DEPARTMENT OF THE ARMY
U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE
8350 RICKETTS POINT ROAD
ABERDEEN PROVING GROUND, MD 21010-5400

REPLY TO
ATTENTION OF

U.S. Nuclear Regulatory Commission
Region I DNMS Kucebsubg Assistance Team
2100 Renaissance Boulevard
King of Prussia, PA 19406

03031110

License No: 19-00294-24

Dear Sir/Madame:

This letter is to request a formal review of our MARSSIM survey performed in 2018 for building E3100 and E31002C located at Edgewood Aberdeen Proving Grounds. The U.S Army has determined that the research conducted at this institute will no longer require the possession, use or storage of radioactive material. The intent upon your concurrence or other guidance of the report is to turn E3100 back over to the Garrison Activity for unrestricted use. The building would no longer belong to the USAMRICD.

Point of contact is Travis W. Lindeblad, Radiation Safety Officer. I may be reached at (410)436-1831 or e-mail at travis.w.lindeblad.civ@mail.mil.

9/27/2019

X Travis W. Lindeblad

Travis W. Lindeblad
RSO
Signed by: LINDEBLAD.TRAVIS.WILLIAM.1094612132

REC'D IN LAT 9-27-19

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NMSS/RGN1 MATERIALS-002

CHAPTER 4
BUILDING E3100 CHARACTERIZATION RESULTS

4.1 CHARACTERIZATION AND OVERVIEW

4.1.1 Characterization activities at E3100 consisted of building reconnaissance, wipe sampling, soil sampling, and analysis of containers with unknown contents. Figures documenting the building layout (per the reconnaissance conducted during this project) and the sample locations can be found at the end of this chapter (Figures 4.1 and 4.16). A summary of detected compounds is included in Table 4.1, a risk assessment matrix is included as Table 4.2, and a complete analytical data summary is included in Tables 4.3 – 4.9. A photographic log of Building E3100 is presented at the end of this chapter (Figure 4.17). Reconnaissance and sample forms are located in Appendix C.2.

4.1.12 Table 1.2 summarizes the list of potential contaminants that have been associated with Building E3100 throughout its operational history which include:

- **Chemical**: Distilled Mustard (HD), Lewisite (L), Tabun (GA), Sarin (GB), Soman (GD), Cyclosarin (GF), O-Ethyl-S (VX), and Russian VX (VR);
- **Biotoxins:** Botulinum toxin, phalloidin, and cholera toxin. Note that botulinum toxin is the only toxin that has approved analytical methods. Also, *Bacillus anthracis* (anthrax) is not a potential contaminant of concern for Building E100, but analytical data were provided in ECBC's data deliverables.

4.2 BUILDING OVERVIEW AND HISTORY

The following sections summarize the construction, layout, and operational history of Building E3100. This information was used to formulate the characterization approach.

4.2.1 Overview and Floorplan

4.2.1.1 Building E3100 was constructed in 1968 as an 81,479 square feet medical research laboratory. The building is constructed of steel columns and beams with a concrete slab-on-grade set on poured concrete strip-and-spread footings. The building also has steel beams and decking on all elevated floors. The addition/annex on the southwest corner (referred to as E3100a or "Library Annex") is wood-framed with wooden trusses and decking on a pier foundation.

4.2.1.2 Figures 4.1 through 4.16 display the 1970 as-built drawings for the main floor, roof, and basement in their present condition as verified during the reconnaissance phase of the building characterization. According to the Real Property Card, Building

E3100 has undergone renovations every few years from 1971 through 1996 varying with changing uses of the building. These changes often corresponded with a reconfiguration of the laboratory spaces. Building E3100 went through major renovations over the years including: a two story 35' x 60' addition with 8' x 60' corridors in 1985, construction of a 22'8" x 9'8" change room in 1991, construction of a two story 44' x 35' addition in 1991, construction of a 26' x 25'4" masonry addition in 1995, and an installation of chemical fume hoods, bio-safety hoods, and chemical/ biological/radiological (CBR) exhaust system in 1995. A penthouse and basement were added to E3100 in 1996 (Sanders & Thomas Incorporated), the penthouse is a 12' x 18'10" addition containing two distilled water units on the roof next to the access stairwell and the basement is a three-room area with a small corridor build between the two bottom rooms. The access room is a 19'6" x 14' which has a staircase with a roof lift on the upper portion of room and electronics room below, next room is a 27'10" x 20'8" containing two biological waste pumps and sump area, the corridor is a 4'4" x 8'0" narrow entryway to the back room which is a 27'10" x 16'2" area containing one 1000 gallon (gal) biological decontamination tank with connections for another tank.

