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U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 078-154-A - Part 2 of 2

Subject: Radioactive Material in Uncontrolled Location,  
Norton, Massachusetts

Investigation at: Norton and Attleboro, Massachusetts

Investigation conducted: November 14, 1978 - April 1, 1979

Investigator: Walter G. Martin  
Walter G. Martin, Chief, Safeguards Branch

6/7/79  
date signed

Approved by: \_\_\_\_\_  
James M. Allan, Deputy Director, Region I

\_\_\_\_\_  
date signed

Investigation Summary:

Investigation on November 14, 1978 - April 1, 1979 (Report No. 078-154-A - Part 2)

Area Investigated: Investigation to determine the source of uranium material found in Norton landfill area. The investigation was based on allegations by Mr. John Sullivan, 33 Chartley Brook Lane, Attleboro, Massachusetts, that Texas Instruments of Attleboro possibly had discarded radioactive material at a private landfill area in Norton, Massachusetts. This investigation concerns itself solely with the uranium material found at the Norton landfill area.

Results: It has been determined that M&C Nuclear, Inc., a totally owned subsidiary of Metals & Controls Inc. (now Texas Instruments) worked with the three types of material found at the Norton landfill site. Other possible sources of the material could not be identified. All of these materials were of the type used in performance of work on AEC contracts by M&C Nuclear and are not representative of any license activities of any companies in the area.

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## I. REASON FOR INVESTIGATION

During the investigation initiated on November 14, 1978 and continuing through January 12, 1979 at the Norton landfill area and several other locations in the Attleboro and Norton, Massachusetts areas, samples were taken from the Norton landfill for analysis of the radioactive material. The analyses indicated that depleted, normal and enriched uranium materials were present at the Norton landfill area. This investigation was performed in two parts; the first part concerned itself with interviews of involved personnel and the second part with records and contract reviews, along with a limited number of interviews. This is the second part of that investigation.

## II. DETAILS

### A. Introduction

The results of the Norton, Massachusetts landfill sample analyses as of December 1, 1978, indicated that large quantities of depleted uranium and lesser quantities of normal and enriched uranium were present at the landfill site. Uranium materials were not found to be present at the other landfill areas surveyed. The results of the analyses of material from the Norton site are shown in Table I. In order to confirm the results of the enriched uranium samples, additional analyses of these samples were performed at the U.S. Department of Energy, New Brunswick Laboratory, Argonne, Illinois. The Analytical Service Request and results of these analyses are included as Enclosure 1 to this report.

### B. Scope of Investigation

This investigation was initiated on November 14, 1978 to determine the possible source of the uranium materials found at the Norton landfill site. The investigation was performed in two parts with the first part concerned with interviews of people concerned with the landfill activities and the possible source of the material and the second part includes a detailed analysis of the material and a review of the work performed by companies in the area during the time span from the year 1957 through 1968. The activities of 13 companies within a radius of 45 miles were reviewed as possible sources of the material. Eleven of these companies were eliminated due to the distance from the landfill site and the type of work performed. The previous activities of D. E. Makepeace and M&C Nuclear Inc. were considered to be the most likely sources of the uranium and the investigation concentrated on their activities.

### C. Individuals Directly Interviewed or Contacted During the NRC Investigation

1. Mr. Kenneth C. Duffy, San Diego, California: Mr. Duffy was the Nuclear Materials Accountability Representative for M&C Nuclear from November 1957 to March 1963.
2. Mr. George H. Scott, Jr.: General Manager, Engelhard Minerals & Chemicals Corporation, Route 152, Plainville, Massachusetts.
3. Mr. William I. George: Assistant Vice President, Texas Instruments Inc., Attleboro, Massachusetts.
4. Mr. Fred Sherman: Project Manager, Texas Instruments Inc., Attleboro, Massachusetts.
5. Mr. Ronald Donn: Argonne National Laboratory
6. Mr. George Morgan: Schenectady Naval Reactors Office

#### D. Investigation Findings

The results of the analyses as of December 1, 1978, indicated large quantities of depleted uranium and small quantities of normal and enriched uranium were present at the Norton landfill site.

A review of the work performed by D. E. Makepeace, Division Engelhard Industries, Plainville, Massachusetts (now Engelhard Industries) during the period 1957 through 1968 did not reveal work performed during that time span which had any similarity to the enriched samples from the Norton landfill area. D. E. Makepeace had performed work with enriched, depleted and normal uranium. The enriched material was not of the type found at the Norton landfill area and there were no large quantities of depleted material unaccounted for.

A review of the work performed by M&C Nuclear Inc., a totally owned subsidiary of Metals & Controls Inc. (now Texas Instruments) revealed that M&C Nuclear had performed work with materials similar to the enriched uranium samples found at the Norton landfill site as well as with normal and depleted uranium.

Table I reveals that many of the areas surveyed and analyzed at the Norton landfill area contained depleted uranium material. M&C Nuclear Inc., in a contract with Argonne National Laboratory, performed a large fabrication job with depleted uranium. Upon completion of this work, there was a depleted uranium loss in excess of one ton. In several telephone conversations with Mr. Kenneth Duffy, former Nuclear Material Accountability Representative for M&C Nuclear, it was learned that M&C Nuclear burned depleted uranium chips and turnings in order to render it non-pyrophoric prior to returning this material to Argonne National Laboratory.

This burning was accomplished out of doors in open trays which frequently spilled over or failed. The ground around these trays was often covered with depleted uranium. It was also learned that large quantities of soil were contained in the drums of material returned to Argonne as a result of trying to shovel this material into drums for return. The area where this burning occurred was cleaned and it is fairly certain that the material resulting from the cleanup was taken to the Norton landfill area. A parking lot and railroad spur are now in the area where the burning took place. A copy of the correspondence relating to this contract and the missing depleted uranium is presented as Enclosure 2 to this report.

