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QUESTIONS FROM THE MARCH 22, 1990 FRESH MEETING

04/23/1990

DOE-FMPC FRESH
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LETTER

QUESTIONS FROM THE MARCH 22, 1990 FRESH MEETING

1. **Have any of the thorium drums lost weight?**

During the process of overpacking, the drums are weighed, weight discrepancies (both gains and losses) have been noted from the original weights recorded 17 years ago. The weight of the thorium materials was recorded by lot number. Since most lots contain multiple drums, weight discrepancies can not be calculated at this time. This information will be available at the end of the project. Due to the deteriorated condition of the drums, it is recognized that weight discrepancies may occur.

2. **How far from a spill or fire would the material travel if an accident were to occur?**

Several scenarios were developed using conservative (worst case) assumptions as to the extent of any radiation exposures which could occur in the event of a fire or spill. It should be noted that only one drum undergoes overpacking at a time. 1) If one or more of the drums of thorium were to burn, it was calculated that material would go off site and exposures to personnel within 5000 feet of the spill site (directly in line with the spill) could receive a radiation dose above the annual allowable level established for the general public. 2) If multiple drums of thorium were to spill and be suspended into the air, again the material would go off site and personnel within 5000 feet in a direct line could receive a dose greater than the annual allowable limit. 3) If one drum of thorium is spilled and suspended into the air, the material should be contained on government property and there would be no exposures to the general public.

There are several precautions being taken to minimize the risk to the public during this overpacking operation. Prior to lifting any drum, the drum is inspected and actions are taken to reduce the potential for a spill to occur. The drum may be moved by hand (prior to picking up with the fork truck) or existing holes may be covered. The movement of the drum is observed to ensure that any spill is quickly identified. The drum is placed into a steel transfer box which can be sealed to minimize the effect of a spill or fire. Emergency team members are standing by at the overpacking site when any non-overpacked thorium is being moved. All necessary equipment to fight a thorium fire has been staged at the location. The movement of the thorium drums, (for this project) is restricted during environmental conditions which increase the potential for an accident or increase the risk associated with an accident (e.g. high winds, temperatures 35°F or below, or very stable atmospheric conditions).

The performance of this project greatly reduces the risk to the public and to the workers on site from a thorium spill or fire.

3. **What is in the Silos?**

There is a project currently underway to determine what is in the silos. A copy of the fact sheet prepared on the K-65 silos is enclosed.

4. **How are cisterns sampled and are sediment samples collected?**

The Ohio Department of Health (ODH) conducted a study of radioactivity in drinking water and other environmental media in the vicinity of the FMPC and reported the results in December 1988.

The water from cisterns was collected and analyzed. Sediment samples were not collected. The water samples were "dipped" from the cisterns or collected from a faucet inside the house. A copy of the ODH data on cistern sampling is enclosed.

The WMCO Environmental Monitoring Group will sample cisterns on an "as requested basis".

