FINAL

RADIOLOGICAL SCOPING SURVEY PLAN

FORT MONMOUTH
EATONTOWN, NEW JERSEY

Prepared for:

U. S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
10 S. HOWARD STREET
BALTIMORE, MARYLAND 21201

Prepared by:

CABRERA SERVICES
RADIOLOGICAL • ENVIRONMENTAL • REMEDIATION

103 E. Mount Royal Ave., Suite 2B

Baltimore, Maryland 21202

February 2008

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

08 February, 2008

Shaw Environmental Inc.
Attn: Mr. Doug Schicho
111 Howard Blvd.
Suite 110
Mount Arlington, NJ 07856

Subject: **Submittal of Final *Radiological Scoping Survey Plan for Fort Monmouth, Eatontown, New Jersey***

Dear Mr. Peck:

Cabrera Services, Inc. is pleased to provide one electronic copy of the subject final documents, including all appendices, figures, and tables for your files. These documents have been subject to CABRERA'S internal quality assurance and technical review. Additional copies are being sent to the distribution list below.

We appreciate the opportunity to support Shaw and USACE Baltimore District on this project. Please feel free to contact me at 410.332.8177 if you have any questions or concerns.

Sincerely,

CABRERA Services, Inc.

Kim A. Nelson

Kim A. Nelson, PG
Project Manager

Enclosures

cc: T. Peck, USACE - *(1 Hard copy, 1 Electronic Copy)*
W. Green, Ft. Monmouth - *(10 Hard Copies)*
J. Jackson, USAEC - *(1 Hard copy, 1 Electronic Copy)*
D. Alberth, USACHPPM - *(1 Hard Copy, 1 Electronic Copy)*
K. Wilson, BRACD - *(1 Hard copy, 1 Electronic Copy)*
J. De Back, BRACD - *(1 Hard copy, 1 Electronic Copy)*

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ACRONYMS

α	Alpha
β	Beta
Am	Americium
^{241}Am	Americium-241
ALARA	As Low As Reasonably Achievable
AMC	Army Materiel Command
ARA	Army Radiation Authorizations
BML	Byproduct Materials License
BRAC	Base Realignment and Closure
CABRERA	Cabrera Services, Inc.
C	Carbon
^{14}C	Carbon-14
^{252}Cf	Californium-252
CHP	Certified Health Physicist
CHSM	Corporate Health and Safety Manager
cm	Centimeter
Co	Cobalt
^{60}Co	Cobalt-60
COC	Chain of Custody
CQC	Contractor Quality Control
CRSM	Corporate Radiation Safety Manager
Cs	Cesium
CSM	Conceptual Site Model
^{137}Cs	Cesium-137
DCGL or DCGL$_W$	Derived Concentration Guideline Level
DoD	Department of Defense
dpm/100 cm^2	Disintegrations per Minute per 100 Square Centimeters
DQCR	Daily Quality Control Report
ECP	Environmental Condition of Property
FSS	Final Status Survey
ft	Feet
GPS	Global Positioning System
H	Hydrogen
^{3}H	Tritium
HEPA	High Efficiency Particulate Air
HSA	Historical Site Assessment
IDW	Investigation-derived waste
keV	Kilo Electron Volts
LBGR	Lower Bound of Gray Region
LTR	License Termination Rule
m	meters
m^2	Square Meters
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum Detectable Activity
MDC or MDC$_{SCAN}$	Minimum Detectable Concentration
mrem/yr	Millirem Per Year
NRC	U.S. Nuclear Regulatory Commission
pCi/g	Picocuries Per Gram
POC	Point of Contact
PPE	personal protective equipment
PM	Project Manager
Pu	Plutonium
^{239}Pu	Plutonium-239
QA	Quality Assurance

QC	Quality Control
Ra	Radium
^{226}Ra	Radium-226
RAM	Radioactive materials
RCOPC	Radionuclide Contaminant of Potential Concern
RSSP	Radiological Scoping Survey Plan
Sr	Strontium
^{90}Sr	Strontium-90
SSHSP	Site Specific Health and Safety Plan
SU	Survey Unit
Th	Thorium
^{230}Th	Thorium-230
U	Uranium
^{235}U	Uranium-235
^{238}U	Uranium-238
U.S.	United States
USACE	U. S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
Zn	Zinc
^{65}Zn	Zinc-65

1.0 PROJECT DESCRIPTION

Cabrera Services, Inc. (CABRERA) has prepared this Radiological Scoping Survey Plan (RSSP) as part of the project Phase I Historical Site Assessment and Phase II Recommendations for Environmental Condition of Property Investigation for Fort Monmouth in Eatontown, New Jersey. This document is based on CABRERA's Final Phase I Historical Site Assessment (HSA) (CABRERA, 2007a) and Final Phase II Environmental Condition of Property Investigation (CABRERA, 2007b).

This RSSP has been designed using the approach outlined in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (Nuclear Regulatory Commission [NRC], 2000) as incorporated into the Department of the Army, Army Materiel Command guidance (AMC, 2004). A Site Specific Health and Safety Plan (SSHSP) has also been generated as part of the Recommendations for Environmental Condition of Property Investigation by Shaw Environmental, Inc., which includes a Site Safety Plan for Radiological Scoping Surveys as Appendix L.

Fort Monmouth has been identified as one of the military installations slated for closure as part of Base Realignment and Closure (BRAC) 2005 (Public Law 101-510 as amended). BRAC is the process by which the nation reshapes its military installations to become more efficient and effective in supporting its forces. As part of this process, an Environmental Condition of Property assessment (ECP) must be completed for all BRAC installations. Completion of the ECP will allow the Army, through U.S. Army Corps of Engineers (USACE) and their contractor(s), to evaluate the type and locations of potential radiological hazards at the facility and the surrounding environment in support of decommissioning at Fort Monmouth. The purpose of this RSSP is to specifically address facilities and areas identified during the HSA as having current or former operations involving radioactive materials falling under NRC licenses, or under Department of the Army Radiation Authorizations (ARA).

The following NRC Licenses and ARAs are applicable to Fort Monmouth:

- NRC License held by the U.S. Army Tank-Automotive & Armaments Command at Rock Island, IL for use by all Department of Defense (DoD) installations and job sites as Byproduct Materials License (BML) 12-0072-06. This license is for radioactive materials use in armaments and artillery systems. This license expires 8/31/08.

- NRC License held by the U.S. Army Armament & Chemical Acquisition and Logistics Activity at Rock Island, IL for use by all DoD installations and job sites as BML 12-0072-13. This license is for radioactive materials use in Chemical Agent Detectors. This license expired 3/31/95 (Note: per Army representatives, all licenses have been renewed and are current as of publication date).

- NRC License held by the U.S. Army Armament & Chemical Acquisition and Logistics Activity at Rock Island, IL for use by all DoD installations and job sites as BML 12-0072-14. This license is for radioactive materials use in Chemical Agent Monitors. This license expired 3/31/98.

• NRC License held by the U.S. Army Soldier & Biological Chemical Command at Aberdeen Proving Ground MD for use by all DoD installations and job sites as BML 19-30563-01. This license is for radioactive materials use in Chemical Agent Detectors and Monitors. This license expires 10/31/10.

• NRC License held by the U.S. Army CECOM Safety Office at Fort Monmouth, NJ for use at Fort Monmouth or other temporary job sites as BML 29-01022-06. This license was for the use of byproduct radioactive materials in research and development and instrument calibrations. This license expires 5/31/2017.

• NRC License held by the U.S. Army CECOM Safety Office at Fort Monmouth, NJ for use at Building 2540A in the Charles Wood Area of Fort Monmouth as BML 29-01022-07. This license was for the use of radiological materials in research and development, for instrument calibrations, analysis of test samples, as check sources, and for the storage of radiological materials. This license expires 10/31/12.

• NRC License held by the U.S. Army CECOM Safety Office at Fort Monmouth, NJ for use at DoD installations and job sites as BML 29-01022-14. This license was for the use of radiological materials in instrument calibrations, and superseded terminated licenses 29-01022-08, 29-01022-11, SMB-1300, SNM-1327, SNM-1896, SNM-1900, and SUB-1150. This license expires 10/31/2013.

• ARA held by the U.S. Army CECOM Safety Office at Fort Monmouth, NJ for use at DoD installations and job sites as ARA 29-10-07 (formerly ARA 24-12-07). This authorization was for the use of radiological materials in lensatic compasses. The authorization expires 1/31/08.

• ARA held by the U.S. Army CECOM Safety Office at Fort Monmouth, NJ for use at DoD installations and job sites as ARA 29-10-06. This authorization was for the use of radiological materials as radioluminous paint. The authorization expired 1/31/08.

• ARA held by the U.S. Army CECOM Safety Office at Fort Monmouth, NJ for use at DoD installations and job sites as ARA 29-10-10. This authorization was for the use of radiological materials in electronic equipment. The authorization expired 1/31/08.

• ARA held by the U.S. Army CECOM Safety Office at Fort Monmouth, NJ for use at DoD installations and job sites as ARA 29-10-12. This authorization was for the use of radiological materials in Night Vision Devices. The authorization expired 1/31/08.

The Army, through the USACE and their contractor(s), will evaluate the type and locations of potential hazards at the facility and the surrounding environment in support of an overall effort to ensure that all facilities and areas at Fort Monmouth can be released for unrestricted use as part of the BRAC process. Such release will be sought from NRC as appropriate for all radioactive materials (RAM) license(s).

Due to the nature of operations at Fort Monmouth, there exists hazard potential from the presence of radioactive materials, primarily from discrete source materials.

The overall project intent is to plan, perform, and document radiological decommissioning efforts to allow release of facilities for "unrestricted release". This phase and previous phases include (1) the identification of known sources/areas of radioactive contamination; (2) identification of areas that need further action; (3) assessment of the likelihood of contaminant migration; (4) identification of areas as impacted or non-impacted; (5) identification of data gaps in impacted areas; and (6) provide information useful for designing subsequent radiological characterization surveys.

1.1 Summary of Existing Site Data

As mentioned previously, a final HSA has been prepared in support of the Environmental Condition of Property assessment based on document review, personal observation, and interviews with personnel at Fort Monmouth. The Army intends to release all facilities and areas at Fort Monmouth for unrestricted use, as part of the BRAC process and in doing so must evaluate the type and location of potential hazards prior to its release.

The HSA has reviewed available information regarding Fort Monmouth, including operating history, survey results, and potential pathways for radioactive and hazardous material release.

Radiological contaminants of potential concern (RCOPCs) were developed from research of Fort Monmouth's NRC RAM licenses and amendments and discussions with key personnel. Based on this research, the RCOPC list is shown in Table 1. It should be noted that this list represents radionuclides that were used predominantly at Fort Monmouth, but may not be all-inclusive since there were NRC licenses applicable to Fort Monmouth that permitted possession of any radionuclide with atomic number between 1 and 83. The goal of developing a RCOPC list is to determine the instrumentation needs for the scoping surveys in order to ensure that all residual contamination will be detected and properly characterized. The list of RCOPCs indicates that instrumentation must be able to detect alpha, low energy to high energy beta, and gamma radiation.

Surveys and samples will need to be collected for a complete assessment of Fort Monmouth. The expected number of survey areas, their MARSSIM classifications, and further characterization specifics are presented in the following sections of this RSSP. This radiological scoping survey is based on recommendations presented in the project HSA, and Recommendations for Phase II ECP Investigation, and includes the following:

- Perform surveys and collect volumetric samples in sealed source storage and use areas to verify the presence or absence of residual radioactive contamination.
- Sample piping, drains, and underground sumps/systems potentially affected by operations.
- Sample hoods and ventilation systems potentially affected by operations.

Although sealed sources are to be removed prior to radiological surveys, areas where these isotopes were used and stored will require evaluation to demonstrate their absence subsequent to removal.

1.2 Site History and Radiological Contaminants

1.2.1 Site History

The Site is located 12 miles west of the Atlantic Ocean and 45 miles south of New York City, just north of Eatontown in Monmouth County, New Jersey (Figure 1). Military operations began at this installation in 1917. Documents gathered from various sources were reviewed and evaluated to extract information on the possession and use of RAM. These documents included licenses, permits, authorizations, inventory records, surveys, historical drawings, and floor plans. In addition, the HSA included a visual inspection of all buildings and areas where RAM was used or stored, and interviews with individuals knowledgeable of RAM handling, storage, and disposal. The use of RAM at Fort Monmouth was historically, and is currently conducted in accordance with a number of NRC licenses and ARAs.

The presence of radioactive materials at Fort Monmouth has been predominantly limited to certain areas and functions of the installation. Historically, laboratory research and development in the areas of radio and electronics use of vacuum tubes and radium dials, and military support equipment such as night vision goggles that contain radioactive commodities, have been among the most common uses of radioactive materials. Much of the activities of the past were performed as part of the Signal Corps Laboratories, first housed in the Squier Building (Building 283) and then in the Myers Center (Building 2700). Other work was performed in the Evans Area of the base, which was closed in the late 1990s due to BRAC 1993 activities, and the work transferred to the CECOM office and laboratory in the Charles Wood Area. Presently, a research laboratory in Building 2540 in the Charles Wood Area is the only site to regularly use and store radioactive materials as part of the research and development activities performed on site. A designated storage area is set aside for drums containing material waiting for disposal, including tritium exit signs removed from Fort Monmouth buildings, smoke alarms containing RAM, and other instruments with associated check sources. These items are periodically removed to Wright Patterson Air Force Base for disposal/recycling. The administrative arm of the CECOM Safety Office is housed in the adjacent Building, 2539, where they maintain files pertaining to the use of any RAM on the installation as well as active NRC licenses and ARAs for Fort Monmouth specifically, as well as for RAM use by the Army worldwide. Throughout Fort Monmouth, equipment containing RAM is noted, particularly as used in chemical and explosives detectors operated by personnel working in security entrance areas, postal facilities, and shipping areas, and emergency responder personnel throughout the installation. Electron Capture Detectors containing Ni-63 are used in the Environmental Laboratory to analyze samples for pesticides and Polychlorinated Biphenyls (PCBs). All of this equipment involves the use of sealed sources rather than research-type materials.

Approximately 22 buildings, building complexes, and/or open areas have been identified as areas where RAM was used, stored, or potentially disposed, based on review of records and interviews as outlined herein, and 4 buildings have been classified as Impacted by RAM. The buildings or areas are discussed in Sections 1.3 and 1.4 and shown in Figure 2.

1.2.2 Radiological Contaminants

The RCOPC at Fort Monmouth are those associated with the use and storage of radioactive commodities by the Garrison and current and former tenants. In addition, radioactive calibration sources and research and development commodities used by the U.S. Army Communications and Electronics Command (CECOM) may present additional sources of radioactive material at Fort Monmouth. The following radionuclides should be considered RCOPCs based on information regarding current and former use, storage, or handling of RAM at Fort Monmouth summarized below in Table 1.

Table 1: Primary Radionuclides Used/Stored at Fort Monmouth (Potential RCOPCs)

Name	Half Life	Principal Emissions
americium-241	432 years	5.4856 MeV (alpha)
californium-25	2.64 years	6.1183 MeV (alpha)
carbon-14	5,730 years	0.1565 MeV ($beta_{max}$)
cesium-137	30.2 years	0.5116 MeV ($beta_{max}$)
chlorine-36	301,000 years	0.2512 MeV ($beta_{max}$)
cobalt-57	270.9 days	0.122 MeV (gamma)
cobalt-60	5.2 years	0.318 MeV ($beta_{max}$) 1.173 MeV (gamma) 1.332 MeV (gamma)
europium-154	8.8 years	0.5694 MeV ($beta_{max}$) 0.2474 MeV (beta) 0.1231 MeV (gamma)
hydrogen-3 (tritium)	12.3 years	18.6 MeV ($beta_{max}$)
iodine-125	60 days	0.035 MeV (gamma)
krypton-85	10.7 years	0.8407 MeV ($beta_{max}$) 0.1512 MeV (gamma)
nickel-63	100.1 years	0.0174 MeV ($beta_{max}$)
plutonium-238	87.75 years	5.499 MeV (alpha) 5.4563 MeV (alpha)
plutonium-239	24,131 years	5.1554 MeV(alpha) 5.1429 MeV(alpha) 5.1046 MeV(alpha)
promethium-147	2.62 years	0.0620 MeV ($beta_{max}$)

Name	Half Life	Principal Emissions
radium-226	1,600 years	4.601 MeV (alpha) 4.784 MeV (alpha) 0.186 MeV (gamma)
radon-222	3.8 days	5.4895 MeV (alpha)
strontium-90/yttrium-90	28.6 years	0.546 MeV ($beta_{max}$)/2.28 MeV ($beta_{max}$)
technetium-99	213,000 years	0.2936 MeV ($beta_{max}$)
thorium-232	14,050,000,000 years	4.0123 MeV (alpha) 3.9472 MeV (alpha)
uranium-238	4,468,000,000 years	4.198 MeV (alpha) 2.268 MeV ($beta_{max}$)[1]

Notes: (1) The 2.268 MeV beta shown for U-238 is actually from Protactinium-234(m), a decay daughter expected to be in equilibrium with the uranium parent.

The list of RCOPCs shown in Table 1 is based on radionuclides known to have been used or to be present at Fort Monmouth. One of the listed RCOPCs, radon-222, while associated with radium, was not used by itself in any commodity, but is potentially present in buildings due to naturally occurring levels of radium in the geologic features beneath buildings. While radon-222 is short-lived, it is continuously regenerated from naturally occurring radium in the soil. Krypton-85 has been listed as a RCOPC due to its being identified as a beta source. Krypton-85 is a noble gas that will disperse rapidly and does not produce radioactive progeny, but will present an external radiation hazard when found in intact glass ampules, as is the case at Fort Monmouth. The remaining RCOPCs are limited by soil and building concentration guidelines addressing the 10 Code of Federal Regulations (CFR) 20.1402 unrestricted release criteria.

1.3 Summary of Impacted Areas

- **Building 275** is and has historically been a communications-electronics museum. The museum contains or contained thoriated lenses (night vision lens), Kodak camera, a radium-containing component on a radio, and vacuum tube were among several museum display items that gave off readings above background level. Numerous non-specific radioactive items have since been removed.
- **Building 283** houses administrative offices and formerly housed research laboratories and signal school training classrooms. A Special Investigation Report issued in 1951 for the Squier Signal Laboratory Director discussed a wipe test performed on samples of aluminum covered with polonium lacquer (approximately 230 mCi) to ensure that no hazard was present.
- **Building 292** serves as storage space for the museum. This storage space contains or

contained a Chinese radio and a vacuum tube where radiological commodities identified with radiological readings above background levels, and radium-contaminated components found in a posted radioactive storage locker. This storage space once contained 65 items containing radioactive materials, but numerous non-specific radioactive items have since been removed.

- **Building 2540** houses space for CECOM Laboratory and Radiological testing. Inventory lists cite multiple radiological materials still in use and Radiation Protection Surveys are conducted regularly in Building 2540, specifically mentioning calibration range (room 108), radiological lab, prep lab (room 102), calibration lab, radwaste storage, excess waste storage (room 109), exposure room, irradiator room, and panoramic range (106A). Some survey results show levels elevated beyond background in certain locations. The surveys note that a Mobile Laboratory that was considered part of this building had a closeout survey completed in August 2001. Minutes from Radiological Control Committee Meetings discuss the disposal of low-level waste (drums containing tritium exit signs and smoke detectors) by shipping to Wright Patterson AFB as well as an inventory of sources, smoke detectors, instruments, etc. Radiological Work Permits were issued for the use of x-ray machines, calibrator use of cesium-137, plutonium-238, technetium-99, and cobalt-60, research and development use of cesium-137, a radium-beryllium source, californium-252, and cobalt-60, and demilitarization activities from excess storage of thorium-232, radium-226, and tritium. Materials used on site are covered under NRC licenses and R & D licenses; testing is done in a low-level environmental lab (e.g., use of high-purity germanium detector, scintillator, etc.); a radioactive material storage area is at this location; building contains an irradiator room (Room 7) with a 2000-curie cobalt-60 source (decayed) and dose rate of 500 milliRad/hour; californium-252 is used for calibration and instrument testing, along with various sealed sources. One of the laboratories has a fume hood, which has been regularly surveyed. Some work involving liquids has been done in the building (Ultima Gold Liquid Scintillation fluids). A storage room adjacent to the building (Room 109) contains unused sealed sources/devices, including Radiac meters (for training) and 10 55-gallon drums containing items such as smoke detectors and tritium compasses – activity is at mCi levels. [Items here are included under the Logistics License.] Nearby "Butler Building" is used to store Radiac equipment only, not sealed calibration sources.

