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200-ZP-1 Dense Non-Aqueous Phase Liquids Investigation Plan

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200-ZP-1 DNAPL INVESTIGATION PLAN

1.0 INTRODUCTION

As part of the ongoing 200-ZP-1 Interim Remedial Measure, an investigation will be conducted at the 216-Z-9 Trench to determine if carbon tetrachloride is present as a dense, non-aqueous phase liquid (DNAPL). This investigation will be an initial step in determining if carbon tetrachloride is present as DNAPL within the saturated zone at the 200-ZP-1 groundwater Operable Unit (OU). DNAPL, if present, would impact the design of the IRM.

The purpose of this document is to provide an implementation plan for conducting a DNAPL Investigation at the 200-ZP-1 OU. This document also discusses the background of 200-ZP-1 activities, explains how the results of the DNAPL Investigation will be incorporated into the overall 200-ZP-1 strategy, and identifies the schedule for the DNAPL Investigation.

1.1 BACKGROUND OF 200-ZP-1 IRM ACTIVITIES

In November 1989, the U.S. Environmental Protection Agency (EPA) included the 200 Areas of the Hanford Site on the National Priorities List (NPL) under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). Inclusion on the NPL initiated the Remedial Investigation (RI)/and Feasibility Study (FS) process for characterizing the nature and extent of contamination, assessing risks to human health and the environment, and selection of remedial measures. As an initial step, a scoping level study was performed for groundwater beneath the 200 West Area, the results of which were reported in *The 200 West Groundwater Aggregate Area Management Study Report* (DOE-RL 1992a).

The purpose of the study was to compile and evaluate the existing body of knowledge to support the *Hanford Site Past Practice Strategy* (DOE-RL 1992b) decision making process. DOE-RL (1992a) recommended that groundwater contaminants/plumes be addressed under one of four past-practice strategy paths (i.e., Expedited Response Action [ERA], Interim Remedial Measures [IRM], Limited Field Investigation [LFI], and Final Remedy Selection [FRS]). Within the 200 West Area, six contaminants/plumes were recommended for immediate interim action as either an ERA or IRM. Twenty-seven high priority groundwater contaminants/plumes were first recommended to undergo LFIs where additional information was needed to determine whether the contaminants/plumes actually warrant an IRM. Tritium was recommended directly for risk assessment (RA) under the FRS path to determine the need for a remedial action. The remaining contaminants detected in the groundwater were proposed for RI in the FRS path because they were generally considered to be low priority.

Within the 200-ZP-1 Operable Unit (OU), DOE-RL (1992a) recommended that carbon tetrachloride be addressed under an ERA, and that chloroform and trichloroethylene be addressed under IRMs. Negotiations among EPA, Washington State Department of Ecology (Ecology) and the U.S. Department of Energy (DOE) resulted in an agreement to address all three under a single IRM. This agreement resulted in the IRM proposed for 200-ZP-1 documented in *Interim Remedial Measure Proposed Plan for the 200-ZP-1 Operable Unit, Hanford, Washington* (DOE-RL 1994).

The decision to proceed with an IRM at 200-ZP-1 was based on available information, a comparative risk assessment, and a current conceptual model. As additional information is gathered during the

course of the IRM, the conceptual model, and thus the remedial design and remediation goals, may be modified as appropriate. This reflects the observational approach recommended by the *Hanford Site Past-Practice Strategy* (DOE-RL 1992b). As the IRM progresses, additional information will be gathered and the conceptual model will be refined, as necessary.

1.2 IRM OBJECTIVES AND DNAPL INVESTIGATION STRATEGY

Of particular importance to the IRM design is determining whether DNAPL is present. The presence of DNAPL in the IRM area would significantly affect the ability of the IRM to achieve two of its three specific objectives. Those two objectives are (1) to significantly reduce contamination in the area of highest concentrations of carbon tetrachloride and (2) preventing further movement of contaminants from the highest concentration area (DOE-RL 1994).

DNAPL present in the area of the IRM would provide a continuing source of carbon tetrachloride for groundwater contamination. Therefore, significantly reducing contamination in the area might not be possible in any reasonable time unless the DNAPL source(s) is either isolated or removed. In addition, it might not be possible to show that the IRM is preventing further movement of contaminants, unless the nature and extent of the contaminants is understood. The depth of contamination could be significantly greater than currently thought if carbon tetrachloride is present as a DNAPL, thereby allowing contaminant migration at depths not impacted by the IRM.

