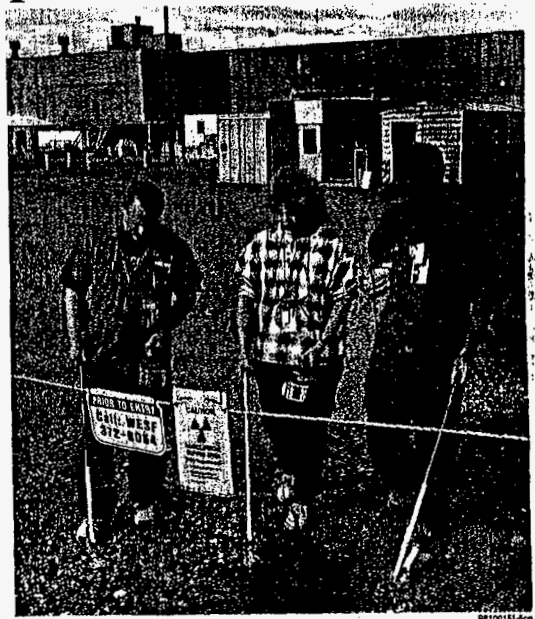
10 Radioactive contamination was spread outside of radiological control areas to 26 locations in Hanford's 200 Area during late September and October. Spread mostly by fruit flies and gnats, some contamination went to the Richland City Landfill in site garbage trucks. Radiological control experts mounted an all-out effort to identify, contain and control the contamination. Solid waste deliveries from Hanford to the city landfill were discontinued, and 210 tons of such waste were removed and placed in low-level burial grounds on site.

In December, the city accepted a "memorandum of agreement" with the Department of Energy that outlines a new trash surveying protocol and forms the basis for resumption of solid waste deliveries from the site to the city landfill. In the meantime, a contract was signed with Basin Disposal, Inc. of Pasco to provide alternative trash disposal services to the Hanford Site.

The contamination consisted of low-level beta/gamma-emitting radioactivity, mostly containing strontium-90 and cesium-137. Site personnel roped off acreage in the 200 East Area and conducted detailed ground and facility surveys until the area was certified as free of contamination. Pest specialists also conducted intensive spraying to eradicate the pests, and trapped insects at locations both on and off the site to verify control measures.

Fluor Daniel Hanford and DOE officials responding to the contamination spreads adopted the "zero tolerance" position that any contamination outside of radiological control areas is unacceptable. Working in a partnership role with the City of Richland and the surrounding area, they issued repeated all-employee bulletins and held news interviews to keep employees and the public informed and assured. They also established an Internet site, made radio announcements about the events, and offered personal and vehicle surveys to persons requesting them.

As the incident wound down, the open communication effort as well as the intense and focused physical response won praise from employees, the public and DOE. ♦



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Surveying for low-level contamination just south of B Plant

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APPENDIX H

FACILITY AND PROGRAM DESCRIPTION

H1.0 HANFORD SITE

The Richland Operations Office (RL) manages the Hanford Site for the U.S. Department of Energy. The Site supports programs in waste management, environmental restoration, science, and energy. RL leases some of the Site land to Washington State, which in turn leases it to U.S. Ecology and Energy Northwest (formerly Washington Public Power Supply System). Including RL personnel, the Hanford Site has a total workforce of 11,131 and an annual budget of approximately $1.1 billion (Fig. H1).

The Hanford Site, approximately 1,450 km^2 (560 mi^2) of semiarid shrub and grasslands, is located just north of the confluence of the Yakima and Columbia Rivers. The Columbia River forms part of the Site's north and east boundaries. Approximately 6 percent of the land area is actively used. The rest of this land, with restricted public access, provides a buffer for the smaller areas historically used for nuclear material production and waste storage and disposal. The developed land is divided into the following five areas.

- The 100 Areas (e.g., 100-B, 100-C, 100-D, 100-F, 100-H, 100-K, 100-N) lie along the south shore of the Columbia River in the northern portion of the Hanford Site and contain reactors used during and after World War II primarily for plutonium production; now all shut down.

- The 200 East and 200 West Areas lie in the center of the Hanford Site; they were used to process spent nuclear fuel to extract plutonium; now they are focused on waste management. They are the primary areas of focus for this event.

- The 300 Area, near the southern border of the Hanford Site, contains laboratories, support facilities, and former fuel-manufacturing facilities.

- The 400 Area, between the 300 and 200 Areas, contains the Fast Flux Test Facility and the Fuels and Materials Examination Facility.

- The 600 Area designates the land between the operational areas.

H1.1. B PLANT

B Plant (formally designated the 221-B Building) was constructed during World War II as a radiochemical processing facility (Fig. H2). It began separations processing using irradiated

Figure H1. Hanford Site, Washington.

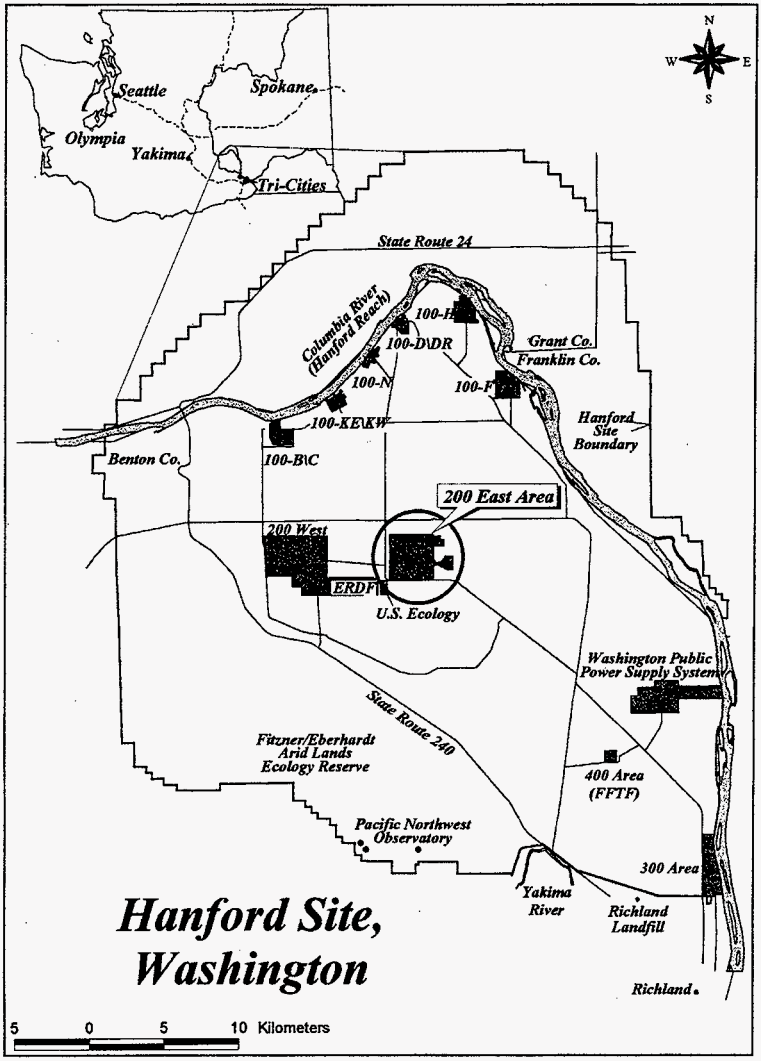
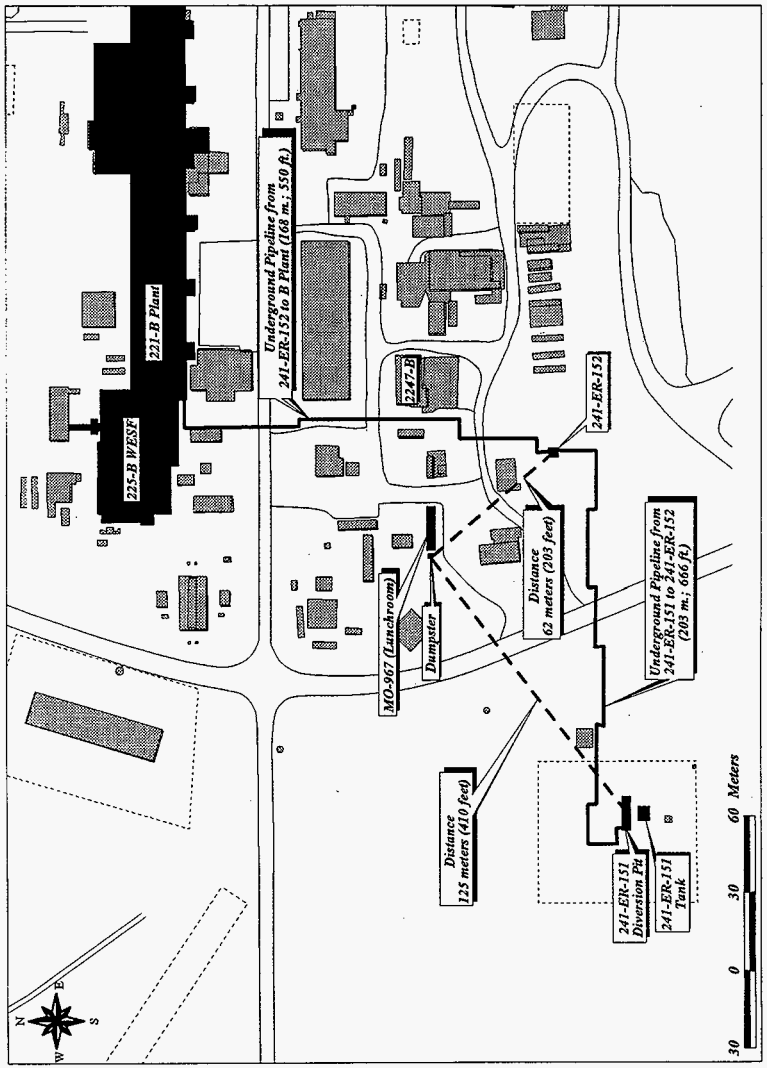


Figure H2. Relationship of Facilities Near B Plant.



uranium feed in April 1945 and operated as a plutonium separations facility until 1952. Between 1954 and 1983, it was used for various operations, including separating strontium-90 (^{90}Sr) and cesium-137 (^{137}Cs) from underground tank waste to aid in the reduction of the heat being generated from radioactive decay. Beginning in 1995, B Plant began undergoing the formal deactivation and shutdown process, which was completed in 1998. The process involves severing the plant's infrastructure from the Waste Encapsulation and Storage Facility (WESF) where the incorporated ^{90}Sr and ^{137}Cs are stored, and blanking deactivated piping and lines, disconnecting power sources, and flushing vessels and cells. The work that began at Diversion Pit 241-ER-152 on September 15, 1998, supported B Plant deactivation and shutdown.

H1.2. 241-ER-152 DIVERSION PIT

During the operations of the B Plant complex as a radiochemical processing facility, liquid solutions of process waste were transferred to other facilities or waste storage tanks through an underground system of pipes. These pipes (steel lines encased in concrete) make up a waste transfer network through which highly radioactive chemical solutions can be pumped to tanks outside of facilities, to waste processing units, and even between the 200 East and 200 West Areas. At many of the intersections in this network, the liquid is directed to its destination through removable piping located in diversion pits. Diversion pits (Fig. H3) are subsurface concrete-lined pits where two or more underground waste transfer pipes penetrate the pit walls, ending in nozzles. By connecting short sections of curved or flexible pipe (jumpers) to the selected nozzles, the liquid waste flow can be directed through any combination of pipes entering the diversion pit for transfer to its final destination. These are attached and manipulated remotely by operators standing at the edge of the pit and using long tools to increase the distance between the operators and the contamination, thereby limiting their radiological exposure.