CRD  
PARAGRAPH  
MISSING

Mr. K. C. Duffy also furnished information with regard to uranium-aluminum fabrication work performed at M&C Nuclear during the period from 1957-1963. He states that there were several contracts for uranium-aluminum work with uranium enriched to small fractions below 20%. One job of this type performed for Belgium had uranium unaccounted for in excess of normal limits. These jobs were performed on a U.S. Government to Foreign Government contract through Metals & Controls Inc. Sample F-12 in Table I represented also by NBL Sample No. E 5581A in Enclosure 1 is the sample of this type of material found at the Norton landfill site.

Mr. Duffy also related that the licensed material at M&C Nuclear during the time span under investigation consisted primarily of uranium metal foil and foil grade ingots of various enrichments. The materials were pure uranium unalloyed with other materials. They were present in small quantities when compared with the M&C Nuclear government contract material.

Materials of unalloyed enriched uranium were not found to be present at the Norton landfill area.

#### E. Conclusions

The conclusion of this investigation is that M&C Nuclear Inc. was the probable source of the uranium materials found at the Norton landfill site and that the materials identified were from contract work performed by M&C Nuclear Inc. for the Atomic Energy Commission.

TABLE INorton, Mass. Landfill Sample Results as of December 1, 1978

<u>Sample No.</u>	<u>Location</u>	<u>Date Sampled</u>	<u>Sample Results</u>	<u>Radiation Survey Results</u> contact (G-M)
0-1	See Map	10/24/78	Depleted Uranium. U-238 in -35 mesh soil fraction = $2.25 \pm 0.9 \text{ E-1 } \mu\text{Ci/gm.}$ X-ray diffraction and emission spectrographic analyses indi- cated Uranium and Silica the major components with Uranium as $\text{U}_3\text{O}_8$ and $\text{UO}_2$ .	2-6 mR/hr
0-2	See Map	10/24/78	Natural Uranium. U-238 in -35 mesh soil fraction = $1.35 \pm 0.45 \text{ E-6 } \mu\text{Ci/gm.}$	2-6 mR/hr
0-3	See Map	10/24/78	Depleted Uranium. U-238 in -35 mesh soil fraction = $= 9.01 \pm 0.32 \text{ E-2 } \mu\text{Ci/gm.}$	10-15 mR/hr
1-1	Hole A top 6"	10/31-11/2/78	-35 mesh soil fraction is depleted Uranium. The soil is approximately 26% Uranium; the Uranium concentration in the soil = $8.6 \text{ E-2 } \mu\text{Ci/gm.}$ A metal strip found in the soil contains enriched Uranium to approximately 8%. X-ray diffraction and emission spectrographic analyses indi- cated the metal strip to be Uranium and Zirconium.	10-15 mR/hr

<u>Sample No.</u>	<u>Location</u>	<u>Date Sampled</u>	<u>Sample Results</u>	<u>Radiation Survey Results</u> contact (G-M)
1-2	Hole A (east side) 3" from top	10/31-11/2/78	-35 mesh soil fraction is depleted Uranium. The soil is approximately 36% Uranium. X-ray diffraction and emission spectrographic analyses indicated Uranium in the Forms $UO_3 \cdot 2H_2O$ and $MgU_2O_6$ .	~ 30 mR/hr
1-3	Hole A 12" depth	10/31-11/2/78	Depleted Uranium.	2 mR/hr
1-4	Hole A 21"-23" depth	10/31-11/2/78	Depleted Uranium and Radium.	1 mR/hr
1-5	Hole B top 3"	10/31-11/2/78	Radium and Uranium-235 present. $Ra^{226}/U^{235} = 36^*$ .	2-3 mR/hr
1-6	Hole C 9" depth	10/31-11/2/78	-35 mesh soil sample contains Radium. The radium concentration in the soil = $1.4 \pm 0.3$ E-2 $\mu Ci/gm$ .	3 mR/hr
1-7	Hole C surface	10/31-11/2/78	Radium and Uranium-235 present. $Ra^{226}/U^{235} = 20^*$ .	1 mR/hr
1-8	Hole D surface	10/31-11/2/78	Radium and Uranium-235 present. $Ra^{226}/U^{235} = 26^*$ .	0.3 mR/hr

<u>Sample No.</u>	<u>Location</u>	<u>Date Sampled</u>	<u>Sample Results</u>	<u>Radiation Survey Result contact (G-M)</u>
1-9	Hole D-1 surface	10/31-11/2/78	Radium and Uranium-235 present. Ra <sup>226</sup> /U <sup>235</sup> = 78*.	0.3 mR/hr
1-10	Hole D 6" depth	10/31-11/2/78	Radium only.	0.2 mR/hr
1-11	Hole D-1 3"-6" depth	10/31-11/2/78	Radium and Uranium-235 present. Ra <sup>226</sup> /U <sup>235</sup> = 45*.	0.3 mR/hr
1-12	metal casting	10/31-11/2/78	The casting contains Uranium enriched to 15 weight percent. X-ray diffraction and emission spectrographic analyses indi- cated Uranium and Aluminum in the Form UA <sup>13</sup> .	~ 30 mR/hr
1-13	Mud A	10/31-11/2/78	Radium and Uranium-235 and 238 present. Ra <sup>226</sup> /U <sup>235</sup> = 1.	0 mR/hr
1-14	Mud B	10/31-11/2/78	Radium only.	0 mR/hr
1-15	Mud C	10/31-11/2/78	Radium only.	0 mR/hr
1-16	Mud D	10/31-11/2/78	Radium only.	0 mR/hr