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7. Abstract The engineering work plan describes the tasks to be performed to seal the leak in the catch tank. Documentation of these tasks is provided along with the corresponding responsibilities, a cost estimate, and a schedule.		
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ENGINEERING WORK PLAN, SEALING LEAK IN CATCH TANK 241-S-302-A

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WHC-SD-WM-WP-069 REV 1
ENGINEERING WORK PLAN
SEALING LEAK IN CATCH TANK 241-S-302-A

R. E. WORTHINGTON
E. W. POWERS
R. E. RUSSELL, MANAGER

JANUARY 7, 1991

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1.0 INTRODUCTION

Catch Tank 241-S-302-A serves as a sump from the floor drain in the 151-S diversion box. In June, 1990 the catch tank was declared a leaker and no further use of the diversion box is allowed until a new catch tank is installed, or the leak in the present tank is sealed.

This work plan covers the activities needed to seal the leak in Catch Tank 241-S-302-A, as a temporary solution until a replacement tank can be designed and installed. The method used will be to pour into the tank three layers of specially formulated grouts which will fill the tank to just above the 50% level. The grouts will be formulated by the U.S. Corps of Engineers (USACE), who are being employed as consultants for this task. The formulations will be designed to provide low porosity and to cure in such a manner as to cover the sludge in the bottom of the tank and effectively seal off the bottom of the tank thereby preventing any leakage from the space above the grout to the leak point which is below the sludge level.

2.0 SCOPE

2.1 OBJECTIVES

1. Contract with USACE to provide necessary consultancy, testing and QA assistance - DOE.
2. Procure premixed grouts to the formulation and QA requirements provided by USACE - WHC.
3. Develop a method for installation of the grout using existing tank penetrations by WHC.
4. Fabricate necessary equipment for the grout installation - WHC.
5. Provide a sump in the grout layers to enable the tank to be pumped empty as required by new Washington Department of Ecology regulations which will become effective in January, 1991 - WHC.
6. Perform a leak test on the repaired tank to demonstrate leak free condition - WHC.

2.2 DELIVERABLES

1. (By USACE) Results of evaluation of grout formulations and specifications for chosen formulations.
2. (By USACE) Evaluation of test results and final analysis of project after completion of task.
3. (By USACE) Provide a project specific Quality Assurance Program.
4. ECNs for modifying the sump pump and to document the addition of grout into the catch tank - WHC.
5. Pouring of three layers of specified grouts meeting QA approval into tank, at intervals recommended by USACE - WHC.
6. Perform an Acceptance Test to verify and to document the sealing of the catch tank - WHC.

3.0 DESCRIPTION

3.1 PHYSICAL DESCRIPTION

Grout formulations will be developed by USACE which will be selected to provide a leak tight grout layer in the catch tank, which is buried 20' below ground level. These grouts will be premixed by a local contractor, approved by WHC QA, and delivered to the tank farm. There they will be pumped into the tank via one of the 4" risers connected to the tank which are accessible above ground level. Each layer will be allowed to cure for about 48 hours before the next layer is poured. A layer of water will be maintained above the grout to eliminate any possible shrinkage.

After pouring the final layer a suitable bladder on the end of a pipe will be inserted down the 12" pipe connecting the tank to the pump pit. This bladder will then be filled with a drilling mud in suspension to form a shallow concave sump. When the final layer has set, the bladder will be withdrawn from the tank. This will form a sump in the grout in which the submersible pump used to empty the tank will be located.

After the final layer has cured to the satisfaction of USACE, a volume of water equivalent to the largest conceivable spill (7000 gallons) will be introduced into the tank and any variation of level measured using a sensitive, ultrasonic level detection device. When it

is confirmed that the tank no longer leaks, the catch tank and the diversion box, will be returned to service, until such time as the catch tank is replaced.

