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MCAS EL TORO
SSIC #5090.3

TECHNICAL

MEMORANDUM

CONCERNING:

Evaluation of Potential Radium 226 Painted
Instrument Gauge Recovered from the
Former Marine Corps Air Station
El Toro, California

Project No. : BLA 990703

PREPARED BY

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CONCLUSION

A specimen was collected from the surface of a Landfill on MCAS El Toro in July 1999, it was undoubtably a gauge that had been painted with a paint that contained Ra 226. Up to the time of this discovery, the DoN had acknowledged that the disposal of radioactive debris in Landfills was quite probable at El Toro. With this discovery and the verification of its radioactive response by those skilled in the art, it has become a certainty that radioactive waste was disposed of in the Landfills at MCAS El Toro. At this time, with the available information, it is not possible to determine if the disposal of Ra 226 at MCAS El Toro is limited or widespread. The extensiveness of the distribution of Ra 226 at MCAS El Toro remains to be determined.

1. INTRODUCTION

The author is currently a member of the El Toro Restoration Advisory Board (RAB) and the Chair of the Research Committee, a sub-committee of the RAB. The Department of the Navy (DoN) has sponsored periodic tours of the Base, allowing members of the community to observe the remediation activities at the time of the tour. I have been able to attend only one tour of El Toro and Tustin owing to a scheduling of all other tours on Saturday morning. An invitation was made by another RAB member, Marcia Rudolph (prior Community Co-Chair of the RAB, present member of the City Council for Lake Forest) for sub-committee members to visit the Site 2 area on the morning of 3 July 1999 that I was able to accept. By that date, the Base had already become the Former Marine Corps Air Station El Toro (MCAS El Toro).

2. BACKGROUND

Site 2 is located in the upper northeast quadrant of the MCAS El Toro, in an area that is reported by the DoN to become a wildlife habitat after Base closure and transfer. Two documents released by the DoN are relevant for radiological activities associated with considering conditions at the Site 2 Landfill.

A. Draft Final Record of Decision (ROD) Operable Unit 2B Landfill Site 2, MCAS El Toro, California; June 1999:

Information available to the public as contained in this document summarizes information regarding the Site 2 Landfill as of June 1999. In the Site Description (page 1-1) a variety of wastes are

reported to have been placed in this Landfill; however, there is no mention that potentially radioactive species could have been discarded in the Landfill. While the DoN gave no indication why there would be a possible presence of radioactivity, data was reported regarding potential radionuclides found in the vicinity of the Site 2 Landfill. The conclusion of the ROD discounted any migration of radionuclides from the Landfill, but attributed the observed results to natural or agricultural sources.

Migration of radionuclides from the Site 2 Landfill may be a subject of controversy, however, as in Figure 2-7 there was a clear indication of elevated general radionuclides in stormwater and seep water. And there were other observed gross alpha and gross beta determinations in water and soil samples indicating the presence of radionuclides.

B. Historical Radiological Assessment (HRA), May 20, 1999:

The recommendations of the HRA omit any recommendation for a further evaluation of radionuclides at the Site 2 Landfill; thus, implying that the DoN does not consider radioactivity a significant risk at this location. In fact, the DoN presents a conclusion that there are no risks arising from any migration of radionuclides at any location at all on the Base. Subsequent communications with Regulatory Agencies and other third parties have not concurred with this DoN conclusion.

In contrast to the recommendations stated in the HRA, the body of the HRA text indicated in detail that there was a wide range of radioactive debris generated during operations at the Station. Unfortunately, there appears to be no record of evidence of the actual destination of any of this type of waste, according to what records and testimony are available.

3. SAMPLE COLLECTION

A. Site 2 Landfill Area:

Site 2 is located in the Borrego Wash, a natural ravine that is clearly subject to periodic flows of rain during the annual rainy season. Most of the area expresses a landscape that one would expect in the limited rainfall region that typifies southern California. The ravine has a variety of access roads for the miscellaneous activities that occur in this area. There is another area, referred to as Site 1 or the Explosive Ordnance Destruction area (EOD), that is at a somewhat higher elevation to the Site 2 Landfill. It is obvious from the terrain that water would flow down from Site 1 and through Site 2. In previous presentations and tours, the DoN has described repairs along the Wash to limit erosion in the area near the Site 2 Landfill.

