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WATER REMOVAL AND HANDLING THE PIT 5 INTERIM REMEDIATION PROJECT JOB NO. 1.1.3.1.02

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THE RALPH M. PARSONS COMPANY

STUDY NO. P120011
WATER REMOVAL AND HANDLING

The Pit 5 Interim Remediation Project
Job No. 1.1.3.1.02

for
Westinghouse Materials Company of Ohio

March, 1989

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1.0 STUDY OBJECTIVES AND SCOPE

The Feed Materials Production Center (FMPC) is a uranium metal processing facility occupying a 1,050 acre site northwest of Cincinnati, Ohio. The FMPC is owned by the U.S. Department of Energy (DOE) and operated under contract by Westinghouse Materials Company of Ohio (WMCO).

Pit 5 is one of the many candidates for remedial action on the FMPC site. The Pit 5 Interim Remediation Project bid was awarded to The Ralph M. Parsons Company (Parsons); Charlotte, North Carolina. Parsons ~~charter~~ is to develop a Design Criteria for the interim remediation of Pit 5. This part of the study ~~covers~~ the handling and removal of water from Pit 5.

Is this correct or is it final

1.1 OBJECTIVE

The objective of this study is to develop criteria and methodology for Pit 5 surface water removal and handling if required. It should be noted that the need for a separate water removal and handling system may not be necessary depending upon the final recommendation for the sludge removal and solidification systems. Some water resulting from liner washdown may require removal and treatment at the completion of the removal and solidification of the sludge. However, this amount of water maybe small compared to the free water considered in this study. Attention will be given to environmental and personnel safety, technical feasibility, schedule and economics.

1.2 SCOPE

This study will consider only the removal of water and tie-ins to the solidification facility or treatment facility. The treatment requirements of the water are not included in the scope of this study, but will be covered in a later study.

2.0 APPROACH

Two alternatives for water removal from Pit 5 have been considered. They are:

A. Removal of surface water from Pit 5 and subsequent storage in a tank or pit to use for slurry mixing or sent to the solidification facility (Alternative A).

water to solidification?

Was Removal and treatment on-site facilities considered?

B. Leaving the surface water in Pit 5 and using it for slurry mixing to enhance pumping (Alternative B).

Evaluation of these alternatives was based on the following considerations:

- o Technical Feasibility
- o Schedule
- o Worker Safety and Health
- o Economic Evaluation

Consideration was also given to any excess water that might be generated from sludge processing. This water may be used for Pit 5 sludge removal or sent to the waste water treatment facility.

3.0 SUMMARY AND CONCLUSIONS

The results of this study show that both alternatives A and B are viable solutions for water removal from Pit 5; therefore, the water removal method chosen will be dependent on how the sludge is removed from Pit 5.

Alternatives A and B equipment and material lists are based on a flow rate of 150 gpm to 300 gpm. Other equipment and materials may perform as well and should be evaluated during title design.

Alternative A is the more expensive solution for water removal from Pit 5. It should be used if the sludge from Pit 5 is removed by mechanical means (i.e. clamshell, dragline).

Alternative B is the best economical solution for water removal from Pit 5. It should be used if the sludge from Pit 5 is removed as a slurry.

4.0 BACKGROUND

Pit 5 is a lined waste disposal pit that covers 3.8 acres. It has a maximum depth of 30 feet, and its length and width are approximately 820 and 240 feet, respectively.

No just 8 also Gen. Sump, Blowdowns, Ref. Sump etc

The pit was used as a settling and storage basin for low level radioactive sludge produced in Plant 8.

Due to changes in Federal policies concerning handling and storage of low level radioactive waste and the questionable integrity of the liner material, Pit 5 has become a chief candidate for remedial action.

Pit 5 has always been considered storage.

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5.0 WATER REMOVAL AND HANDLING SCENARIOS

5.1 TO HOLDING TANK - ALTERNATIVE A

geologic & environ. reaction?