3.2 ENGINEERING TASKS AND RESPONSIBILITIES

1. Expedite consultancy contract with USACE and establish a working relationship with them, including transfer of information etc.. Task Order DE-AT06-91RL12102 - DOE.
2. Measure temperature in the tank. Information requested by USACE - WHC.
3. Prepare ECNs for sealing tank leak using grout and for the modifications to the submersible pump installed in the tank. ECN 106893 and ECN 106894 - WHC.
4. Acquire and test bladders for use as sump former - WHC.
5. Procure premixed grout prepared to USACE specifications - supplier.
6. Perform a test plan to functionally check out all equipment and to verify the grout behavior. 241-S-302-A Catch Tank Leak Repair Functional Checkout Test Plan, addendum to WHC-SD-WM-WP-069 - supplier.
7. Prepare Work Package for the task in the J-1 and J-4 format. Document number 2W-90-02558/Surveillance - WHC.
8. Prepare video camera procedures for monitoring the grout installation. Procedure for CCTV Inspections. Generic Procedure for CCTV Inspections WHC-SD-NR-TCP-006, REV 0 - WHC.
9. Prepare ultrasonic leak test procedures for measuring variations in liquid level in a manner sensitive enough to demonstrate the presence or absence of a leak in the catch tank in less than ten days. Ultrasonic monitoring, 200 West area, catch tank. Operating Procedure for Liquid Level Monitoring of the 241-S-302-A Catch Tank WHC-SD-WM-TC-012 - WHC.
10. Demonstrate the ultrasonic leak test procedure and arrange for the actual test to be performed - WHC.
11. Approve final USACE analyses of grout test results and issue final report - WHC.
12. Prepare and issue a final Engineering Report describing all the work carried out and presenting all test results including those generated by the Corps of Engineers - WHC.

3.3 VERIFICATION

There will be formal reviews by WHC and DOE of the recommended USACE formulations and grouting procedures and of their final analyses.

USACE will provide Quality Assurance personnel to direct and monitor the preparation of the grouts by the readymix contractor.

Normal QA procedures will be in place at all stages of the task. QA will review the ultrasonic measurement system used to detect the presence of any leak after grouting - WHC.

Signed records will be kept of all activities and these will be audited at the completion of the task - WHC.

3.4 PROCUREMENT

WHC Engineering Services will be responsible for all equipment and material procurement. In the purchase of grout raw materials and in the choice of the readymix contractor, they will be receptive to the recommendations of USACE, who will also define grout acceptance criteria.

3.5 INSTALLATION

Preparation of the tank and associated equipment for grouting and the reinstatement of such, at completion of the task, will be carried out by Waste Management personnel under the supervision and guidance of Engineering Services staff. Pouring of the grout will be performed by the readymix contractor under the supervision of Engineering Services.

3.6 PRE-OPERATIONAL AND OPERATIONAL TESTS

Pre-operational and post-operational testing of the grouts will be the responsibility of the USACE. Test emplacement of the grout will be performed at the contractor's site, under the supervision and guidance of Engineering Services and USACE personnel. Leak testing of the tank after repair will be performed by WHC Engineering and Surveillance and Testing in collaboration with Engineering Services personnel. Failure of the tank to pass the leak test will automatically prevent the tank from being returned to service.

4.0 ORGANIZATION

4.1 COGNIZANT ORGANIZATION

Engineering Services.
R.E.Russell, Cognizant Manager.
R.E.Worthington, Cognizant Engineer.
E. W. Powers, Project Engineer.

4.2 CONSULTING ORGANIZATION

U.S. Corps of Engineers, Walla Walla District.
R. A. Kaden, Acting Chief Geotech Branch.
S. Tatro, Cement and Concrete Engineer.
U.S. Corps of Engineers, Waterways Experiment Station, Vicksburg, MS
J. A. Boa Jr. Engineer

