U.S. NUCLEAR REGULATORY COMMISSION

Region III

Report No. 070-00832/92001(DRSS)
040-01020/92001(DRSS)

License No. SNM-764 (Retired)
SMB-239 (Retired)

Docket No. 070-00832
040-01020

Facility: Minnesota Mining and
Manufacturing Company (3M)
220-2E-02, 3M Center
St. Paul, MN 55144-1000

Inspection At: Burial Site
Section 34, Township 45 North, Range 17 West
Pine County
Kerrick, Minnesota

Inspection Conducted: July 20 and October 20, 1992

Inspectors: _____ 2/2/93
D. G. Wiedeman Date
Senior Health Physicist

_____ 2/2/93
R. L. Glinski, Jr. Date
Radiation Specialist

Approved: _____ 2/3/93
Roy J. Caniano Date
Chief, Fuel Facilities and
Contaminated Sites Section

Inspection Summary

Inspection on July 20 and October 20, 1992 (Reports No. 070-00832/92001(DRSS); No. 040-01020(DRSS))
Areas Inspected: This was an environmental and safety assessment of a burial site located in Kerrick, Minnesota where from December 7, 1966 to November 27, 1968, four burials of radioactive materials occurred under the provisions of 10 CFR 20.304, the regulation in effect at that time. This inspection included independent radiological surveys, placement and collection of thermoluminscent dosimeters (TLDs) and radon monitors; collection of surface

and well water; vegetation, soil, particulate air samples and collection of soil bore samples. This inspection also included a review and evaluation of historical documents that pertain to the site.

Results: The NRC inspectors did not identify any radiation levels or environmental sampling results that would present an immediate radiologic hazard to members of the public or to the environment. The data collected from this inspection will be used for assisting in a radiological dose assessment to determine if any remedial actions will be required at the site and to determine if radiological concentrations meet current NRC guidelines as described in the NRC Branch Technical Position (BTP) (Federal Register/Vol. 46, No. 205/October 23, 1981).

DETAILS

1. Persons Contacted

*Fred Entwistle, Health Physicist (3M)
#*Robert Wissink, Corporate Radiation Safety Officer (3M)
*Duane Hall, Manager, Health Physics (3M)
*Bruce W. Kramer, Senior Geologist, Geology Department (3M)
*Michael Falco, Senior Environmental Engineer, Environmental and Pollution Control (3M)
*Enrique Gentzsch, Minnesota Pollution Control Agency
James Pennino, Hydrologist, Minnesota Pollution Control Agency
Timothy Donakowski, Health Physicist 1, Minnesota Department of Health
@Steve Dravkowski, Extension Educator, County Extension Service, Hinkley, MN

*Attended the exit meeting conducted on July 21, 1992
#Attended the exit meeting conducted on October 20, 1992
@Contacted by telephone on August 11, 1992

2. Background

Atomic Energy Commission (AEC) Special Nuclear Material License No. SNM-764, was issued to 3M on January 17, 1964 and expired October 31, 1967. This license authorized enriched uranium-235 (93.0%) and 180 grams of plutonium. The authorized use was for research, development, and loading fuel into space nuclear auxiliary power (SNAP) systems and scrap recovery from fuel production activities. All licensed activities involved in this operation were being conducted under a classified government contract. AEC Source Material License No. SMB-239 was issued on May 9, 1961 and expired on May 2, 1967. This license authorized 1100 lbs. of source materials. The licensee was authorized to conduct research and development into the production of uranium dioxide (UO_2) and thorium dioxide (ThO_2) microspheres as nuclear fuel. During the mid-1960's timeframe, the AEC awarded this contract to another AEC contractor; therefore, 3M's licensed activities focused upon scrap recovery and decommissioning of their facilities. All licensed uses of plutonium were transferred to other 3M Special Nuclear Material licenses. In a letter to the AEC dated May 20, 1966, the licensee stated, "All material containing enriched uranium have been returned to Los Alamos Scientific Laboratory (LASL), and most equipment used for natural uranium...has been transferred to a 3M subsidiary. The remaining natural uranium contaminated materials and equipment have been drummed up and are awaiting shipment to a disposal site." In another letter to the Commission dated November 17, 1967, the licensee informed the Commission that all buildings that were formally used for licensed activities had been decontaminated. The licensee also stated, "Our last shipment containing all remaining enriched uranium was made to Goodyear Atomic Corporation on June 20, 1967. Scrap materials such as lockers, piping, duct work and miscellaneous items having a slight amount of contamination were sealed in steel drums and buried under a minimum of

