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RESOURCE CONSERVATION RECOVERY ACT RESPONSE TO ITEMS A1 - A7 OF RCRA SECTION - FFCA FEDERAL FACILITIES COMPLIANCE AGREEMENT

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FMPC
Resource Conservation Recovery Act: Response to Items A1-A7 of RCRA Section of the Federal Facilities Compliance Agreement

30 Day Deliverable

August 17, 1986

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FEED MATERIALS PRODUCTION CENTER
RESPONSE TO ITEMS A1-A7 OF RCRA SECTION
FEDERAL FACILITIES COMPLIANCE AGREEMENT

30 Day Deliverable

August 17, 1986

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RESPONSE TO FFCA

Item A.1	Conduct hazardous waste determination on all waste streams previously identified.
Response:	Initial hazardous determinations have been completed, with plans for additional characterization of waste streams (see attached report).
Attachment:	Report - "RCRA Determinations for Feed Materials Production Center Waste Streams."

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RCRA DETERMINATIONS FOR FEED MATERIALS PRODUCTION CENTER WASTE STREAMS

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EXECUTIVE SUMMARY

A hazardous waste determination was conducted for all identified FMPC waste streams. Of the 65 identified waste streams, four are listed as RCRA hazardous wastes and 12 more are considered as source material regulated under AEA authority and, therefore, exempt from RCRA. For the remaining 49 waste streams and a portion of the approximately 35,000 drums of stored waste, the evaluation of existing data shows that a final hazardous waste determination requires additional data and should not be made at this time. These wastes will be sampled and analyzed under an EPA-approved program to assure compliance with RCRA requirements.

The existing data were analyzed to establish a priority ranking for sampling these waste streams. Priorities of high (A), medium (B), and low (C) were assigned based on the following waste stream parameters: 1) volume of waste generation; 2) schedule of next generation; 3) potential to contain hazardous constituents/characteristics; and 4) results of previous sampling. For the 49 waste streams, 13 were category A, 7 were category B, and 29 were category C.

The sampling and analytical program, with its commitment of manpower and budget, will be accomplished within an approximate one year period. This program will comprise a portion of the first phase of the Remedial Investigation/Feasibility Study (RI/FS) to be conducted at the FMPC as required in the Federal Facility Compliance Agreement signed by DOE and EPA.

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1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) and the United States Department of Energy (DOE) have entered into a Federal Facility Compliance Agreement (FFCA) pursuant to Executive Order 12088 (43 F.R. 47707). The FFCA pertains to DOE's Feed Materials Production Center (FMPC) located near Fernald, Ohio. This agreement was signed on July 18, 1986 to ensure compliance of the facility with existing environmental statutes and regulations including the Clean Air Act (CAA), as amended, 42 U.S.C. 7401 et seq., the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 et seq., and the Resource Conservation and Recovery Act (RCRA), as amended, 42 U.S.C. 6901 et seq.

As presented in the terms of the FFCA, DOE shall achieve compliance with interim status regulations at all areas subject to control under RCRA. To accomplish this goal, the DOE will conduct a hazardous waste determination on all previously untested waste streams generated at the facility, pursuant to 40 CFR 262.11. In addition, for purposes of this agreement, the "mixed wastes", which are hazardous wastes mixed with source, special nuclear or byproduct material, currently located at the FMPC are subject to RCRA regulations.

This report summarizes the results of the hazardous waste determination for the FMPC waste streams. The following sections present a description of the background for the facilities (Section 2.0); an identification and analysis of waste streams as defined by RCRA currently generated or stored (Section 3.0); and recommendations for further analyses and determinations (Section 4.0).

2.0 BACKGROUND

The FMPC is an industrial facility owned by the U.S. Department of Energy (DOE) and currently under the direction of Westinghouse Materials Company of Ohio (WMCO). Production operations cover approximately 55 hectares (136 acres) within a larger 425 hectare (1050 acre) site that lies about 32 Km. (20 mi.) northwest of downtown Cincinnati, Ohio.

In the late 1940's the FMPC was built in response to the U.S. Atomic Energy Commission long-term plan to establish an in-house integrated production complex for processing uranium and uranium compounds from natural uranium ore concentrates. A variety of chemical and metallurgical process steps are utilized to support the primary mission of supplying metallic fuel cores for the production reactors located at Richland, Washington and Savannah River, South Carolina. Some metal is shipped directly to DOE facilities at Oak Ridge, Tennessee and Rocky Flats, Colorado. All operations at the FMPC are administered through the DOE Oak Ridge Operations Office.

Currently, the primary function of the FMPC is the production of metallic uranium fuel cores and other uranium compounds for use in U.S. defense programs. Prior to 1986, small amounts of thorium were also processed. The FMPC has generated radioactive and non-radioactive hazardous waste as a result of uranium and thorium processing.

This section describes the various facilities and operations that generate wastes at FMPC and identifies those waste streams. The history of hazardous waste compliance at FMPC is also discussed as well as the current status of compliance.

2.1 Site Operations Generating Wastes

A number of chemical and metallurgical process steps are utilized at the FMPC to convert uranium ore concentrates and recycle materials into the uranium oxides, ingots, and billets produced at the facility. Eight plants are operational and involved in the uranium production process, and several of these processes generate liquid and solid wastes. A description of plant operations generating wastes is presented below.

2.1.1 Sampling Plant (Plant 1)

The Sampling Plant operations are important adjuncts in the support of other plant and project functions. Weighing and sampling of incoming feed materials establish the nuclear materials accountability base.

A safe Geometry Digestion System provides the FMPC with a capability of safely processing enriched materials containing up

to 10 percent ^{235}U.

Other operations carried out by the Sampling Plant include: opening of unirradiated fuel rods containing enriched uranium dioxide pellets and powders; reclaiming uranium values from cleaning solvents by distillation and recovery of solvents for reuse; reconditioning steel drums for use throughout the project; and storage of waste materials, recycle materials, and uranium bearing concentrates.

2.1.2 Refinery (Plants 2 and 3)

Uranium Trioxide (orange oxide), UO_3, is produced in three steps: digestion, extraction, and denitration.

After sampling and analysis, feed materials from various sources are fed into tanks for digestion in nitric acid. The resulting slurry consists of acid insolubles and a solution of impure uranyl nitrate and excess nitric acid. The slurry is then pumped to the extraction system. Low-grade uranium slurries require filtration and evaporation prior to extraction.

In the primary extraction column of the Refinery, the aqueous feed slurry is brought into contact with an organic solvent--a mixture of tributyl phosphate and kerosene. The organic solvent selectively extracts the uranium; most of the nitric acid and impurities are left behind in the aqueous raffinate. A raffinate mixer-settler may be used in series with the primary extraction column to further reduce the uranium content of the aqueous waste stream leaving the primary extraction column.

Additional purification of the uranium contained in the extract stream is achieved by scrubbing with a small counterflow of water in the compound primary extraction column. The aqueous stream from the scrubbing operation combines with the aqueous feed in the primary extraction column. The purified uranyl nitrate is recovered from the organic solvent stream by re-extraction with deionized water in stripping columns. In the absence of nitric acid, the uranyl nitrate contained in the solvent is preferentially attracted to the water. After treatment with a sodium carbonate solution for removal of degradation products, the stripped solvent stream is recycled to the primary extraction column. The aqueous uranyl nitrate product is sampled and analyzed to assure conformance with specification.

In the denitration process, aqueous uranyl nitrate at about 100 g/L U is concentrated by evaporation and boildown to approximately 1200-1300 g/L. It is then calcined batchwise in denitration pots to yield uranium trioxide, the end product of the refinery operations. The UO_3 product is packaged and may be retained for further processing or shipped to other DOE sites.

The Nitric Acid Recovery Plant operates in conjunction with the Refinery to recover nitric acid from the off-gases generated in the refinery processes. Nitric acid is recovered from the exhaust gas streams in the digestion and denitration areas and from several other minor sources. This acid is returned to the digestion area of the Refinery for reuse.

Uranium contained in aqueous waste streams from the solvent treatment and cleanout operations is precipitated with magnesium, sodium hydroxide, or calcium oxide. Extraction raffinate and other low-level uranium wastes are precipitated and neutralized with lime and filtered. The residue is drummed and stored at Plant 1 and the filtrate is discharged to the General Sump.

2.1.3 Green Salt Plant (Plant 4)

Uranium trioxide is converted to uranium dioxide, UO_2, in the Green Salt Plant by reduction with hydrogen. The UO_2 is then converted to uranium tetrafluoride, UF_4, or green salt, in a reaction with anhydrous hydrogen fluoride.

Uranium trioxide is fed to stainless steel fluidized bed reactors which are heated in the range of 985-1100°F (530-593°C). Dissociated ammonia enters the bottom of the reactors through a gas diffuser. The hydrogen and nitrogen hold the UO_3 powder in suspension in a fluidized bed. Partially converted UO_3 overflows from the first fluid bed reactor into the second where the reaction with hydrogen is completed.

Hydrofluorination takes place in groups of three heated horizontal ribbon-screw reactors, arranged in vertical stacks. Each reactor tube is 16 in. in diameter and 20 ft. in length (0.40 x 6.1m). Uranium dioxide enters at one end of the top reactor and is conveyed slowly to the other end and stirred by a power-driven ribbon screw. The operating temperature is progressively higher for each reactor, starting at about 300°F (150°C) in the first reactor and ranging up to 1200°F (650°C) in the third reactor. Anhydrous hydrogen fluoride gas enters at the discharge end of the bottom reactor and flows countercurrent to the uranium dioxide up through the three reactors.

Excess hydrogen fluoride is vented from the top reactor, filtered, and condensed to a dilute hydrogen fluoride solution (ranging from 20 to 35 percent HF).

The uranium tetrafluoride product is weighed, blended, sampled for chemical analysis, and packaged in 10-gallon (38-liter) cans.

2.1.4 Metals Production Plant (Plant 5)

Uranium metal is produced from uranium tetrafluoride in a thermite-type reaction with magnesium metal. This reduction takes place in a closed steel reduction pot which is lined with packed magnesium fluoride slag. Uranium tetrafluoride and magnesium granules are blended and charged into the slag-lined pot. The pot is capped with slag, sealed, and heated in a resistance furnace at temperatures up to 1500°F (815°C) until the contents react spontaneously. At this point, internal temperatures of the pot may reach up to 3000°F (1650°C). About 5 minutes after this reaction, the pot is removed, cooled, and the uranium mass, called a derby, is separated, cleaned, weighed (approximately 335 lbs or 152 kg) and transferred to the casting area. Some slag from the pot liner is milled for reuse as liner material, but an excess of the material is formed in each reaction and the bulk of this slag becomes waste.

In the casting process, cleaned derbies and scrap uranium metal are put into a graphite crucible. The loaded crucible is placed in a vacuum induction furnace and heated for about 95 minutes to approximately 2700°F (1480°C). A shear plug in the bottom of the crucible is then broken to permit the molten metal to flow into a heated graphite mold located directly under the crucible. After cooling, the mold is removed from the ingot, cleaned, and readied for reuse.

2.1.5 Metals Fabrication Plant (Plant 6)

Ingots made for extrusion are heat-treated in a molten salt bath in the Metals Fabrication Plant before shipment to an off-site extrusion facility. The metal is returned to the plant as extruded tubes approximately 10 feet (3.0 m) in length. These tubes are cut into 8-inch (20.3 cm) lengths on a cut-off lathe. Further processing consists of: heat-treating in molten salt, quenching in oil, and reaming; reduction of the outside diameter; and machining of each end face on a multi-station transfer machine. The finished tubular cores are cleaned and inspected for surface defects, dimensional accuracy and grain size before packaging for shipment to another DOE site.

In the Machining Area, the rods are cut into blanks, heat-treated and machined to final size. The machined cores are stamped for identification, degreased, pickled in nitric acid, rinsed, and inspected for surface defects, dimensional accuracy, and grain size.

2.1.6 Recovery Plant (Plant 8)

Uranium recycle materials for process operations at FMPC and elsewhere are sorted, calcined, screened, milled, and blended as necessary. Recycled materials containing metallics, oil, and graphite must be roasted (calcined) to oxidize these components. In addition, waste sludges from the General Sump are processed here. Recoverable material is sent back to Plants 2/3 and wastes are drummed ans stored. Several furnaces are used for this purpose: a rotary kiln, three multiple-hearth vertical furnaces, and two small single-hearth furnaces.