The inside surfaces of the diversion pits normally are contaminated with radioactive material deposited when waste liquids leaked through the pipe connections or installed valves. The pit surfaces and all the equipment in the pit are routinely contaminated with slightly to moderately radioactive liquid used to flush the pipes and tanks after a highly radioactive waste transfer. Most diversion pits in the system, including the 241-ER-152 Diversion Pit, have drains in the bottom of the pit leading to a tank where the flush water accumulates and is pumped out periodically. Except during jumper work, the pits are covered with large concrete cover blocks that are intended to contain the contamination and shield workers on the surface from direct radiation from the contamination or waste in the piping. To line up the system for a transfer, an open-top tent is erected around the pit, fixative is sprayed on the inside to "fix" smearable contamination, cover blocks are removed, and the jumpers are placed in the appropriate configuration. This process was under way at the 241-ER-152 Diversion Pit on September 15.

The 241-ER-152 Diversion Pit is located approximately 170 meters (560 feet) directly south of the west end of the B Plant/WESF main structure. The pit has a 3 meter by 3 meter (10-foot by 10-foot) square opening, with the floor surface 4 meters (13 feet 7 inches) below the pit rim. Five pipes penetrate the walls at a level of 0.3 meter (1 foot) above the floor (Fig. H4).

Figure H3. Typical Diversion Pit Under Construction.

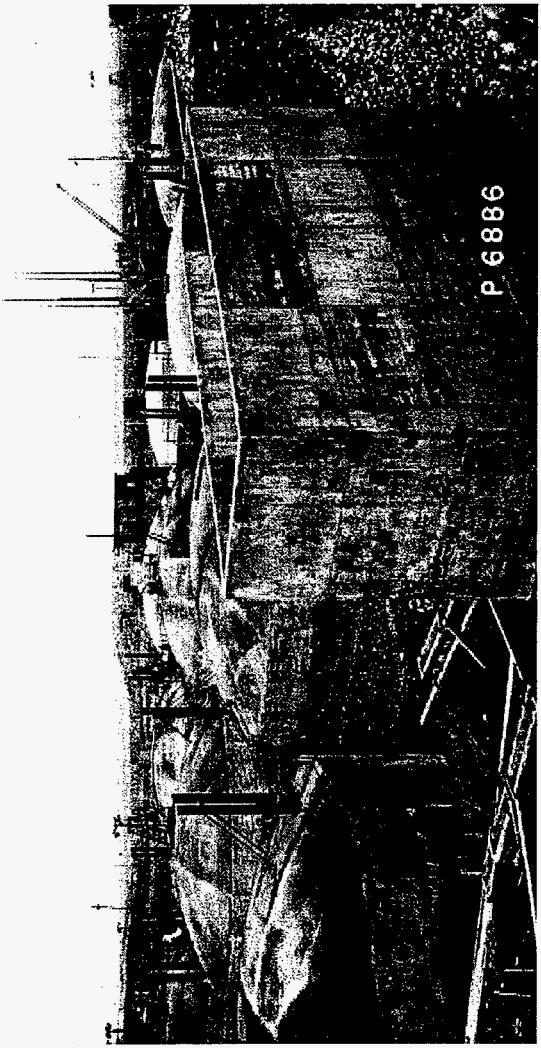
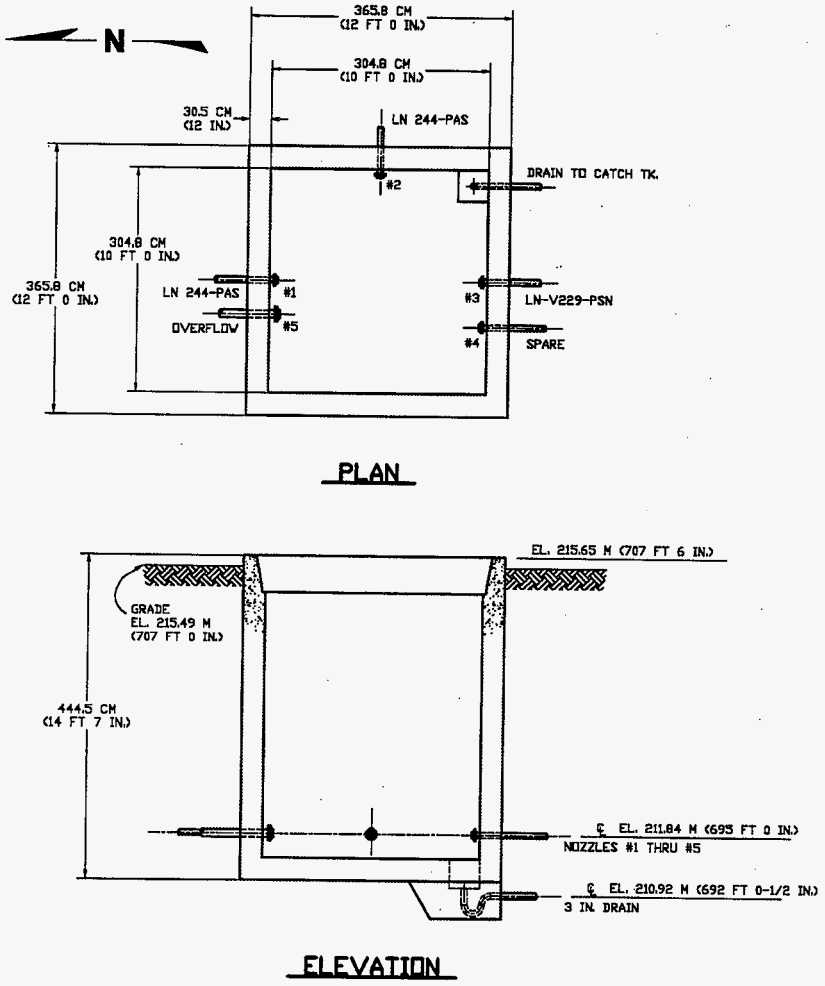


Figure H4. Diversion Pit 241-ER-152 Drawing.



The piping system is part of the Tank Waste Remediation System (TWRS) Project, which includes the responsibility of safely managing and retrieving for disposal 204.4 million liters (54 million gallons) of radioactive waste stored in 177 underground tanks.

H1.3 WORK CONTROL

For work such as the task performed at Diversion Pit 241-ER-152 beginning September 15, TWRS uses a planning and scheduling organization to control work. The organization reviews the work and, if necessary, develops a work package. The work package contains the instructions on how to perform the work. Often the work package references preapproved procedures for significant portions of the work. The work packages are reviewed by Operations, Engineering, Radiological Control, and other organizations as necessary. Before they are worked, packages are reviewed and released by the shift office. When the work is completed, the work packages are archived and signed off as complete. The package would identify the use of a fixative but would not necessarily note that it is monosaccharide based.

H1.4 CONSTRUCTION FORCES AREA

The following auxiliary structures related to the B Plant/WESF operations are located in the area between the main B Plant/WESF structure and the 241-ER-152 Diversion Pit.

- Temporary mobile structures and permanent structures were used by the Site Engineering and Construction contractor to support their operations, including the shutdown of the B Plant facility.

- The MO-967 Mobile Office is used as a construction personnel staging area and lunchroom.

- Other structures in the area include an Ironworker's Shop (2247-B), a Construction Ice House (2201-B) to support drinking water supplies for the construction force, restroom structures, and other support buildings.

These auxiliary facilities are located near major facilities like the B Plant complex to support the facilities. They use the utilities provided by the main facilities. Many of these auxiliary facilities are being shut down and closed because the major tasks in the B Plant shutdown are completed. Construction workers and other craft personnel are moving to other facilities on the Site.

H1.5 CANISTER STORAGE BUILDING

The Canister Storage Building, approximately 464 meters (0.3 mile) from the B Plant complex, is being constructed in the 200 East Area to provide dry staging and interim storage for spent nuclear fuel from water-filled basins in the 100 K Area, which are approximately11 kilometers

(7 miles) away. The Canister Storage Building is located 1.3 kilometers (0.8 mile) from 241-ER-152.

The Canister Storage Building consists of a steel operating-area shelter enclosing the load-in/load-out area and the Hot Conditioning System Annex and three equal sized below-grade concrete vaults covered by a concrete operating deck. Support functions and equipment are housed in a steel support building located at the north side of the operations building.

H2.0 RADIOLOGICAL CONTROL PROGRAM

Routine radiological monitoring is a fundamental radiological control practice across the nuclear industry. The Hanford Site has operated a routine radiological monitoring program since Site operations began in the early 1940s. The goal of the Site Radiological Monitoring Program is to evaluate the effectiveness of Site operations in anticipating, preventing, and controlling potential environmental and public impacts.

H2.1 OVERVIEW

Primary emphasis on control and measurement of radioactive material is placed at individual facilities, with confirmatory measurements being made for the balance of Site areas.

- *Facility Programs—Facility radiological monitoring programs focus on specific tasks and activities at individual facilities.*

- *Site Programs—Site radiological monitoring programs focus on the interface areas between facilities and the balance of the Site and at offsite locations.*

Routine radiological monitoring programs are designed using a graded approach. A graded approach focuses resources and attention on those areas and activities with the greatest risks. Routine radiological monitoring of facility and Site operations is performed at intervals ranging from per shift to annually. The routine radiological monitoring program is designed and operated with enough flexibility to be increased or decreased in accordance with information from daily Site operations.

The regulatory requirements applicable to the routine radiological monitoring program at Project Hanford Management Contract (PHMC) programs and facilities applied under this graded approach concept are Title 10 *Code of Federal Regulations* (CFR) Part 835 "Occupational Radiation Protection"[1] and the *Hanford Site Radiological Control Manual*[2]. The PHMC

[1] 10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, Title 10, Part 835, as amended.

implements these requirements using a PHMC-specific program requirement such as that found in HNF-PRO-435, *Required Radiological Surveillances*[3]. Before the PHMC began (October 1, 1996), similar program control documents governing the planning and execution of routine radiological monitoring programs also were in effect.

PHMC major subcontractors monitor within and immediately adjacent to facility boundaries for potential radiological impacts. The Near-Facility Monitoring Program, jointly operated by Waste Management Federal Services of Hanford, Inc. (WMH), Waste Management Federal Services, Inc., Northwest Operations (WMNW), Fluor Daniel Hanford, Inc.(FDH), and DynCorp Tri-Cities Services, Inc. (DYN), monitors the spaces outside facility boundaries out to the Site boundary. Similarly, PHMC major subcontractors monitor items leaving facilities for potential radioactivity and DYN oversees PHMC Sitewide infrastructure processes for monitoring items leaving the Hanford Site.

H2.2 ROLES AND RESPONSIBILITIES

As specified in 10 CFR 835, the PHMC Radiological Control Program operates in compliance with the Radiation Protection Program (RPP), which was written by FDH and approved by the U.S. Department of Energy (DOE). Compliance with the regulations in 10 CFR 835 is implemented primarily through compliance with the *Hanford Site Radiological Control Manual*, a policy and guidance manual common to all DOE contractors on the Hanford Site.

The PHMC Radiological Control organization is responsible for the program controlling radioactive materials and controlling the radiation dose to workers and visitors in the PHMC-controlled facilities and areas. The program is organized similarly to the main PHMC contract structure, with the FDH Site Radiation Protection director integrating five company-level radiological control managers—B&W Hanford Company (BWHC), Lockheed Martin Hanford Corporation (LMHC)/TWRS, DYN, DE&S Hanford, Inc., and WMH—who report directly to their subcontractor company management. Thirteen facility/project radiological control managers report directly to plant managers or directors. These facility/project radiological control managers are matrixed to subcontractor company-level radiological control managers.

The FDH Radiation Protection director maintains a small central radiological control organization that establishes PHMC radiation protection standards, maintains the Site-level Radiation Protection Interpretive Authority, and provides Site technical experts to write and support PHMC-wide radiological control procedures. The central radiological control

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[2] HSRCM-1, Rev. 2, *Hanford Site Radiological Control Manual*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, 1994. Available on the Internet as DOE/RL-96-109, *Hanford Radiological Control Manual*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, at http://www.hanford.gov/docs/r196-109/a006t010.htm.