four feet of earth on 3M owned land near Kerrick, Minnesota." This site was selected by 3M based upon it meeting the 3M site selection criteria of having (1) proper geological conditions (an impermeable soil underlain by rock); (2) accessibility by truck for transport purposes; and (3) isolation from any population center.

In a September 1970 report, 3M made some conservative estimates on the maximum amount of radioactive material that could have been buried at that time. The amount of material estimated at that time included 40 millicuries of 93% enriched uranium, 3.0 millicuries of natural uranium and 1.5 millicuries of natural thorium. The burials occurred on four separate occasions from December 7, 1966 to November 27, 1968. After further investigation into their records, 3M now contends that the amount of enriched uranium buried at the site was below what was previously estimated. In a letter to the NRC dated October 1, 1992 (see Attachment A), 3M provided an updated estimate of the quantities of radioactive materials which were buried with their scrap materials during the December 1966 - November 1968 timeframe. In summary, the revised estimates are as follows:

	Thorium-232=	1.51 millicuries
(natural)	Uranium-238=	3.11 millicuries
(enriched)	Uranium-235=	11.99 millicuries

For a summary of the description of these burials, see Attachment I.

The requirements that were in effect at the time of the burials (10 CFR 20.304) allowed any licensee to bury small quantities of licensed material without notifying or obtaining approval from the Commission. This former regulation did not place any restrictions on radioactive containment, geological characteristics, land use, environmental monitoring of the site or continued licensing by the Commission. However, burial of small quantities of licensed material under Section 20.304 was restricted by the following three requirements:

(1) the total quantity of licensed and other radioactive material buried at any one location and time does not exceed, at the time of burial, 1,000 times the amount specified in Appendix C of this part;

(2) Burial is at a minimum depth of four feet; and

(3) Successive burials are separated by distances of at least six feet and not more than 12 burials are made in any year.

The NRC inspectors review of licensee documents and discussions with cognizant licensee representatives indicate that each of the four burials consisted of less than 50 millicuries which did not exceed 1000 times the limit in Appendix C; were buried at a minimum depth of four feet; were separated by a distance of at least six feet, and no more than two burials occurred in any one year.

Initially, site selection investigations were discussed with the Minnesota Water Pollution Control Commission (MWPCC). After several potential sites were identified that met the siting criteria described above, personnel from MWPCC reviewed the sites in the field with 3M Engineering personnel. Five hundred twenty acres of land in Pine County, Minnesota, near the town of Kerrick (population 56 as of 1992), was selected as the site which received the best evaluation from the MWPCC. This evaluation from MWPCC was transmitted to 3M in a letter from L. H. Smith from the MWPCC dated August 11, 1965. Another letter from MWPCC dated December 27, 1965, approved in principle the type of facility which 3M proposed. Based upon the above letters from MWPCC, 3M prepared final plans and specifications and submitted them to the MWPCC on September 8, 1966. 3M was notified of the State of Minnesota's approval of this action and issuance of Permit WPC No. 5227 in a letter dated October 10, 1966 (see Attachment B). Condition No. 4 of Permit No. WPC 5227 issued by MWPCC to 3M on October 7, 1966, states in part, "The special conditions given above do not apply to radioactive wastes which must be disposed of in accordance with applicable regulations and rules of the Atomic Energy Commission. The disposal of radioactive wastes at this site is not prohibited if done in conformance with U. S. Atomic Energy Commission requirements...."

