

START

100-BC-1

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DON'T SAY IT. Write It!

July 15, 1991

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SUBJECT: General Sampling and Analysis Plan for Vadose Zone Drilling for 100 Area Operable Units.

Attached is detailed information for Vadose drill holes for 100-HR-1, 100-DR-1, 100-BC-1, 100-KR-1, 100-NR-1 and 100-FR-1 Operable Unit Sites. The information is being provided to assist you in estimating your drilling equipment/manpower needs to accomplish this vadose drilling program in a 18 month period beginning October 1, 1991.

If you need more information or have any questions please contact me at 6-8739 or stop by in Room 21, 450 Hill Street.

Thanks.



GENERAL SAMPLING AND ANALYSIS PLAN FOR VADOSE ZONE DRILLING AT TEN OPERABLE UNITS IN THE 100 AREAS

Introduction

The following information is based on agreements concerning work scope for specific operable units (OU) in the 100 Areas as agreed upon between the U. S. Department of Energy (DOE), U. S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology). The work scope is a result of negotiations undertaken in response to commitments and milestones spelled out in the Hanford Federal Facility Agreement and Consent Order Change Package (91-TPA-111) and the approach presented in the Hanford Site Past Practice Investigation Strategy (June 1991, Draft 5). Material provided herein is intended to focus the drilling requirements and support generating a detailed cost estimate and work schedule. Additional information will be provided as it becomes available.

Scope

This document is designed to furnish detailed information related to various drilling specifications in the form of a table. The narrative section is provided to give supplementary information on site evaluation parameters and to highlight issues that have yet to be resolved by the negotiating parties.

Operable Unit Designations

The operable units addressed in the rescoping effort, in the order of priority, are as follows:

- 100-HR-1 Source OU
- 100-DR-1 Source OU
- 100-HR-3 Ground Water OU
- 100-BC-1 Source OU
- 100-BC-5 Ground Water OU
- 100-KR-1 Source OU
- 100-KR-4 Ground Water OU
- *100-NR-1 Source and Ground Water OU
- *100-NR-3 Source OU
- *100-FR-1 Source and Ground Water OU

*The 100 N Area was originally divided into three source OUs (100-NR-1, 2, and 3) and had no ground water OU designated. Subsequently, the 100-NR-1 work plan was written to include the sources within that OU as well as the ground water associated with the N Area. During rescoping, the N Area was divided into only two OUs, 100-NR-1 which combines all N Area sources into one operable unit, and one newly defined ground water operable unit (100-NR-2). Similarly, the 100 F Area contained only two source OUs (100-FR-1, and 2) and no ground water OU. The 100-FR-1 work plan was written to cover the FR-1 source units and the F Area ground water. Under the rescoped approach a new OU was created (100-FR-3) to cover the ground water and 100-FR-1 will address only the sources within that OU.

Drilling Logistics

At this time tentative agreement has been reached on the topic of devoting

drilling equipment and resources to one operable unit (or reactor area) at a time to improve efficiencies and control costs. It is recognized, however, that some milestone commitments may cause a deviation from this approach. The regulators are awaiting an integrated schedule, due at the end of August, to reserve final judgement on this matter.

Vadose Zone Sampling

Sampling through the vadose zone will take place on 5' intervals from the surface to total depth. All samples will be screened for radioactivity and volatile organics. When field screening indicates that samples are "clean" one additional sample will be taken and drilling terminated at this point. If field screening indicates that contamination is present, the borehole will continue and extend into ground water for at least one sample of the aquifer matrix. For this reason borehole depths and sample numbers presented in the table are to be considered a maximum.

Sample Analysis

The majority of samples taken during the initial round of sampling will be analyzed for the full suite of inorganics (TAL), organics (TCL), and radionuclides at a quality level III. As drilling progresses and data are reviewed and interpreted the constituent list will be modified to include only the analytes of interest.

It has not been agreed upon whether samples will be taken for analysis of physical parameters. Our position is that, due to the drilling techniques employed, data on physical parameters would be of questionable value and that if this information is needed for engineering studies, etc., that it should be collected on an area-wide basis using the appropriate equipment.

Borehole Geophysics

No agreement has been reached regarding the necessity for or the type of downhole geophysical logging that may be employed. However, EPA has indicated that some logging should be conducted.

