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Name: N. Naiknimbalkar

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7. Abstract

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CONTENTS

1.0 SCOPE OF WORK

This description of work details the field activities associated with boreholes/test pits in the 100-DR-2 Operable Unit and will serve as a field guide for those performing the work. It should be used in conjunction with the work plan for the 100-DR-2 Operable Unit for general investigation strategy and with the *Environmental Investigations and Site Characterization Manual* (WHC 1988a) for specific procedures. Borehole and test pit locations are shown on Figure 1.

Three sites in 100-DR-1 Operable Unit where a borehole or a test pit will be excavated are described as follows.

1. 116-DR-3 (105-DR Storage Basin Trench) is a 60- by 40- by 10-ft trench. The site was active during 1955, and received 4,000,000 L of contaminated sludge and water from 105-DR fuel storage basin. A 10-ft long, 3-ft wide, and up to 20 ft deep test pit will be excavated at this site. If no contamination is encountered, a second, similar size test pit will be excavated. Physical samples will also be collected from this site.

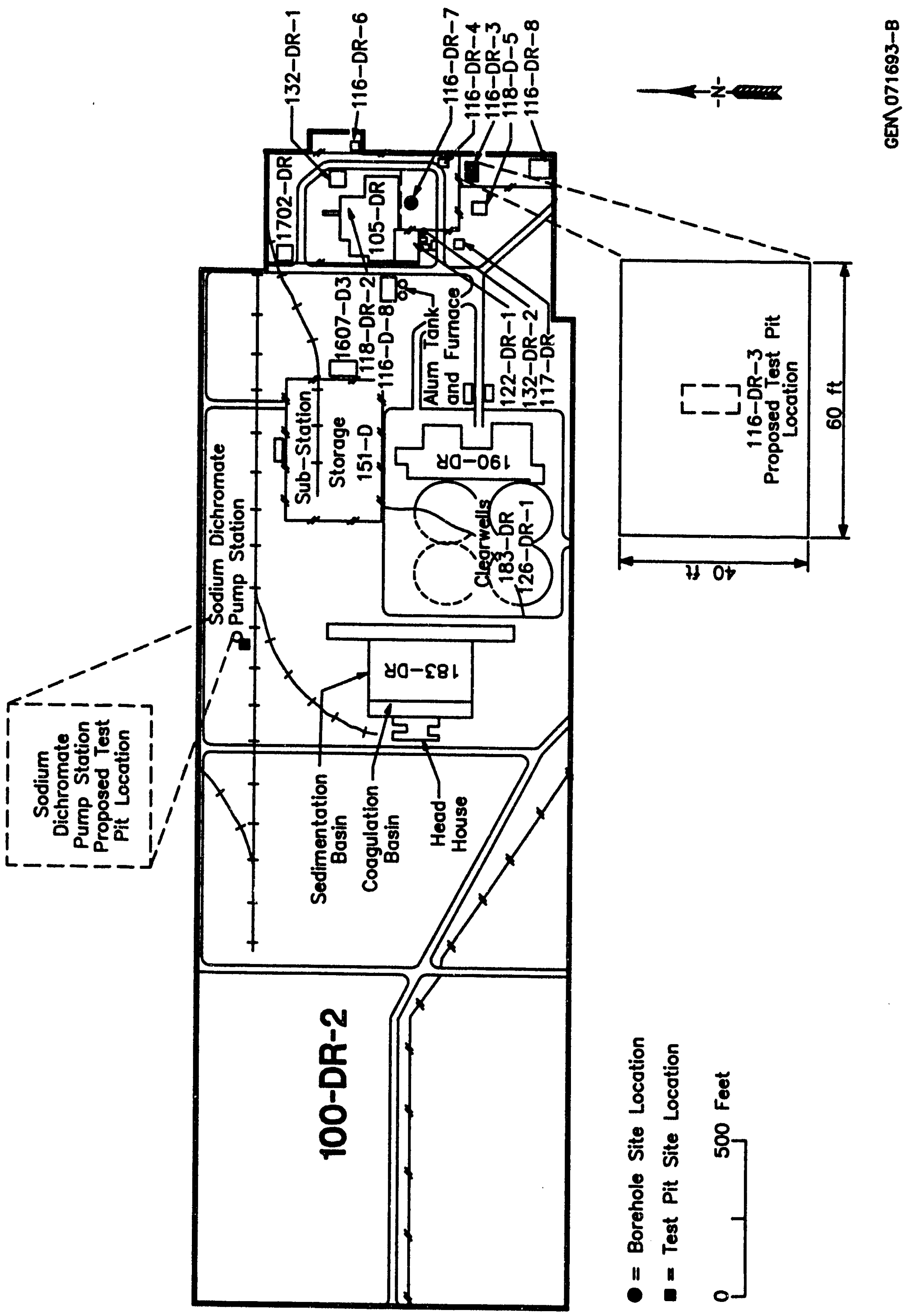
2. 116-DR-7 (105-DR Inkwell Crib) is a 5- by 5- by 10-ft potassium borate disposal crib. The site was active during 1953, and received 4,000 L of liquid potassium borate from the 3X system prior to the Ball 3X system upgrade. A borehole will be drilled through the crib.