FACTSHEET: K-65 SILOS

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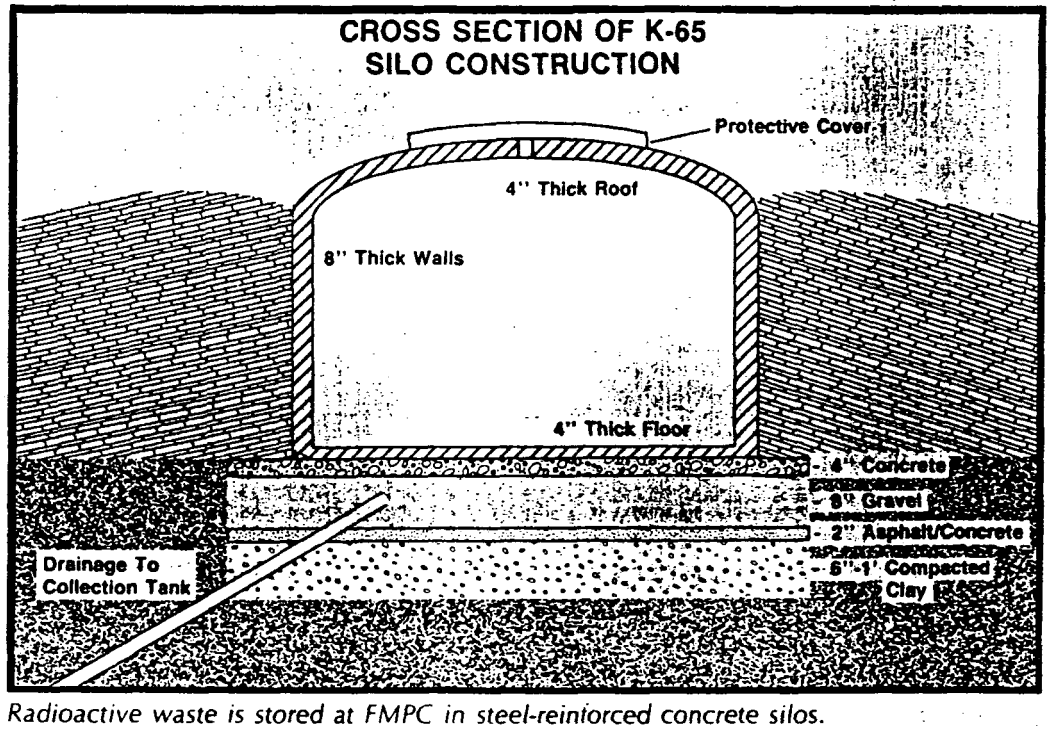
FERNALD, OH

FMPC WASTE STORAGE SILOS

As a part of an on-going environmental protection program, the Feed Materials Production Center (FMPC) is renovating its waste storage facilities. Improving the management of wastes in two concrete silos, the K-65 silos, is a part of this renovation. The K-65 silos contain radioactive wastes that would present a radiation hazard if not properly contained. The new plant contractor, Westinghouse Materials Company of Ohio (WMCO), has initiated measures to ensure that the silos are structurally sound and that the waste is isolated from the environment.

Construction Details

The K-65 silos are 36 feet tall and 80 feet in diameter. Their walls are 8 inches thick and made of steel-reinforced concrete. The domed roofs are also made of reinforced concrete. The silos were constructed with floors of 4-inch-thick concrete bases, which were placed on an 8-inch layer of gravel containing a drainage system that leads to a collection tank. Beneath the layer of gravel are layers of asphalt and clay.



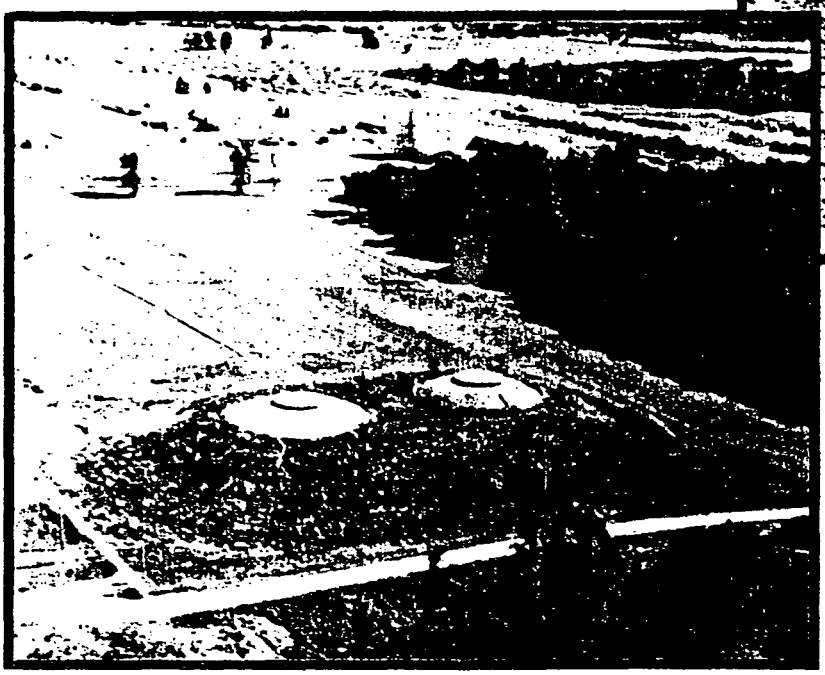
Radioactive waste is stored at FMPC in steel-reinforced concrete silos.