According to reference a. (see Section 7.0), there could be approximately 750,000 gallons of surface water in Pit 5. This surface water can be removed by a submersible pump in ten working days and stored in a 1,000,000 gallon holding tank. Due to environmental, geological and public reaction, the digging of a new pit to hold the water is not feasible and; therefore, was eliminated from consideration. The holding tank should be similar in design to the existing temporary high and low nitrate holding tanks. It is suggested that one of those existing temporary tanks be used for water storage from Pit 5. Once the surface water is removed, removal of Pit 5 sludge will be done by mechanical means, i.e., dragline or backhoe and subsequently deposited in a Hopper located next to Pit 5. This sludge will then be sent to the solidification facility.

Condition

Control of water quality is normally a critical consideration in solidification. Down H seem to be worth trouble for 750 kgal

During sludge solidification, water may be sent from the holding tank to the sludge solidification facility as needed. After sludge solidification is completed, excess water will be sent to the general sump for treatment. The water in the holding tank will be used for the sludge solidification process, washing of the slurry piping and cleanup of the plastic liner in Pit 5. The use of this water will eliminate or reduce the need for "clean" water which would otherwise have been used and would subsequently require treatment. A schematic of this scenario detailing sludge removal rates, pipe footage, etc. used for the purpose of this study is shown in Figure 1.

Another option is to create a dam and allow excess water to be stored in the pit while the sludge is removed by mechanical means. Since there is not enough information on the sludge density and composition at this time, this option was eliminated from consideration and will be evaluated at a later date when additional information becomes available.

5.2 TO PROCESS - ALTERNATIVE B

In this scenario, the surface water remains in Pit 5 and will be mixed with the sludge and pumped as a slurry to the solidification facility which may be located north-east of Pit 5. During sludge solidification, excess water may be removed from the slurry by clarification, or sludge thickening. This

water may be sent back to Pit 5 and subsequently to the general sump for treatment. The excess water will be used for washing the slurry line after pumping ceases each day and reused for mixing of the slurry and liner washing. This will eliminate or reduce the need for "clean" water which would otherwise have been used and would require subsequent treatment. A schematic of this scenario detailing sludge removal rates, pipe footage, etc. used for the purpose of this study are shown in Figure 2.

6.0 EVALUATION OF WATER REMOVAL AND HANDLING SCENARIOS

6.1 TECHNICAL FEASIBILITY

Alternative A and B are both viable options for water removal from Pit 5. The alternative chosen will be determined by the method used for sludge removal from Pit 5. The service life required of Pit 5 water removal equipment and materials is 2-1/2 years. For this reason, 4 inch schedule 40 carbon steel welded pipe is recommended as corrosion will be negligible. Also, 4 inch diameter pipe is more feasible from a flow rate and friction loss viewpoint based on a flow rate of 150 gpm to 300 gpm. The piping will not be insulated or heat traced as the piping system will be drained at the end of each day to prevent freezing. Since the excess water removed from Pit 5 will eventually be processed by the BDN facility, it is recommended that the excess water be routed to one of the existing temporary high or low nitrate holding tanks for Alternative A. Welded pipe and fittings shall be used to eliminate potential worker and environmental exposure from leaks. Because the radioactivity level of the water is sufficiently low, the piping will not be double contained. The piping and equipment used for water removal are standard stocked items which are readily available and do not require a long lead time for purchase.

6.2 SCHEDULE EVALUATION

The schedule for water removal will be accomplished during sludge removal, and can easily be done within the 78 week schedule for sludge removal.

6.3 WORKER SAFETY

In order to ensure personnel safety during the water removal operations, all work will be performed in accordance with the FMPC Environmental, Safety and Health (ES&H) Procedures, as well as the Radiological

Safety Manual. Among other requirements, these procedures identify the maximum permissible radionuclide concentrations and the types of protective clothing required. It should be noted that during previous sludge sampling efforts [Characterization Investigation Study - Geotechnical Evaluation of Waste Pit Material Properties and Boring Logs, Weston, 1988] irritating odors were encountered that forced the workers to wear Level B protective clothing.

I have a hard time believing this No. I need reference

The removal of the water from Pit 5 is not expected to be a labor intensive effort. In fact, only 2 employees will be needed to operate and maintain the water removal equipment.

DOE Orders require radiation exposures to be kept below 1 rem/yr and that the exposures be further reduced by maintaining them as low as reasonably achievable (ALARA). In DOE/EV/1830-T5 "A Guide to Reducing Radiation Exposure to ALARA", occupational dose equivalent limits are recommended for various types of operations. This guide recommends a maximum dose rate of 0.125 mrem/hr for continuously occupied work areas, such as the raft floating in the pit.

