To: CHG Characterization Engineering
From: Characterization Engineering

Project/Program/Department:
Characterization Project

Design Authority/Design Agent/Cog. RN Dale/C. G. Linschooten/ TR Farris

Supporting document submitted for review and approval prior to release. This document encompasses the ETP, Functional Design Requirements and ABU.

Receiver Remarks:
ETN-99-0009

Design Baseline Document? [X] Yes [ ] No

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Approval Designator (F)
Reason for Transmittal (G)
Disposition (H) & (I)

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Design Authority RN Dale
Design Agent CG Linschooten
Cog. Eng. TR Farris
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QA Manager McElroy
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Env.

18. L. L. Linschooten 4-17-00

Signature of EDT Date

Authorization Representative Date for Receiving Organization

19. RM Boger

Design Authority/Design Cog. Manager

20. JS Schofield

Authorization Representative Date for Receiving Organization

21. DOE APPROVAL (if required)

Ct. No.
[X] Approved
[X] Approved w/comments
[X] Disapproved w/comments

BD-7400-172-2 (05/96) GEF097
ENGINEERING TASK PLAN FOR WATER SUPPLY FOR RMCS SPRAY WASH TRAILER

R.M. Boger
Prepared by CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-76RLO1830

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Abstract: This ETP defines the task and deliverables associated with the design, fabrication and testing of an improved spray wash system for the Rotary Mode Core Sampling (RMCS) Spray Wash Trailer.

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Approved For Public Release
ENGINEERING TASK PLAN FOR WATER SUPPLY
FOR RMCS SPRAY WASH TRAILER

Characterization Engineering
River Protection Project
CH2M HILL Hanford Group, Inc.
Richland, Washington

Prepared by
C. G. Linschooten
Numatec Hanford Corporation
Richland, Washington

April 2000
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1.0 INTRODUCTION

When the drillstring and sampling equipment is removed from waste storage tanks by the core drilling truck, the components are washed. Washing is performed with one of five spray washers depending upon the component being removed:

1. The Cable Spray Washer item number H-2-690134-11 (LMHC 1996) cleans the sampler hoist cable as it is withdrawn from the drillstring carrying the Remote Latch Unit (RLU) and sampler. It also cleans the grapple hoist cable as it is withdrawn from the drillstring carrying the pintle rod and grapple. The Cable Spray Washer washing fluid is supplied at a maximum pressure of 500 psig (35 bars).

2. The Riser Sleeve drill string spray washer, item number H-2-690134-14 (LMHC 1996), has an array of washer nozzles at the bottom to wash the drill string as it is pulled out of the tank after sampling is complete. The washing fluid for the riser sleeve washer has a maximum pressure of 1200 psig (83 bars).

3. The Drill Rod Washer Manifold, item number H-2-690134-17 (LMHC 1996), washes the drill rod a second time as it is pulled out of the tank. (The drill rod may be washed twice since it was in direct contact with the waste and will be the most contaminated.) The washing fluid for the drill rod washer has a maximum pressure of 500 psig (35 bars).

4. The Riser Sleeve Spray Washer, item number H-2-690134-15 (LMHC 1996), cleans the riser sleeve as it is taken out of the riser after sampling is complete. The washing fluid for the riser sleeve spray washer has a maximum pressure of 500 psig (35 bars).

5. The Shielded Receiver Tube Spray Washer, item number H-2-690020-91 (LMHC 1994c), cleans the shielded receiver tube after the sampling operation is complete. The washing fluid for the shielded receiver tube spray washer has a maximum pressure of 500 psig (35 bars).

2.0 SCOPE

This Engineering Task Plan addresses all activities associated with procurement and testing of a trailer-mounted spray wash system for core sampling operations.
3.0 DESCRIPTION

3.1 PHYSICAL DESCRIPTION

3.1.1 SPRAY WASH SYSTEM
The spray wash system shall be a self contained, compact design and shall be trailer-mounted. The system shall include: the tank, electric motor driven pump, electrical switch gear, plumbing, and controls. The pump discharge shall be split into two spray wash supply lines--one high pressure supply line and one low pressure supply line. The high pressure supply line and low pressure supply line will each have its own hose reel. The pump shall be mounted in such a way that it will be easy to install and remove mechanical and electrical components. The trailer shall have a pintle trailer hitch with safety chains to be able to be towed by existing equipment.