Uranium recycle materials of differing ^{235}U enrichments must be kept segregated throughout the process and while in storage.

2.1.7 Pilot Plant

This unit of the FMPC production complex has a wide range of chemical-metallurgical process equipment for smaller quantities of uranium or thorium products. It is principally used for handling enriched uranium feed materials containing up to 10 percent ^{235}U. Safe geometry solvent extraction columns are used for uranium purification.

The Pilot Plant has also been utilized for the infrequent processing of thorium. The plant can produce purified thorium nitrate, thorium oxalate, thorium metal, and thoria gel (hydrated oxide). Thorium processing includes a complete solvent-extraction refining system, a multi-tank system for precipitation, several filters, an oven-drying system, atmospheric furnaces for dehydration and metal reduction, vacuum furnaces for dezincing, and all auxiliary systems, including milling, dust collection, and sawing.

Equipment not used for thorium processing is available for such operations as metallic shot preparation, plasma-spraying in inert atmosphere, salt-bath heat-treating, and high-temperature gas-solid reaction (reduction of UF_6 to UF_4).

2.1.8 Special Products Plant (Plant 9)

Operations in this plant involve processing uranium metal pieces larger in size than those processed in the Metals Production and Metals Fabrication plants. Ingot sizes range from 11 to 13 in (28-33 cm) in diameter and weigh up to 1925 lbs (873 kg).

A decladding operation (Zirnlo process) is also performed in this plant. Reject fuel elements from the cladding operation of reactor sites are processed to remove the jacket materials that encase the uranium metal fuel elements. Clad elements are immersed in a solution of hydrofluoric acid to dissolve the jacket and the unaffected uranium metal cores are recovered for reuse.

2.2 Hazardous Waste Management

Solid and liquid low level radioactive wastes are generated at the FMPC. The facilities for handling the wastes are discussed below.

2.2.1 Solid Waste Facilities

Noncombustible low level radioactive solid wastes generated at FMPC are drummed for off-site disposal. The uranium content of these wastes is regarded as below economic recovery levels.

Contaminated combustible solid wastes are baled or drummed awaiting the availability of suitable incineration or disposal. Contaminated waste oils and solvent are stored in drums or bulk tanks awaiting the availability of the DOE TSCA incinerator in Oak Ridge, Tennessee.

Filter cake, from Plant 8, resulting from the filtration of raffinates and sludges accumulated in General Sump tanks, is now stored in drums awaiting processing for off-site disposal.

2.2.2 Liquid Waste Facilities

Liquid wastes are generated to some degree in every operation at FMPC. The three branches of the liquid waste stream are: process waste, sanitary sewage, and storm water.

2.2.2.1 Process Waste

All of the major process areas have individual treatment facilities capable of pretreating the liquid wastes that are peculiar to that particular process step. In these plant treatment units, almost all of the radioactive materials in the wastes are removed as filter cake processed for recovery of Uranium values. The filtrate produced is sent to the General Sump.

Physically the General Sump is a collection of vertical tanks of various sizes, pumps, piping, and valves established on a controlled pad. It is designed to facilitate the transfer and storage of liquid wastes within and discharge from the tankage complex. The tankage complex is designed for both grab and contineous sampling. Controls are simple but adequate. The pad is equipped with its own sump and drainage trenches to handle any leaks or accidental spills.

The process wastes from the various production plants and service facilities are received at the General Sump, assayed, and segregated or selectively combined as required. If a certain waste exceeds discard specifications, it is sent to the Refinery

for recovery of uranium values.

Acidic raffinates from the refinery extraction process are segregated, neutralized with CaO, and then pumped to Plant 8 for solids removal by filtration on rotary vacuum filters.

Most other uranium-bearing wastes are adjusted for the pH with calcium oxide to obtain a maximum precipitation of radioactive material, and settled and decanted in successive steps prior to supernatant liquor discharge to the river. The settled sludges are also transferred to Plant 8 for filtration.

Before discharge from the General Sump to the Wet Chemical Waste Pit or to the Miami River all liquid wastes are sampled to determine concentrations and total content of radioactive materials.

Waste slurries, including neutralized refinery raffinate, General Sump slurry, and slag leach slurry, are filtered on rotary vacuum filters in Plant 8. The filter cake solids are currently stored in drums on controlled storage pads for shipment for off-site disposal. The solids-free filtrate is pumped to Pit 5 for subsequent discharge to the Great Miami River.

2.2.2.2 Sanitary Sewage

The sanitary waste collection and treatment system is completely separated from the process waste system. Uranium contamination occurs only through the plant laundry and showers; however, most of the uranium is removed in the normal sanitary sewage treatment and captured in the sludge, which is dried and roasted in Plant 8 for recovery of uranium values.

2.2.2.3 Storm Water

It is possible for uranium to enter the storm water system through accidental spills or pickup of settled particulates from stack emmissions. Control and recovery of spills is made possible through diversion facilities, and a newly installed storm water lagoon will provide for retention and settling of site run off.

2.2.3 Waste Management Strategies

The overriding strategy for handling contaminated and non-contaminated wastes at the FMPC is the minimization of waste products coupled with the cost effective disposition of the wastes in a manner that is environmentally sound. Inherent in waste management efforts is the intent to meet or exceed applicable health and safety , environmental pollution control, and ALARA standards.

2.2.3.1 Low-Level Radioactive/Hazardous Mixed Wastes

Low-Level Radioactive/Hazardous Mixed Wastes are a small fraction of total FMPC waste management activities. There are three (3) main approaches for handling and disposition of these materials. First, all wastes of this type are received, handled, treated, and stored in containers compatible with the materials being stored. All containers are properly labeled, stacked and maintained for safe operation of the container storage facility.

Second, where possible, low-level radioactive/hazardous mixed wastes are chemically treated to minimize their hazardous qualities. As an example, this is currently being accomplished in a plant test for the conversion of barium chloride to barium sulfate.

Third, Radioactive/Hazardous Mixed Wastes which cannot be converted to non-harzardous forms are stored until final disposition can be arranged. Characterization and volumes of wastes suitable for hazardous waste incineration have been identified. FMPC waste materials have been placed on the list of feed sources for the Oak Ridge Operation TSCA Incinerator which will become operational in 1987. Alternative disposition arrangements are also being made should the start-up of the Oak Ridge, Tennessee TSCA incinerator be delayed.

2.2.3.2 Low-Level Radioactive/Toxic Mixed Wastes

The FMPC has drums of solvent still bottoms and sludges that are slightly contaminated with uranium and PCB's. Arrangements have been made to place these wastes onto the waiting list of feed materials for the Oak Ridge, Tennessee TSCA Incinerator. In the event that use of the TSCA Incinator becomes delayed, arrangements are also being made to consider alternatives for the disposition of these waste materials.

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3.0 IDENTIFICATION OF WASTE STREAMS

3.1 Process Waste Streams

Many of the FMPC process components generate a number of waste streams. Generally, these wastes are both solids and liquids, radioactive and non-radioactive, and often mixed. Table 1 presents a listing of sixty-five (65) identified waste streams at the FMPC. Other information provided on the table includes a waste stream description, annual volume of material generated and the FMPC Material Code (accountability number).

With the information provided in the first four columns of Table 1, an analysis of each waste stream was conducted to determine if the waste would be considered hazardous in light of the process or material properties (Subpart A of 40 CFR, Part 262.11). The analytical sequence followed is given below:

A. Is the waste excluded under regulation 40 CFR, Part 261.4?

B. Is the waste listed as a hazardous waste under Sub part D of 40 CFR, Part 261 (an analysis may be conducted to demonstrate that a waste is not hazardous)?

C. If the waste is not listed as a hazardous waste in Subpart D of 40 CFR, Part 261, the operator must determine whether the waste is identified in Subpart C of 40 CFR, Part 261 by either:

   1. Testing according to methods set forth in Subpart C of 40 CFR, Part 261 or equivalent approved methods under 40 CFR 260.21; or

   2. Applying knowledge of the characteristics of the waste in light of the material or process used.

Applying the first criteria, the waste was compared to the list of excluded materials under regulation 40 CFR, Part 261.4. Of the 65 wastes, 12 were found on this exclusion list. These wastes will not require additional sampling and analysis for a RCRA determination.

Second, the waste was compared to the list of identified hazardous wastes presented in 40 CFR, Part 261. Of the 65 wastes identified at the FMPC, four (4) are considered hazardous and will not undergo further analysis in the sampling program.

For the remaining 49 waste streams, final hazardous waste determinations have not been made at this time due to the lack of

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TABLE 1
HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Neutralized raffinate from general sump	002	620	An acidic mixture of magnesium and aluminum nitrates neutralized to pH 11.9 by the addition of caustic and lime filtered to a damp-dry sludge.		I		I	N/A	EPA 1110	Simple random SW-846	B
Slag leach cake	001	1300	Magnesium fluoride from the reduction operation, acid leached to remove uranium, neutralized with lime, filtered and washed.		I		I	N/A	EPA 1310	Simple random ASTM D346-75	B
Magnesium oxide and magnesium zirconate from crucible clean-out	030	12	Dry powders resulting from the clean-out of graphite crucibles.		I		I	N/A	EPA 1310	Simple random ASTM D346-75	C
High fluoride scrap salts and floor sweepings	065	200	Magnesium fluoride and uranium fluoride spillage, in dry powdered form.		I		I	N/A	EPA 1310	Simple random ASTM D346-75	A
Low fluoride scrap salts and floor sweepings	066	3	Mixed salts and some oxide spillage, with little fluoride content, in dry powdered form.		I		I	N/A	EPA 1310	Simple random ASTM D346-75	A
Non-oily, non-halide wet sump filter cake	069	300	Salts and uranium oxides filtered out of the floor drainage system (damp-dry).		I		I	N/A	EPA 1310	Simple random ASTM D346-75	B
Off-specification uranium tetrafluoride (UF4)	082	40	Uranium fluoride, a green, dry homogeneous, uniform particle powdered salt which does not meet product specifications.	I			I	N/A	N/A	N/A	N/A

* Volumes from "Material Characterization Support, Low Level Waste Processing and Shipping Systems". Martin Marietta. April, 1986. (unless otherwise noted)

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TABLE 1
HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Sludges from RMI	041 042 068	90	Oily and non-oily sludges from extrusion.		X		X	N/A	EPA 1310	Simple random ASTM D346-75	A
Contaminated oily Hilco cake	020	2	Hydrocarbon cutting oil from machining operations, containing uranium oxide, filtered to a damp-dry sludge; could contain some unoxidized uranium metal fines.		X		X	N/A	EPA 1010 EPA 1310 EPA 8010 EPA 8015 EPA 8020 EPA 8100	Simple random ASTM D1452-65	A
Wet magnesium fluoride (MgF_2), drum residues from decontamination	021	30	Damp magnesium fluoride from drum washing operations.		X		X	N/A	EPA 1310	Simple random ASTM D1452-65	C
Oily sludges containing high free metal	041	26	Similar to MTC 020 above but does contain unoxidized uranium metal.		X		X	N/A	EPA 1310 EPA 3050 EPA 8010 EPA 8015 EPA 8020 EPA 8100 EPA 1010	Simple random ASTM D1452-65	A
Non-oily sludges	042	2	Damp dry sludges from clean-up and floor drain sources, containing miscellaneous process salts and oxides.		X		X	N/A	EPA 1310 EPA 3050 EPA 1010	Simple random ASTM D1452-65	A
Non-oily sludge, containing high or low metal	046	20	Similar to MTC 042 but containing unoxidized uranium metal.		X		X	N/A	EPA 1010 EPA 1310 EPA 3050	Simple random ASTM D1452-65	A

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TABLE I
HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Uranium metal	055 056	115	Massive metal scrap.	X			X	N/A	N/A	N/A	N/A
Dust collector residues containing high fluoride	062 135	430	Magnesium and uranium fluorides similar to MTC 065		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D2234-76	C
Dust collector residues containing high fluoride-pyrophoric	064	0.5	Similar to waste number 15, but containing metallic magnesium and/or uranium fines.		X		X	X	EPA 1010	Simple random ASTM D2234-76	C
Dust collector residues-low flouride	132	100	Uranium oxide fines not containing much uranium fluoride.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D2234-76	C
Non-briquettable chips and turnings	107 110	65	Metallic uranium chips and turnings too small to inter-mesh in the briquetting operation; may be oily.	X			X	N/A	N/A	N/A	N/A
Wet crushed magnesium fluoride slag from pot blow-outs	057	2	Magnesium flouride (damp) resulting from furnace failure; chunky material less than 1" in size (top failure).		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C
Dry crushed magnesium fluoride slag from pot blow-outs	077	2	Same as MTC 057 but the magnesium fluoride was not wetted by the cooling water system (bottom failure).		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C