Is this right — I thought it was 5 rem/yr

Data from the sludge sampling tests show dose rates ranging from 0.17 to 2.38 mR/hr for mixed Beta/Gamma fields and from 0.068 to 0.58 mR/hr for Gamma only. The referenced study does not indicate at what distance from the sludge the measurements were made, however, it is implied that the radiation detector was positioned very close to the samples. By positioning the operators away from the edge of the pit their radiation exposures will be significantly reduced.

What raft?

This dose maybe attributed to shine from silos, I recommend getting some PIC measurements

These measured dose rates are greater than the recommended maximum permissible dose rates. However, additional dose rate measurements should be taken at locations above and near the pit in order to provide a more accurate assessment of the radiation fields that will expose workers. This type of dose rate measurement is useful in providing additional information for development of the worker safety procedures.

6.4 ECONOMIC EVALUATION

Below is a cost estimate which includes installation for Alternatives A and B based on estimates of equipment and materials as shown in Figures 1 and 2 of this study.

These are energy motions

again PIC measurements required

8

why are these presented? They are not on an equivalent basis - should be part of complete estimate for remedial alternatives for Pit 5

Alternative A Cost

Equipment or Material	Installed Cost
1) 1 pump 200 GPM submersible w/a high TDH	$ 7,500
2) 2600 feet of 4" sch 40 carbon steel pipe	$54,600 @ $21 LF
3) 200 feet of 4" plastic pipe	$ 4,800 @ $24 LF
4) 10 feet of 2" sch 40 carbon steel pipe	$ 100
5) 10 feet of 1" sch 40 carbon steel pipe	$ 100
6) 2-4" gate valves	$ 2,400
7) 3-1" vent valves	$ 400
8) 3-2" drain valves	$ 1,300
	$71,200[1]

Alternative B Cost

Equipment or Material	Installed Cost
1) 2600 feet of 4" sch 40 carbon steel pipe	$54,600 @ $21 LF
2) 10 feet of 2" sch 40 carbon steel pipe	$ 100
3) 10 feet of 1" sch 40 carbon steel pipe	$ 100
4) 1-4" gate valves	$ 1,200
5) 3-1" vent valves	$ 400
6) 3-2" drain valves	$ 1,300
	$57,700

7.0 REFERENCES

a. Preliminary Remedial Action Alternatives for Pit 5 at the Feed Materials Production Center, Fernald, Ohio, Revision 1, September 1988.

b. Remedial Investigation and Feasibility Study, Feed Materials Production Center Fernald, Ohio, Task 1 Report Description of Current Situation, Revision 0 January 30, 1987.

c. Characterization Investigation Study Volume 2: Chemical and Radiological Analyses of the Waste Storage Pits by A. J. Solow, D. R. Phoenix, Roy F. Weston, Incorporated, November 1987.

d. Means Mechanical Cost Data, 1989 12th Annual Edition by R. S. Means Company, Inc.

Note Data "c" is a summary of data in references "b" & "d" below. Detailed data should be available from backup data.

