UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 1, 2018

EA-18-051

Jason Watt, Director
Coleman A. Young Int. Airport
11499 Conner Ave.
Detroit, MI 48213

SUBJECT: COLEMAN A. YOUNG INTERNATIONAL AIRPORT — RESULTS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT AND REQUEST FOR CONFIRMATION OF VOLUNTARY CONTROLS; EXERCISE OF ENFORCEMENT DISCRETION

Dear Mr. Watt:

I am writing to provide the results of the U.S. Nuclear Regulatory Commission (NRC) staff's initial site visit to the property at 11499 Conner Avenue, Detroit, Michigan, performed on April 17-19, 2018. The results are summarized below and are discussed in further detail in the enclosed report.

As described in the site summary attached to our letter dated January 29, 2018,[1] our records indicate that the Executive Hangar at the Coleman A. Young International Airport property, formerly the Detroit City Airport, was previously used by companies that repaired/refurbished aircraft dials and gauges. The staff believes these companies likely serviced vintage aircraft self-luminous instruments (gauges) containing radium-226, a radioactive material regulated by the NRC.

During the initial site visit, the staff conducted radiation surveys over approximately 50 percent of the areas inside Hangars 9, 10, and 13 of the Executive Terminal. The staff did not survey the other hangars inside the Executive Terminal, areas outside the hangars, or under the driveway or building foundations. Hangars 9, 10, and 13 were identified to the NRC by the State of Michigan as the locations of previous dial and gauge repair companies and were therefore the only areas surveyed.

As was discussed with representatives of the Coleman A. Young International Airport during our initial site visit, the staff found some levels of radiation that were above the average background reading in Hangars 9 and 13. However, these measurements indicate that, even with conservative assumptions, a member of the public regularly working in these areas would not receive an annual dose in excess of 25 millirem per year, the limit for unrestricted use, found in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 20.1402, *Radiological criteria for unrestricted use*. Also during our visit, the staff found elevated radiation levels on aircraft gauges, equipment switches, and other items around the office (i.e., luminous products) in Hangar 13.

[1] Agencywide Documents Access and Management System (ADAMS) Accession No. ML17244A035.

Up to 100 luminous products (e.g., gauges) may be possessed under a general license in accordance with 10 CFR 31.12(a)(4), *General license for certain items and self-luminous products containing radium-226*. Based on the survey conducted, the staff estimates that there are fewer than 100 dials and gauges containing Ra-226 stored in the hangers; therefore, Coleman A. Young International Airport is considered a General Licensee. As a General Licensee, Coleman A. Young International Airport must comply with certain requirements under 10 CFR 31.12(c), which include that it:

(1) Must notify the NRC should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive materials. A report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of the Office of Nuclear Material Safety and Safeguards (NMSS), U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001 within 30 days.

(2) Must not abandon products containing radium-226. The product, and any radioactive material from the product, may only be disposed of in accordance with 10 CFR 20.2008, *Disposal of certain byproduct material*, or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC.

(3) Must not export (i.e., transfer to a person or an international organization in a foreign country) products containing radium-226 except in accordance with 10 CFR Part 110, *Export and Import of Nuclear Equipment and Material*.

(4) Must dispose of products containing radium-226 only at a disposal facility authorized to dispose of radioactive material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under 10 CFR Part 30, *Rules of General Applicability to Domestic Licensing of Byproduct Material*, or equivalent regulations of an Agreement State, or as otherwise approved by the NRC.

(5) Must respond to written requests (including this request) from the NRC to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If you cannot provide the requested information within the allotted time, you must, within that same time period, request a longer period to supply the information. A written justification for the request must be provided to the Director of NMSS by means of an appropriate method listed in 10 CFR 30.6(a).

As discussed in the enclosure, the staff identified several damaged self-luminous aircraft gauges containing radium-226, as well as elevated radiation levels on aircraft gauges and surfaces within the building, indicating a loss of radioactive material. However, you had not reported this damage to the NRC, as required in 10 CFR 31.12(c)(1). Based on this discovery, the staff determined that a violation of NRC requirements, as stated above in item (1), occurred.

After identifying the presence of the broken radium-containing gauges and switches during the site visit, the staff conducted additional measurements to test for removable contamination on the items and in the Hangars. Having found removable contamination on several items, the staff placed the gauges and other materials on the roof of the offices, which is entirely situated within Hangar 13, to control the potential spread of contamination. Please note that the staff did not survey each individual aircraft gauge or item. Once placed on the roof, the exposure levels from

the items do not exceed the action level at industrial use locations, as discussed in the NRC's Temporary Instruction 2800/043[2] for recommending limiting routine access.

Following placement of the items on the roof of the offices within Hangar 13, a representative of the Coleman A. Young International Airport verbally committed to comply with the general license requirements of 10 CFR 31.12. Specifically, the representative verbally committed that no further work would be performed on the radium gauges, no additional radium gauges would be received, and the items on the roof would remain there.

The violation of 10 CFR 31.12(c)(1) for not reporting the damaged items was evaluated in accordance with the NRC Enforcement Policy and has been characterized at Severity Level III, a violation that could have resulted in moderate safety or security consequences. However, I have been authorized, after consultation with the Director, Office of Enforcement, to exercise enforcement discretion in this case in accordance with Section 3.5, "Violations Involving Special Circumstances," of the Enforcement Policy. Consistent with the Enforcement Guidance Memorandum (EGM) 09-004, "Interim Guidance for Dispositioning Violations of Naturally Occurring and Accelerator-Produced Radioactive Materials (NARM) Requirements,"[3] the NRC will not cite the violation because: (1) the failure did not result in an actual safety, health, or security consequence; (2) the failure was not willful; (3) a reasonable argument was provided that the Coleman A. Young International Airport was not aware that the requirement was applicable; and (4) a representative from the Coleman A. Young International Airport committed to comply with general license requirements associated with 10 CFR 31.12. The current Enforcement Policy is included on the NRC's Web site http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

If you contest this action or its significance, a response must be provided within 30 days of the date of this letter, with the basis for denial and/or corrected information, to the NRC, ATTN.: Document Control Desk, Washington, D.C. 20555-0001, with a copy to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Please note that the exercise of enforcement discretion applies only to the damaged items as identified by the staff during the initial site visit on April 17–19, 2018. The Coleman A. Young International Airport is required to follow 10 CFR 31.12(c)(1) and notify the NRC should there be any indication of possible additional damage to or changes to the state of the products now in its possession, should additional gauges be received or acquired in the future that have indication of possible damage, or if any other gauges are identified in the other hangars. Should additional damage be identified, a report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of NMSS within 30 days of the date of identification, as described on page 2 above.

Due to the low levels of contamination found on the dials and gauges, the staff concludes that there are no immediate health and safety concerns at this site. However, the staff supports the site owner representative's decision to limit access to the areas were the gauges and dials are stored.

In accordance with 10 CFR 31.12(c)(5), the staff requests the following for information within **120 days** of the date of this letter:

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[2] ADAMS Accession No. ML16330A678.
[3] ADAMS Accession No. ML091340060.

1) Plans for either continued possession of the aircraft gauges and other items or disposition of the items.

2) Confirmation of the requested controls put in place, of limiting access, for the material that is currently being stored on the roof of the building in Hangar 13.

With respect to the limited areas in Hangars 9 and 13 where we found levels of radiation above the average background, our survey of the site does not constitute final characterization of the site. However, as discussed above, these levels indicate that, even with conservative assumptions, a member of the public regularly working in these areas would not receive an annual dose in excess of 25 millirem per year, the limit for unrestricted use, found in 10 CFR 20.1402.

As part of any voluntary cleanup effort, we recommend that you consult an NRC or Agreement State specifically licensed service provider to ensure that there is limited potential for radiological contamination to be spread. If you dispose of the gauges and other items, a licensed service provider should be utilized to conduct any packaging of radioactive waste for transport. Please be aware that any remediation activities pursued at your site may also have to meet any State of Michigan requirements and standards. As previously discussed, any voluntary site cleanup is the financial responsibility of the site owner.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

We will be contacting you in the near future to discuss this letter and report. Please contact Mr. Stephen Koenick, Chief, Low-Level Waste and Projects Branch, Division of Decommissioning, Uranium Recovery and Waste Programs, NMSS, at (301) 415-6631, or Mr. Richard Chang, Project Manager, at (301) 415-5888, should you have any questions in the interim.

Sincerely,

/RA/

John R. Tappert, Director
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 03039055

Enclosures:
1. Site Status Report for Detroit City Airport
2. Copy of Applicable NRC Regulations

REGISTERED LETTER – RETURN RECEIPT REQUESTED

SUBJECT: COLEMAN A. YOUNG INTERNATIONAL AIRPORT — RESULTS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT AND REQUEST FOR CONFIRMATION OF VOLUNTARY CONTROLS; EXERCISE OF ENFORCEMENT DISCRETION, November 1, 2018

DISTRIBUTION:
RidsRgn3MailCenter B. Lin, RIII M. Burgess, NMSS L. Sreenivas, OE

ADAMS Accession No.: ML18149A397 ***via e-mail**

OFFICE	DUWP/MDB/PM	DUWP/LA	DUWP/MDB	DUWP/MDB	RIII/DNMS/BC
NAME	JWhited	CHolston	RNelson*	CGrossman*	MKunowski*
DATE	05/29/2018	05/31/2018	06/05/2018	07/19/2018	07/25/2018
OFFICE	DUWP/MDB/BC	NMSS EC	OE/EB	OGC (NLO)	DUWP
NAME	SKoenick	MBurgess	LSreenivas*	IIrvin*	JTappert
DATE	08/20/2018	08/21/2018	08/29/2018	09/26/2018	11/01/2018

OFFICIAL RECORD COPY

Enclosure 1

OAK RIDGE ASSOCIATED UNIVERSITIES:

SITE STATUS REPORT FOR COLEMAN A. YOUNG INTERNATIONAL AIRPORT (FORMERLY DETROIT CITY AIRPORT) AT 11499 CONNER STREET IN DETROIT, MICHIGAN

November 1, 2018

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) requested that Oak Ridge Associated Universities (ORAU) perform a radiation survey of Hangars 9, 10, and 13 at the 11499 Conner Street, Detroit City Airport property in Detroit, Michigan. Circa 1992 records obtained from the Michigan Department of Environmental Quality demonstrate the presence of luminous radium material. These materials possibly date from operations as far back as World War II, when the use of luminous radium materials was prevalent in historic aircraft instruments. Many radium-containing aircraft instruments were identified, inventoried, and removed by 2003. The objective of this survey was to confirm the 2003 cleanup activities and locate discrete and/or distributed sources of radium, if any, in Hangars 9, 10, and 13.

ORAU performed radiation surveys in accessible portions of Hangars 9, 10, and 13 on April 17-19, 2018. Surveys confirm that discrete sources of radium remain in Hangars 9 and 13, though no elevated radiation levels were identified in Hangar 10. Radium contamination was found on the floor, in boxes containing gauges/instruments, and on other miscellaneous items. The site contact is aware of the location of identified items containing discrete sources of radium, including most of the small items that were moved to the roof of the offices/rooms inside Hangar 13 to control the potential spread of contamination—the exception is one gauge, located in the lower level offices, which appeared to be in use. Measurements of radiation levels provide confidence that receptors would not exceed the 25 mrem/yr dose limit. Based on the above observations, it is recommended that the NRC staff not perform a scoping survey at the Detroit City Airport property. However, NRC should maintain contact with airport personnel under a General License, as discussed in Title 10 of the *Code of Federal Regulations* Section 31.12, *General license for certain items and self-luminous products containing Radium-226*, to ensure identified discrete sources of radium are properly dispositioned, especially as related to items with removable activity in Hangar 13.

SITE STATUS REPORT

Property:	Detroit City Airport 11499 Conner Street Detroit, MI 48213
Docket Number:	03039055
Current Property Name(s):	Coleman A. Young International Airport
Current Property Owner(s):	City of Detroit
Inspection Dates:	April 17–19, 2018
Inspector(s):	Bill Lin and Mike Kunowski/ U.S. Nuclear Regulatory Commission (NRC), supported by Kaitlin Engel and Teresa Brown/Oak Ridge Associated Universities (ORAU)

1.0 INTRODUCTION

The Energy Policy Act of 2005 amended section 11e.(3) of the Atomic Energy Act of 1954 to place discrete sources of radium-226 (Ra-226) under U.S. Nuclear Regulatory Commission (NRC) regulatory authority as byproduct material. The property at 11499 Conner Street in Detroit, Michigan (MI) was identified as the site of three post-World War II aircraft instrument repair companies that repaired/refurbished aircraft dials and gauges containing luminous radium materials (ORNL 2017). The objectives of the survey were to confirm previous cleanup activities and determine if discrete sources of radium-226 (Ra-226) and/or distributed Ra-226 contamination are still present, to identify the areas of highest contamination, to determine if there are any current health and safety concerns, and to determine if further action by the NRC is needed. Surveys were performed as described within NRC's procedure, Temporary Instruction (TI) 2800/043, "Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources" (NRC 2017).

Data collected during the survey are used to either eliminate the property from future NRC consideration or to plan future actions that may be needed to reduce Ra-226 exposure to current or future site occupants to levels that do not exceed the applicable regulatory requirement. It is important to note that destructive testing is not generally performed, as described within TI 2800/043.

2.0 PROPERTY DESCRIPTION AND INITIAL SITE VISIT CONSIDERATIONS

2.1 Property Description and History

The approximately 205,000-ft^2 Executive Terminal at the Detroit City Airport (renamed the Coleman A. Young International Airport in 2003) was built in 1966 and is currently used to house private, cargo, and corporate airplanes. The terminal, shown in Figure 1, extends 1,014 feet parallel to Conner Street, with width of 250 feet at the southeast end, 204 feet for the middle section of 786 feet, and 127.5 feet for the bay on the northern end. The two-story-tall structure sits on a concrete pile foundation. The Executive Terminal consists of 14 hangar bays

(numbered in Figure 1), of which Hangars 9, 10, and 13 are linked to companies that repaired/refurbished aircraft dials and gauges containing luminous radium materials (ORNL 2017).