4.3 CUSTOMER ORGANIZATION

Waste Management.
D. M. Bogen

241-S-302-A CATCH TANK SCHEDULE

1991

Assumed Start Up Date January 25, 1991

	JAN			FEB			MARCH		
	11	18	25	8	11	22	8	15	22
ECN for Tank Temp Thermocouple	■								
Thermocouple Fabrication	■								
Determine Tank Temperature	■								
ECN for Grout Installation	■								
ECN for Pump Modification	■								
Grout Adapter & Covers Fabrication	o								
Work Package (J-4 Format)	■								
Leak Test Procedure	■								
Video Camera Procedure	■								
Test Emplacement Procedure	o								
Task Order to USACE	12/27								
QA Plan to DOE/RL	o	1/12							
QA Plan Approval			1/24						
Grout Formulations to WHC			1/24						
Draft Specifications for DOE/RL (review & comment)			1/26						
DOE/RL Approval				2/2					
Grout Procurement	o								
Support Equipment & Material Procurement	o								
Test Emplacement & Equipment Checkout						2/5			
Dry Run - Grout Emplacement						2/6			
1st Grout Pour						2/7			
2nd Grout Pour							2/11		
3rd Grout Pour							2/15		
Leak Test							2/18	2/27	
Tank In Service Decision									o
Final Report									o

- Completed
- o Due Date

NOTE: GROUT POUR DATES WEATHER DEPENDANT. WIND MUST BE 15 mph OR LESS, TEMP 32° TO 80°F.

5.0 SCHEDULE
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6.0 COST ESTIMATE (Revised Jan. 1, 1991)

ENGINEERING DEPT. COST

Engineering dept. man hours estimated.....	850
@ \$75.00 per man hour, including overheads etc.....	\$63,750
USACE estimated cost(Task Order 00X-PM-02-00).....	\$45,000
Leak measurement and video work.....	\$41,000
ESTIMATED ENGINEERING COST.....	<u>\$149,750</u>
ESTIMATED GROUT PROCUREMENT COST.....	\$20,000
<u>TOTAL COST.....</u>	<u>\$169,750</u>

7.0 SAFETY AND QUALITY ASSURANCE

1. The sealing of the catch tank by grouting has been assigned a Safety Classification of 3 in accordance with Management Requirements and Procedures WHC-CM-1-3, section MRP 5.46 Rev 2.
2. An Impact Level 3 has been assigned to this project in accordance with MRP 5.42.
3. All work will be performed to comply with the requirements WHC-CM-4-2 and appropriate EPs, as defined in WHC-CM-6-1. Quality control of the grouts will be under the control of USACE and will conform to their QA program.

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ADDENDUM

241-S-302-A CATCH TANK LEAK REPAIR

FUNCTIONAL CHECKOUT TEST PLAN

241-S-302-A CATCH TANK LEAK REPAIR FUNCTIONAL CHECKOUT TEST PLAN

1.0 PURPOSE

The purpose of this functional checkout test plan is to provide a method whereby the grout can be mixed on a large scale in the manner prescribed by the US Army Corps of Engineers (USACE) and to train grout contractors (supplier) personnel and to functionally checkout the pumping equipment and the sump form. This will be accomplished under the direct supervision of Westinghouse Hanford Company (WHC) personnel.

The intent is to prepare a full size form the same size as the catch tank and to assemble the actual pumping equipment and grout adapter that will be used for the actual grout installation. The grout is to be mixed in the exact quantities and sequence under the direct supervision of USACE personnel. This test pour will be completed in the exact same time intervals including total mix and transit times.

This test plan has been developed for the express purpose to accomplish the following functions:

- To familiarize and train grout contractors (supplier) personnel
- To verify and validate the full scale material mix quantities and mixing sequence
- To determine mixing times, transport time, and emplacement time
- To functionally checkout the pumping equipment, grout adapter, and the sump balloon
- Determine equipment cleanup requirements

This functional checkout test plan is to be performed by the grout contractor at the contractor site, under the supervision and guidance of WHC and USACE personnel.

2.0 IMPACT LEVEL

The quality assurance impact level of this procedure is a 3.

3.0 SAFETY CLASS

The safety class of this test plan is a 3.

4.0 BACKGROUND

Catch Tank 241-S-302-A serves as a sump from the floor drain in the 151-S Diversion Box. In June, 1990, the catch tank was declared a leaker and no further use of the diversion box is allowed until a new catch tank is installed, or the leak in the present tank is sealed.

The proposed solution to this problem is to leak seal the tank as a temporary solution until a replacement tank can be designed and installed. The method used will be to place into the tank three separate layers of specially formulated grouts which will fill the tank to just above the 50% level. The grouts will be formulated by the U.S. Corps of Engineers (USACE), who are being employed as consultants for this task. The formulations will be designed to provide low porosity and to cure in such a manner as to cover the sand and effectively seal off the bottom of the tank thereby preventing any leakage from the space above the grout to the leak point which is below the sand level.