Prior to the first burial, disposal plans were discussed with the Minnesota Department of Health because of their interest in the matter, and their involvement with citizen groups in the Kerrick area. On August 16, 1977, Jack Ferman, Ph.D from the Minnesota Pollution Control Agency (MPCA) met with 3M representatives to discuss the burials and gather additional background information regarding the safety significance of the burials. In a memorandum dated August 17, 1977 to Tim K. Scherkenbach, Chief of the Compliance and Enforcement Section of MPCA, Dr. Ferman stated, "Based on the information provided and the lack of population in the burial area, the approximately 0.5 kg U-235 that remains in Minnesota is judged to pose no hazard to the health and safety of the public" (see Attachment C, page 2).

3. Site Profile

The site consists of approximately 520 acres entirely within Section 34, Township 45 North, Range 17 West. The site is served by an unpaved county road (County Road 54) and is approximately 5 miles east of the intersection of County Road 46 and State Highway 23 at the town of Kerrick. The location of the property is shown in Attachment D. There are no buildings or personnel located on the 520 acre property owned by 3M. The burial area is estimated to occupy only 10,000 ft^2 of the 520 acres. The nearest residence is located approximately 1.5 miles west of the burial site. This rural farm is occupied and is serviced with an onsite water well approximately 80 feet in depth. The burial site access is controlled by a locked gate and partial fence along the roadway and a barbed wire fence surrounds the burial site. At the time of this inspection the property was posted with signs that stated "Private Property-No hunting, fishing, trapping or trespassing for any reason is strictly forbidden. Violators will be prosecuted." Waste

disposals occurred in two locations, the east location was used for chemical disposals and the west location was used for radiological disposals. The total disposal area for chemical and radiological wastes is estimated to be less than 5 acres of the 520 acres of property. Topographically, both sites are in the highest part of the section, the southeast corner. It appeared to the NRC inspectors that the radiological disposal site drains (rain & snow melt) to the northwest. This was corroborated by personnel from 3M.

On August 11, 1992, Mr. Steve Dravkowski from the County Extension, located in Hinkley, Minnesota, was contacted regarding the suitability for future farming in the area of the burial site. According to Mr. Dravkowski, general farming in Pine County, Minnesota has been on a steady decline for at least the past ten years. Mr. Dravkowski assumed that this steady decrease in farming was related to diverse soil and climate conditions in the northern Pine County area. He further stated that a pH of 6.0 is considered ideal soil acidity for farming; however, the acidity in northern Pine County is below a pH of 5 and is not conducive to high yield farming. Most of the farming is in the southern portion of Pine County. Pine County is the largest county in comparison of the surrounding counties; however, in 1987 there were only 1,085 active farms in Pine County. Mr. Dravkowski further stated that a Soils Productivity Index, which is a test to determine the soils innate ability to produce crops, has never been conducted in Pine County due to financial constraints.

4. Review of Historical Environmental Data

On October 5, 1972, a representative from the Minnesota Department of Health collected well and groundwater samples from the burial site and surrounding area. In an un-dated letter to a resident of Kerrick, Minnesota, A. J. Starin, Public Health Engineer, stated "No indications of contamination which might be attributed to the water from the disposal pond were found in the samples examined. In addition, an analysis for radioactivity made on all of the samples showed that alpha and beta emissions were within the normal range for natural radiation" (see Attachment E).