1.4 Summary of Non-Impacted Areas

- **Building 116**: Warehouse/Shipping & Receiving; used by Base Contractor for Garrison Supply, contains secure radiological storage areas.
- **Building 173**: Environmental Laboratory; Electron Capture Detectors are used for environmental sample analysis in designated room.
- **Building 205**: Wackenhut/Alutiiq Security Office; three explosives detectors are stored in Room 136.
- **Building 282**: Main Post Fire Department; once used explosive detectors containing sources, have been removed.

- **Building 451**: Postal Facility; once used explosive detectors containing sources, have been removed.
- **Building 602**: High Security Fabrication & Testing; once used explosive detectors containing sources, have been removed.
- **Building 1075**: Patterson Health Clinic; used radioisotopes in thyroid treatment in late 1960's-early 1970's; may have used incinerator on the grounds that has since been demolished.
- **Building 2535**: Battery Test Facility; battery testing facility.
- **Buildings 2502-2507**: Fabrication and Integration; CERDEC fabrication and integration of materials into military vehicles.
- **Building 2539**: Communications and Electronics Command (CECOM) Safety Office; administrative area.
- **Building 2560**: Charles Wood Fire Department.
- **Building 2700**: Myers Center (Administrative); once used explosive detectors containing sources, have been removed.
- **Building 2701**: Charles Wood Entry Area; once used explosive detectors containing sources, have been removed.
- **Building 2704**: Environmental Test Facility; military environmental conditions testing facility.
- **Building 2705**: U.S. Army Communications, Engineering, Research, and Development Center (CERDEC) (formerly Army Research Laboratory [ARL]); formerly contained a Night Vision lab and had radioactive source use, currently administrative.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Responsibilities for key project personnel are as follows:

- **USACE Project Manager** – The USACE PM is responsible for the technical execution of the project objectives, including direct management of project contractors.
- **Program Manager** – The Program Manager is responsible for overall project objectives, scope, budget, and quality of submittals. He/she will ensure that adequate corporate resources are made available to the Project Manager (PM). He/she will also provide senior technical review and support. He/she will communicate directly with USACE management personnel, as necessary.
- **Project Manager** – The PM is responsible for planning, coordinating, integrating, monitoring, and managing project activities. He/she is also responsible for day-to-day management and monitoring of the project budget, schedule, and scope. He/she will work with the Quality Assurance Coordinator to ensure procedural compliance for all tasks. He/she will be the contractor's primary point of contact with USACE and the regulatory team members. He/she will work directly with the Field Operations Lead during implementation of on-site activities.
- **Field Operations Lead** – The Field Operations Lead is responsible for organization, scheduling, and implementation of field activities for the project. He/she will be in frequent communication with the PM and will be the Contractor's primary on-site point of contact for other Project Team personnel. He will be responsible for the activities of field sampling teams and subcontractors. He is responsible for preparation and submittal of the Daily Quality Control Reports (DQCR) and will work with other team members with Quality Assurance (QA) responsibility to ensure that all field activities are completed in a safe and efficient manner, in accordance with procedures as outlined in project Work Plans.
- **Corporate Health and Safety Manager** – The Corporate Health and Safety Manager (CHSM) is responsible for the development and overall implementation of the Site-Specific Safety and Health Plan (SSHP), in accordance with USACE's safety protocol. He/she is also responsible for implementing any appropriate medical monitoring programs for this project. In concert with the Corporate Radiation Safety Manager and USACE's Site Safety Officer, he/she will review field monitoring data and authorize upgrades/downgrades in personal protective equipment (PPE). He/she will also perform field safety audits during field characterization activities.
- **Corporate Radiation Safety Manager** – The Corporate Radiation Safety Manager (CRSM) is responsible for the overall implementation of the SSHP with regard to radiological issues. He/she is also responsible for the implementation of the Contractor's Radiation Protection Program. He/she will work closely with the CHSM and Site Radiation Safety Manager to ensure the adequacy and appropriateness of radiation safety measures during field activities. He/she will perform field audits during field characterization activities.
- **Project Health Physicist** – The Project Health Physicist is responsible for all radiological field activities and has authority to direct such activities, to stop and restart work if necessary, and to take appropriate actions, as required, to address radiological emergency situations. He/she will work directly with the Field Operations Lead, the CRSM, and the SRSM to ensure

that radiological survey and sampling activities and QA procedures are properly implemented and followed.

The Contractor will also provide additional personnel to conduct the field effort, including engineering and technical support staff.

3.0 SCOPE, OBJECTIVES, AND SURVEY DESIGN

3.1 Scope

This document presents the plan for the Fort Monmouth Scoping Survey activities, which are designed in accordance with AMC (2004) and MARSSIM (NRC, 2000) guidance. This survey specifically addresses the survey of four buildings (the Museum, the Museum storage facility, the Squier building, and the CECOM Laboratory). The sampling protocol and rationale will be presented in sections to follow.

The overall objective of this project is to define the nature and extent of radiological contamination and develop and document a cost-effective approach for releasing the site for unrestricted use. This objective will be reached if the following tasks are completed.

3.1.1 Radiological Scoping Survey

Direct measurements utilizing smear and static total activity of radiological materials potentially present in Fort Monmouth media will be performed. Scans surveys of the survey units will be provided. Sampling and analysis of survey unit media will provide the quantification of contaminant levels in each sample that will be used to estimate contaminant levels in a survey area. The sampling and analysis effort at Fort Monmouth shall include the following activities.

3.1.1.1 Task 1 – Mobilization

Mobilization includes survey preparation, travel to the site, any site-specific training required by the Garrison, and establishment of on-site support facilities for survey performance.

3.1.1.2 Task 2 – Survey Activities

Areas are designated as impacted based on the presence, or potential presence of contamination. In order to confirm the extent of radiological impacts to these areas, the following field tasks shall be implemented.

- Direct alpha and beta radioactivity scan surveys
- Integrated direct surface alpha and beta radioactivity measurements
- Smear sample collection and analysis
- Volumetric sampling of suspect floor drains, High Efficiency Particulate Air (HEPA) filters, and hoods and ventilation systems

3.1.2 Task 3 – Investigation-Derived Waste Management/Disposal

The Contractor will conduct packaging, removal, disposal, and general management of any Investigation Derived Waste generated during the performance of Fort Monmouth scoping survey process.

3.1.3 Task 4 – Survey Results

The survey results will be submitted in the form of a scoping/characterization report. The report will detail the amount, type, and location of radioactive contamination found during the field effort by building and survey unit.

3.2 Objectives

The U.S. Army Environmental Center (USAEC), with support from the USACE, is responsible for evaluating whether BRAC installations are suitable for release or reuse with respect to environmental conditions.

The overall objective of this Characterization Survey scope is to define the nature and extent of radiological contamination at Fort Monmouth and to develop and document a cost-effective approach for releasing the site for unrestricted use. The scoping surveys have been designed following AMC (2004) guidance for Impacted Class 3 areas and with the rigor of a MARSSIM Final Status Survey (FSS) for any Class 2 or Class 1 areas so that areas confirmed to be free of residual contamination may be released after this step.

Conversely, buildings or areas found to have residual radioactive contamination will be evaluated against the initial MARSSIM survey unit (SU) classifications assigned in the ECP recommendations to assess whether any impacted areas may require upgrade. The NRC must be notified in cases in which Class 2 or Class 1 areas are involved in accordance with AMC (2004) guidance described in section 6.e.(2).

Overall project objectives should be achieved in a four-phased effort:

Phase I – Develop HSA identifying those areas of Fort Monmouth that are impacted by residual radioactive contamination (completed).

Phase II – Conduct characterization scoping surveys including radiological sampling and analysis, hazards assessment, disposal alternatives evaluation, and cost estimates for any actions required to release the site for unrestricted use, and associated waste disposal.

Phase III – Development of any necessary remediation plan and design documents, execution of the designs, disposal of identified waste, and the transfer of radioactive material.

Phase IV – Implement the FSS for the remediated areas and prepare all necessary correspondence to have the NRC licenses and ARAs modified to remove any reference to Fort Monmouth.

3.3 Survey Design

The design of this characterization survey incorporates the methods and locations for the performance of sampling and direct measurements in order to assess the nature and extent of site contaminants of concern. Following the HSA nomenclature, the survey units for the Fort Monmouth site will be divided into building areas.

3.3.1 Conceptual Site Model

The radiological Conceptual Site Model (CSM), originally developed as part of the HSA, uses available information to provide potential contaminant pathways to support the determination of methods to assess the nature and extent of contamination, the determination of areas and media to be sampled, and the development of strategies for data collection. The Fort Monmouth CSM is presented in complete format in the project HSA (CABRERA, 2007a) and is summarized in the following sections.

Surface contamination of building materials (work surfaces, shelves, floors, walls, ceilings, hoods, ventilation systems, etc.) is considered a primary transport mechanism. A secondary mechanism shows contaminants leaching from soil or from leaky drain/sewer systems to groundwater. Contaminant pathway scenarios:

Scenario 1 - Leaks and/or spills: this possibility could result from sealed sources or storage containers that have been compromised, laboratory spill incidents, or the transfer of contamination from unsealed radiological sources/commodities.

Scenario 2 - Storage/disposal activities: materials that have been stored on the museum shelves or in the museum storage building (Buildings 275 and 292), any materials stored onsite awaiting offsite disposal, or any materials disposed of down laboratory sinks (either in Building 2540 – CECOM laboratory or in Building 283 old research facilities) could then contaminate areas apart from where they were in active use.

Building 275 Classification as MARSSIM Class 3 is appropriate for Building 275, which is the Communications-Electronics Museum, which contains various historical displays that include demilitarized artifacts. During the site observation conducted for the HSA, several displays with radioactive material were identified: the AN/PRC-10 Radio Miniaturization Display, the Vacuum Tube Development Display, the Night Vision Equipment Display, and the Combat Photography Display. The isotopes of concern associated with the artifacts in these displays are radium and thorium. Since the radioactive materials associated with these artifacts are of robust construction, spread of contamination is unlikely to occur, but contaminant pathway Scenario 2 from the CSM applies in Building 275. Sample coordinates are shown in and listed with Figure 5 following Section 10.0 of this plan.

Building 283 Classification as MARSSIM Class 3 is appropriate for Building 283, which was utilized as a laboratory with wet labs, and limited evidence was found of radio communication work that was performed in the basement of the building. Laboratory drains lines were covered over, but original janitorial sinks remain. Contaminant pathway Scenarios 1 and 2 from the CSM apply in Building 283. Sample coordinates are shown in and listed with Figure 6 following Section 10.0 of this plan.

Building 292 Classification as MARSSIM Class 3 is appropriate for Building 292, which stored museum artifacts containing radioactive materials are stored inside three locked and posted cabinets in one area of the building. A foreign radio with radioluminescent backlight components and an electron tube were found in the main storage area. The main storage area has 6-8 moveable storage shelves containing hundreds to thousands of artifacts. Additional shelf storage is present in a back area of the building. Contaminant pathway Scenario 2 from the CSM applies in Building 292. Sample coordinates are shown in and listed with Figure 7 following Section 10.0 of this plan.

Building 2540

Classification as MARSSIM Class 1 is appropriate for Building 2540, which currently houses the CECOM Laboratory and radiological testing facility. The building houses a gamma irradiator, Radiac calibrators, a storage room for low-level radioactive material with multiple radioactive sources from the demilitarization of commodities, a nuclear counting laboratory, and several health physics laboratories. Radioactive sources consist of alpha, beta, gamma, and neutron emitters. Contaminant pathway Scenarios 1 and 2 from the CSM apply in Building 2540. Sample coordinates are shown in and listed with Figures 8 through 15 following Section 10.0 of this plan.

3.4 Residual Radioactivity Screening Levels

The radionuclides potentially present at the site are numerous and varied with respect to radiation and cleanup criteria. The following tables are based on screening levels from NRC NUREG 1757, Volume 2 Tables H.1 and H.2, and NUREG/CR-5512 Volume 3 Table 5.19. The screening guideline levels and the transferable radioactivity goal for each RCOPC are presented in Table 2.

On June 21, 1997, the NRC published the final rule on "Radiological Criteria for License Termination", the License Termination Rule (LTR), as Subpart E to 10 CFR Part 20. The criteria for termination with unrestricted release is residual radioactivity, which is undistinguishable from background, and results in a total effective dose equivalent to an average member of the critical group that does not exceed 25 millirem per year (mrem/yr), including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). Determination of the levels which are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from excavation and waste disposal activities. For the release of the Fort Monmouth site, a dose objective of 25 mrem/yr above background will be applicable and is therefore used as the basis for conducting the site characterization surveys.

Supplemental information regarding the implementation of the LTR, including screening criteria for building surfaces and soil, was published by NRC in the Federal Register Volume 63, Number 222, November 18, 1998; the Federal Register Volume 64, Number 234, December 7, 1999; and also the Federal Register Volume 65, Number 114, June 13, 2000. Soil screening criteria used for RCOPCs not presented in the preceding Federal Register documents have been referenced from Table 5.19 of NUREG/CR-5512, Volume 3, October 1999, where possible.

These screening criteria will be used as guideline activity limits and to establish instrument/analysis sensitivity requirements for RCOPCs during the performance of characterization activities.

Table 2: Acceptable License Termination Screening Values for Building Surface Contamination

Agency / Reference	Beta/Gamma Total (dpm/100cm^2)	Beta/Gamma Removable (dpm/100cm^2)
USNRC NUREG 1757, Vol. 1, Table B.1 Building Surface Screening Values, NUREG/CR-5512	Am-241: 27 Cf-252: 86.8 C-14: 3.7E+06 Cs-137: 28,000 Cl-36: 500,000 Co-57: 211,000 Co-60: 7.1E+03 Eu-154: 11,500 H-3: 1.2 E+08 I-125: Not Listed[1] Kr-85: Not Listed[1] Ni-63: 1.8E+06 Pu-238: 30.6 Pu-239: 27.9 Pm-147: 343,000 Ra-226 + C[2]: 315 Rn-222: Not Listed[1] Sr/Y-90: 8,700 Tc-99: 1.3E+06 Th-232 + C[2]: 6.03 U-238: 101	Not Listed[3]

Notes:

1. Kr-85 and Rn-222 do not have an associated soil or building DCGL since they are gases that do not combine or attach to soil or building structures; these disperse rapidly in open spaces, and I-125 is too short-lived to be of concern
2. + C represents value for the radionuclide with its decay chain progeny present in equilibrium.
3. Assumes removable fraction is 10% or less of the total surface contamination.

3.5 MARSSIM Basis

MARSSIM (NRC, 2000) provides a method to determine the number of measurement locations required in a given survey unit in order to satisfy MARSSIM Final Status Survey guidance. A minimum number of measurement locations are required in each survey unit to obtain sufficient statistical confidence that the conclusions drawn from the measurements are correct. The following subsections describe the basis for and derivation of the minimum required measurement locations per survey unit.

3.5.1 Area Classification Based on Contamination Potential

Each building area will be designated as one or more survey units following MARSSIM (NRC, 2000) guidance.

Surveys performed in support of the characterization process will be designed, as possible, to also support MARSSIM final status release. Section 2.2 of MARSSIM provides the following definitions for classifying areas (herein identified as survey units):

Non-Impacted Areas: Areas that have no reasonable potential for residual contamination.

Impacted Areas: Any area not classified as non-impacted. Areas with a possibility of containing residual radioactivity in excess of natural background levels.

Class 1 Areas: Impacted areas that have, or had prior to remediation, a potential for contamination (based on site operating history) or known contamination (based on previous radiological surveys) above the Derived Concentration Guideline Level used for Non-Parametric Statistical Test ($DCGL_w$).

Class 2 Areas: Impacted areas that, prior to remediation, are not likely to have concentrations of residual radioactivity that exceed the $DCGL_w$.

Class 3 Areas: Impacted areas that have a low probability of containing residual radioactivity.

3.5.2 Number of Sample Locations for Survey Units and Reference Area

MARSSIM discusses a method to determine the number of sample locations required in a given SU. A minimum number of sample locations are required in the SU to obtain sufficient statistical confidence that the conclusions drawn from the measurements are correct. For the purpose of this characterization survey, the minimum required number of measurements is based on expected radionuclide concentrations near or at background in site areas that may be suitable for release for unrestricted use. The following sections describe the basis for and derivation of the minimum required measurement locations per SU.

3.5.3 Estimation of Relative Shift

The minimum number of measurement locations required is dependent on the distribution of site residual radionuclide concentrations relative to the Derived Concentration Guideline Level (DCGLw) and acceptable decision error limits (α and β).

The relative shift describes the relationship of site residual radionuclide concentrations to the DCGLw and is calculated using the guidance found in Section 5.5.2.3 of MARSSIM (NRC, 2000). The relative shift is calculated as follows:

$$\Delta/_{\sigma} = \frac{DCGL_w - LBGR}{\sigma}$$

Where: $DCGL_w$ = Derived Concentration Guideline Level

LBGR = concentration at the Lower Bound of the Gray Region (LBGR). The LBGR is the concentration at which the survey unit has an acceptable probability of passing the statistical tests.

σ = an estimate of the standard deviation of the concentration of residual radioactivity in the survey unit (which includes real spatial variability in the concentration as well as the precision of the measurement system).

DCGLs have not been developed for this RSSP since this is a field measurement and characterization of the site land areas and structures. The application of NUREG-1757 screening values would be appropriate at the time of final release surveys.

The sigma associated with the concentration of any residual radioactivity in the survey units is estimated to be low since the SUs have been set up to assure relatively homogenous concentrations based on geometry at the site. In addition, the sigma is expected to be small due to the use of precise laboratory measurement methods for volumetric and smear samples. Sigma is expected to be approximately 0.15.

Utilizing a screening level as a measure of the DCGL and setting the LBGR equal to ½ of the screening level for radioisotopes of concern and using a sigma of 0.15, a relative shift of

$$\Delta/_{\sigma} = \frac{DCGL_w - LBGR}{\sigma}$$

Or, substituting values

$$\Delta/_{\sigma} = \frac{1.0 - 0.5}{0.15} = 3.3$$

Using the parameters discussed above, the relative shift is calculated to be 3.3, or, conservatively, rounded to 3.

3.5.4 Determination of Number of Required Sample Locations

Many of the RCOPCs are not naturally present in the environment or are present in quantities considered to be insignificant. Therefore the one-sample statistical test, sign test, may be used for all soil and structure SUs. The number of suggested measurement locations per SU is 14 per MARSSIM (NRC, 2000, Table 5.5) given a relative shift of 3 and an error rate for both Type I and Type II errors of five percent (i.e., $\alpha = \beta = 0.05$). The actual number of systematic measurements to be performed in each land area and structure SU is 14. To be consistent with the number of samples taken in Class 3 areas as described by AMC guidance (AMC, 2004) the number of systematic measurements taken will be increased to 30. This will allow for needed flexibility should some of the isotopes to be analyzed fall into a "difficult to determine" category. The 30 measurements will allow for a delta /sigma of as low as 1.0 and a sigma of as much as 0.5.

3.5.5 Integrated Measurement Locations

Measurement locations in Class 1 survey units will be established using a random start point in a systematic triangular grid. The grid spacing for Class 1 survey units will be determined, based on the measured area of the survey unit, using the following equation (Equation 5-7 from MARSSIM).

$$L = \sqrt{\frac{\mathrm{A}}{0.866\,\mathrm{N}}}$$

Where:	L	=	grid spacing for survey unit
	A	=	area of survey unit
	N	=	number of measurement locations

A computer-aided drawing program will be used to lay a triangular grid with proper length spacing over the SU. A random start point for the grid will be established using a computer-generated random coordinate set. The number of sample locations corresponding to the random grid will be determined using CAD.