3. Sodium Dichromate Tanker Car Offloading Facility is located adjacent to french drain north of the railroad tracks on the northern boundary of the operable unit. A 10-ft long, 3-ft wide, and up to 20-ft deep test pit will be excavated at this site. Two "large anomaly" depressions, at 30 and 80 ft east of the french drain, will be excavated with a backhoe to 3- to 5-ft depth and samples will be screened with hexavalent chromium test kit.

The 100-DR-2 work plan is in preparation. Since 100-DR-2 Operable Unit is adjacent to 100-DR-1 Operable Unit and the 100-DR-1 work plan (DOE-RL 1991) has been approved, several subsections of the approved work plan have been cited as guidance. The soil screening, geologic sampling, soil sampling, analytical sampling, and geophysical logging will be conducted in accordance with the 100-DR-1 work plan.

Environmental Investigation Instruction (EII) 5.2, Soil and Sediment Sampling, Appendix B, Section 4.1, steps 6, 7, and 8 (WHC 1988a) will be changed through an instruction change authorization (as was done for 100-NR-1 and 100-FR-1 operable units descriptions of work) to align the EII with actual field work process at 100-DR-2 Operable Unit.

Figure 1. Location of Borehole/Test Pits in the 100-DR-2 Area.



2.0 GENERAL REQUIREMENTS

All personnel working to this description of work will have completed the 40-h hazardous waste site worker training program and will perform all work in accordance with the following:

- WHC-EP-0383, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan* (WHC 1990)
- WHC-CM-1-6, *Radiological Control Manual* (WHC 1993a)
- WHC-IP-0692, *Health Physics Procedures Manual* (WHC 1991)
- WHC-CM-4-11, *ALARA Program* (WHC 1988b)
- WHC-CM-4-3, *Industrial Safety Manual*, Vol. 1 through 3 (WHC 1987)
- WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988c)
- WHC-CM-7-7, *Environmental Investigations and Site Characterization Manual* (WHC 1988a)
- WHC-SD-EN-SAD-002, *100 Area Low Hazard Characterization Activities Safety Assessment*, Rev. 0 (Taylor 1991)
- Site-specific health and safety plan/job safety analysis.

3.0 SAMPLING AND FIELD ACTIVITIES

3.1 SOIL SCREENING

All samples and cuttings will be field screened for evidence of radionuclides, organics, and chromium (VI) at 5-ft intervals (DOE-RL 1991, Section 5.1.1.5.2). Radionuclides will be screened per EII 3.4, Field Screening (WHC 1988a). Chromium will be screened using a portable hexavalent chromium test kit. The field geologist will record screening results in the borehole log per EII 9.1, Geologic Logging (WHC 1988a).