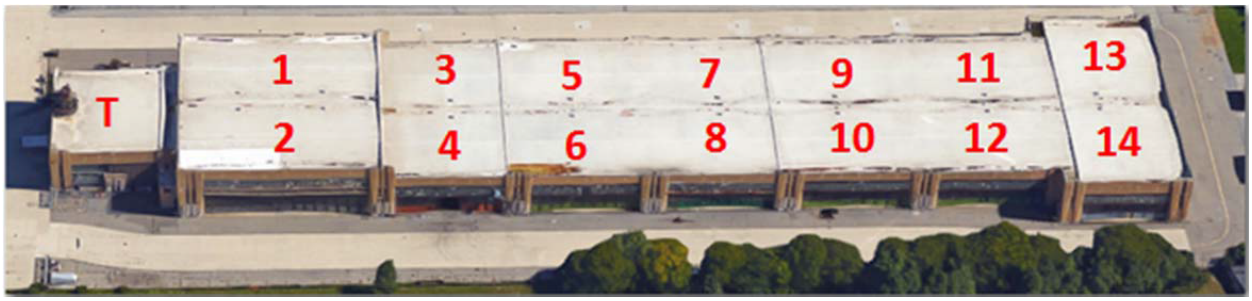


Figure 1. Detroit City Airport Executive Terminal and Hangars (Google Earth 2017)

Use of luminous radium materials was prevalent in manufacturing of aircraft instruments during the World War II era. Applications of luminous radium materials included aircraft instrumentation, such as faces, needles, and pointers of dials and gauges, switches, toggles, and other luminous markings. Aircraft instrument repair businesses were common during the war and in the post-war era and included the repair/refurbishing of aircraft dials and gauges containing luminous radium materials. Post-war aircraft instrument repair companies located at the Detroit City Airport included Beacon Instrument Service, Michigan Aviation Company, and Detroit Pilot Center (ORNL 2017).

- **Beacon Instrument Service Inc.** Records indicate that Beacon Instrument occupied space in Hangars 9 and 13 and repaired aircraft instruments containing luminous radium. Beacon Instrument was incorporated in 1966, though it is unknown when this company closed (ORNL 2017).

- **Michigan Aviation Company.** Michigan Aviation Company was located in Hangars 9 and/or 10 of the Executive Terminal. In 2001, the MI Department of Environmental Quality (DEQ) coordinated with the U.S. Army to arrange a pickup of discrete radium-bearing instruments and parts. By 2003, the parts were removed by a U.S. Army contractor. It is known that the Michigan Aviation Company existed in 1954, though it is unknown when this company closed (ORNL 2017).

- **Detroit Pilot Center.** Detroit Pilot Center was in an unknown location at the Detroit City Airport, possibly in a separate building north of the current terminal building. An address of 12401 Conner St., Detroit, MI was identified for this company. In 2000, Hangar 10 at Detroit City Airport contained aircraft instruments belonging to Detroit Pilot Center. It is unknown when this company was incorporated or closed (ORNL 2017).

In 1997, the State of Michigan Department of Environmental Quality (MI DEQ) conducted radiological surveys in some areas of Hangar 9 and detected contamination in excess of MI DEQ surface contamination limits applicable at that time. Over a period of several years (2000-2003), MI DEQ conducted radiological surveys in Hangars 9, 10, and 13. Based on results from these surveys, MI DEQ recommendations were to: “secure storage of aircraft instruments and related parts containing luminous radium; reduce worker exposure; decontaminate radiologically contaminated floors, countertops, and other surfaces; and seal radiologically contaminated surfaces that could not be decontaminated” (ORNL 2017).

In 2001, MI DEQ catalogued radium-containing gauges, dials, toggles, and switches belonging to Beacon Instruments, Michigan Aviation, and Detroit Pilot Center. The detailed inventory was sent to the U.S. Army to confirm these were of military origin. Upon receiving confirmation, the MI DEQ coordinated with the U.S. Army to package and dispose of radium-containing aircraft instruments at a permitted offsite disposal facility—this action was completed by 2003 (ORNL 2017).

2.2 Initial Site Visit Considerations

Prior to commencing survey activities each day, the general property layout was examined for consistency with historical information and to identify impediments to conducting the survey and/or health and safety considerations. No health or safety issues were noted other than identifying a small mercury spill in Hangar 13. Limited access was noted in some areas due to stockpiled equipment and aircraft, etc., as pictured in Attachment A and outlined in further detail in Attachment B. Many surfaces were covered in thick dust or carpet, so the inspection team's alpha radiation measurements may be underestimated (i.e., thin layers of dust or carpeting can partially or completely shield alpha radiation).

3.0 SITE OBSERVATIONS AND FINDINGS

3.1 Summary of Activities

The inspection team conducted a survey at the 11499 Conner Street property on April 17-19, 2018. A pre-inspection meeting was held on April 17, 2018, which included the following people: Mike Kunowski and Bill Lin (NRC), Bob Skowrenek and Marcus Quinlan (MI DEQ), Tobin Hunter (Coleman A. Young International Airport), and Kaitlin Engel and Teresa Brown (ORAU). Participants discussed the inspection team's intention to re-visit the locations identified as potentially contaminated during historical operations and, specifically, to perform general area radiation surveys in Hangars 9, 10, and 13.

Radiological surveys performed by the inspection team consisted of gamma radiation scans within the building using a Ludlum model 44-10 2-inch by 2-inch (2×2) sodium iodide detector connected to a Ludlum model 2221 ratemeter/scaler, alpha-plus-beta radiation direct measurements using a Ludlum model 44-142 plastic scintillator connected to a Ludlum model 2221 ratemeter/scaler, and radiation exposure rate measurements using a Ludlum model 192 sodium iodide-based µR ratemeter.[1] A hand-held identiFINDER R300-Z was used to confirm, if possible, the presence of Ra-226 when elevated radiation levels were encountered. Table 1 presents the specific instruments used during the site visit. Smear samples were also collected at selected locations to quantify the removable activity levels.

[1]Roentgen is a unit of exposure (energy absorbed in air), whereas a rem is a unit of dose delivered to a person (resulting from the radiation energy absorbed in that person). While Roentgen and rem are related, these are different units. Because they are similar for gamma ray energies from Ra-226, NRC makes the simplifying assumption in this case that these units are equivalent (1 Roentgen = 1 rem).

Table 1. Detroit City Airport Survey Instruments			
Radiation Type (Units)	**Detector Type**	**Detector Model (Number)**	**Ratemeter (Number)**
Alpha-plus-beta (cpm)	Plastic Scintillator	44-142 (919) Calibrated 04/10/2018 44-142 (920) Calibrated 04/10/2018	2221 (1139) Calibrated 04/06/2018 2221 (1144) Calibrated 04/06/2018
Gross gamma (cpm)	Sodium Iodide	44-10 (1151) Calibrated 11/03/2017 44-10 (1152) Calibrated 11/03/2017	2221 (1139) Calibrated 04/06/2018 2221 (1144) Calibrated 04/06/2018
Gross gamma (µR/h)	Exposure Meter	192 (1127) Calibrated 06/02/2017 192 (1128) Calibrated 06/02/2017	N/A
Gamma Spectrum Analyzer (identiFINDER)	Cesium Iodide	R300-Z (CG0343)[a]	N/A

N/A = not applicable
Number = ORAU equipment barcode
cpm = counts per minute
µR/h = microRoentgen per hour
[a]A known radium source is used to confirm the identiFINDER will identify Ra-226.

Summary of Daily Activities – April 17, 2018:

The inspection team arrived at 8:20 a.m. and met with representatives from NRC, MI DEQ, and the airport. Surveys were conducted within accessible floor space of Hangar 9, including the hangar bay floor and offices/rooms on the ground and second level of the building within Hangar 9. Additionally, an NRC member of the team surveyed the roof of the building within Hangar 9. The team surveyed all available floor space, though stored materials precluded full access, resulting in an estimated overall floor coverage of 50-75 percent. An estimated 75 percent of the roof was surveyed. The team identified six discrete areas of elevated radiation levels on the second level (unoccupied) offices on the southern side of the hangar, collected smears, and confirmed the presence of Ra-226 at one of the six elevated locations using the identiFINDER. There was an insufficient amount of radioactivity for the identiFINDER to confirm the presence of Ra-226 at the other five locations. The team concluded Hangar 9 surveys and departed the site at approximately 4:00 p.m. No radiation levels above background were identified on the roof of the building within Hangar 9.

Summary of Daily Activities – April 18, 2018:

The inspection team arrived at 8:00 a.m. and began surveys in Hangar 13. Surveys were conducted on accessible floor space, including the hangar bay floor, the roof over the offices, and offices/rooms on the ground and second level. The team surveyed all available floor space, though stored materials precluded full access, resulting in an estimated overall floor coverage of 50-75 percent. The team identified 25 areas of, or items with, elevated radiation levels, including the floor, boxed equipment, gauges (with and without faceplates), a rug, a bag of gauge needles, and a desk/table. Smears were collected, and the presence of Ra-226 was confirmed at 9 of the 25 elevated locations using the identiFINDER. There was an insufficient amount of radioactivity for the identiFINDER to confirm the presence of Ra-226 at the other 16 locations. The team concluded Hangar 13 surveys for the day and departed the site at approximately 4:00 p.m.

Summary of Daily Activities – April 19, 2018:

The inspection team arrived at 8:10 a.m., returned to Hangar 13 to complete elevated measurement data collection, and then proceeded to Hangar 10. Surveys in Hangar 10 were conducted on accessible floor space, including the hangar bay floor and offices/rooms on the ground level. Surveys were conducted on the roof of the one-story building in Hangar 10 but not on the roof of the smaller, two-story building because access was not available. The team surveyed all available floor space, though stored materials precluded full access, resulting in an estimated overall floor coverage of 75-80 percent. The team did not identify elevated radiation levels within Hangar 10, concluded surveys by noon, conducted a post-survey briefing with Mr. Hunter, and departed the site at approximately 2:30 p.m.

3.2 Summary of Results

Appendix A presents photographs taken during the initial site visit. Appendix B presents survey tabulated results and associated data maps. Table B-1 presents the gamma radiation survey data summary by hangar, floor levels (lower or upper) and room description. Listed information includes the number of measurements, minimum and maximum scan measurements, mean and median measurements, and the standard deviation of measurements.

Table B-2 presents results from the investigation of 31 elevated measurement locations in Hangars 9 and 13. Results include the measurement location, smear number and associated analytical laboratory alpha-plus-beta result in disintegrations per minute per 100 cm^2 (dpm/100 cm^2); gross and net total alpha-plus-beta total present gross responses in cpm and dpm/100 cm^2, respectively; contact gross 2×2 sodium iodide and exposure rates on contact in cpm and µR/h; respectively; and exposure rates in µR/h collected at 1 meter from the surface.

Figures B-1 through B-10 present the general layout surveys overlaid onto ORAU-generated facility drawings, the range of gamma radiation measurements (to be compared to Table B-1), and the approximate location of elevated radiation measurements (to be compared to Table B-2). Figures B-1 through B-3 are from Hangar 9; Figures B-4 through B-6 are from Hangar 10; and Figures B-7 through B-10 are from Hangar 13. Note that drawings are not to scale and illustrated features are based on the observations of surveyors during the initial site visit.

Smears were submitted for gross alpha-plus-beta analysis at a radio-analytical laboratory. Static field measurements of total alpha-plus-beta surface activity in units of cpm were converted to total Ra-226 surface activity in units of dpm/100 cm^2 using the following equation:

$$dpm/100\ cm^2 = \frac{C - B}{\varepsilon_{tot} \times G}$$

Where:

C = measured count rate (cpm)
B = background count rate (cpm)
G = geometry factor (unitless) = $\frac{Physical\ Detector\ Area\ (cm^2)}{100\ cm^2}$ = 1.0
ε_{tot} = total weighted efficiency (unitless) = 1.3

A total weighted efficiency of 1.3 was estimated at the ORAU facility after conducting a series of radiation measurements using alpha/beta sources and assuming that short-lived decay products are at 75 percent equilibrium with the Ra-226 parent. Due to the number of emissions from Ra-226 and its associated progeny, multiple radiation particles are counted during the surface activity measurement. Therefore, a total weighted efficiency for Ra-226 and its associated progeny was calculated by:

$$\varepsilon_{tot} = \sum_{n} F_n \times \varepsilon_{i,n} \times \varepsilon_{s,n}$$

Where:

F_n = fractional abundance of n^{th} emission,
$\varepsilon_{i,n}$ = instrument efficiency for n^{th} emission, and
$\varepsilon_{s,n}$ = surface efficiency (0.25 for low-energy beta particles, 0.5 for high-energy beta particles) for n^{th} emission.

Following is a summary of team observations and radiation measurement data from each hangar:

Hangar 9. As presented in Table B-1, discrete radiation measurements were collected at 211 locations within Hangar 9, including the main bay area and two levels of offices/rooms positioned along the southern hangar. As discussed previously, the roof of the building within Hangar 9 was surveyed and no measurements above background were observed. Measurement data from the Hangar 9 bay are consistent with expected background radiation levels, which are on the order of 10 kcpm with the 2×2 sodium iodide detector and are on the order of 10 µR/h with the exposure ratemeter. Measurement data show that gamma radiation in and around offices/rooms is elevated relative to expected background radiation levels. Specifically, measured 2×2 sodium iodide detector responses in excess of 20 kcpm, and exposure rate measurements are on the order of 20 µR/h were observed. These relatively elevated responses are likely due to naturally occurring radioactive material (NORM) within the cinder block structure. It is also possible that radiation levels are due to uranium or thorium

glazing on the block wall (i.e., are not associated with discrete sources of Ra-226). No discrete sources of Ra-226 were identified in the bay area or within the three lower offices/rooms.

The three upper-level office/rooms contain six small areas of elevated radiation. Table B-2 presents radiation measurement data collected at two locations in the eastern-most room and four locations in the middle room. Five of the six locations are smaller than the Model 44-142 probe area (100 cm^2), though one is spread over a (circular) drum outline, covering a total surface area of approximately 0.4 m^2. (It is noted that in a February 2001 letter, MI DEQ stated that the U.S. Army representative "…asked that the gauges and other items be collected to one location" and the letter author "…estimates a total volume of less than one 55-gallon drum" [MI DEQ 2001].) Maximum radiation levels are associated with a small (< 100 cm^2) area of elevated activity in the middle room (Location 1), including 61 dpm/100 cm^2 removable alpha-plus-beta radiation, 62,000 dpm/100 cm^2 total alpha-plus-beta radiation, and approximately 115,000 cpm gross gamma and gross 60 µR/h on contact. The maximum gross 1-m exposure rate measurement of 23 µR/h (Location 2) is slightly elevated compared to the 18 µR/h background result. The identiFINDER positively identified Ra-226 at Location 1. As shown in Table B-2, smear results demonstrate non-zero levels of removable activity, though the removable quantity is small relative to the total (fixed plus removable) surface activity.

Hangar 10. As presented in Table B-1, discrete radiation measurements were collected at approximately 151 locations within Hangar 10, including the main bay area, offices/rooms positioned along the southern hangar wall, and the roof of the offices/rooms. The roof of the two-story building within Hangar 10 (as shown in Photo A-7) was not surveyed because it was inaccessible. As in Hangar 9, typical 2×2 sodium iodide detector responses in/near the cinder block approach 20 kcpm, and exposure rate measurements approach 20 µR/h, due to NORM in, and/or glazes on, the block walls. No discrete sources of Ra-226 were identified in Hangar 10.