3.5.6 Bias Sample Measurements

At least one bias sample will be collected in each SU at the location of the maximum scan result. If areas of elevated radioactivity are identified during the GWS, additional bias samples will be collected to facilitate evaluation of elevated area radionuclide concentrations.

4.0 FIELD ACTIVITIES

Scoping activities will be performed within the Fort Monmouth areas presented in Section 3.3.1.

4.1 Radiological Samples and Measurements

The scoping survey to be performed at Fort Monmouth is designed in accordance with AMC guidance (AMC, 2004) for Class 3 areas and in accordance with final status survey guidance as described in MARSSIM (NRC, 2000). Planned activities performed in support of the Class 1 radiological scoping survey include the following:

- Perform systematic and bias direct alpha and beta radiation integrated measurements on structure floor and wall surfaces
- Perform direct alpha and beta radiation scan surveys on structure surfaces and bias locations
- Collection and analysis of transferable contamination "smear" samples
- Collection and analysis of volumetric samples from suspect HEPA filters
- Collection and analysis of volumetric samples from janitor closet and laboratory sink "J" traps

Using MARSSIM (NRC, 2000) guidance, structures at Fort Monmouth will be divided into Class 1 or Class 2 SUs, based on the preliminary MARSSIM classification identified during the HSA. The SU classifications are based on the building/structure room area and the potential for elevated activity from sources and equipment. For structures, MARSSIM (NRC, 2000) suggests that Class 1 SUs be not more than 100 m^2 in size, be scanned at a 100% coverage rate, and have systematic and bias sampling performed on the area. MARSSIM Class 2 structure SUs should be not more than 1,000 m^2 in size, be scanned at a rate of 10% to 100% (10 to 50% for floors and walls) and have systematic and judgmental (bias) sampling performed on the area.

Integrated alpha and beta activity measurements will be performed and smears will be collected. Smear samples will be collected at each measurement location and analyzed on-site using a Ludlum 2929, or equivalent smear counter.

General area dose rates will also be performed at each integrated measurement location, using a Bicron Microrem meter, or equivalent detector.

For the purposes of this RSSP, Class 1 structure SUs will have a 100% alpha and beta activity scan of floors and walls up to a height of 6 feet (2 m), and 30 smears taken within the SU. Class 2 structure SUs will have a 100% scan performed on floors, and 30 smears taken per the SU. Class 3 structure SUs will have scan surveys performed at a rate of 5% of the total surface area and 30 random smears taken per area, in accordance with AMC guidance.

Sample locations and coordinates are included in figures tab following Section 10.0 of this plan.

4.1.1 Building 275 - Museum

Building 275 is the Communications-Electronics Museum, which contains various historical displays that include demilitarized artifacts. The HSA indicates a MARSSIM Class 3 classification for this building is appropriate. The display case shelves will be scanned at a rate of 5% of the surface area for residual contamination, with specific regard to storage areas for radioactive commodities. At least one smear will be taken inside the display cases of: AN/PRC-10 Radio Miniaturization Display, Vacuum Tube Development Display, Night Vision Equipment Display, and the Combat Photography Display. Thirty random smears and 30 static measurements will be taken in the listed SU areas in the building.

The following areas in Building 275 will be considered a Class 3 SU. Figure 5 presents the general layout of Building 275 SU.

<u>Building 275 Class 3 Survey Unit includes :</u>

- AN/PRC-10 Radio Miniaturization Display Case
- Vacuum Tube Development Display Case
- Night Vision Equipment Display
- Combat Photography Display
- All other display cases

4.1.2 Building 283 – Squier Hall

Building 283 was utilized as a laboratory with wet labs, and it has been classified as MARSSIM Class 3 during the HSA. Evidence was found of radio communication work performed in the basement of the building. Laboratory drain lines were covered over, but original janitorial sinks remain. A bias floor scan will be conducted of 5% of the total floor areas of the former wet lab rooms, the basement area where radio communications repair supplies were stored and equipment repair took place, and the floors in janitor closets containing sinks (the scan will cover an area of no greater than 1,000 square meters). As part of MARSSIM-type sampling, the janitorial sink traps and the covered over floor drains will be sampled. . Thirty random smears and 30 static measurements will be taken in the listed SU areas in the building.

The following areas in Building 283 will be considered a Class 3 SU. Figure 6 presents the general layout of Building 283 SU.

<u>Building 283 Class 3 Survey Unit includes:</u>

- Former wet lab rooms
- Basement area where radio communications repair supplies were stored and equipment repair took place
- Floors in janitor closets that contain sinks

<u>Janitor's Closet Sinks:</u> One sludge sample will be collected from drains within each of the janitor's closet sinks and submitted for laboratory analysis. If a sample is not available, then a smear will be collected from the pipe interior. Water present in the trap may be discarded as uncontaminated. Sample will be submitted to offsite laboratory for radiological analysis.

<u>Covered Floor Drains in Former Wet Labs:</u> One sludge sample will be collected from each

covered drain located in the former wet lab rooms and submitted for laboratory analysis. If a sample is not available, then a smear will be collected from the pipe interior. Water present in the trap may be discarded as uncontaminated. Sample will be submitted to offsite laboratory for radiological analysis.

4.1.3 Building 292 - Museum Storage

Building 292 is the Museum storage facility, where museum artifacts containing radioactive materials are stored. The HSA found a MARSSIM Class 3 classification for this building to be appropriate. Artifacts containing radioactive materials are stored in one area of the building inside three locked cabinets, with radioactive material posting. A foreign radio with radioluminescent backlight components and an electron tube were also found in the main storage area. The main storage area has 6-8 moveable storage shelves containing hundreds to thousands of artifacts. Additional shelf storage is present in a back area of the building. The fixed storage cabinets do not need further surveying, based on the results of previous surveys. The display case shelves will be scanned at a rate of 5% of the surface area for residual contamination, with specific regard to storage areas for radioactive commodities. A bias floor scan will also be conducted in random locations of 5% of the total floor areas around the posted cabinets, the moveable storage shelves, and the back area storage shelves (the scan will cover an area of no greater than 1,000 square meters). Thirty random smears and 30 static measurements will be taken in the listed SU areas in the building.

The following areas in Building 292 will be considered a Class 3 SU. Figure 7 presents the general layout of Building 292 SU.

Building 292 Class 3 Survey Unit includes:

- Shelves in the Three Posted Cabinets
- Movable Storage Shelves
- Back Area Storage Shelves
- Floors of Storage Areas

4.1.4 Building 2540 – CECOM Laboratory

Building 2540 currently houses the CECOM Laboratory and radiological testing facility. The building houses a gamma irradiator and several Radiac calibrators, and contains a low-level storage room with multiple radioactive sources from the demilitarization of commodities, a nuclear counting laboratory, and several health physics laboratories. Radioactive sources consist of alpha, beta, gamma, and neutron emitters. The facility is classified as MARSSIM Class 1. Bias scan surveys will be conducted of 100% of the laboratories, testing facilities, and radioactive commodities storage areas. Scan surveys will also be conducted in surrounding the areas where radioactive commodities have been present to ascertain that there is no loss of radioactive material from the immediate area.

The following areas in Building 2540 will be considered Class 1. Figures 8 through 15 present the general layout of Building 2540 SUs.

Building 2540 Class 1 Survey Units include:

- Laboratory Rooms
- Testing Facilities
- Radioactive Commodity Storage Areas
- Pad area Surrounding Radioactive Commodity Storage Areas

These SU will have 100% alpha and beta activity scan of floors and walls up to a height of 6 feet (2 m). Ventilation ducts, HEPA filters and drains present in these areas will require examination, smear and static measurements on entrance points from the Class 1 SU to these building features. Should measurements show unacceptable levels, then further investigation and sampling of these areas will be necessary.

5.0 SAMPLING APPARATUS AND FIELD INSTRUMENTATION

The purpose of this section is to describe survey instruments and methodologies that will be used for surveys implemented during site radiological investigations. Specific measurement/sampling frequencies and approaches are discussed in Section 4.

For enclosed and unenclosed structures, scanning and integrated direct measurements and surface smears will be performed to measure surface radioactivity concentrations of site RCOPCs. These measurements will be based on alpha or beta emissions, depending upon the RCOPC of interest. Smears will be measured on-site, and then composited, as appropriate, prior to submittal to an accredited laboratory for additional radiological analyses.

5.1 Direct Radiation Measurements

Site surfaces will be measured for alpha and beta activity using surface scan and integrated measurement techniques. Surveys will be performed in accordance with Contractor Standard Operating Procedures.

Alpha and beta activity scan and integrated measurements on floors, and lower walls as possible, will be performed using a Ludlum Model 43-37 floor monitor (active area of 582 cm^2), or equivalent detector. In certain instances where accessibility may be an issue, such as stairwells, the floor monitor may be replaced with a Ludlum 43-68 (active area of 126 cm^2) handheld alpha/beta gas proportional detector, or equivalent detector. Both the 43-37 and 43-68 detectors will be coupled to a Ludlum 2360 Alpha-Beta Data Logger, or equivalent data logger. The 43-37 and the 43-68 will be calibrated to measure both alpha and beta surface activity (i.e., dual channel analysis). These detectors are not sensitive to relatively low-energy alpha/beta activity due to the presence of their Mylar® entrance windows. Beta emitters with maximum energies less than approximately 40 kilo electron volts (keV) will not be detected. Should lower energy beta emitters such as tritium be expected to have been present in quantities significant to review more carefully, then a Ludlum 44-110 windowless gas proportional counter or equivalent will be utilized.

Differential Global Positioning System (GPS) [for outside areas] and a Total Station® robotic spatial locating system (for inside buildings and possibly for some outside areas) will be used to locate survey/sample points and also to perform scan surveys. GPS is accurate to less than 1 meter, but must have line of sight between the measurement location and at least four satellites in the NAVSTAR constellation, which is deployed and maintained by the DoD. The Total Station® is positioned in the field using a known benchmark or monument. Once located, the Total Station® requires one known position to convert its relative position into a desired coordinate system and therefore can provide precise distance and positioning correlation of radiation scanning equipment used on floors, walls and overhead areas.

Appendix A contains Radionuclide Minimum Detectable Activity (MDA) calculations and related information.

5.1.1 Structure Surface Scans

Structure surfaces will be surveyed for alpha/beta activity using surface scan measurement techniques. Surface scan measurements will be accomplished using the Ludlum 43-37 and 43-68 detectors coupled with a Ludlum 2360 data logger. Scans will be performed at coverages as presented in Section 3.3. The purpose of the scans is to identify elevated surface radiological activity and additional bias sampling, as required. These surveys will provide position-correlated gross count rate data form SU surfaces in the subject buildings.

In grids where less than 100% scan surveys are required, surveys should be performed by scanning only across the applicable number of survey passes. For example, following 50% scan survey requirements, the surveyor will only scan half of the total number of passes required to cover 100% of each grid. Scans may be performed using an alternate approach, but only with the consent of the contractor field supervisor.

5.1.2 Integrated Surface Radioactivity Measurements

For integrated measurements, an instrument is held in a stationary position for a set period of time to obtain either (1) a general area dose rate or (2) an integrated measurement at a systematic or biased location.

5.1.2.1 Integrated Measurements

Integrated measurements will be performed at systematic and biased locations. The Ludlum 43-68 or 43-37 probe with a Ludlum 2360 data logger for alpha and beta activity will be used for taking integrated measurements. The 2360 data logger allows for recording of both alpha and beta channels simultaneously at a 1-second interval allowing for a high density of data points. Alpha and beta measurement results will be recorded separately.

One background measurement will also be performed and recorded for each detector for each different type of surface material being surveyed (e.g., concrete, asphalt, wood) and in each separate survey area (i.e., as general background activity changes from area to area). The background measurement will be performed by placing a piece of wood (approximately ½" to 1" thick) over the detector and holding the detector against the surface to be surveyed. This result will be recorded and subtracted from the integrated measurement results. The primary purpose of the background measurements is to correct the instrument for ambient gamma dose that can result in additional beta counts. Alpha background will also be recorded so that it may be subtracted from integrated measurement results, if appropriate.

Integrated measurement background and surface measurement times for this characterization survey will be as follows.

Note that alpha and beta results will be collected at each measurement location, however the count time should be based on whether scan is specifically intended for alpha or beta activity measurements.

Count times for integrated alpha/beta measurements are as follows:

- Alpha limiting integrated count times using the 43-68 will be 1 minutes
- Alpha limiting background count times using the 43-68 will be 5 minutes
- Beta limiting integrated count times using the 43-68 will be 1 minute
- Beta limiting background count times using the 43-68 will be 1 minute

- Alpha limiting integrated count times using the 43-37 will be 1 minutes
- Alpha limiting background count times using the 43-37 will be 5 minutes
- Beta limiting integrated count times using the 43-37 will be 1 minute
- Beta limiting background count times using the 43-37 will be 1 minute

After completion of all systematic integrated measurements, additional bias measurement locations may be required. Bias measurements of surface alpha and beta radioactivity may be performed at the following locations:

- Cracks in floors or walls,
- Corners of floors and walls,
- Openings in floors or walls such as drains and ducts,
- Horizontal structures with surfaces where airborne contamination may have settled (e.g., building joists, etc.), and
- Additional areas where contamination would be expected to accumulate.

Integrated measurements will be performed by following procedures for operation of contamination survey meters, alpha-beta counting instrumentation, and the use of radiation instrumentation alpha/beta counting and smear worksheet templates.

The net count rate will be determined as the difference between the measurement count rate and the daily background count rate measured prior to use.

Surface measurements of the interior surface of the underground conduit running between the two buildings will be performed using a gas proportional pipe probe detector, or equivalent detector. Detectors of this type are not sensitive to relatively low-energy beta activity due to the presence of the Mylar® entrance window.

5.2 Smear Sample Collection and Analysis

Smear samples will be collected at locations, as appropriate, to quantify transferable surface alpha and beta radioactivity. Smear samples will be collected over approximately 100 cm^2. Smear samples will be analyzed for alpha and beta radioactivity using a Ludlum 2929 alpha/beta scintillation counter or equivalent in accordance with Contractor's Standard Operating Procedure for Alpha-Beta Counting Instrumentation.

6.0 SAMPLE CHAIN OF CUSTODY/DOCUMENTATION

6.1 Field Log

Project data will be recorded in a field data logbook (or other equivalent method of data record) and subsequently transferred to an electronic format. Field data logbook records shall be sufficient to allow data transactions to be reconstructed after the project is completed. The PM or designee, is responsible to ensure logbook(s) entries are completed appropriately. The designee will review the Project Logbook at least weekly and will report significant issues to the PM.

Each survey team will maintain a logbook to document their field activities. The following information, at a minimum, will be recorded:

- Instrument (e.g., meter/detector) serial numbers
- Names of field survey personnel
- Identification of area surveyed
- Description of large obstacles or geographic features that limit accessibility to the areas to be surveyed
- Notes regarding equipment performance (e.g., loss of satellite signal, technical malfunction, etc.)
- Notes regarding any issue related to the survey and requiring documentation

Field data logbooks will be permanently bound and the pages will be numbered. Pages may not be removed from logbooks under any circumstances. All entries are to be made in blue or black ink. Entries shall be legible, factual, detailed, and complete and shall be signed and dated by the individual(s) making the entries. If a mistake is made, the error shall be denoted by placing a single line through the erroneous entry and initialing the deletion. Under no circumstances shall any previously entered information be completely obliterated. Use of whiteout in data logbooks is not permitted for any reason.

6.1.1 Project Logbook

All significant events which occur during this Scoping Survey will be documented and retained for future reference. While many types of project events have specific forms on which they are documented, many events occur on a routine basis during survey field activities that must be documented as they occur. Additionally, project data transactions must also be recorded as they occur. To provide a practical means of capturing this information, a project logbook will be initiated upon project commencement.

Significant project events, including data transactions involving project electronic data, shall be recorded in the Project Logbook. Data transactions are defined as any transfer, download, export, copy, differential correction, sort, or other manipulation performed on project electronic data. Project Logbook records shall be sufficient to allow data transactions to be reconstructed after the project is completed.

The Field Operations Lead shall be responsible for maintaining the Project Logbook and will review the Project Logbook at least daily to report significant issues.

The Project Logbook is considered a legal record and will be permanently bound and the pages will be pre-numbered. Pages may not be removed from the logbook under any circumstances. Entries shall be legible, factual, detailed, and complete and shall be signed and dated by the individual(s) making the entries. If a mistake is made, the individual making the entry shall place a single line through the erroneous entry and shall initial and date the deletion. Under no circumstances shall any previously entered information be completely obliterated. Use of whiteout in the Project Logbook is not permitted for any reason. Only one Project Logbook will be maintained. If a Project Logbook is completely filled, another volume shall be initiated. In this case, each volume shall be sequentially numbered.

6.1.2 Project Electronic Data

Much of this survey will rely on data collected and stored electronically. Electronic data is subject to damage and/or loss if not properly protected. As such, all project electronic data shall be downloaded from its collection device (e.g., laptop computers, data loggers, etc.) on at least a daily basis. At the conclusion of each day's survey activities, the Field Supervisor shall back up all electronic data collected that day to appropriate removable media (e.g., CD or equivalent) and shall ensure the backup is removed from site. Under no circumstances shall the backup be stored in the same building in which the original project electronic data is stored.

Data files shall be named according to a naming protocol designated by the Field Site Manager. No variations from this protocol shall occur without the prior concurrence of the field supervisor. During data download and transfer transactions, the applicable data file name(s) shall be included in project data logbook entries.

6.2 Photographs

The Contractor should not plan to take photographs at the Site due to Army restrictions. The Contractor may, as necessary, work through USACE or designated point of contact (POC) at the Installation to have photographs taken of specific items on-site. Photographs may also be taken off-site. If photographs are taken, a photograph log-sheet will be used to manage photo numbers and locations. The photographic log-sheet will include the following items:

- Date
- Time
- Photographer
- Name of site
- General direction faced and description of the subject and area
- Sequential number of the photograph

6.3 Sample Documentation

This section describes procedures for maintaining sample control through proper sample documentation. When samples are collected for radiological analysis, documentation such as sample labels, daily DQCRs, chain-of-custody (COC) forms, and field logbooks will be completed. The information presented in this section enables the maintenance of sample integrity from the time of the sample collection through transport to the laboratory.

The following sections outline the standard practices and procedures to be used when documenting a sampling event. All documentation will be completed with indelible ink.

6.3.1 Sample Labels and/or Tags

Sample labels will include the following items:

- Client name
- Project name
- Sample location
- Date/time
- Sample collector
- Sample identification
- Preservation
- Analyses requested

The sample labels and COC will be generated using an electronic database management system to more accurately and precisely manage the sample identification numbers, labeling, and chain-of-custody.

6.3.2 Sample Field Sheets and/or Logbook

The on-site Field Site Manager will keep a project field logbook. The field logbook will be bound and have numbered, water-resistant pages. The site name and project name and number will be recorded on the inside front cover of the field logbook. All pertinent information regarding the site and sampling procedures will be documented as near to real-time as possible in military time. At the conclusion of each day, the person maintaining the field logbook will sign and date the day's documentation entries. Notations in the field logbook will be made in logbook fashion, noting the time and date of all entries. No blank pages or blank portions of pages will be permitted. If a page is not completely filled in, a line will be drawn through the blank portion and initialed by the person keeping the log. Information recorded on other project documentation (boring logs, well installation/development logs) will not be repeated in the field logbook, except in summary form to avoid transcription errors. The field logbook will be kept in the Field Site Manager's possession or in a secure place during fieldwork. Field team members will also have there own logbooks for entry during the duration of the project.

6.3.3 Chain of Custody Records

A chain-of-custody form will be completed and will accompany the samples. Detailed sample CoC procedures to be followed will be provided in the Laboratory QA plan. The following information will be provided on the chain-of-custody:

- Site name
- Laboratory name and contact.
- Turnaround time-only if site-specific conditions require non-standard turnaround time).
- Sample ID, matrix, sample date, and collection time.
- Parameters, analytical methods, bottle type, bottle volume, sample type, and preservative.
- Signed release on bottom of chain-of-custody.

6.3.4 Receipt for Sample Forms

The analytical services laboratories will analyze the condition of the samples upon receipt. This information will be recorded on a form. The form will include the date, client's name, cooler number, temperature of samples, etc. The laboratory sample custodian or manager will sign and date the form. The form will be returned to the PM via facsimile or email within 24 hours of receiving the samples.