4.2.1.3 According to a review of Directorate of Safety, Health, and Environment [DSHE, now DPW, Engineering Division (DPW/ED)] documents prepared by Weston, three underground storage tanks (USTs) were associated with Building E3100; a 500-gal diesel fuel UST, a 1000-gal diesel fuel UST, and a 1000-gal UST (reported as never being used). The 1000-gal diesel fuel UST and the unused 1000-gal UST were abandoned in place in 1995 and 1996 respectively, and the 500-gal UST was scheduled to be removed by December 1991. A Maryland Department of Environment (MDE) registration certificate documenting closure of the 1000-gal diesel fuel UST is available from Mr. Bill Arguero, DSHEECD, Contracting, Hazardous Waste and Compliance Projects. No MDE registration certificate was found for the unused 1000-gal UST and no documents were found confirming the removal of the 500-gal UST. None of the three tanks was reported as leaking underground storage tanks (LUSTs). A building survey questionnaire prepared by Weston indicated that there was an unused 5,000-gal toxic waste tank removed in approximately 2001; however, there was no documentation found to support the existence or removal of this 5,000-gal tank. (Weston, 2007).

4.2.1.4 Included with E3100 are several outbuildings, E3100-1C, and E3100-2C and E3100-1D. E3100-1C was used as a 90-day waste storage facility. E3100-2C was used for radioactive waste storage and E3100-1D was a cold storage for biological waste. As-built drawings are not available for these structures; therefore, they were evaluated for sample locations during the reconnaissance phase. Room wipe results for these ancillary facilities are included in Table 4.3

4.2.2 Ventilation System

E3100 is equipped with a ventilation system that was used to collect and remove any chemical, radiological, or biological vapors through the fume hoods located in laboratories throughout the building. The vapors/aerosols were associated with laboratory activities involving chemical, radioactive and biological ingredients. These

materials were exhausted from the fume hoods via ducts to charcoal filters mounted on the building roof (Figure 4.16). The ventilation ducts that are connected to the fume hoods in the laboratories pass vertically up through the upper floors to the building roof. The CAFS on the roof of Building E3100 are the pull-through type with a pre-filter, particulate and charcoal bed. As of August 2018, the ventilation system in this building was still active.

4.2.3 Operational History

There is conflicting documentation as to whether this building was built as a testing laboratory (Maryland Historical Trust Correspondence) or as a hospital (Weston 2007). In 1979, Building E3100 became a medical research laboratory for chemical defense. According to a 2007 Weston report, CA was handled as dilute agents in permitted areas of E3100. A review of historical records available for this building show that BA was handled in permitted areas of this building (Rooms 99, 104, 105, 128, 147, 153, and 158). Radiological materials were handled in permitted areas in E3100 (Rooms 35, 52, 89, 94, 99, 104, 105, 144, 153, 168, 102C, 108A, 113A, 113B). (Weston, 2007).

4.3 CHEMICAL AND BIOLOGICAL AGENT ANALYTICAL DATA

4.3.1 Characterization activities at E3100, E3100A (E3100-1C (90-day waste storage), E3100-2C (radioactive waste storage) and E3100-1D (biological waste cold storage) occurred between 13 June and 30 July 2018. Wipe samples were collected from walls, floors, laboratory benches, floor drains, sink drains, and laboratory ventilation hoods in all rooms with potential for contamination (restrooms and administrative space, the library annex, for example, were not characterized). In accordance with the WP, all hoods and drains that were identified during reconnaissance were sampled. Rooftop CAFS, unidentifiable contents of containers, and a basement sump were also sampled.