3.2 DESIGN REQUIREMENTS

The overall safety classification of the spray wash system is General Service (GS).

3.2.1 INTERFACES

3.2.1.1 Spray Washer Power Supply. The electrical power shall be compatible with the existing available electrical power: 240 VAC, 60 Amp, single phase. The electrical connector shall be an RST-240/120-B HUBBELL 460B12W(male flanged inlet), 125/250 VAC, 60 Amp, 3P, 4W. The spray wash system is supplied with electrical power from an electrical distribution trailer (see drawings H-2-85340 [LMHC 1994] and H-2-85341 [LMHC 1994a]).

3.2.1.2 The tank fill opening shall be accessible without the use of ladders or stairs.

3.2.1.3 The end of the 400-psig (28 bars) spray wash supply hose will have a 3/8 Hansen Socket Quick Connect series 3-HK Socket, part number LL3-H21.

3.2.1.4 The end of the 1200-psig (83 bars) spray wash supply hose will have a 3/8 Hansen Plug Quick Connect series 3-HK Plug, part number LL3-K21.

3.2.1.5 The trailer hitch will be 2 ¾ inches (7 cm) minimum pintle hitch with safety chains.

3.2.2 PERFORMANCE CHARACTERISTICS

3.2.2.1 The trailer-mounted supply tank shall have a minimum capacity of 200 gallons (760 liters) and a maximum capacity of 300 gallons (1135 liters). The tank shall be
made of a material compatible with the washing fluid, which is 0.3 molar Lithium Bromide (LiBr) solution in water.

3.2.2.2 The pump discharge shall be divided into two spray wash supply lines.

3.2.2.3 A high pressure supply line shall supply 4 gpm (15 liters/min) spray wash fluid adjustable from 0 psig (0 bar) to 1200 psig (83 bars).

3.2.2.4 A low pressure supply line shall supply 4 gpm (15 liters) spray wash fluid adjustable from 0 psig (0 bar) to 400 psig (28 bars).

3.2.2.5 Each spray wash line shall have a hose reel with 50 feet (15.2 m) of hose.

3.2.2.6 All wettable system components shall be made of a material compatible with 0.3 molar LiBr. solution in water at 130°F (55°C).

3.2.2.7 The entire spray wash system shall be protected from freezing.

3.2.2.8 The tank shall be designed to be freeze and thaw resistant.

3.2.2.9 The system shall be capable of measuring the total volume of fluid used for washing.

3.2.2.10 The system shall be capable of supplying 130°F +/- 10°F (55°C +/- 5°C) spray wash fluid at a minimum ambient temperature of 20°F (-7°C), at 8 GPM (30 liters/min) continuously for 5 minutes and a minimum of 150 gallons per hour (570 liters/hour).

3.2.2.11 The system shall have a temperature indication of +/- 5°F (+/-3°C) for the spray wash fluid.

3.2.2.12 The system shall have maximum start up time of 4 hours.

3.2.2.13 When the trailer is not connected to a pulling vehicle, the trailer shall be stable when one 250 lbs (115 kg) person is walking anywhere on the trailer.

3.2.2.14 The applicable design standard for electrical equipment shall be NFPA 70, the National Electric Code.

3.2.3 PHYSICAL CHARACTERISTICS

3.2.3.1 All handles, switches, and connections that must be operated or mated in the field must be operable by a person wearing two pairs of size 10 leather gloves.

3.2.3.2 The trailer shall have a single axle.

3.2.3.3 The reels shall be self-retracting fixed reels with a hose guide.

3.2.3.4 The tank shall be capable of being filled with 4-gallon (15 liter) bottles or a hose.

3.2.3.5 The system shall be able to be easily drained completely.

3.2.3.6 All gauges shall be oriented for ease of reading.

3.2.4 RELIABILITY

3.2.4.1 The spray wash system shall be capable of being operated for at least 2000 hours before requiring replacement. The system shall be capable of being started at least 5000 times.
3.2.5 MAINTAINABILITY

3.2.5.1 All parts shall be readily accessible for field maintenance.

3.2.6 ENVIRONMENT

3.2.6.1 Operational environment:

3.2.6.2 The spray wash system shall operate reliably when exposed to summer heat (110°F) (44°C), intense direct sunlight, freezing rain, rain, snow, winter cold (20°F) (-7°C) and high winds of 30 mph (48 km/hour) and gusts up to 45 mph (73 km/hour) with blowing dust.