OPERABLE UNIT: 100-HR-1 (sheet 1 of 1)

| Site | Waste/Type | Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/Internal | Sample Analysis | Start Date |
|-------------------------|---|-----------------|--|--------------------|-----------|--------------------|--|------------|
| 107-H (116-H-7) | Retention Basin: 600x273x20 cooling water waste, decontamination waste | 3 | 1 borehole 10-ft above water table, 2 boreholes into water table | 35 ft 55 ft | Hanford | 5 ft | Beta/gamma, combustible organic compounds, ionizable organic compounds | |
| 116-H-1 (3 trenches) | Trench: 200x25x15 | 1 | 1 borehole in north trench | 35 ft | Hanford | 8/5 ft | Beta/gamma, combustible organic compounds, ionizable organic compounds | |
| 116-H-2 | Trench: 275x100x6 | 1 | 1 borehole within trench at head | 35 ft | Hanford | 8/5 ft | Radionuclides Organics | |
| 116-H-3 | French Drain: 3-ft dia. by 15-ft deep. decontamination fuel elements spacer wastes | 1 | Drill through drain | 35 ft | Hanford | 8/5 ft | Radionuclides Organics | |
| 117-H (116-H-9) | Reactor confinement seal pit drainage Crib: No contam. found in 1978 sampling | 1 | Crib is 10x10x10; no inventory available | 35 ft | Hanford | 8/5 ft | Radionuclides | |
| 100-H | Burning pit: 100x100 x10; nonradioactive combustible materials, paints, chemical solvents | 1 | | 35 ft | Hanford | 8/5 ft | | |
| TOTAL: | | 8 | | | | | | |

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| OPERABLE UNIT: 100-DR-1 (sheet 1 of 2) | | | | | | | | |
|--|---|---|--|---------------|---------------------------|------------------------|---|------------|
| Site | Waste/Type | Priority/ Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/ Interval | Sample Analysis | Start Date |
| 116-D-1A (105-D Fuel Storage Basin, Trench #1) | Trench: 130x10x6 200,000 L of contam. water and sludge from 105-D Storage Basin | Highest/1 | Middle of trench to water table | 85 ft | Manford/Ringold Unit 1 | 17/5 ft | Radionuclides Organics Inorganics | 10/01/91 |
| 116-D-1B (105-D Fuel Storage Basin, trench #2) | Trench: 100x10x15 Contaminated water and sludge from 105-D Fuel Storage Basin | Highest/1 | Middle of trench to water table | 85 ft | Manford/Ringold Unit 1 | 17/5 ft | Radionuclides Organics Inorganics | |
| 116-D-6 (Cushion corridor decon. french drain) | French drain: 3-ft dia, 3-ft deep. Water from changing room and waste decon. station | Highest/1 | Middle of drain to water table | 85 ft | Manford/Ringold Unit 1 | 17/5 ft | Radionuclides Organics Inorganics | |
| 107-D (116-D-7) | Retention basin: 467x230x20 | High/1 | Cooling water, sludge waste, rupture fuel element. Middle of basin. | 65 ft | Mostly Manford | 13/5 ft | Contaminants identified during sludge sampling | |
| 107-DR (116-DR-9) | Retention basin: 600x230x20; cooling water waste, ruptured fuel elements | High/1 | Between 107-DR and 107-D, possibly 1 boring in middle of basin to groundwater table | 65 ft | Mostly Manford | 13/5 ft | Contaminants identified during sludge sampling | |
| 116-DR-1 (107-DR Liquid waste disposal trench #1) | Trench: 300x15x20 40 million L effluent overflow from 107-D retention basin | High/1 | Drill to 10 ft above water table, screen for rad. and cr. | 65 ft | Mostly Manford | 13/5 ft | Radionuclides Organics Inorganics | |
| 116-DR-2 (107-DR Liquid waste disposal trench #2) | Trench: 150x10x20 | High/1 Contingent on 116-DR- 1 results | Drill to 10 ft above water table, screen for rad. and cr. | 65 ft | Mostly Manford | 13/5 ft | Radionuclides Organics Inorganics | |
| 116-D-2 | Pluto crib: 10x10x10 Rec'd 4,000 L effluent water from tubes following fuel cladding failures | High/1 | Drill through center of crib to water table | 85 ft | Manford/Ringold | 13/5 ft | Radionuclides Organics Inorganics | |
| 116-D-9 (117-D) | Reactor confinement seal pit drainage crib: 10x10x10 420,000 L of waste | High/1 | Drill to 10 ft above water table | 65 ft | Mostly Manford | 13/5 ft | Radionuclides Organics Inorganics | |

