

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No.: 040-06264

License No.: SMB-00833 (Terminated)

Report No.: 040-06264/96001(DNMS)

Licensee: Michigan Chemical (now Velsicol Chemical Corporation)


Facilities: Breckenridge Disposal Site (Closed)

Location: Rural Breckenridge, Michigan

Dates: October 31, 1996 (onsite), November 26, 1996
(telephone followup)

Inspectors: G. M. McCann, Senior Radiation Specialist
E. Kulzer, Radiation Specialist

Accompanying
Personnel: D. Minaar, Chief, Michigan Department of Environmental
Quality (DEQ), Drinking Water and Radiological Protection
Division (DWRPD), Radiological Protection Section (RPS)
R. Skowronek, Chief, DEQ, DWRPD, RPS, Radioactive Material
and Standards Unit

Approved By: Bruce L. Jorgensen, Chief 
Decommissioning Branch

9612160038 961210
PDR ADOCK 04006264
C PDR

EXECUTIVE SUMMARY

Michigan Chemical Corporation
Breckenridge Disposal Site, MI
NRC Inspection Report No. 040-06264/96001(DNMS)

On October 3, 1996, NRC Region III received a telephone call from a representative of the Michigan Department of Environmental Quality's Radiological Protection Section, indicating that a former radioactive burial site (previously authorized by the NRC), and located near Breckenridge, Michigan, may have been trenched into during an environmental survey for chemical contaminants by an environmental consultant.

In response to this call, NRC staff determined that the site had been used by the former Michigan Chemical Corporation (MCC), now owned by the Velsicol Chemical Corporation (VCC). MCC used this site between 1967 and 1970 as a low-level burial site pursuant to Title 10 of the Code of Federal Regulations, Part 20, Section 20.304, "Disposal by Burial in Soil" (rescinded January 28, 1981). The staff also determined through discussion with the environmental contractor that the trenching depth should not have penetrated the buried waste.

On October 31, 1996, NRC inspectors, assisted by State of Michigan radiological health personnel, performed a radiological scoping survey, to evaluate the radiological conditions at the site, and to determine if the site presented any significant health and safety risk to the public and the environment.

The direct beta and gamma radiological measurements, and gamma radio-analyses of soil samples collected by the inspectors, identified levels of contamination which appeared to be significantly in excess of NRC guidelines for unrestricted use. Measurements performed by the inspectors in areas adjoining the property did not identify the migration of radiological contamination off-site. Additionally, the inspectors determined that access to the site was uncontrolled, however, the inspectors observed that a chain-link fence was being installed by VCC concurrent with the NRC survey. On November 26, 1996, the NRC was informed by VCC that the chain-link security fence had been completed.

It appears that the site, with the installation of the security fence, and based on past and current radiological measurements, does not pose an immediate threat to the public and environment. However, it appears that further radiological characterization by VCC will be necessary, in order to determine if this site can be released for unrestricted use or if remediation of the radiological contamination will be necessary to insure the long-term health and safety of the public, and the environment. The company will be asked to provide a schedule and approach for further characterization of the site. Additionally, after the NRC has reviewed the characterization data, an evaluation will be conducted regarding the appropriate Agency approach for dealing with the site.

DETAILS

Background

In 1956, Michigan Chemical Corporation (MCC), now Velsicol Chemical Corporation (VCC), built a rare earth processing plant within their already existing chemical plant site at St. Louis, Michigan. This rare earth plant was operated by MCC for the Atomic Energy Commission (AEC) until September 1960, at which time MCC became sole owner through acquisition from the AEC.

The feed-stock materials used by MCC contained licensable quantities of source material. Therefore, MCC applied for and on May 18, 1965, was issued Source Material License No. STC-0833 for possession only of thorium. The license was later amended to authorize possession and use of uranium and thorium and Source Material License No. STC-0833 was changed to Source Material License No. SMB-0833. The use of licensable materials was authorized until April 1971 when License No. SMB-0833 was terminated.