6.4 Field Records

Field analytical records will include the following field data forms for recording the results/measurements and QA/QC checks for field surveys:

- Calibration curves as appropriate
- Radiological screening instruments QC checks
- Instrument calibrations

6.5 Corrections to Documentation

Corrections to documentation will consist of placing a single line through an incorrect entry, noting corrected information, and initializing and dating the changes.

7.0 SAMPLE PACKAGING AND SHIPPING

Procedures to be followed for sample volumes, containers, preservatives, and holding times will be specified in the Contract Laboratory's QA plan.

7.1 Sample Handling

The Field Operations Lead shall arrange for delivery of all coolers, labels, and sample containers prior to conducting field activities. Sample containers will be labeled using preprinted labels. The labels will include the project name and number, unique sample ID, sample date and time of collection, sample procedure (i.e., composite, grab), preservative used, analysis requested, and sampler's initials.

7.2 Sample Transport

Sample labels, field notebook information, and chain-of-custody forms are checked for accuracy in sample identification and to verify that all the required information has been supplied. As soon as the sampling team is ready to transport samples from the field to the laboratory, the laboratory point-of-contact shall be notified by telephone of the shipment, along with the estimated time of arrival.

Samples will be shipped to the laboratory via overnight carrier, or, if possible, the laboratory may arrange for sample pickup at the site. The Field Operations Lead will coordinate the transport of samples.

7.3 Sample Shipping Procedures

The field personnel will notify the laboratory 24 to 48 hours in advance of sample shipment so that the laboratory personnel will be alerted for receipt of sample shipment. If necessary, special arrangements will be made for sample receipt outside of normal business hours. Field logbooks will contain the laboratory point-of-contact, telephone number, and address. Shipments containing radioactive materials must be prepared in compliance with 49 CFR 172, Subpart H, and should be prepared by individuals who are trained and authorized to ship RAM.

8.0 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) is expected to be minimal as a result of this investigation. IDW will be generated from the use of PPE, disposable sampling equipment, and possibly from decontamination fluids during field investigation activities. IDW will be containerized and staged at the site until characterization results are received from the laboratory and the final disposition of the waste is determined. IDW will be stored in Type 7A steel drums placed on pallets (or other standard and appropriate containers). The containers will be labeled with the type and volume of the contents, date, and contact information. Depending on the constituents of concern, fencing or other special marking may be required. The containers will be inspected on a routine basis to ensure that they are properly sealed and intact, and that markings remain clearly visible. Temporary storage of this IDW will be coordinated with appropriate personnel at Ft. Monmouth in accordance with all installation, Army, and State guidelines.

IDW that has not come in contact with significant contamination such as paper towels, and packaging will be collected on an as-needed basis to maintain the site in a clean and orderly manner. This waste will be containerized and transported to a designated collection bin. Acceptable containers will be sealed boxes or plastic garbage bags.

9.0 CONTRACTOR QUALITY CONTROL (CQC)

Contractor Quality Control (CQC) three-Phase Inspection procedures will be implemented to ensure that a QC program is in place that ensures that sampling and analytical activities and the resulting chemical and radiological parameter measurement data comply with the DQOs and the requirements of this RSSP. This QC program will be maintained throughout all field and laboratory work by means of a three-phase control process. The CQC process encompasses review of project activities by an assigned QA officer (Field) at three distinct phases (preparatory, initial, and follow-up). The Field Operations Lead can summarize this process within the DQCRs. The frequency of implementation is specified by each definable feature of work. A definable feature of work is a task that is separate and distinct from other tasks and has separate control requirements. For this project the following activities are definable features of work:

- Sample location survey and clearance
- Radiological Surveys
- Building material sampling
- Soil/sediment/surface water/vegetation/groundwater sampling

In addition, the QC process ensures that minimum data reporting requirements are achieved and are implemented according to project requirements.

The preparatory phase consists of an inspection by the Field Site Manager prior to the beginning of any definable feature of work. This inspection includes a review of all work requirements, a physical examination of all required materials and equipment, an examination of work areas, and a demonstration of all field activities. The field team will be instructed on the overall field program and be instructed to read this document and the Site Specific Health and Safety Plan. As new sampling or technical personnel arrive on-site during the work effort, they will also be instructed to read these plans prior to beginning site tasks.

A checklist of required on-site materials will be used during the preparatory phase of the inspection. The checklist should be modified as appropriate to accommodate site conditions.

9.1.1 Preparatory Meeting/Inspection

The Field Operations Lead will review all pertinent sections of the applicable plans and specifications during the preparatory meeting in order to ensure that all field personnel are cognizant of the overall project DQOs as well as any specific sampling and analysis requirements.

Instruments will be calibrated during the preparatory meeting using certified standards or gases, etc. Frequency and contents of data reporting requirements should be discussed.

The sampling team should demonstrate in detail how each type of sample will be collected, using the intended sample containers, sampling equipment, decontamination, and sample handling procedures.

Equipment decontamination procedures will be demonstrated in detail using the proper decontamination solutions in accordance with this RSSP.

The sample numbering system, sample labeling, and sample shipment documentation requirements will be fully discussed with the sampling team. A full set of sample custody forms will be completed for use as a guide during sampling activities. The laboratory addresses and phone numbers will be available and recorded on the forms. Analytical test methods and sample preservation requirements will be fully discussed and recorded on the form. Laboratory turnaround times shall be established and documented.

9.1.2 Initial Phase Inspection

The initial Phase Inspection shall be performed when sampling is first initiated for each definable feature of work as listed in Section 4.0. The Field Operations Lead shall oversee sampling activities and review the work for compliance with the contract requirements. Initial calibration and ongoing calibration will be observed, verified, and documented.

Field notes shall include the following items:

- Date/time of sampling
- Sampler's signature
- Field screening data (calibration, sample, QC)
- Brief description of sample
- Sample location numbers and reference to sampling maps and appropriate documentation sheets

Individual sample labels and chains-of-custody will be inspected for accuracy, completeness, and consistency. The packaging and shipping of samples will be inspected for compliance with applicable requirements.

9.1.3 Follow-up Phase Inspection

The follow-up Phase inspection is required on an as-needed basis to ensure continued compliance with contract requirements. General procedures and documentation will be periodically checked to ensure they are complete, accurate, and consistently executed throughout the duration of the project. Inspections will also include a review of any field data and daily calibration log of instruments being used.

9.2 Daily Quality Control Reports (DQCR)

During the field investigation, a DQCR will be prepared. These DQCRs will be entered in an electronic format so that they can be transferred through email more efficiently to the USACE PM and project personnel. The original paper copy will be dated and signed by the Field Operations Lead. Copies of the DQCRs will be given to an on-site USACE representative and sent to the USACE PM on a weekly basis.

DQCRs will serve to document the daily activities occurring on the project. The weather for each day and any additional environmental conditions or observations pertinent to field activities will be documented. The level of PPE worn at the site for that day will be recorded. A list of team members present and their role on the project as well as visitors to the immediate investigation area will be included. Any meetings or briefings will be summarized. Significant issues that may require coordination with USACE will be discussed. Work completed for the day and project will be discussed. Any changes or delays in the project will also be discussed, along with any safety issues that may arise.

9.3 Corrective Actions

Nonconformance and the subsequent corrective actions allow for the resolution of problems within the project. Any member of the project team may identify nonconformance items. The important step is identifying the nonconformance item and initiating the corrective action procedures that will bring the nonconformance item into the project, and DQO conformance requirements.

The first step is identifying the problem. The next step is to notify the appropriate project team member in the chain of command. For example, for field activities the Field Operations Lead or QAC should be contacted immediately. If the Field Operations Lead is able to correct the problem, and the documentation has been completed and the proper procedures have been put in place to prevent a similar problem in the future, the notification of additional project team members is not necessary. However, if the Field Operations Lead cannot resolve the problem, the Field Site Manager would contact the PM. The PM and Field Operations Lead, will discuss alternatives to correcting the noncompliance item or notify the USACE representatives and other team members to help identify the corrective action. The problem and corrective action will be documented and included in the DQCR, which will be submitted to the appropriate USACE representatives. Team members will also be informed of the problem and the corrective actions. These steps will serve to prevent similar problems in future activities.

10.0 REFERENCES

(AMC, 2004) Army Materiel Command, "*Guidance on Radiological Decommissioning Survey for Areas where U.S. Nuclear Regulatory Commission Licensed Commodities Were Used*", AMCPE-SG-G (11-9h), April 2004.

(CABRERA, 2007a) "*Historical Site Assessment and Addendum to Environmental Condition of Property Report, Fort Monmouth, Eatontown, New Jersey*", January 2007.

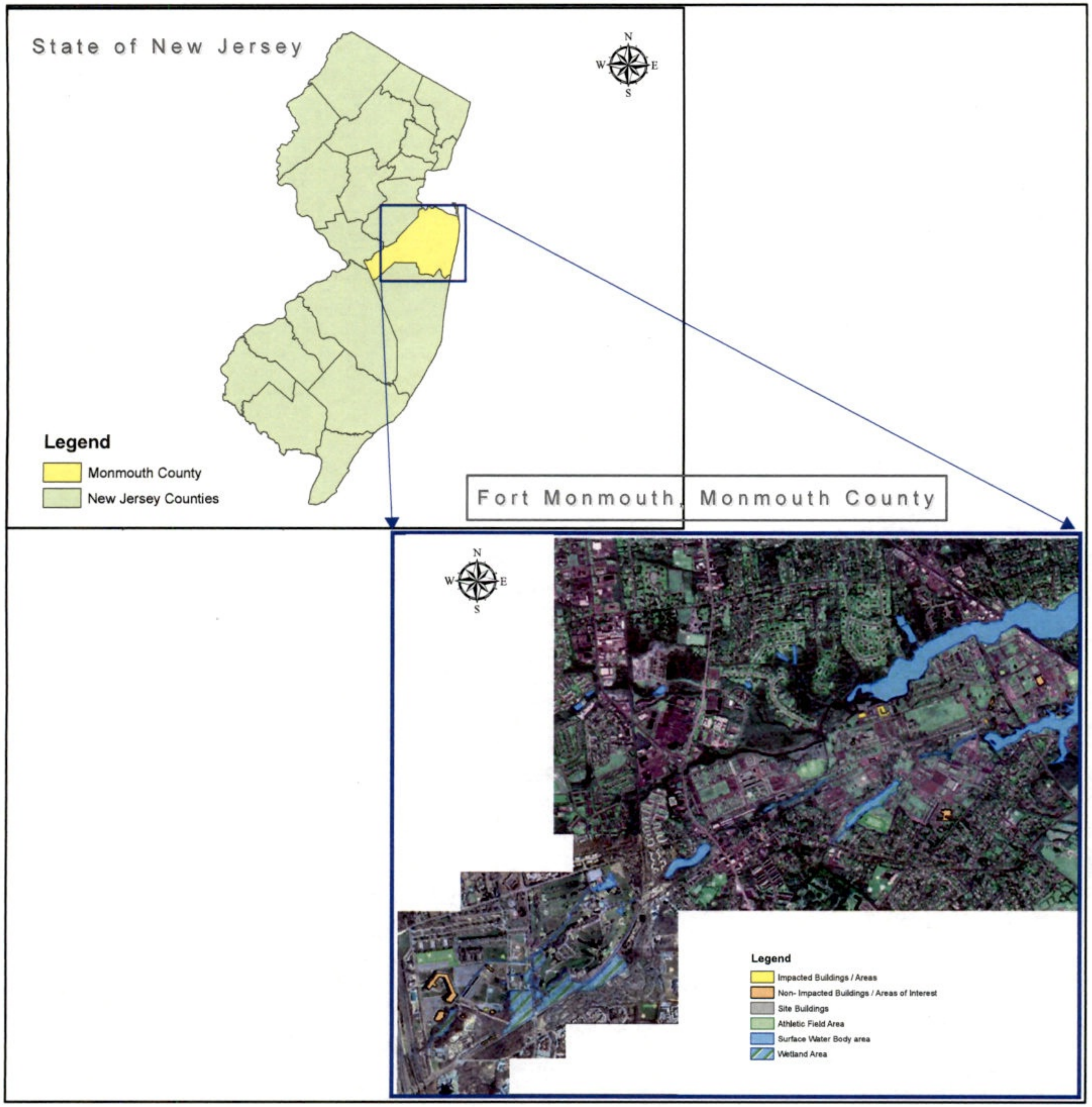
(CABRERA, 2007b) "*Recommendations for Phase II Environmental Condition of Property Investigation, Fort Monmouth, Eatontown, New Jersey*".

(CABRERA, 2007c) "*Site Safety Plan for Radiological Scoping Surveys, Fort Monmouth, Eatontown, New Jersey, Georgia*" April 2007.

(NRC, 2000) NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM), U.S. Nuclear Regulatory Commission, dated August, 2000.

(Shaw, 2007) "*Site Specific Health and Safety Plan For Fort Monmouth Phase II ECP*".

FIGURES



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FORT MONMOUTH

MONMOUTH COUNTY
NEW JERSEY

Date: April, 2007

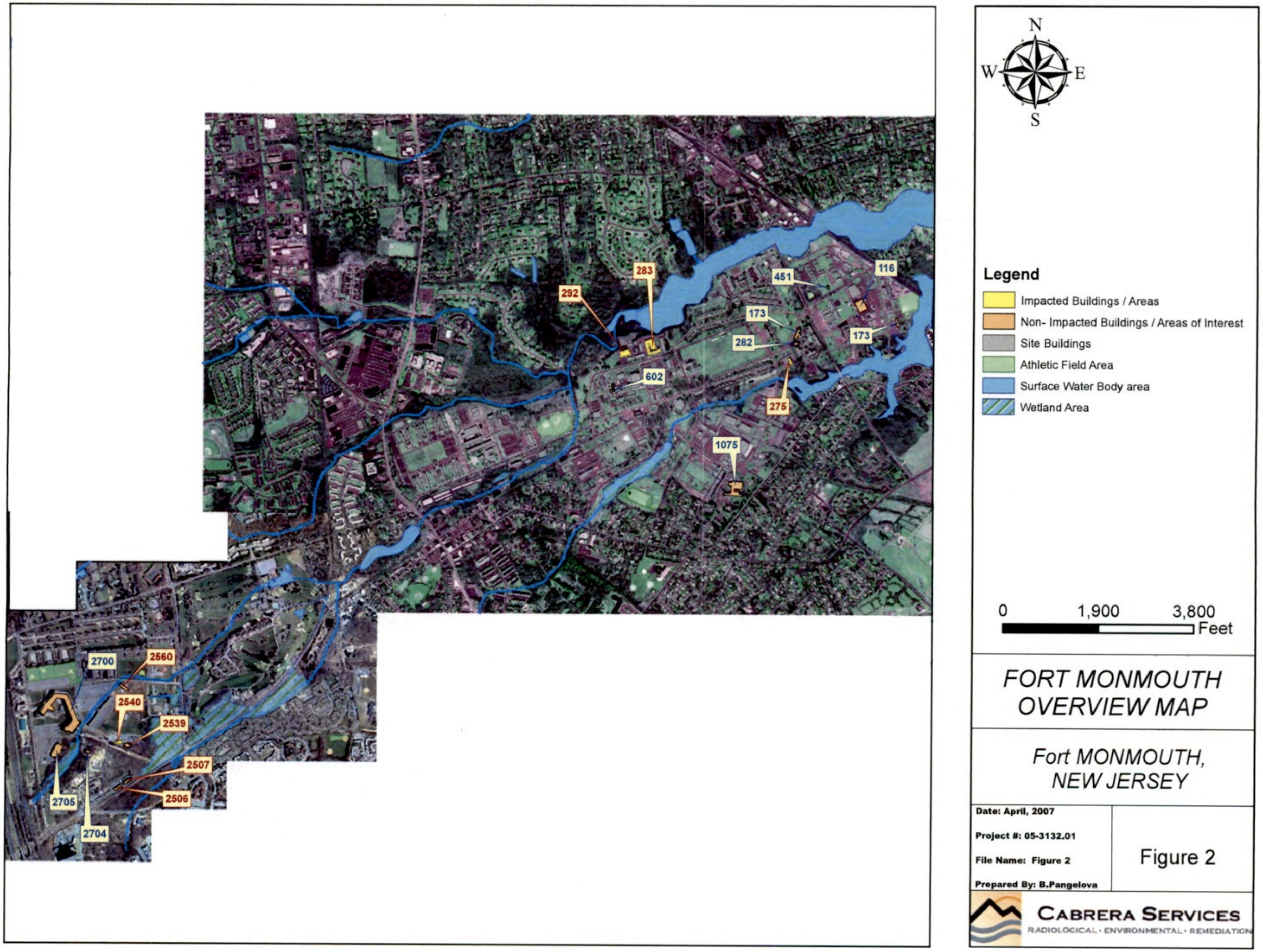
Project #: 05-3132.01

File Name: Figure 1

Prepared By: B.Pangelova

Figure 1

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION



FORT MONMOUTH
OVERVIEW MAP

Fort MONMOUTH,
NEW JERSEY

Date: April, 2007

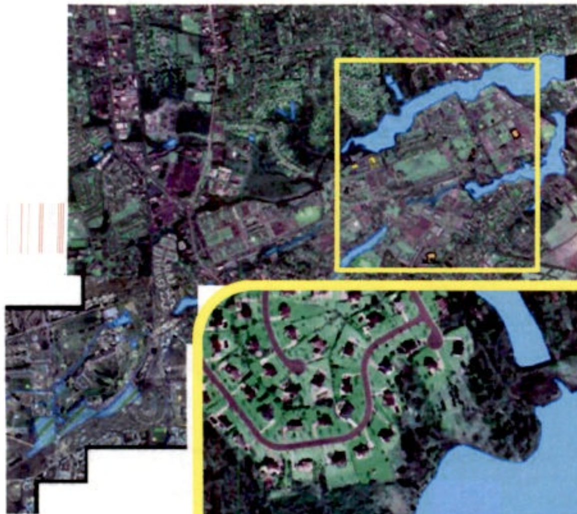
Project #: 05-3132.01

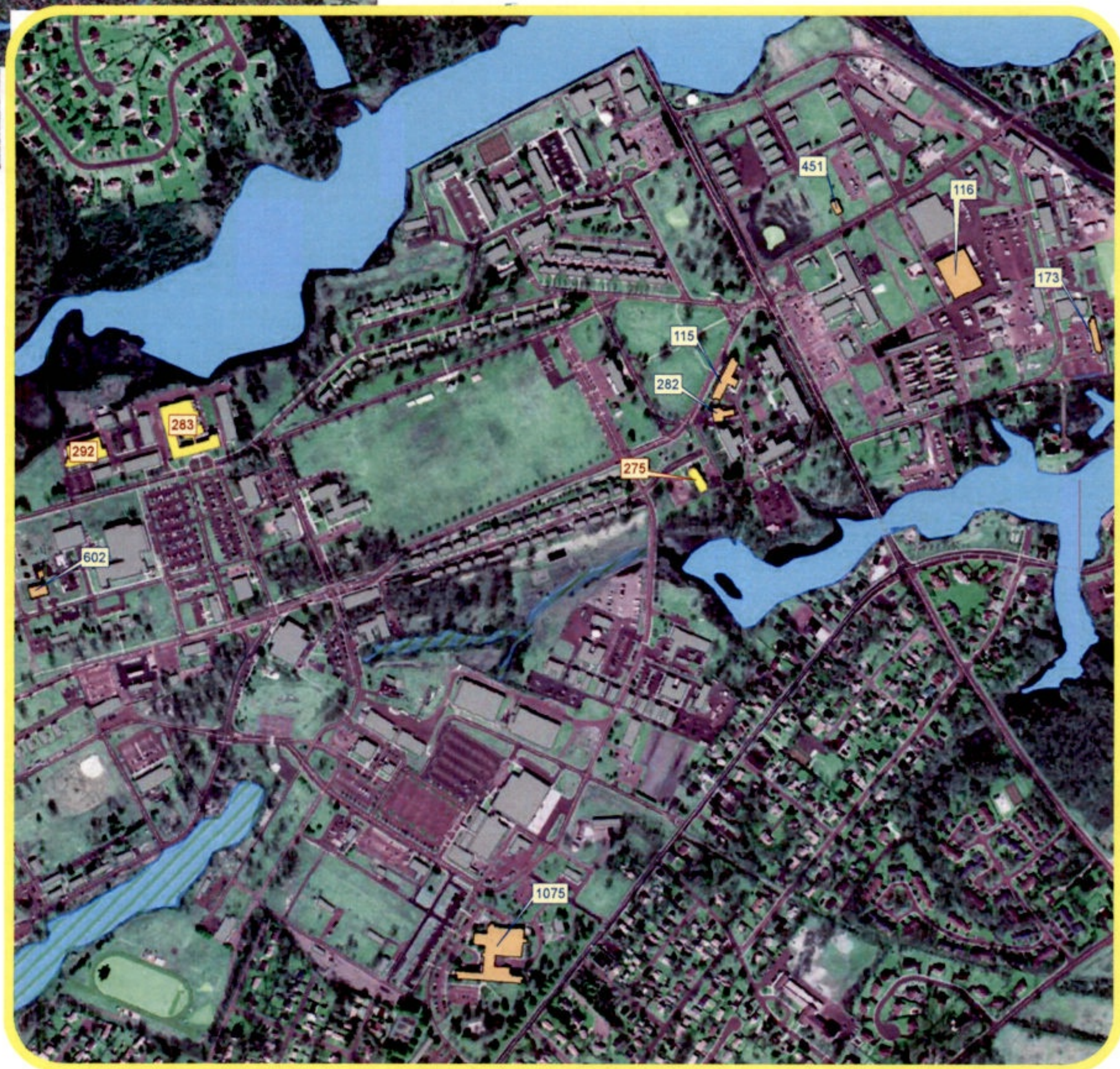
File Name: Figure 2

Prepared By: B.Pangelova

Figure 2

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION





N
W E
S

Legend

- Impacted Buildings / Areas
- Non- Impacted Buildings / Areas of Interest
- Site Buildings
- Athletic Field Area
- Surface Water Body area
- Wetland Area