In August 1983, 3M collected seven water samples from groundwater monitoring wells located near the burial location. Three of the wells were located at the periphery of the 520 acre parcel of property. Well number 1 is located to the northwest of the burial site, well number 6 is to the southwest, and well number 3 is to the southeast. The depths of these wells are 55, 105 and 64 feet and their distances from the burial site were 3700, 1500 and 1500 feet, respectively. The other four wells were located approximately 1000 feet northeast of the burial site. Wells 3A, 4A and 5A are shallow and approximately 20 feet deep. Well 5B is 70 feet deep. All samples were analyzed for total thorium, total uranium, uranium-235, and uranium-238 by an independent laboratory. Due to the complexity and sensitivity of these radiochemical analyses, the licensee concluded that the analysis results were inclusive and that the extremely low levels of uranium and thorium found in the well water

samples were either from the natural environment, from the radiological burial site, or a combination of both.

On May 19, 1992, 3M collected groundwater samples from various areas around the radiological burial site. These samples were analyzed for isotopic uranium, thorium-232, and gross beta activity by an independent laboratory, Controls for Environmental Pollution, Inc. in Santa Fe, New Mexico (see Attachment F). This report indicates that the isotopic uranium results fall within the environmental groundwater level range reported for east central Minnesota by the U. S. Environmental Protection Agency in 1983. The gross beta results were similar to those reported by the Minnesota Department of Health in October 1972.

5. Independent Measurements

On July 20, 1992, the NRC initiated an environmental sampling program at the Kerrick, Minnesota site. This continued through October 20, 1992 and included direct radiation surveys, analysis of soil (including bore samples), water, vegetation, air particulate, radon, and TLD collection. For the TLD and radon placement and collection, 3M participated by placing their own TLD and radon monitors. Also participating by placing their own TLD's and splitting a limited number of water, vegetation and soil samples was the Minnesota Department of Health. Described below under each sampling topic are the results of those sample analyses.

Direct Radiation Measurements

On July 20, 1992, the inspectors toured the site and adjacent property and conducted independent radiation surveys using a Ludlum Model 3 survey instrument with a Model 44-9 pancake probe, NRC tag No. 037301 which was calibrated on January 2, 1992, and a Ludlum Model 19 Micro-R meter, NRC Tag No. 014808, which was calibrated on February 18, 1992. Background measurements taken in a controlled location remote from burial site with the Ludlum Model 3 showed 50 counts per minute (cpm). An instrument response check with a 1 μCi cesium-137 check source showed 11,000 cpm and a .006 μCi thorium-230 check source showed 1,600 cpm. Background measurements with the Ludlum Model 19 showed 10-18 μR/hour. Random measurements over each former burial plot, and on the inside and outside perimeter of the fenced burial areas showed no radiation levels above natural background. The NRC inspectors direct radiation measurements were similar to the licensee's survey results and the State Department of Health.

TLD Results

During the inspection on July 20, 1992, the NRC inspectors placed five (5) thermoluminscent dosimeters (TLDs) over the center of each burial plot, location 1, 2, 3 and 4 along with a control TLD located approximately 100 feet northwest of the burial fence post (see Attachment G for approximate locations of the TLDs). NRC TLD #2801 (location 1) was collocated with the State of Minnesota's TLD #0000055 and #0000056. NRC TLD #2802 (location 2) was collocated with the State

of Minnesota's TLD #0000053 and #0000054. These TLD's were also collocated with track etch radon monitors that were supplied by the licensee. On October 20, 1992, the TLD's were collected and returned to the NRC Region I office for analysis. The following shows the results of the TLD exposure for the field monitoring period of July 20 to October 20, 1992 (92 days):

NRC TLDs

SERIAL NO.	LOCATION	RESULTS in net exposure mR/92 days
2801	location #1	17.2 ± 0.7; 4.2
2802	location #2	16.0 ± 0.7; 4.1
2803	location #3	15.6 ± 0.7; 4.0
2804	location #4	20.4 ± 0.8; 4.6
2805	up wind control	16.3 ± 0.7; 4.1