4.3.2 A total of 364 surface wipe samples consisting of 146 composited room wipe samples, 114 composited drain wipe samples, 51 composited hood wipe samples, and 53 CAFS wipe samples. A total of 66 soil samples were collected (depths of 12-inches and 24-inches at each location) consisting of 19 sub-slab and 14 perimeter soil samples. One liquid sample was collected from a sump located in the basement. All samples collected from E3100 were analyzed for HD, L, GA, GB, GD, GF, VX, and VR. All wipe samples were also analyzed for arsenic compounds adamsite (DM), diphenyl-dichloroarsine (DA), and diphenylcyanoarsine (DC); and soil samples were analyzed for ABPs 1,4-dithiane, 1,4-thioxane, diisopropyl methyphosphonate (DIMP), dimethyl methylphosphonate (DMMP), s-2-diisopropylaminoethyl methylphosphonthionic acid (EA2192), ethyl methylphosphonic acid (EMPA), isopropyl methylphosphonic acid (IMPA), methylphosphonic acid (MPA), and pinacolyl methylphosphonic acid (PMPA). In addition, samples from select rooms with a history biotoxin use or rooms with "unknown usage" were analyzed for botulinum toxin and *Bacillus anthracis* (anthrax). Anthrax is not a potential contaminant of concern for Building E100, but analytical data were provided in ECBC's data deliverables.

4.3.3 ***There were no agent detections in any of the samples collected from Building E3100, but ABPs1,4-dithiane and 1,4-thioxane were detected in 10 samples (summarized in Table 4.1).*** All MINICAMS and DAAMS air monitoring data were non-detect.

Table 4.1 Summary of Agent Breakdown Product Detections in Building E3100

Sample ID	Sample Type	Room Number	Detected Analyte	Concentration
APG-E3100-134-R-117	Room Wipe	134	1,4-Dithiane (Mustard Breakdown Products)	0.052 mg/m^2
APG-E3100-147-R-11	Room Wipe	147	1,4-Dithiane (Mustard Breakdown Products)	0.0091 J µg/sample
APG-E3100-147-D-11	Drain Wipe	147	1,4-Dithiane (Mustard Breakdown Products)	0.19 µg/sample
APG-E3100-111-H-46	Hood Wipe	111	1,4-Dithiane 1,4-Thioxane (Mustard Breakdown Products)	1.2 µg/sample 0.25 J µg/sample
APG-E3100-F-122	CAFS Unit Pre-Filter Wipe	Roof	1,4-Dithiane (Mustard Breakdown Products)	2.3 µg/sample
APG-E3100-F-168A	CAFS Unit Pre-Filter Wipe	Roof	1,4-Dithiane (Mustard Breakdown Products)	1.4 µg/sample
APG-E3100-F-53A	CAFS Unit Pre-Filter Wipe	Roof	1,4-Dithiane 1,4-Thioxane (Mustard Breakdown Products)	5.7 E µg/sample 0.31 µg/sample
APG-E3100-F-95	CAFS Unit Pre-Filter Wipe	Roof	1,4-Dithiane (Mustard Breakdown Products)	0.89 J µg/sample
APG-E3100-F-110	CAFS Unit Pre-Filter Wipe	Roof	1,4-Dithiane (Mustard Breakdown Products)	0.30 J µg/sample
APG-E3100-F-111	CAFS Unit Pre-Filter Wipe	Roof	1,4-Dithiane 1,4-Thioxane (Mustard Breakdown Products)	2.4 µg/sample 0.18 J µg/sample

Notes:
mg/m2 - milligrams per square meter
µg/sample - micrograms per sample
µg/kg - micrograms per kilogram
J - Analyte detected, estimated concentration
Samples collected using wipe templates with a known sampling area are reported in mg/m2.
Samples collected without using wipe templates (drains, ductwork) are reported in µg/sample.

4.3.4 Total arsenic analysis was conducted on wipe samples to detect residual concentrations of arsenical riot control agents (DM, DA, and DC) and breakdown products of L. Total arsenic detections were widespread but low-level in all media

(room, drain, and hood wipes). In room surface wipes, the highest detected concentration was 0.62 mg/m^2 in Room 161, but most concentrations were two orders of magnitude lower. The highest concentrations measured in a drain wipe and hood wipe sample were 570 micrograms per sample (µg/sample) and 42 µg/sample, respectively in Room 124. Again, most concentrations measured in hoods and drains were two orders of magnitude lower. Arsenic may originate from a variety of non-agent related sources, and there were no detections of L); hence, concentrations of arsenic are likely attributed to a non-agent related source. Sources of arsenic in a military/industrial setting could include arsenical wood preservatives, pesticides, and airborne arsenic from combustion of fossil fuels. Ultimately, any residual arsenic concerns will be addressed via a representative Toxicity Characteristic Leachate Procedure (TCLP) sample of building materials in accordance with Resource Conservation and Recovery Act (RCRA) guidelines.