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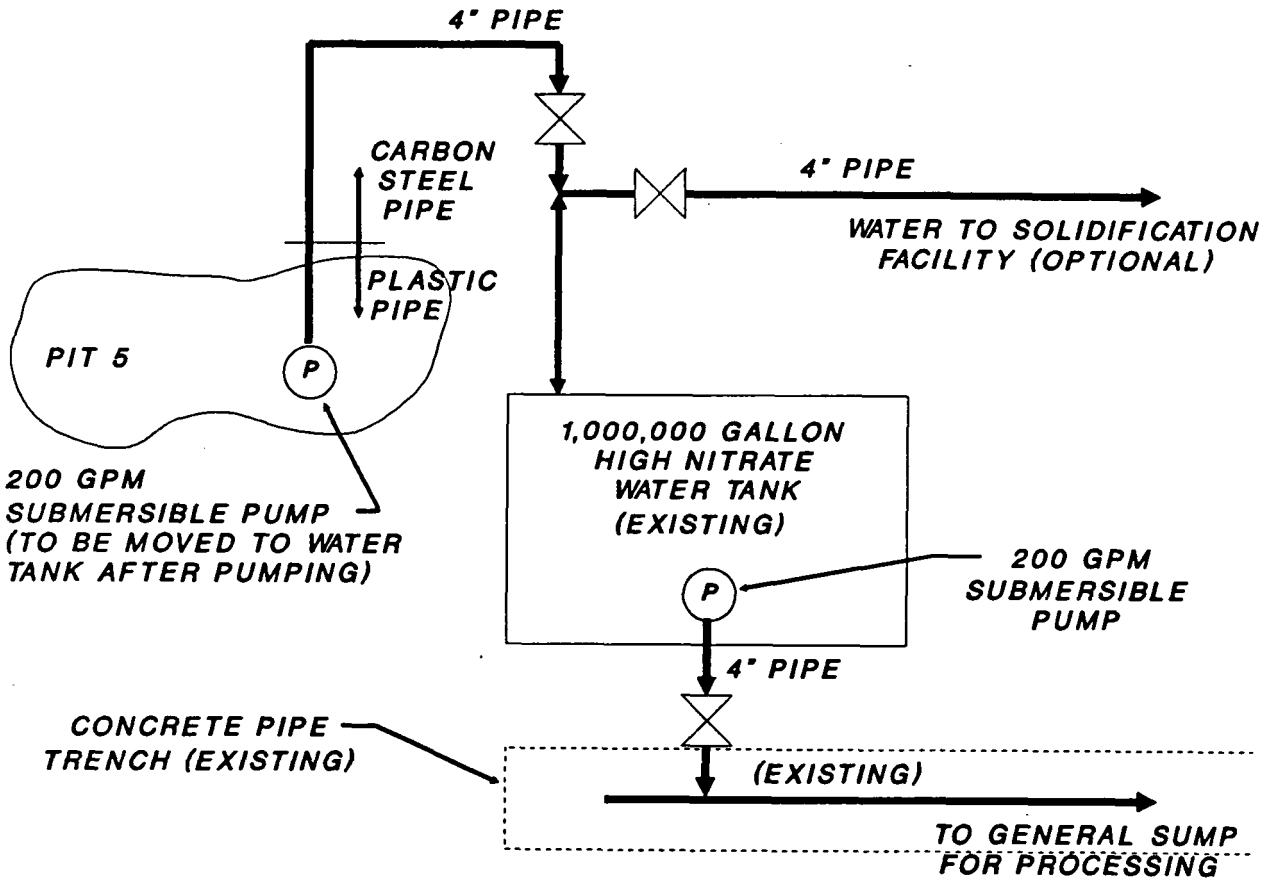
[1] If the existing 1,000,000 gallon tank cannot be used, a new temporary 1,000,000 gallon tank can be installed for $53,000. If water is required at the solidification facility an additional 300 feet of 4" sch 40 carbon steel pipe and one 4" gate valve are required at a cost of $7,500.

Data from water in 5 should be available from utilities personnel.

e. Parsons letter P-WP-10, February 28, 1989 to R. S. Shirley from R. H. Nixdorf, Subject: Pit 5 Remediation Schedule.