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TABLE I
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WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Unfired reduction charges and magnesium fluoride from liner cave-ins	079	4	A mixture of powdered magnesium fluoride, magnesium metal pellets, and uranium fluoride.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D420-69	C
Contaminated magnesium	019	2	Magnesium metal pellets separated from the mixture described in MTC 079		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C
Contaminated combustibles	027	2	Paper, wood, cloth, etc. contaminated with uranium.		X		X	N/A	N/A	N/A	A
Contaminated non-combustibles	025 028	3	Scrap sheet metal, broken tools, old wire, control instruments, gages, etc. contaminated with uranium.		X		X	N/A	N/A	N/A	B
Dust collector bags	029	>2	Wool cloth bags lined with the process salts and uranium oxide fines.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D1452-65	C
Rockwell cleanings and spills	070 071	30	Cleanings from an industrial furnace; uranium oxides, broken fire brick, etc.		X		X	N/A	EPA 1010 EPA 1310 EPA 3050	Simple random ASTM D420-69	C
Bad reduction-no derby formed	084	1	The malfunction of a reduction operation; like MTC 079 however, the reaction may have proceeded to produce some uranium metal.		X		X	N/A	EPA 1010 EPA 1310 EPA 3050	Simple random ASTM D420-69	C

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TABLE 1

HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCESS	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Solid metal with imbedded steel (RMI)	119	1	Uranium metal with steel imbedded.	X			X	N/A	N/A	N/A	N/A
Dirty prill (+20 mesh) containing high uranium and magnesium fluoride	129	25	Steel pellets used in a cleaning method similar to sand-blasting, contaminated with uranium oxide and magnesium fluoride larger than 20 mesh screen size.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C
Partially oxidized metals	131	2	Massive uranium metal so badly oxidized as to be unfit for recycle in metal fabrication.	X			X	N/A	N/A	N/A	N/A
Contaminated soil, bricks, etc.	011	2	From plant process area spills, leaks, etc.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D420-69	B
Sludges, salt, and chloride	044	30	Dry sodium and potassium chlorides (soft powdery form) from molten salt baths (bottom portion) contaminated with uranium.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D1452-65	A
Furnace solidified chloride salt	060	50	Same salt material as FMPC 044 but solidified in a drum as one rock-like block; a minimum of sludge and uranium.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D1452-65	B
Furnace solidified non-chloride salt	061	10	Same as MYC 060 but salt is sodium and lithium carbonate.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D1452-65	A

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TABLE 1

HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Non-recoverable contaminated trash	003	2	Same as MTC 025/028 but from a different plant area.		X		X	N/A	N/A	N/A	C
Sample bottles	014	5	Empty glass, plastic, and metal sample bottles which have been rinsed; they are still contaminated.		X		X	N/A	N/A	N/A	A
Contaminated graphite	008 017 024	20	Graphite (carbon) molds used in uranium melting and casting operations.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C
Existing incinerator ash (+20 mesh)	033	45	Ash resulting from the combustion of plant trash not contaminated with uranium, coarser than 20 mesh screen size.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C
Existing incinerator ash (-20 mesh)	032 059	Included with 033	Same as MTC 033, but finer than 20 mesh.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C
Magnesium fluoride slag	034	4400	Magnesium fluoride salt in chunky form resulting from the reduction operation, contaminated with uranium.		X		X	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C
Waste uranium metal (spills)	219	35	Uranium metal dross resulting from melting operations.	X			X	N/A	N/A	N/A	N/A

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TABLE 1
HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

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				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Scrap high temperature uranium oxide (U3O8)	101	190	Uranium (black) oxide too impure for process use.	I			I	N/A	N/A	N/A	N/A
Dry cleaning sludges	013	2	Perchloroethylene from the plant laundry.		I	I		N/A	N/A	N/A	A
Contaminated oil	015	1	Miscellaneous vacuum pump, lube, and hydraulic pump oils also contains water-soluble cutting oil.		I		I	N/A	EPA 1310 EPA 3030 EPA 8010 EPA 8015 EPA 8020 EPA 8100	Simple random COLIWASA in SW-846	A
Contaminated TBP/kerosene	022	<1	The tributylphosphate/kerosene mixture used in the extraction of pure uranyl nitrate from aqueous feed streams.		I		I	N/A	EPA 1310 EPA 3030 EPA 8010 EPA 8015 EPA 8020 EPA 8100	Simple random COLIWASA in SW-846	C
Oil MgF2	023	<1	Magnesium fluoride which became oily from leaking hydraulic systems.		I		I	N/A	EPA 3010 EPA 3050 EPA 8010 EPA 8015 EPA 8020 EPA 8100	Simple random COLIWASA in SW-846	C
Misc. samples non metalic	047	<1	Laboratory samples of process materials no longer needed (oxides, fluorides, etc.).		I		I	N/A	EPA 1310 EPA 3050	Simple random ASTM D346-75	C

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TABLE 1
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WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Calcium fluoride	058	4	A salt resulting from the neutralization of a leak from an acid tank, using lime; this is a one-time waste stream.		X		X	N/A	EPA 1010	Simple random COLIWASA in SW-846	C
Partially oxidized metal with thorium	080	<1	Oxidized uranium metal containing some thorium. This is a one-time waste stream from the pilot plant.	X			X	N/A	N/A	N/A	N/A
Partially oxidized metal with no thorium	081	<1	Same as waste MIC 080 with no thorium.	X			X	N/A	N/A	N/A	N/A
Alloyed uranium	139	<1	One drum containing pieces of uranium alloyed with a very low concentration of titanium and iron.	X			X	N/A	N/A	N/A	N/A
U3O8 (Black uranium oxide)	154	55	Same material as MIC 055, 056 except that the material is now fully oxidized; this practice is no longer in use.	X			X	N/A	N /A	N/A	N/A
Reject uranium oxide (UO3)	157	<1	Uranium oxide (orange powder) which does not meet process specifications.	X			X	N/A	N/A	N/A	N/A

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TABLE I
HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Depleted declad solution	001	<1	Sodium aluminate solution containing undissolved sludge.		X		X	N/A	EPA 1310 EPA 3050	Simple random COLIWASA in SW-846	B
General waste-process area (33 dumpsters/wk)	003	327	Paper, cardboard, and other combustible material possibly contaminated due to its origin in the process area; in baled form.		X		X	N/A	N/A	N/A	C
Wood	N/A	218	Old crates, pallets, skids, etc., possibly contaminated.		X		X	N/A	N/A	N/A	C
Filters	N/A	12	High efficiency particulate air filters (HEPA); an anticipated waste stream not yet generated.		X		X	N/A	N/A	N/A	C
Non-process area general waste (blue area)	N/A	61	Non-contaminated general waste from the plant support areas such as office buildings and maintenance shops; includes waste packing materials.		X		X	N/A	N/A	N/A	C
Construction materials	N/A	57	Both demolition debris, possibly contaminated, and scraps of new construction materials.		X		X	N/A	N/A	N/A	C
Cafeteria wastes	N/A	38	Paper plates, napkins, garbage, etc.		X		X	N/A	N/A	N/A	C

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TABLE I
HAZARDOUS WASTE DETERMINATION OF WASTE STREAMS AT FMPC

WASTE STREAM	FMPC MATERIAL CODE	ANNUAL VOLUME* (M. TONS)	WASTE STREAM DESCRIPTION	EXCLUDED FROM REGULATION UNDER 40 CFR PART 261.4		LISTED AS A HAZARDOUS WASTE IN SUBPART D OF 40 CFR PART 261		TO BE IDENTIFIED IN SUBPART C OF 40 CFR PART 261			SAMPLING PRIORITY
				YES	NO	YES	NO	BY KNOWLEDGE OF PROCES	BY TEST METHOD (NUMBER)	SAMPLING METHODOLOGY RECOMMENDED	
Rubbish "type 1" currently assigned to sanitary landfill	N/A	30	Metal banding, other wire, scrap sheet metal and other non-contaminated non-combustibles.		X		X	N/A	N/A	N/A	C
Spent solvent (1,1,1-trichloroethane)	013	1100 lbs.	Dirty degreasing solvent arising from the plant maintence activities.		X	X		N/A	N/A	N/A	C
Spent Eutectic salts (BaCl, KCl, NaCl)	N/A	50,000 lbs.	Waste salts from RMI.		X	X		N/A	EPA 1310 EPA 3050	Simple random (ASTM 420-69)	C
Spent Solvent (methylene chloride, and perchloroethylene) (from RMI)	N/A	1300 lbs.	Toxic wastes received from an outside supplier (RMI) for disposal.		X	X		N/A	N/A	N/A	C
Oily sludges	039		Water soluble cutting oil, grade SUN 031.		X		X	N/A	EPA 1310 EPA 3050 EPA 8010 EPA 8015 EPA 8020 EPA 8100	Simple random COLIWASA in SW-846	A

* Volu ..e " Material Characterization Support, Low Level Waste Processing and Shipping Systems ". Martin Marietta. April,1986. (unless otherwise noted)

test data or data resulting from unapproved EPA testing methods. Sampling methodologies for these wastes have been provided in Table 1. Further waste sample analysis by approved EPA methods will take place for the final determination of hazardous status.

A priority ranking for sampling was established for these 49 waste streams to determine which should be sampled first. Priorities of high (A), medium (B), and low (C) were assigned to these streams with the high (A) priority streams to be sampled first. This ranking was based on the following waste stream parameters: 1) volume of waste generation, 2) schedule of next generation of each waste stream, 3) potential of each stream to contain hazardous characteristics/constituents, and 4) results of previous sampling.

3.2 Stored Wastes

Wastes from onsite operations are presently stored in drums until appropiate plans for disposal are finalized. The number of waste drums listed in Table 2 is divided into process and general wastes. Sufficient information is not available at this time, to make a final RCRA determination, therefore a sampling program will be initiated. A specific number of drums, inventory quantities, product material, and lot numbers will be selected for the waste characterization sampling program.

Drummed process waste originates from the waste streams identified in Table 1. Drums of depleted waste or waste otherwise scheduled for disposal includes raffinate, sludge leach cake, depleted residue, other remelt metal, and a limited quantity of waste received from another DOE facility. There are approximately 35,000 drums of this classification of waste. The general drummed waste includes gloves, glass, concrete, and other products segregated in the processing facilities. Approximately 2500 drums of this material is onsite.

A sampling program will be conducted to characterize the stored waste drums. Inventory data will be analyzed to develop an adequate sampling program by direct drum sampling or sampling appropiate production runs when waste is being generated. A final determination of the hazardous status of these wastes will be made following receipt of test data gathered during the waste analytical program.

TABLE 2

APPROXIMATE WASTE DRUM INVENTORY*

MATERIALS	DRUMS
Process waste:	
Raffinate, sludge leach cake, etc.	34,800
General waste:	
Gloves, glass, concrete, etc.	2,450
Total	37,250

*April 1986-excludes recoverable inventory

4.0 RECOMMENDATIONS

Because of the uncertain hazardous nature of many of the waste streams at the FMPC, a detailed sampling program will be designed and initiated. Information gathered during this sampling program will be utilized to make the determination of all waste streams. In addition, it will be used in the Remedial Investigation and Feasibility Studies (RI/FS) to be completed later in this compliance program.

Sampling of waste stream material will be conducted as detailed in a work plan to be submitted to EPA by October 15, 1986. This plan will identify the scope of activities to be conducted including sampling schedule, sampling locations, sampling methodologies, laboratory test procedures, sample chain of custody, quality assurance program, and anticipated reporting formats.

4.1 Sampling Schedule and Locations

Upon EPA approval of the work plan, sampling of the identified process waste streams will be conducted. Since the facility is not designed to produce all waste streams on a continuous basis, waste sampling will be scheduled as that waste stream is generated. The sampling priority established in Table 1 will be followed.