Contents of the Silos

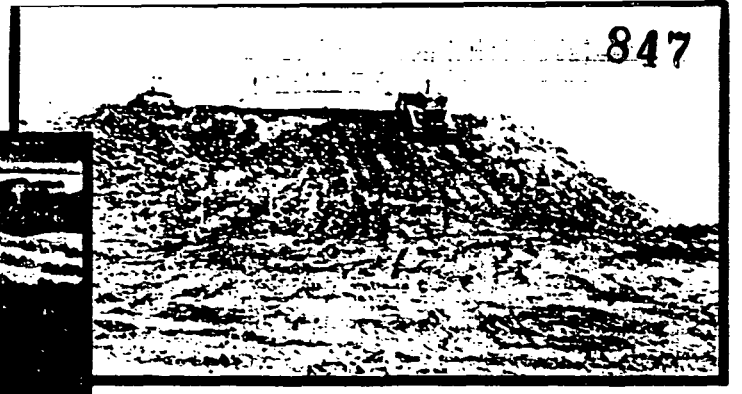
The K-65 silos contain waste from the Manhattan Project, the World War II program that produced the first atomic bombs. For this work, a uranium-rich ore called pitchblende was imported from Belgian Congo. Pitchblende was treated with nitric acid to dissolve the uranium away from the ore. The remaining waste was mixed with water and pumped into the silos where the solids settled. The liquids at the surface were pumped back out of the silos into a waste treatment facility. What remains in the silos now is about 9,700 tons of residual solids.

The residues in the silos emit radiation. The radioactivity levels of the residues are approximately the same as tailings from uranium mining and milling. Also like uranium tailings, these residues produce radon, a radioactive gas. The production of radon from the waste will remain essentially constant for more than 100 years. FMPC is performing a feasibility investigation for the control of radon emissions from the K-65 silos.

The stored waste presents a potential hazard and requires careful storage techniques to ensure safety and isolation from the environment.



Installation of protective membranes over the silos' domes began in April 1986.



An embankment was built around the silos in 1964 to help protect them from the weather and provide structural support.

Past Improvements

In 1964, 12 years after the silos were constructed, internal corrosion and natural deterioration made repairs to the walls necessary. At that time, the walls of the silos were covered with asbestos and an earthen embankment was placed around the silos to protect them from additional weathering. Vents in the silos were sealed in 1979, and the embankment was enlarged in 1983 to reduce erosion.

Recent Improvements

A major testing program and structural analysis of the K-65 silos took place in the summer and fall of 1985. The investigation included a reassessment of the silo's original design. This program included computer analysis of the containment structure and field work that tested the soil under and around the silos. The resulting data was computer analyzed and then interpreted by a team of experts. Their findings concluded that, although the silos showed evidence of cracks, the walls and base concrete slabs were stable and would remain so for the next 5 to 10 years.

The tops of the silos were determined to need remedial action. In January 1986, self-supporting, protective covers for the domes of the silos were constructed and put in place. The installation of waterproof protective membranes over the tops of the silos began in April 1986. Radiation levels around the silos, at the facility boundaries, and off the plant site have been regularly monitored and found to be much below the U.S. Department of Energy's health and safety limits.