Hangar 13. As presented in Table B-1, discrete radiation measurements were collected at 287 locations within Hangar 13, including the main bay area, two levels of offices/rooms positioned along the south end of the hangar, and the roof of the upper level offices/rooms. Measurement data across most of Hangar 13 are generally consistent with expected background radiation levels, which are on the order of 10 kcpm with the 2×2 sodium iodide detector and are on the order of 10 µR/h with the exposure ratemeter. No discrete sources of Ra-226 were identified in the bay area or within five of the six lower offices/rooms. A radium gauge was found in lower level Room 1 (see Hangar 13 Offices Location 11 in Table B-2). The gauge was intact and appeared to be in use (i.e., was not covered in dust), so the gauge was left in the place of discovery.

Upper-level office/rooms and the roof above office/rooms contained several small areas of elevated radiation and gauges/items. Table B-2 presents elevated measurement data collected from 12 locations/items in upper level rooms and 12 locations/items on the roof. Elevated measurements were collected from gauges and other individual items, boxes of items, items stored in desk drawers, a benchtop table, and tile and wood floors. Specific items of note include radium-containing gauges without faceplates on the roof and a bag or radium gauge needles in Room 4. The largest contaminated area is estimated to be approximately 3.6 m^2 in Room 4, though most elevated measurements are associated with small (< 100 cm^2) areas or gauges/items. Maximum measurements include 1,194 dpm/100 cm^2 removable alpha-plus-beta radiation; 640,000 dpm/100 cm^2 total alpha-plus-beta radiation; and approximately 566,000 cpm gross gamma and gross 700 µR/h on contact. The maximum gross 1-m exposure rate measurement of 25 µR/h (from a gauge) is over three times the 8 µR/h localized background

result. The identiFINDER positively identified Ra-226 at nine different locations within Hangar 13. As shown in Table B-2, smear results demonstrate non-zero levels of removable activity, though the removable quantity is small relative to the total (fixed plus removable) surface activity. Small movable items on the upper level were moved to the roof of the offices/rooms within the hangar prior to the team's leaving the property, and the airport representative stated that he would mark the area to limit access.

3.3 Summary of Dose Assessment Results

This discussion is divided into two subsections: Dose Assessment Method and Dose Assessment Results.

Dose Assessment Method:

The NRC procedure, TI 2800/043, presents screening-level exposure rates that the inspection team may use, while on site, to quickly determine whether gamma radiation levels could result in a dose above the 100 mrem/yr public dose limit in Title 10 of the *Code of Federal Regulations* Section 20.1301, *Dose limits for individual members of the* public (10 CFR 20.1301). Specifically, an exposure rate at 1-m of 40 µR/h above background conservatively corresponds to 100 mrem/yr assuming 2,300 hours of exposure in an industrial setting, or 15 µR/h at 1-m conservatively corresponds to 100 mrem/yr after 6,800 hours of exposure in a residential setting. These screening values do not consider site-specific conditions or internal exposure pathways (e.g., inhalation and ingestion). Therefore, dose assessment methods described herein rely upon the Dose Assessment Technical Basis Document for Potential Exposures to Discrete Sources of Radium-226 and Associated Contamination (hereafter the Technical Basis Document; ORISE 2017) to account for site-specific conditions and all potential pathways.

The Technical Basis Document presents default concentration-based screening levels based on guidance in NUREG-1757 (NRC 2006) using the Decontamination and Decommissioning (DandD) code Version 2.4 (NRC 2001). The Technical Basis Document also presents methods for developing site-specific screening levels and dose estimates, assuming a default conceptual model may not apply at a given site. The site is currently configured for industrial use. However, for added conservatism, the site was modeled as a residential use site. Therefore, the average member of the critical group at the Detroit City Airport property is a residential building occupant, who is conservatively assumed to spend up to 5,770 hours in an apartment-like structure; and potential exposure pathways include external gamma, inhalation, and secondary ingestion. The following discussion describes the dose assessment methods and results, which are presented in more detail in Appendix B.

Because measured values are preferable to modeled values, measured exposure rate in µR/h are used to estimate dose received via the external gamma pathway (assuming 1 µR/h ~ 1 µrem/h). The Technical Basis Document presents dose-to-source ratios (DSRs) for the inhalation (1.61×10^{-8} mrem/hr per dpm/100 cm^2) and secondary ingestion (4.30×10^{-8} mrem/hr per dpm/100 cm^2) pathways, for a total DSR of 5.91×10^{-8} mrem/hr per dpm/100 cm^2 (see ORISE 2017, Table 4.3). These DSRs are selected for a small area of elevated activity on the order of 0.1 m^2, representing the average small areas of elevated activity encountered during the April 2018 survey. The dose estimate method, therefore, consists of the following calculations, which include multiplying the occupancy time by the measured exposure rate (for the external dose), and by multiplying the occupancy time by the measured surface activity and total DSR (for the internal dose):

$$\text{External Dose } \left(\frac{\text{mrem}}{\text{yr}}\right) = Time\left(\frac{h}{yr}\right) \times \frac{Measured\ Exposure\ Rate\ \left(\frac{\mu R}{hr} \sim \frac{\mu rem}{hr}\right)}{1000\ \mu rem/mrem},$$

$$\text{Internal Dose } \left(\frac{\text{mrem}}{\text{yr}}\right) = Time\left(\frac{h}{yr}\right) \times Surface\ Activity\left(\frac{dpm}{100\ cm^2}\right) \times 5.91 \times 10^{-8}\left(\frac{mrem/h}{dpm/100\ cm^2}\right),$$

and finally,

Total Dose = External Dose + Internal Dose.

Note that even when doses are averaged over a reasonably conservative area, such as a room or apartment, the DSRs for small areas are still used given the sum of the contaminated area is a very small percentage of the total. For example, Hangar 13 upper level contains the highest number of small areas of elevated activity (12), with a total estimated contaminated area of about 2 m^2, compared to a total apartment area of approximately 80 m^2. Therefore, an upper estimate of the contaminated area represents less than 3 percent of total habitable space.

Because only small areas of elevated activity were identified, the dose assessment was performed assuming two occupancy duration scenarios. The first scenario assumes an individual would spend the entire 5,770-h/yr occupancy period in the portion of the cinder block structure containing the highest-activity small area of elevated activity ("maximum area" scenario). This scenario is very conservative given an individual is highly unlikely to spend all of the occupancy period in a portion of one of these structures. The second scenario assumes an individual would spend the 5,770-h/yr occupancy period averaged over the entire level of a structure (e.g., all of the Hangar 9 structure's upper level). This scenario is still conservative but more closely aligns with the conceptual model described in the Technical Basis Document. Therefore, the first scenario is intended to generate an upper bound of the dose within a given survey unit, and the second scenario is intended to generate a still conservative but more realistic representation of conditions expected to be encountered within a survey unit.

The source term for each scenario is a net value (excludes background) and is also conservatively estimated. The source term in the first ("maximum area") scenario is defined as the average measurement from the portion of the cinder block structure containing the highest measured radioactivity. The source term in the second scenario is the average of all measured radioactivity over the entire level of the structure. Values are conservative because results for a given small area of elevated activity are weighted equally with background measurements, though the area containing elevated activity is a very small fraction of the total surface area in any structure. Background is likewise estimated by averaging all measurements in the targeted area, though excluding locations with elevated activity. Note that radiation data for items moved to and isolated on the roof of the offices within Hangar 13 are not included in the source term calculations. Source terms were calculated to include small areas of elevated activity, primarily on the floors, in the Hangar 9 upper level, the Hangar 13 upper level, and on the roof of the office within Hangar 9.

In summary, the dose assessment method described herein uses multiple conservative assumptions. For example, worst-case doses assume a residential receptor spends 100 percent of the occupancy period in a portion of the single level of a cinder block structure within each hangar. Additionally, an "average" source term is conservatively biased by combining, in an unweighted manner, measurements of small areas of elevated activity with larger areas of background measurements even though the areas of elevated activity represent

a very small percentage of the total surface area. As a result of this layered conservatism, dose estimates presented in the following discussion should overestimate the true value.

Dose Assessment Results:

Appendix C presents dose assessment results for all survey units. Tables C-1 through C-3 present individual location measurements and average source term results for the Hangar 9 upper level, the Hangar 13 upper level, and the roof of the offices within Hangar 13, respectively. Table C-4 lists dose estimates for the external gamma pathway only, and Table C-5 lists dose estimates for internal pathways only, representing potential doses via inhalation and secondary ingestion. These values must be added to the corresponding values in Table C-4 to estimate the total dose to the hypothetical future occupant, who may be exposed through all potential exposure pathways. As presented in Table C-6, the maximum estimated dose, assuming an individual spends the entire 5,770-hours/yr occupancy period in a small portion on one of the cinder block structures, is 9.8 mrem/yr (Hangar 13 upper level hallway). Considering any level as a whole, the highest estimated dose is 7.0 mrem/yr (Hangar 9 upper level).

Two dose limits are considered in this assessment. The first dose limit is the 100 mrem/yr public dose limit in 10 CFR 20.1301. An estimated dose above 100 mrem/yr to the average member of the critical group would require immediate action, such as access controls to limit current occupant exposures to discrete sources of Ra-226. The second dose limit is the 25 mrem/yr unrestricted use limit in 10 CFR 20.1402, *Radiological criteria for unrestricted use*. An estimated dose above 25 mrem/yr to the average member of the critical group would not require immediate action, though controls or additional characterization and remediation may be required prior to release. In any case, no action is required if the estimated dose is less than 25 mrem/yr.

These results demonstrate that current and potential future occupants are unlikely to receive a dose above the 25 mrem/yr unrestricted use limit in 10 CFR 20.1402. Therefore, although discrete sources of Ra-226 were identified within several areas at the Detroit City Airport site, none are present at concentrations that would reasonably produce a dose above regulatory limits.

4.0 OBSERVATIONS AND RECOMMENDATIONS

Based on the data collected, Detroit City Airport Hangars 9 and 13 contain discrete sources of Ra-226, as determined by the following observations:

- Elevated direct gamma radiation due to Ra-226 was identified on multiple gauges, on floor surfaces, and other miscellaneous items (needles and benchtops, etc.)—Ra-226 is present at multiple locations.

- Removable Ra-226 activity was found on some items, when measurements could be collected, some equipment containing Ra-226 does not include faceplates or other barriers, and there is potential for contaminant migration.

- Elevated direct gamma radiation due to Ra-226 was positively identified at ten different locations.

- Measurements of radiation levels from areas (excluding the items placed on the roof of the offices within Hangar 13) provide confidence that receptors would not exceed the 25 mrem/yr limit even when receptors average occupancy time across small areas of elevated activity.

Based on the above observations, it is recommended that the NRC not perform a scoping survey at the Detroit City Airport. The rationale is that the initial site visit already generated a robust dataset that meets the scoping survey purpose to identify the general level and extent of contamination. However, NRC should maintain contact with airport personnel under a General License, as discussed in Title 10 of the *Code of Federal Regulations* Section 31.12, *General license for certain items and self-luminous products containing Radium-226*, to ensure identified discrete sources of radium are properly dispositioned, especially as related to items with removable activity in Hangar 13. All small items containing discrete sources of Ra-226 were moved to the roof of the offices within Hangar 13 to control the potential spread of contamination, with the exception of one gauge located in the lower level offices that appeared to be in use. The site contact is aware of the location of both the stored items and the item with elevated levels of radiation that was not moved during the initial site visit and will limit access to the stored items.

5.0 REFERENCES

MI DEQ 2001. "Interoffice Communication — Inventory of radium instrument," Letter from Sara D. DeCair to the Michigan Department of Environmental Quality, February 21. (An attachment to the document with Agencywide Documents Access and Management System [ADAMS] Accession No. ML17244A036).

NRC 2001. *Residual Radioactive Contamination from Decommissioning – User's Manual DandD Version 2.1*, NUREG/CR-5512, Vol. 2. U.S. Nuclear Regulatory Commission, April. (ADAMS Accession No. ML010940257).

NRC 2006. *Consolidated Decommissioning Guidance – Characterization, Survey, and Determination of Radiological Criteria*, NUREG-1757, Vol. 2, Rev. 1, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., September. (ADAMS Accession No. ML063000252).

NRC 2017. *Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources*, Temporary Instruction 2800/043, Rev. 1 U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., January. (ADAMS Accession No. ML16330A678)

ORNL 2017. *Detroit City Airport Site Summary (currently Coleman A. Young International Airport) Detroit, MI*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, April 18. (ADAMS Accession No. ML17244A036).

ORISE 2017. *Dose Assessment Technical Basis Document for Potential Exposures to Discrete Sources of Radium-226 and Associated Contamination*, DCN 5289-TR-01-2, Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee, May 30. (ADAMS Accession No. ML17152A204).

