30. PATH FORWARD

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30.1 INTRODUCTION

Much has been learned in the past 10 years, but there is still much to do. The three parties (the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology) have laid out a general approach in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 2007, particularly Appendix I):

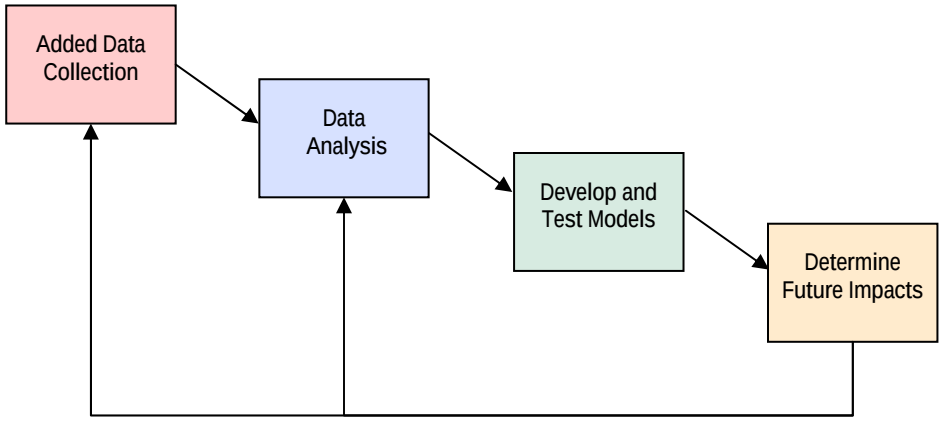
Although much was done in Phase 1, there is still work to do. Data must be collected; analyses must be performed; models must be developed, run, and tested; and future impacts must be estimated.

- Retrieve as much waste as technically possible from tanks
- Stabilize the tanks
- Decontaminate and decommission other facilities
- Remediate the contaminated soil
- Minimize moisture coming into the tank farms
- Monitor the impacts.

The Tank Farm Vadose Zone Program will support these efforts. In particular, the project will perform the following (Figure 30-1):

- Collect additional field and laboratory data
- Analyze new data (whether collected from its efforts or from other efforts)
- Develop needed models for the determination of long-term human-health and environmental impacts,
- Test models
- Determine the effect of such new data on long-term human-health and environmental impacts.

Figure 30-1. Path Forward



30.2 COLLECTION OF NEW DATA

Data collection in such hazardous areas as the Hanford Site tank farms is expensive. Chapter 29 summarized the important data needs. Table 30-1 lists the key data needs.

Table 30-1. Key Data Needs

Area	Description	Driver
Inventory	Residual waste and retrieval tank leaks, currently established, will be measured after retrieval.	Key driver for intruder impacts; impacts groundwater analyses.
Existing subsurface inventory	Content and extent of contaminants; major leaks have been characterized by borehole and direct-push sediment samples, as well as gamma radiation and high-resistivity resolution measurements.	Key driver for groundwater analyses.
Contaminant release	Release models (including effect of grout leachate).	Key driver for groundwater analyses for residual wastes in tanks.
Recharge	Performance of current gravel surface / performance of interim and permanent surface barriers.	Key driver for groundwater analyses.
Mobile contaminants	What could cause contaminants not currently mobile to become mobile.	Such contaminants drive the groundwater analyses.

High-resolution resistivity methods should provide areas of high contaminant concentration. Boreholes deep into the subsurface will now be selected, based on such results, and used to determine how important contaminants move. The collection of near-surface sediment samples, using the new hydraulic hammer direct-push tool, is expected to increase. Modern, established, geophysical radiation detection equipment (gamma radiation, soil moisture neutron logging) is expected to continue. The use of more sophisticated geophysical techniques (for example, deep radar imaging, seismic monitoring) will continue to be investigated.

30.3 ANALYSIS OF DATA

Once sediments are collected in the field, they must be analyzed in the laboratory. The analysis includes not only the determination of the contamination present, but also the properties of the sediments themselves as well as parameters associated with contaminant movement. Through comparison with the properties of uncontaminated soil, it can be determined how much, if any, the sediments have changed after contact with tank waste. The analyses also reduce the uncertainties with future waste movement.

Using residual tank waste materials, laboratory tests are under way to determine the processes that are important for the contaminants leaving closed tank facilities. However, because of the multiple chemical processing campaigns and multiple waste transfers, the residual waste in each tank is likely to be different. Moreover, how the tanks are closed (for example, the type of filler material) will affect the release rate and must be investigated. Thus, the laboratory investigations will be continuing.

Other projects (such as the Groundwater Remediation Project and its Science and Technology activity) also are collecting data with potential benefit to tank waste movement. A close cooperation with these groups is maintained to not only quickly transfer data and information, but also to optimize Hanford Site efforts. Investigations of past operations records will continue to be a valuable source, as such records contain valuable insights.

30.4 DEVELOP AND TEST NEEDED MODELS

The biggest impacts to groundwater from tank wastes are likely to be in the future. Models are needed to estimate such future impacts. Some parts of the model (for example, moisture and contaminant movement) are fairly well established, but still have uncertainties. Other parts (for example, how contaminants will be released from the residual material left in closed facilities) must be developed.

After models are developed, they need to be tested. As the models predict events far into the future, perfect tests cannot occur. However, the models can and will be tested under a variety of conditions.

30.5 LONG-TERM HUMAN-HEALTH AND ENVIRONMENTAL IMPACTS

The models are used to estimate the future long-term human-health and environmental impacts. Estimates are provided because the input data are uncertain and because the results depend on decisions yet to be made (for example, How much waste will actually be left? Will there be retrieval leaks? How will the soil be remediated? How will the farms be closed?) Thus, the analyses will not only make one estimate, but will also investigate other cases, particularly the "what if we are wrong" cases.

Based on the suite of such estimates, new data and or analyses may be needed. The cycle begins again.

30.6 REFERENCE

Ecology et al. 2007, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, *Hanford Federal Facility Agreement and Consent Order*, as amended through July 23, 2007, 89-10, Rev. 7, Olympia, Washington. This document is available from any of the parties.