5.0 EQUIPMENT AND MATERIAL

The following list of equipment and material is to identify the special equipment necessary to accomplish this procedure.

- Tank Form (9' x 40' x 1' excavation) - supplier
- Grout - supplier
- Grout adapter - WHC
- Mounting for suspension of grout adapter - supplier
- Pump, hopper screen and hoses - supplier (subcontractor)
- Batch trucks - supplier
- Flow cone ASTM, C-939 - USACE
- Sump balloon, funnel, containers, PVC pipe - WHC
- Drilling mud - USACE
- Scale - supplier
- Water - supplier
- Material quantities may be weighed and verified in advance of actual mixing to facilitate this procedure.

6.0 PREPARATORY WORK

1. Prepare a form (at suppliers site) 9' wide x 40' long x 12" deep, ± 6 " in width and length, ± 2 " in depth.
2. Mount or suspend the grout adapter in a vertical position. Grout adapter shall be at a location on the centerline of the form a distance of 23' from one end. The grout pumping hoses shall be attached to the grout adapter.

7.2 MIX #2

Add materials in exact quantities in the following sequence; USACE will verify material quantities and sequence.

<u>MATERIAL</u>	<u>QUANTITY</u>	<u>(USACE) VERIFICATION</u>
Water (80% of total)	3017.52 lbs	_____
Fly Ash	3512.7 lbs ±10	_____
Silica Fume *	557.5 lbs ±1	_____
Bentonite *	170.1 lbs ±1	_____
Masonry Sand	4479.3 lbs ±10	_____

NOTE: Grout set up time starts when cement is added.

Admixture **	40.5 lbs ±0.1	_____
Portland Cement (Type 11)	3168.34 lbs _____ (time)	_____
Water	754.38 lbs	_____
Mix 60 minutes to simulate transit time		_____

* Add manually

** To be added manually along with cement

8.0 GROUT EMPLACEMENT

1. After addition of cement to grout mix and 60 to 90 minute mix time, start Mix #1 grout pour. This delay simulates the time in transit from contractor to job site and setup.
2. Dump grout into pump hopper through 1/2" mesh screen. Break up lumps if any occur.
3. Start pumping grout at a rate of 42 to 48 gal per minute. Determine proper rate by adjusting as required to permit the grout to flow slowly and steadily from the perforated end of the grout adapter. Record the pump flow rate _____ WHC.
4. Monitor the grout behavior as it flows from the grout adapter. It should be a continuous flow at a relatively low velocity. _____ record observation WHC. Start Mix #2 grout pour immediately after Mix #1 has been poured.
5. USACE personnel shall determine flow ability using the flow cone method in accordance with American Society for Testing and Materials (ASTM), C-939.
6. USACE personnel shall determine flowrate every 30 minutes up to 2 hours after time of mixing. Record the flowrates.

<u>TIME OF MIX</u>	<u>FLOW RATE</u>	<u>(USACE) VERIFICATION</u>
0 Time of mix	_____ secs	_____
30 min	_____ secs	_____
60 min	_____ secs	_____
90 min	_____ secs	_____

7. Verify that grout flows readily and distributes itself over the entire form in a relatively level condition. A level surface is not required as this particular grout formation has been selected for it's sealing capabilities. Grout distributes itself over the entire form _____ record observation WHC.

8. Permit grout to set. Check to see if an indentation can be made with thumb pressure (approximately 10 lbs force). Continue checking until a thumb indentation cannot be made. Record time of each test and results (USACE).

Mix time + 4 hours	_____
Mix time + 5 hours	_____
Mix time + 6 hours	_____
Mix time + 7 hours	_____
Mix time + 8 hours	_____

9. Remove grout adapter and disconnect pump and hoses. Wash out equipment as required.

10. Grout adapter shall be stored by the pumping subcontractor until ready for first grout pour at the job site.

11. Monitor grout emplacement over a period of three days. WHC personnel will accomplish this task.

12. The grout emplacement will be disposed of by the contractor at their convenience.