4.4 CONTAINERS WITH UNKNOWN CONTENTS

4.4.1 Ten items with unknown contents were identified during building reconnaissance and were removed from Building E3100 from June 15 through July 24, 2018. Containers included small laboratory glassware (e.g. vials), jars, and a bottle. Containers were associated with laboratory operations.

4.4.2 ECBC analyzed the contents of each container using a qualitative full-scan mode (300-400amu) GCMS method (MT-67) for TICs. For this qualitative analysis, ECBC uses the NIST library embedded in their software for identification when there is >90% match. The top twenty compounds (by peak area) were reported in the analytical results. This method did not detect ABPs within the top 20 TICs (Table 4.9) in the ten items tested. All containers and contents were decontaminated/destroyed by CTF following analysis.

4.5 CHEMICAL AND BIOLOGICAL AGENT POST-CHARACTERIZATION RISK ASSESSMENT

4.5.1 An assessment of the post-characterization risk of agent exposure was conducted for E3100 (Appendix F) in accordance with Department of the Army Pamphlet (DA PAM) 385-30 (October 2007). The risk assessment was based on a scenario of releasing the building to the general public for either re-use or demolition. The potential hazards associated with releasing E3100 to the general public through re-use or demolition are:

1) exposure to detected ABPs (1,4-Dithiane and 1,4-Thioxane) in rooftop CAFS and interior building surfaces;

2) exposure to potential residual chemical agent that may be present in areas of the buildings that were inaccessible during the characterization, such as piping contained within the building slab or duct work extending into the ceiling from fume hood; and

3) exposure to potential residual biotoxins which cannot be confirmed or denied due to the lack of available analytical methods. For purposes of worker protection during

the characterization effort, it was necessary to assume that biotoxins could potentially be present anywhere in the building, and Level C PPE was required (Tychem suits, NIOSH CBRN-approved respirator, and full PDS support).

The risks associated with each of these potential hazards is outlined in the following section.

4.5.2 ***Without recommended controls in place*** the following risk scenarios area associated with the identified hazards:

1) Based on multiple detections of ABPs (1,4-Dithiane and 1,4-Thioxane) at E3100 and the persistency of these compounds, ***a risk assessment code of "Moderate Risk"*** was determined for the current building condition based on a *"Occasional"* probability of agent exposure and a *"Marginal"* severity associated with the exposure (Appendix F).

2) Based on the potential for chemical agent to persist in occluded spaces (duct work and piping) that were not accessible during characterization, ***a risk assessment code of "Moderate Risk"*** was determined for the current building condition based on a *"Seldom"* probability of agent exposure and a *"Critical"* severity associated with the exposure (Appendix F).

3) There are no analytical methods for assessing the residual presence of phalloidin and cholera toxin in the E3100 bioresearch laboratories. Hence there is a remote possibility that these compounds could persist. Hence, ***a risk assessment code of "Low Risk"*** was determined for the current building condition based on a *"Seldom"* probability of agent exposure and a *"Marginal"* severity associated with the exposure (Appendix F).

Without recommended controls in place, the primary risk drivers are the confirmed presence of ABPs and the potential for chemical agent to persist in occluded spaces. Therefore, Table 4.2 reflects an overall risk assessment code of "***Moderate Risk***" without recommended controls in place.

4.5.3 Level C PPE and real-time chemical agent air monitoring are the recommended controls for crews removing and/or decontaminating CAFS, duct work, and piping contained within slabs to reduce the probability of agent exposure to "Unlikely" thereby reducing the overall risk to "***Low***" (Table 4.2). Although the risk associated with biotoxin exposure was ranked as "***Low***" without controls in place, Level C PPE would afford added protection against exposure to phalloidin and cholera toxin.