On-going Improvements

Planning for improved management of the silos' contents is under way. The first step in a waste management study will be to sample and characterize the contents of the silos as part of a comprehensive waste facility investigation being conducted by WMCO with assistance from Roy F. Weston, Inc., an environmental service firm. Advanced Sciences, Inc. and International Technologies Corp. are also assisting. The results will be used to improve the storage of the waste.

The waste in the K-65 silos is a concern for FMPC management. Measures to ensure that it is isolated from the environment have been taken, and remedial actions are ongoing. The U.S. Department of Energy is working with other State and Federal Regulatory Agencies to develop plans for the improvement of environmental protection at the site. The removal and long-term disposal of the waste are important goals for FMPC and have high priority for FMPC's management.

3.2 CISTERNS

Results of the analyses for gross alpha, gross beta and uranium in these water supplies were as follows:

gross alpha activity	< = 3 pCi/l	-	36
	> 3 and < = 15 pCi/l	-	1
	> 15 pCi/l	-	1
gross beta activity	< = 4 pCi/l	-	34
	> 4 and < = 15 pCi/l	-	4 *
	> 15 pCi/l	-	2
uranium activity	< = 3 pCi/l	-	53
	> 3 and < = 15 pCi/	-	0
	> 15 pCi/l	-	1

Figure 10 displays the locations of all cisterns sampled by the ODH. All analytical results for cistern samples are presented in Table 3. The symbol of a square denotes a cistern location and the gross alpha results for all cisterns sampled have been plotted in Figure 12. The gross beta results for all cisterns sampled have been been plotted in Figure 13 and the uranium results in Figure 14.

Only one cistern water sample was found to contain a concentration of uranium significantly above background. This cistern's source of water was rainwater collected via the roof gutters. According to the owner, the cistern had been disconnected from this collection system approximately 2 years prior to sample collection and had not been used for drinking since that time. The water which was present in the cistern at the time of sampling, therefore, had not been disturbed for approximately two years. Prior to sampling, the owner agitated the water in the cistern. A dipper was used to collect water from the cistern.

At many of the homes surveyed the resident utilized hauled water (water hauled in by truck and transferred from the truck to the cistern) in addition to rainwater as a cistern water source. The frequency of delivery varied widely from every other week to once in a several year period.

A number of residents also had a well which was used as a drinking water source in addition to the cistern. Some of the residents had discontinued using their cistern or well water for drinking purposes and were now using a community water supply or buying bottled water.

* Some of the cisterns have been included in more than one activity category due to variations in the gross beta results obtained upon resample.

TABLE 3

CISTERN WATER SAMPLE RESULTS (FMPC)

(pCi/l +/- 2 sigma error)