FIGURE 1 ALTERNATIVE A SCHEMATIC



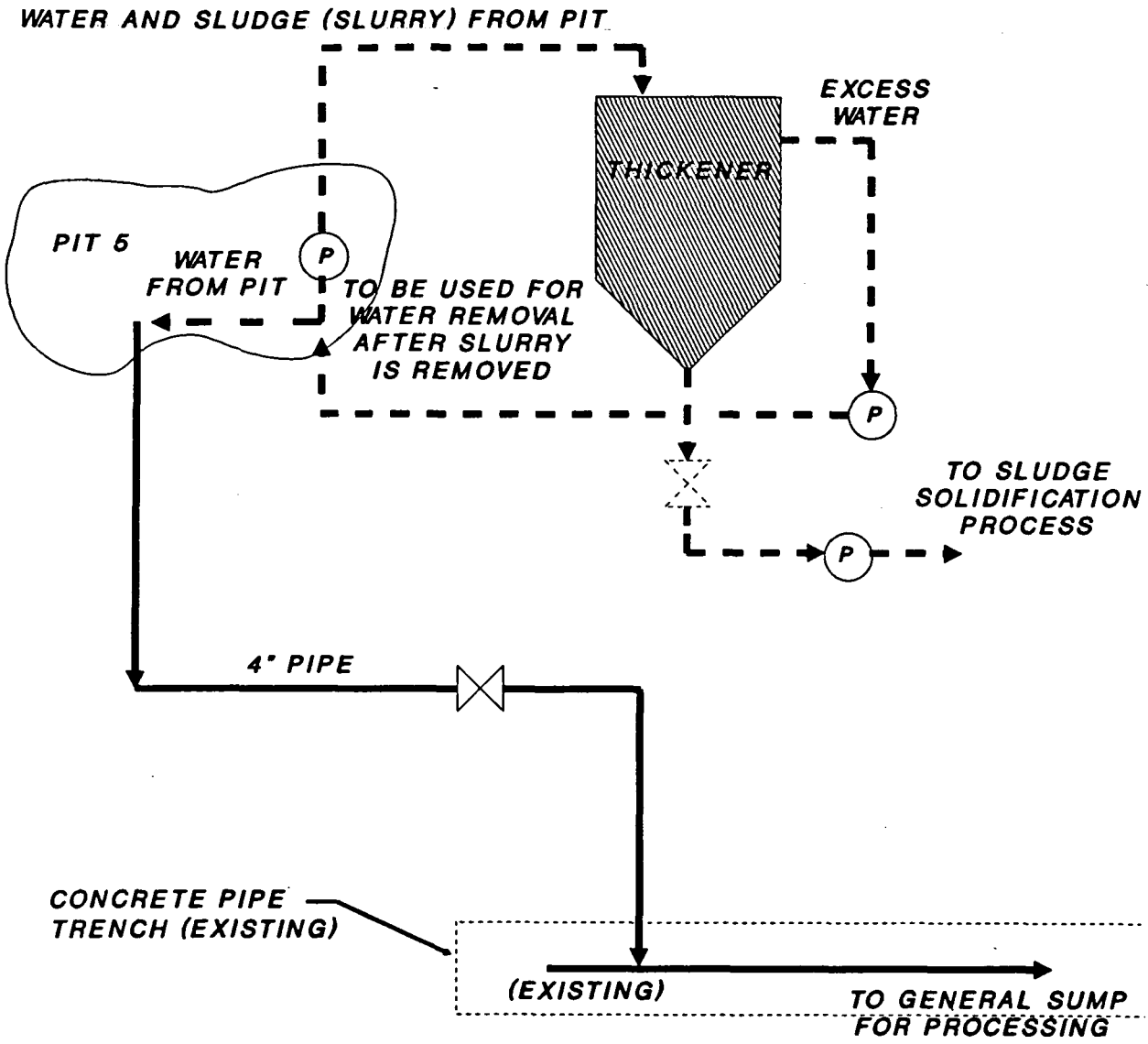
EQUIPMENT AND MATERIAL LIST

(1) SUBMERSIBLE PUMP 200 GPM
2600 FEET OF 4" SCH 40 CARBON STEEL PIPE
200 FEET OF 4" SCH 40 PLASTIC PIPE
10 FEET OF 2" SCH 40 CARBON STEEL PIPE
10 FEET OF 1" SCH 40 CARBON STEEL PIPE

(2) 4" GATE VALVES
(3) 1" VENT VALVES
(3) 2" DRAIN VALVES

NOTE: SLUDGE REMOVAL EQUIPMENT & PIPING ARE NOT INCLUDED IN THE EQUIPMENT AND MATERIAL LIST

FIGURE 2 ALTERNATIVE B SCHEMATIC



EQUIPMENT AND MATERIAL LIST

2600 FEET OF 4" SCH 40 CARBON STEEL PIPE
10 FEET OF 2" SCH 40 CARBON STEEL PIPE
10 FEET OF 1" SCH 40 CARBON STEEL PIPE
(1) 4" GATE VALVES
(3) 1" VENT VALVES
(3) 2" DRAIN VALVES

NOTE: SLUDGE REMOVAL EQUIPMENT & PIPING ARE NOT INCLUDED IN THE EQUIPMENT AND MATERIAL LIST