APPENDIX A

PHOTOS FROM THE DETROIT CITY AIRPORT SURVEY

A-1. Hangar 9 Bay Looking Southeast

A-2. Hangar 9 Offices

A-3. Hangar 9 Upper Level Offices

A-4. Hangar 9 Upper Level Offices

A-5. Hangar 9 Upper Level Offices

A-6. Hangar 10 Bay Looking Northwest

A-7. Hangar 10 Room 103 (Upper Room)

A-8. Hangar 10 Lower Level Offices/Roof

A-9. Hangar 13 Looking Northeast

A-10. Hangar 13 Offices

A-11. Roof of Offices within Hangar 13 Looking West

A-12. Elevated Items Placed on Roof of Offices within Hangar 13

A-13. Elevated Items on Roof of Offices within Hangar 13

A-14. Elevated Areas on Roof of Offices within Hangar 13

A-15. Elevated Item on Roof of Offices

A-16. Hangar 13 Upper Level Offices

A-17. Hangar 13 Upper Level Offices

A-18. Hangar 13 Upper Level Offices

A-19. Hangar 13 Lower Level Offices

A-20. Hangar 13 Upper Level Offices, Spilled Mercury

APPENDIX B

SURVEY RESULTS FROM THE DETROIT CITY AIRPORT SURVEY

Site: Detroit City Airport	**Area:** Hangar 9	**Date(s):**04/17/2018	**Time:** 1300/1420
Surveyor(s): TLB		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	192/1127	NA	5-15 µR/h[a]
Gamma	2221/1139	44-10/1151	7-18 kcpm[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

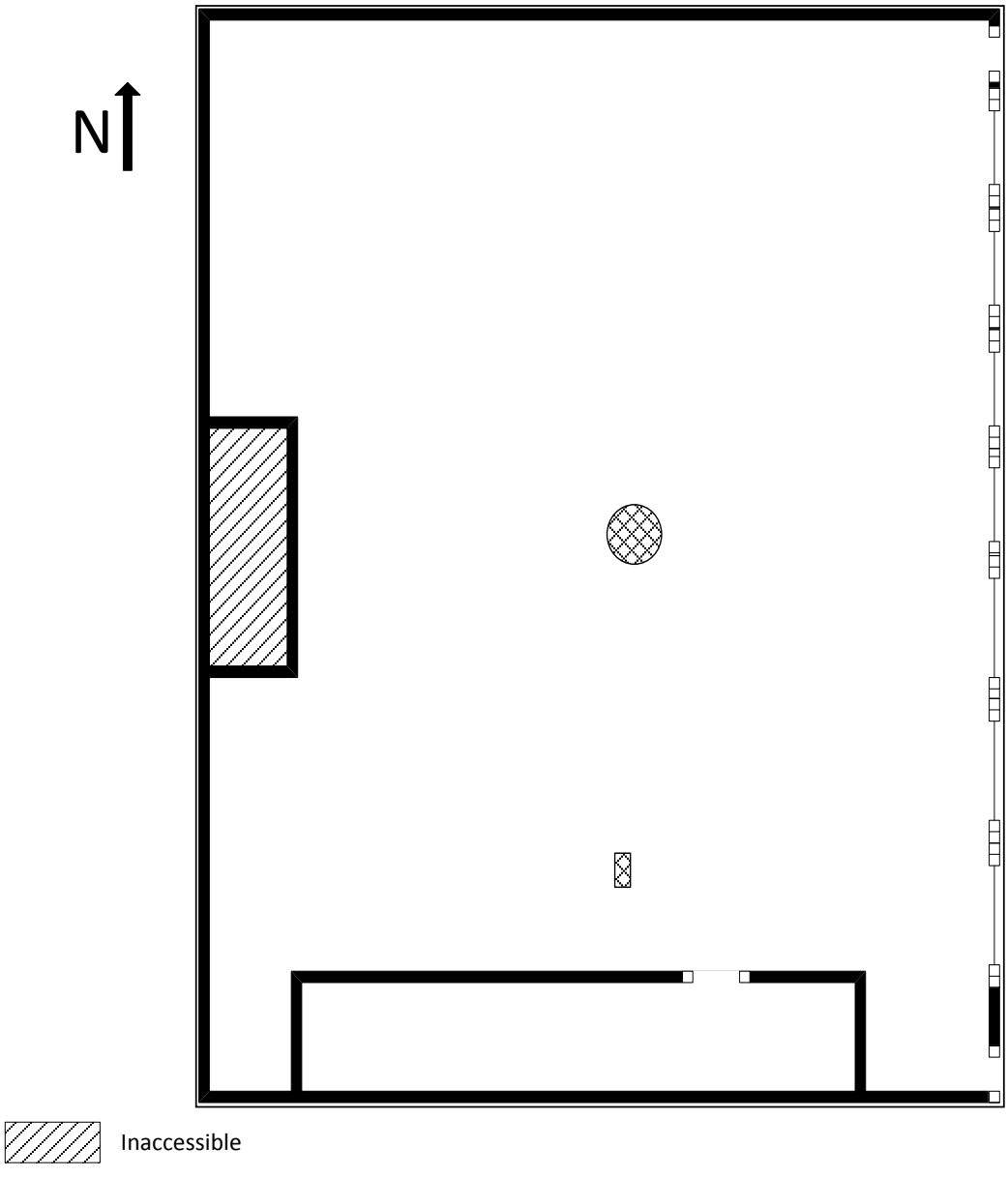


Figure B-1. Hangar 9 Bay Floor

Site: Detroit City Airport	**Area:** Hangar 9	**Date(s):**04/17/2018	**Time:** 1010/1130
Surveyor(s): KME		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1144	44-10/1152	17-35 kcpm[a]
Gamma	192/1128	NA	14-28 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

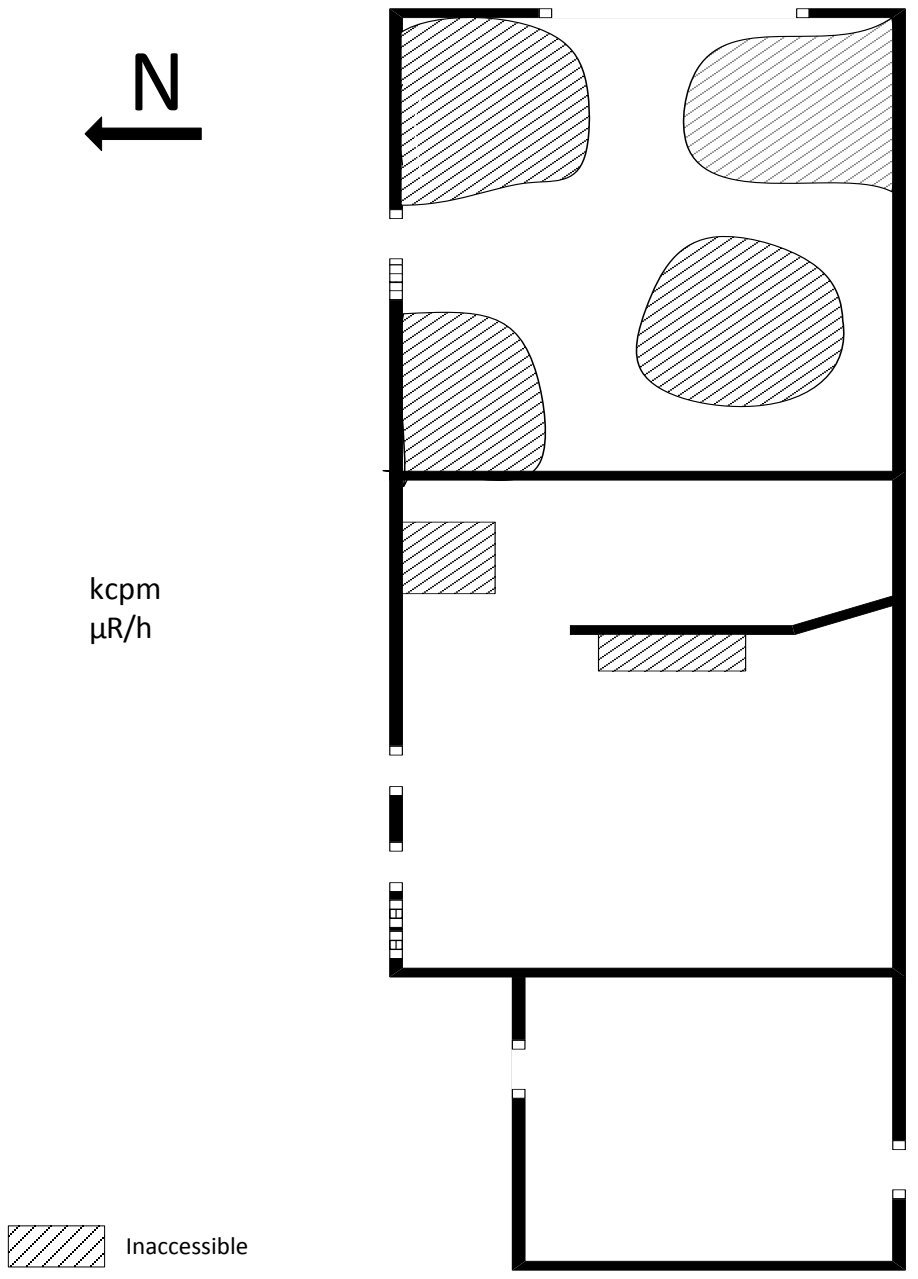
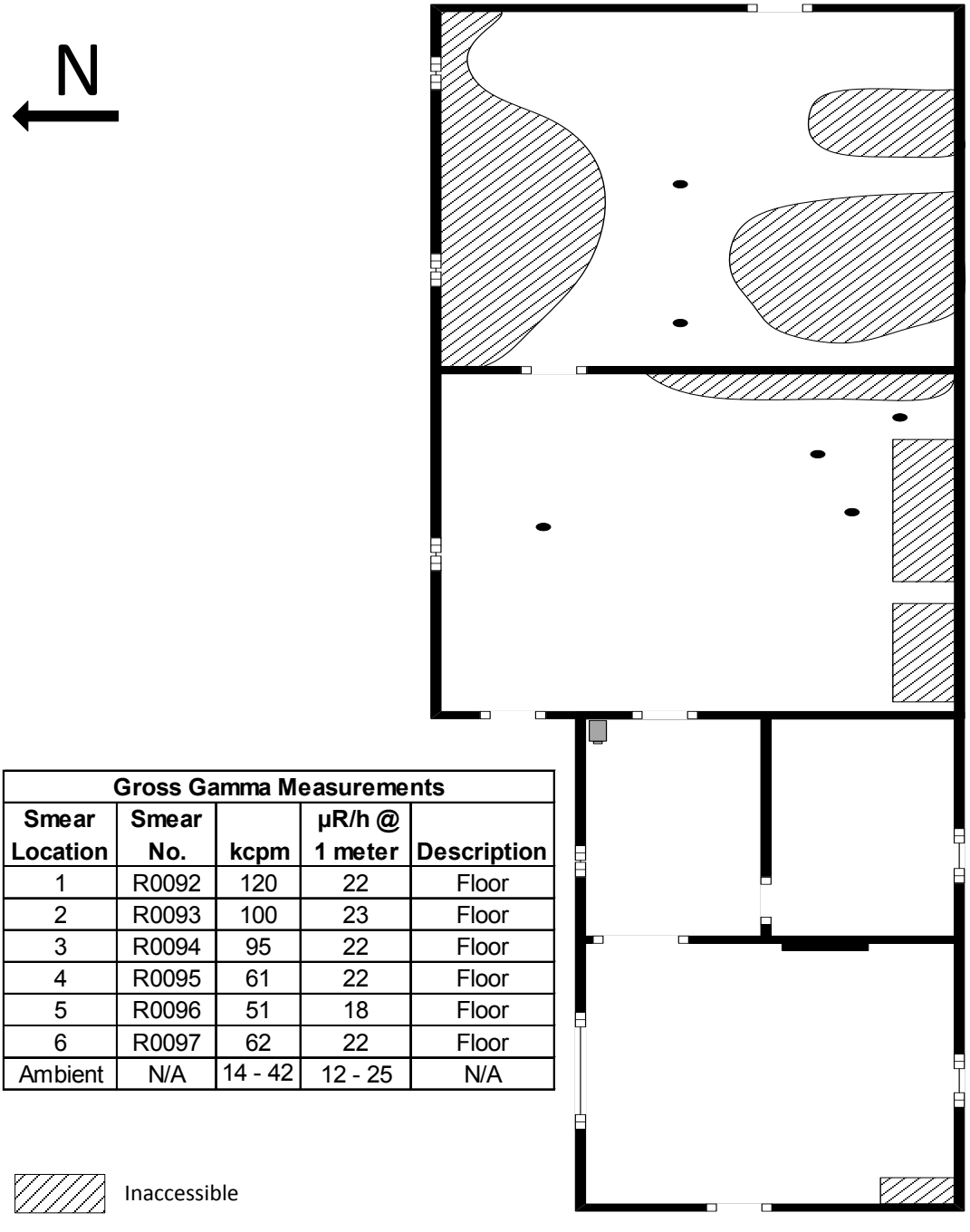


Figure B-2. Hangar 9 Lower Level Offices

Site: Detroit City Airport	**Area:** Hangar 9	**Date(s):**04/17/2018	**Time:** 1130/1420
Surveyor(s): TLB/KME		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1139 and 1144	44-10/1151 and 1152	14 - 42 kcpm[a]
Gamma	192/1127 and 1128	NA	12 - 25 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



Gross Gamma Measurements				
Smear Location	**Smear No.**	**kcpm**	**µR/h @ 1 meter**	**Description**
1	R0092	120	22	Floor
2	R0093	100	23	Floor
3	R0094	95	22	Floor
4	R0095	61	22	Floor
5	R0096	51	18	Floor
6	R0097	62	22	Floor
Ambient	N/A	14 - 42	12 - 25	N/A

Figure B-3. Hangar 9 Upper Level Offices

Site: Detroit City Airport	**Area:** Hangar 10	**Date(s):**04/19/2018	**Time:** 0950/1145
Surveyor(s): TLB/KME		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1144 and 1139	44-10/1152 and 1151	7-25 kcpm[a]
Gamma	192/1128 and 1127	NA	6-16 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

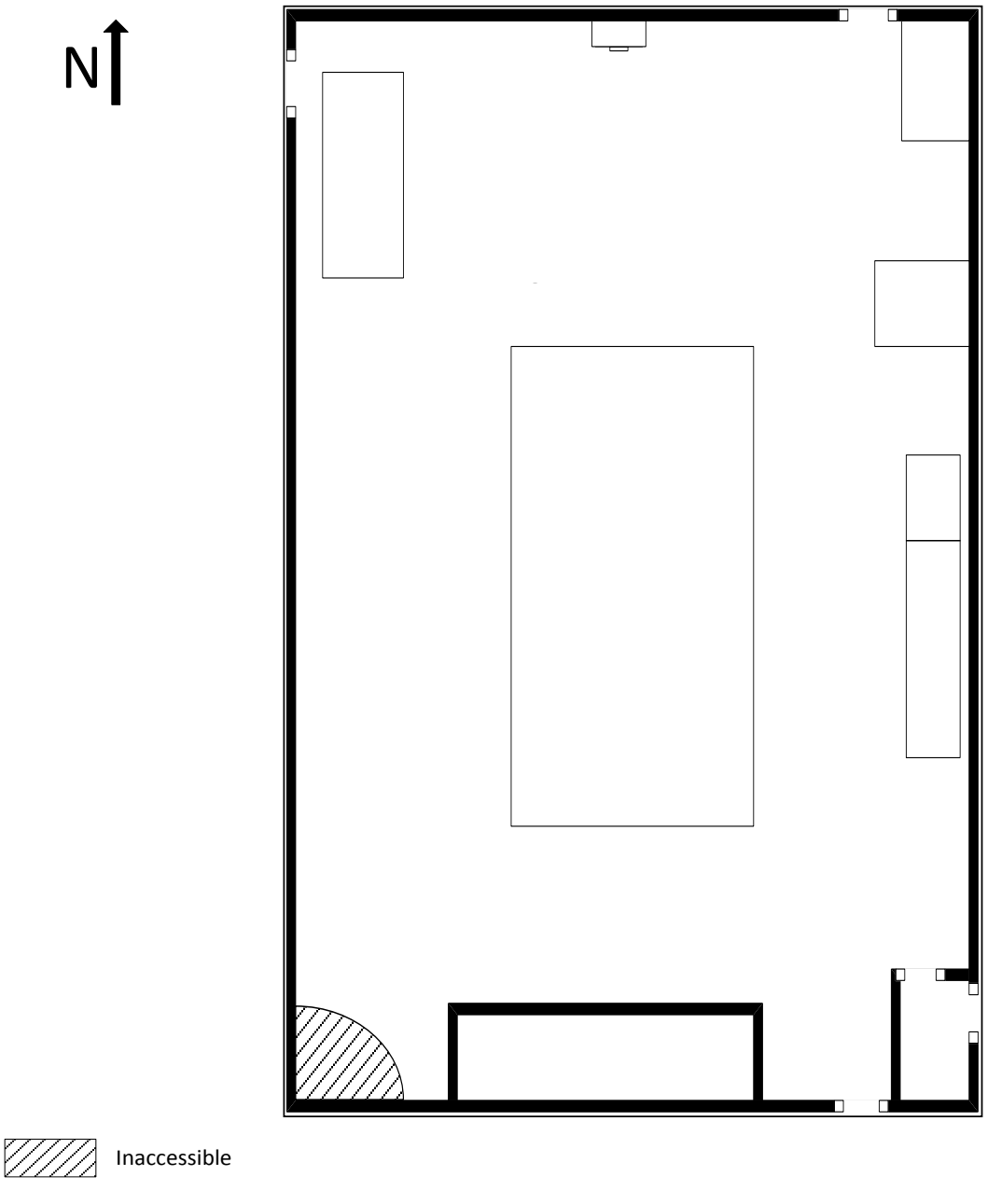


Figure B-4. Hangar 10 Bay Floor and Room Below Room 103

Site: Detroit City Airport	**Area:** Hangar 10	**Date(s):**04/19/2018	**Time:** 0945/1120
Surveyor(s): TLB/BL		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1139	44-10/1151	11-25 kcpm[a]
Gamma	192/1127	NA	11-23 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