Note- Results are reported as: Measurement ± Random error; Total error

Transit Dose= 3.6 ± 0.3; 2.9

State of Minnesota TLDs

Serial No.	Location	Results
0000055 0000056	location #1	6.8 μR/hour= 15.01 mR/92 days
0000052 0000053	location #2	6.5 μR/hour= 14.3 mR/92 days

3M TLD Results

On May 15, 1992, the licensee placed 15 TLD's in and around the burial area. These TLD's were removed on October 20, 1992, and were processed by an independent contractor (Eberline Environmental). The licensee reported the following results:

Control TLD	8.87 ± 0.24 μR/hour=	19.5 ± 0.5 mR/92 days
Lowest Result	6.82 ± 2.00 μR/hour=	15.0 ± 4.4 mR/92 days
highest Result	9.62 ± 3.54 μR/hour	21.2 ± 7.7 mR/92 days

The results of the exposure to the NRC TLDs was compared with the results from the State of Minnesota and the licensee. This comparison indicates all results were statistically the same. A review of the data in NUREG-0837,

Volume 10, No. 4 "NRC TLD Direct Radiation Monitoring Network" shows that the typical background radiation levels at control locations approximately 16-17 miles from Prairie Island and Monticello Nuclear Plants ranged between 17-18 mR/quarter. The NRC inspectors concluded that from the data presented above, the radiation levels in and around the Kerrick, Minnesota burial site are typical background radiation levels found in Minnesota and the buried thorium and uranium are not contributing to an increase in background radiation levels.

Radon Monitoring

On July 20, 1992, the licensee placed five radon monitors which were collocated with the NRC and some of the State Department of Health TLDs'. The results from the licensee's radon monitors (R. S. Landauer and Co.) are tabulated below:

SERIAL NO.	LOCATION	RESULTS in AVERAGE RADON CONCENTRATION pCi/liter
3687447	location #1	0.4
3687448	location #2	0.4
3687449	location #3	0.3
3687450	location #4	0.4
3687451	up wind control	0.3

The results indicate that the radon concentration over the burial site are not significantly different from the natural radon concentrations found in the general area of the burial site. Further, the licensee's results of radon monitoring was compared to the limits specified in 10 CFR 20, Appendix B for radon-222. The licensee's results were below the occupational limit of 30 pCi/liter and non-occupational limit of 3 pCi/liter. The NRC inspectors concluded from the data referenced above that no radon above natural emissions were identified in or around the burial site.

NRC Air Particulate Samples

On July 20, 1992, the NRC inspectors placed air particulate samplers on all four areas over the burial locations and in an upwind control location approximately 100 feet to the northwest of the burial site fence post. The samplers were collected on October 20, 1992 (92 days) and returned to the Region III office for analysis. On October 28, 1992, the air particulate samples were counted in the Region III laboratory. The following are the results of the air particulate samples:

Location	alpha/dpm	beta/dpm
Blank-Control	<1.5	<2.9
Control Up-Wind	<1.5	<5.5
Station #1	<2.4	<2.9
Station #2	<2.4	<5.0
Station #3	<1.5	<5.0
Station #4	<1.5	<6.0

All four stations that were sampled did not show any appreciable increase in radioactive particulates when compared to the up-wind and blank controls. The NRC inspectors concluded from the data presented above that no radioactive airborne particulates were identified in or around the burial site.

Vegetation Samples

On July 20, 1992, the NRC inspectors collected two bags of various species of grasses, weeds, plants and leaves from the various plants and trees located within the burial site. These samples were split with the representative from the Minnesota Department of Health. A review of the analytical results from the Minnesota Department of Health shows that all identified nuclides were at the lower limit of detection (LLD). The NRC composite samples were sent to the Radiological and Environmental Sciences Laboratory (RESL) in Idaho Falls, Idaho. The results of the analyses are presented below:

Nuclide	Results in pCi/sample BAG#1	BAG#2
Thorium-228	0.4 ±.04	0.7 ±.06
Thorium-230	0.1 ±.03	0.3 ±.04
Thorium-232	0.06 ±.002	0.2 ±.03
Uranium-234/233	0.1 ±.02	10.3 ±.03
Uranium-235	0.01 ±.001	0.01 ±.008
Uranium-238	0.08 ±.002	0.3 ±.03

According to the literature from U.S. EPA[2], the estimate of daily intake of uranium from grown foods in the U.S. is in the range of 0.2-0.9 pCi/day and the average annual ingestion of uranium in food is about 360 μg or 240 pCi. If the highest concentration of nuclides found in the weeds, grasses and leaves collected within the burial site were to be consumed daily for one year (0.7 pCi X 365 days= 255 pCi), the total concentration would be equivalent to the national average for uranium found in vegetation. The National Council on Radiation Protection (NCRP) Report No. 94 (Page 111) indicates that thorium-230 and thorium-232 found in fresh vegetables during a study in New York City diets in May 1978 ranged between .07 pCi/day (2.6 mBq) and .06 pCi/day.

The NRC inspectors concluded from the data presented above that neither the thorium nor uranium levels found in the vegetation within the burial site were not significantly different from the concentrations found normally in nature.

Well and Groundwater Analysis (NRC)

On July 20, 1992, the NRC inspectors collected seven water samples from various areas in and around the burial site. During the collection process, four of the water samples were split with the Minnesota Department of Health representative. The samples are identified as the following: (1) Well No. 1, (2) Well No. 3A, (3) Barn Well, (4) Surface H_2O swamp, (5) Inlet to Beaver pond, (6) Municipal H_2O-Big Lake, and (7) Delzer Residence. The following is a summary of those analyses as reported by RESL:

Location	Nuclide	Results in pCi/liter
Well No. 1	thorium-228	.15 ± .12
	thorium-230	.012 ± .055
	thorium-232	.08 ± .10
	uranium-234	-.02 ± .03
	uranium-235	-.01 ± .011
	uranium-238	-.006 ± .015
Well No. 3A	thorium-228	.02 ± .11
	thorium-230	.07 ± .06
	thorium-232	.12 ± .10
	uranium-234	.02 ± .03
	uranium-235	.002 ± .014
	uranium-238	.02 ± .02
Barn Well	thorium-228	-.005 ± .11
	thorium-230	-.06 ± .05
	thorium-232	-.03 ± .09
	uranium-234	-.01 ± .027
	uranium-235	-.013 ± .013
	uranium-238	.02 ± .02
Surface H_2O Swamp	thorium-228	.049 ± .017
	thorium-230	-.09 ± .15
	thorium-232	-.06 ± .1
	uranium-234	.17 ± .18
	uranium-235	.05 ± .07
	uranium-238	-.04 ± .1
Inlet to Beaver Pond	thorium-228	.03 ± .11
	thorium-230	.01 ± .06
	thorium-232	-.10 ± .09
	uranium-234	-.05 ± .02
	uranium-235	.002± .014
	uranium-238	.03 ± .02

Big Lake*	thorium-228	0. ± .11
	thorium-230	-.04 ± .05
	thorium-232	-.06 ± .09
	uranium-234	.09 ± .03
	uranium-235	.001± .013
	uranium-238	.07 ± .03
Delzer Residence	thorium-228	-.05 ± .11
	thorium-230	.05 ± .06
	thorium-232	.05 ± .10
	uranium-234	.0 ± .03
	uranium-235	.012 ± .015
	uranium-238	.02 ± .02

* Note - The "Big Lake" sample was taken from Lake Michigan (Illinois) and was taken as a control sample to compare thorium and uranium levels at the burial site with those found in the Great Lakes area.