LOG #	LOCATION	GROSS ALPHA	GROSS BETA	URANIUM
025	FH 03.3	< 3.0	4.8 E0 +/- 4.0 E0	1.0 E-1 +/- 3.0 E-
*029	FR 00.9	1.96 E1 +/- 5.5 E0	6.47 E1 +/- 8.0 E0	2.93 E1 +/- 2.29 E
*029	FR 00.9	(K-40) 1.97 E2 +/- 6.8 E1		
*029	FB 00.9	2.9 E+1 +/- 4.2 E0	5.8 E1 +/- 5.2 E0	2.03 E1 +/- 2.1 E0
035	FQ 01.3	< 3.0	< 4.0	8.0 E-1 +/- 5.0 E-
038	FA 02.3	4.0 E0 +/- 2.9 E0	< 4.0	1.1 E0 +/- 5.0 E-
040	FR 05.0	< 3.0	< 4.0	1.0 E-1 +/- 4.0 E-
050	FG 03.3	< 3.0	< 4.0	2.0 E-1 +/- 2.0 E-
*061	FL 01.0	< 3.0	2.74 E1 +/- 4.7 E0	1.0 E0 +/- 5.0 E-
*061	FL 01.0	< 3.0	< 4.0	Analysis not performe
*061	FL 01.0	(K-40) none detected	5.0 E0 +/- 3.6 E0	0.0 E0 +/- 3.0 E-
066	FH 02.5	< 3.0	< 4.0	0.0 E0 +/- 2.0 E-
071	FH 03.2	< 3.0	< 4.0	0.0 E0 +/- 2.0 E-
074	FH 04.3	< 3.0	< 4.0	6.0 E-1 +/- 5.0 E-
079	FF 08.0	< 3.0	< 4.0	1.0 E-1 +/- 2.0 E-
086	FL 01.9	< 3.0	< 4.0	2.0 E-1 +/- 3.0 E-
088	FB 00.7	< 3.0	< 4.0	4.0 E-1 +/- 4.0 E-
090	FK 02.8	< 3.0	< 4.0	4.0 E-1 +/- 4.0 E-
093	FF 02.5	< 3.0	< 4.0	2.0 E-1 +/- 4.0 E-
108	FA 00.7	< 3.0	< 4.0	7.0 E-1 +/- 5.0 E-
110	FH 02.6	< 3.0	< 4.0	7.0 E-1 +/- 5.0 E-
111	FH 02.6	< 3.0	< 4.0	0.0 E0 +/- 4.0 E-
115	FF 00.7	< 3.0	< 4.0	0.0 E0 +/- 2.0 E-
122	FL 01.9	< 3.0	< 4.0	2.0 E-1 +/- 3.0 E-
125	FC 04.5	< 3.0	< 4.0	1.2 E0 +/- 4.0 E-
132	FR 03.4	< 3.0	4.3 E0 +/- 3.1 E0	1.1 E0 +/- 5.0 E-
133	FH 01.5	< 3.0	< 4.0	8.0 E-1 +/- 4.0 E-
138	FA 02.4	< 3.0	< 4.0	0.0 E0 +/- 3.0 E-
140	FJ 01.7	< 3.0	< 4.0	0.0 E0 +/- 2.9 E-
141	FK 02.6	< 3.0	< 4.0	0.0 E0 +/- 3.0 E-
160	FR 02.9	< 3.0	< 4.0	1.0 E-1 +/- 4.0 E-
163	FK 01.7	< 3.0	< 4.0	1.5 E-1 +/- 2.5 E-
169	FK 03.8	< 3.0	< 4.0	1.0 E-1 +/- 2.0 E-
175	FK 02.8	< 3.0	< 4.0	5.0 E-1 +/- 4.0 E-
*176	FJ 02.5	< 3.0	< 4.0	0.0 E0 +/- 3.0 E-
*176	FJ 02.5	< 3.0	< 4.0	1.0 E-1 +/- 2.0 E-
190	FR 02.9	< 3.0	< 4.0	5.0 E-1 +/- 4.0 E-
200	FH 04.0	< 3.0	< 4.0	0.0 E0 +/- 4.0 E-
227	FF 04.5	< 3.0	< 4.0	2.0 E-1 +/- 3.0 E-
233	FR 04.0	< 3.0	3.0 E0 +/- 3.0 E0	0.0 E0 +/- 2.0 E-
236	FH 02.6	< 3.0	< 4.0	5.0 E-2 +/- 2.0 E-
242	FK 03.1	< 3.0	9.0 E0 +/- 5.0 E0	1.0 E-1 +/- 2.0 E-

- Log# 029 - One cistern existed at this location and was sampled twice.
  Log# 061 - One cistern existed at this location and was sampled three times
  Log# 176 - Two cisterns existed at this location.