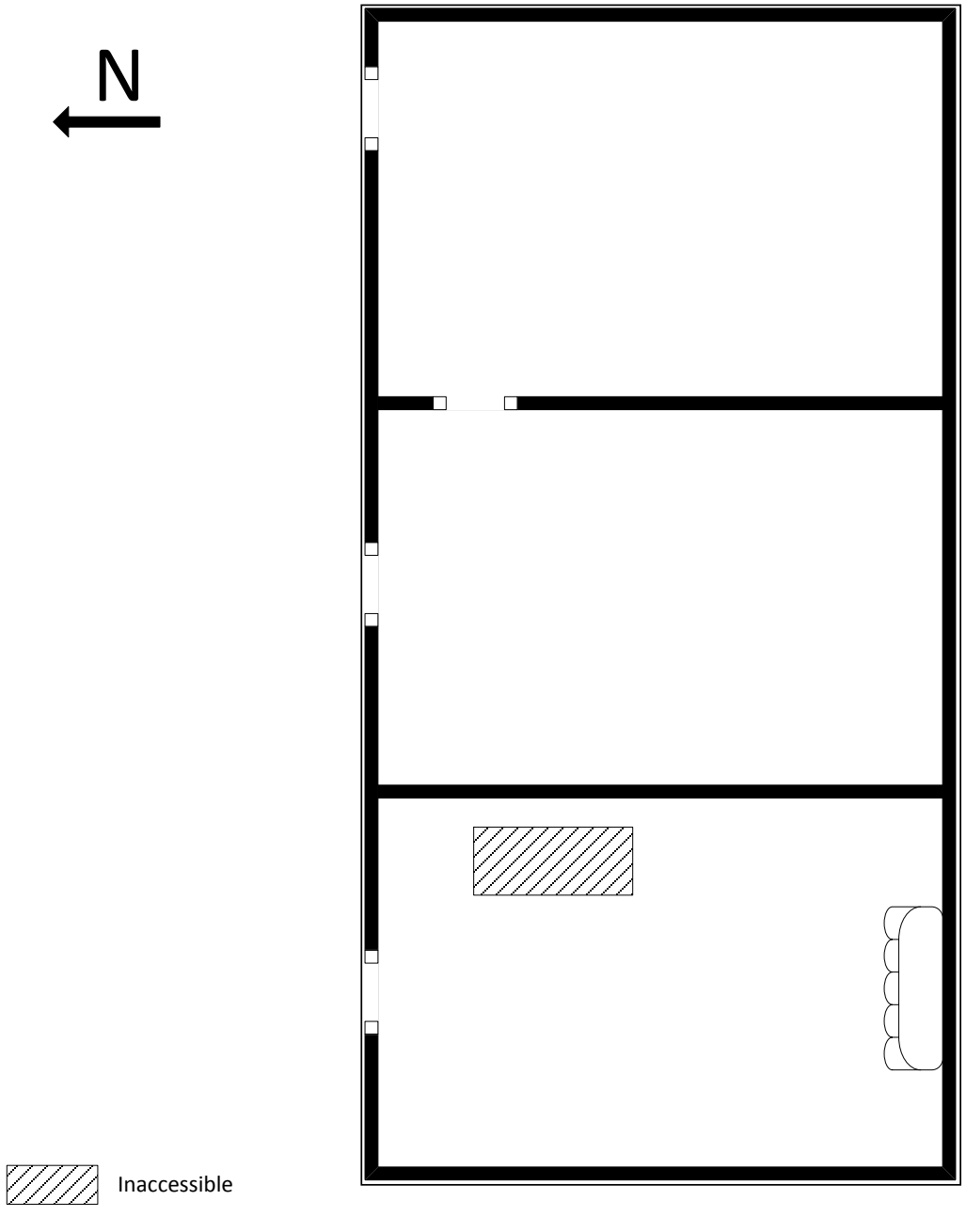


Figure B-5. Hangar 10 Lower Level Offices

Site: Detroit City Airport	**Area:** Hangar 10	**Date(s):**04/19/2018	**Time:** 0945/1120
Surveyor(s): TLB/KME		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1139	44-10/1151	12-19 kcpm[a]
Gamma	192/1127	NA	11-18 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

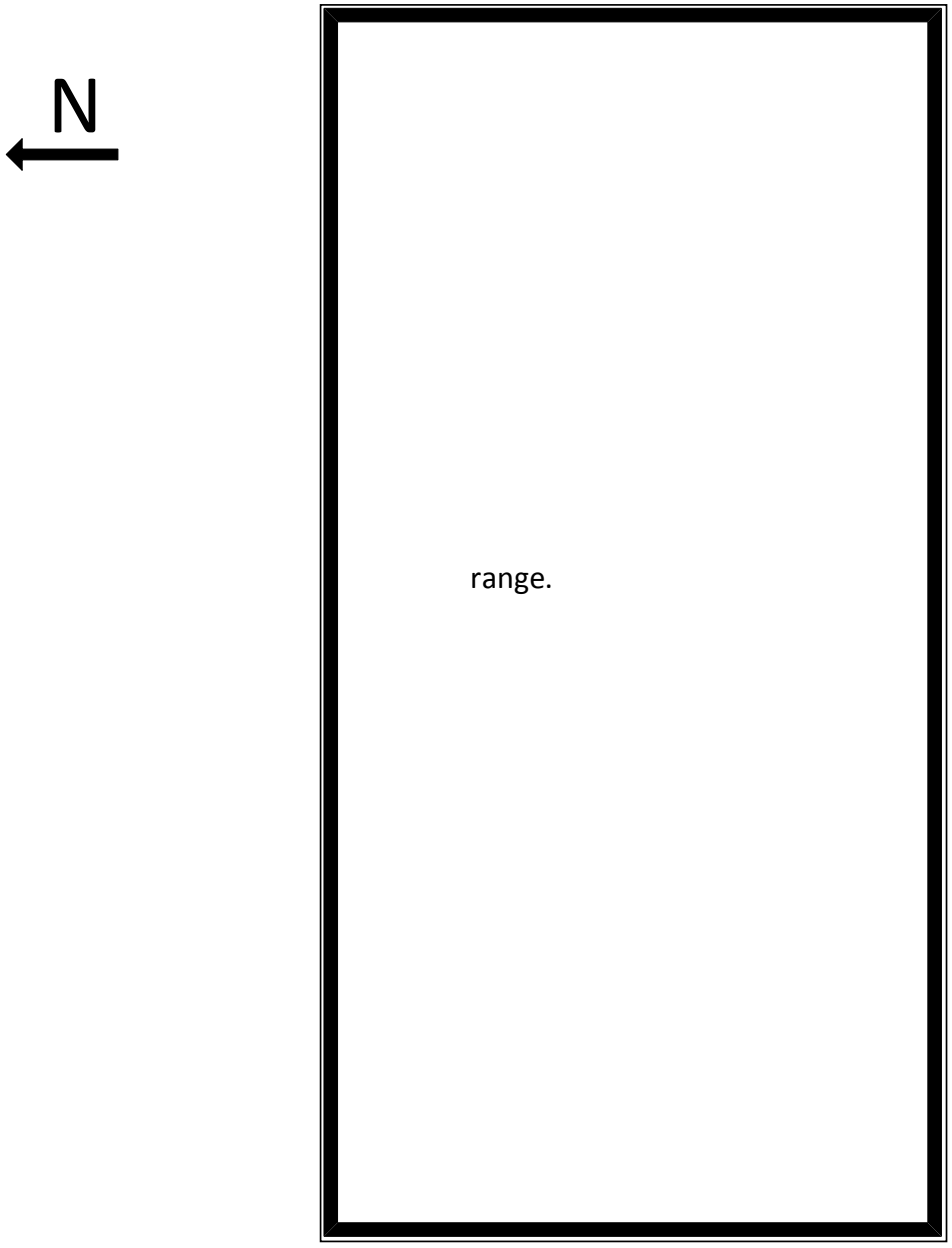


Figure B-6. Hangar 10 Lower Level Offices' Roof

Site: Detroit City Airport	**Area:** Hangar 13	**Date(s):**04/18/2018	**Time:** 1000/1145
Surveyor(s): TLB		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1139	44-10/1151	6-15 kcpm[a]
Gamma	192/1127	NA	5-15 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

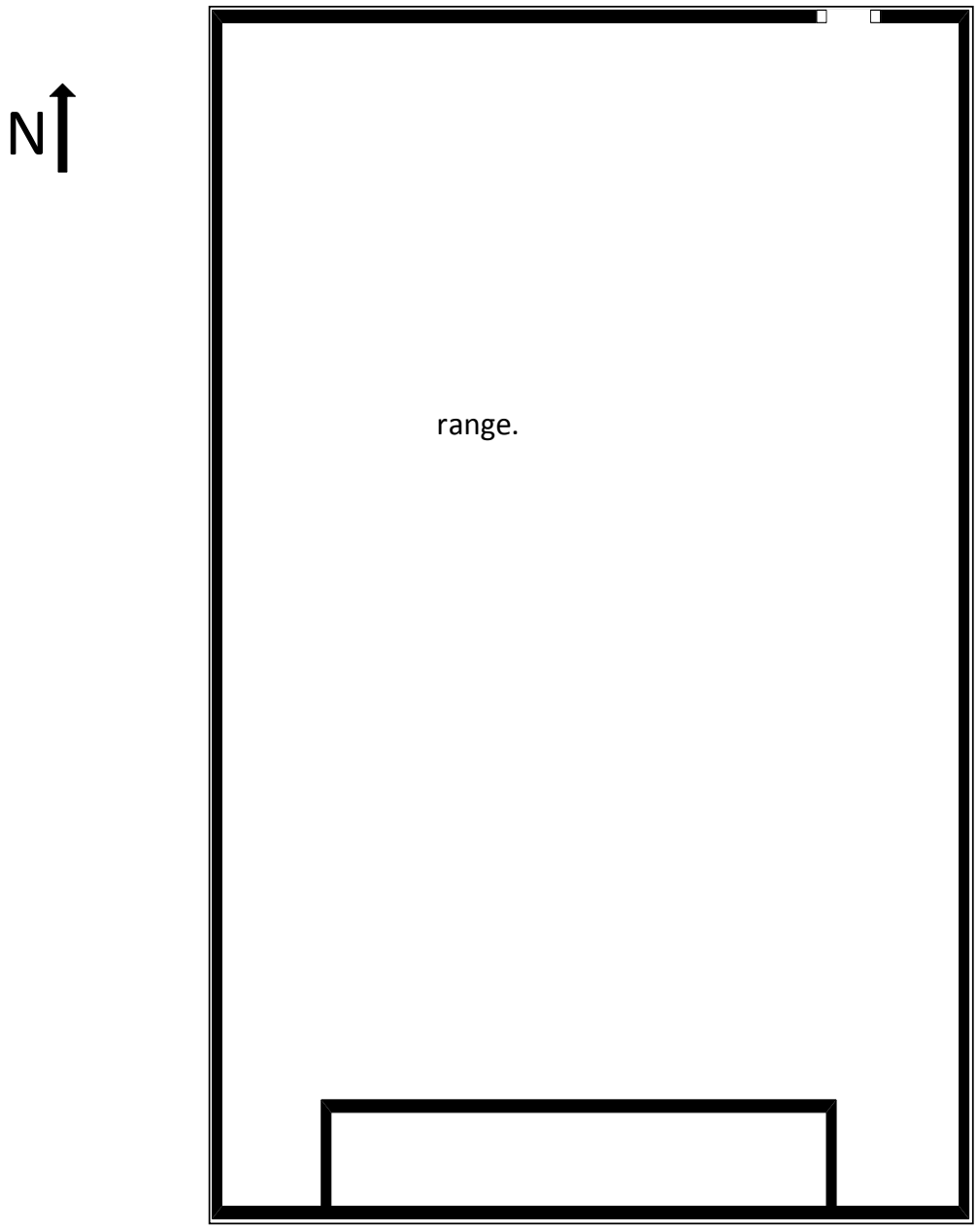


Figure B-7. Hangar 13 Bay Floor

Site: Detroit City Airport	**Area:** Hangar 13	**Date(s):**04/18/2018	**Time:** 0830/1000
Surveyor(s): TLB		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1139	44-10/1151	7-15 kcpm[a]
Gamma	192/1127	NA	5-14 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