The action level from radionuclides screening is twice background, which is equal to 150 counts per minute. Prior to initiating drilling, determine a one-time instrument background reading using the above instruments at the background site described in the 100-DR-1 work plan (DOE-RL 1991, Section 5.1.1.2.3). This site (WHC 1993b) was chosen because previous surface radiation surveys have not indicated radiological contamination at the site. Instrument background will be measured on freshly disturbed surface soil, holding the instruments <1 in. from the soil. The field geologist will record the background levels in the borehole log per EII 9.1, Geologic Logging (WHC 1988a) prior to the start of drilling.

3.2 GEOLOGIC SAMPLING

For a borehole, geologic samples will be taken at 5-ft intervals and at major stratigraphic changes for the preparation of borehole logs, per Section 5.1.5.2 of the 100-DR-1 work plan (DOE-RL 1991) and EII 9.1, Geologic Logging (WHC 1988a). The field geologist shall archive the nonradioactive geologic samples per EII 5.7A, Hanford Geotechnical Sample Library Control (WHC 1988a).

For test pit sampling, the following process will be used. The bucket of the backhoe will be decontaminated before commencing sampling activities. Samples shall be taken from the center of the bucket before the excavated material is placed on the ground. All sample material will be collected in the order shown in Section 4.0. A minimum of one sample or a maximum of two samples will be collected per the following guidance. The criterion for sample selection is as follows:

- Collect one sample the first time the material does not pass the radiation, organic, or chromium (VI) screening criteria.

All test pit material will be field screened for radionuclides per Section 3.1. Sample material will be collected per EII 5.2, Soil and Sediment Sampling, Appendix I (WHC 1988a). A field logbook (WHC-N-429-2) will be used to document activities associated with the sample collection. The logbook will be used and maintained per EII 1.5, Field Logbooks (WHC 1988a).

All samples collected will be packaged and sent to an offsite laboratory for analysis. The packaging of the samples is done per EII 5.11, Sample Packaging and Shipping (WHC 1988a). A chain of custody is initiated and maintained after the sample is collected. The chain of custody is done per EII 5.1, Chain of Custody (WHC 1988a).

Any excavated test pit soil will be replaced in the test pit site after sampling is completed in the reverse order of the excavation and packed.

3.3 SOIL SAMPLING (PHYSICAL PROPERTY)

Up to five samples for physical property analysis (Section 5.1.1.5.2 of DOE-RL 1991) will be collected from test pit at 116-DR-3 (105-DR Storage Basin Trench). No radioactive samples will be collected, and samples will be taken from below the fill in undisturbed material. To collect the samples, it may be necessary to continue past the screening cutoff point discussed below.

At intervals where both physical property and analytical sampling are called for, analytical sampling takes priority.

In lieu of a carbide-tipped core barrel per Section 5.1.5.2 of the 100-DR-1 work plan (DOE-RL 1991), a split-spoon sampler will be used.

The field geologist must use professional judgement to select samples that are representative of the principle soil types that can be sampled with the split-spoon sampler. Two 6-in. sleeves will provide adequate sample volume. The field geologist will record the selected samples in the borehole log per EII 9.1, Geologic Logging (WHC 1988a).

These samples will be analyzed for the following parameters using American Society for Testing and Materials (ASTM) methods. Bulk density and K_{unsat} will be calculated.

- bulk density
- particle size distribution (ASTM D422-63)
- moisture content (ASTM D2325-68, D3152-72)
- saturated hydraulic conductivity (K_{sat}) (ASTM D2434-68)
- unsaturated hydraulic conductivity (K_{unsat}) at 10% moisture content after full saturation.

3.4 ANALYTICAL SAMPLING AND DEPTHS

Borehole analytical sampling will be conducted using a 5-in. outside diameter split-spoon sampler per Section 5.1.1.5.2 of the 100-DR-1 work plan (DOE-RL 1991) and EII 5.2, Soil and Sediment Sampling (WHC 1988a). Soil cuttings will be continuously screened according to the above criteria from the surface to the final depth. Analytical sampling will be based on the following:

1. If cuttings fail the screening criteria, begin sampling at that point and continue sampling at 5-ft intervals. Send samples out for analysis. Stop sampling (and analysis) 5 ft below the groundwater table or when two consecutive samples, from below the expected waste depth, pass screening criteria.