MCC stopped its chemical operations in September 1978, and upon request of the Michigan Department of Natural Resources (MDNR), a study was made to investigate the extent of chemical contamination on the 55 acre site at St. Louis, Michigan. The study concluded that the site was contaminated with toxic organic compounds. Therefore, the MDNR requested Velsicol to develop a Site Environmental Security Plan to stabilize the site soils. The plan called for the following: the demolition of all onsite structures; the installation of a slurry wall; a groundwater interceptor drain; a clay cap; a fence surrounding the site; signs inside the fence warning that the site contains toxic chemicals; and a granite marker at each gate warning that the site contains hazardous chemicals.

These requirements and specific land use restrictions were imposed on Velsicol by a Consent Judgement issued by a U.S. District Court on December 27, 1982. The NRC conducted a number of inspections during this period, and determined that the site was also contaminated with licensable radiological materials. The site stabilization plan provided by VCC to control the chemical waste was considered acceptable by the NRC. The site today exists as a capped burial site. The NRC conducted a special inspection at the St. Louis site on July 7, 1995 (NRC Report No. 999-90063/95002(DRSS)), and did not identify any radiological materials in excess of NRC guidelines.

Between 1967 and 1970 MCC buried process wastes from an yttrium recovery operation on a tract of property known as the "Breckenridge Disposal Site." The feed material for the yttrium recovery process was from several sources including uranium mill tailings and thorium recovery residues; the wastes therefore contained small quantities of naturally occurring radioisotopes from the uranium, actinium, and thorium decay series. Disposals at this site were reportedly in compliance with the provisions of 10 CFR 20.304, "Disposal by Burial in the Soil".

The Breckenridge Disposal Site is located on Madison Road in Bethany Township, Gratiot County, approximately 7.5 km east-northeast of St. Louis, Michigan. The site is a narrow, triangular shaped parcel of land, covering an area of

2.2 acres. The parcel is bounded on the north by Madison Road and on the east by Bush Creek. The land is basically level. The southern tip of the property is covered with tall trees and brush. A chain-link security fence was being constructed at the time of the NRC survey, and surrounds the section containing the burial trenches. At the northern end is a deep chemical disposal well, which is capped and no longer used. The reported approximate depth of the well is 600-800 m. Two drain tiles were located on the side of the site bordering Bush Creek. The surrounding land is primarily agricultural; the nearest residence is approximately 0.2 km east of the site. Figure 1 is a diagram of the Breckenridge Disposal Site.

In 1982, NRC contracted with Oak Ridge Associated Universities (ORAU), Oak Ridge, TN, to conduct surveys to evaluate the radiological conditions at the Breckenridge Disposal Site. ORAU identified direct radiological (beta-gamma) levels, and concentrations of radiological materials in soil samples in excess of NRC unrestricted release guideline limits. However, ORAU indicated that the levels were limited, and that no migration of materials from the site was identified. ORAU's findings were documented in *Radiological Assessment of the Breckenridge Disposal Site, Velsicol Chemical Corporation, St. Louis, Michigan, Final Report, July 1982*.

Survey Observations and Findings

1.0 Management Oversight (IP 87104)

Memphis Environmental Center, Inc. (MEC) is a division of Velsicol Chemical Company (VCC). MEC is responsible for managing VCC environmental affairs relating to the chemical contamination on VCC properties. This includes managing site security, monitoring for migration of contaminants, and remediation of chemically contaminated sites. According to the Project Manager responsible for the oversight of the Breckenridge Disposal Site, MEC has had extensive experience (since 1979) in monitoring the cleanup of chemically contaminated sites (including Environmental Protection Agency Superfund Sites) for VCC, and for other companies as a consulting service.

VCC is an international concern with four chemical plants within the United States. The Project Manager reports to MEC's Manager of Environmental Management Division. This individual reports to VCC's Vice-President of Safety, Environment, and Health, who is located at VCC's corporate office. VCC's corporate offices are located in Rosemont, Illinois.