Table 4.2 Risk Assessment Matrix for E100 (Source DA PAM 385-30)

Overall Risk Assessment Code with recommended controls in place (Level C PPE and CA air monitoring):	
Overall Risk Assessment Code without recommended controls in place:	**M**

Risk Assessment Code (RAC) Matrix

	Probability				
Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic			H	H	M
Critical		H	H	**M – potential agent in occluded spaces**	
Marginal	H	M	**M – detected ABPs**		
Negligible	M				

RAC Chart
H = High Risk
M = Moderate Risk

"Severity" - is the level of severity if	
Catastrophic	Death or permanent total disability.
Critical	Permanent partial disability, temporary total disability exceeding 3 months.
Marginal	Lost days due to injury or illness no exceeding 3 months.
Negligible	First aid or minor medical treatment.
"Probability" - is the likelihood of agent exposure.	
Frequent	Occurs very often; known to happen regularly.
Likely	Occurs several times; a common occurrence.
Occasional	Occurs sporadically, but is not uncommon.
Seldom	Remotely possible; could occur at some time.
Unlikely	Can assume will not occur, but not impossible

4.6 ORM RESULTS

4.6.1 Representatives from Parsons' subcontractor, Tidewater, investigated Building E3100 on 9-10 August and on 13-15 August 2018. A total of 220 samples were collected for ACM analysis, 646 locations were screened for LBP using X-Ray fluorescence (XRF), 2 composited building material sample was analyzed for TCLP lead, and 9 paint/substrate samples were analyzed for PCBs. Tidewater also surveyed the

buildings for potentially regulated waste (e.g., items which may contain mercury, PCBs, etc.).

4.6.2 Locations of samples, results of the analyses, and locations and types of affected building materials for E3100 can be found in Tidewater's ORM Report. Tidewater also investigated Building E3100-A (Library Annex).

4.6.3 Tidewater assessed all potential ACM in E3100. The following materials were found to contain ACM based on laboratory samples:

- Beige 9x9 Floor tile and Mastic (12,500 square feet);
- Small pipe elbow (350 each);
- Grey/white floor tile 12x12 and mastic (4,500 square feet);
- 12x12 Beige floor tile and mastic (3,500 square feet);
- White pipe elbow (300 each);
- Mastic on fiberglass insulation (3,500 square feet);
- Black mastic on metal wall sheet (5,000 square feet);
- Yellow end-cap mastic (300 square feet);
- White floor tile and mastic (1,500 square feet);
- Grey terrazzo with black mastic (3,000 square feet);
- Yellow mastic on pipe fitting (300 linear feet);
- 12x12 pink floor tile and mastic (3,500 square feet);
- Green 12x12 floor tile and mastic (4,500 square feet);
- Large pipe insulation (300 linear feet);
- Black expansion joint (6,000 linear feet);

4.6.4 All of the ACM identified in E3100 is friable. Abatement of these materials would be required prior to release of this building to the public or demolition in accordance with the recommendations summarized in Section 3.1 of the E3100 ORM survey report (Appendix E). Note that there is also a risk associated with exposure to ABPs and possibly biological agents during portions of the ACM abatement process since some locations containing friable ACM (particularly asbestos insulation) are associated with locations that couldn't be assess during the agent characterization investigation (e.g., fume hood exhausts, ductwork).

4.6.5 The components listed below were found to contain LBP through XRF screening:

- Ceramic wall tiles;
- Painted ceramic wall tiles;
- Ceramic sinks and urinals;
- Painted metal sinks;
- Painted metal columns behind walls above ceilings;
- Painted metal beams and cross beams above ceilings;
- Painted metal exhaust tubes in labs;
- Glazed wall blocks;
- Painted metal entry door jambs;
- Painted plaster walls;
- Painted concrete columns;
- Metal wall sheeting behind walls (elemental lead encasement of radiation use);
- Painted metal window casings;
- Painted metal trims;
- Painted metal columns;
- Painted concrete blocks in the stairwell;
- Painted metal door lentils on the roof;
- Painted metal drain pipes on the roof;
- Painted metal handrail on the exterior;
- Painted metal columns on the exterior, and;
- Painted concrete flooring on the exterior.

4.6.6 Building materials were sampled to determine if the anticipated waste stream from the building during demolition activities would have the potential to contain levels of lead high enough to require disposal of this waste as hazardous waste.