[3] HNF-PRO-435, *Required Radiological Surveillances*, Fluor Daniel Hanford, Inc., Richland, Washington.

organization is the final approval authority for regulatory requirement bases. Accountability for requirements given to the facilities and projects, decision-making based on documented technical bases, and integration of Sitewide radiological control is through the Radiation Protection Center of Expertise (RPCOE) Process. The RPCOE is a committee consisting of facility and project radiological control managers. The RPCOE routinely meets under the direction of the FDH Radiation Protection director, the chairperson.

The facility and project radiological control managers directly control the radiation protection staff engineers and facility technical authorities and the radiological control technicians (RCT) for each facility radiological control program. Facilities may use Sitewide or facility-specific procedures for the radiological control tasks. Facilities and projects are responsible for supervising and training all facility radiological control personnel.

The FDH Environmental Compliance Program organization is responsible for the program monitoring the release of radioactive material into the environment. Liquid and gaseous effluents that may contain radioactive material are continuously monitored for radioactivity. Near-facility environmental monitoring is defined as monitoring near facilities that have potential to discharge or have discharged, stored, or disposed of radioactive materials. Monitoring locations are associated mostly with major nuclear facilities, environmental restoration activities, and waste storage or disposal facilities such as burial grounds, tank farms, ponds, cribs, trenches, and ditches. Routine sampling and monitoring includes samples from ambient air, water from surface-water disposal units, external radiation, soil, sediment, vegetation, and animals.

H2.3 RADIOLOGICAL AND HAZARD IDENTIFICATION CONTROL

The primary occupational radiological hazards that may be encountered in PHMC-operated facilities consist of direct-radiation-dose hazards, external contamination hazards, and potential uptakes of radioactive materials into the body through inhalation, ingestion, injection, or immersion. The types of radioactive material that may be encountered include a wide range of fission products, transuranic radionuclides, and neutron-activated materials. Radioactive materials that may be encountered in the workplace range from levels typical of environmental samples (picocuries of radioactivity per gram) to millions of curies of radioactive material in a wide variety of physical and chemical forms, both contained and widely dispersed. Strict limits of doses of ionizing radiation from these radioactive materials are defined for occupationally exposed workers, with much-reduced dose limits specified for minors and members of the public during direct onsite access at a DOE facility.

Basic radiological control on the Hanford Site includes clearly marked areas that are controlled for radiation protection purposes. Many facilities and areas of the Hanford Site are posted as radiologically controlled areas (RCA). Access to these areas requires a minimal amount of training or escorting. Individuals must at least be aware that hazards exist in the RCA; safety requires that they read and follow the posted signs and directives.

Areas where external sources of ionizing radiation exist are posted as radiation areas or high radiation areas and are not only posted, but protected from individual entry by barriers and locked doors. Access to these areas for performing work tasks requires various levels of training, instrumentation for measuring the external radiation levels, and the wearing of dosimeters to measure the individual's accumulated exposure to ionizing radiation.

Areas where radioactive material is, or has the potential to be, in a loose or uncontained form are called contamination areas (CA) and High Contamination Areas (HCA) for very high levels of these loose radioactive materials. Uncontained radioactive material or contamination can cause shallow doses to the skin if it is present on, or near, uncovered skin. If the contamination is in an easily dispersible form, such as a dust, powder, or gas, it could be inhaled into the body where it will expose the organs and tissues. Measured or potential areas of radioactivity in the air are controlled and posted as airborne radioactivity areas (ARA). If the contamination is on foodstuffs or in drinking water, the radioactive material could be ingested and cause internal doses to the individual. Areas that surround CAs are posted as radiological buffer areas (RBA). Contamination is not expected in an RBA, but surveys of hands and feet are required for personnel leaving an RBA.

To prevent radioactive contamination from spreading outside the controlled areas, all equipment and material leaving a CA, HCA, or ARA is surveyed for release. Using portable instruments sensitive to alpha radiation or beta and gamma radiation emitted from any contamination on the surface, RCTs carefully scan the surfaces of equipment and materials to verify that contamination is not present. Personnel leaving a CA, HCA, or ARA must be surveyed for contamination. DOE regulations and the *Hanford Radiological Control Manual* require that instruments and survey techniques must be sensitive enough to meet fixed and removable surface contamination limits. Higher levels of radioactive contamination are allowed for radionuclides that are less hazardous to humans. The PHMC Radiological Control Program does not release equipment and materials from a CA, HCA, or ARA if approved survey techniques and detection instrumentation detect any radioactive material. Properly surveyed material released from a CA, HCA, or ARA can be released unconditionally from any RCA on the Hanford Site and released off Site.

Workers who perform tasks in contaminated areas or on contaminated equipment are required to wear protective clothing to keep the contamination off their skin. The protective clothing is controlled after use to prevent any contamination from being released. Respirators that filter airborne contaminants are required when other engineered controls are not available to prevent exposure to airborne contamination.

Work practices such as using glovebags or portable containment rooms that limit the spread of contamination to the smallest possible work location must to be considered by the work planners using the PHMC as low as reasonably achievable work practices program and used, if practical. Dust fixative sprays and other products or techniques are used to contain or control contamination when practical.

The PHMC Radiological Control Program uses routine surveillance techniques to ensure that the contamination control activities are effective. Routine surveys are scheduled in

noncontamination areas to verify their status. Following approved procedures, direct surveys are made with portable radiation survey instruments to look for surface contamination. Loose surface contamination is surveyed by lightly rubbing a survey medium over an area of approximately 100 square centimeters. The medium is analyzed for any radioactive material. This is called a technical smear.

The documentation on the survey form expresses surface contamination in disintegrations per minute per 100 cm^2. Surveys include readings of external radiation doses. If the contamination found is beyond the range of a typical beta/gamma and alpha contamination meter, portable dose meters will be used to measure the radiation field over the contamination. Experimentally derived factors can relate the dose readings to contamination levels on the surface. These readings will be documented in the survey reports in millirems or millirads per hour. The control of radioactive material requires that when a survey detects contamination in an area where it was not expected, a wider survey area or an increased survey frequency is initiated to determine the contamination source and to control its spread as soon as possible.

H2.4 MECHANISM OF DISCOVERY

The 1998 City of Richland Landfill-contamination event was identified initially through the operation of the routine radiological monitoring program. DYN was performing routine radiological monitoring of the 200 East Area construction forces facilities (CFF). Monitoring had been increased to daily checks (on week days) in early August for selected 200 East Area CFFs, because radiologically contaminated rodent activity was evident in the immediate vicinity. These checks were negative through Friday, September 25, 1998. On Monday, September 28, 1998, checks of Mobile Office MO-967, used as a lunchroom, detected several spots of radioactive contamination.

H3.0 BIOLOGICAL VECTOR CONTROL PROGRAM

PHMC biological vector control is a function of The FDH Office of Biological Control, contracted by the PHMC to WMNW. The FDH Office of Biological Control is conducted at the Hanford Site by licensed professionals experienced in the control of pest animals and vegetation, particularly when associated with radioactive contamination. Pest control goals include limiting pest ingress and egress at facilities, creating a healthy work environment, training maintenance staff to control and prevent biologic intrusion, controlling plant- and animal-caused transport of contamination, and preventing pest damage to waste facilities.

Biota-caused transport of radioactive contamination is controlled by The FDH Office of Biological Control working in cooperation with the Near-Facility Environmental Monitoring group at WMNW, DYN RCTs, and facility management. Environmental monitoring near operations facilities is directed by the PHMC as part of the Environmental Compliance Program, which funds Near-Facility Environmental Monitoring. Monitoring of ambient air, soil, vegetation, and selected animals is directed by WMNW and conducted by DYN Site

Surveillance RCTs. Site facility landlords are responsible for monitoring areas inside each tank farm perimeter and within active waste-site boundaries for contamination spread and can call on The FDH Office of Biological Control for mitigation support.

Biological controls can be implemented either at the request of facility management in response to facility monitoring or as a result of routine radioactivity surveillances of Near-Facility Environmental Monitoring detecting radioactive contamination resulting from biotic activity (e.g., contaminated mouse feces). Discovery of biota-related contamination activates additional monitoring and surveillance in conjunction with increased animal control by The FDH Office of Biological Control (WMNW).

Environmental monitoring, including insect, animal, and vegetation monitoring, has existed at the Hanford Site since 1944. The Hanford Site operations pioneered the science of environmental monitoring. It was unique for measuring contamination levels in stack gases, vegetation, river water, wildlife, and groundwater. In the 1940s and 1950s, the Site's environmental monitoring records were among the most complete in the world. Reports were issued monthly and quarterly.

Annual DOE and contractor environmental status reports have been issued since 1965, documenting approximately 2,000 incidents of biota-related radioactive contamination. These incidents involved approximately 50 separate species of biota. The most common animal species involved in radioactive contamination is the deer mouse (*Peromyscus maniculatus*); the most common vegetation implicated in such incidents is the tumbleweed (*Salsola kali*). Terrestrial and flying insects are recognized vectors of contamination. In the past, flying insects near and on the Columbia River have served as frequent vectors of contamination, affecting the food chain and regional ecosystem. (Harvester ants [*Pogonomyrmex owyheei*] are relatively common intruders to below-ground waste facilities.) *Fruit flies (Drosophila spp.) previously have* ***NOT*** *been noted in the transfer of radioactive contamination.* As a result, monitoring of fruit flies has not been a routine activity.

Biological vector control in the vicinity of this contamination incident goes back more than 20 years (see Section 5.3). Even though fruit flies were not identified as vectors in the radioactive contamination spread in August, the WMNW The FDH Office of Biological Control team responded to concerns identified by both facility radiation surveys and routine Near-Facility Environmental Monitoring radiation surveys. Control efforts had focused on harvester ants and/or rodents at the B Plant K-3 Filter Building (BWHC facility), 241-ER-151 Diversion Pit (LMHC/TWRS), 241-ER-152 Diversion Pit (LMHC/TWRS), associated transfer lines (LMHC/TWRS), and various craft shops (Fluor Daniel Northwest, Inc.). Because all species collected during pest control operations are surveyed for radioactivity, and because numbers of contaminated species were higher than expected, radiation control surveys were focusing on this area when, on September 28, fruit flies were found to be spreading contamination. Because this was a new radiological vector, additional flying-insect traps were purchased to monitor the potential fruit fly-caused spread of contamination. When more contaminated fruit flies were discovered, chemical control measures were implemented, including purchasing a truck-mounted fogger for area treatment.

H4.0 SOLID WASTE DISPOSAL PRACTICES

DYN is responsible for collecting and transporting nonradioactive and nonhazardous solid waste (refuse) for offsite disposal. DYN operates two 27 cubic meter (35-cubic-yard) capacity compactor trucks that collect and dispose of the refuse collected from approximately 300 dumpsters on the Hanford Site. In each of the past two years, DYN Transportation Operations has transported approximately 1450 metric tons (1,600 tons) of refuse to the City landfill. Major categories of refuse disposed of off Site consist of the following:

- Office and lunchroom refuse consisting of paper, cardboard, plastics, textiles, and food refuse.
- Construction debris consisting of metals, wood products, grounds maintenance refuse, and miscellaneous debris.

Before this contamination event occurred, the process for collection, transport, and offsite disposal of Hanford refuse was as follows.

- PHMC and contractor procedures identified the types of refuse that can be placed in the dumpsters.
- DYN Transportation Operations collected refuse placed in dumpsters for delivery to the City landfill.
- Refuse from areas where radioactive contamination could occur was surveyed for release before leaving such areas.