The analysis of well water samples collected by 3M in August 1983 and May 19, 1992, was compared with the well and groundwater analysis of samples collected by the NRC inspectors on July 20, 1992. All three analytical results (3M and NRC) were compared with the EPA Maximum Contaminant Level Goals (MCLG) and the National Primary Drinking Water Regulations (Notice of proposed rules dated 7/18/91). All sets of analyses were well below the EPA MCLG of 30 picocuries/liter (pCi/l) for uranium in drinking water. Further, representatives from the U.S. EPA[1,2] indicated that the uranium activity in the drinking water in the State of Minnesota ranges from 0.01 - 67.99 picocuries/liter and the national average for uranium in drinking water is 2.0 pCi/liter. From the above information it can be concluded that the trace amounts of uranium found in the wells and groundwater that were sampled at the Kerrick site are acceptable for drinking water.

Well and Groundwater Analysis (State of Minnesota)

On July 20, 1992, the NRC inspectors split well and groundwater samples with the Minnesota Department of Health. These samples consisted of four individual samples from selected areas in and around the burial site. These samples were analyzed at the State of Minnesota Environmental Health Laboratory. The State issued the results of their analyses in a memorandum dated November 3, 1992 (see Attachment H). This report states, "Based on the above results and interpretations, we feel that there are no indications that the buried uranium and thorium waste is contaminating areas outside the disposal site". The only abnormality identified was a surface water sample

---

[1] Cothern, C. R., and Lappenbusch, W. L., "Uranium in U.S. Surface, Ground, and Domestic Waters," Vol. 3, EPA-570/9-81-001, April 1981.

[2] Cothern, C. R., and Lappenbusch, W. L., "Occurrence of Uranium in Drinking Water in the U.S.," Health Physics, Volume 45, No. 1, pp 89-99.

identified as "300 yards southwest" (swampy area). This sample showed gross alpha of 59 pCi/liter and gross beta of 91 pCi/liter, the sample also showed 40 pCi/liter of cesium-137.

The NRC inspectors review of the data provided by the State of Minnesota indicates that the area that showed excessive levels of gross alpha/beta and cesium-137 was contrary to the findings by NRC. Therefore, this area was re-sampled on October 20, 1992. The analysis and evaluation of this sample and the analysis of the States data showed the following:

(1) the State of Minnesota report dated November 3, 1992, identifying the groundwater sample as "300 yards southwest" was incorrect and should be identified as "300 yards northwest."

(2) The NRC re-analysis of this sample showed normal gross alpha/beta levels.

(3) The NRC laboratory analysis showed the levels of cesium-137 as 0.01 pCi/liter which is considered the lower limit of detection. The only nuclides identified were natural daughters of radium, e.g., 45 pCi/liter lead-212 and 54 pCi/liter bismuth-214.

The analysis of the remaining water samples collected by the Minnesota Department of Health was compared with the well and groundwater sample analysis of samples collected by the NRC inspectors on July 20, 1992. This evaluation and comparison of analytical data indicates that both analyses were similar.

Soil Samples and Bore Sample Analysis

On July 20, 1992, five soil surface samples were taken along with two bore samples taken at a depth of 7 feet and 12 feet. The bore samples were split with the State of Minnesota representative. Attachment G shows approximately where the samples were taken. The sample identification are listed as Station #'s 1-4 and Control location #5. The bore samples are identified as "shallow core" and "deep core." The results of the analyses from the NRC by RESL and the State of Minnesota are presented below:

Location	Nuclide	State Results* pCi/gram	NRC Results pCi/gram
Station #1	cesium-137	.02	NA
	thorium-228	<.13	.52 ± .02
	thorium-230	<.005	.61 ± .03
	thorium-232	.2 ± .03	.52 ± .02
	uranium-234/233	<4.9	.46 ± .02
	uranium-235	.01 ± .001	.02 ± .013
	uranium-238	.08 ± .005	.50 ± .02