Tidewater collected representative samples, consisting of appropriate amounts of building materials such as cement block, wood, metal, and other building materials found in the building, to properly reflect the potential waste stream. The 2 TCLP lead samples collected in Building E3100 of the paint and underlying substrate did not contain lead in excess of the RCRA hazardous waste threshold of 5 milligrams per liter (mg/L). A representative sample of demolition material should be collected from this building for TCLP-lead analysis for confirmatory purposes.

4.6.7 PCBs were detected in the 6 of the 9 paint/wall substrate samples at low concentrations but were not above the federal TSCA hazardous waste disposal threshold of 50 milligrams per kilogram (mg/kg). Hence, PCB abatement efforts are not required for any painted surfaces.

4.6.8 The following materials are suspected of containing potentially regulated waste (see Appendix E for total quantities):

- Tube florescent fixtures;
- Florescent fixtures;
- Incandescent/CFL bulbs;
- Mercury vapor lights;
- Mercury switch/thermostat;
- Emergency exit sign;
- Smoke/heat detectors;
- Door closers;
- Water fountain;
- Window/wall mount A/C unit;
- Transformer;
- Cooler rooms;
- Above ground storage tank (exterior);
- Emergency generator;
- Fire system control box;
- Exterior A/C units/chillers;
- Hydraulic lift (exterior);
- Chiller/cooling towers;
- Fire suppression system; and
- Rooftop HVAC units;

4.6.9 A complete inventory of these items is included in Appendix E. These wastes need to be separated from the general waste streams prior to demolition and disposed of in accordance with all federal, state, and local regulations.

4.7 MARSSIM SURVEY

Two separate MARSSIM reports for building E3100 and E3100-2C (a radioactive waste storage conex) are included in Appendix H and are pending review by Nuclear Regulatory Commission (NRC). There was one Class 3 survey unit in E3100 and one Class 2 survey in E3100-2C. The results of these surveys are summarized in the following sections.

4.7.1 E3100 MARSSIM Survey

4.7.1.1 There is a single Class 3 survey unit (SU) in building E3100 consisting of Rooms 34, 35, 52, 89, 94, 99, 102C, 104, 105, 107,107A, 108A, 113A, 113B, 143, 144, 153, and 168. The contaminants of concern are H-3 and C-14. Release limits, or DCGLs for these are taken from the survey plan. These are:

- Surface Derived Concentration Guideline Level over a Wide Surface Area (DCGLw) – 600,000 disintegrations per minute (dpm) /100 square centimeters ($cm^{2)}$
- Removable Surface DCGLw – 60,000 dpm /100 cm^2
- Investigation level – 150,000 dpm /100 cm^2

4.7.1.2 All beta static readings in the survey units were below the DCGLw. As a result, the statistical Wilcoxon Rank Sum Test (NRC, 2000) was not required to be used. All smear results were below the DCGLw for removable contamination. The highest reading was at 132 dpm/100 cm^2. The beta scans showed typical background distributions around a mean value. Outliers were found in all survey units, the highest reading being 4,643 cpm. This is well below the investigation level of 15,000 cpm.

4.7.1.3 Since no readings exceeded the DCGLw, statistical tests of the data are not required. Per MARSSIM protocols, the null hypothesis stated as "the residual activity in the survey unit exceeds the release criteria" is rejected, and the alternative hypothesis that "residual contamination meets the release criteria" is accepted. All survey units were found to meet the requirements for unrestricted release from NRC licensing, based on the survey plan and NRC requirements. It is recommended that they be so released.

4.7.2 E3100-2C MARSSIM Survey

4.7.2.1 The radioactive waste storage conex (E3100-2C) is a single Class 2 SU The contaminants of concern are H-3 and C-14. Release limits, or DCGLs for these are taken from the survey plan. These are:

- Surface Derived Concentration Guideline Level over a Wide Surface Area (DCGLw) – 600,000 disintegrations per minute (dpm) /100 cm^2
- Removable Surface DCGLw – 60,000 dpm /100 cm^2
- Investigation level – 150,000 dpm /100 cm^2

4.7.2.2 An investigation level for beta scans, was set at 15,000 counts per minute (cpm). Since this level was encountered at multiple locations, the survey unit was scanned as a Class 1 area by scanning 100% of the floor area, and up to two (2) meters on the walls of the conex. The highest reading (148,718 cpm) was found on the north wall of the conex.