Sampling of stored wastes will be conducted concurrently with the priority waste streams mentioned above. This sampling program will be developed with consideration for the physical location and accessability of the drums, or if possible, utilization of a production waste stream to characterize drummed waste.

It is anticipated that all sampling will be completed within one year from the date of the EPA approved work plan.

4.2 Sampling Methodologies

Specific methodologies and analysis procedures for each identified waste stream will comply with requirements of 40 CFR 261 Subpart C and appropriate appendices as presented in Table 1. The sampling analytical methodologies presented in Table 1 will form the basis of the work plan to be developed. Statistical confidence will be considered for the adequacy of sampling each process waste stream and stored waste.

The following methods will be used to conduct the analysis of the waste streams identified in Table 1.

Analysis Methods - Characteristics of Hazardous Waste

TITLE	METHOD NO. (EPA/ASTM)
Ignitability	1010
Corrosivity	1110
Extraction Procedure Toxicity Test	1310 (metals)
Acid Digestion of Sludges	3050
Acid Digestion of Oil, Grease or Gas	3030
Halogenated Volatile Organics	8010
Non-Halogenated Volatile Organics	8015
Aromatic Volatile Organics	8020
Polynuclear Aromatic Hydrocarbons	8100
Mixed Wastes (U-Isotopes)	600

4.3 Quality Assurance

The approach and methods of quality assurance will include the following factors:

A. QA organization and responsibilities;
B. Representative sampling procedures;
C. Chain of custody procedures and documentation;
D. Instrument calibration procedures;
E. Analytical procedures;
F. Data analysis, reporting and recording procedures;
G. Internal QC checks;
H. Performance and system audits;
I. Preventive maintenance procedures; and
J. Specific procedures to routinely assess precision, accuracy, completeness, compatibility and representativeness.

These quality assurance programs-procedures will be used to ensure that all information, data and resulting decisions completed under the work plan will be appropriate for the RCRA determination.

RESPONSE TO FFCA

Item A.2 Commence a hazardous waste analysis program for materials in the landfill and going to the incinerator.

Response: Materials in the landfill (Pit No. 4) will be characterized by the sitewide RI/FS. The Characterization Investigation Study (CIS), which is a part of the RI/FS, will specifically investigate the pit area at the FMPC. The CIS was initiated in March, 1986. A comprehensive workplan is currently being prepared for the CIS. Tentatively, the site investigation of the pit area (indluding sampling of the landfill contents) is scheduled to be initiated in September of 1986.

Operation of the incinerator (oil burner) at the FMPC was discontinued by WMCO on May 7, 1986 as a result of an internal audit of the facility. No waste materials are currently being incinerated at the burner. Waste oil inventories, slated for future incineration at the facility, will be sampled and sent to an analytical lab for testing. All samples will be analyzed for hazardous characteristics and selected hazardous constituents. Analytical results on the waste oil samples will be provided to USEPA after receipt and approval by the DOE.

Operation of the incinerator will not resume without the specific authorization of the DOE.

RESPONSE TO FFCA

Item A.3 Update the operating records . . . pursuant to 40 CFR 265.73 and 265.309.

Response: In accordance with 40 CFR 265.73, General Facility Standards, the operating records of each RCRA facility at the FMPC include a copy of the Part B application, which contains waste descriptions and maps showing the location of waste stored or disposed on site. In addition, the operating record format has been revised to meet the requirements of 40 CFR 265.73.

Attached (Att. A.3-1) is a sample of the newly drafted hazardous waste receipt/transfer log, which will record the EPA Hazardous Waste Code, physical state, and description of the method(s) used to treat, store, or dispose of the material. This log will be employed at all FMPC RCRA facilities.

40 CFR 265.309 requires that for hazardous waste landfills, an operating record be maintained which includes a map of each cell and a listing of the contents and approximate location of each hazardous waste type. The FMPC facility of concern is Pit 4. Attachment A.3-2 describes, to the extent known, the quantities and location of hazardous waste within Pit 4.

Attachments: A.3-1 Revised Material Receipt/Transfer Log

A.3-2 Landfill (Pit 4) Operating History

RESPONSE TO FFCA

Item A.3 Update the operating records . . . pursuant to 40 CFR 265.73 and 265.309.

Response: In accordance with 40 CFR 265.73, General Facility Standards, the operating records of each RCRA facility at the FMPC include a copy of the Part B application, which contains waste descriptions and maps showing the location of waste stored or disposed on site. In addition, the operating record format has been revised to meet the requirements of 40 CFR 265.73.

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40 CFR 265.309 requires that for hazardous waste landfills, an operating record be maintained which includes a map of each cell and a listing of the contents and approximate location of each hazardous waste type. The FMPC facility of concern is Pit 4. Attachment A.3-2 describes, to the extent known, the quantities and location of hazardous waste within Pit 4.

Attachments: A.3-1 Revised Material Receipt/Transfer Log

A.3-2 Landfill (Pit 4) Operating History

FMPC
WASTE MANAGEMENT DEPARTMENT- HAZARDOUS WASTE CONTAINER STORAGE FACILITY
MATERIAL RECEIVED/TRANSFERRED LOG

MANIFEST/ LOT AND DRUM #	DATE	INITIALS	MATERIAL	COMMON NAME	EPA #	PHYSICAL STATE	QUANTITY	DISPOSITION /EPA CODE	LOCATION	COMMENTS
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										
A. B.										

A. = RECEIVED
B. = TRANSFER

Attachment A.3-2

LANDFILL (PIT 4) OPERATING HISTORY

Pit No. 4 at the FMPC was constructed in 1960 at a cost of $35,716. The pit was constructed by excavating into the underlying blue clay strata to provide an impervious material for lining the pit walls and bottom. A minimum of 12 inches of compacted clay was added to line the inner slopes of the pit walls. The maximum depth of Pit 4 was 24 feet with a total volume of 53,000 cubic yards.

Pit No. 4 was employed as a dry chemical pit at the FMPC. Dry solid residue material from miscellaneous FMPC operations was trucked out to the pit, dumped from a concrete pad, and pushed into the pit by a bulldozer. Rainwater which collected in Pit No. 4 was drained to Pit 3 until it became filled in 1977. Currently, rainwater collected at Pit 4 is conveyed to either FMPC Pit 5 or Pit No. 6 and cycled through the waste treatment ponds.

The pit has received the following low level radioactive wastes: process residues, scrap graphite, non-burnable trash and asbestos. Records show Pit 4 to contain approximately 3,000,300 kg of uranium and 61,700 pounds of thorium. Between May, 1981 and April, 1983, Pit No. 4 received approximately 23,500 pounds of uranium contaminated eutectic salts containing barium chloride. No detailed inventory or residue location map exists for the materials stored in Pit 4.

RCRA groundwater monitoring wells have been constructed at Pit 4. Currently, one round of groundwater samples have been collected and analyzed for 93 radiological and chemical parameters.

Pit No. 4 is currently inactive. No materials are presently deposited in the facility.

RESPONSE TO FFCA

Item A.4 Include the printed full name and signature of the person receiving hazardous waste and the date.

Response: Hazardous wastes received at the FMPC from RMI are also contaminated with uranium, and are therefore classified as mixed waste. This material is shipped under two manifests - one for nuclear materials accountability and one for hazardous material. Manifests are signed by the transportation personnel who receives the shipped drum(s). The completed manifest will include the printed full name, and signature of the receiver, and the date of receipt. The sequence of events for receiving hazardous waste shipments is outlined in the following attachment.

Attachment: Sequence of Events for Handling Hazardous Waste Receipts.

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SEQUENCE OF EVENTS FOR HANDLING HAZARDOUS WASTE RECEIPTS

1) The Shipper calls ahead of the shipment and informs FMPC of the hazardous waste to be shipped.

2) FMPC checks with the personnel involved with the hazardous waste if space is available to receive the waste.

3) After the shipment is approved by the FMPC, the shipment is sent.

4) Transportation at the FMPC receives and checks the shipment. Transportation also signs the manifest.

5) The original manifest is sent back to the shipper and copies are sent to all plants which will be involved with the hazardous waste. Transportation keeps a copy for their records.

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RESPONSE TO FFCA

Item A.5 Update the facility closure plan to reflect the year the facility expects to begin closure.

Response: The following addition has been proposed for the FMPC hazardous waste facility closure plan:

EXPECTED YEAR OF CLOSURE

The FMPC is assumed to always remain under the permanent care of the U. S. DOE or other authorized federal agency. The hazardous waste units listed in this submittal (with the exception of Pit 4) will be necessary to plant operations as long as present DOE missions are carried out at the site. The closure plans presented herein represent partial closure or closure of a contingency nature necessary to meet the intent of RCRA regulations. Final closure of the units will occur as part of decontamination and decommissing the entire FMPC facility. Current DOE planning studies project production activities at the FMPC for at least 50 years. The year 2035 may, therefore, be used as an estimated date of closure for the FMPC hazardous waste units.

RESPONSE TO FFCA

Item A.6 Collect runoff from the active portions of the landfill . . .

Response: A plan for the interim control of surface runoff from Pit 4 has been developed and implemented (see attached).

Attachment: Report - "Landfill (Pit 4) Interim Surface Water Runoff Control Plan"

LANDFILL (PIT 4)

INTERIM SURFACE PLAN

RUNOFF CONTROL PLAN

TABLE OF CONTENTS

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- 5.1 Surface Water Runoff Analysis
- 5.2 Berm Containment Area
- 5.3 Peripheral Road Ditches
- 5.4 Adequacy to Control Runoff
- 5.5 Maintenance Procedures

6.0 CONCLUSIONS

1.0 INTRODUCTION

The Department of Energy (DOE), as the facility landfill operator, is required to adopt procedures to "Collect run-off from the active portions of the landfill as required by the Resource Conservation and Recovery Act (RCRA) 40 CFR 265.302(b)". Other requirements are also applicable to surface water control at the landfill (Pit 4). The regulations stipulate:

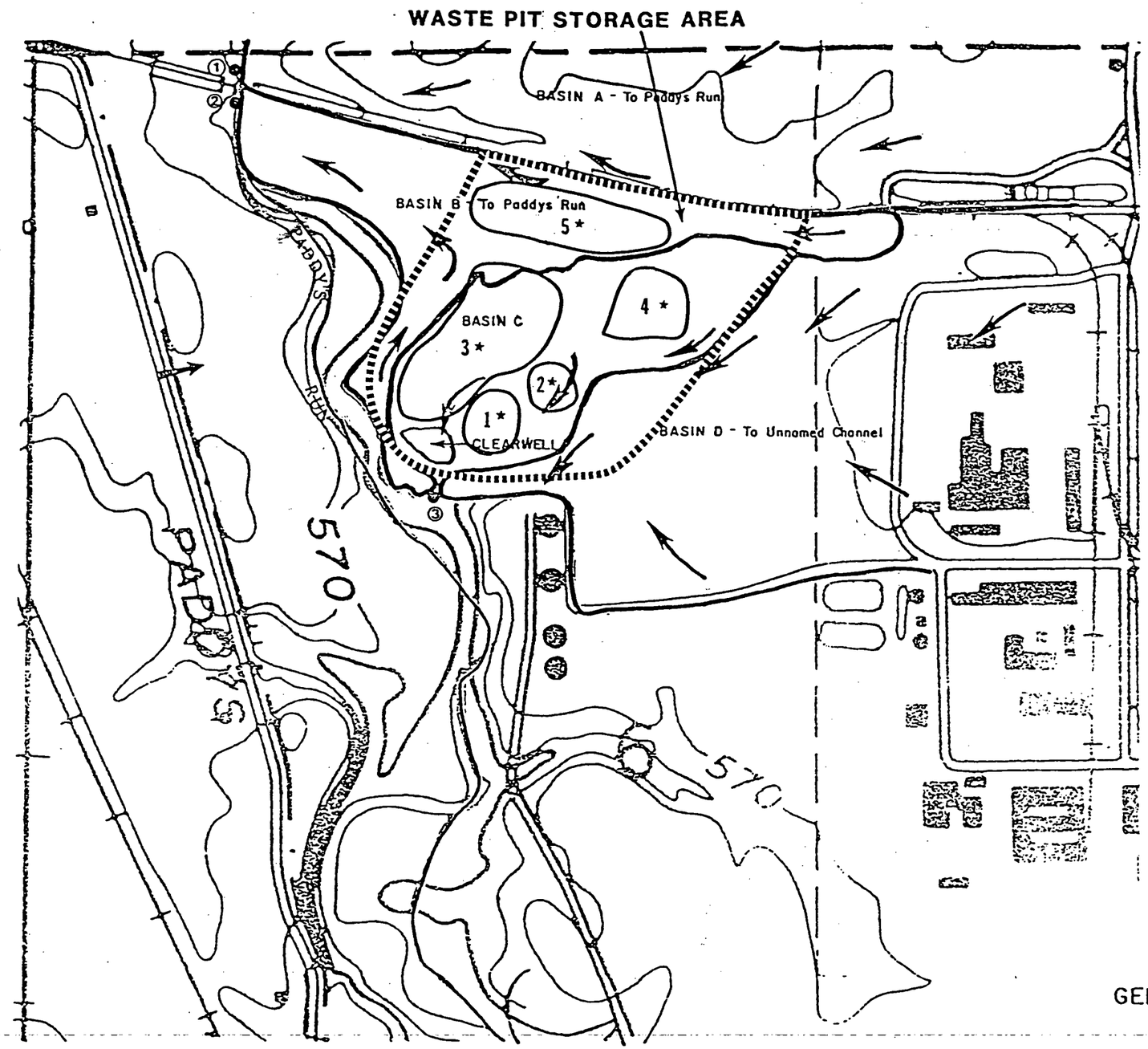
a) The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 25-year storm (40 CFR 265.302 [a]);

b) The owner or operator must design, construct, operate and maintain a runoff management system to collect and control at least the water volume resulting from a 25 year, 24 hour storm (40 CFR 265.302 [b]); and,

c) Collection and holding facilities (e.g., tanks or basins) associated with run-on and runoff control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system (40 CFR 265.302 [c]).