0 550 1,100
Feet

FORT MONMOUTH, MAIN POST

Fort Monmouth, Main Post
NEW JERSEY

Date: April, 2007

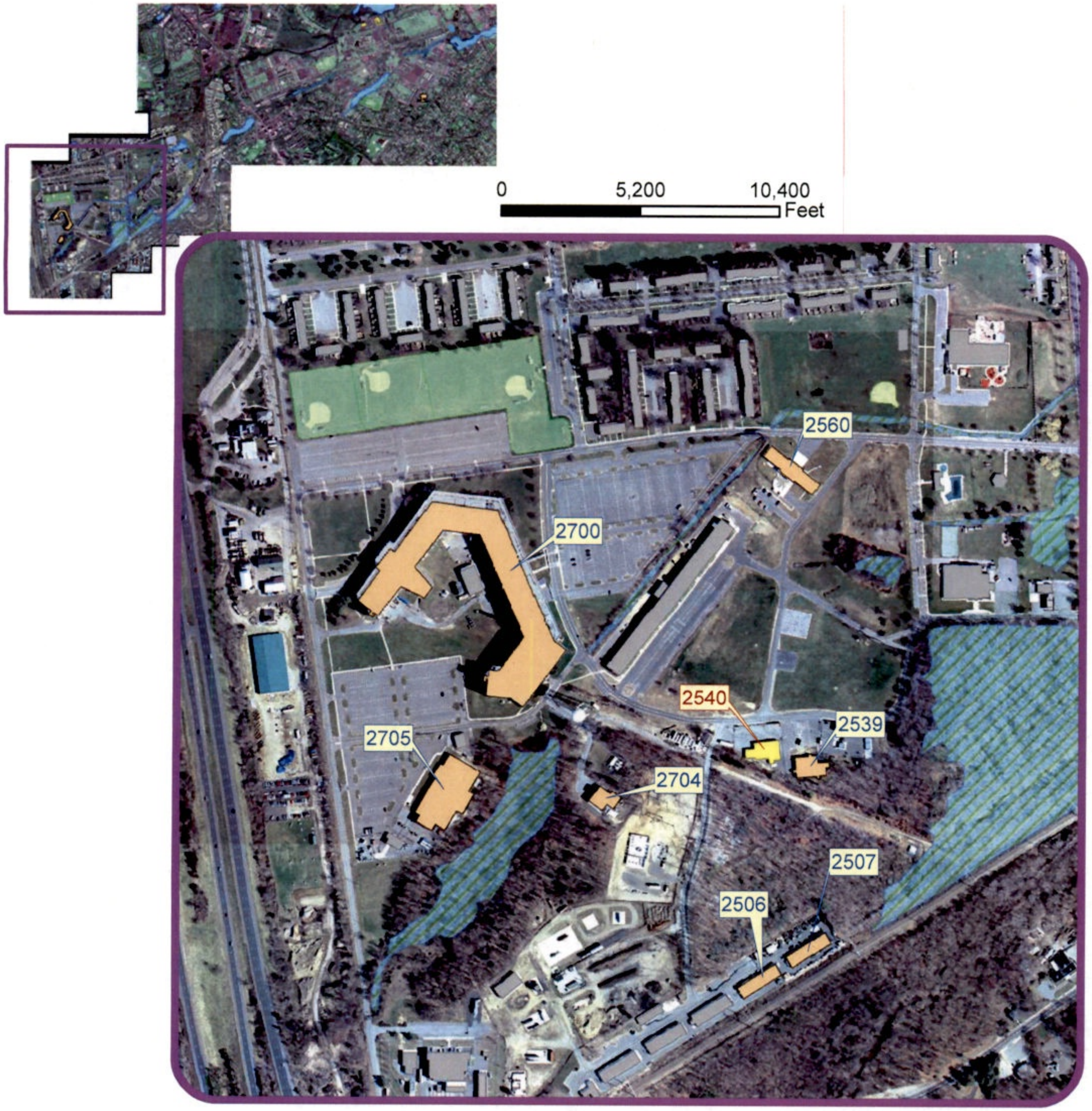
Project #: 05-3132.04

File Name: Figure 3

Prepared By: B.Pangelova

Figure 3

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION



N
W
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Legend

- Impacted Buildings / Areas
- Non- Impacted Buildings / Areas of Interest
- Site Buildings
- Athletic Field Area
- Surface Water Body area
- Wetland Area

0 520 1,040 Feet

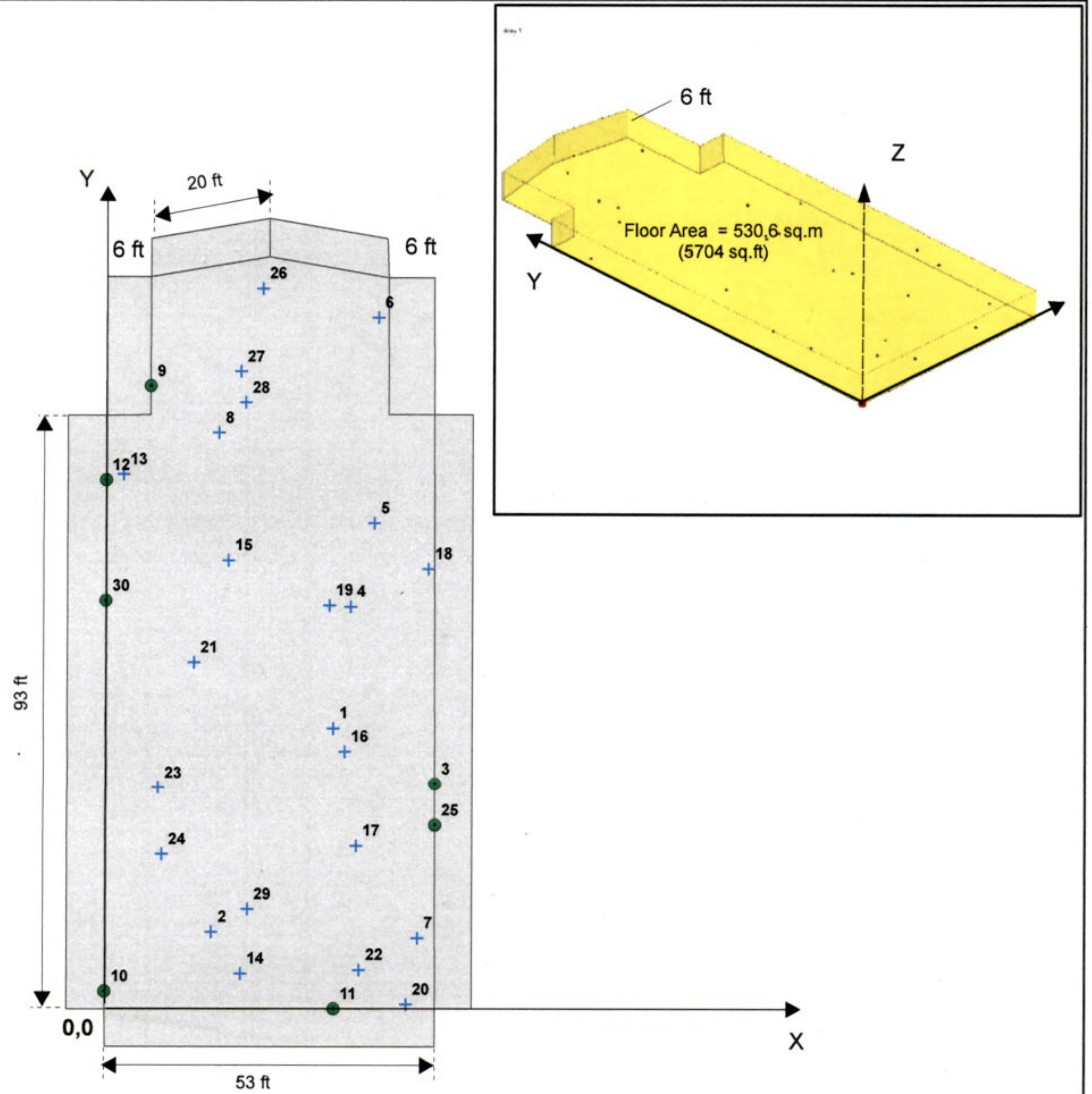
FORT MONMOUTH, CHARLES WOOD AREA

Fort Monmouth, Charles Wood Area
NEW JERSEY

Date: April, 2007
Project #: 05-3132.04
File Name: Figure 4
Prepared By: B.Pangelova

Figure 4

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION



Legend

Class 3 Sample Locations

+ Floor Sample Locations

● Wall Sample Locations

Feet
0 4 8 16 24 32

BUILDING 275
IMPACTED AREA AND
SYSTEMATIC SAMPLE LOCATIONS

Fort Monmouth,
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

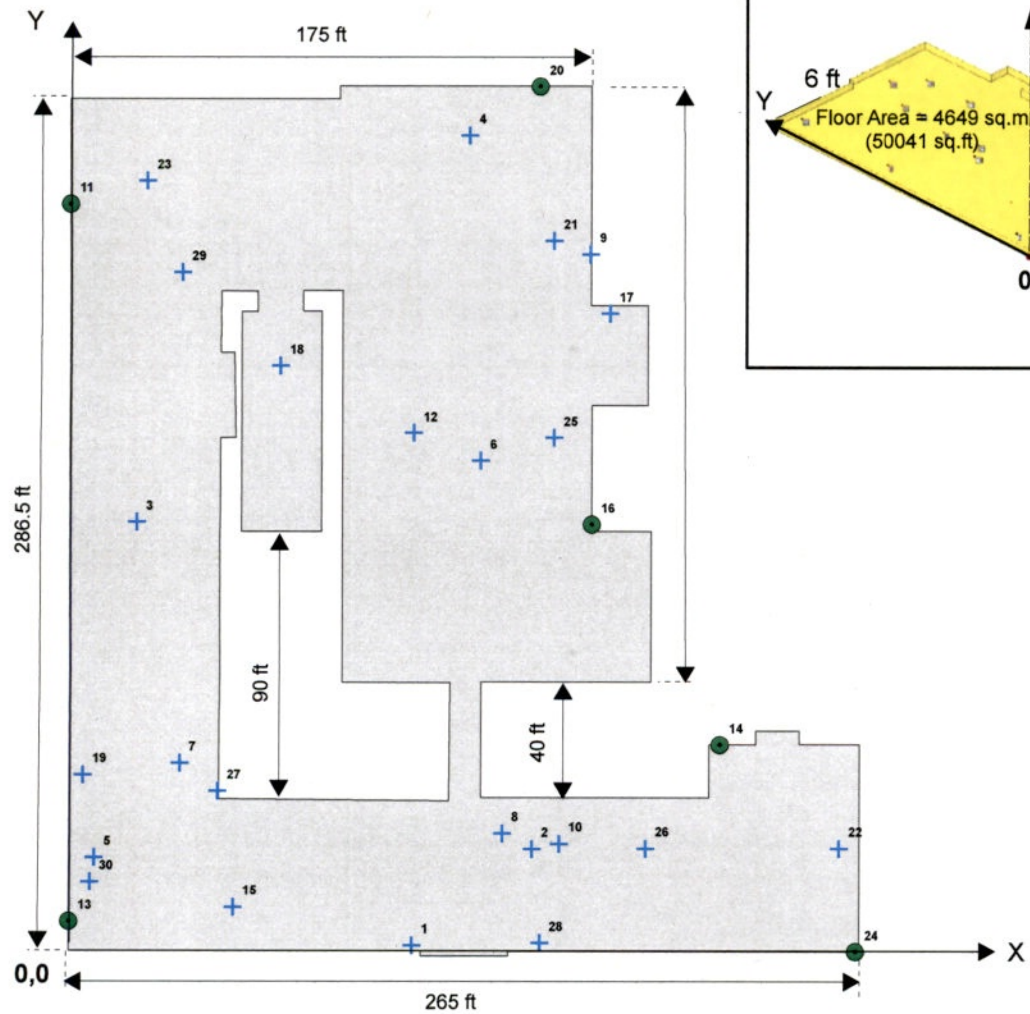
File Name: Figure 5

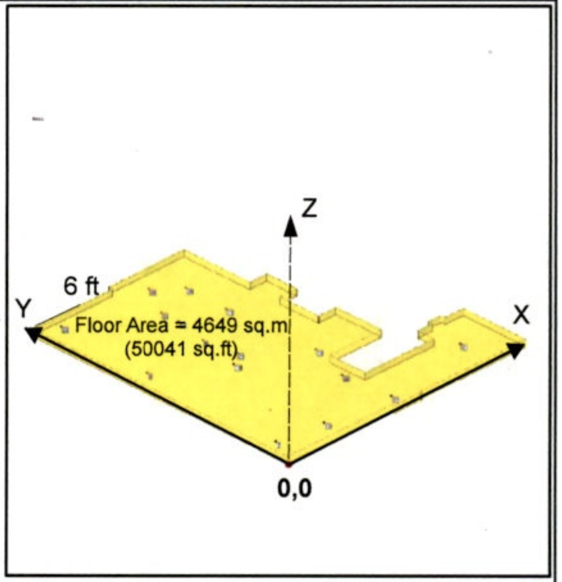
Prepared By: B.Pangelova

Figure 5

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X (ft)	Y (ft)	Z(ft)	Type	Surface	Bldg.	Site
1	35.2848	44.319	0	Class 3 Systematics	Floor	275	Monmouth
2	16.245	11.9796	0	Class 3 Systematics	Floor	275	Monmouth
3	51.3145	35.5062	1.8207	Class 3 Systematics	Wall	275	Monmouth
4	37.9906	63.4911	0	Class 3 Systematics	Floor	275	Monmouth
5	41.7122	76.5814	0	Class 3 Systematics	Floor	275	Monmouth
6	42.2844	108.9449	0	Class 3 Systematics	Floor	275	Monmouth
7	48.6127	11.0747	0	Class 3 Systematics	Floor	275	Monmouth
8	17.263	90.6403	0	Class 3 Systematics	Floor	275	Monmouth
9	6.5321	98.0095	3.5371	Class 3 Systematics	Wall	275	Monmouth
10	-0.498	2.6797	5.4338	Class 3 Systematics	Wall	275	Monmouth
11	35.4755	-0.0434	5.1296	Class 3 Systematics	Wall	275	Monmouth
12	-0.448	83.2243	4.7945	Class 3 Systematics	Wall	275	Monmouth
13	2.2819	84.1178	0	Class 3 Systematics	Floor	275	Monmouth
14	20.8092	5.4757	0	Class 3 Systematics	Floor	275	Monmouth
15	18.8128	70.7329	0	Class 3 Systematics	Floor	275	Monmouth
16	37.1345	40.6418	0	Class 3 Systematics	Floor	275	Monmouth
17	38.9531	25.6085	0	Class 3 Systematics	Floor	275	Monmouth
18	50.2479	69.4282	0	Class 3 Systematics	Floor	275	Monmouth
19	34.6738	63.7019	0	Class 3 Systematics	Floor	275	Monmouth
20	46.8336	0.6503	0	Class 3 Systematics	Floor	275	Monmouth
21	13.4203	54.6505	0	Class 3 Systematics	Floor	275	Monmouth
22	39.4621	6.0507	0	Class 3 Systematics	Floor	275	Monmouth
23	7.7776	34.8609	0	Class 3 Systematics	Floor	275	Monmouth
24	8.4259	24.2226	0	Class 3 Systematics	Floor	275	Monmouth
25	51.3313	28.8789	0.9171	Class 3 Systematics	Wall	275	Monmouth
26	24.1504	113.5012	0	Class 3 Systematics	Floor	275	Monmouth
27	20.6943	100.3047	0	Class 3 Systematics	Floor	275	Monmouth
28	21.491	95.4036	0	Class 3 Systematics	Floor	275	Monmouth
29	21.8533	15.5561	0	Class 3 Systematics	Floor	275	Monmouth
30	-0.4597	64.3799	4.8568	Class 3 Systematics	Wall	275	Monmouth