3.2.6.3 Storage environment:

The components of the system shall be able to withstand storage temperature extremes from -20°F (-29°C) to 140°F (60°C).

The system shall withstand severe weather including freezing rain, rain, snow, intense direct sunlight, winds to 70 mph (113 km/hour), and blowing sand and dust.

3.2.7 TRANSPORTABILITY

3.2.7.1 The trailer shall be a compact design for optimum maneuverability.

3.2.7.2 The trailer shall meet all the applicable DOT requirements.

3.3 ENGINEERING TASKS

The engineering tasks contained in this task plan are the minimum necessary activities to provide a water supply system for the core sampling spray washers that is safe to deploy in the RPP tank farm facilities. The overall task is to procure and test a system that will meet the functions and requirements identified in this ETP. Characterization Engineering (CE) will complete the engineering tasks.

3.3.1 DESIGN

ECNs must be generated to accommodate necessary changes for the new system. The only anticipated ECNs relate to the Riser Sleeve hose quick connect.

3.3.2 PROCEDURES

Operation and maintenance procedures will be prepared and/or revised as required to support the operation and the maintenance of the new spray wash fluid supply system.

3.3.3 SPARES

A list of recommended spare parts will be provided for the spray wash fluid supply system.
3.4 DESIGN VERIFICATION

Independent design verification will be performed in accordance with HNF-IP-0842, Volume IV, Section 4.24 "Design Verification" (LMHC 1998a). Design reviews will be conducted per LMH-PRO-1819 (LMHC 1998). The safety classification of the RMCS Support Trucks is General Service (GS).

3.5 PROCUREMENT/FABRICATION TASKS

Procurement activities will be performed by CE.

3.6 INSTALLATION TASKS

The only installation task currently identified are the Hansen quick connect on the riser sleeve, assembly item number H-2-690134-14 (LMHC 1996), and the strainer assembly, item number H-2-690127-38 (LMHC 1994b).

3.7 PRE-OPERATIONAL AND OPERATIONAL TESTS

Testing will be documented and conducted per HNF-IP-0842, Volume IV, Section 4.28 "Testing Practices Requirements" (LMHC 1998a). An appropriate test/inspection report will be issued to document the results of acceptance and operational testing performed.

3.8 ACCEPTANCE FOR BENEFICIAL USE

An Acceptance for Beneficial Use (ABU) will be developed per HNF-IP-0842, Volume IV, Section 3.12, "Acceptance of Structures, Systems and Components for Beneficial Use" (LMHC 1998a), and Characterization Engineering Desk Instruction, DI-CP-004-02, "Acceptance for Beneficial Use (ABU)" (Boger 1999). The ABU is included as an Appendix to this ETP.

3.9 RISK ASSESSMENT

No potential risk can be identified to complete this task. Characterization Engineering and CPO are in concurrence to complete this task and the funding is available.

4.0 ORGANIZATION

4.1 CHARACTERIZATION FIELD ENGINEERING (CFE)

CFE will provide Cognizant Engineer support as required for this task. CFE will prepare or revise all operating and maintenance procedures, as required, to support the deployment of the new system.

Cognizant Manager: J. S. Schofield
Cognizant Engineer: R. N. Dale

4.2 CHARACTERIZATION ENGINEERING

CE will provide Design Authority support for this task. CE personnel will prepare all documentation associated with the development of the design requirements, procurement
specifications, and fabrication and testing of the new system. CE personnel and the
cognizant engineer will witness all testing, and the Design Authority will approve the
results of all testing.

Design Authority: G. P. Janicek
Project Manager: J. D. Criddle Jr.
Responsible Engineer: C. G. Linschooten

4.3 CHARACTERIZATION PROJECT OPERATIONS
Characterization Project Operations (CPO) will provide review of specifications and
procedures associated with this task. The logistics of performing on-site testing will be
the responsibility of CPO with the support of CE/CFE.