Drivers of the collection vehicles receive training about the types of refuse that are prohibited, this serves as an additional mechanism to prevent nonconforming refuse from being taken to the City landfill.

H4.1 AGREEMENT WITH THE CITY OF RICHLAND

RL entered into a contract with the City of Richland to dispose of nonradioactive, nonhazardous solid refuse. The contract was signed in September 1995, effective October 1, 1995, through September 30, 2005, and on March 31, 1996, the Hanford Central Landfill was closed. The City of Richland owns and operates a municipal landfill, which is permitted by the Benton-Franklin Health Department. The City agreed to accept the following types of refuse during the period that the City landfill had adequate capacity and is permitted to accept the refuse it is receiving, and while the contract with the City is in effect:

- Paper and cardboard
- Wood and miscellaneous debris
- Construction debris

- Metals
- Plastic
- Grounds maintenance refuse
- Food refuse
- Textiles
- Glass
- Noncontagious medical refuse
- Rubber and leather refuse.

The City will not accept any of the following types of refuse:

- Hazardous or dangerous materials or liquids
- Asbestos-containing materials
- Automotive-type batteries (lead acid)
- Explosives
- Flammable liquids
- Any regulated material
- Demolition debris that is or typically would be deposited in demolition landfill
- Radioactive waste.

The City will not accept refuse held in metal or plastic drums or other containers. Any containers of material must be emptied at the landfill for City inspection. All drums must have bottoms and tops removed by DOE or its contractor before they are disposed of in the City landfill.

H4.2 OFFSITE (NON-HANFORD) LANDFILL REFUSE ACTIVITIES

The first Hanford Site refuse was delivered to the City landfill on December 29, 1995. Starting on that date, each load was inspected by an RCT as it was unloaded and spread out on the face of the landfill. The RCT used professional judgment to identify portions of the refuse to survey for radioactive contamination using field detection instruments. After several weeks with no contamination detected, the surveys were conducted on the days that Hanford Site refuse was delivered, but not necessarily at the time the truck was unloaded. The surveys focused on areas where refuse from the Hanford Site had been deposited. Daily surveys continued through the first week of April 1996. Because no contamination was detected during these daily surveys, survey frequency was reduced to weekly. Weekly surveys began on April 10, 1996, and continued until October 31, 1997. Daily surveys were reinstituted on November 3, 1997, when radioactive rubber boots were discovered. The daily surveys continued through January 15, 1998. It was later determined that characterization of the material indicated that the radiological material discovered on the boots was not consistent with enriched uranium present at the Hanford Site. Therefore, the conclusion drawn from all the information available is that the material could not have originated from Hanford Site activities.

State regulations require the City to cover all refuse received with at least 15.24 centimeters (6 inches) of cover by the end of each operating day. The general public has not been allowed in

the active area of the City landfill, although commercial accounts still unload directly into the City landfill. In addition to the refuse collected from Hanford Site dumpsters, other Hanford Site refuse is delivered to the City landfill. These shipments are accompanied by a Solid Waste Disposal Receipt - Bulk Wastes form, which requires a certification that the refuse[4] meets the acceptance criteria for disposal of nondangerous, nonradioactive refuse at the City landfill. All Hanford Site refuse shipments to the City landfill were stopped on October 1 (September 30 for sanitary refuse; October 1 for construction debris). No Hanford Site refuse has been delivered to the City landfill since that time.

H4.3 SURVEILLANCE AND OTHER PROTECTIVE MEASURES

Hanford Site refuse destined for offsite disposal is subjected to a number of protective measures established to prevent inadvertently transferring unacceptable substances, especially radioactive materials, to the disposal site. Site policies and procedures require facilities that store and/or handle radioactive materials to implement an appropriate level of protective measures to prevent a loss of control and to have monitoring systems to verify that control measures are effective. Contamination is controlled at the source and barriers are in place at the boundaries.

[4] Although the City of Richland uses the term "waste" to mean only contaminated material, on the Hanford Site the term also is used to mean refuse.

APPENDIX I

PROJECT HANFORD LESSONS LEARNED

Title: Contamination Spread Outside of Radiation Control Areas by Fruit Flies

Date: January 7, 1999

Identifier: 1999-RL-HNF-0001

Lessons Learned Statement:

An effective radiological controls program is vigilant in protecting the public, workers, and the environment and is open to the possibility of new mechanisms (such as fruit flies) for spreading contamination.

Glycerin/monosaccharide (simple sugar)-based fixatives used to hold radioactive contamination in place might attract insects that subsequently can spread contamination. The biological vector, fruit flies, had not been identified previously within the DOE Complex and was therefore not considered by operations personnel.

Radioactive contamination can be spread by multiple mechanisms, including plants and animals. Operations must be monitored and controlled to preclude as many of those means as possible. Monitoring must be thorough enough to detect unexpected contamination spread. Response systems must be able to contain and control contamination until the spreading mechanism is determined and controlled.

Public reaction to the spread of contamination off site can be minimized by proactively addressing public health and safety concerns and perceptions through the following:

- Frequent timely status reports to all employees, local news media, and government officials on containment and cleanup efforts
- Monitoring for offsite effects to show that there is no impact to the community. In this event, flying-insect traps were set up outside site boundaries to verify that no fruit flies carried contamination to local crops.
- Bioassays on request
- Surveys of personal effects on request.

Discussion of Activities:

Summary:

Fruit flies spread contamination from a diversion pit located at the Hanford Site's 200 East Area to nearby buildings and to refuse that was then unknowingly transported off site to the City of Richland Landfill. Extensive radiological surveys and testing, including bioassays, showed that no personnel were contaminated.

Details:

On September 10, 1998, Diversion Pit 241-ER-152 was sprayed with a glycerin/ monosaccharide-based fixative to reduce the likelihood of contamination spread during subsequent planned work in that pit. Similar products are used at other sites in the DOE Complex.

On September 15, 1998, while the pit was open to the environment for jumper manipulation, fruit flies were attracted to the fixative, flew into the pit, and laid eggs. The adult flies and their eggs became contaminated. Some fruit flies, probably from the next generation, later followed odors of food and refuse to a nearby temporary construction office, MO-967, where they deposited contamination in the lunchroom, in hallways, on light switches, and in a nearby garbage can and a dumpster.

At 7:45 a.m. on Monday, September 28, 1998, the dumpster at MO-967 was emptied one day ahead of its normal schedule and its contents were taken to the City landfill, the principal disposal site for uncontaminated Hanford Site solid refuse. At 8:45 a.m. that same day, routine radiological surveys revealed contamination in MO-967 and a nearby dumpster. A fact-finding meeting determined that contamination might have been transported to the City landfill. Subsequent surveys detected contamination in two Site garbage trucks, two mobile office trailers, five other buildings, a government van, several other locations, and on the personal belongings of two workers.

Contamination was later found on refuse from the Hanford Site in the City landfill. Environmental permits were obtained to move the contaminated waste back onto the Hanford Site, where it was placed in low-level waste burial grounds.

Analysis:

An investigation team worked aggressively to determine the source of contamination. Fruit flies were suspected early in the incident because of the locations of the initial contamination and because a radiological control technician observed a speck of contamination "fly away." Flying-insect traps were set to confirm fruit flies as the transport vector. In one extreme instance approximately 260 nanocuries of strontium-90 were found on nine captured fruit flies.

No rapid notification process existed for informing the waste transportation workers to stop hauling refuse.

The root cause of this event was determined to be the failure to establish preventive processes to preclude the transfer of contamination by biological vectors (fruit flies), which led to inadvertent contamination in offsite locations. Additional information about this event can be found online at: <http://www.hanford.gov/safety/conspread/index.html>.

Recommended actions:

Aggressively control biologic transport mechanisms when using glycerin/monosaccharide (simple sugar)-based fixatives for contamination control. Control is particularly important when such fixatives are used in areas open to the environment.

Monitor materials originating from the vicinity of contaminated areas with a graded approach, especially those items destined for offsite disposition.

Biological vector control programs should:

- Consider using fixatives that do not attract animals
- Require routine surveys of areas known to have had contamination spreads by biological transport vectors
- Be integrated with programs of adjacent facilities
- Require dumpsters to be closed when not in use and to have access guards or screens on bottom drainage openings
- Control food substances, including refuse, entering areas near sites known to have potential for contamination spread.

Estimated Savings/Cost Avoidance: The cost of this event is estimated to be at least $2 million.

Priority Descriptor: RED/Urgent (based on the actual spread of contamination off Site)

Functional Categories (DOE): Conduct of Operations; Emergency Management; Environmental Protection; Radiation Protection

Functional Categories (Hanford specific): None

Originator: Fluor Daniel Hanford, Inc.

Contact: Project Hanford Lessons Learned Coordinator; (509) 373-7664; FAX 373-2084; e-mail: ^PHMC Lessons Learned

Name of Authorized Derivative Classifier: Mike Spracklen (509) 376-3730

Name of Reviewing Official: John Bickford

Keyword(s): contamination, solid waste, gnats, fruit flies, garbage, fixative

References:

Operating Experience Weekly Summaries 98-40 and 98-41

HNF-3628, *Fall 1998 200 East Area Biological Vector Contamination Report DOE This Month*, September 1998

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APPENDIX J

FRUIT FLY BIOLOGY AND HYPOTHETICAL SCENARIO

FRUIT FLY LIFE-CYCLE AND PHYSICAL CHARACATERISTICS

Drosophila flies (also known as pomace flies, vinegar flies banana flies, and small fruit flies) belong to the fly (Class Insecta, order Diptera) family Drosophilidae. Although most commonly referred to as "fruit flies," only flies of the family Tephritidae are true fruit flies. Drosophila flies are typically about 2.5 to 5 millimeters (1.1 to 1.5 inches) in length, fold their transparent wings over their backs horizontal to the ground, are yellowish brown to dark brown in color, fly in circular patterns, and have red eyes. They are strong fliers, having been observed to fly over 15 kilometers (6.5 miles) in 24 hours. Drosophila is most active in the morning and evening but, depending on light and weather, may be active at any time of day.

Drosophila, as do all flies, go through a complete metamorphosis, that is they progress from egg, to larva, to pupa, to adult. The adults emerge from eggs in 8 to 10 days; the adults may live for up to three months and lay from 500 to 2,000 eggs. Drosophila eggs are deposited as long as a food source is available, and resultant adults may emerge daily until the food source or the fly population is eliminated. Food sources can be as unexpected as an alcohol-based ink, mop water, or drainage-saturated soil. The adults also carry fungi spores that are deposited with the eggs and contribute to and hasten fermentation.

Drosophila metamorphosis:

Egg (2 – 24 hours) – larva (4 - 6 days) – pupa (2 – 4 days) – adult (up to 24 hours).

As indicated in the summary and overall timelines, the natural life history characteristics, life cycle, and adaptability of Drosophila fit perfectly with the opportunity in September 1998 to enter the contaminated 241-ER-152 Diversion Pit, as hypothesized below.

HYPOTHESIS OF THE FRUIT FLY SCENARIO

Following is a hypothesis of the likely fruit-fly scenario, beginning in the 241-ER-152 Diversion Pit and moving to the MO-967 Mobile Office.

- Evidence indicates that the primary opportunity for fruit flies to enter the pit was while the cover blocks were off for about 3 hours on September 15 and potentially through miscellaneous engineered penetrations.

- When the cover blocks were replaced, some fruit flies remained in the pit. They likely fed on the glycerin/monosaccharide-based fixative covering the contamination and became contaminated. While they were in the pit, they laid eggs.

- The eggs became larvae and the larvae matured into adult fruit flies around September 25.

- The contaminated adult fruit flies began to emerge from the pit through unsealed joints between the cover blocks, valve-handle penetrations, and wire ways.