The third specific objective of the IRM is to provide information that will lead to development of a final remedy which will be protective of human health and the environment (DOE-RL 1994). This specific objective cannot be fully achieved without determining if DNAPL is present in the saturated zone.

The selection of the investigation strategy is documented in *Strategy for Investigating the Presence of Carbon Tetrachloride Dense Non-Aqueous Phase Liquids in the Unconfined Aquifer Beneath the 216-Z-9 Trench*, (BHI 1994). This strategy is to use a partitioning interwell tracer test (PITT) to investigate an area where DNAPL would likely occur if present at 200-ZP-1. BHI (1994) provides background information concerning the need for this activity, and documents an evaluation of the site using the methodology detailed in the EPA document *Evaluation of the Likelihood of DNAPL Presence at NPL Sites* (EPA 1993).

1.3 DNAPL INVESTIGATION GENERAL OBJECTIVE

The general objective of the DNAPL Investigation is to determine if DNAPL is present within the 200-ZP-1 OU. The more specific objective is to determine if DNAPL is present in the saturated zone in the area of the 216-Z-9 Trench.

1.4 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required to support decisions and are determined based on the end uses (or objectives) of the data to be collected. Expected users of the test data include: (1) U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Washington State Department of Ecology

(Ecology) remedial project managers, and (2) Environmental Restoration Contractor (ERC) remedial investigation coordinators and support teams.

To ensure that data collected for each data gathering activity are of sufficient quality to support the end uses of the data, activity specific DQOs will be developed. The importance and ramifications of the decisions to be made for each activity forms the basis for defining the DQOs. Specific DQOs for the individual activities will be developed in Descriptions of Work (DOWs) for each activity.

2.0 DNAPL INVESTIGATION

The DNAPL investigation will occur in three phases. The purpose for the phasing of the investigation is to group activities in a logical sequence which allows for the results of one phase to be evaluated prior to proceeding to the next phase. This will also allow plans for a phase of the investigation to be modified based upon results of a previous phase. The phases are described below.

2.1 PHASE I

Phase I will consist of preparing and characterizing the test site, performing laboratory tests to identify tracers, and modeling the tracer test. Preparation of the test site will consist of deepening two vadose zone wells near the 216-Z-9 Trench, gathering data from soil and water sampling to support test modeling, and performing limited analyses to identify DNAPL presence. An aquifer test to determine aquifer characteristics to support the modelling will also be performed. Data from these activities will be used to model the tracer test. An outcome of the modelling of the tracer test will be identification of recommended types and amounts of tracers to be used, and estimates of the time required for the test.

2.2 PHASE II

Phase II will consist of evaluating information gained from Phase I, and determining if Phase III is needed and feasible. If DNAPL is detected in the saturated zone during the deepening of the two wells, the strategy for the DNAPL Investigation will be reevaluated. In this case, the main data objective would already have been achieved and the tracer test would not be needed to support this objective. However, information from Phase I could be used to support a future partitioning interwell tracer test to determine the volume or distribution of DNAPL present. The optimum design of this test would be different than what is discussed here.

The feasibility of performing the partitioning interwell tracer test will be evaluated and documented in a feasibility report. This feasibility report will consider the costs, times, and regulatory considerations of performing the tracer test. Information to support this feasibility report will come directly from Phase I activities.

If deemed to be both needed and feasible, planning and procurement documentation for Phase III will be prepared.

2.3 PHASE III

Phase III will consist of conducting a partitioning interwell tracer test, evaluating results, and preparing the final report. In general terms, the test will consist of passing a suite of partitioning and non-partitioning tracers through the area between two wells (Figure 1). The non-partitioning tracers will travel with groundwater to the extraction well where their arrival will be detected. The partitioning tracer will travel at the same rate as the non-partitioning tracer unless DNAPL is encountered. If DNAPL is present, the partitioning tracer will react with DNAPL and its arrival at the withdrawal well will be delayed. By comparing the arrival times of the partitioning and non-partitioning tracers, the occurrence of DNAPL can be detected.

3.0 INCORPORATION OF RESULTS

The logic of the investigation is illustrated in Figure 2, and is briefly discussed below.

- If DNAPL is not detected in the area of the test, the IRM pump and treat activities would continue as planned. Data from the pump and treat activities and other data gathering activities would continue to be examined for evidence of DNAPL (e.g., rebound of concentrations after pumping ceases). Because approximately 65% of the carbon tetrachloride disposed of in the area cannot be accounted for (Last and Rohay 1993), it is possible that DNAPL exists in an area other than the area of the test. Therefore, not finding DNAPL in this area will not conclusively indicate that DNAPL does not exist within 200-ZP-1.