The landfill (Pit 4) (Figure 1) occupies an area of approximately 2.5 acres located in the northwest portion of the facility. The landfill is located between Pit 6 and Pit 3 and was used to dispose of solid waste from the processing facility. The landfill is not currently active and has been partially backfilled, graded and covered with fill material. The landfill is known to have received an EP toxic (Barium) hazardous waste and is currently being studied to determine whether the site contains other hazardous wastes as defined by RCRA. During the evaluation process, the operator has adopted water control management procedures to minimize potential offsite surface water impacts and to comply with RCRA surface water control design criteria.

Drainage patterns in the Waste Pit Storage Area are illustrated in Figure 1. The majority of surface runoff from the pits, pads, and berms in this area is routed into the Clearwell where it is



EXPLANATION:

① ● DISCHARGE POINT FOR BASIN A
② ● DISCHARGE POINT FOR BASIN B
③ ● DISCHARGE POINT FOR BASIN D

NOTE: Basin C discharge point is to clearwell.

(1*) APPROXIMATE BOUNDARY OF WASTE PIT

GENERALIZED SURFACE WATER FLOW PATTERNS

REFERENCE: BASE MAP TAKEN FROM U.S.G.S. 7.5' TOPOGRAPHIC MAP, SHANDON, OHIO (1981) QUADRANGLE

THE SURFACE WATER FLOW PATTERNS SHOWN REPRESENT AN EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON PRESENTLY AVAILABLE DATA. VARIATIONS FROM THESE CONDITIONS MAY OCCUR.

FIGURE 1

held prior to discharge to the Great Miami River. However, water from three of the four small drainage basins in the Waste Pit Storage Area is conveyed to Paddy's Run at the three points as shown on Figure 1; the fourth drainage basin empties into the Clearwell.

The RI/FS currently underway on the Waste Pit Storage Area will recommend remedial alternatives for these three small sub-basins. Under normal conditions, runoff from Pit 4 formerly flowed to the Clearwell; however, the drainage ditch is not adequately sized to contain the flow from a 25 year storm from both Pit 4 and the rest of drainage basin C. In order to comply with the requirement of 40 CFR 265.302 (b), an external berm has been constructed to segregate and contain runoff from Pit 4 for separate routing through the waste treatment pits to the Clearwell.

The following demonstrates that the landfill is designed, constructed and managed in accordance with DOE/EPA surface water runoff compliance agreement criteria and applicable RCRA regulations.

2.0 APPROACH AND OBJECTIVES

Surface water protection is an integral component of the overall design and operation of the landfill. The primary mechanism of water resource protection will be strict adherence to the following plan to segregate, contain, and convey potentially contamininated stormwater runoff. Within the immediate area of the landfill, stormwater runoff may be contaminated or uncontaminated depending on the area drained. Stormwater handled as a contaminated waste includes all run-off that has the potential for direct contact with suspected hazardous material or residue and other unexposed waste within the landfill. Uncontaminated stormwater generated above or adjacent to the landfill will be conveyed or directed around the landfill (Pit 4).

The existing surface water control strategy for the landfill (Pit 4) is based on the following assumptions:

1. The control system is designed to control, contain and treat the total and peak flow from the 25 year 24 hour storm event;

2. The system is designed to divert uncontaminated surface water runoff from the 25 year 24 hour storm, around the landfill; and

3. The system is designed and maintained to remove collected contaminated surface water runoff from the structure in order to maintain the storage design capacity and to minimize the potential for surface water infiltration.

3.0 METHODS

The landfill surface water control plan is designed in accordance with standard design practices. The determination of peak discharge flow rates was based on Technical Publication (TP-40), where the rainfall depth for the 25 year 24 hour storm event was estimated to be 4.5 inches. The procedures used to determine peak and total flow rates of runoff are those contained in the SCS National Engineering Handbook, Section 4, Hydrology (NEH-4); and SCS Technical Release 55, Urban Hydrology for Small Watersheds (TR-55).

Ditch volume calculations were based on the SCS method assuming the soils within the study area resemble the hydrologic soil group C in runoff response. The runoff curve numbers (RCN) used were obtained from TR-55, assuming the composite land use classification is rated as pasture-poor cover. The analysis yielded RCN's of 68 to 89 for various areas based on antecedent soil moisture condition III (Saturated Soils).

The adopted surface water design features are as follows:

Run-on Controls: There are two run-on controls in place at Pit 4. They consist of:

1. A series of drainage ditches which divert run-on along the east and south sides of the Pit. These ditches prevent run-on of surface flow from adjacent access roads, from Pit 6 and from undeveloped land to the south of Pit 4. The ditches will convey the peak flow from a 25 year 24 hour storm event where surface water flow velocities are equal to or less than 5.0 feet per second.

2. An approximately 4 foot high earthern berm located along the north and west sides of Pit 4. This berm prevents run-on to Pit 4 from the eastern sides of Pits 3 and 5.

Runoff Controls: There are three runoff controls in place at Pit 4. They consist of:

1. An internal drainage system formed by placement of waste and cover material to minimize ponding within Pit 4. If ponding of surface water (precipitation) does occur, standing water is pumped to Pit 5 or 6 for inclusion in the FMPC waste water treatment flows. The system will control, contain, and convey the peak flows and total runoff from the 25 year 24 hour storm event.

2 A two foot perimeter (berm elevation on the 584 foot contour) berm around the landfill located to convey, contain and treat surface water. The perimeter containment berm is located to

contain runoff from the northwest corner of the landfill where runoff from inside the pit boundary occurs. The berm location and design is based on the "worst-case" assumption that the area within the berm is impervious and where all rainfall within this drainage area is collected inside the berm.

3. A sump and portable sump pump to convey collected surface water flow from within the perimeter berm drainage area to either Pit 5 or the the Dry Residue Pit No. 6 for inclusion in the FMPC waste water treatment flows.

4.0 OTHER CONSIDERED DISIGN ALTERNATIVES

Surface water runoff control planning activities included an evaluation of the feasibility of lining the existing landfill area. This alternative was eliminated because the existing landfill has received hazardous waste and may require additional studies prior to closing the facility. If a liner is installed, the existing topographic surface would require extensive grading, and would require the placement of material suitable to serve as the liner foundation. If a liner is installed, additional material will be required to anchor the liner, after which a surface water control plan would have to be adopted. Since current landfill site characterization studies are required to comply with the signed Federal Facility Compliance Agreement, the installation of a liner could perclude further studies and could preempt the adoption of an alternative waste mitigation and/or closure plan.

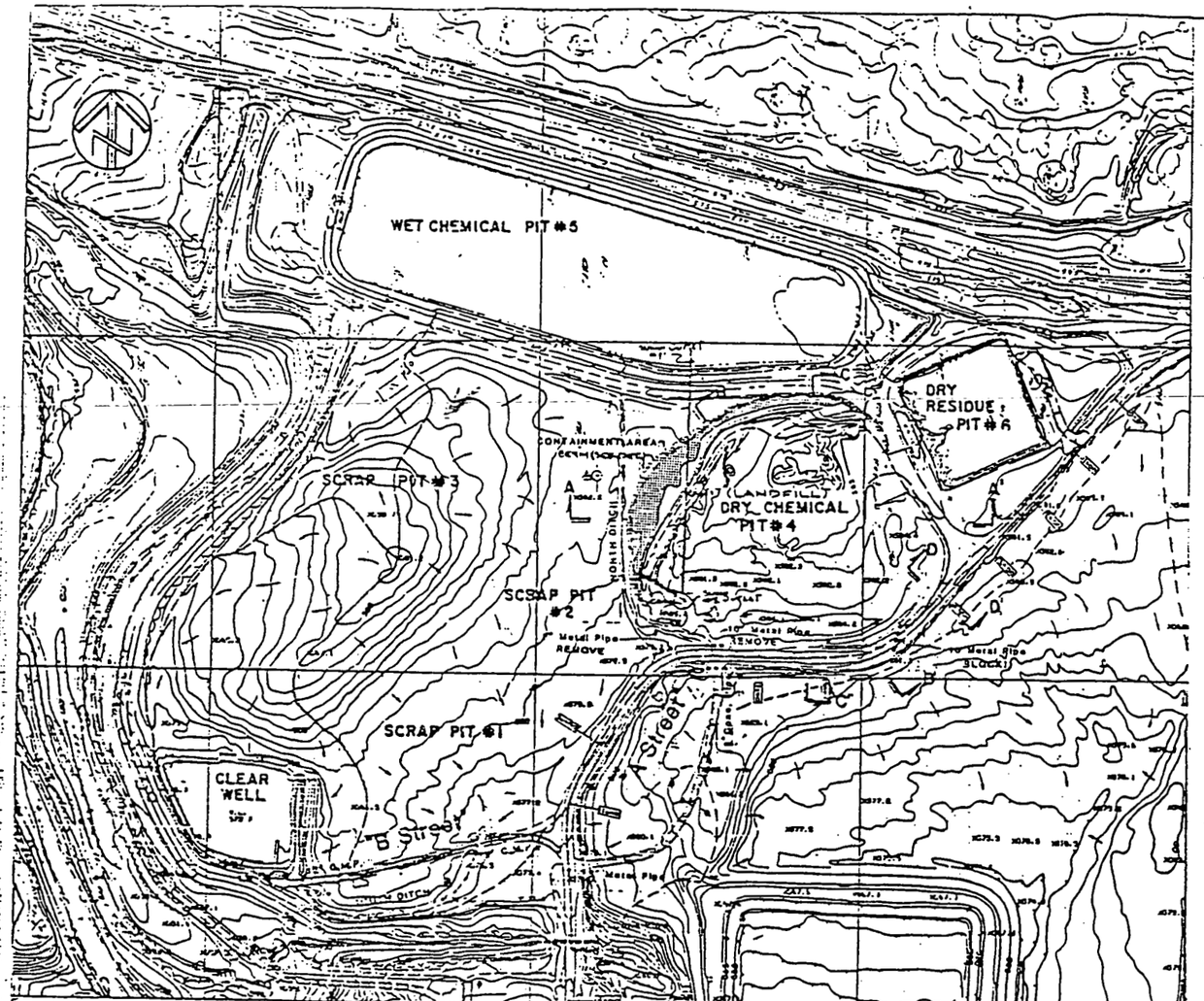
5.0 SURFACE WATER CONTAINMENT STRATEGY

A storm water containment strategy has been adopted for the disturbed landfill area. The existing topography effectively drains to a sump located in the southwest corner of the landfill (Figure 2). In addition, in areas that are not internally drained within the landfill, potentially contaminated surface water runoff from the disturbed area will be controlled and contained by the external berm and a sump pump.