Legend

Class 3 Sample Locations

- + Floor Sample Locations
- ● Wall Sample Locations

Feet
0 12.525 50 75 100

BUILDING 283
IMPACTED AREA AND
SYSTEMATIC SAMPLE LOCATIONS

Fort Monmouth,
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

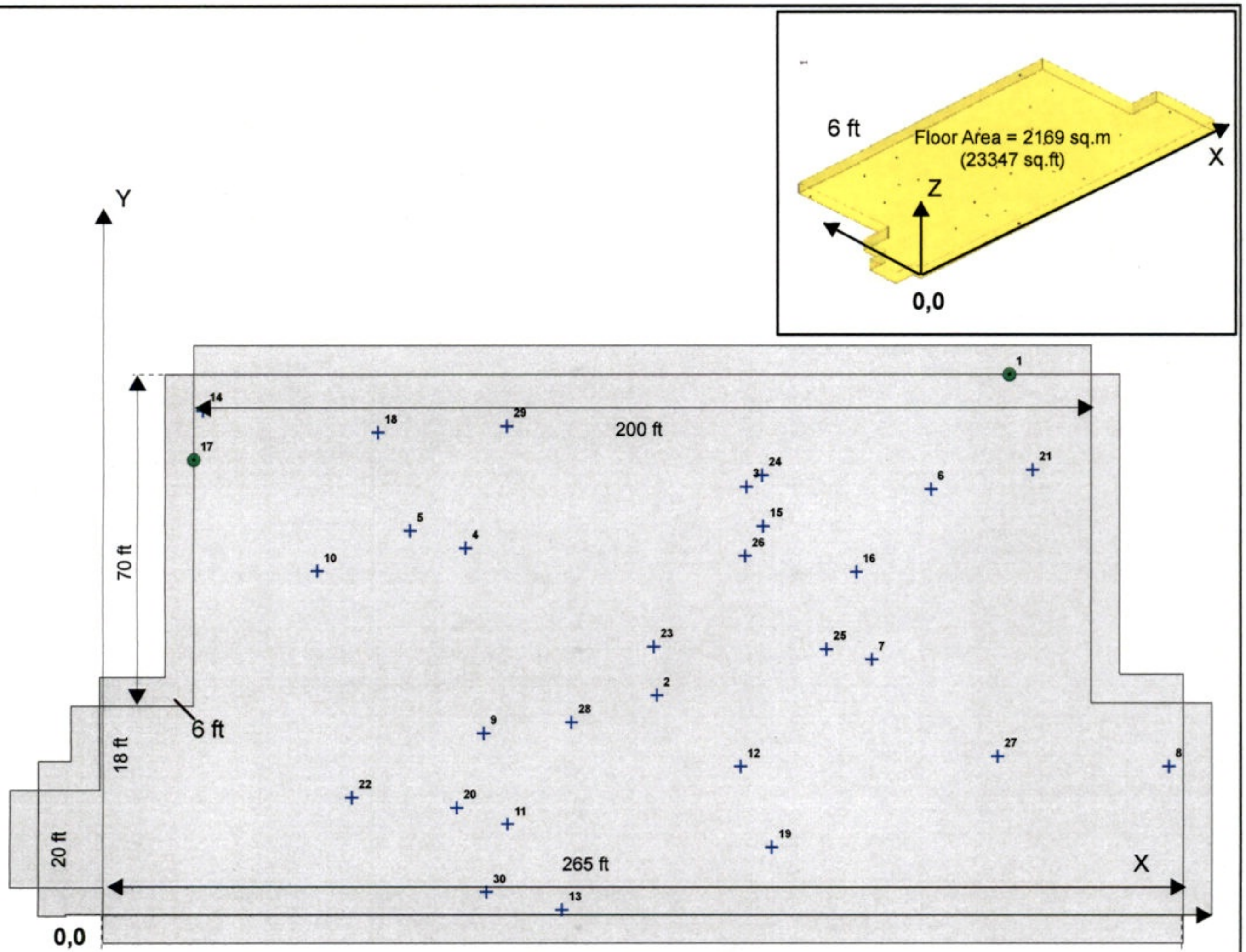
File Name: Figure 6

Prepared By: B.Pangelova

Figure 6

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Label	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	114.9239	2.3983	0	Class 3 Systematics	Floor	283	Monmouth
2	155.0881	34.7976	0	Class 3 Systematics	Floor	283	Monmouth
3	22.4636	144.9128	0	Class 3 Systematics	Floor	283	Monmouth
4	133.7598	274.6514	0	Class 3 Systematics	Floor	283	Monmouth
5	8.4873	31.9151	0	Class 3 Systematics	Floor	283	Monmouth
6	137.6442	165.6469	0	Class 3 Systematics	Floor	283	Monmouth
7	37.091	63.7236	0	Class 3 Systematics	Floor	283	Monmouth
8	145.1186	40.0361	0	Class 3 Systematics	Floor	283	Monmouth
9	174.298	234.684	0	Class 3 Systematics	Floor	283	Monmouth
10	164.2074	36.5515	0	Class 3 Systematics	Floor	283	Monmouth
11	0.014	251.4157	3.0793	Class 3 Systematics	Wall	283	Monmouth
12	115.1852	174.9522	0	Class 3 Systematics	Floor	283	Monmouth
13	0.0274	10.4989	1.4661	Class 3 Systematics	Wall	283	Monmouth
14	217.9501	69.8742	4.8896	Class 3 Systematics	Wall	283	Monmouth
15	55.0118	15.3044	0	Class 3 Systematics	Floor	283	Monmouth
16	174.8576	144.1168	0.1268	Class 3 Systematics	Wall	283	Monmouth
17	180.9435	214.9291	0	Class 3 Systematics	Floor	283	Monmouth
18	70.4723	197.4281	0	Class 3 Systematics	Floor	283	Monmouth
19	4.7088	59.7638	0	Class 3 Systematics	Floor	283	Monmouth
20	157.2725	291.1502	0.764	Class 3 Systematics	Wall	283	Monmouth
21	162.1078	239.1646	0	Class 3 Systematics	Floor	283	Monmouth
22	257.9983	35.016	0	Class 3 Systematics	Floor	283	Monmouth
23	25.856	259.3076	0	Class 3 Systematics	Floor	283	Monmouth
24	263.4865	0.3109	2.2342	Class 3 Systematics	Wall	283	Monmouth
25	162.2145	173.4076	0	Class 3 Systematics	Floor	283	Monmouth
26	193.2187	34.9612	0	Class 3 Systematics	Floor	283	Monmouth
27	49.7534	54.2831	0	Class 3 Systematics	Floor	283	Monmouth
28	157.7639	3.2269	0	Class 3 Systematics	Floor	283	Monmouth
29	37.6511	228.6393	0	Class 3 Systematics	Floor	283	Monmouth
30	7.1166	23.7252	0	Class 3 Systematics	Floor	283	Monmouth



Legend

Class 3 Sample Locations

+ Floor Sample Locations

● Wall Sample Locations

Feet
0 5 10 20 30 40

BUILDING 292
IMPACTED AREA AND
SYSTEMATIC SAMPLE LOCATIONS

Fort Monmouth,
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name: Figure 7

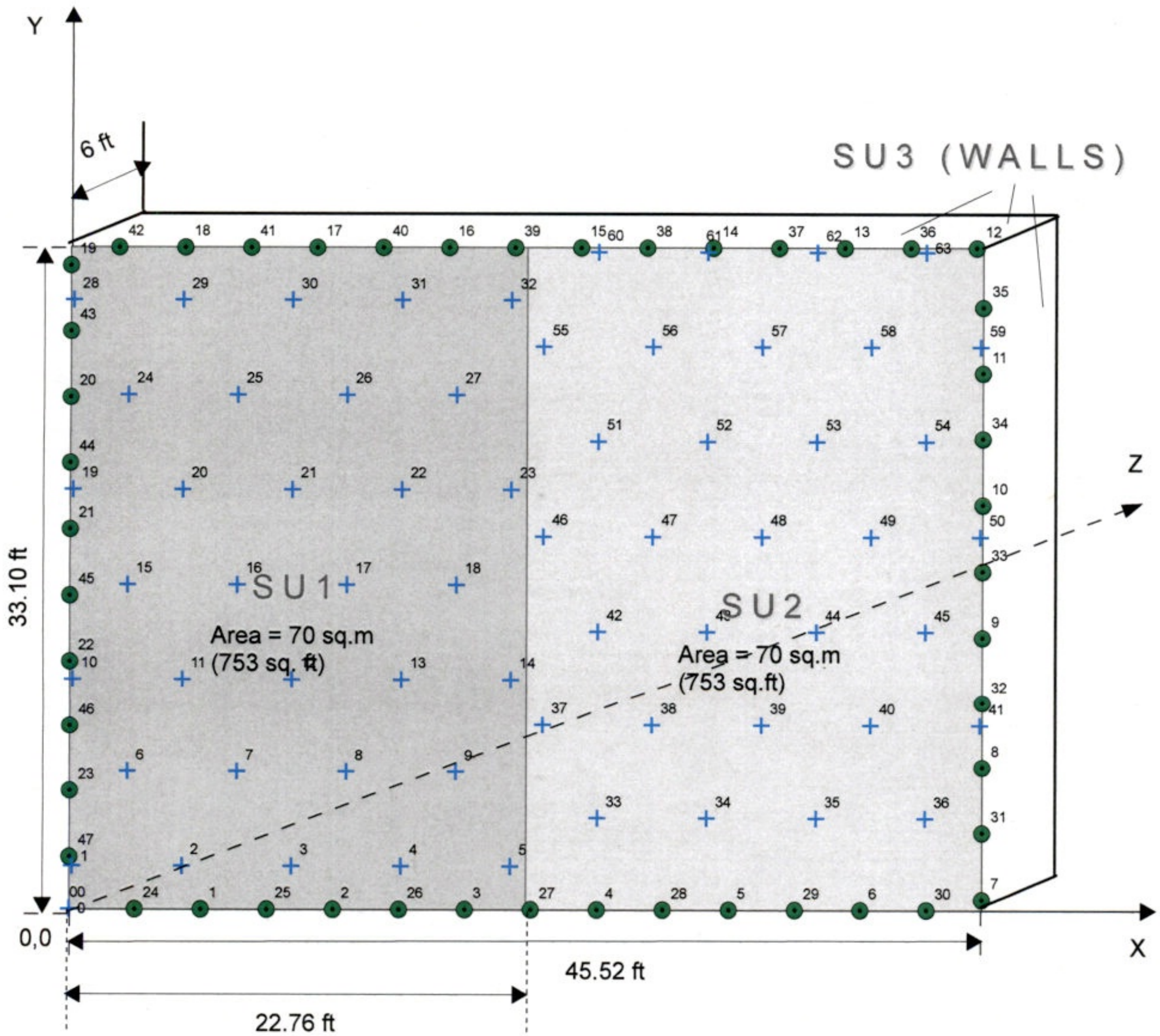
Prepared By: B.Pangelova

Figure 7

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X(ft)	Y(ft)	Z (ft)	Type	Surface	Bldg.	Site
1	190.0801	113.4453	2.886	Random	Wall	292	Monmouth
2	116.0397	46.2848	0	Random	Floor	292	Monmouth
3	134.8301	90.1045	0	Random	Floor	292	Monmouth
4	75.9168	77.2473	0	Random	Floor	292	Monmouth
5	64.2606	80.8721	0	Random	Floor	292	Monmouth
6	173.5997	89.5923	0	Random	Floor	292	Monmouth
7	161.2101	53.856	0	Random	Floor	292	Monmouth
8	223.4759	31.4787	0	Random	Floor	292	Monmouth
9	79.726	38.3464	0	Random	Floor	292	Monmouth
10	44.8176	72.3803	0	Random	Floor	292	Monmouth
11	84.7662	19.3465	0	Random	Floor	292	Monmouth
12	133.637	31.4576	0	Random	Floor	292	Monmouth
13	96.192	1.0876	0	Random	Floor	292	Monmouth
14	20.7943	105.9716	0	Random	Floor	292	Monmouth
15	138.3146	81.8925	0	Random	Floor	292	Monmouth
16	157.884	72.291	0	Random	Floor	292	Monmouth
17	18.9071	95.6898	1.6347	Random	Wall	292	Monmouth
18	57.5064	101.3585	0	Random	Floor	292	Monmouth
19	140.1917	14.4094	0	Random	Floor	292	Monmouth
20	74.1243	22.9199	0	Random	Floor	292	Monmouth
21	194.8993	93.5942	0	Random	Floor	292	Monmouth
22	52.0827	24.996	0	Random	Floor	292	Monmouth
23	115.3839	56.5457	0	Random	Floor	292	Monmouth
24	138.1302	92.4973	0	Random	Floor	292	Monmouth
25	151.625	56.0564	0	Random	Floor	292	Monmouth
26	134.5854	75.6163	0	Random	Floor	292	Monmouth
27	187.6492	33.5698	0	Random	Floor	292	Monmouth
28	98.154	40.6116	0	Random	Floor	292	Monmouth
29	84.5482	102.7024	0	Random	Floor	292	Monmouth
30	80.3503	4.8549	0	Random	Floor	292	Monmouth


SU9
6 ft Walls
Office
Admin Area
SU8
Closet
SU1
Radiation Facillity
SU2
Radiation Facillity
SU4
Work Area
SU6
Machine Shop
SU10
SU12
SU3 (Radiation Facility)
6 ft Walls
SU7 (Machine Shop)
6 ft Walls
SU14
Concrete Pad
SU13
6 ft Walls
SU5 (Work Area)
6 ft Walls
SU11
6 ft Walls
Legend
SU1 (Radiation Facillity)
SU2 (Radiation Facillity)
SU4 (Work Area)
SU6 (Machine Shop)
SU8
SU10
SU12
SU14
BUILDING 2540
FLOOR PLAN and
CLASS 1 SURVEY UNITS
FORT MONMOUTH
NEW JERSEY
Date: September, 2006
Project #: 05-3132.04
File Name: Figure 8
Prepared By: B.Pangelova
Figure 8
CABRERA SERVICES
RADIOLOGICAL • ENVIRONMENTAL • REMEDIATION



Legend

Class1 Sample Locations

- Floor Sample Locations
- Wall Sample Locations
- Class 1 SU1
- Class 1 SU2
- Class 1 SU3

Feet: 0 1.5 3 6 9 12

BUILDING 2540, RADIATION FACILITY
SU1, SU2 (FLOOR AREA ONLY) and SU3 (WALLS ONLY)
SYSTEMATIC SAMPLE LOCATIONS

FORT MONMOUTH
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name : Figure 9

Prepared By: B.Pangelova

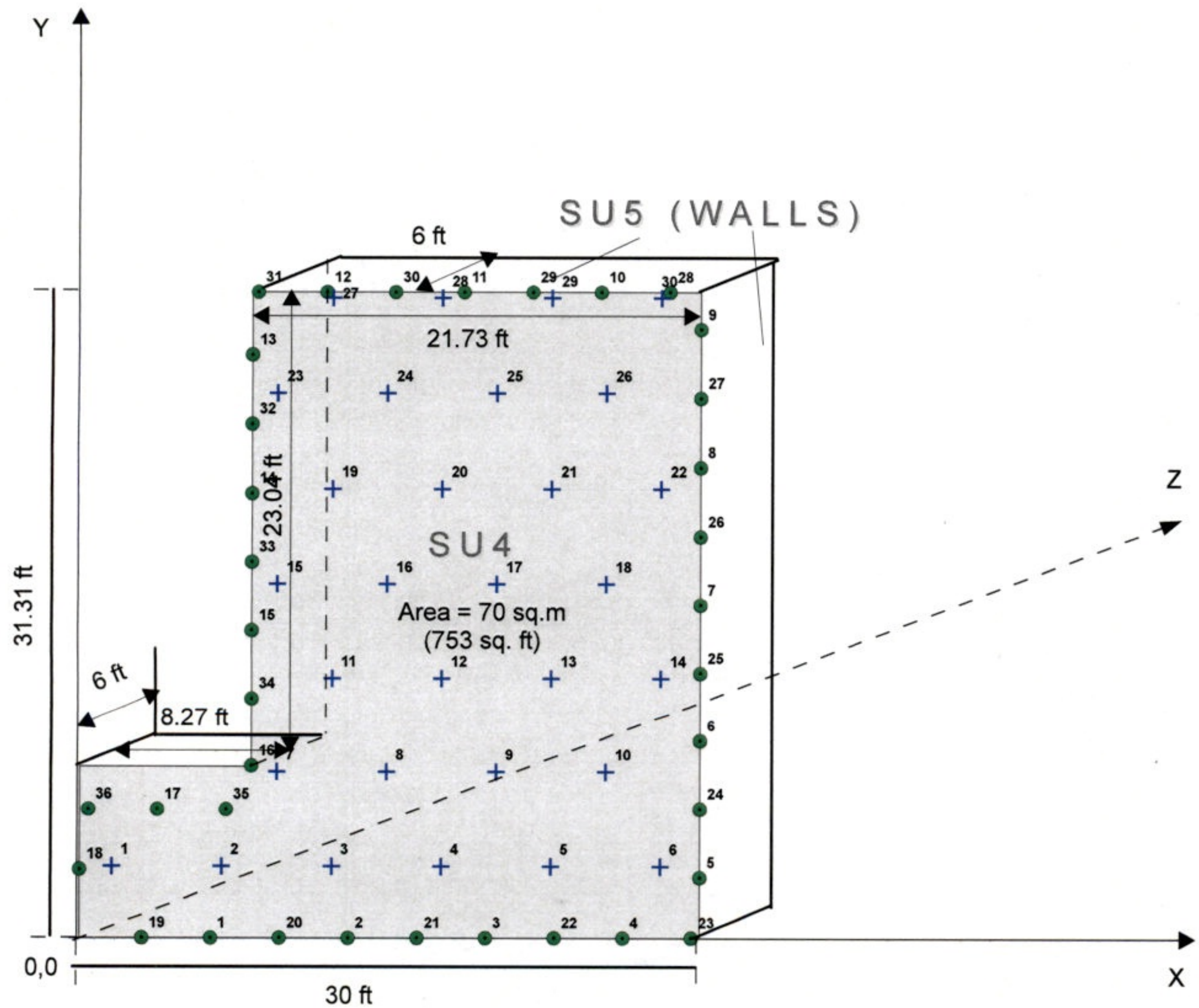
Figure 9

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X(ft)	Y(ft)	Type	Surface	Bldg.	Site
1	0.1481	2.1204	Class 1 Systematic	Floor	2540-SU1	Monmouth
2	5.6047	2.1204	Class 1 Systematic	Floor	2540-SU1	Monmouth
3	11.0614	2.1204	Class 1 Systematic	Floor	2540-SU1	Monmouth
4	16.518	2.1204	Class 1 Systematic	Floor	2540-SU1	Monmouth
5	21.9747	2.1204	Class 1 Systematic	Floor	2540-SU1	Monmouth
6	2.8764	6.846	Class 1 Systematic	Floor	2540-SU1	Monmouth
7	8.333	6.846	Class 1 Systematic	Floor	2540-SU1	Monmouth
8	13.7897	6.846	Class 1 Systematic	Floor	2540-SU1	Monmouth
9	19.2463	6.846	Class 1 Systematic	Floor	2540-SU1	Monmouth
10	0.1481	11.5716	Class 1 Systematic	Floor	2540-SU1	Monmouth
11	5.6047	11.5716	Class 1 Systematic	Floor	2540-SU1	Monmouth
12	11.0614	11.5716	Class 1 Systematic	Floor	2540-SU1	Monmouth
13	16.518	11.5716	Class 1 Systematic	Floor	2540-SU1	Monmouth
14	21.9747	11.5716	Class 1 Systematic	Floor	2540-SU1	Monmouth
15	2.8764	16.2972	Class 1 Systematic	Floor	2540-SU1	Monmouth
16	8.333	16.2972	Class 1 Systematic	Floor	2540-SU1	Monmouth
17	13.7897	16.2972	Class 1 Systematic	Floor	2540-SU1	Monmouth
18	19.2463	16.2972	Class 1 Systematic	Floor	2540-SU1	Monmouth
19	0.1481	21.0228	Class 1 Systematic	Floor	2540-SU1	Monmouth
20	5.6047	21.0228	Class 1 Systematic	Floor	2540-SU1	Monmouth
21	11.0614	21.0228	Class 1 Systematic	Floor	2540-SU1	Monmouth
22	16.518	21.0228	Class 1 Systematic	Floor	2540-SU1	Monmouth
23	21.9747	21.0228	Class 1 Systematic	Floor	2540-SU1	Monmouth
24	2.8764	25.7484	Class 1 Systematic	Floor	2540-SU1	Monmouth
25	8.333	25.7484	Class 1 Systematic	Floor	2540-SU1	Monmouth
26	13.7897	25.7484	Class 1 Systematic	Floor	2540-SU1	Monmouth
27	19.2463	25.7484	Class 1 Systematic	Floor	2540-SU1	Monmouth
28	0.1481	30.474	Class 1 Systematic	Floor	2540-SU1	Monmouth
29	5.6047	30.474	Class 1 Systematic	Floor	2540-SU1	Monmouth
30	11.0614	30.474	Class 1 Systematic	Floor	2540-SU1	Monmouth
31	16.518	30.474	Class 1 Systematic	Floor	2540-SU1	Monmouth
32	21.9747	30.474	Class 1 Systematic	Floor	2540-SU1	Monmouth
33	26.3065	4.5253	Class 1 Systematic	Floor	2540-SU2	Monmouth
34	31.7631	4.5253	Class 1 Systematic	Floor	2540-SU2	Monmouth
35	37.2198	4.5253	Class 1 Systematic	Floor	2540-SU2	Monmouth
36	42.6764	4.5253	Class 1 Systematic	Floor	2540-SU2	Monmouth
37	23.5781	9.2509	Class 1 Systematic	Floor	2540-SU2	Monmouth
38	29.0348	9.2509	Class 1 Systematic	Floor	2540-SU2	Monmouth
39	34.4915	9.2509	Class 1 Systematic	Floor	2540-SU2	Monmouth
40	39.9481	9.2509	Class 1 Systematic	Floor	2540-SU2	Monmouth
41	45.4048	9.2509	Class 1 Systematic	Floor	2540-SU2	Monmouth
42	26.3065	13.9765	Class 1 Systematic	Floor	2540-SU2	Monmouth
43	31.7631	13.9765	Class 1 Systematic	Floor	2540-SU2	Monmouth
44	37.2198	13.9765	Class 1 Systematic	Floor	2540-SU2	Monmouth
45	42.6764	13.9765	Class 1 Systematic	Floor	2540-SU2	Monmouth
46	23.5781	18.7021	Class 1 Systematic	Floor	2540-SU2	Monmouth
47	29.0348	18.7021	Class 1 Systematic	Floor	2540-SU2	Monmouth
48	34.4915	18.7021	Class 1 Systematic	Floor	2540-SU2	Monmouth
49	39.9481	18.7021	Class 1 Systematic	Floor	2540-SU2	Monmouth
50	45.4048	18.7021	Class 1 Systematic	Floor	2540-SU2	Monmouth
51	26.3065	23.4277	Class 1 Systematic	Floor	2540-SU2	Monmouth