- As the fruit flies emerged on September 25, the prevailing wind was blowing from the northwest, theoretically bringing with it the attractant odors from the MO-967 Mobile Office dumpster and lunchroom. The 241-ER-152 Diversion Pit was downwind from the MO-967 Mobile Office (NW to SE). NOTE: Winds were recorded as averaging 11.3 kilometers (7 miles) per hour from the northwest, variable from the east, and 11.3 kilometers (7 miles) per hour from the west-northwest.

- During the 3-day period from September 25 to 28, the wind direction shifted, placing the MO-967 Mobile Office downwind from the 241-ER-152 Diversion Pit. The new wind direction carried the fruit flies from the pit toward the northwest, allowing the flies to reach other locations (notably the MO-967 Mobile Office). NOTE: On September 26, wind averages were 10 kilometers (6 miles) per hour from the north-northwest, 10 kilometers (6 miles) per hour from the northeast, and variant from 3 to 11.3 kilometers (2 to 7 miles) per hour. On September 27, wind averages were east-northeast at 5 kilometers (3 miles) per hour, southeast at 11.3 kilometers (7 miles) per hour, and variant at 3 kilometers (2 miles) per hour. On September 28, wind averages were southeast at 12.9 kilometers (8 miles) per hour northeast at 5 kilometers (3 miles) per hour, and southeast at 8 kilometers (5 miles) per hour.

EXHIBITS

EXHIBIT A OVERALL TIMELINE

EXHIBIT B MAP OF 200 EAST AREA, SHOWING FACILITIES AND FLYING-INSECT TRAPS

EXHIBIT C LOCATION MAPS OF FLYING-INSECT TRAPS

C-1 200 West Area Showing Facilities and Flying-Insect Traps
C-2 300 Area Showing Facilities and Flying-Insect Traps
C-3 400 Area Showing Facilities and Flying-Insect Traps
C-4 Flying-Insect Trap Locations at Remote Areas of the Hanford Site

EXHIBIT D MAP OF CITY OF RICHLAND LANDFILL

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EXHIBIT A

OVERALL TIMELINE

(Provided in plastic sleeve)

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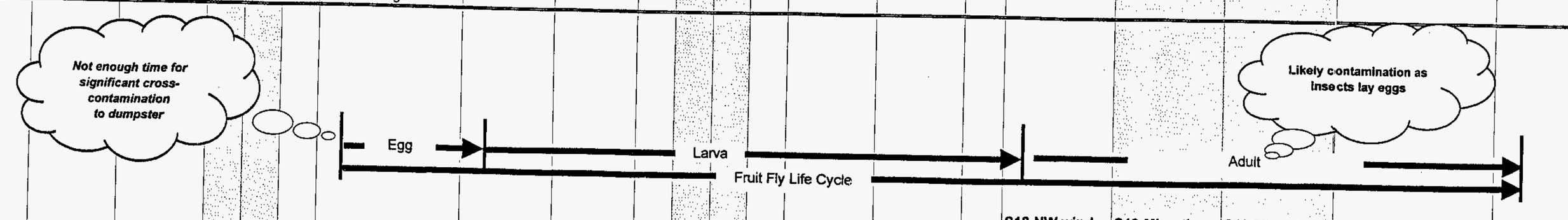
Incident Technical Components	Timeline entries (August – December)

Diversion Pit 241-ER-152

- **Thurs, September 10:** S2-Fixative applied to 241-ER-152.
- **Tue, September 15:** S4-Cover blocks off 3:30 to 6:30 a.m. to perform jumper work. S5-955 liters of water leaked into pit during flush after pipe cutting. S6-Airborne contamination escaped from tent covering 241-ER-152. S7-Fruit flies may have entered pit and laid eggs. S9-Air sample taken in tent consistent with other findings.
- **Wed, September 16:** S10-Work to clean up contamination spread. S10a-Air sample taken September 15 was counted.
- **Thurs, September 17:** S10b-Began surveying to reduce contamination area.
- **Wed, September 23:** S12-Leak check failed.
- **Mon, September 28:** S24-Routine radiological survey identified contamination.
- **Wed, September 30:** S44a-First flying-insect traps placed near 241-ER-152.
- **Thurs, October 1:** O9b-Contaminated insects found in traps near 241-ER-152.
- **Thurs, October 8:** O50-Glovebag installed at 241-ER-152 to permit sampling inside the pit. O51-Contaminated fruit flies found in 241-ER-152.
- **Fri, October 9:** O62-Contaminated fruit flies found in traps in 241-ER-152 and glovebag.
- **Wed, October 14:** O79-Contaminated fruit flies found in traps in 241-ER-152 and glovebag.
- **Mon, October 26:** O86-Contaminated fruit flies found in flying-insect traps at 241-ER-152. O88a-241-ER-152 inspected; some leaks in seal were identified and corrected.
- **Tue, October 27:** O91-241-ER-152 and glovebag sprayed with pyrethrin.
- **Wed, October 28:** O92-241-ER-152 sprayed with PRO Control Plus and new traps installed to determine if pests were controlled.

Biological



Meteorological Data

Predominant Wind Direction (Summarized)
* Morning
* Balance of day
* Evening

- **Fri, September 25:** S18-NW wind brings scent of food and refuse. S18-(Note: 241-ER-152 to MO-967 is from SE to NW) From NW 7 From E Var From W-NW 7
- **Sat, September 26:** S19-Migration begins as wind is variable. S19- From N-NW 6 From NE 6 From Var 2-7
- **Sun, September 27:** S19-Migration active as wind shifts from E to SE. S19- From Var 2 Rom E-NE 3 From SE 7
- **Mon, September 28:** S19-Migration ongoing as wind shifts SE to attract, and NE to carry. S19- From SE 8 From NE 3 From SE 5
- **Tue, September 29:** Migration ends as life cycle ends. Adults emerge daily well into December.

Radiological Survey

- **Tue, August 4:** A1-Contaminated mouse feces found around B Plant.
- **Tue, August 11:** A2-Daily routine radiological surveys began south of B Plant/WESF.
- **Tue, September 8:** S1-The FDH Office of Biological Control started receiving normal seasonal complaints about gnats and fruit flies.
- **Fri, September 11:** S3-A contaminated ant hill was found near 241-ER-151.
- **Wed, September 23:** S14-Worker gloves contaminated in 241-ER-152 or 2247-B.
- **Fri, September 25:** S17-Routine survey of MO-967 showed no contamination. S18a-B Plant, TWRS, WMNW, and the FDH Office of Biological Control met to discuss contamination spread SW of B Plant.
- **Sat, September 26:** S20-Employees entered MO-967 to use the kitchen. S21-The 2247-B Ironworkers Shop received contamination.
- **Sun, September 27:** S20-Employees entered MO-967 to use the kitchen. S21-The 2247-B Ironworkers Shop received contamination.
- **Mon, September 28:** S24-Low levels of radioactive contamination found in MO-967; then dumpster was checked. S25-Dumpster surveyed after it had been emptied. Reportable contamination found. S27-Van of FDNW Craftsmen surveyed; Personnel negative but van contaminated.
- **Tue, September 29:** DUMPSTER SURVEY. S31-Locations of contamination (light switch, trash cans, walls) indicated previously unknown vector. S32-Single contaminated fruit fly (first contaminated flying insect) was found, leading to consideration of fruit flies as likely vectors; investigation intensified. S34-High levels of contamination found in 2247-B. S26-Iron Worker and personal vehicle surveyed; negative. Found five contami-nated socks at home. S28-LMHC RadCon informed DYN RadCon of contaminated Ironworker's boot.
- **Wed, September 30:** DUMPSTER SURVEY. S43a-DYN Transportation Operations notified of contamination in a dumpster. S44a-First flying-insect traps placed near MO-967. S45-Began surveying personnel and equipment exiting RBA. S46-RadCon personnel intensively surveyed all real estate and equipment around WESF.
- **Thurs, October 1:** DUMPSTER SURVEY. O4-DESH informed DYN that contamination was found on boot of carpenter entering K Basins. O5-275-E Carpenter Shop Building surveyed, one spot of contamination found. O6-Canister Storage Building complex posted as a second RBA. O7-Beta-emitting contamination found on facilities and refuse; mainly was strontium-90. O9a-Flying-insect traps set in and around precautionary isolation area. O12-19 liter (5-gal) refuse can outside 2247-B found contaminated.
- **Fri, October 2:** DUMPSTER SURVEY. O16-Flying-insect traps and mouse traps checked. Contaminated fruit flies were first trapped at MO-967. O17-Contamination found on pop cans outside of 2711-E in pop-can recycle area. O18-Extensive bioassays began. O19-Contaminated fruit flies found in 200-East Area FDNW complex dumpster.
- **Sun, October 4:** O20-Contamination found in dumpsters outside 272-E and 2707-E. O21-Contamination found in garbage can outside 225-BE. O22-Contamination found inside 2711-E men's shower room on rubber floor mat. O22-Contamination found on carpet in 2711-E. O23-Contamination found in MO-996 dumpster.
- **Mon, October 5:** O24a-Insect trapping was extended Sitewide, including 200 Areas, 100 Areas, and 300 Areas. O32-Contaminated fruit flies found in traps in and around MO-967 and MO-966. O33-TRWS RCT found contamination near 218-B and on the Atlanta Avenue roadway near intersection with 7th Street.
- **Tue, October 6:** O36-At Canister Storage Building and surrounding office buildings, contamination was found in garbage cans, a plastic tub, and specks on the floor.
- **Wed, October 7:** O45-Four vendor trucks surveyed, results negative. Solid Waste Team contacted all vendors who were recently in the area and offered personnel and vehicle surveys but were turned down.
- **Thurs, October 8:** O53-Normal work resumed at Canister Storage Building construction site after contamination had been removed from several locations inside and outside. O56-Four vendor trucks again surveyed, results negative. Daily surveys continued. O58-95 flying-insect traps set on and off Site.
- **Fri, October 9:** O56-Four vendor trucks again surveyed, results negative.
- **Sat, October 10:** O56-Four vendor trucks again surveyed, results negative.
- **Sun, October 11:** O56-Four vendor trucks again surveyed, results negative. O68a-Bag of contaminated refuse found in dumpster NE of 2750-E, another in dumpster N of 2750-E.
- **Mon, October 12:** O56-Four vendor trucks again surveyed, results negative. O72-Continued surveying Site dumpsters. O74-Contaminated refuse was found in a 200 West Area dumpster by the 2306-W Bottle Storage (Skid Shack), not related to contamination spread.
- **Tue, October 13:** O56-Four vendor trucks again surveyed, results negative.
- **Wed, October 14:** O56-Four vendor trucks again surveyed, results negative. O80-Contamination was found on refuse in a dumpster near 2201-B.
- **Thurs, October 15:** O56-Four vendor trucks again surveyed, results negative.
- **Sun, October 18:** O83a-Surveys of RBA completed.
- **Mon, October 19:** O56-Four vendor trucks again surveyed, results negative. O84-Shoulder-to-shoulder survey of RBA. RBA released and returned to normal operations.
- **Tue, October 20:** O85a-No significant events through Sunday, October 25. O85b-Site surveys continued. Dumpster and vendor surveys were ongoing.
- **Wed, October 21:** O85c-PNNL placed 10 flying-insect traps off Site. Insects trapped were not contaminated.
- **Mon, October 26:** O87-Contamination found in flying-insect traps north of MO-966. O88-Contamination found in dumpster outside 2101-M. Dumpster sealed in plastic and taken out of service.
- **Fri, October 30:** O93-One contaminated fruit fly found in trap near U.S. Ecology dumpster.
- **Mon, November 2:** N2-Trash can in Canister Storage Building found contaminated.
- **Fri, November 6:** N3-Dead fruit fly found in office of 2247-B.
- **Thurs, November 12:** N6-Temporary survey station established in 4843 in 400 Area to survey refuse going off Site. N7-First refuse shipment surveyed in 4843.
- **Mon, November 16:** N8-A bag of refuse was found in 4843 survey area with contamination (apparently fruit fly pieces).
- **Tue, November 17:** N10-Six flying-insect traps placed in 4843 and remained active through December 31.
- **Fri, December 4:** D1-All flying-insect traps removed by December 4 except the six in 4843.
- **Thurs, December 31:** D2-No contamination reported in 4843 between November 16 and December 31. D3-Note: December 31 determined as cutoff date for this report.