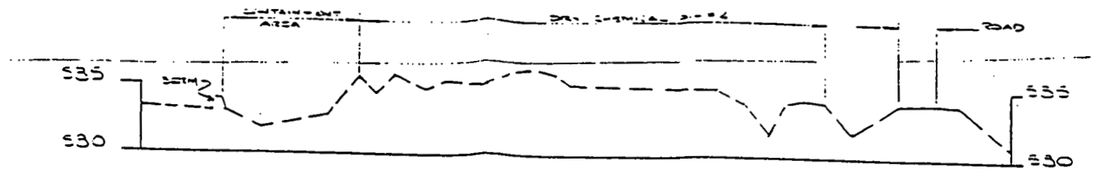
All non-contaminated surface water will be diverted away from the landfill area, conveyed and discharged in accordance with approved procedures.

5.1 Surface Water Runoff Analysis

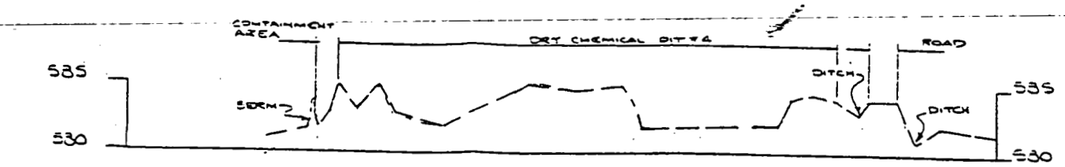
The storm water control strategy assumes all water falling within the pit is conveyed to the sump located in the southwest corner



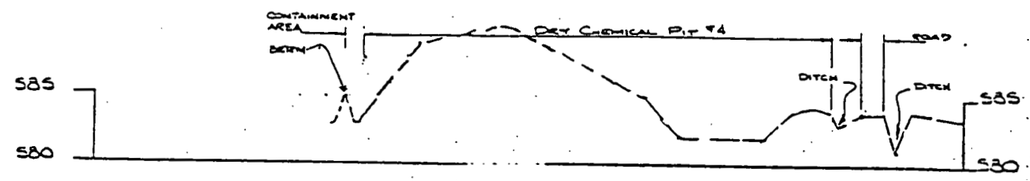
SITE PLAN
SCALE: 1" = 100'



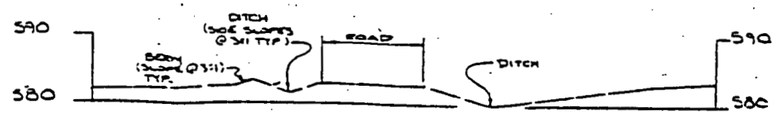
SECTION A-A'
SCALE: 1" = 50' (HORIZ.)
1" = 5' (VERT.)



SECTION B-B'
SCALE: 1" = 50' (HORIZ.)
1" = 5' (VERT.)



SECTION C-C'
SCALE: 1" = 50' (HORIZ.)



SECTION D-D'
(Typical Road Ditch Detail)
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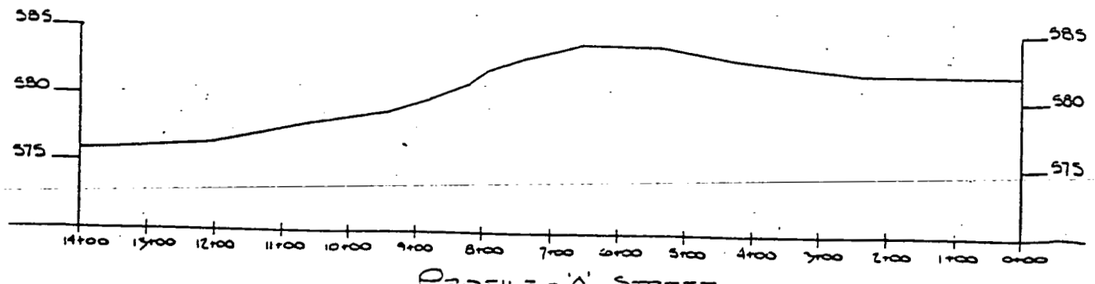
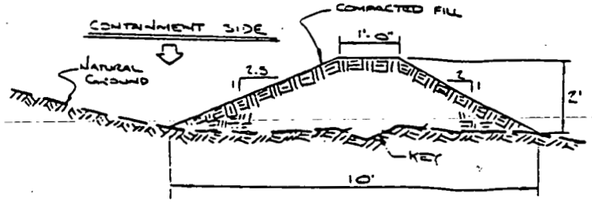


PROFILE - 'A' STREET
SCALE: 1" = 100' (HORIZ.)
1" = 5' (VERT.)



Typical Berm Detail
(N.T.S.)

REDUCED DRAWING!
DO NOT SCALE –

DESIGNED:	ADVANCED SCIENCES INC.
DRAWN BY: PACKER	INTERIM RUN-OFF CONTROL PLAN LANDFILL – PIT #4
CHECKED BY:	
DATE:	(FIGURE 2)

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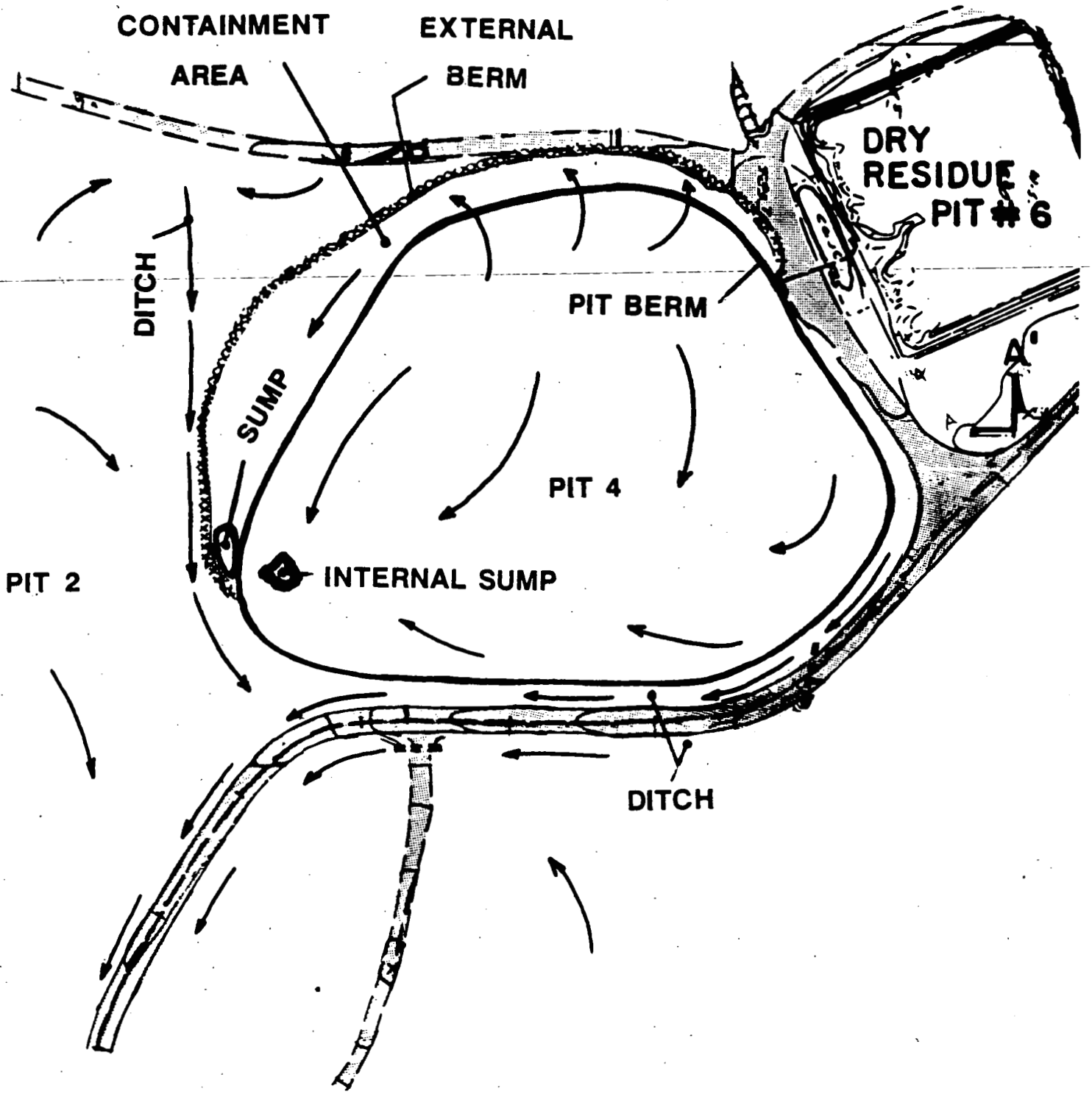

FIGURE 2
(DETAIL)

of the landfill. In the event of a 25 year 24 hour storm, approximately 0.90 acre feet (294,000 gallons) will be collected in the pit where the depth of the water in the pit will be approximately 1.5 to 2.0 feet.

The "worst case" scenario is based on the following calculations.

Rainfall= 4.5 inches
Runoff= 100 %
Drainage Area = 2.3 acres
Surface Runoff= 4.5 in/12 ipf x 2.3 acres =0.90 acre feet (294,000 gallons)

The sump has a capacity to contain approximately 1.5 acre feet prior to discharging to the adjacent drainage.

5.2 Berm Containment Area

The landfill berm containment area is designed to control surface water runoff from the area between the landfill and Wet Chemical Pit No. 5 (Figure 2) where surface water from the land fill cover is externally draining to the adjacent drainage area. The berm is located to collect surface water that could potentially be contaminanted in the event of a 25 year 24 hour storm event. The berm is located and designed to contain the total volume from the design storm event and designed with at least a one foot free board. Contained water is conveyed to the sump area located adjacent to the landfill interior sump.

The berm containment drainage area is approximately 0.60 acres. Runoff from the design storm from this area is approximately 0.23 acre feet (75,000 gallons) and will have a ponded depth of approximately 0.75-1.0 feet. The ponded area will have a surface area of approximately 0.20--0.30 acres. Water will be ponded behind the berm and pumped from the berm containment sump and conveyed to Pit 5 or 6 (Figure 2).

5.3 Peripheral Road Ditches

Landfill ditches are designed with the capacity to convey the peak flow from the 25 year 24 hour storm event. The ditches are designed with a berm located immediately adjacent to the landfill with ditch drainage grade lines located adjacent to the berm. Surface water flow is conveyed around the landfill and conveyed through the approved drainage plan structures. The peak flow from the 25 year storm for the drainage area above the landfill is extremely small (less than one acre). Since the area is so small, the ditch is designed to convey a 2 cubic feet per second peak flow. Assumptions for the ditch, assuming a triangular configuration with 3:1 side slopes and a depth of 1.0 foot, include:

Peak flow = 2 cubic feet per second
Triagular Ditch Width = 6.0 feet
Ditch Configuration= 3:1 Side Slopes
Ditch Depth= 1.0 feet
Ditch Grade= 0.05 percent
Mannings Roughness Coefficient= 0.022
Flow Results
Depth of Flow=0.37 feet
Flow Velocity=4.8 feet per second
Froude Number=2.0

5.4 Adequacy to Control Runoff

The Landfill (Pit 4) drainage control plan incorporates a strom water containment strategy controlling surface water runoff from the landfill disturbed area in accordance with the criteria outlined in 40 CFR 265.302(b). In addition, the water control structures are constructed using standard engineering criteria and designed with appropriate freeboard and safety features.

5.5 Maintenance Procedures

The following routine maintenance activities will be periodically implemented to ensure the landfill surface water runoff control structures are functioning as designed:

1. Conduct routine field surveys to identify berms, ditches or sumps that may require repairs, modification or cleaning;

2. Periodically maintain sump pumps, and discharge pipes;

3. Conduct periodic field surveys of berms, ditches where seeps or springs have developed; and

4. After rainfall runoff events, ensure water collected in pit sumps are conveyed to Pit 5 or 6 within 72 hours after the designed storm runoff event. Prior to pumping, surface water samples will be obtained and analyzed to determine whether collected water may contain RCRA listed hazardous waste constituents. In the event listed wastes are identified, WMCO will adopt an appropriate waste control treatment process prior to pumping runoff effluent to Pits 5 or 6.