4.7.2.3 Combined static measurements were calculated by adding adjusted H-3 smear results (multiplied by 10 to account for the removable fraction) to the beta measurement (of C-14). The average combined static measurement is 144,232 dpm/100cm^2 and two locations exceed the DCGLw. Because the average reading is below the DCGLw, the statistical Wilcoxon Rank Sum Test (NRC, 2000) is required to be used. In summary, the Rank Sum of adjusted reference data totals 1,616, which is greater than the critical value of 1,238 (see Appendix H for detailed calculations). Thus, we can reject null hypothesis that the average survey unit concentration exceeds the DCGLw. Further, an elevated measurement comparison is required. Per MARSSIM, an elevated measurement should not exceed the DCGLemc. This value is the product of an area factor and the DCGLw and was calculated to be 10,800,000 dpm/100cm^2. All combined static limits were below the DCGLemc.

4.7.2.4 Per MARSSIM protocols, the null hypothesis stated as "the residual activity in the survey unit exceeds the release criteria" is rejected, and the alternative hypostheis that "residual contamination meets the release criteria" is accepted. All survey units were found to meet the requirements for unrestricted release from NRC licensing, based on the survey plan and NRC requirements. It is recommended that they be so released.

4.8 SUMMARY AND RECOMMENDATIONS

4.8.1 A total of 364 surface wipe samples consisting of 146 composited room wipe samples, 114 composited drain wipe samples, 51 composited hood wipe samples, and 53 CAFS wipe samples. A total of 66 soil samples were collected (depths of 12-inches and 24-inches at each location) consisting of 19 sub-slab and 14 perimeter soil samples. One liquid sample was collected from a sump located in the basement. All samples collected from E3100 were analyzed for HD, L, GA, GB, GD, GF, VX, and VR. All wipe samples were also analyzed for arsenic compounds DM, DA, and DC; and soil samples were analyzed for agent breakdown products (ABPs) 1,4-dithiane, 1,4-thioxane, DIMP, DMMP, EA2192, EMPA, IMPA, MPA, and PMPA. In addition, samples from select rooms with a history biotoxin use or rooms with "unknown usage" were analyzed for botulinum toxin and *Bacillus anthracis* (anthrax). Anthrax is not a potential

contaminant of concern for Building E100, but analytical data were provided in ECBC's data deliverables.

4.8.2 ***There were no agent detections in any of the samples collected from Building E3100, but ABPs1,4-dithiane and 1,4-thioxane were detected in 10 samples (summarized in Table 4.1).*** All MINICAMS and DAAMS air monitoring data were non-detect. No CA or BA-related compounds were identified in containers with unknown substances in Building E3100.

4.8.3 Without recommended controls in place, the primary risk drivers for final building disposition are the confirmed presence of ABPs and the potential for chemical agent to persist in occluded spaces. Therefore, Table 4.2 reflects an overall risk assessment code of "***Moderate Risk***" without recommended controls in place. Level C PPE and real-time chemical agent air monitoring are the recommended controls for crews removing and/or decontaminating CAFS, duct work, and piping contained within slabs to reduce the probability of agent exposure to "Unlikely" thereby reducing the overall risk to "***Low***" (Table 4.2). Although the risk associated with biotoxin exposure was ranked as "***Low***" without controls in place, Level C PPE would afford added protection against exposure to phalloidin and cholera toxin. Respiratory protection for ORM hazards may still be needed depending on the sequencing of abatement and demolition.

4.8.4 Inspection and sampling was conducted to assess the presence of asbestos, lead-based paint, PCB-based paint, and ORM. Friable ACM was encountered throughout the building associated with numerous components/surfaces. Abatement of friable ACM would be required prior to release of this building to the public or demolition in accordance with the recommendations summarized in Section 3.1 of the E3100 ORM survey report (Appendix E). No abatement is anticipated for lead or PCBs in paint. Potentially regulated wastes (fluorescent bulbs, etc.) catalogued in Appendix E would need to be separated from the general waste streams prior to demolition and disposed of in accordance with (IAW) all federal, state, and local regulations.

4.8.5 All MARSSIM survey units in E3100 and E3100-2C were found to meet the requirements for unrestricted release from NRC licensing, based on the survey plan and NRC requirements. It is recommended that they be so released. The MARSSIM survey reports for E3100 and E3100-2C are pending NRC review.