Dumpster Pick-up

Truck #3500

- **Tue, September 15:** S8-200 East Area pick-up.
- **Thurs, September 17:** S11-200 East Area pick-up.
- **Fri, September 25:** S16-Refuse pick up switched to this truck.
- **Mon, September 28:** S22-MO-967 dumpster emptied while being moved - 7:45 a.m.
- **Tue, September 29:** S30-Regular pick-up day for 200 East Area.
- **Wed, September 30:** S40-Outside of Garbage Truck #3500 was found contaminated and was isolated in 273-E.
- **Thurs, October 1:** O8-Inside of truck found contaminated.
- **Fri, October 9:** O61b-Onsite refuse was disposed of in 200 West Area Low-Level Burial Grounds.

Truck #6060

- **Tue, September 22:** S11-200 East Area pick-up.
- **Fri, September 25:** S15-Truck Broke Down with ~ 50% refuse from the 400 Area.
- **Fri, October 2:** O15-Contamination found inside Garbage Truck #6060 in the garage. The truck was isolated in 273-E.

Eradication Program

- **Wed, September 30:** S42-Precautionary isolation established south of B Plant.
- **Thurs, October 1:** O9-Seasonal spraying and fumigation activities were ongoing.
- **Fri, October 2:** O14-RBA formally established south of B Plant.
- **Mon, October 5:** O25-Spot treatments with insecticides began near 241-ER-152 and at local dumpsters and garbage cans.
- **Thurs, October 8:** O47-200 East Area garbage trucks fogged.
- **Sat, October 10:** O64-Malathion 50 sprayed around entire RBA at B Plant (first fogging).
- **Sun, October 11:** O68-Second fogging of RBA.
- **Mon, October 12:** O71a-Third fogging of RBA.
- **Tue, October 13:** O76-No fogging because of high winds.
- **Wed, October 14:** O81-No fogging because of high winds.
- **Thurs, October 15:** O83-Spraying/fogging resumed at RBA; continued until October 19.
- **Mon, October 19:** O85-RBA fogging ended.
- **Mon, October 26:** O89-Fogging resumed at RBA and continued through October 31.
- **Mon, November 2:** N1-Fogging reinitiated at former RBA and continued through November 9.
- **Mon, November 9:** N4-Fogging terminated at former RBA.

Mobilization of Organization

Communication

Employee

- **Wed, September 30:** S36-PHMC fact-finding meeting held; potential that MO-967 dumpster was emptied before the RCT arrival. Follow-up actions identified.
- **Thurs, October 1:** O1-Situation Room was established in the Alternate Emergency Operations Center.
- **Mon, October 5:** O26-PHMC companies, City of Richland, WDOH, and RL started meeting daily. Formed integration team with four major subteams.
- **Thurs, October 15:** O82-Site equipment and personnel demobilized.

Offsite

- **Wed, September 30:** S38-Notification made to City of Richland.
- **Mon, October 5:** O27-First all-employee General Delivery notice sent. O30-Updates posted on Hanford Internet, Site radio station, and DYN telephone hotline.
- **Wed, October 7:** O48-B Plant/WESF employees requested more information, including proper radiological terminology in news releases and company e-mail.
- **Thurs, October 8:** O54-Meeting held with employees concerned about the area south of B Plant. O55-Personnel monitoring offered to construction workers. O59-New page added to Hanford Web Site, accessible at http://www.hanford.gov/safety/conspread/index.html.
- **Mon, October 26:** O90-RL briefed City of Richland.

Media

- **Wed, September 30:** S48-Press release issued by FDH.
- **Thurs, October 1:** O11-Press release issued by City of Richland. Media inquiries began.
- **Mon, October 5:** O28-Regular updates provided to media and officials from City of Richland and Washington State. O29-FDH held press conference, City of Richland participated. O29a-Received call from Oregon Office of Energy regarding food service information.
- **Wed, October 7:** O37-Policy Team established process for daily updates to governmental agencies. O44-PHMC and representative from the City held a briefing for local media. O46-WDOH expressed concern about release to atmosphere; requested a daily status of the onsite situation.

Official Notification and Permits

- **Mon, September 28:** S29-Initial notification on contamination made to FDH.
- **Tue, September 29:** S29-Initial notification on contamination made to RL. S33-DYN initiated occurrence reporting and issued NCN.
- **Wed, September 30:** S41-Alternate Emergency Operations Center activated at 2420 Stevens Center.
- **Thurs, October 1:** O13-WDOH officially notified of possible radioactive air emission from Truck #3500 and at City landfill. O13c-ONC initiated NCN to offsite agencies.
- **Sat, October 3:** O13b-WDOH notified of RL's intent to remove contaminated refuse from City landfill to the Hanford Site.
- **Mon, October 5:** O34-Preparation of NOCs began.
- **Wed, October 7:** O38-WDOH approved NOCs for retrieval of contaminated waste at City landfill and burial of that waste at the Hanford Site. O49-EPA approved NOC for burial of contaminated waste from City landfill at the Hanford Site.
- **Thurs, October 8:** O49a-EPA approved NOC for retrieval of contaminated waste from the City landfill.
- **Tue, October 13:** O75-WDOH and EPA approved additional burial in the Low-Level Burial Grounds.

Landfill

- **Tue, September 22:** S11-Debris arrived at the City landfill. Highly unlikely that any contamination reached this load.
- **Wed, September 23:** S13-Debris arrived at the City landfill.
- **Mon, September 28:** S23-Unknowingly contaminated refuse arrived at the City landfill in Truck #3500 - 1:30 p.m.
- **Tue, September 29:** S30-Refuse arrived at the City landfill in Truck #3500.
- **Wed, September 30:** S37-Identified possibility that contamination reached the City landfill. S39-RCT dispatched to the City landfill at 1:30 p.m. S43-City of Richland updated. Retrieval discussions initiated. S44-Shipments of sanitary waste to the City landfill suspended.
- **Thurs, October 1:** O2-Shipments of construction debris to the City landfill suspended. O3-RCT resurveyed the City landfill. O10-Planning for retrieval from the City landfill continued with City landfill management. O3a-1:45 DYN met with City Manager and Benton County to plan landfill survey. O13a-ONC officially notified the City of Richland of the possibility of landfill contamination.
- **Fri, October 2:** O19a-A bulldozer and backhoe were staged at the City landfill, and portable fencing to isolate Hanford Site refuse from landfill workers and the public.
- **Mon, October 5:** O24-Flying-insect traps placed at the City landfill. O31-Exploration started at the City landfill to find contamination.
- **Tue, October 6:** O35-First cell of Hanford Site refuse located at the City landfill.
- **Wed, October 7:** O39-Initial contamination detected in Hanford Site refuse at the City landfill, primarily on food refuse. O40-Clear plastic bag and piece of cardboard discovered contaminated at the City landfill. O41-Airborne radiological monitoring established at the City landfill as part of evaluation. O42-High winds curtailed excavation at the City landfill; area of contaminated materials covered with tarp. O43-Excavation activities halted at the City landfill pending approval of NOC.
- **Thurs, October 8:** O52-Solid Waste Team began discussing with the City the requirements for resuming hauling Hanford refuse to the City landfill. O57-Dursban 50W insecticide treatment initiated at the City landfill.
- **Fri, October 9:** O49-Approved NOC for retrieval was delivered to the City landfill and workers were briefed. O60-Started removing waste at the City landfill at 7:30 a.m. O61a-Refuse from the City landfill taken to Low-Level Burial Grounds in the 200 East Area. O63-Work in the City landfill planned for daylight hours over the weekend (7:00 a.m. to 7:00 p.m.)
- **Sat, October 10:** O65-Report of contaminated material found in second cell at the City landfill.
- **Sun, October 11:** O66-Last contamination spot found in the City landfill. O67-DYN, FDH, RL, City, and WDOH agreed to stop invasive excavation of the City landfill after identified contamination was removed.
- **Mon, October 12:** O70-All activities to remove Hanford Site refuse from the City landfill were completed except one contingency container. O71-Insecticide treatments at the City landfill were terminated.
- **Wed, October 14:** O69-Of 544,000 kg (600 tons) excavated at the City landfill, 191,000 kg (210 tons) of material were removed to the 200 West Area burial grounds. 23 kg (50 lb) of contaminated material were found. O76a-Contingency container removed from the City landfill to the Site. O77-Final surveys of the City landfill completed, disturbed area restored, layer of soil placed over area. O78-City of Richland agreed that activities at the City landfill were complete.
- **Fri, October 30:** O94-The memorandum of understanding between DYN and BDI Transfer was prepared.
- **Tue, November 10:** N5-Memorandum of understanding signed between DYN and BDI Transfer, Pasco WA, for one year, for additional refuse capability.
- **Mon, November 16:** N9-The first shipment of Hanford Site refuse was released to BDI Transfer.

Terms

218-B = Emergency Equipment Storage Shed	FDH = Fluor Daniel Hanford, Inc.
225-BE = Encapsulation Maintenance Shop	FDNW = Fluor Daniel Northwest, Inc.
241-ER-151 = Diversion Pit	LMHC = Lockheed Martin Hanford Corporation
241-ER-152 = Diversion Pit	MO-966 = Lunchroom Trailer at 224-B
241-ER-191 = Diversion Pit	MO-967 = Mobil Office
272-E = Fabrication, Mockup Shop Building	MO-996 = Mobile Office at 272-AW
273-E = Material Storage Building	NCN = Not-Classified Notification
275-E=Carpenter Shop Building	NOC = Notice of Construction
2101-M = Spare Parts Warehouse, Office Building	ONC = Occurrence Notification Center
2201-B = Construction Ice House	PHMC = Project Hanford Management Contract
2247-B = Ironworker's Shop	PNNL = Pacific Northwest National Laboratory
2306-W = Bottle Storage (Skid Shack)	PUREX = Plutonium-Uranium Extraction (Facility)
2707-E = Change House	RadCon = Radiological Control
2711-E = 2E Garage	RBA = radiological buffer area
2750-E = Waste Management Services and Operating Facility	RCT = radiological control technician
4843 = Storage Building (temporary survey station)	RL = U.S. Department of Energy, Richland Operations Office
B Plant = 221-B Process Building Canyon	TWRS = Tank Waste Remediation System
BDI = BDI Transfer	WDOH = Washington State Department of Health
DYN = DynCorp Tri-Cities Services, Inc.	WESF = Waste Encapsulation and Storage Facility (225-B)
EPA = U.S. Environmental Protection Agency	WMNW = Waste Management Federal Services, Inc., Northwest Operations

Exhibit A: Overall Timeline.