6.0 CONCLUSIONS

The surface water control is designed and constructed to contain all surface water runoff from the 25 year 24 hour storm event and is in compliance with applicable RCRA surface water runoff control regulations and criteria.

RESPONSE TO FFCA

Item A.7 Prepare and maintain onsite a written outline for a groundwater quality assessment program . . .

Response: A groundwater quality assessment program for Pit 4 has been prepared (see attachment).

FEED MATERIALS PRODUCTION CENTER

GROUNDWATER QUALITY ASSESSMENT PROGRAM OUTLINE

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GROUNDWATER QUALITY ASSESSMENT PROGRAM OUTLINE

1.0 INTRODUCTION

Waste Pit #4 at the Feed Materials Production Center in Fernald, Ohio is subject to regulations of the Resource Conservation and Recovery Act (RCRA). Interim status regulations (as described in Task A7 of the Federal Facilities Compliance Agreement (FFCA) are addressed by this Response which presents a Groundwater Quality Assessment Program Outline (GQAPO) prepared in conformance with 40CFR 265.93 (a). The intent of this Outline is to present a groundwater monitoring program which is capable of identifying:

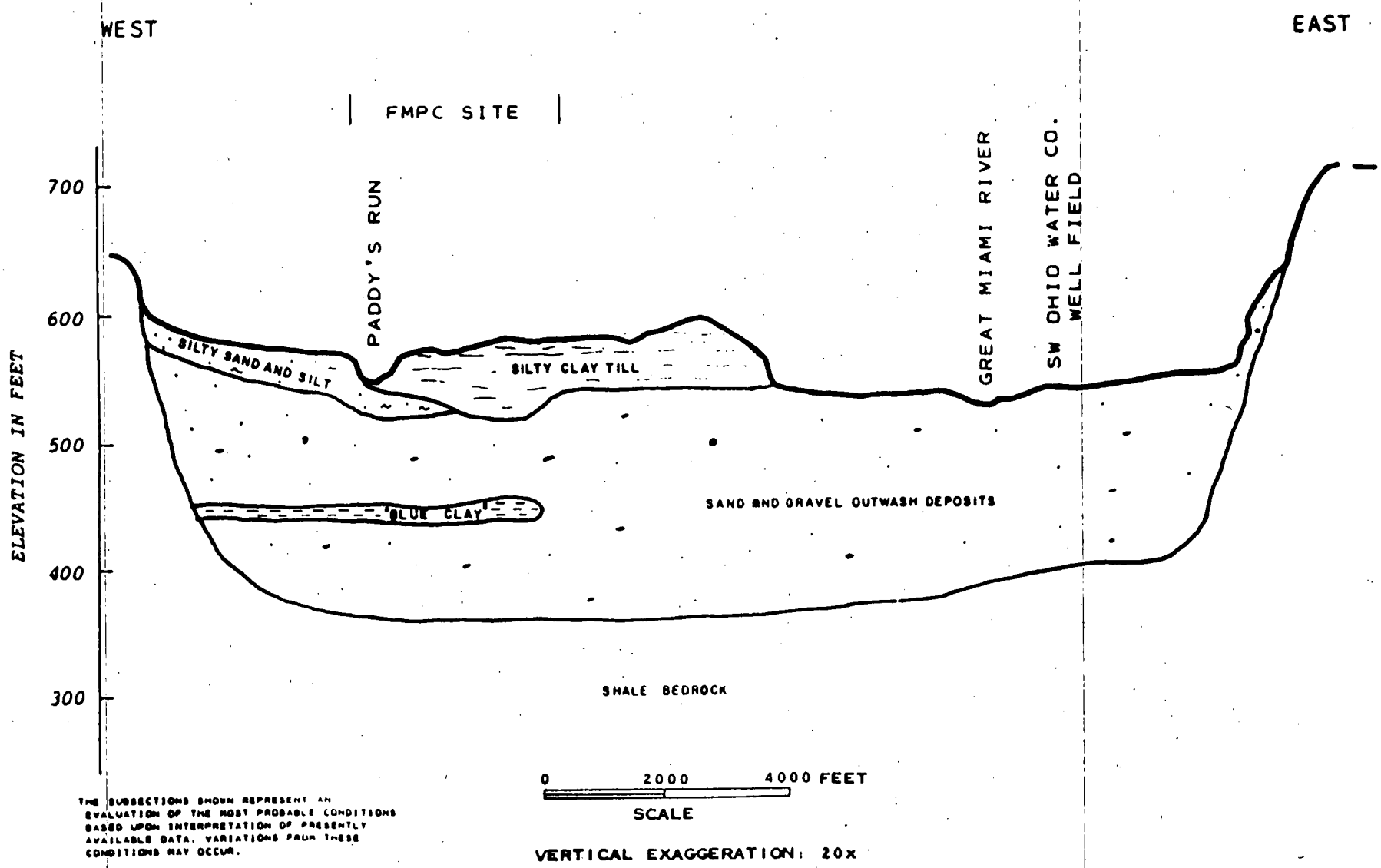
- Whether hazardous waste or hazardous waste constituents have entered the groundwater.
- The rate and extent of migration of hazardous waste or hazardous waste constituents in the groundwater.
- The concentration of hazardous waste or hazardous waste constituents in the groundwater.

In the event that implementation of the GQAPO becomes necessary, a more detailed Work Plan will be developed for review and approval by the appropriate regulatory agencies prior to GQAPO initiation. This Groundwater Quality Assessment Program Outline will be modified as necessary to address groundwater quality in each of the groundwater bearing regiemes which underly Pit 4.

2.0 FMPC GEOLOGY AND HYDROLOGY

The FMPC is located in a two-mile wide valley filled with glacial deposits. This valley parallels the Great Miami River between the towns of Ross and Hooven, Ohio. A generalized geologic cross-section for the FMPC site area is presented in Figure 1.

- In Late Ordovician time (approximately 450 million years ago) sediments which would become a predominantly flat-lying shale with thin interbedded limestone were deposited in a shallow sea. This shale (a part of the Cincinnatian Series) is the relatively impermeable bedrock which now underlies the FMPC site area.
- Sometime prior to, or perhaps contemporaneous with, Pleistocene glaciation, a large watercourse (larger than the present-day Great Miami River) cut its



THE SUBSECTIONS SHOWN REPRESENT AN EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATION OF PRESENTLY AVAILABLE DATA. VARIATIONS FROM THESE CONDITIONS MAY OCCUR.

GENERALIZED GEOLOGIC CROSS SECTION OF NEW HAVEN TROUGH

DAMES & MOORE

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FIGURE 1

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channel into this shale bedrock to a level of more than 200 feet below that of the present-day Great Miami River. This approximately two-mile wide channel (informally called the New Haven Trough) maybe an abandoned course of the ancestral Ohio River.

- During subsequent Pleistocene glacial advances and retreats across the site area (Illinoisan-approximately 300,000 years to 400,000 years ago and Wisconsinan-approximately 100,000 years ago) the New Haven Trough was filled with about 200 feet of glacial sediments. These sediments were deposited by water running from the margins of the glaciers and consisted mainly of well sorted sand and gravel. Deposited on top of these sediments was a blanket of clay-rich, relatively impermeable glacial till from a more recent event.

- Erosion by the Great Miami River and its tributaries then removed significant portions of the glacial till and left terrace remnants which stand topographically higher than surrounding bottom lands. The FMPC site lies on top of one of these terrace remnants.

2.1 SAND AND GRAVEL AQUIFER

Unconformably overlying the shale bedrock is a sequence of highly permeable sand and gravel glacial outwash deposits laid down by the meltwaters of receding continental ice sheets. These outwash deposits generally consist of an unconsolidated medium to coarse grained, olive brown 200 foot thick layer of sand and gravel. The sand and gravel layer is arranged in irregularly alternating layers of silty sand, medium to coarse sand, and medium to coarse gravel.

In the vicinity of the Waste Pit Storage Area, this layer is separated into two units by a 10 to 20 foot thick layer of greenish-black silty clay. The FMPC production wells are completed below this "blue clay" layer. This blue clay layer underlies about 360 acres of the site and apparently occurs only in the vicinity of the Waste Pit Storage Area and the production wells. It was probably deposited in an ice marginal lake or as a backwater deposit of a glacial stream. The top of this "blue clay" layer lies about 125 feet below the land surface.

Hydrologically, the sand and gravel above and below the "blue clay" layer acts as a single unit. The "blue clay" layer is not sufficiently extensive to act as an aquitard and no significant head differences exist between wells completed above and below this layer.

Transmissivities and hydraulic conductivities for the sand and gravel are reported to range from 35,000 gpd/ft to 300,000 gpd/ft and 270 ft/day to 370 ft/day respectively. Total porosities have been estimated at 25%. Average hydraulic gradients for the area measured by the USGS from water level measurements made in August, 1982 are low and were calculated to range from 0.001 ft/ft to 0.005 ft/ft. Using this data, the rate of groundwater movement (horizontal groundwater velocity) is calculated to range between 1.1 ft/day and 9.3 ft/day.

Figure 2 is a Dames & Moore water level contour map for the sand and gravel aquifer. This map shows that groundwater movement is generally to the south and east in the area around Pit 4. The upper 20 to 30 feet of the sand and gravel deposits are not saturated and water in this aquifer occurs approximately 60 to 90 feet below land surface depending upon surface elevation and thickness of till.

2.2 GLACIAL TILL

At the surface of the site and overlying the sand and gravel outwash deposits is a 20 to 50 foot thick layer of glacial till composed of a dense, olive-gray silty clay. The till varies in texture and composition both laterally and vertically and contains lenses of poorly sorted fine to medium grained sand and gravel. The base of the till occurs at about elevation of 540 ft MSL and overlies the sand and gravel outwash deposits.

To the west and south of the site, the silty clay till laterally grades into a sequence of silty sand and silt with some layers of silty clay. The silty clay till continuous to the north and east of the site and directly overlies the bedrock in these areas. In the lower reaches of Paddy's Run and the storm Sewer Outfall Ditch, the silty clay till has been eroded away and the underlying sand and gravel are exposed.

A saturated zone occurs within the silty clay till approximately 4 to 9 feet below land surface in some areas of the FMPC site. This saturated zone was encountered in three shallow wells around Pit 4 (MW-19TP, MW-21TP and MW-22TP) and is probably recharged by precipitation. It was not detected in test pits near well clusters to the east and south of the Waste Pit Storage Area. This saturated zone may be present because of vertical variations of composition and texture of the till, or near-surface weathering or desiccation induced fracturing of the till.

Aquifer testing of this saturated zone has measured hydraulic conductivities of 0.2 ft/day to 2.5 ft/day with associated transmissivities of 3.5 gpd/ft to 150 gpd/ft.

3.0 IDENTIFICATION OF WHETHER HAZARDOUS WASTE OR HAZARDOUS WASTE CONSTITUENTS HAVE ENTERED THE GROUNDWATER

This section of the Pit 4 Groundwater Quality Assessment Program Outline describes the four techniques which are used to identify whether hazardous waste or hazardous waste contituents have entered the groundwater. These techniques include: statistical re-evaluation, well re-sampling or sampling of additional wells, review of operational procedures and additional well installation.

3.1 STATISTICAL RE-EVALUATION

The use of the student's t-test is required for groundwater monitoring data under 40 CFR 265 Subpart F. However, this test, which assumes the data sets are random samples from normally distributed populations, often gives "false positives" for indicator parameters.

In the event that initial students t-test analyses of data obtained from quarterly RCRA sampling events indicate significant concentrations of hazardous waste or hazardous waste constituents, further statistical evaluation will be conducted. The Wilcoxon Two-Sample Rank Sum Test will be used as a secondary check to evaluate the significance of statistical increase.

The Wilcoxon Two-Sample Rank Sum Test can be used to identify if there is statistical difference betwen upgradient and downgradient wells. This test does not assume that the data are from normal populations. The test does assume that the data consists of two independent randon samples, sample 1 from popu- lation 1 and sample 2 from population 1 and u2 denotes the mean of population. The null hypothesis asserts that the two populations equivalent, and thus under this hypothesis ul=u2. This test is relatively insensitive to outliers (a value which is serveral orders of magnitude lower or higher than the majority of values in a set).