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TABLE 3 continued

(pCi (pCi/l +/- 2 sigma error)

LOG#	LOCATION	GROSS ALPHA	GROSS BETA	URANIUM
243	FA 02.5	< 3.0	< 4.0	2.0 E-1 +/- 2.0 E-
248	FJ 02.6	< 3.0	< 4.0	3.0 E-1 +/- 5.0 E-
*256	FH 01.2	< 3.0	< 4.0	0.0 E0 +/- 4.0 E-
269	FE 03.3	< 3.0	< 4.0	0.0 E0 +/- 2.0 E-
270	FG 03.0	< 3.0	< 4.0	0.0 E0 +/- 3.0 E-
278	FK 01.8	< 3.0	< 4.0	5.3 E-2 +/- 2.9 E-
280	FK 01.2	< 3.0	< 4.0	1.0 E-1 +/- 3.0 E-
281	FK 02.7	< 3.0	< 4.0	0.0 E0 +/- 2.2 E-
282	FK 02.8	< 3.0	< 4.0	3.0 E-1 +/- 4.0 E-
283	FJ 02.3	< 3.0	< 4.0	5.0 E-2 +/- 2.0 E-
291	FK 01.1	< 3.0	< 4.0	3.1 E-1 +/- 3.7 E-
292	FK 01.0	< 3.0	< 4.0	8.3 E-1 +/- 4.3 E-
293	FK 02.1	< 3.0	< 4.0	6.2 E-1 +/- 3.9 E-
294	FH 02.5	< 3.0	< 4.0	6.7 E-1 +/- 4.0 E-
301	FK 02.0	< 3.0	< 4.0	1.4 E-1 +/- 2.4 E-
314	FF 04.0	< 3.0	< 4.0	4.6 E-1 +/- 3.4 E-

- Log# 256 - A spring feeds this cistern.

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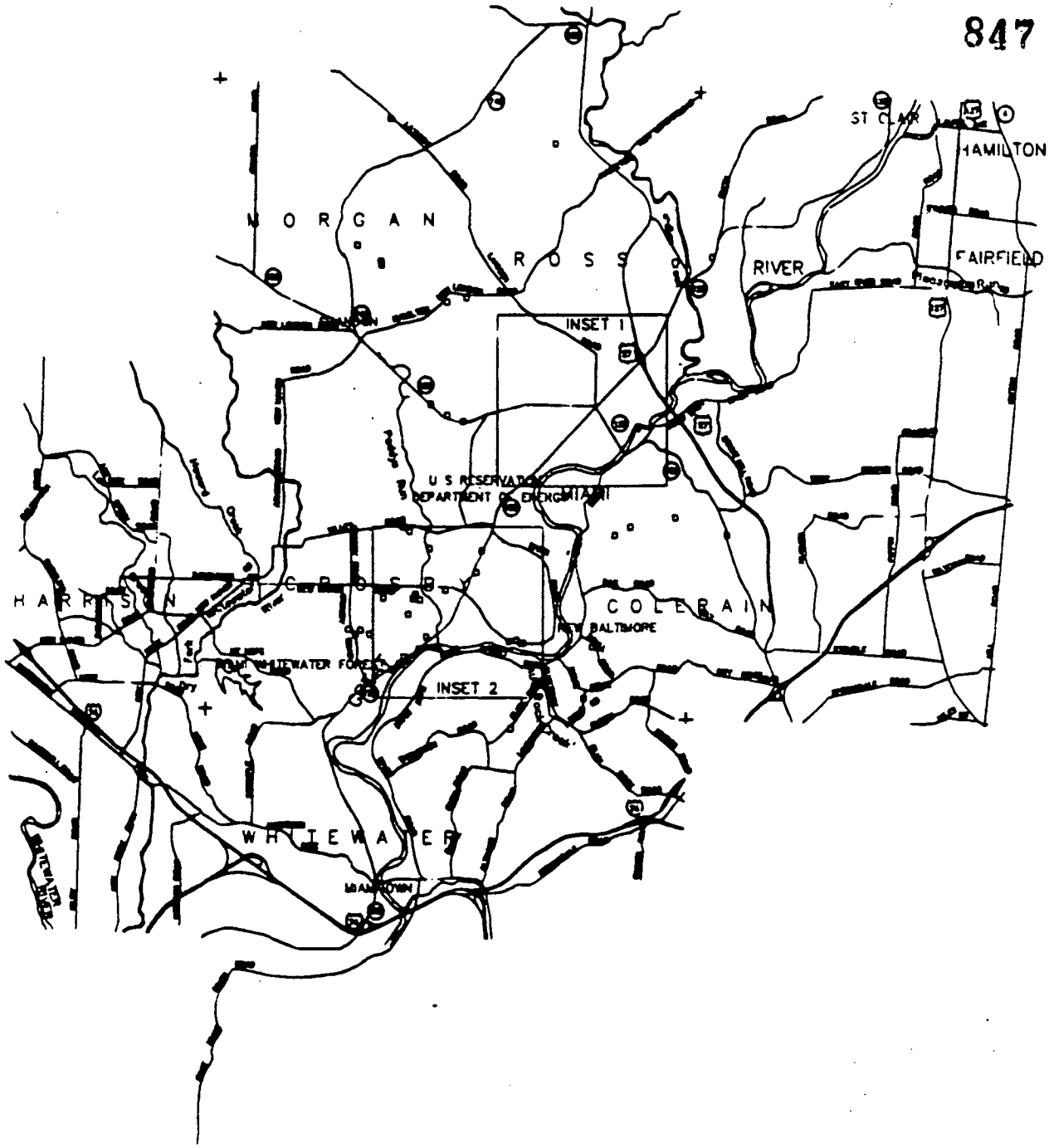