EXHIBIT B

MAP OF 200 EAST AREA, SHOWING FACILITIES AND FLYING-INSECT TRAPS

(Provided in plastic sleeve)

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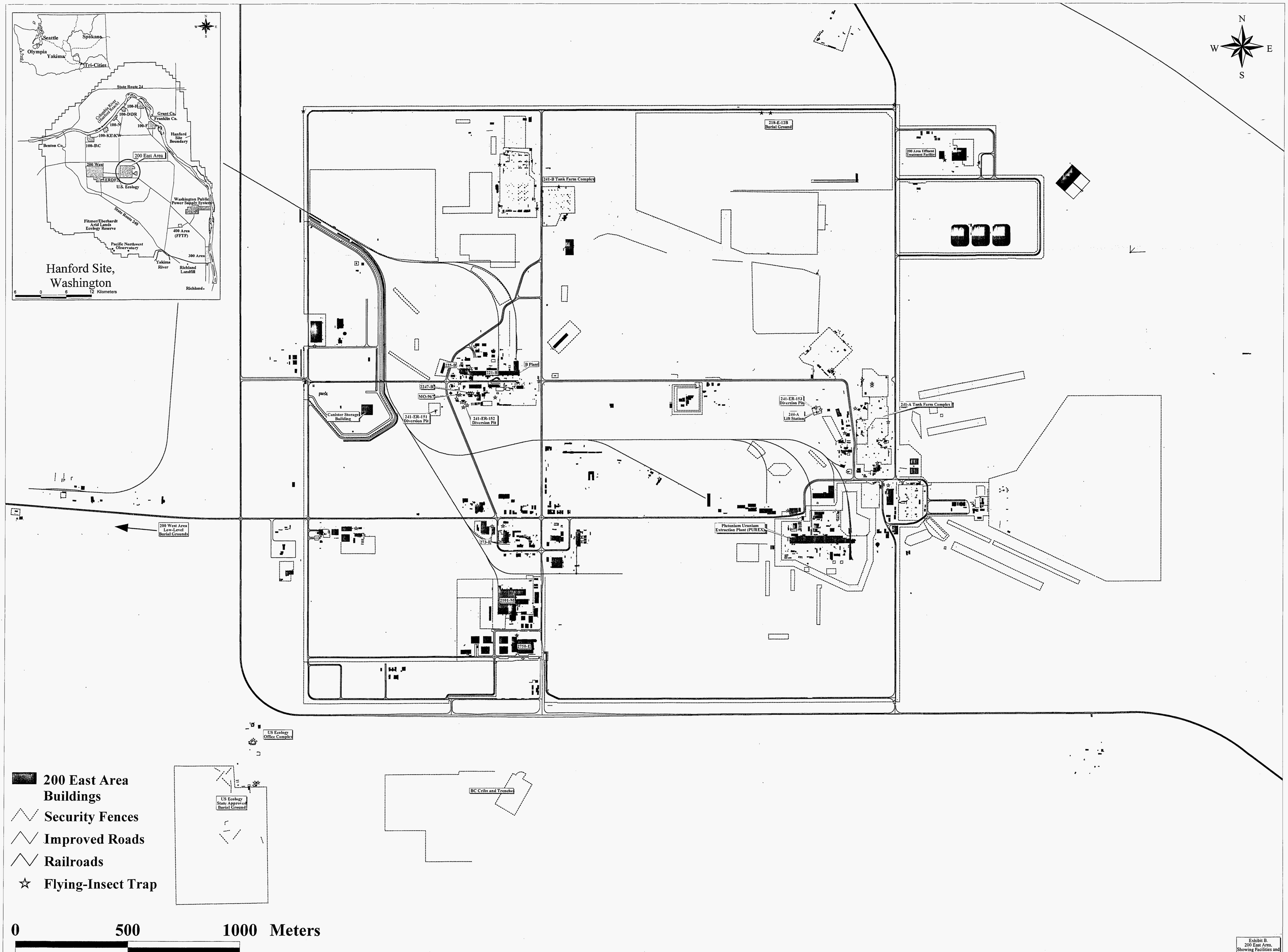

Exhibit B.
200 East Area,
Showing Facilities and
Flying-Insect Traps.

EXHIBIT C

LOCATION MAPS OF FLYING-INSECT TRAPS

C-1 200 West Area Showing Facilities and Flying-Insect Traps

C-2 300 Area Showing Facilities and Flying-Insect Traps

C-3 400 Area Showing Facilities and Flying-Insect Traps

C-4 Flying-Insect Trap Locations at Remote Areas of the Hanford Site

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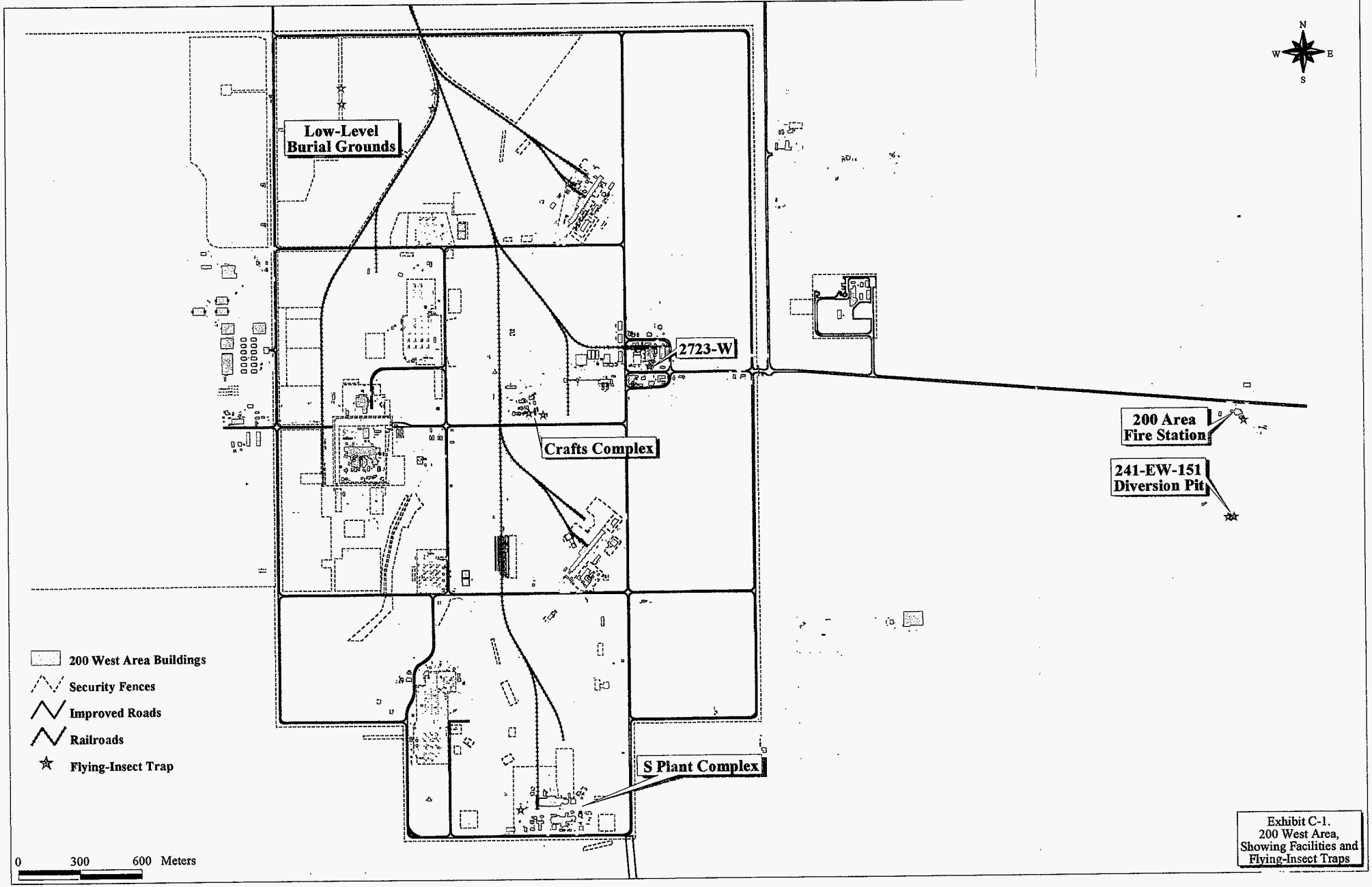