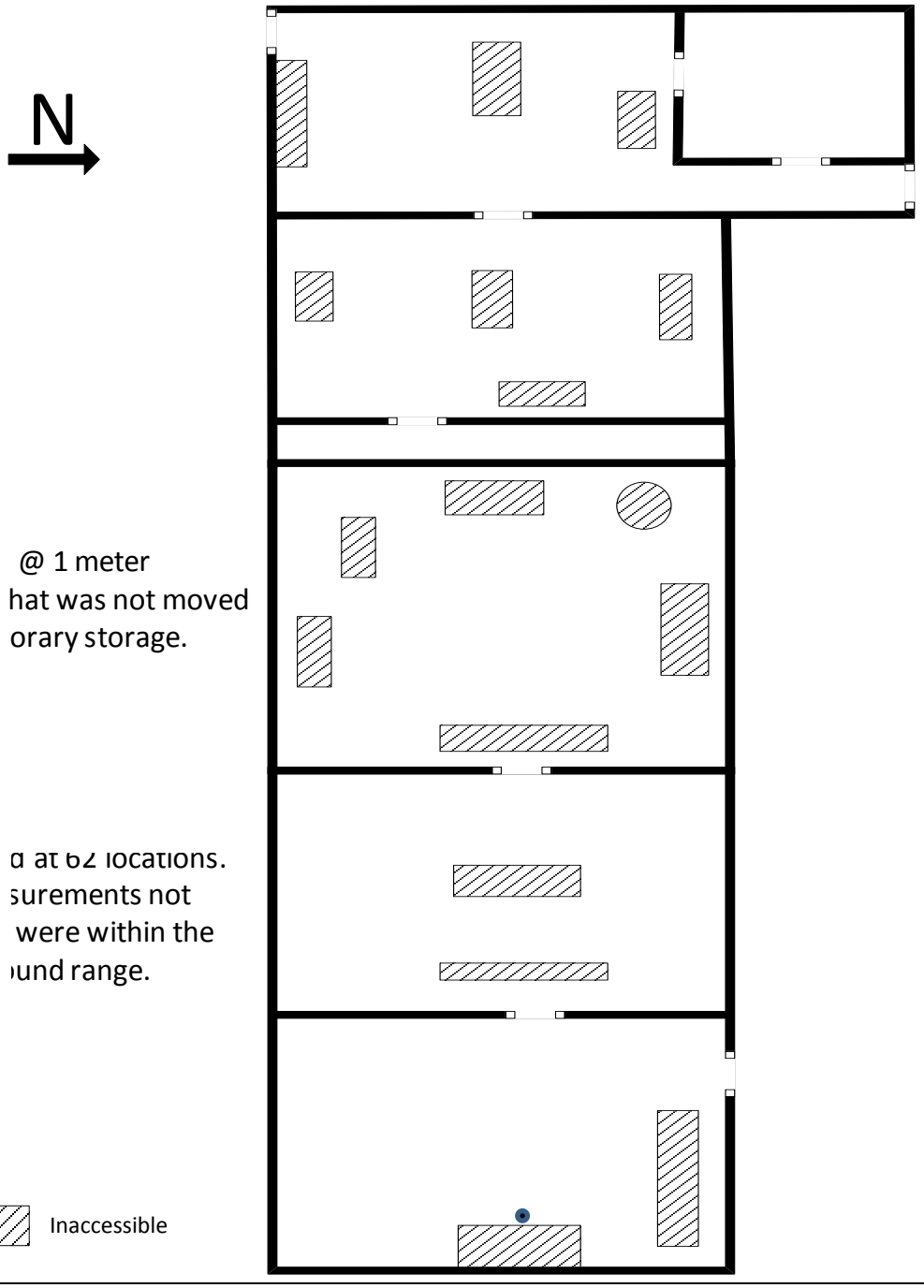
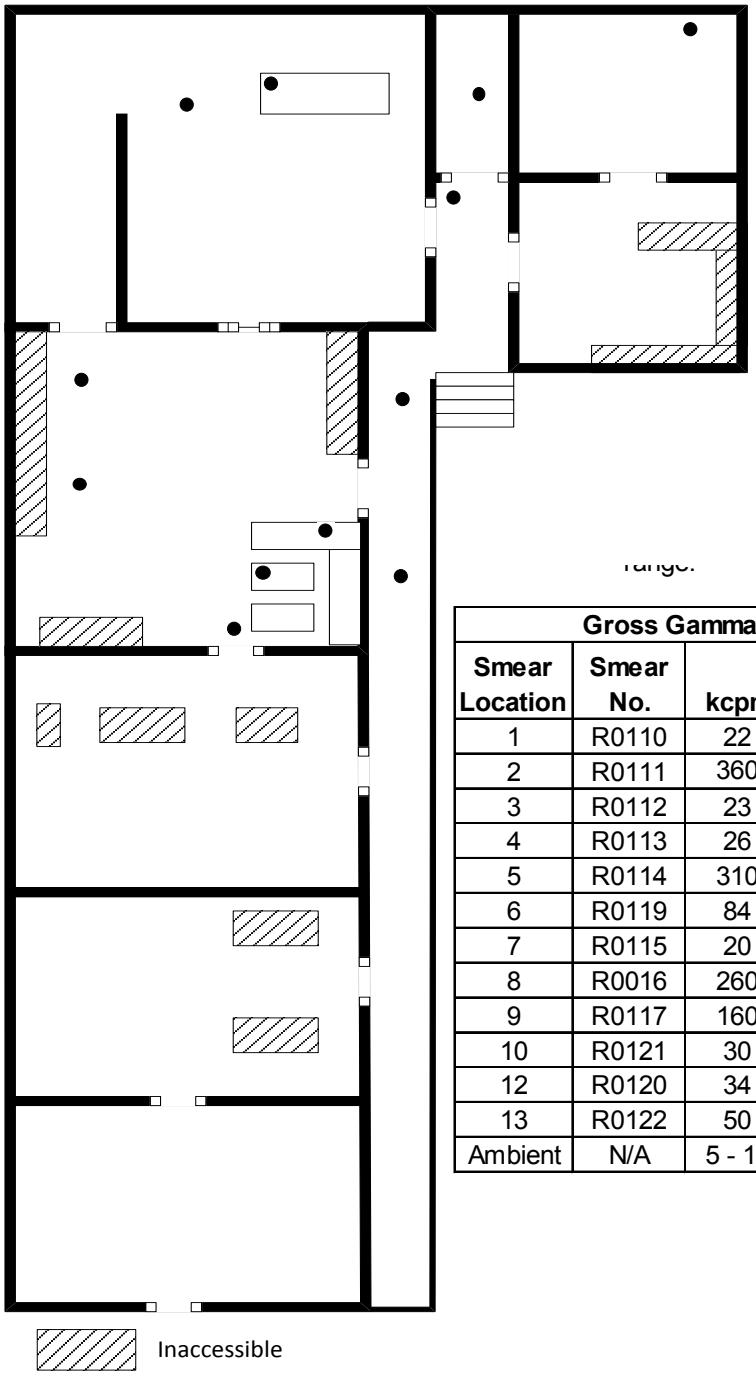


Figure B-8. Hangar 13 Lower Level Offices

Site: Detroit City Airport	**Area:** Hangar 13	**Date(s):**04/18/2018	**Time:** 1300/1600
Surveyor(s): TLB/KME		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1139 and 1144	44-10/1151 and 1152	5-20 kcpm[a]
Gamma	192/1127 and 1128	NA	5-16 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

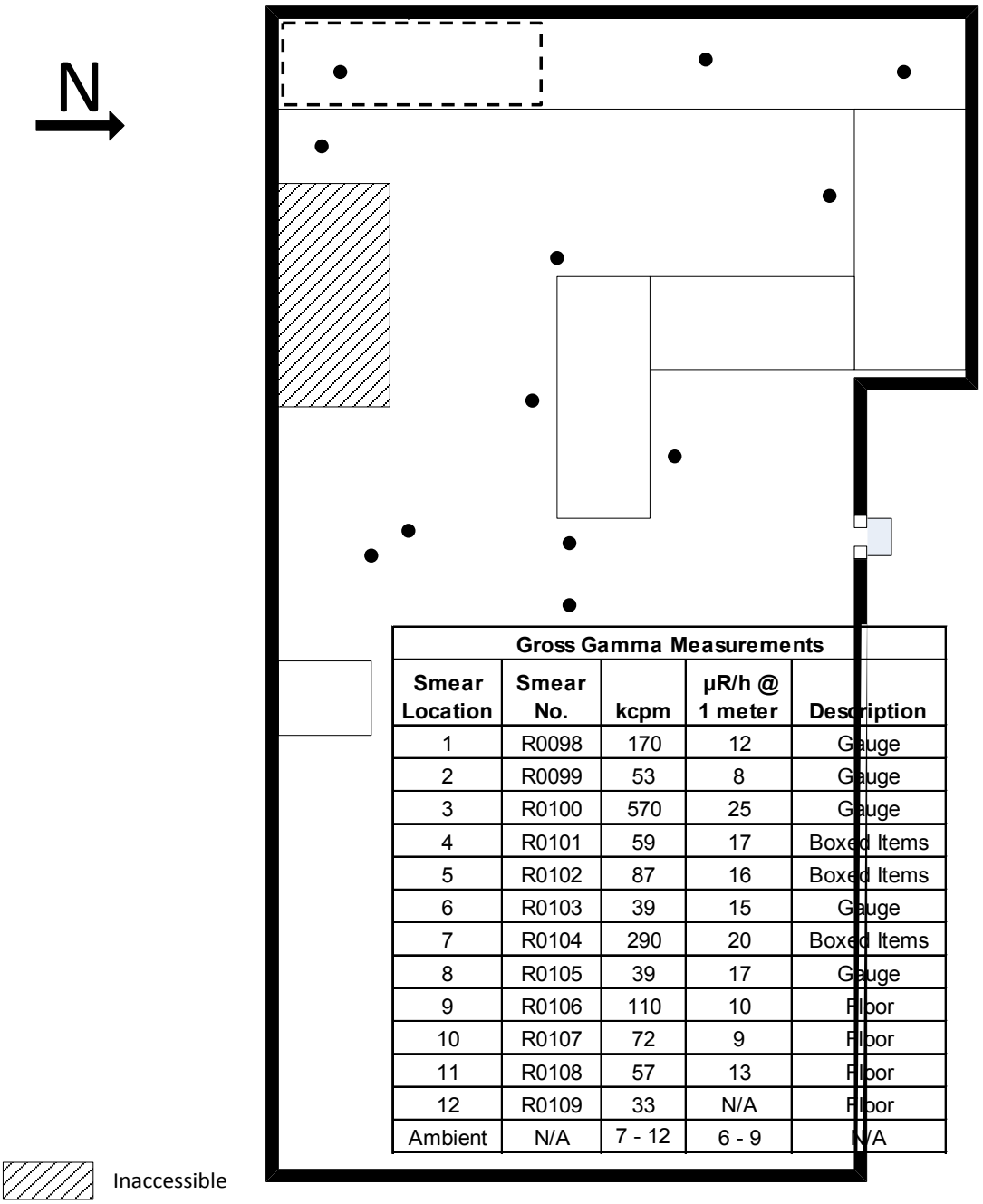


Gross Gamma Measurements				
Smear Location	**Smear No.**	**kcpm**	**µR/h @ 1 meter**	**Description**
1	R0110	22	8	Floor
2	R0111	360	15	Gauge
3	R0112	23	13	Floor
4	R0113	26	13	Floor
5	R0114	310	17	Boxed Items
6	R0119	84	14	Floor
7	R0115	20	12	Floor
8	R0016	260	14	Gauges
9	R0117	160	14	Floor
10	R0121	30	11	Floor
12	R0120	34	15	Table
13	R0122	50	10	Floor
Ambient	N/A	5 - 18	5 - 15	N/A

Figure B-9. Hangar 13 Upper Level Offices

Surveyor(s): KME		**Purpose:** Site Visit	
Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221/1144	44-10/1152	7-12 kcpm[a]
Gamma	192/1128	NA	6-9 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



Gross Gamma Measurements				
Smear Location	**Smear No.**	**kcpm**	**µR/h @ 1 meter**	**Description**
1	R0098	170	12	Gauge
2	R0099	53	8	Gauge
3	R0100	570	25	Gauge
4	R0101	59	17	Boxed Items
5	R0102	87	16	Boxed Items
6	R0103	39	15	Gauge
7	R0104	290	20	Boxed Items
8	R0105	39	17	Gauge
9	R0106	110	10	Floor
10	R0107	72	9	Floor
11	R0108	57	13	Floor
12	R0109	33	N/A	Floor
Ambient	N/A	7 - 12	6 - 9	N/A

Figure B-10. Hangar 13 Upper Level Offices' Roof

Table B-1. Summary of Scan Data									
Hangar	**Rooms**	**Coverage**	**No. Meas.**	**Meas. Units**	**Min.**	**Max.**	**Mean**	**Median**	**St. Dev.**
9	Bay	75%	104	cpm	7,000	18,000	10,375	10,000	1,760
				µR/h	5.0	15.0	9.2	9.0	1.8
	Lower Level	80%	50	cpm	17,000	35,000	23,140	23,000	3,648
				µR/h	14	28	19	19	3.2
	Upper Level	60%	57	cpm	14,300	115,356	29,349	25,000	20,605
				µR/h	12	25	19	19	3
10	Bay	75%	99	cpm	7,000	25,000	10,404	10,000	2,379
				µR/h	6.0	16	9.3	9.0	2.3
	Lower Level	90%	44	cpm	11,000	25,000	17,043	17,000	2,998
				µR/h	11	23	17	17	2.5
	Roof	100%	8	cpm	12,000	18,700	15,625	16,250	2,488
				µR/h	11	18	14	14	2.3
13	Bay	50%	110	cpm	6,400	15,200	9,275	9,000	1,250
				µR/h	5.0	15.0	8.5	8.0	1.5
	Lower Level	75%	62	cpm	6,800	96,880	11,666	10,150	11,104
				µR/h	5.0	14	9.3	10	1.8
	Upper Level	75%	71	cpm	5,000	360,574	33,168	11,200	69,094
				µR/h	5.0	17	10	9.0	3.1
	Roof	80%	44	cpm	6,800	566,248	42,803	9,200	95,750
				µR/h	6.0	25	10	8.0	4.2

Table B-2. Summary Data for Small Area of Elevated Activity									
Smear Location	Location Description	Removable Alpha-plus-Beta		Total Alpha-plus-Beta		Gross Gamma			Comment
				Gross	Net[a]	Contact		1 m	
		Smear No.	dpm/ 100 cm^2	cpm	dpm/ 100 cm^2	cpm	µR/h	µR/h	
Hangar 9 Upper Level Offices/Rooms									
Background	N/A	N/A	N/A	349	N/A	14,000	N/A	18	N/A
1	UL Middle Rm.	R0092	61	80,514	62,000	115,356	60	22	Floor, poured concrete; < 100 cm^2
2	UL Middle Rm.	R0093	52	43,560	33,000	99,946	40	23	Floor, drum outline; ~0.4 m^2
3	UL East Rm.	R0094	8	53,106	41,000	95,166	35	22	Floor, poured concrete; < 100 cm^2
4	UL East Rm.	R0095	3	18,747	14,000	60,720	35	22	Floor, poured concrete; < 100 cm^2
5	UL Middle Rm.	R0096	30	40,729	31,000	50,765	28	18	Floor, poured concrete; < 100 cm^2
6	UL Middle Rm.	R0097	5	32,415	25,000	61,960	32	22	Floor; < 100 cm^2
Hangar 13 Offices/Rooms (April 18)									
Background	N/A	N/A	N/A	302	N/A	8,000	N/A	8	N/A
1	UL Rm 7	R0110	4	15,015	11,000	22,115	20	8	0.4 m^2 rug
2	UL Rm 6	R0111	7	17,572	13,000	360,574	700	15	Gauge
3	UL Rm 5 Doorway	R0112	3	913	470	22,876	20	13	Spot near doorway; < 100 cm^2
4	UL Rm 5	R0113	2	3,625	2,600	26,086	23	13	Carpeted floor; ~0.4 m^2
5	UL Rm 5	R0114	28	23,782	18,000	309,759	480	17	Box in desk drawer
7	UL Hallway	R0115	1	1,480	910	19,886	20	12	Small spot on floor
8	UL Rm 4	R0116	7	825,965	640,000	256,002	200	14	Bag of gauge needles
9	UL Hallway	R0117	1	23,819	18,000	159,914	170	14	~0.3 m^2 in corridor along wall