OPERABLE UNIT: 100-DR-1 (sheet 2 of 2)

| Site | Waste/Type | Priority/ Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/ Interval | Sample Analysis | Start Date | |
|--------------|---|---------------------------------|--|---------------|-----------------------|------------------------|---|------------|--|
| 132-D-3 | Effluent pumping station. Received water from 118-D-6 reactor. Contained decontamination chemicals | High/1 | Drill to water table | 75 ft | Hanford, some Ringold | 15/5 ft | Radionuclides Organics Inorganics | | |
| 116-D-5 | Process effluent outfall structure and pipeline to river. Effluent from 116-D-9 retention basins | Low/1 | Drill along riverbank near outfall | 65 ft | Hanford | 13/5 ft | Radionuclides Organics Inorganics | | |
| 116-DR-5 | Process effluent outfall structure and pipeline to river. Effluent from 116-D-7 and 116-DR-9 retention basins | Low/1 | Drill along river bank near outfall | 65 ft | Hanford | 13/5 ft | Radionuclides Organics Inorganics | | |
| 116-D-3 | French drain: 3-ft dia. by 5-ft deep. 30,000 L of low-level fission products | Low/1 | Drill through crib to 10-ft above water table | 65 ft | Hanford | 13/5 ft | Radionuclides Organics Inorganics | | |
| 116-D-4 | French drain: 3-ft dia. by 5-ft deep. 30,000 L of low-level fission products | Low/1 | Drill through crib to 10-ft above water table | 65 ft | Hanford | 13/5 ft | Radionuclides Organics Inorganics | | |
| Tile Field | Septic tank: Sanitary sewage | Low/1 | Drill close to inlet of field | shallow | Hanford | 5-ft | Radionuclides Organics Inorganics | | |
| 130-D-1 Tank | Gasoline Storage Tank | Low/1 | Drill by using screening methods 10-ft above water table | 65 ft | Hanford | 5-ft | | | |
| | Waste Acid Reservoir | Low/1 | Drill 10-ft below the base of reservoir | | Hanford | 5-ft | | | |
| TOTAL | | 17 | | | | | | | |

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OPERABLE UNIT: 100-BC-1 (sheet 1 of 1)

| Site | Waste/Type | Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/Internal | Sample Analysis | Start Date |
|--------------------------------|--|-----------------|---|------------|-----------|--------------------|-------------------|------------|
| 116-B-1 (107-B Trench) | Liquid waste disposal trench: 200x30x15 Effluent overflowed from 116-B-11 retention basin | 1 | Drill inside of trench | 45 ft | Hanford | 9/5-ft | Rad, TCL, TAL, SO | |
| 116-B-11 (107-B) | Retention basin: 450x230x24 Cooling water effluent from B Reactor | 1 | Drill adjacent to basin | 45 ft | Hanford | 9/5-ft | Rad, TAL, TCL | |
| 116-C-5 (107-C, 2 steel tanks) | Retention basin; cooling water effluent in each basin from C Reactor. 15x33-ft dia | 3 shallow (6) | Shallow holes for sludge sampling inside each basin | 15 ft | Hanford | 5-ft | Rad, TCL, TAL, SO | |
| | | 1 | Adjacent to tanks | 45 ft | | 9/5-ft | | |
| 116-B-3 (105-B Crib) | Pluto crib: 10x10x11 Effluent from reactor tubes | 1 | Depth limited to screening | 45 ft | Hanford | | Rad, TCL, TAL, SO | |
| 116-B-5 (108-B Crib) | Crib: 84x16x10; low-level waste from contaminated maintenance shop and contamination pad | 1 | | 45 ft | Hanford | 9/5-ft | Rad, TCL, TAL, SO | |
| TOTAL: | | 11 | | | | | | |

TAL = Target Analyte List for organic constituents.
TCL = Target Compound List for organic compounds.
SO = Sulfamate, oscalate.

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OPERABLE UNIT: 100-NR-1 (sheet 1 of 2)

| Site | Waste/Type | Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/ Internal | Sample Analysis | Start Date |
|--------------------------------|--|-----------------|--|-------------|-----------------|---------------------|---|------------|
| 120-N-2 (1324-N) | Surface impoundment: 140x75x15; corrosive regeneration wastes and filter backwash water | 1 | Drill in vadose zone | 80 ft | Hanford/Ringold | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |
| 120-N-11 (1324-NA) | Percolation Pond: 270x80x15; corrosive regeneration wastes and filter backwash water | 1 | Drill in vadose zone | 80 ft | Hanford/Ringold | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |
| South Settling Pond | Surface impoundment: 110x50x15; corrosive regeneration wastes and filter backwash water | 1 | Drill in vadose zone | 80 ft | Hanford/Ringold | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |
| 166-N Tank Farm | 200x180; 80,000 gal diesel oil from UN-100N-17; 200 gal diesel oil from UN-100-N-21 fuel oil | 1 | Drill in vadose zone | 80 ft | Hanford/Ringold | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |
| 119-N Cooling water drain line | Drain line: 2-in dia connected to 36-in reactor coolant line. Reactor cooling water | 1 | Drill in vadose zone | 80 ft | Hanford/Ringold | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |
| 124-N-3 Septic Tank system | Concrete Tank: 500-gal capacity; cesspool | 1 | Drill in vadose zone; drill in leach field | 80 ft | Hanford/Ringold | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |
| 124-N-1 (163-N septic tank) | Septic tank and seepage pit. Sanitary sewage | 1 | Drill in leach field | 80 ft | Hanford/Ringold | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |
| 124-N-8 (N septic tank) | Septic tank and drain field; sanitary sewage | 1 | Shallow vadose boring in leach field | 30 to 80 ft | Hanford | 5-ft | Comprehensive list, Rad, Inorganics, Organics, PCBs | |