- If DNAPL is detected in the area of the test, a decision would be made whether to further characterize the extent of DNAPL. To isolate or remediate the DNAPL, more information concerning its distribution would be needed than what will be provided by this investigation. The investigation method to be used would be chosen at that time and may or may not involve additional tracer tests.

  A decision would also be made as to how to proceed with pump and treat activities. A decision would be made to (1) continue pump and treat activities, avoiding areas where DNAPL is suspected, (2) continue limited pump and treat of the dissolved phase while further characterizing the DNAPL, or (3) stop pump and treat activities of the dissolved phase and concentrate resources to address the DNAPL.

- If the results of the investigation are inconclusive, a decision would be made to perform another DNAPL investigation, to continue the IRM as though DNAPL is not present, or to continue the IRM as though DNAPL is present. The decision will be made based on many factors including the budget and time requirements of performing another DNAPL investigation, the risks associated with continuing the IRM without conclusive evidence of the presence or absence of DNAPL, and the possibility of obtaining conclusive evidence with a second DNAPL investigation. Other pertinent factors will also be considered.

4.0 SCHEDULE

As stated above, the DNAPL Investigation will be performed in three phases. The schedule for performing the DNAPL Investigation is presented in Figure 3.

Figure 1. Conceptual Configuration of a Partitioning Interwell Tracer Test. (from BHI 1994)