Table B-2. Summary Data for Small Area of Elevated Activity									
Smear Location	Location Description	Removable Alpha-plus-Beta		Total Alpha-plus-Beta		Gross Gamma			Comment
				Gross	Net[a]	Contact		1 m	
		Smear No.	dpm/ 100 cm^2	cpm	dpm/ 100 cm^2	cpm	µR/h	µR/h	
Hangar 13 Offices/Rooms (April 19)									
Background	N/A	N/A	N/A	326	N/A	9,000	N/A	8	N/A
11	LL Rm 1	R0118	2	6,343	4,600	96,880	80	13	Gauge
6	UL Rm 4	R0119	1	2,813	1,900	83,504	70	14	Tile floor; ~3.6 m^2
12	UL Rm 4	R0120	20	6,969	5,100	34,096	30	15	Benchtop table; 100 cm^2
10	UL Rm 4	R0121	2	1,100	600	29,744	27	11	Tile floor; ~0.4 m^2
13	UL Rms 3/4	R0122	1	2,245	1,500	49,698	45	10	Tile floor; ~ 0.3 m^2
Hangar 13 "Office Roof" (above upper level offices)									
Background	N/A	N/A	N/A	448	N/A	8,000	N/A	7	N/A
1	Roof	R0098	3	11,497	8,500	169,925	80	12	Gauge
2	Roof	R0099	5	7,715	5,600	53,283	47	8	Gauges, no faceplates
3	Roof	R0100	1194	80,899	62,000	566,248	390	25	Gauge
4	Roof	R0101	2	31,629	24,000	58,847	35	17	Small box in larger box
5	Roof	R0102	3	60,444	46,000	86,633	60	16	Box exterior near bottom
6	Roof	R0103	114	228,471	180,000	39,123	22	15	Object with no faceplate
7	Roof	R0104	4	127,166	97,000	288,751	350	20	Boxes in a file drawer
8	Roof	R0105	5	1,464	780	39,048	40	17	Gauge with no faceplate
9	Roof	R0106	1	4,915	3,400	110,355	95	10	Dusty wood floor; ~100 cm^2
10	Roof	R0107	149	72,599	56,000	72,112	40	9	Small spot on dusty wood floor
11	Roof	R0108	2	2,667	1,700	57,200	42	13	Dusty wood floor; ~100 cm^2
12	Roof	R0109	595	20,985	16,000	33,498	--	--	Small spot on dusty wood floor

[a]Total efficiency of 1.3 assumed; all dpm measurement values rounded to three significant digits.

LL = lower level, N/A = not applicable/not determined, UL = upper level

APPENDIX C

DOSE ASSESSMENT FOR THE DETROIT CITY AIRPORT

Table C-1. Hangar 9 Upper Level Rooms								
Meas. No.	Alpha-plus-Beta				Gross Gamma			Comment
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm²	cpm	dpm/100 cm²	cpm	µR/h	µR/h	
Hangar 9 Upper Level East Room								
1	—	—	—	—	24,000	—	20	—
2	—	—	—	—	27,000	—	19	—
3	—	—	—	—	30,000	—	22	—
4	—	—	—	—	28,000	—	21	—
5	—	—	—	—	29,000	—	22	—
6	—	—	—	—	28,000	—	22	—
7	R0094	8	53,106	41,000	95,200	35	22	Floor, poured concrete; < 100 cm²
8	—	—	—	—	34,000	—	25	Excluded from background set
9	—	—	—	—	25,000	—	19	—
10	R0095	3	18,747	14,000	60,700	35	22	Floor, poured concrete; < 100 cm²
11	—	—	—	—	26,000	—	18	—
			Room Background	0	27,100		20	Excludes locations 7, 8, and 12
			Room Average	5,000	37,000		21	Includes all east room locations
Hangar 9 Upper Level Middle Room								
12	—	—	—	—	30,000	—	25	—
13	—	—	—	—	33,000	—	23	—
14	R0093	52	43,560	33,000	99,900	40	23	Floor, drum outline; ~0.4 m²
15	—	—	—	—	42,000	—	24	—
16	R0097	5	32,415	25,000	62,000	32	22	Floor; < 100 cm²
17	—	—	—	—	27,000	—	18	—
18	—	—	—	—	31,000	—	22	—
19	—	—	—	—	32,000	—	21	—
20	R0092	61	80,514	62,000	115,400	60	22	Floor, poured concrete; < 100 cm²
21	R0096	30	40,729	31,000	50,800	28	18	Floor, poured concrete; < 100 cm²
22	—	—	—	—	41,000	—	22	—
23	—	—	—	—	26,000	—	19	—

Table C-1. Hangar 9 Upper Level Rooms								
Meas. No.	Alpha-plus-Beta				Gross Gamma			
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm²	cpm	dpm/100 cm²	cpm	µR/h	µR/h	Comment
24	—	—	—	—	23,000	—	18	—
25	—	—	—	—	26,000	—	20	—
26	—	—	—	—	32,000	—	25	—
27	—	—	—	—	40,000	—	20	—
28	—	—	—	—	23,000	—	17	—
29	—	—	—	—	28,000	—	20	—
30	—	—	—	—	25,000	—	20	—
31	—	—	—	—	28,000	—	21	—
			Room Background	0	30,400		21	Excludes locations 14, 16, 20, and 21
			Room Average	7,600	40,800		21	Includes all middle room locations
Hangar 9 Upper Level West Room								
32	—	—	—	—	17,000	—	13	—
33	—	—	—	—	17,600	—	19	—
34	—	—	—	—	17,300	—	18	—
35	—	—	—	—	18,000	—	16	—
36	—	—	—	—	16,700	—	15	—
37	—	—	—	—	17,600	—	15	—
38	—	—	—	—	16,800	—	15	—
39	—	—	—	—	26,000	—	20	—
40	—	—	—	—	15,600	—	17	—
41	—	—	—	—	16,400	—	16	—
42	—	—	—	—	16,500	—	15	—
43	—	—	—	—	16,600	—	15	—
44	—	—	—	—	16,600	—	16	—
45	—	—	—	—	17,200	—	15	—
46	—	—	—	—	17,000	—	15	—
47	—	—	—	—	15,500	—	14	—

Table C-1. Hangar 9 Upper Level Rooms								
Meas. No.	Alpha-plus-Beta				Gross Gamma			
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm²	cpm	dpm/100 cm²	cpm	µR/h	µR/h	Comment
48	—	—	—	—	15,500	—	15	—
49	—	—	—	—	17,200	—	14	—
50	—	—	—	—	16,600	—	13	—
51	—	—	—	—	14,300	—	12	—
52	—	—	—	—	15,500	—	17	—
53	—	—	—	—	19,000	—	18	—
54	—	—	—	—	17,000	—	17	—
55	—	—	—	—	16,500	—	14	—
56	—	—	—	—	17,000	—	12	—
57	—	—	—	—	24,000	—	20	—
			Room Background	0	17,300		16	All values are at background
Hangar 9 Upper Level Summary								
			Hangar 9 Upper Level Rooms Background	0	23,100		18	Excludes seven locations
			Hangar 9 Upper Level Rooms Average	3,600	29,400		19	Includes all upper level office locations

[a]Total efficiency of 1.3 assumed; all dpm measurement values rounded to two significant digits.

Table C-2. Hangar 13 Upper Level Rooms								
Meas. No.	Alpha-plus-Beta				Gross Gamma			Comment
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm^2	cpm	dpm/100 cm^2	cpm	µR/h	µR/h	
Hangar 13 Upper Level Eastern Rooms and Hallway Combined								
1	R0114	28	23,782	18,000	309,800	480	17	Box in desk drawer
2	—	—	—	—	14,000	—	11	—
3	—	—	—	—	20,000	—	16	—
4	—	—	—	—	16,000	—	14	—
5	R0119	1	2,813	1,900	83,500	70	14	Tile floor; small spots 3.6 m2 area
6	—	—	—	—	14,000	—	12	—
7	R0121	2	1,100	600	29,700	27	11	Tile floor; ~0.4 m2
8	—	—	—	—	12,000	—	12	—
9	—	—	—	—	13,000	—	12	—
10	—	—	—	—	13,000	—	13	—
11	—	—	—	—	18,000	—	15	—
12	R0120	20	6,969	5,100	34,100	30	15	Benchtop table; 100 cm2
13	R0116	7	825,965	640,000	256,000	200	14	Bag of gauge needles
14	—	—	—	—	15,000	—	12	—
15	—	—	—	—	14,000	—	12	—
16	—	—	—	—	16,000	—	13	—
17	—	—	—	—	16,000	—	14	—
18	—	—	—	—	9,400	—	8	—
19	—	—	—	—	9,600	—	8	—
20	—	—	—	—	9,400	—	8	—
21	—	—	—	—	8,900	—	8	—
22	—	—	—	—	9,000	—	8	—
23	R0110	4	15,015	11,000	22,100	20	8	0.4 m2 rug
24	—	—	—	—	8,900	—	7	—
25	—	—	—	—	12,000	—	8	—
26	R0111	7	17,572	13,000	360,600	700	15	Gauge

Table C-2. Hangar 13 Upper Level Rooms								
Meas. No.	Alpha-plus-Beta				Gross Gamma			Comment
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm^2	cpm	dpm/100 cm^2	cpm	µR/h	µR/h	
27	—	—	—	—	10,000	—	10	—
28	—	—	—	—	12,000	—	13	—
29	—	—	—	—	13,000	—	10	—
30	—	—	—	—	13,000	—	14	—
31	R0113	2	3,625	2,600	26,100	23	13	Carpeted floor; ~0.4 m2
32	R0116	7	825,965	640,000	256,000	200	14	Bag of gauge needles
33	—	—	—	—	10,000	—	9	—
34	R0122	1	2,245	1,500	49,700	45	10	Tile floor; ~ 0.3 m2
35	—	—	—	—	52,000	45	--	—
36	—	—	—	—	18,000	—	14	—
37	—	—	—	—	9,200	—	9	—
38	—	—	—	—	8,300	—	8	—
39	—	—	—	—	11,800	—	9	—
40	—	—	—	—	12,500	—	11	—
41	R0117	1	23,819	18,000	159,900	170	14	~0.3 m2 in corridor along wall
42	—	—	—	—	81,000	48	14	—
43	R0112	3	913	470	22,900	20	13	Spot near doorway; < 100 cm2
44	R0115	1	1,480	910	19,900	20	12	Small spot on floor
45	—	—	—	—	12,000	—	10	—
			Eastern Rooms Background	0	12,300		11	Excludes locations with >= 20,000 cpm
			Eastern Rooms Average	1,000	23,400		11	Includes all structural locations
Hangar 13 Upper Level Hallway Only								
35	—	—	—	—	52,000	45	—	—
36	—	—	—	—	18,000	—	14	—
37	—	—	—	—	9,200	—	9	—
38	—	—	—	—	8,300	—	8	—
39	—	—	—	—	11,800	—	9	—
40	—	—	—	—	12,500	—	11	—

Table C-2. Hangar 13 Upper Level Rooms								
Meas. No.	Alpha-plus-Beta				Gross Gamma			Comment
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm²	cpm	dpm/100 cm²	cpm	µR/h	µR/h	
41	R0117	1	23,819	18,000	159,900	170	14	~0.3 m2 in corridor along wall
42	—	—	—	—	81,000	48	14	—
43	R0112	3	913	470	22,900	20	13	Spot near doorway; < 100 cm2
44	R0115	1	1,480	910	19,900	20	12	Small spot on floor
45	—	—	—	—	12,000	—	10	—
			Hallway Only Background	0	10,800		9.4	Excludes locations with > 12,500 cpm
			Hallway Only Average	1,800	37,000		11	Includes all structural locations
Hangar 13 Upper Level Western Rooms								
46	—	—	—	—	8,200	—	8	—
47	—	—	—	—	7,000	—	8	—
48	—	—	—	—	5,000	—	5	—
49	—	—	—	—	8,400	—	8	—
50	—	—	—	—	6,500	—	7	—
51	—	—	—	—	6,400	—	6	—
52	—	—	—	—	8,500	—	8	—
53	—	—	—	—	8,500	—	8	—
54	—	—	—	—	8,900	—	8	—
55	—	—	—	—	11,200	—	10	—
56	—	—	—	—	8,700	—	5	—
57	—	—	—	—	9,600	—	8	—
58	—	—	—	—	8,900	—	7	—
59	—	—	—	—	8,700	—	5	—
60	—	—	—	—	8,500	—	9	—
61	—	—	—	—	6,300	—	6	—
62	—	—	—	—	8,600	—	6	—
63	—	—	—	—	7,400	—	7	—
64	—	—	—	—	8,800	—	8	—
65	—	—	—	—	9,100	—	9	—

Table C-2. Hangar 13 Upper Level Rooms								
Meas. No.	Alpha-plus-Beta				Gross Gamma			
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm^2	cpm	dpm/100 cm^2	cpm	µR/h	µR/h	Comment
66	—	—	—	—	7,800	—	7	—
67	—	—	—	—	8,000	—	8	—
68	—	—	—	—	8,400	—	7	—
69	—	—	—	—	8,200	—	7	—
70	—	—	—	—	8,300	—	7	—
71	—	—	—	—	9,800	—	10	—
Western Rooms Background				0	8,200		7	All values are at background
Hangar 13 Upper Level Summary								
Hangar 13 Upper Level Rooms Background				0	10,200		9.0	Excludes sixteen locations
Hangar 13 Upper Level Rooms Average				630	17,500		10	Includes all upper level office structural locations

[a]Total efficiency of 1.3 assumed; all dpm measurement values rounded to two significant digits.