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OPERABLE UNIT: 100-NR-1 (sheet 2 of 2)

| Site | Waste/Type | Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/Internal | Sample Analysis | Start Date |
|---------------------------------------|--|-----------------|---|------------|-----------------|--------------------|---------------------------|------------|
| 1322-N and 1322-NA Sample Building | Sump overflow releases at pilot plant treatment facility; low-level radioactive waste | 1 | Vadose zone boring; north of 1322-N | 80 ft | Hanford/Ringold | 5-ft | Rad. | |
| 116-N-2 (1310-N) | Radioactive chemical waste treatment of storage facility; low-level radioactive chemical waste | 2 | One hole at UN-100-N-5 and one hole for UPR inside berm | 80 ft | Hanford/Ringold | 5-ft | Rad, Inorganics, Organics | |
| 124-N-9 Septic Tank | Septic tank and drain field; sanitary sewage | 1 | Drill at proximal area of leach field | 80 ft | Hanford/Ringold | 5-ft | Rad, Inorganics, Organics | |
| 124-N-2 (182-N) septic system | Septic tank and drain field sanitary sewage | 1 | Drill at proximal area of leach field | 80 ft | Hanford/Ringold | 5-ft | Rad, Inorganics, Organics | |
| 1314-N Liquid waste load-out facility | 80x30 transfer station. Reactor decontamination solution | 1 | Drill at proximal area of leach field | 80 ft | Hanford/Ringold | 5-ft | Rad, Inorganics, Organics | |
| TOTAL | | 14 | | | | | | |

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OPERABLE UNIT: 100-KR-1 (sheet 1 of 1)

| Site | Waste/Type | Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/Internal | Sample Analysis | Start Date |
|----------------------------------|--|-----------------|--|------------|-----------|--------------------|---|------------|
| 116-K-1 | Effluent crib: High-activity from fuel element failure 46 Ci; 10,000 cpm 40 kg sodium dichromate | 1 | Center of crib | | Hanford | 5-ft | Full suite level III | |
| 116-K-2 | Effluent trench; 2,100 Ci; 1,000-12,000 cpm; misc. water treatment chemicals | 1 | At head end (west) of trench | | Hanford | 5-ft | Full suite level III | |
| 116-KW-3 Retention basins (3) | Retention basins; 3.9 Ci; soil 2,000 cpm culvert area | 3 | One vadose zone boring close to basins | | Hanford | 5-ft | Full suite level III plus contaminants of concern | |
| 116-KE-4 Retention basins (3) | Retention basins; 6.2 Ci; soil 2,000 cpm-culvert area | 3 | One vadose zone boring close to basins | | Hanford | 5-ft | Full suite level III plus contaminants of concern | |
| TOTAL | | 8 | | | | | | |

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OPERABLE UNIT: 100-FR-1 (sheet 1 of 1)

| Site | Waste/Type | Prop. Boreholes | Comments | Max. Depth | Lithology | # Samples/Internal | Sample Analysis | Start Date |
|---|--|-----------------|---|------------|-----------|--------------------|----------------------|------------|
| 116-FR-1 (Lewis Canal) | Liquid wastes from F Reactor and 190-F buildings, decont. wastes and contaminated reactor coolants | 1 | One borehole at each effluent discharge point of trench | | Hanford | 5-ft | Full suite level III | |
| 116-F-2 (107-F basin overflow trench) | Effluent overflow from 116-F-14 retention basin | 1 | Drill at head end of trench | | Hanford | 5-ft | Full suite level III | |
| 116-F-6 (1608-F liquid waste disposal trench) | Coolant water effluent from reactor maintenance outages | 1 | Drill at head end of trench | | Hanford | 5-ft | Full suite level III | |
| 116-F-9 (PNL animal waste leach trench) | Contaminated wash/waste water from animal pens, containing Sr and ²³⁹ Pu | 3 | Three holes, one in each arm, preferably near discharge point | | Hanford | 5-ft | Full suite level III | |
| 116-F-14 (107-F) Retention basin | Waste effluent from F Reactor and reactor building drains | 1 | Adjacent to retention basin in area of known contamination | | Hanford | 5-ft | Full suite level III | |
| 108-F French drain | Condensate from hoods inside the 108-F biology lab. Possibly contaminated with plutonium | 1 | Location to be determined based on research | | Hanford | 5-ft | Full suite level III | |
| TOTAL | | 8 | | | | | | |
| GRAND TOTAL | | <u>66</u> | | | | | | |

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