2. If cuttings pass the screening criteria, continue sampling at 5-ft intervals and temporarily store samples (EII 5.7A) until the expected waste depth is reached or cuttings fail the screening criteria. If the expected waste depth is reached, take a sample at this depth and an additional two consecutive samples at 5-ft intervals and send for analysis. If the cuttings fail, proceed as in item 1, above.

Expected waste depths are shown in Table 1.

Table 1. Expected Waste Depths (below ground surface).

Site	Expected Waste Depth (ft)	Estimated Borehole/Test Pit Depth (ft)[a]	Estimated Depth to Groundwater (ft)
DR-3 (105-DR Storage Basin Trench)	0 to 10	20	77
116-DR-7 (105-DR Inkwell Crib)	0 to 10	20	77
Sodium Dichromate Tanker Car Offloading Facility	0 to 10	20	77

[a]Actual depth to be determined in the field.

3.5 GEOPHYSICAL LOGGING

Log boreholes using spectral gamma per Section 5.1.5.5 of the 100-DR-1 work plan (DOE-RL 1991) and EII 11.1, Geophysical Logging (WHC 1988a). If the equipment is not available, use gross gamma.

4.0 ANALYSES

Samples collected for chemical analysis will be analyzed for the target compound list (TCL) and target analyte list (TAL) constituents, for specific anions that may be present, using EPA (1986) Level IV methods (SW-846 methods will be used to analyze test pit samples and CLP methods will be used to analyze vadose borehole samples for all analytes except radionuclides, which will be analyzed by standard methods as defined in the laboratory statement of work. Estimated quantity of material needed for analyses are shown in Tables 2 and 3.

Table 2. Borehole Sampling Contaminants of Concern.

Analyte	Method	Holding Time	Container/Volume
Generic			
ICP/AA metals	200.7 CLP-M[a]	6 mo	Glass, 500 mL
Mercury	245.1 CLP-M, 245.5 CLP-M	28 d	
Anions/IC:			
fluorides	EPA 300[b]	28 d	Glass/plastic, 250 mL
sulfates	EPA 300[b]		
nitrates, nitrites	EPA 353.2		
TMA			
Gross alpha	EA-10	6 mo	Glass/plastic, 1,000 mL
Gross beta	EA-10		
Gamma spec	RC-30		
Strontium-90	RC-306, RC-303, RC-309, RC-304		
Weston			
Gross alpha	PRO-032-15	6 mo	Glass/plastic, 1,000 Ml
Gross beta	PRO-032-15		
Gamma spec	PRO-042-5		
Strontium-90	PRO-032-38, PRO-032-25		
222-S Laboratory			
Total activity	Prep: LA-548-111 Procedure: LA-508-121	24 h	Plastic or glass small vial (at least 1 g)

AA = atomic absorption
IC = ion chromatography
ICP = inductively coupled plasma.

NOTE: There are no chemical preservation requirements.

[a]Modified for the Contract Laboratory Program.
[b]Modified (Lindahl 1984).

Table 3. Test Pit Sampling Contaminants of Concern.

Analyte	Method	Holding Time	Container/Volume
ICP/AA Metals Mercury	SW-846 SW-846	6 mo 28 d	Glass, 250 mL
Anions: Sulfate Fluoride Nitrate/nitrite	 EPA 300[a] EPA 300[a] EPA 353.2	 28 d 28 d 28 d	 Glass or plastic, 250 mL
Radionuclides: ^{90}Sr Gross alpha Gross beta Gamma spec	Lab SOP	6 mo	Glass or plastic, 1,000 mL
Total activity (222-S Lab)	Lab SOP	6 mo	Glass or plastic small vial (at least 1 g)

[a]EPA 300/modified per work plan quality assurance project plan.
AA = atomic absorption
ICP = inductively coupled plasma
SOP = standard operating procedure.