52	31.7631	23.4277	Class 1 Systematic	Floor	2540-SU2	Monmouth
53	37.2198	23.4277	Class 1 Systematic	Floor	2540-SU2	Monmouth
54	42.6764	23.4277	Class 1 Systematic	Floor	2540-SU2	Monmouth
55	23.5781	28.1533	Class 1 Systematic	Floor	2540-SU2	Monmouth
56	29.0348	28.1533	Class 1 Systematic	Floor	2540-SU2	Monmouth
57	34.4915	28.1533	Class 1 Systematic	Floor	2540-SU2	Monmouth
58	39.9481	28.1533	Class 1 Systematic	Floor	2540-SU2	Monmouth
59	45.4048	28.1533	Class 1 Systematic	Floor	2540-SU2	Monmouth
60	26.3065	32.8789	Class 1 Systematic	Floor	2540-SU2	Monmouth
61	31.7631	32.8789	Class 1 Systematic	Floor	2540-SU2	Monmouth
62	37.2198	32.8789	Class 1 Systematic	Floor	2540-SU2	Monmouth
63	42.6764	32.8789	Class 1 Systematic	Floor	2540-SU2	Monmouth

Sample ID	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	6.5415	0	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
2	13.1245	0	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
3	19.7076	0	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
4	26.2906	0	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
5	32.8736	0	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
6	39.4567	0	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
7	45.52	0.5197	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
8	45.52	7.1027	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
9	45.52	13.6857	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
10	45.52	20.2688	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
11	45.52	26.8518	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
12	45.1852	33.1	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
13	38.6021	33.1	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
14	32.0191	33.1	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
15	25.4361	33.1	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
16	18.8531	33.1	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
17	12.27	33.1	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
18	5.687	33.1	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
19	0	32.204	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
20	0	25.6209	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
21	0	19.0379	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
22	0	12.4549	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
23	0	5.8719	0.0822	Class 1 Systematic	Wall	2540-SU3	Monmouth
24	3.25	0	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
25	9.833	0	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
26	16.4161	0	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
27	22.9991	0	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
28	29.5821	0	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
29	36.1651	0	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
30	42.7482	0	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
31	45.52	3.8112	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
32	45.52	10.3942	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
33	45.52	16.9773	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
34	45.52	23.5603	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
35	45.52	30.1433	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
36	41.8937	33.1	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
37	35.3106	33.1	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
38	28.7276	33.1	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
39	22.1446	33.1	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
40	15.5615	33.1	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
41	8.9785	33.1	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
42	2.3955	33.1	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
43	0	28.9125	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
44	0	22.3294	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
45	0	15.7464	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
46	0	9.1634	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth
47	0	2.5803	5.7832	Class 1 Systematic	Wall	2540-SU3	Monmouth



Legend

Class1 Sample Locations

- Floor Sample Locations
- Wall Sample Locations
- Class 1 SU4
- Class 1 SU5

Feet
0 1.5 3 6 9 12

BUILDING 2540, WORK AREA
SU4 (FLOOR AREA ONLY) and SU5 (WALLS ONLY)
SYSTEMATIC SAMPLE LOCATIONS

FORT MONMOUTH
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name : Figure 10

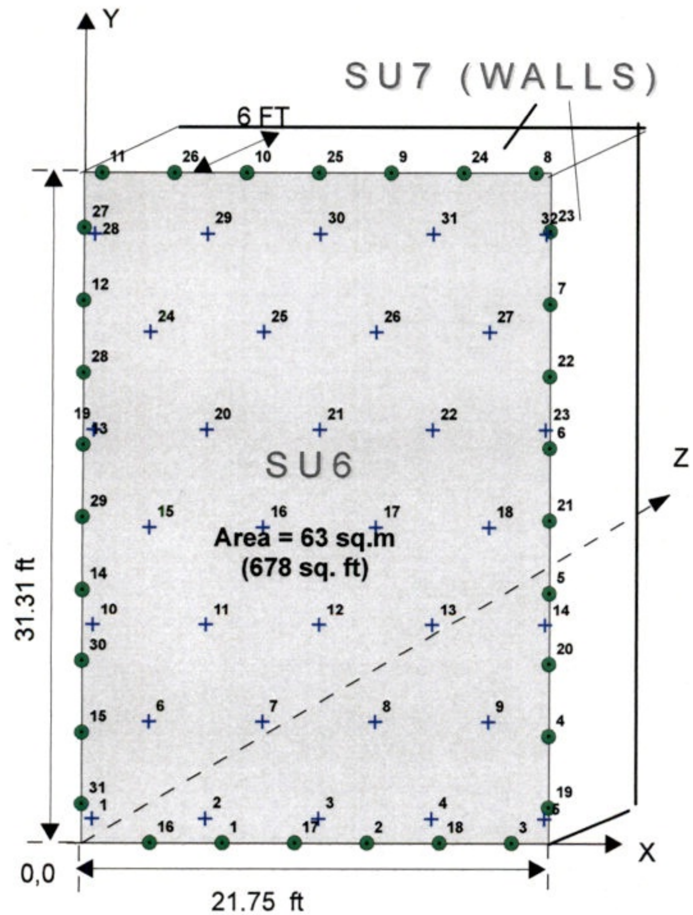
Prepared By: B.Pangelova

Figure 10

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample (ID)	XCoord	YCoord	Type	Surface	Bldg.	Site
1	1.5571	3.4433	Class 1 Systematic	Floor	2540-SU4	Monmouth
2	6.8641	3.4433	Class 1 Systematic	Floor	2540-SU4	Monmouth
3	12.1711	3.4433	Class 1 Systematic	Floor	2540-SU4	Monmouth
4	17.478	3.4433	Class 1 Systematic	Floor	2540-SU4	Monmouth
5	22.785	3.4433	Class 1 Systematic	Floor	2540-SU4	Monmouth
6	28.092	3.4433	Class 1 Systematic	Floor	2540-SU4	Monmouth
7	9.5176	8.0393	Class 1 Systematic	Floor	2540-SU4	Monmouth
8	14.8246	8.0393	Class 1 Systematic	Floor	2540-SU4	Monmouth
9	20.1315	8.0393	Class 1 Systematic	Floor	2540-SU4	Monmouth
10	25.4385	8.0393	Class 1 Systematic	Floor	2540-SU4	Monmouth
11	12.1711	12.6353	Class 1 Systematic	Floor	2540-SU4	Monmouth
12	17.478	12.6353	Class 1 Systematic	Floor	2540-SU4	Monmouth
13	22.785	12.6353	Class 1 Systematic	Floor	2540-SU4	Monmouth
14	28.092	12.6353	Class 1 Systematic	Floor	2540-SU4	Monmouth
15	9.5176	17.2312	Class 1 Systematic	Floor	2540-SU4	Monmouth
16	14.8246	17.2312	Class 1 Systematic	Floor	2540-SU4	Monmouth
17	20.1315	17.2312	Class 1 Systematic	Floor	2540-SU4	Monmouth
18	25.4385	17.2312	Class 1 Systematic	Floor	2540-SU4	Monmouth
19	12.1711	21.8272	Class 1 Systematic	Floor	2540-SU4	Monmouth
20	17.478	21.8272	Class 1 Systematic	Floor	2540-SU4	Monmouth
21	22.785	21.8272	Class 1 Systematic	Floor	2540-SU4	Monmouth
22	28.092	21.8272	Class 1 Systematic	Floor	2540-SU4	Monmouth
23	9.5176	26.4232	Class 1 Systematic	Floor	2540-SU4	Monmouth
24	14.8246	26.4232	Class 1 Systematic	Floor	2540-SU4	Monmouth
25	20.1315	26.4232	Class 1 Systematic	Floor	2540-SU4	Monmouth
26	25.4385	26.4232	Class 1 Systematic	Floor	2540-SU4	Monmouth
27	12.1711	31.0192	Class 1 Systematic	Floor	2540-SU4	Monmouth
28	17.478	31.0192	Class 1 Systematic	Floor	2540-SU4	Monmouth
29	22.785	31.0192	Class 1 Systematic	Floor	2540-SU4	Monmouth
30	28.092	31.0192	Class 1 Systematic	Floor	2540-SU4	Monmouth

Sample ID	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	6.3317	0	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
2	12.9777	0	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
3	19.6237	0	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
4	26.2697	0	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
5	30	2.9157	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
6	30	9.5617	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
7	30	16.2077	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
8	30	22.8538	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
9	30	29.4998	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
10	25.1642	31.31	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
11	18.5182	31.31	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
12	11.8722	31.31	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
13	8.27	28.2662	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
14	8.27	21.6201	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
15	8.27	14.9741	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
16	8.27	8.3281	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
17	3.7421	6.21	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
18	0	3.3061	0.1805	Class 1 Systematic	Wall	2540-SU5	Monmouth
19	3.0087	0	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
20	9.6547	0	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
21	16.3007	0	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
22	22.9467	0	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
23	29.5927	0	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
24	30	6.2387	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
25	30	12.8847	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
26	30	19.5308	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
27	30	26.1768	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
28	28.4872	31.31	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
29	21.8412	31.31	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
30	15.1952	31.31	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
31	8.5492	31.31	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
32	8.27	24.9432	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
33	8.27	18.2971	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
34	8.27	11.6511	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
35	7.0651	6.21	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth
36	0.4191	6.21	5.9362	Class 1 Systematic	Wall	2540-SU5	Monmouth



Legend

Class1 Sample Locations

+ Floor Sample Locations
● Wall Sample Locations

Class 1 SU 6

Class 1 SU 7

Feet
0 1.25 2.5 5 7.5 10

BUILDING 2540, MACHINE SHOP
SU6 (FLOOR AREA ONLY) and SU7 (WALLS ONLY)
SYSTEMATIC SAMPLE LOCATIONS

FORT MONMOUTH
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name: Figure 11

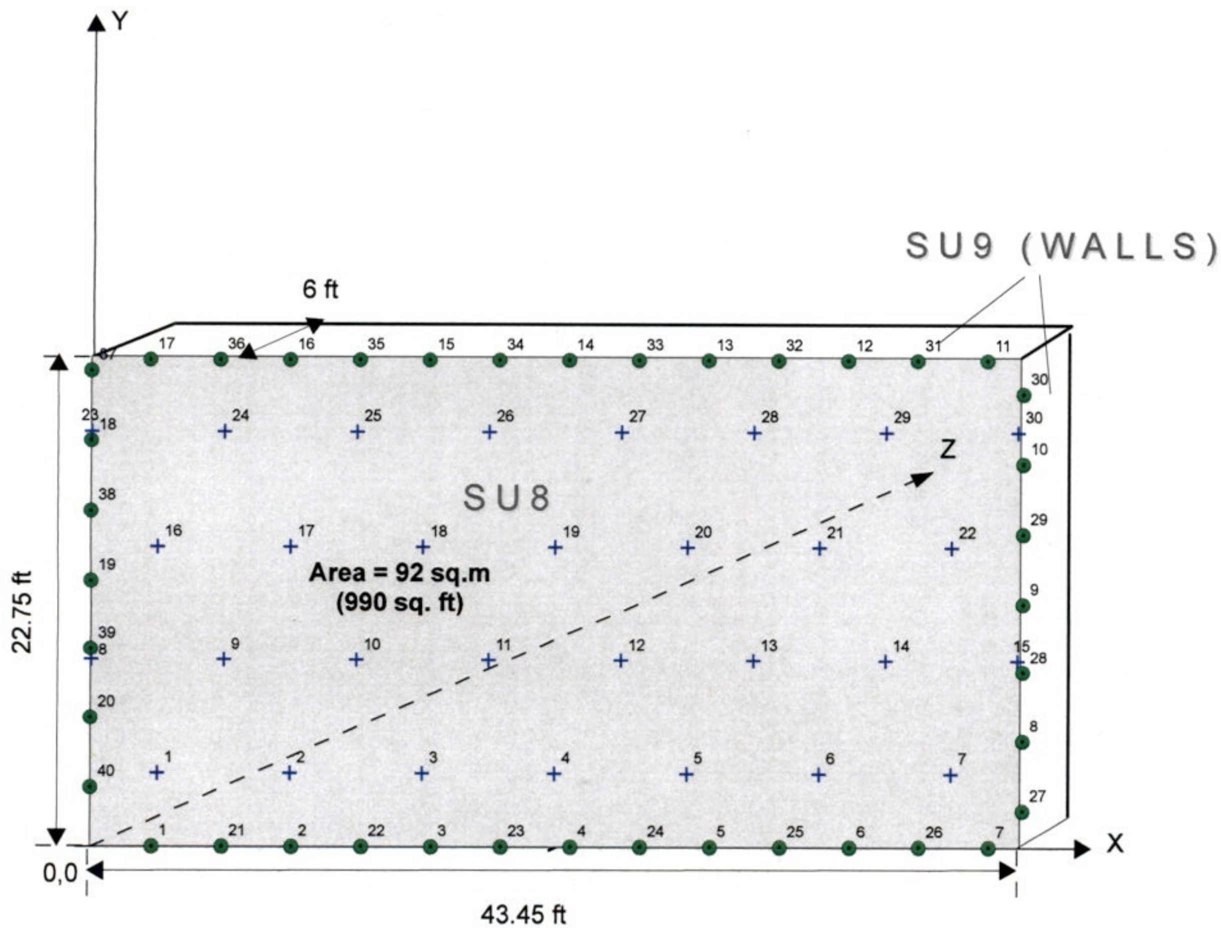
Prepared By: B.Pangelova

Figure 11

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X(ft)	Y(ft)	Type	Surface	Bldg.	Site
1	0.4817	1.1285	Class 1 Systematic	Floor	2540-SU6	Monmouth
2	5.7467	1.1285	Class 1 Systematic	Floor	2540-SU6	Monmouth
3	11.0117	1.1285	Class 1 Systematic	Floor	2540-SU6	Monmouth
4	16.2767	1.1285	Class 1 Systematic	Floor	2540-SU6	Monmouth
5	21.5417	1.1285	Class 1 Systematic	Floor	2540-SU6	Monmouth
6	3.1142	5.6881	Class 1 Systematic	Floor	2540-SU6	Monmouth
7	8.3792	5.6881	Class 1 Systematic	Floor	2540-SU6	Monmouth
8	13.6442	5.6881	Class 1 Systematic	Floor	2540-SU6	Monmouth
9	18.9092	5.6881	Class 1 Systematic	Floor	2540-SU6	Monmouth
10	0.4817	10.2477	Class 1 Systematic	Floor	2540-SU6	Monmouth
11	5.7467	10.2477	Class 1 Systematic	Floor	2540-SU6	Monmouth
12	11.0117	10.2477	Class 1 Systematic	Floor	2540-SU6	Monmouth
13	16.2767	10.2477	Class 1 Systematic	Floor	2540-SU6	Monmouth
14	21.5417	10.2477	Class 1 Systematic	Floor	2540-SU6	Monmouth
15	3.1142	14.8074	Class 1 Systematic	Floor	2540-SU6	Monmouth
16	8.3792	14.8074	Class 1 Systematic	Floor	2540-SU6	Monmouth
17	13.6442	14.8074	Class 1 Systematic	Floor	2540-SU6	Monmouth
18	18.9092	14.8074	Class 1 Systematic	Floor	2540-SU6	Monmouth
19	0.4817	19.367	Class 1 Systematic	Floor	2540-SU6	Monmouth
20	5.7467	19.367	Class 1 Systematic	Floor	2540-SU6	Monmouth
21	11.0117	19.367	Class 1 Systematic	Floor	2540-SU6	Monmouth
22	16.2767	19.367	Class 1 Systematic	Floor	2540-SU6	Monmouth
23	21.5417	19.367	Class 1 Systematic	Floor	2540-SU6	Monmouth
24	3.1142	23.9266	Class 1 Systematic	Floor	2540-SU6	Monmouth
25	8.3792	23.9266	Class 1 Systematic	Floor	2540-SU6	Monmouth
26	13.6442	23.9266	Class 1 Systematic	Floor	2540-SU6	Monmouth
27	18.9092	23.9266	Class 1 Systematic	Floor	2540-SU6	Monmouth
28	0.4817	28.4862	Class 1 Systematic	Floor	2540-SU6	Monmouth
29	5.7467	28.4862	Class 1 Systematic	Floor	2540-SU6	Monmouth
30	11.0117	28.4862	Class 1 Systematic	Floor	2540-SU6	Monmouth
31	16.2767	28.4862	Class 1 Systematic	Floor	2540-SU6	Monmouth
32	21.5417	28.4862	Class 1 Systematic	Floor	2540-SU6	Monmouth

Sample ID	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	6.5396	0	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
2	13.2792	0	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
3	20.0188	0	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
4	21.73	5.0285	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
5	21.73	11.7681	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
6	21.73	18.5078	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
7	21.73	25.2474	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
8	21.0529	31.31	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
9	14.3133	31.31	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
10	7.5736	31.31	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
11	0.834	31.31	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
12	0	25.4043	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
13	0	18.6647	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
14	0	11.925	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
15	0	5.1854	0.0694	Class 1 Systematic	Wall	2540-SU7	Monmouth
16	3.1697	0	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
17	9.9094	0	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
18	16.649	0	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
19	21.73	1.6587	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
20	21.73	8.3983	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
21	21.73	15.138	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
22	21.73	21.8776	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
23	21.73	28.6173	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
24	17.6831	31.31	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
25	10.9434	31.31	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
26	4.2038	31.31	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
27	0	28.7741	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
28	0	22.0345	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
29	0	15.2948	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
30	0	8.5552	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth
31	0	1.8155	5.9061	Class 1 Systematic	Wall	2540-SU7	Monmouth



Legend

Class1 Sample Locations

- + Floor Sample Locations
- ● Wall Sample Locations
- Class 1 SU 8
- Class 1 SU 9

BUILDING 2540
SU8 (FLOOR AREA ONLY) and SU9 (WALLS ONLY)
SYSTEMATIC SAMPLE LOCATIONS

FORT MONMOUTH
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name : Figure 12