A kurtosis test also can be used to test the number and location of wells that could be sampled if a set of data is a random sample from a normally distributed population. The kurtosis of a distribution describes its degree of peakedness or, more exactly, its peakedness relative to the length and size of its tails. A distribution that is relatively flat and has short tails is of low kurtosis and is said to be platykurtic. A distribution with a sharp peak and long tapering tails is of high kurtosis and is termed leptokurtic. The normal distribution is considered to be of intermediate kurtosis, and is said to be mesokurtic.

A series of kurtosis tests, the Geary test, can be used for identifying if the sets of data for the downgradient wells are random samples from normally distributed populations.

The ultimate goal of the above test is to verify mathematically that hazardous waste or hazardous waste constituents have entered the groundwater. Actual implementation of the (GQAPO) as described in this document is contingent on the identification of hazardous waste or hazardous waste constituents have entered the groundwater.

3.2 WELL RE-SAMPLING OR SAMPLING OF ADDITIONAL EXISTING WELLS

Additional analytical data beyond that obtained from quarterly sampling at the facility may be necessary to confirm the presence of hazardous waste or hazardous waste constituents materials in the groundwater. Wells will be resampled in order to confirm data accuracy and repeatability if warranted.

Extensive groundwater monitoring programs are underway at the Feed Materials Production Center. Associated with these programs is the drilling and installation of numerous specifically to monitor Pit 4, a number of them could be sampled for this purpose.

The number and location of wells that could be sampled to provide supplementary groundwater quality data related to Pit 4 cannot be specified at this time. However, wells currently are available both upgradient and downgradient of Pit 4 in predominant groundwater flow directions. Groundwater sampling will be conducted with strict adherence to EPA approved procedures (Ref. 1 and 2).

3.3 REVIEW OF OPERATIONAL PROCEDURES

In the event of a statistically significant increase in water quality indicator criteria, a review of recent Pit 4 operational/disposal procedures will be conducted. This review will help assess if a change in operational or disposal practices at the Pit or the site may have effected local groundwater quality. The review will include correlation of recently disposed waste with affected water quality indicators, examination of inspection reports and manifest or log sheets for unusual occurrences, and an assessment of the physical integrity of the wells reporting the statistically significant increase. Recent weather conditions also will be evaluated as well as non-FMPC activities in the site area.

3.4 ADDITIONAL WELL INSTALLATION

Wells may be installed on-site and off-site as part of the Groundwater Quality Assessment Program if they are needed to identify whether or not hazardous waste or hazardous waste constituents have entered the groundwater. These wells would be placed so as to assist in the characterization of the source or sources of groundwater pollution. A variety of well drilling techniques are suitable to subsurface conditions. Two of the appropriate methods used successfully at the site are rotary wash or hollow stem augers (Ref. 2).

A typical well schematic is presented in Figure 2. Well pipe and screen material will be stainless steel with PVC in the unsaturated portion of the aquifer. Well screen slot size will be selected on-site according to the sediment encountered. A seal with a minimum thickness of 2 feet will be installed immediately above the sand pack which surrounds the screen. A sand/bentonite mixture will be used as backfill. To prevent the inflow of surface water along the riser pipe, a secondary seal of grout will be placed at the ground surface. Protective casings with vented locking caps also will be installed for each monitoring well.

4.0 INDENTIFICATION OF RATE AND EXTENT OF MITIGRATION OF HAZARDOUS WASTE OR HAZARDOUS WASTE CONSTITUENTS IN THE GROUNDWATER

This section of the Groundwater Quality Assessment Program Outline introduces the 5 techniques which are used to delineate the rate and extent of migration of hazardous wastes or hazardous waste constituents in the groundwater. The techniques that will be discussed are: sampling or resampling of wells, installation of additional monitoring wells, hydrologic testing of aquifer properties, computer modeling of contaminant transport and the use of geophysical surveys.

4.1 SAMPLING OR RE-SAMPLING OF WELLS

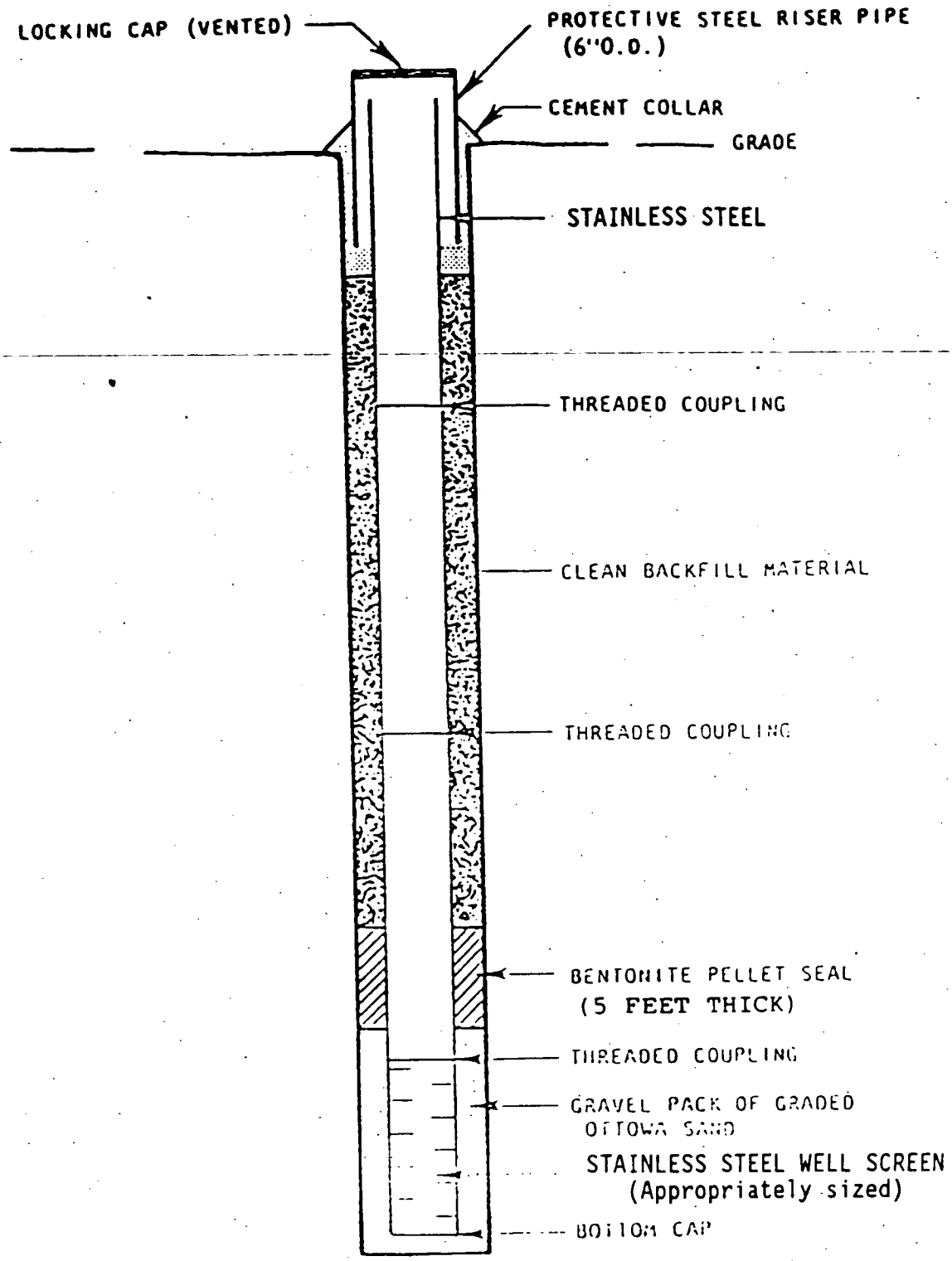
Sampling conducted during the first part of the Groundwater Quality Assessment Program (as outlined in Section 3.0) was focused in an area close to the predicted point of contaminant entry to groundwater. In order to define the extent of migration of hazardous substances once they have been identified, additional samplng is required. A number of wells are cur- rently in place across the facility and surrounding area. Selected wells may be chosen for sampling in a attempt to delineate the dispersive boundaries of the hazardous substances.

4.2 INSTALLATION OF ADDITIONAL MONITORING WELLS

Many existing wells at the FMPC were placed for reasons other than to specifically monitor Pit #4. Therefore, the installation of additional wells may be required. These wells would be placed at greater distances from the point of contaminant introduction to the groundwater system in order to delineate plume boundaries. Monitoring well drilling and installation procedures which were outlined in Section 3.4 will be followed.

4.3 HYDROLOGIC TESTING OF AQUIFER PROPERTIES

In order to estimate the rate of migration of hazardous substances, aquifer properties need to be evaluated. Sieve analyses of selected aquifer sediments collected during well installation yield a plot of grain size distribution. A



TYPICAL MONITOR WELL SCHEMATIC

DAMES & MOORE

FIGURE 2

characterization of the water bearing capacity of these sediments then is possible.

In situ hydraulic conductivity will be measured through the use of slug tests. During these tests, water level recovery is recorded in response to an instantaneous change in the volume of water in the well. In-situ measurements of aquifer properties averaged over a large aquifer volume are provided by pump tests. During this field test, water is pumped at a known rate from a well and drawdown is measure in one or more observation wells. Analyses of pump test data yields estimates of aquifer transmissivity and storativity. Other tests of aquifer properties may be conducted as needed (Ref. 3 & 4).

4.4 COMPUTER MODELING OF CONTAMINANT TRANSPORT

A groundwater species transport model will be used in conjunction with quantitiative contaminant concentrations at selected well locations to aid in the prediction of the extent of hazardous wastes or hazardous waste constituents in the groundwater. The model also will be used to aid in the prediction of the rate and future extent of contamination. The hydraulic aquifer properties discussed in Section 4.3 would be used as necessary in order to calibrate the model to actual site conditions.

The aquifer model will yield a continuous estimate of the plume boundaries and will integrate the scattered contaminant concentration data points derived from the monitoring well sampling program. A two dimensional horizontal (plan view) effluent transport model has been used previously to successfully model the flow system at the site.

4.5 GEOPHYSICAL SURVEY METHODS

Geophysical survey methods may be effective in tracing the location of hazardous wastes or hazardous waste constituents in the groundwater. The use of these methods is contingent on the properties of the detected hazardous substances in the groundwater. A particular method will be selected after the completion of initial stages at the Groundwater Quality Assessment Programs. For example, if barium chloride salts are found to be present in the groundwater, either alone or in conjunction with other hazardous constituents, electrical resistivity methods may effectively define the plume of contamination.

5.0 IDENTIFICATION OF THE CONCENTRATION OF HAZARDOUS WASTE OR HAZARDOUS WASTE CONSTITUENTS IN GROUNDWATER

Contaninant types and concentrations will be identified during part of the GQAPO described in Sections 3.0 and 4.0. Selected initial samples collected will be anlayzed for priority pollutants and those parameters listed in 40 CFR 261, Appendix VIII. Upon completion of these analyses, hazardous waste or

hazardous waste constituents which have reached groundwater will be identified. Samples collected in order to define the extent of contaminant migration will be tested for a series indicator paramenters. These paramenters will consist of those compounds which were found in detectable concentrations during initial sampling. All samples will be analyzed in accordance with EPA laboratory protocol (Ref. 5 and 6).

REFERENCES

1) Scaff, Marion R., McNabb, James F., Dunlap, Robert L., Fryborgen, John, 1982 Manual of Groundwater Sampling Procedures, U.S. EPA, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma.

2) U. S. Environmental Protection Agency, 1980, Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities, SW-611, Office of Solid Waste.

3) U. S. Department of the Interior, 1981, Ground Water Manual, Water and Power Resources Service. U. S. Government Printing Office.

4) U. S. Department of the Interior, 1977, National Handbook for Recommended Methods for Water Data Acquisition, Chapter 2-Groundwater, Office of Water Data Coordination Geological Survey.

5) U. S. Environmental Protection Agency, 1983, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.

6) American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 16th. Edition 1985.

ACRONYMS

CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
FFCA	Federal Facilities Compliance Agreement
FMPC	Feed Materials Production Center
GQAPO	Groundwater Quality Assessment Program Outline
MSL	Mean Sea Level
NPDES	National Pollutant Discharge Elimination System
RCRA	Resource Conservation and Recovery Act
TP	Test Pit
USGS	United States Geological Survey