Exhibit C-1.
200 West Area,
Showing Facilities and
Flying-Insect Traps

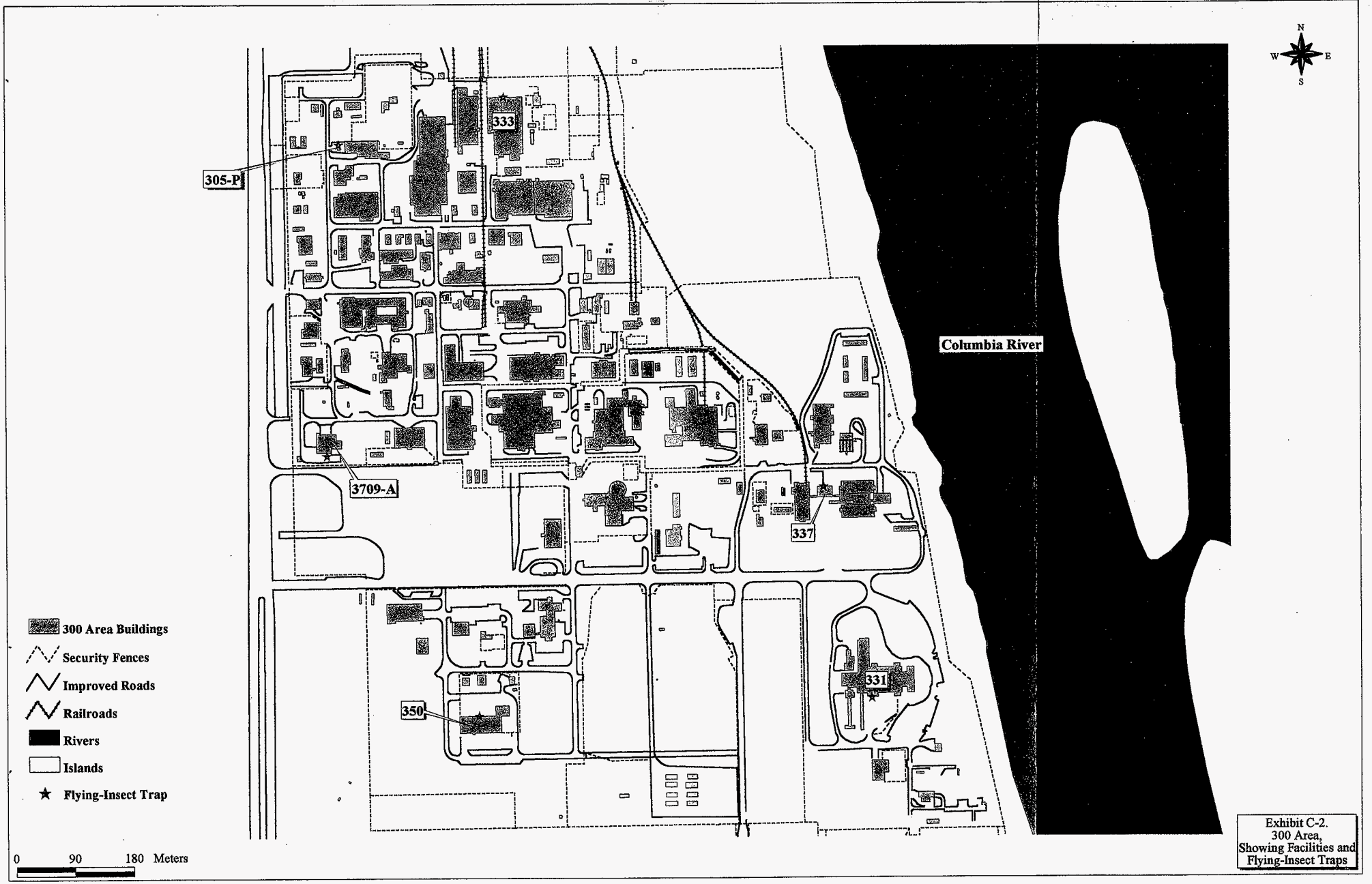

Exhibit C-2.
300 Area,
Showing Facilities and
Flying-Insect Traps

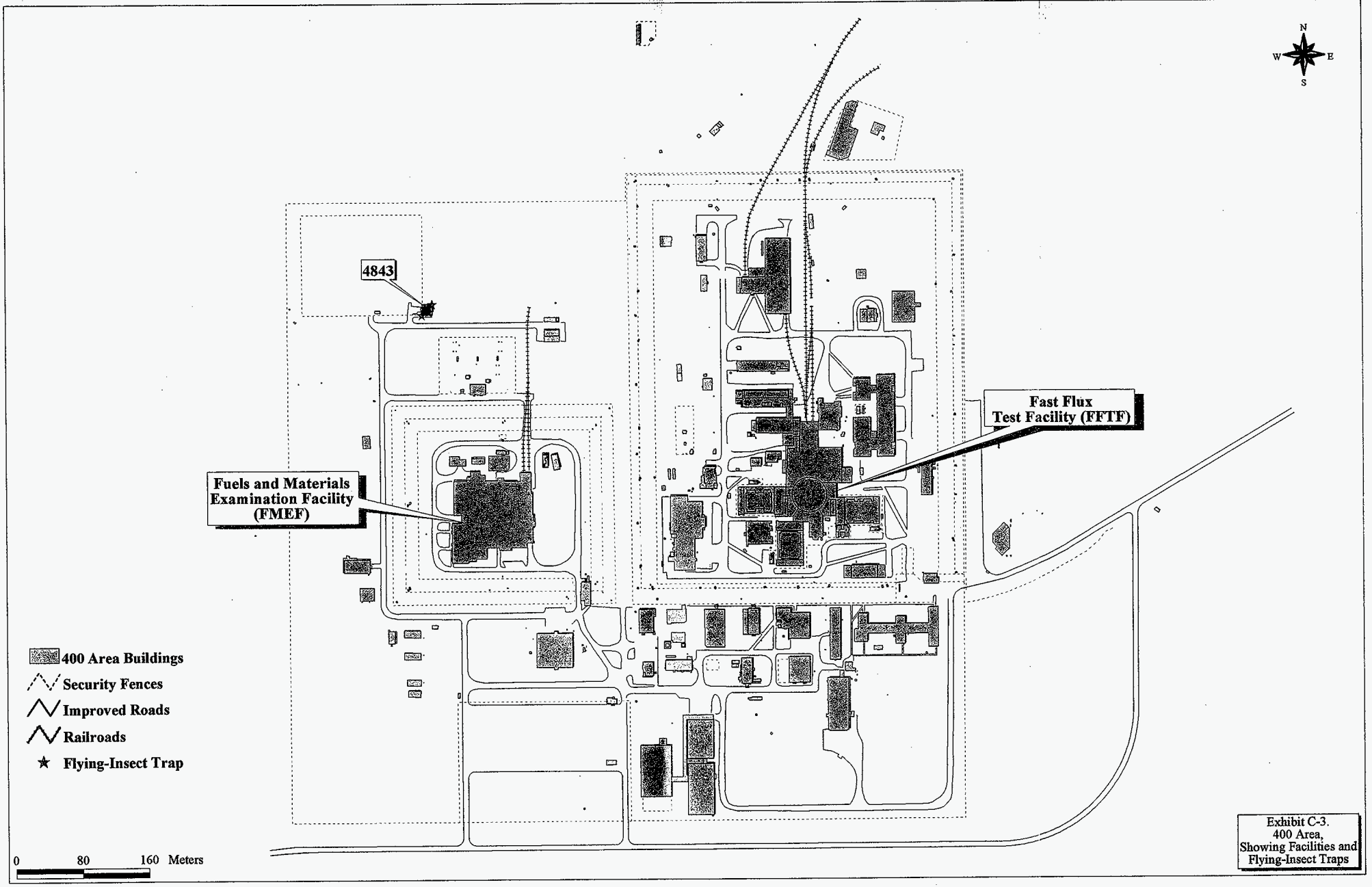

Exhibit C-3.
400 Area,
Showing Facilities and
Flying-Insect Traps

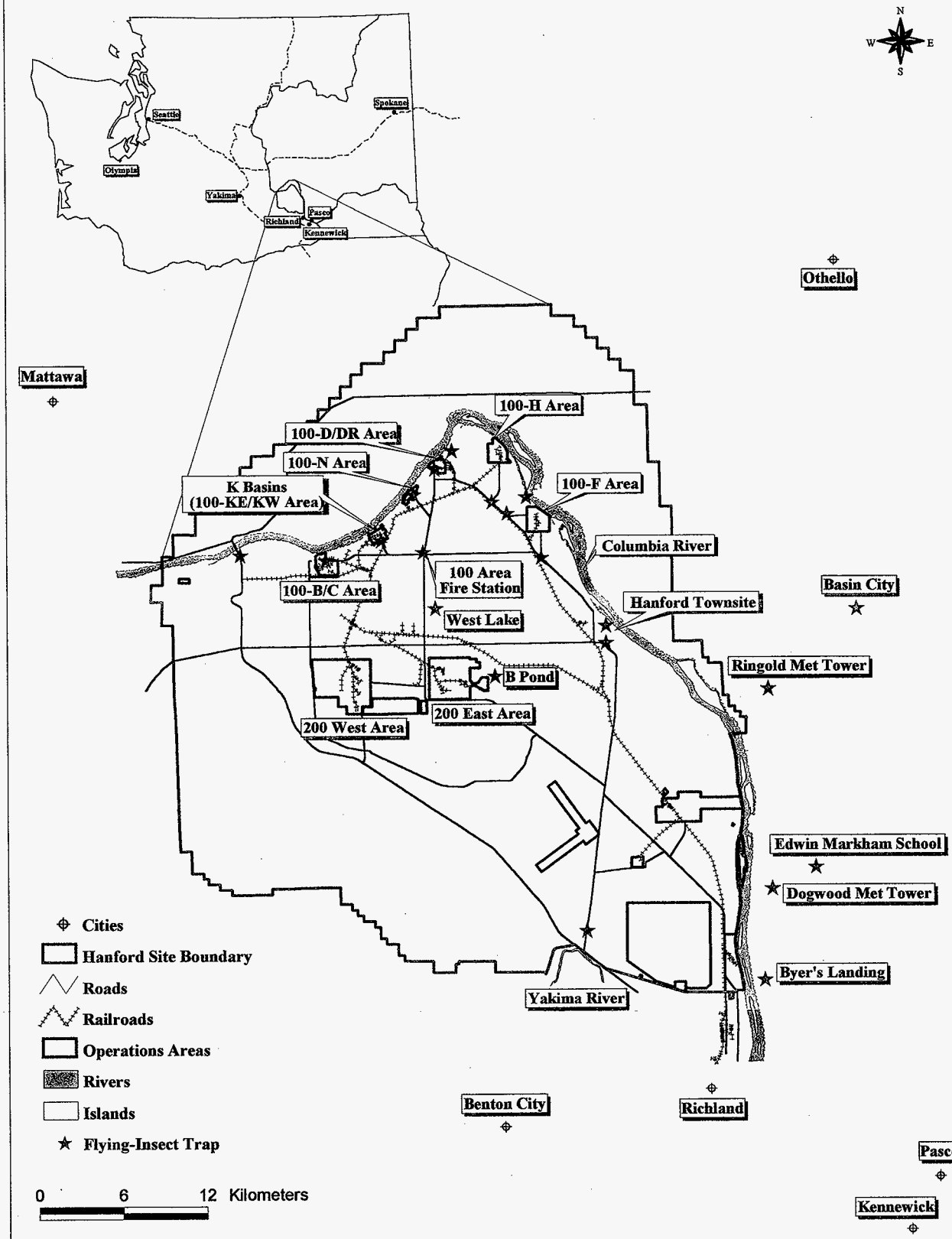

Exhibit C-4. Flying-Insect Trap Locations at Remote Areas of the Hanford Site.

EXHIBIT D

MAP OF CITY OF RICHLAND LANDFILL

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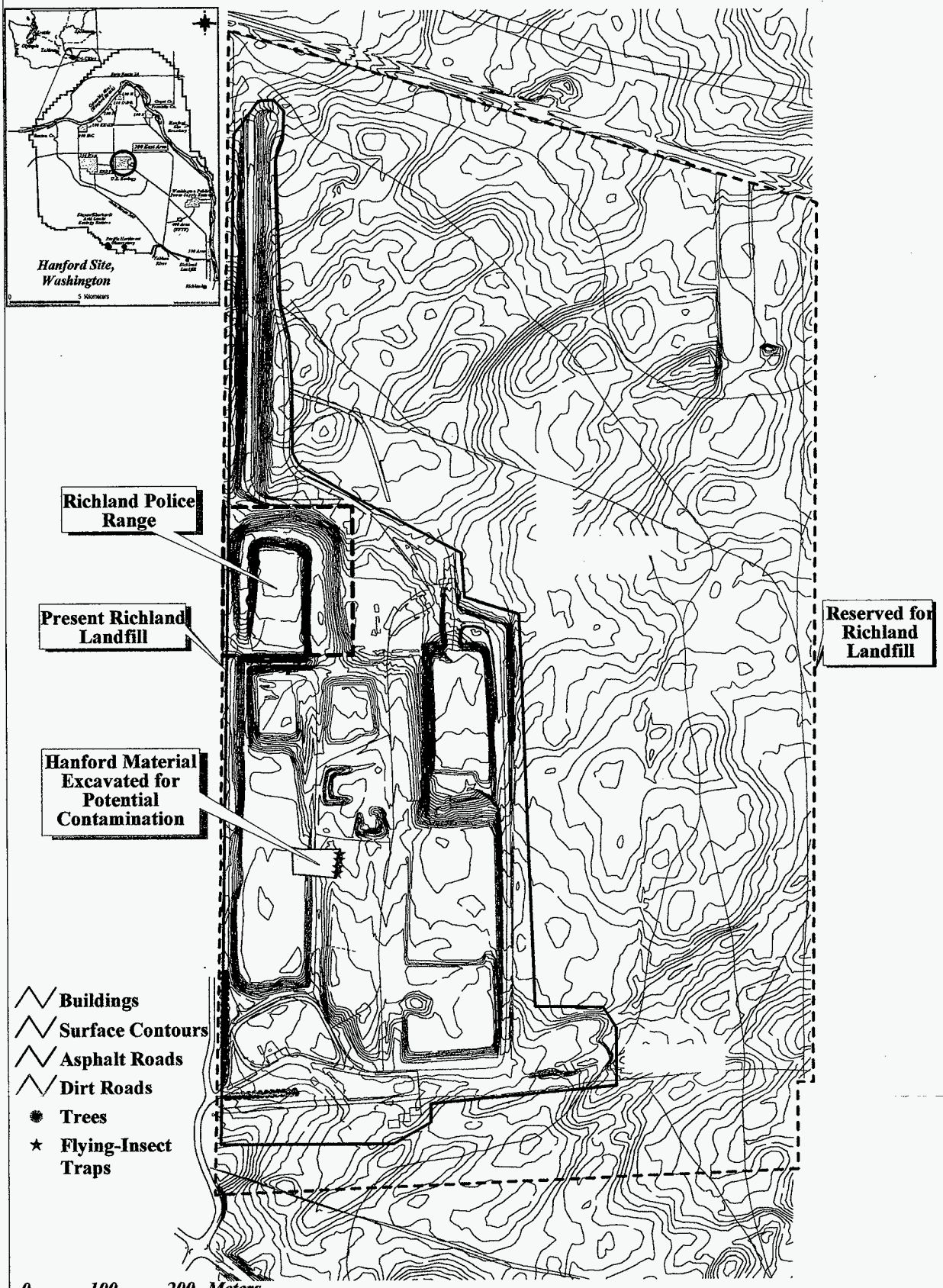

Exhibit D. Map of Richland City Landfill

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	Ranade, D.G.	H6-23
	Shoup, R.L.	H8-67
	Swan, R.J.	H6-23
	Umek, A.M.	S7-40
	Watts, R.L.	H6-34
	Whalen, C.L.	A3-02

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