Station #2	cesium-137	.01	NA
	thorium-228	<.10	.53 ± .02
	thorium-230	<.50	.58 ± .02
	thorium-232	.2 ± .03	.50 ± .02
	uranium-234/233	<4.2	.40 ± .02
	uranium-235	<.004	.02 ± .002
	uranium-238	.08 ± .004	.42 ± .02
Station #3	cesium-137	.01	NA
	thorium-228	<.13	.51 ± .02
	thorium-230	<.64	.56 ± .02
	thorium-232	.23 ± .04	.51 ± .02
	uranium-234/233	<5.0	.46 ± .02
	uranium-235	<.80	.03 ± .01
	uranium-238	<.09 ± .03	.50 ± .02
Station #4	cesium-137	.01	NA
	thorium-228	<.13	.61 ± .02
	thorium-230	<.67	.63 ± .03
	thorium-232	.23 ± .03	.59 ± .02
	uranium-234/233	<4.8	.49 ± .02
	uranium-235	<.08	.03 ± .01
	uranium-238	.08 ± .006	.52 ± .02
Control #5	cesium-137	.065 ± .002	NA
	thorium-228	<.16	.51 ± .02
	thorium-230	<.007	.54 ± .02
	thorium-232	.22 ± .003	.50 ± .02
	uranium-234/233	<6.1	.41 ± .01
	uranium-235	.011 ± .001	.02 ± .01
	uranium-238	.07 ± .005	.44 ± .02
shallow core 5-7 feet	thorium-228	<.30	.70 ± .03
	thorium-230	<1.5	.68 ± .03
	thorium-232	.51 ± .05	.70 ± .03
	uranium-234/233	<12.0	.54 ± .02
	uranium-235	<.19	.03 ± .01
	uranium-238	.15 ± .01	.62 ± .02
	cesium-137	<.01	NA

deep core	thorium-228	<.24	.57 ± .03
9-12 feet	thorium-230	<1.5	.60 ± .03
	thorium-232	.29 ± .04	.58 ± .03
	uranium-234/233	<12.0	.47 ± .02
	uranium-235	<.19	.02 ± .011
	uranium-238	.12 ± .02	.49 ± .02
	cesium-137	<.01	NA

NOTE - NA = Not Analyzed for this nuclide

* All analytical results from the Minnesota Department of Health of thorium and uranium were typically less than the NRC results. The Department of Health obtained their results by gamma spectrometry only, and quantified the results by counting either low abundance gamma rays or photons of daughter nuclides.

No violations of NRC requirements were identified.

6. Conclusion

The NRC staffs review of all the well and groundwater environmental data taken from the 3M burial site in Kerrick, Minnesota shows a close correlation between those taken by the licensee and the State of Minnesota, Department of Health. A review of all environmental sampling data indicates that the site does not appear to represent an immediate threat to the health and safety to the public or the environment. This data will be used to determine if any remediation activities are warranted.

7. Exit Meeting

The NRC inspectors met with the individuals identified in Section 1 of this report and summarized the findings of the inspection. The inspectors informed the licensee and State of Minnesota personnel that the independent radiologic survey indicated that the direct radiation measurements in and around the former burial site were not above natural background levels.

The inspectors also informed the licensee representatives that the environmental samples that were collected would be sent to the U. S. Department of Energy, Radiological and Environmental Sciences Laboratory (RESL) in Idaho Falls, Idaho for analysis and the TLD's which will be collected in October 1992 will be analyzed by the NRC Region I office. During the course of the inspection and during the exit meeting with the licensee, the licensee did not identify any documents or inspection findings and/or statements as proprietary in nature.

Attachment A: Letter dated 10/1/92 (3M to NRC)
B: Letter dated 10/10/66 w/attachments (State of Minnesota to 3M)
C: Memo dated 7/17/77 (Ferman to Scherkenbach)
D: Property Location and Plot Plan
E: Undated letter (10/5/72) (MN Department of Health to Resident)
F: Memo dated 7/22/92 regarding water analysis (3M)
G: Location map for TLD and radon monitors
H. Memo dated 11/3/92 (MN Department of Health)