Operations Manager: M. R. Kembel
Core Sampling Manager: J. S. Lee

4.4 QUALITY ASSURANCE AND SAFETY
CH2M HILL Hanford Group, Inc. (CHG) will provide Quality Assurance (QA) and
Safety support.

QA Engineer: M. L. McElroy
Safety Engineer: C. D. Jackson

4.5 RADIATION ENGINEERING
Not applicable.

4.6 FLAMMABLE GAS EQUIPMENT ADVISORY BOARD
Not applicable.

5.0 SCHEDULE AND COST ESTIMATE
The CE Project Manager will maintain a detailed schedule for all tasks. A rough schedule is
included in Appendix A. The scheduled completion of this task will be affected by the priorities
assigned by CE and CPO based upon project commitments.

Estimated Cost:

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Engineering expenses will be charged to Cost Account Charge Number (CACN)102250/Code of
Accounts (COA) B000. Quality Assurance, Safety, and RADCON will also be charged to
CACN 102250 for this task. CPO and maintenance expenses are funded separately.
6.0 CONFIGURATION MANAGEMENT

A vendor information file will be established per LMH-PRO-1819 (LMHC 1998) to contain catalog cuts, performance specifications, and/or installation/operation instructions for components or systems supplied by the manufacturer. All modifications made to standard manufacturer products will be documented on H-2 series drawings.

7.0 QUALITY ASSURANCE

All work associated with this task will be in compliance with HNF-IP-0842, Volume XI, Quality Assurance Program, Section 1.1. (LMHC 19989a). QA oversight will be provided as defined in this ETP. QA will participate in the review of design, specification, and testing documents, witness testing as specified in the test procedures, and approve test results.

8.0 SAFETY AND AUTHORIZATION BASIS

All work associated with this task will be in compliance with HNF-IP-0842, Volume IX, Section 1.1, “RPP Safety Program Plan” (LMHC 1998). Safety will participate in the review of design, specification, and testing documents.

The AB for the system will be HNF-SD-WM-SAR-067, “TWRS Final Safety Analysis Report” (HNF 1999), HNF-SD-WM-TSR-006 (HNF 1999a), and WHC-SD-WM-SAD-035 (LMHC 1997). The applicable industry safety standards will be considered for all safety concerns associated with this task. The Unreviewed Safety Question (USQ) process will be used as required per HNF-IP-0842, Volume IV, Section 5.4, “Unreviewed Safety Questions” (LMHC-1998a).

9.0 SYSTEMS ENGINEERING

This activity is necessary to support the characterization of the waste in the underground waste storage tanks on the Hanford Site. This activity supports the Tank Farms task identified in the Work Breakdown Structure (WBS) as task number 1.1.1.1.1.1.9, Core Sampling Systems.

10.0 CLOSEOUT COSTS

If the task is no longer required, an estimate will be prepared before the task is closed. The amounts of all outstanding purchase agreements will be included as closeout costs.
11.0 REFERENCES


Appendix A. Schedule
Appendix B. Cold Weather Operating Parameters and Design Considerations.

Considered is an 80-gallon tank made of 1/8-inch-thick stainless steel plate with no insulation. The hose is to be ½-inch I.D, 50 feet long, not considering the rubber on the hose.

Preliminary calculations indicate that, when electrical power is disconnected from the spray wash fluid supply system, the water is at 130°F in the tank, and the outside temperature is 0°F, it takes approximately two days for the water to cool to 32°F and another four days to freeze solid in the tank. Hoses filled with 130°F water will most likely freeze solid in 8 to 12 hours. Therefore, all the hoses and the pump should be blown out after every shift, and the tank should be emptied when the tank is exposed to freezing conditions for longer than 3 days.

The tank and pump can be insulated with PVC foam panels to slow this process. The heater in the tank can be wired to accept 110 VAC. Powered by 110 VAC the heater puts out approximately 1900 watts and will keep the tank warm as long as the electric power is on and there is insulation. Alternately the tank and the pump can be heat traced to prevent freezing, which also requires electric power.

If the tank freezes solid, it is probable that the heater will be damaged. If the pump freezes, it will probably be ruined. If the hoses freeze, the integrity of the hoses might be lost.
Appendix C. Acceptance for Beneficial Use
### DOCUMENTATION REQUIRED from Project WATER SUPPLY FOR MCS SPRAY WASH TRAILER

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