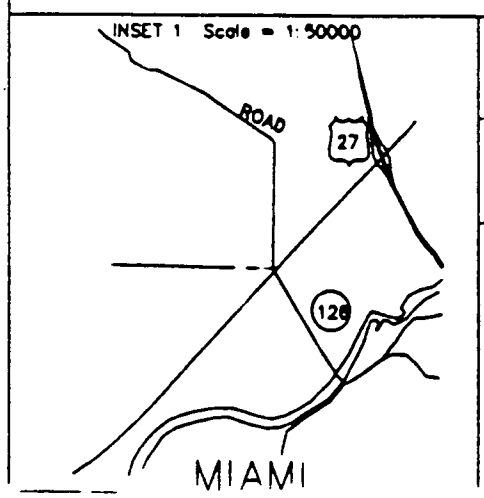

Ohio Department of Health
Water Sampling Project
in the Vicinity of
Feed Materials Production Center

Cistern Sampling Locations
24 November, 1986
Scale 1:100000
Consultant VEGA Inc. Milford OH

Symbol Key

O - Well □ - Cistern Δ - Surface Water
+ - Split Sample ↑ - Log Number of Sample

Symbol Color Table

NUCLIDE SAMPLE	pC/l BLACK	GREEN	RED
Uranium	<= 3	> 3 and <= 15	> 15
Alpha	<= 3	> 3 and <= 15	> 15
Beta	<= 4	> 4 and <= 15	> 15

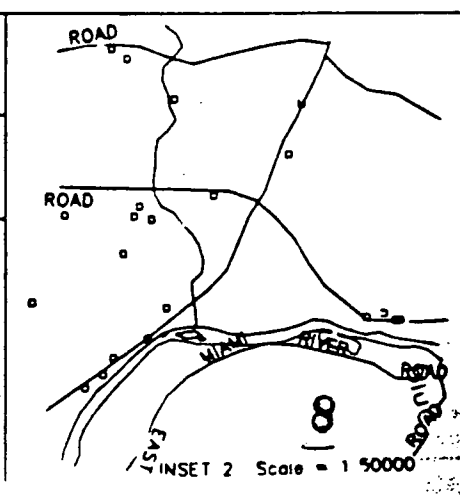

Figure 10 Cistern Sampling Locations (FMPC)