Shaded locations consolidated and isolated; data excluded from summaries

Table C-3. Hangar 13 Roof								
Meas. No.	Alpha-plus-Beta				Gross Gamma			
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm^2	cpm	dpm/100 cm^2	cpm	µR/h	µR/h	Comment
1	R0101	2	31,629	24,000	58,800	35	17	Small box in larger box
2	R0102	3	60,444	46,000	86,600	60	16	Box exterior near bottom
3	—	—	—	—	12,000	—	11	—
4	—	—	—	—	14,000	—	13	—
5	R0107	149	72,599	56,000	72,100	40	9	Small spot on dusty wood floor
6	R0109	595	20,985	16,000	33,500	—	—	Small spot on dusty wood floor
7	—	—	—	—	8,200	—	7	—
8	—	—	—	—	8,800	—	8	—
9	—	—	—	—	7,500	—	7	—
10	—	—	—	—	6,800	—	6	—
11	—	—	—	—	6,800	—	6	—
12	—	—	—	—	6,800	—	7	—
13	—	—	—	—	7,800	—	7	—
14	—	—	—	—	7,300	—	6	—
15	—	—	—	—	7,300	—	7	—
16	—	—	—	—	9,100	—	8	—
17	—	—	—	—	7,000	—	6	—
18	—	—	—	—	8,200	—	7.5	—
19	—	—	—	—	8,300	—	8	—
20	—	—	—	—	9,300	—	8	—
21	R0106	1	4,915	3,400	110,400	95	10	Dusty wood floor; ~100 cm^2
22	R0098	3	11,497	8,500	169,900	80	12	Gauge
23	R0099	5	7,715	5,600	53,300	47	8	Gauges, no faceplates
24	R0100	1194	80,899	62,000	566,200	390	25	Gauge
25	—	—	—	—	22,000	—	12	—
26	—	—	—	—	14,000	—	13	—
27	R0103	114	228,471	180,000	39,100	22	15	Object with no faceplate
28	R0108	2	2,667	1,700	57,200	42	13	Dusty wood floor; ~100 cm^2

Table C-3. Hangar 13 Roof								
Meas. No.	Alpha-plus-Beta				Gross Gamma			
	Smear No.	Removable	Total Gross	Total Net[a]	Contact		1 m	
		dpm/100 cm^2	cpm	dpm/100 cm^2	cpm	µR/h	µR/h	Comment
29	—	—	—	—	10,000	—	9	—
30	—	—	—	—	9,000	—	9	—
31	—	—	—	—	8,800	—	9	—
32	—	—	—	—	11,000	—	8	—
33	—	—	—	—	10,000	—	8	—
34	—	—	—	—	9,100	—	8	—
35	—	—	—	—	8,800	—	8	—
36	—	—	—	—	7,500	—	7	—
37	—	—	—	—	8,500	—	7	—
38	—	—	—	—	7,500	—	7	—
39	—	—	—	—	8,200	—	7	—
40	—	—	—	—	8,700	—	8	—
41	—	—	—	—	12,000	—	10	—
42	—	—	—	—	18,000	—	16	—
43	R0105	5	1,464	780	39,000	40	17	Gauge with no faceplate
44	R0104	4	127,166	97,000	288,800	350	20	Boxes in a file drawer
Hangar 13 Roof Background				0	9,600		8.4	Excludes eight locations
Hangar 13 Roof Average				2,100	16,200		8.6	Includes all structural locations

[a]Total efficiency of 1.3 assumed; all dpm measurement values rounded to two significant digits.

Shaded locations consolidated and isolated; data excluded from summaries

Table C-4. Estimated Dose from the External Pathways Only							
Description	Measured µR/hr at 1 m				Gamma-only Dose (mrem/yr)		Locations used in max room calculations
	Survey Unit Avg		Max Area Avg				
	All Data	Bkg	All Data	Bkg	Survey Unit	Max Area	
H9 Upper Level	19	18	21	20	5.8	5.8	Calculated for east room
H13 Upper Level	10	9.0	11	9.4	3.5	9.2	Calculated for hallway only
H13 Roof	8.6	8.4	8.6	8.4	1.2	1.2	All one area (no walled rooms)

Level Avg = the average value considering all data collected in structure level
Max Area Avg = the average value for the area with the highest measured radioactivity
All Data = results from across the entire structure level, as applicable
Bkg = all results excluding results from individual items or small areas of elevated activity

Table C-5. Estimated Dose from the Internal Pathways Only							
Description	Measured dpm/100 cm^2				Internal Dose (mrem/yr)		Locations used in max room calculations
	Level Avg		Max Area Avg				
	All Data	Bkg	All Data	Bkg	Survey Unit	Max Area	
H9 Upper Level	3,600	0	5,000	0	1.2	1.7	Calculated for east room
H13 Upper Level	630	0	1,800	0	0.2	0.6	Calculated for hallway only
H13 Roof	2,100	0	2,100	0	0.7	0.7	All one area (no walled rooms)

Level Avg = the average value considering all data collected in structure level
Max Area Avg = the average value for the area with the highest measured radioactivity
All Data = results from across the entire structure level, as applicable
Bkg = all results excluding results from individual items or small areas of elevated activity

Table C-6. Total Estimated Dose		
Description	Total Dose (mrem/yr)	
	Level	Max Area
H9 Upper Level	7.0	7.5
H13 Upper Level	3.7	9.8
H13 Roof	1.9	1.9

Enclosure 2

U.S. NUCLEAR REGULATORY COMMISSION

APPLICABLE REGULATIONS FROM

TITLE 10 OF THE *CODE OF FEDERAL REGULATIONS*

§ 20.2008 Disposal of certain byproduct material.

(a) Licensed material as defined in paragraphs (3) and (4) of the definition of *Byproduct material* set forth in §20.1003 may be disposed of in accordance with part 61 of this chapter, even though it is not defined as low-level radioactive waste. Therefore, any licensed byproduct material being disposed of at a facility, or transferred for ultimate disposal at a facility licensed under part 61 of this chapter, must meet the requirements of § 20.2006.

(b) A licensee may dispose of byproduct material, as defined in paragraphs (3) and (4) of the definition of *Byproduct material* set forth in § 20.1003, at a disposal facility authorized to dispose of such material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005.

[72 FR 55922, Oct. 1, 2007]

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§ 31.12 General license for certain items and self-luminous products containing radium-226

(a) A general license is hereby issued to any person to acquire, receive, possess, use, or transfer, in accordance with the provisions of paragraphs (b), (c), and (d) of this section, radium-226 contained in the following products manufactured prior to November 30, 2007.

(1) Antiquities originally intended for use by the general public. For the purposes of this paragraph, antiquities mean products originally intended for use by the general public and distributed in the late 19th and early 20th centuries, such as radium emanator jars, revigators, radium water jars, radon generators, refrigerator cards, radium bath salts, and healing pads.

(2) Intact timepieces containing greater than 0.037 megabecquerel (1 microcurie), nonintact timepieces, and timepiece hands and dials no longer installed in timepieces.

(3) Luminous items installed in air, marine, or land vehicles.

(4) All other luminous products, provided that no more than 100 items are used or stored at the same location at any one time.

(5) Small radium sources containing no more than 0.037 megabecquerel (1 microcurie) of radium-226. For the purposes of this paragraph, "small radium sources" means discrete survey instrument check sources, sources contained in radiation measuring instruments, sources used in educational demonstrations (such as cloud chambers and spinthariscopes), electron tubes, lightning rods, ionization sources, static eliminators, or as designated by the NRC.

(b) Persons who acquire, receive, possess, use, or transfer byproduct material under the general license issued in paragraph (a) of this section are exempt from the provisions of 10 CFR parts 19, 20, and 21, and § 30.50 and 30.51 of this chapter, to the extent that the receipt, possession, use, or transfer of byproduct material is within the terms of the general license; provided, however, that this exemption shall not be deemed to apply to any such person specifically licensed under this chapter.

(c) Any person who acquires, receives, possesses, uses, or transfers byproduct material in accordance with the general license in paragraph (a) of this section:

(1) Shall notify the NRC should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive material. A report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of the Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001 within 30 days.

(2) Shall not abandon products containing radium-226. The product, and any radioactive material from the product, may only be disposed of according to § 20.2008 of this chapter or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC.

(3) Shall not export products containing radium-226 except in accordance with part 110 of this chapter.

(4) Shall dispose of products containing radium-226 at a disposal facility authorized to dispose of radioactive material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under part 30 of this chapter, or equivalent regulations of an Agreement State, or as otherwise approved by the NRC.

(5) Shall respond to written requests from the NRC to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the information by providing the Director of the Office of Nuclear Material Safety and Safeguards, by an appropriate method listed in § 30.6(a) of this chapter, a written justification for the request.

(d) The general license in paragraph (a) of this section does not authorize the manufacture, assembly, disassembly, repair, or import of products containing radium-226, except that timepieces may be disassembled and repaired.

[53 FR 19246, May 27, 1988; 72 FR 55927 Oct. 1, 2007; 79 FR 75739, Dec. 19, 2014]

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U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

§ 30.6 Communications.

(a) Unless otherwise specified or covered under the regional licensing program as provided in paragraph (b) of this section, any communication or report concerning the regulations in parts 30 through 37 and 39 of this chapter and any application filed under these regulations may be submitted to the Commission as follows:

(1) By mail addressed: ATTN: Document Control Desk, Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001.

(2) By hand delivery to the NRC's offices at 11555 Rockville Pike, Rockville, Maryland.

(3) Where practicable, by electronic submission, for example, via Electronic Information Exchange, or CD–ROM. Electronic submissions must be made in a manner that enables the NRC to receive, read, authenticate, distribute, and archive the submission, and process and retrieve it a single page at a time. Detailed guidance on making electronic submissions can be obtained by visiting the NRC 's Web site at *http://www.nrc.gov/site-help/e-submittals.html;* by e-mail to *MSHD.Resource@nrc.gov;* or by writing the Office of the Chief Information Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001. The guidance discusses, among other topics, the formats the NRC can accept, the use of electronic signatures, and the treatment of nonpublic information.

(b) The Commission has delegated to the four Regional Administrators licensing authority for selected parts of its decentralized licensing program for nuclear materials as described in paragraph (b)(1) of this section. Any communication, report, or application covered under this licensing program must be submitted to the appropriate Regional Administrator. The Administrators' jurisdictions and mailing addresses are listed in paragraph (b)(2) of this section.

(1) The delegated licensing program includes authority to issue, renew, amend, cancel, modify, suspend, or revoke licenses for nuclear materials issued pursuant to 10 CFR parts 30 through 36, 39, 40, and 70 to all persons for academic, medical, and industrial uses, with the following exceptions:

(i) Activities in the fuel cycle and special nuclear material in quantities sufficient to constitute a critical mass in any room or area. This exception does not apply to license modifications relating to termination of special nuclear material licenses that authorize possession of larger quantities when the case is referred for action from NRC's Headquarters to the Regional Administrators.

(ii) Health and safety design review of sealed sources and devices and approval, for licensing purposes, of sealed sources and devices.

(iii) Processing of source material for extracting of metallic compounds (including Zirconium, Hafnium, Tantalum, Titanium, Niobium, etc.).

(iv) Distribution of products containing radioactive material under §§ 32.11 through 32.30 and 40.52 of this chapter to persons exempt from licensing requirements.

(v) New uses or techniques for use of byproducts, source, or special nuclear material.

(2) *Submissions*. (i) *Region I*. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region I non-Agreement States and the District of Columbia: Connecticut, Delaware, and Vermont. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, Region I, 2100 Renaissance Boulevard, Suite 100, King of Prussia, PA 19406–2713; where email is appropriate it should be addressed to *RidsRgn1MailCenter.Resource@nrc.gov*.

(ii) *Region II.* The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region II non-Agreement States and territories: West Virginia, Puerto Rico, and the Virgin Islands. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, Region I, 2100 Renaissance Boulevard, Suite 100, King of Prussia, PA 19406–2713; where email is appropriate it should be addressed to *RidsRgn1MailCenter.Resource@nrc.gov*.

(iii) *Region III.* (A) The regional licensing program for mining and milling involves all Federal facilities in the region, and non-Federal licensees in the Region III non-Agreement States of Indiana, Michigan, Missouri and the Region III Agreement States of Minnesota, Wisconsin, and Iowa. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 2443 Warrenville Road, Suite 210, Lisle, IL 60532 –4352; where e-mail is appropriate it should be addressed to *RidsRgn3MailCenter.Resource@nrc.gov*.

(B) Otherwise, the regional licensing program involves all Federal facilities in the region and non-Federal licensees in the Region III non-Agreement States of Indiana, Michigan, and Missouri. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 2443 Warrenville Road, Suite 210, Lisle, IL 60532–4352; where e-mail is appropriate it should be addressed to *RidsRgn3MailCenter.Resource@nrc.gov*.

(iv) *Region IV.* (A) The regional licensing program for mining and milling involves all Federal facilities in the region, and non-Federal licensees in the Region IV non-Agreement States and territory of Alaska, Hawaii, Idaho, Montana, South Dakota, Wyoming and Guam and Region IV Agreement States of Oregon, California, Nevada, New Mexico, Louisiana, Mississippi, Arkansas, Oklahoma, Kansas, Nebraska, and North Dakota. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region IV, Division of Nuclear Materials Safety, 1600 E. Lamar Blvd., Arlington, TX 76011–4511; where email is appropriate, it should be addressed to *RidsRgn4MailCenter.Resource@nrc.gov*.

(B) Otherwise, the regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region IV non-Agreement States and territory: Alaska, Hawaii, Idaho, Montana, South Dakota, Wyoming, and Guam. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region IV, Division of Nuclear Materials Safety, 1600 E. Lamar Blvd., Arlington, TX 76011–4511; where email is appropriate, it should be addressed to *RidsRgn4MailCenter.Resource@nrc.gov*.

[48 FR 16031, Apr. 14, 1983, as amended at 49 FR 19630, May 9, 1984; 49 FR 47824, Dec. 7, 1984; 50 FR 14693, Apr. 11, 1985; 51 FR 36000, Oct. 8, 1986; 52 FR 8241, Mar. 17, 1987; 52 FR 38392, Oct. 16, 1987; 52 FR 48093, Dec. 18, 1987; 53 FR 3862, Feb. 10, 1988; 53 FR 43420, Oct. 27, 1988; 58 FR 7736, Feb. 9, 1993; 58 FR 64111, Dec. 6, 1993; 59 FR 17465, Apr. 13, 1994; 60 FR 24551, May 9, 1995; 62 FR 22880, Apr. 28, 1997; 68 FR 58803, Oct. 10, 2003; 70 FR 69421, Nov. 16, 2005; 71 FR 15007, Mar. 27, 2006; 72 FR 33386, Jun. 18, 2007; 73 FR 5717, Jan. 31, 2008; 74 FR 62681, Dec. 1, 2009; 75 FR 21980, Apr. 27, 2010; 75 FR 73942, Nov. 30, 2010; 76 FR 72085, Nov. 22, 2011; 77 FR 39905, Jul. 6, 2012; 77 FR 43689, Jul. 25, 2012; 78 FR 17006, Mar. 19, 2013; 78 FR 32338, May 29, 2013; 79 FR 75739, Dec. 19, 2014; 80 FR 74979, Dec. 1, 2015]

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