An unusual, approximately circular area was noticed due east of the likely Landfill boundary. (There is no specific marking of the area to indicate where the accepted boundary of the landfill is located.) This grey area had markedly different vegetation from the area around it. The surrounding area had a very typical vegetation of dried, yellow grasses. The grey area had a limited green vegetation on it. The grey color penetrated no deeper than 1 cm into the soil.

In inspecting this grey area, I and the members of my party came upon a small piece of debris (referred to as Specimen A). While none of us remember precisely the location of the debris, we all

remember the inspection of the piece of debris and its original location, in general. I placed the device in a handkerchief and placed it in my pocket for inspection and evaluation at a later time. Several other bits of debris were collected by the party, including what we believed to be M 14 shell casings. The area had numerous other pieces of debris in addition to the casings. Items included 55 gallon drums, drum lids, trash, asphalt, and a vehicle; they were inspected, but not disturbed. This other debris is consistent with what the DoN has reported to be in the area of the landfill, now.

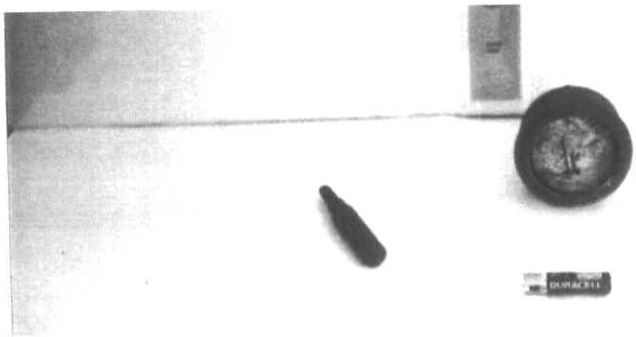
B. Storage of Specimen A:

Upon reflection, the possibility that this item was a potential radium painted gauge had to be considered possible. Since Radium 226 is primarily an alpha emitter, containing the item (such as in a plastic bag) is considered a suitable means to contain the radioactivity. Consequently, the wrapped gauge was further contained in a box, and kept away from any human or animal contact. After the evaluation of Specimen A, it was further contained in a sealable plastic bag, from which air could be readily expelled.

Since the day of its acquisition, the specimen has been under my control, or in my view during any evaluation. I will attest to the chain of custody of this item from the point of its collection until the time of this report. For purposes of this Technical Memorandum, Specimen A should be considered a sample collected that day for subsequent testing and evaluation. Under standard sampling protocols, sample residues are returned to their point of origin after testing has been completed. It is intended that this protocol would be maintained.

C. Description of Specimen A:

The device is circular, about 5 cm in diameter, and about 3 cm thick. The dial or front plate retains a light grey color. The body of the gauge appears to be heavily corroded iron. There is no cover plate (glass or otherwise), and any printing is no longer visible to the eye. There is one pointer arm on the device. Photographs of the device have been made, and are included on the next pages of this report. The M 14 casing and a AAA battery have been added into the photograph to provide an indication of relative size.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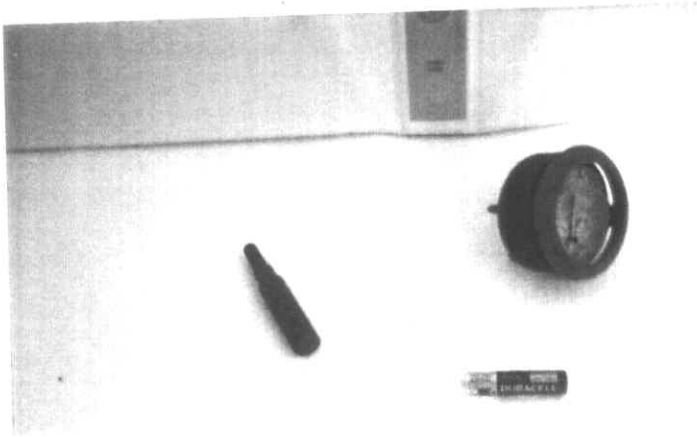
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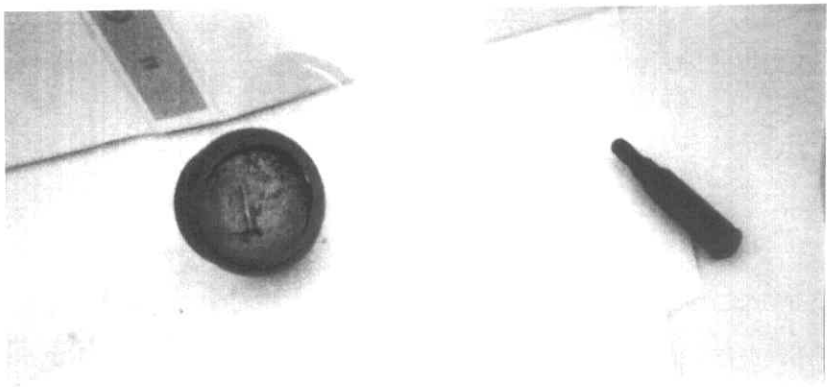