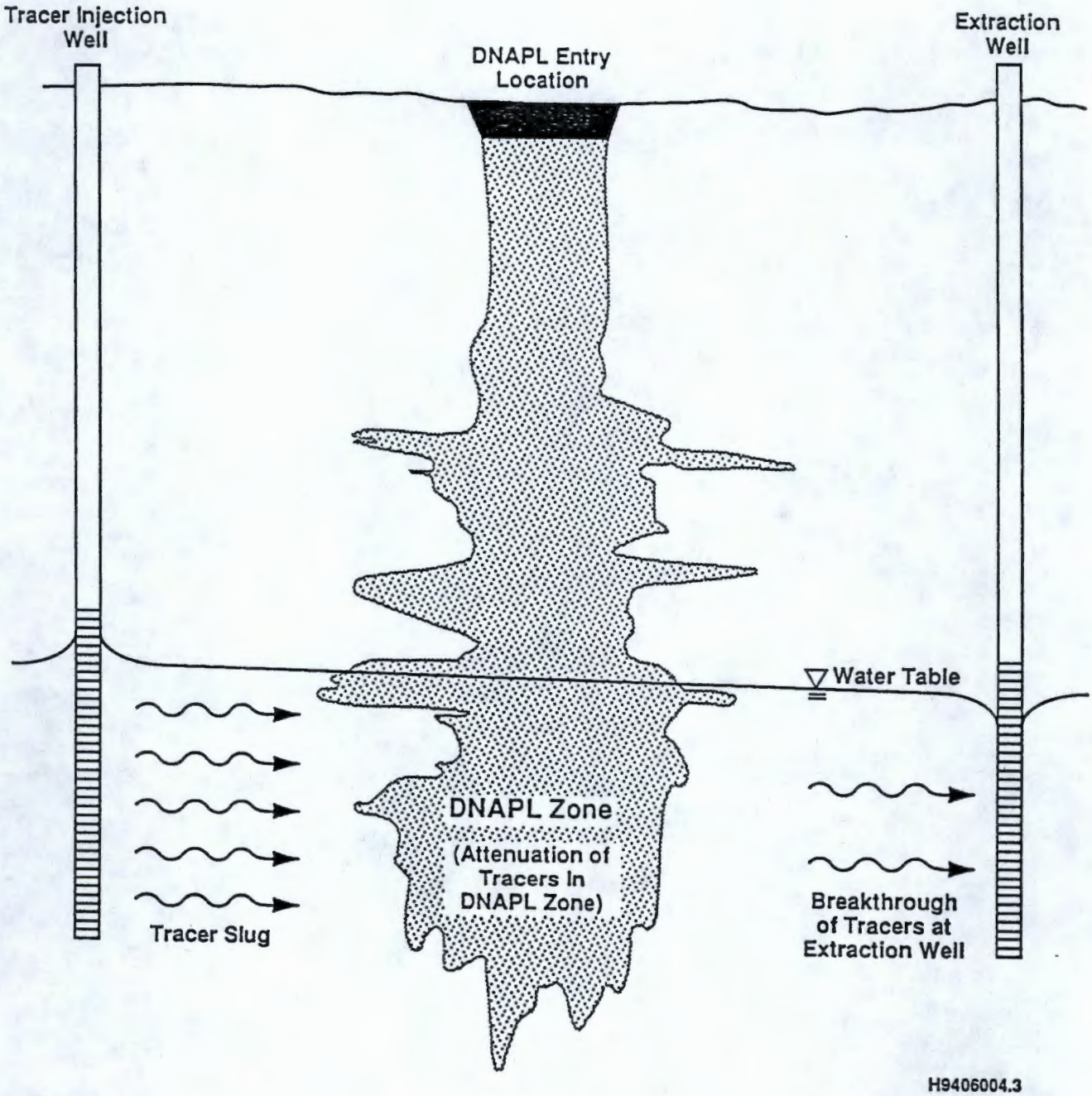


Figure 2. 200-ZP-1 IRM DNAPL Investigation Logic.