During a November 26, 1996, telephone conversation, the Project Manager indicated that MEC does not have any health physics expertise as part of their staff. He indicated that his company was eager to resolve this issue, and that he had already talked to a number of health physics service consulting companies with the intent of contracting with one of the services.

2.0 Security and Access Control (IP 87104)

NRC inspectors observed access to the disposal site was uncontrolled. However, it was also determined that MEC was in the process of completing a chain-link security fence around the site.

The NRC inspectors determined, with one exception, that the ground over the burial site had not been disturbed. The NRC inspectors had been informed by the State of Michigan's Department of Environmental Quality, that an MEC environmental team looking for burial of chemicals had inadvertently dug into the cover over the trenches. However, it was believed that the contractor had dug only three feet into the cover. This would not have penetrated to the actual buried waste which was supposed to be at least six feet below the surface. The NRC inspectors identified the areas where the trenching had taken place. The trenches had been back-filled, and the inspectors performed direct survey measurements, and collected soil samples from these trenched areas (See Section 4.0 below for measurement and analytical results).

On November 26, 1996, during a telephone conversation between the MEC Project Manager and an NRC inspector, it was indicated that MEC was making arrangements with their Site Custodian for the Michigan Chemical Corporation, St. Louis, Michigan Site, to check the Breckenridge Disposal Site on a weekly basis. The Site Custodian's weekly checks would include the verification of the integrity of the site security fence, and for obvious signs of intrusion into the site. It was also indicated during the call that the chain-link security fence which was under construction during the NRC onsite survey had been completed.

Based on the placement of the security fence, and the weekly checks to be made by the VCC's Site Custodian, it appears that adequate site security, and access controls are in place, such that inadvertent intrusion into the site is unlikely.

3.0 Posting (IP 87104)

The NRC inspectors did not observe any radiological caution signs at the site. During the November 26, 1996, telephone conversation it was determined that MEC had not believed posting of such caution signs to be necessary. The MEC Project Manager indicated that the company was in the process of arranging for the placement of "No Trespassing" signs, and a general informational sign which would specify a company contact and telephone number. It was also indicated that the need for radiological caution signs would be re-evaluated after contracting with a health physics service company, and after further radiological site characterization.

4.0 Independent Measurements (IP 87104)

The NRC and Michigan DEQ inspectors performed a general area gamma radiation survey of the Breckenridge Disposal Site. The entire site was walked by the inspectors. In addition to the site walk-over survey, the

inspectors performed a gamma walk-over survey outside of the security fence in areas immediately adjoining the side, and along the stream which adjoins the site. The gamma detection and measuring instrumentation used by the inspectors are listed in Table 1.

The inspectors performed gamma measurements at two different off-site locations, in order to establish an average gamma background value for the area. Some measurements were taken in a farm field immediately across from the disposal site, and the other measurements were taken along a roadside approximately one mile from the site. The gamma background level for the instrumentation was 6-8 microroentgens per hour ($\mu\text{R/h}$).

The inspectors walk-over survey identified a number of areas with elevated gamma radiation levels (ranging from 10 $\mu\text{R/h}$ to 50 $\mu\text{R/h}$) which were above the NRC guideline value for gamma radiation levels in unrestricted areas. The NRC guideline value is 10 $\mu\text{R/h}$ at 1 meter above the ground surface, as cited in NRC *Policy and Guidance Directive FC 83-23: Termination of Byproduct, Source and Special Nuclear Material Licenses*, dated November 4, 1993. Gamma surface radiation levels ranged from 30 $\mu\text{R/h}$ to 330 $\mu\text{R/h}$.

The inspectors collected six surface soil samples from the disposal site from areas with elevated gamma readings ("biased" samples). Additionally, three other soil samples were collected, one from a farm field across the road (north) from the disposal site, and two from the area below two drain tiles which empty into the stream adjoining the disposal site. The soil sample collection locations are identified on Figure 1.