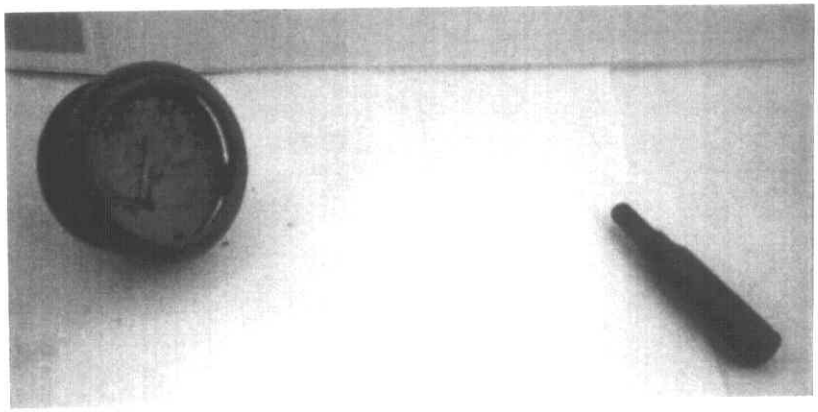

4. SAMPLE EVALUATION

Many academic departments are reducing their use of radionuclides; hence, Geiger counters are not that readily found. While I had not considered it a pressing issue to evaluate the gauge, I was pleased to learn that one campus Health and Safety Office was quite willing to evaluate these types of samples from the community. This is done as a public service for the community. It is apparently common to find radioactive materials used in unexpected ways, such as in the glazes on pottery in people's homes. They were willing to evaluate the device.

A. Preliminary Testing:

On 7 September, 1999 I brought the device to the California State University at Fullerton for evaluation. While the lead Health and Safety Officer was not available, Skip Heins was. He used a Ludlum Model # 12C Pancake Open Window Geiger counter to measure the emissions of the device. His preliminary test elicited a response of 3000 cpm from the device, with background levels around 3-5 cpm in the room. This was a sufficiently high response to conclude that there was a likely probability that this gauge was painted with a paint that contained Ra 226 and was a radioactive item.

B. Comprehensive Evaluation:

Based upon this preliminary study, I considered it important to repeat the experiment, perhaps with more care and precision. A more complete evaluation was performed on 15 September, 1999 in the Health and Safety Office at CSUF by the chief health officer, Sue Fisher. The same Geiger counter was used, but in this case the response was 20,000 cpm at the dial face. This value declined sharply as the detector was moved from the device. A 1.38 microcurie source of Ra 226, that Ms. Fisher used as a standard, was found to give a response of 40,000 cpm.

At a distance of 0.5 M from the device, the readings from the dial had declined back to the background levels of 3-5 cpm in the room. When a piece of polyethylene (about 1 mm thick) was placed in front of the device, the detector counts dropped to much less than 50% of the unshielded level. When a piece of lead (about 2 mm thick) was added to the shielding, the only detection was at the background level in the room. These results are consistent with the hypothesis that the device had been painted with Radium 226 paint, which is primarily an alpha emitter.

An additional evaluation of the device with a Victorine Ion Chamber Model 450 instrument provided an estimate of the millirems/hr that the device was emitting. The emission was at the rate of about 34 millirems/hr, a level that was again consistent with a Ra 226 painted device.

C. Safety Issues:

While these readings are readily reproducible and clearly above background, it was Ms. Fisher's observation that the device did not present an immediate health risk to anyone if the device was stored in a safe manner. This means that the device should be stored in, at the least, an airtight plastic bag with some secondary containment. The particulates that had fallen off of the device (i.e. corrosion byproducts) during storage were found to be emitters, also. This indicates that handling of the device should be avoided, as the particulate would be a potential pathway of ingestion exposure to radioactivity. Ms. Fisher's advice for storing the device was in full agreement with Mr. Jay Brady, a Principal Health Physicist (Ret.), with whom extensive discussions had already been held regarding safe handling of such a device.