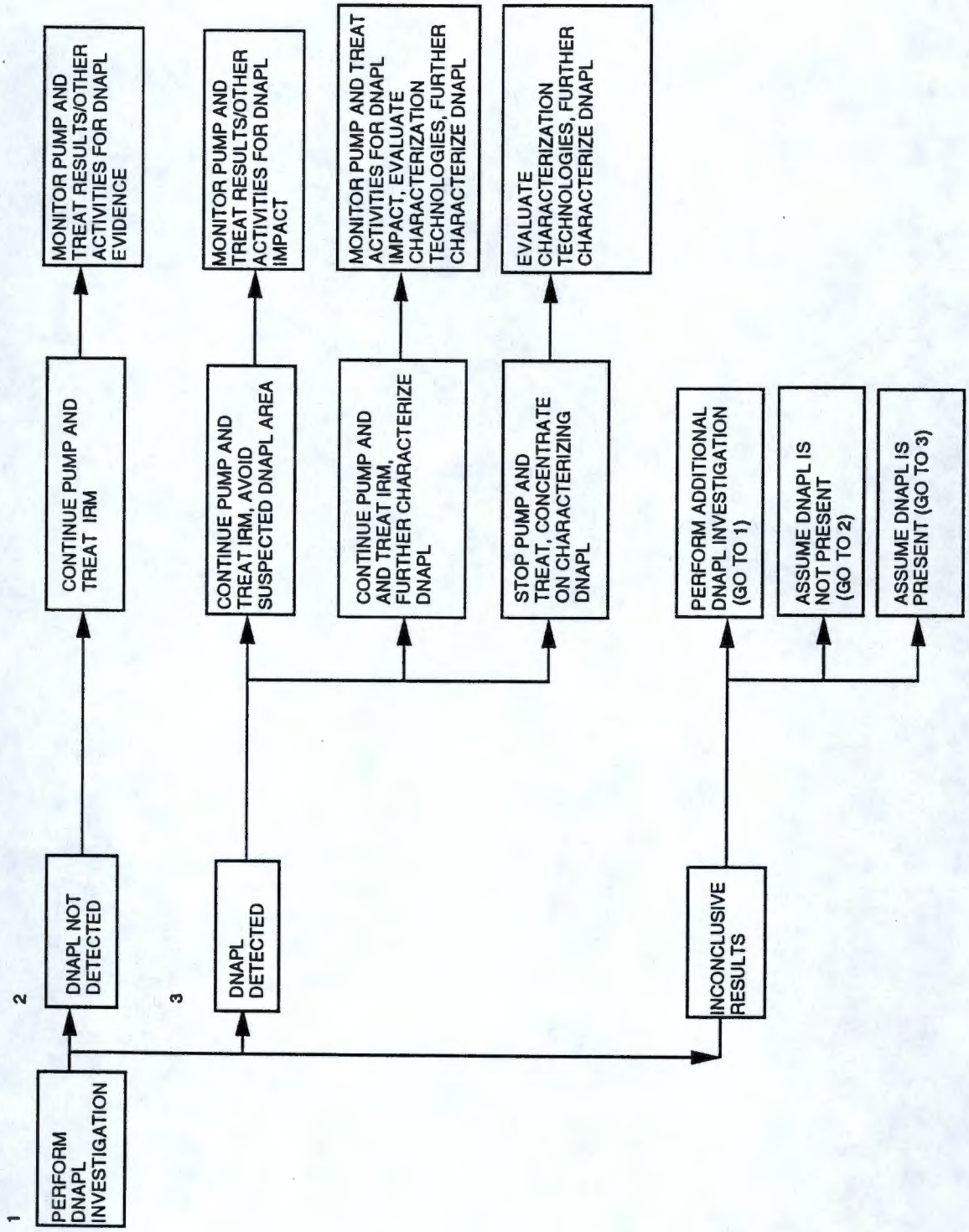
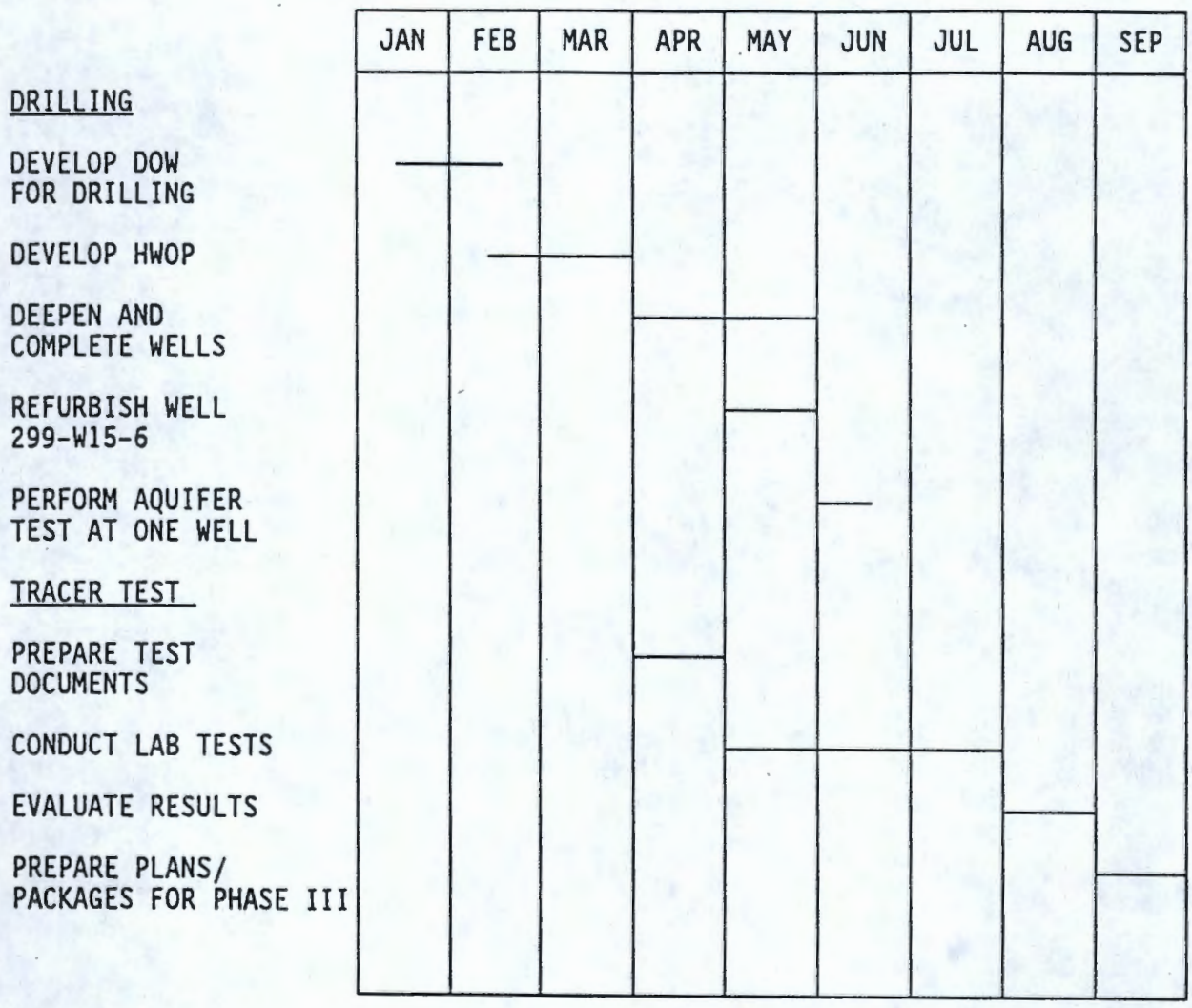


Figure 3. DNAPL Investigation Schedule for FY95.



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