The NRC has established soil radioactive material concentration guidelines for the disposal or storage of thorium and uranium wastes. These guidelines are cited in the NRC Branch Technical Position, *Disposal or Onsite Storage of Thorium or Uranium From Past Operations*, 46FR205, October 23, 1981. The maximum concentrations for surface soil in areas accessible to the public are 10 pCi/g of natural thorium (Th-232 + Th-232 with daughters in equilibrium), and 10 pCi/g of natural uranium (U-238 + U-238 with daughters in equilibrium). All of the biased soil samples exceeded the thorium limit, and 5 of the 6 samples exceeded the uranium limit. It is probable that the burial trenches content are of higher radionuclide concentrations.

The "biased" surface samples, collected from locations of elevated contact radiation levels, contained concentrations ranging from <1 pCi/g to 390 pCi/g, U-234 & U-238; and 28 pCi/g to 302 pCi/g, Th-228 & Th-232. The off-site soil sample, and the two drain tile samples were all <1 pCi/g for thorium and uranium. Table 2 contains the analyses results for the soil samples collected from and near the Breckenridge Disposal Site.

5.0 Exit Meeting (IP 87104)

At the conclusion of the onsite inspection on October 31, 1996, and during the November 26, 1996 telephone conversation, the preliminary results of the inspection were discussed with the individual identified below. The NRC's Site Decommissioning Management Plan (SDMP) and the need for additional site characterization were discussed. The company representative expressed a desire to resolve any issues which the NRC may have with the Breckenridge Disposal Site.

PARTIAL LIST OF PERSONS CONTACTED

- * J. Phillips, R.G., Project Manager, Breckenridge Disposal Site, Memphis Environmental Center, Inc.
- * Attended onsite exit meeting conducted October 31, 1996, and participated in November 23, 1996, telephone conversation.

Attachments:

- Table 1 - Survey Instruments
- Table 2 - Soil Sample Data
- Figure 1 - Site Diagram

INSPECTION PROCEDURES USED

IP 83822: Radiation Protection
IP 84900: Low-level Radioactive Waste Storage
IP 87104: Decommissioning Inspection For Materials Licensees

TABLE 1

Survey Instruments

Instrument	Model No.	Serial No.	Probe	Last Calibration
Ludlum	2241-2	130052	Ludlum 44-9	06/14/96
Ludlum	2241-2	130059	Ludlum 44-9	06/13/96
Ludlum	19	011021	n/a	04/11/96
Ludlum	19	016339	n/a	05/22/96

The meters and probes were serviced and calibrated on an annual basis. Calibrations were performed with National Bureau of Standards (NBS) traceable sources. Background checks were performed during the inspection to verify detector constancy and determine efficiencies. Source checks were performed using a strontium-90/yttrium-90 check source, Serial Number S-2134 (NRC Tag No. 013251). The average beta efficiency for the Ludlum count rate meters (Model 2241-2) with the Model 44-9 probes was about 25 percent. The gamma scintillation detectors (Ludlum 44-10) were checked for constancy only. Average background for the GM pancake probes (Ludlum 44-9) was 40 to 50 counts per minute (cpm). The Model 19 meters varied from 6 to 8 microroentgens per hour background radiation ($\mu\text{R/h}$) (1.5 to 2.0 nanocoulombs per kilogram per hour (nC/kg/h)).

TABLE 2

Soil Sample Data

Sam ple Num ber	Location of Sample	Direct Measureme nt (μ R/hour)	natural uranium* pCi/g	natural thorium (thorium 232+228) (pCi/gram)
1	soil sample, BDS*	20	82 \pm 28	28 \pm 2
2	soil sample BDS	57	<1.0	29 \pm 2
3	soil sample BDS	90	<16.0	31 \pm 2
4	soil sample BDS	100	35 \pm 10	72 \pm 5
5	soil sample BDS	140	121 \pm 40	126 \pm 8
6	soil sample BDS (890 cpm)	330	390 \pm 70	302 \pm 28
7	soil sample, farm field North of BDS	8	<1.0	<1
8	soil sample, below drain tile area, Bush Creek	7	<1.0	<1
9	soil sample, below drain tile, Bush Creek	7	<1.0	<1

*Breckenridge Disposal Site, readings are surface measurements

Figure 1