Sample containers normally should be filled in the following order:

1. TAL
2. radioisotopes
3. total activity.

If, in the judgement of the sampling scientist, there will be insufficient sample material for all five items, then samples should be filled in the following order:

1. radioisotopes
2. semivolatiles/PCB/pesticides/anions
3. TAL
4. total activity.

If full sample volume requirements cannot be met, the sampling scientist will record the volume obtained and the reason why the full sample volume requirement was not collected, if known, in the sampling scientists logbook per EII 1.5, Field Logbooks (WHC 1988a).

5.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Internal quality control (QC) samples shall be collected by the sampling scientist as specified in Appendix A of the Quality Assurance Project Plan (DOE-RL 1991) and documented in the sampling logbook per EII 1.5, Field Logbooks (WHC 1988a).

1. Collect one duplicate for every 20 soil samples.
2. Collect split samples at the same frequency as duplicates.
3. Collect field blanks at the same frequency as duplicates. Analyze only for volatiles.
4. Collect one sample each month from any source of water introduced into the hole during drilling. Only one sample is required for both groundwater and vadose borings. Analyze for the full suite of water paramcters.
5. Collect equipment blanks at the same frequency as duplicates.
6. Collect one volatile organics analysis (VOA) trip blank for each batch of containers shipped to the sampling (site) facility.

At present the use of hexavalent chromium (water leach method) is considered experimental. Quality control measures should include laboratory confirmation of all results >1 ppm. The remaining filtrate should be saved for laboratory determination of chromate content by spectrophotometric methods.

At least one duplicate extraction and chromate determination should be made per 20 samples or a minimum of one per day.

The test should be conducted on a background soil from the vicinity that is known to be uncontaminated with chromate.

Field spikes can be prepared by weighing out the soil and adding 50 ppm chromate standard provided with the hexavalent chromium kit. One milli-liter of the 50 ppm chromate standard corresponds to 2.5 ppm in 20 g soil.

Report results of the test as "ppm water soluble chromate." The data sheet should include sample number, a brief soil description, soil weight and water volumes used in the extraction, and the aliquot size used for chromate determination.

6.0 SCHEDULE

The field work at these three sites will start in August 1993 and will be completed by September 30, 1993. An Agreement Activity Notification form will be issued at least 5 days prior to the start of field work.

7.0 CHANGES TO DESCRIPTION OF WORK

Unforeseeable major changes to this description of work, such as analyzing different parameters, using different analytical methods, or changing the sampling interval will be submitted on an Engineering Change Notice form. (Foreseeable changes will be submitted to the lead regulatory agency for approval or review prior to deviating from the description of work.) Copies will be submitted to the lead regulatory agency and appropriate field personnel within 10 working days of the change.

8.0 REFERENCES

DOE/RL 1991, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-DR-1 Operable Unit, Hanford Site, Richland, Washington*, DOE/RL-89-09, Draft C, U.S. Department of Energy, Richland Field Office, Richland, Washington.

Lindahl, P. C., 1984, *Determination of Inorganic Ions in Aqueous and Solid Samples of Ion Chromatography*, EPA/600/4-84, Argonne National Laboratory, Argonne, Illinois.

Taylor, W. E., 1991, *100 Area Low Hazard Characterization Activities Safety Assessment*, WHC-SD-EN-SAD-002, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988a, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988b, *ALARA Program*, WHC-CM-4-11, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988c, *Environmental Compliance Manual*, WHC-CM-7-5, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan*, WHC-EP-0383, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991, *Health Physics Procedures Manual*, WHC-IP-0692, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993a, *Radiological Control Manual*, WHC-CM-1-6, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993b, *100-NR-1 Surface Radiation Survey*, WHC-SD-EN-TI-085, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

ATTACHMENT 1

100-DR-2 DESCRIPTION OF WORK PROJECT CHANGE FORM

Date: ____________________

Person Initiating Change: ________________________________

Change: ____

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Reason for Change: ____

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APPROVAL:

Field Team Leader: ____________________________________

Operable Unit Coordinator: ______________________________

Quality Assurance: ____________________________________

END

DATE
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