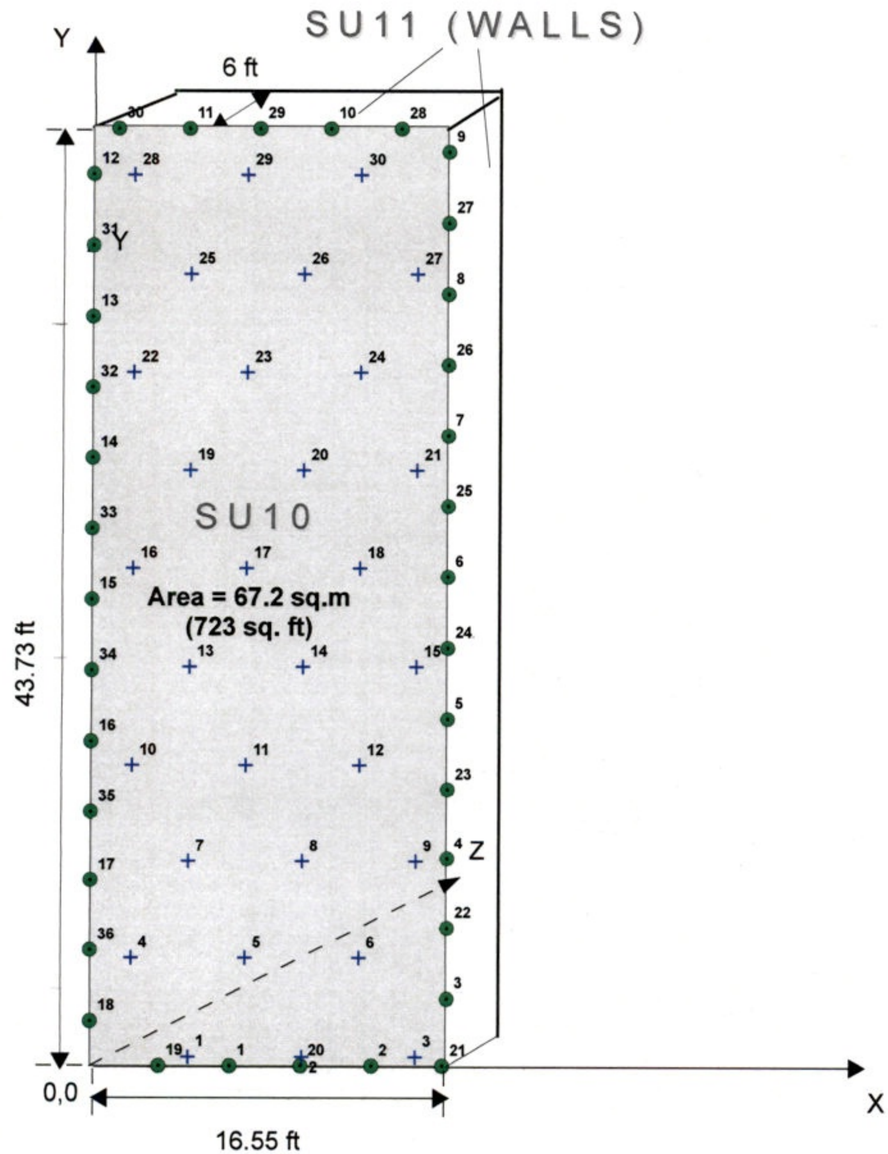
Prepared By: B.Pangelova

Figure 12

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X(ft)	Y(ft)	Type	Surface	Bldg.	Site
1	3.1104	3.3795	Class 1 Systematic	Floor	2540-SU8	Monmouth
2	9.2786	3.3795	Class 1 Systematic	Floor	2540-SU8	Monmouth
3	15.4469	3.3795	Class 1 Systematic	Floor	2540-SU8	Monmouth
4	21.6151	3.3795	Class 1 Systematic	Floor	2540-SU8	Monmouth
5	27.7833	3.3795	Class 1 Systematic	Floor	2540-SU8	Monmouth
6	33.9515	3.3795	Class 1 Systematic	Floor	2540-SU8	Monmouth
7	40.1197	3.3795	Class 1 Systematic	Floor	2540-SU8	Monmouth
8	0.0263	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
9	6.1945	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
10	12.3627	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
11	18.531	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
12	24.6992	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
13	30.8674	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
14	37.0356	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
15	43.2038	8.7213	Class 1 Systematic	Floor	2540-SU8	Monmouth
16	3.1104	14.0632	Class 1 Systematic	Floor	2540-SU8	Monmouth
17	9.2786	14.0632	Class 1 Systematic	Floor	2540-SU8	Monmouth
18	15.4469	14.0632	Class 1 Systematic	Floor	2540-SU8	Monmouth
19	21.6151	14.0632	Class 1 Systematic	Floor	2540-SU8	Monmouth
20	27.7833	14.0632	Class 1 Systematic	Floor	2540-SU8	Monmouth
21	33.9515	14.0632	Class 1 Systematic	Floor	2540-SU8	Monmouth
22	40.1197	14.0632	Class 1 Systematic	Floor	2540-SU8	Monmouth
23	0.0263	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth
24	6.1945	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth
25	12.3627	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth
26	18.531	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth
27	24.6992	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth
28	30.8674	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth
29	37.0356	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth
30	43.2038	19.405	Class 1 Systematic	Floor	2540-SU8	Monmouth

Sample ID	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	2.8581	0	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
2	9.3617	0	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
3	15.8653	0	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
4	22.369	0	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
5	28.8726	0	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
6	35.3762	0	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
7	41.8798	0	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
8	43.45	4.9334	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
9	43.45	11.4371	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
10	43.45	17.9407	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
11	41.7557	22.75	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
12	35.2521	22.75	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
13	28.7484	22.75	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
14	22.2448	22.75	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
15	15.7412	22.75	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
16	9.2376	22.75	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
17	2.734	22.75	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
18	0	18.9803	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
19	0	12.4767	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
20	0	5.9731	0.2483	Class 1 Systematic	Wall	2540-SU9	Monmouth
21	6.1099	0	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
22	12.6135	0	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
23	19.1171	0	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
24	25.6208	0	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
25	32.1244	0	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
26	38.628	0	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
27	43.45	1.6816	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
28	43.45	8.1853	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
29	43.45	14.6889	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
30	43.45	21.1925	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
31	38.5039	22.75	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
32	32.0003	22.75	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
33	25.4966	22.75	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
34	18.993	22.75	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
35	12.4894	22.75	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
36	5.9858	22.75	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
37	0	22.2321	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
38	0	15.7285	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
39	0	9.2249	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth
40	0	2.7213	5.8806	Class 1 Systematic	Wall	2540-SU9	Monmouth



Legend

Class1 Sample Locations

- + Floor Sample Locations
- ● Wall Sample Locations
- Class 1 SU 10
- Class 1 SU 11

Feet: 0 1.5 3 6 9 12

BUILDING 2540
SU10 (FLOOR AREA ONLY) and SU11 (WALLS ONLY)
SYSTEMATIC SAMPLE LOCATIONS

FORT MONMOUTH
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name : Figure 13

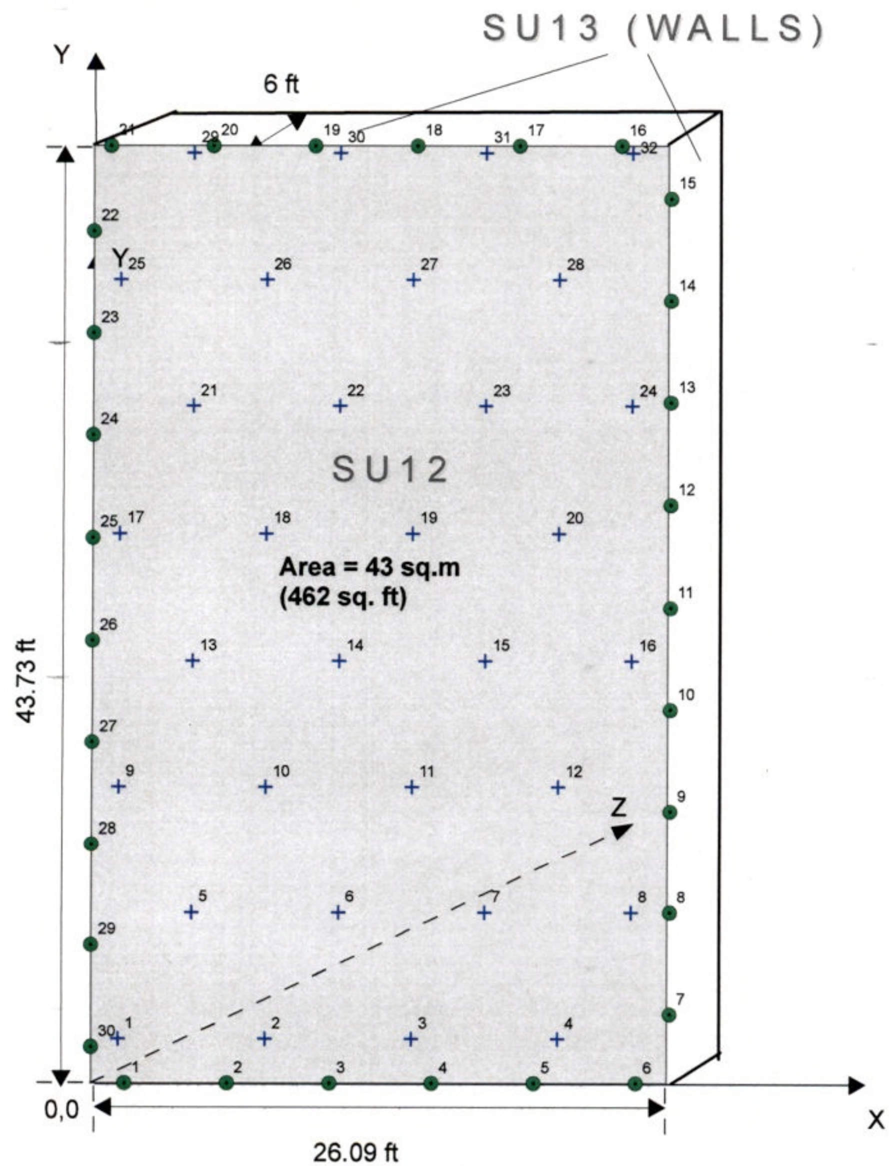
Prepared By: B.Pangelova

Figure 13

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X(ft)	Y(ft)	Type	Surface	Bldg.	Site
1	4.5417	0.4116	Class 1 Systematic	Floor	2540-SU10	Monmouth
2	9.8197	0.4116	Class 1 Systematic	Floor	2540-SU10	Monmouth
3	15.0976	0.4116	Class 1 Systematic	Floor	2540-SU10	Monmouth
4	1.9028	4.9824	Class 1 Systematic	Floor	2540-SU10	Monmouth
5	7.1807	4.9824	Class 1 Systematic	Floor	2540-SU10	Monmouth
6	12.4586	4.9824	Class 1 Systematic	Floor	2540-SU10	Monmouth
7	4.5417	9.5532	Class 1 Systematic	Floor	2540-SU10	Monmouth
8	9.8197	9.5532	Class 1 Systematic	Floor	2540-SU10	Monmouth
9	15.0976	9.5532	Class 1 Systematic	Floor	2540-SU10	Monmouth
10	1.9028	14.124	Class 1 Systematic	Floor	2540-SU10	Monmouth
11	7.1807	14.124	Class 1 Systematic	Floor	2540-SU10	Monmouth
12	12.4586	14.124	Class 1 Systematic	Floor	2540-SU10	Monmouth
13	4.5417	18.6948	Class 1 Systematic	Floor	2540-SU10	Monmouth
14	9.8197	18.6948	Class 1 Systematic	Floor	2540-SU10	Monmouth
15	15.0976	18.6948	Class 1 Systematic	Floor	2540-SU10	Monmouth
16	1.9028	23.2656	Class 1 Systematic	Floor	2540-SU10	Monmouth
17	7.1807	23.2656	Class 1 Systematic	Floor	2540-SU10	Monmouth
18	12.4586	23.2656	Class 1 Systematic	Floor	2540-SU10	Monmouth
19	4.5417	27.8364	Class 1 Systematic	Floor	2540-SU10	Monmouth
20	9.8197	27.8364	Class 1 Systematic	Floor	2540-SU10	Monmouth
21	15.0976	27.8364	Class 1 Systematic	Floor	2540-SU10	Monmouth
22	1.9028	32.4072	Class 1 Systematic	Floor	2540-SU10	Monmouth
23	7.1807	32.4072	Class 1 Systematic	Floor	2540-SU10	Monmouth
24	12.4586	32.4072	Class 1 Systematic	Floor	2540-SU10	Monmouth
25	4.5417	36.9781	Class 1 Systematic	Floor	2540-SU10	Monmouth
26	9.8197	36.9781	Class 1 Systematic	Floor	2540-SU10	Monmouth
27	15.0976	36.9781	Class 1 Systematic	Floor	2540-SU10	Monmouth
28	1.9028	41.5489	Class 1 Systematic	Floor	2540-SU10	Monmouth
29	7.1807	41.5489	Class 1 Systematic	Floor	2540-SU10	Monmouth
30	12.4586	41.5489	Class 1 Systematic	Floor	2540-SU10	Monmouth

Sample ID	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	6.4712	0	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
2	13.0611	0	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
3	16.55	3.1011	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
4	16.55	9.691	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
5	16.55	16.281	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
6	16.55	22.8709	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
7	16.55	29.4609	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
8	16.55	36.0508	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
9	16.55	42.6408	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
10	11.0493	43.73	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
11	4.4593	43.73	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
12	0	41.5994	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
13	0	35.0094	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
14	0	28.4195	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
15	0	21.8295	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
16	0	15.2395	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
17	0	8.6496	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
18	0	2.0596	0.2039	Class 1 Systematic	Wall	2540-SU11	Monmouth
19	3.1762	0	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
20	9.7661	0	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
21	16.3561	0	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
22	16.55	6.396	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
23	16.55	12.986	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
24	16.55	19.5759	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
25	16.55	26.1659	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
26	16.55	32.7559	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
27	16.55	39.3458	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
28	14.3442	43.73	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
29	7.7543	43.73	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
30	1.1643	43.73	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
31	0	38.3044	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
32	0	31.7144	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
33	0	25.1245	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
34	0	18.5345	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
35	0	11.9446	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth
36	0	5.3546	5.911	Class 1 Systematic	Wall	2540-SU11	Monmouth



Legend

- + Floor Sample Locations
- ● Wall Sample Locations
- Class 1 SU 12
- Class 1 SU 13

Feet: 0 1.5 3 6 9 12

BUILDING 2540
SU12 (FLOOR AREA ONLY) and SU13 (WALLS ONLY)
SYSTEMATIC SAMPLE LOCATIONS

FORT MONMOUTH
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name : Figure 14

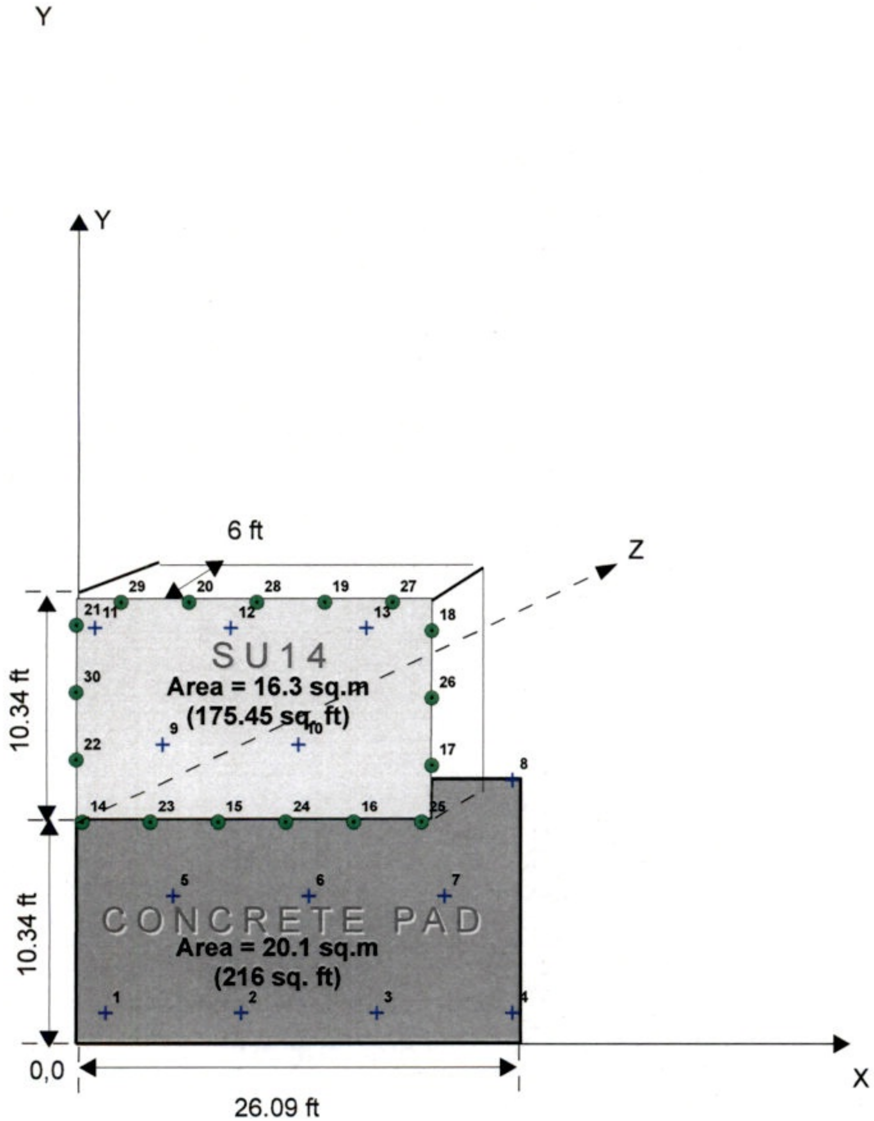
Prepared By: B.Pangelova

Figure 14

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X(ft)	Y(ft)	Type	Surface	Bldg.	Site
1	1.2357	2.0602	Class 1 Systematic	Floor	2540-SU12	Monmouth
2	8.0543	2.0602	Class 1 Systematic	Floor	2540-SU12	Monmouth
3	14.8728	2.0602	Class 1 Systematic	Floor	2540-SU12	Monmouth
4	21.6914	2.0602	Class 1 Systematic	Floor	2540-SU12	Monmouth
5	4.645	7.9653	Class 1 Systematic	Floor	2540-SU12	Monmouth
6	11.4636	7.9653	Class 1 Systematic	Floor	2540-SU12	Monmouth
7	18.2821	7.9653	Class 1 Systematic	Floor	2540-SU12	Monmouth
8	25.1007	7.9653	Class 1 Systematic	Floor	2540-SU12	Monmouth
9	1.2357	13.8703	Class 1 Systematic	Floor	2540-SU12	Monmouth
10	8.0543	13.8703	Class 1 Systematic	Floor	2540-SU12	Monmouth
11	14.8728	13.8703	Class 1 Systematic	Floor	2540-SU12	Monmouth
12	21.6914	13.8703	Class 1 Systematic	Floor	2540-SU12	Monmouth
13	4.645	19.7754	Class 1 Systematic	Floor	2540-SU12	Monmouth
14	11.4636	19.7754	Class 1 Systematic	Floor	2540-SU12	Monmouth
15	18.2821	19.7754	Class 1 Systematic	Floor	2540-SU12	Monmouth
16	25.1007	19.7754	Class 1 Systematic	Floor	2540-SU12	Monmouth
17	1.2357	25.6804	Class 1 Systematic	Floor	2540-SU12	Monmouth
18	8.0543	25.6804	Class 1 Systematic	Floor	2540-SU12	Monmouth
19	14.8728	25.6804	Class 1 Systematic	Floor	2540-SU12	Monmouth
20	21.6914	25.6804	Class 1 Systematic	Floor	2540-SU12	Monmouth
21	4.645	31.5854	Class 1 Systematic	Floor	2540-SU12	Monmouth
22	11.4636	31.5854	Class 1 Systematic	Floor	2540-SU12	Monmouth
23	18.2821	31.5854	Class 1 Systematic	Floor	2540-SU12	Monmouth
24	25.1007	31.5854	Class 1 Systematic	Floor	2540-SU12	Monmouth
25	1.2357	37.4905	Class 1 Systematic	Floor	2540-SU12	Monmouth
26	8.0543	37.4905	Class 1 Systematic	Floor	2540-SU12	Monmouth
27	14.8728	37.4905	Class 1 Systematic	Floor	2540-SU12	Monmouth
28	21.6914	37.4905	Class 1 Systematic	Floor	2540-SU12	Monmouth
29	4.645	43.3955	Class 1 Systematic	Floor	2540-SU12	Monmouth
30	11.4636	43.3955	Class 1 Systematic	Floor	2540-SU12	Monmouth
31	18.2821	43.3955	Class 1 Systematic	Floor	2540-SU12	Monmouth
32	25.1007	43.3955	Class 1 Systematic	Floor	2540-SU12	Monmouth

Sample ID	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	1.5459	0	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
2	6.3056	0	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
3	11.0653	0	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
4	15.825	0	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
5	20.5847	0	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
6	25.3444	0	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
7	26.9	3.204	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
8	26.9	7.9637	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
9	26.9	12.7234	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
10	26.9	17.4831	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
11	26.9	22.2428	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
12	26.9	27.0025	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
13	26.9	31.7621	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
14	26.9	36.5218	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
15	26.9	41.2815	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
16	24.5888	43.73	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
17	19.8291	43.73	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
18	15.0694	43.73	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
19	10.3098	43.73	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
20	5.5501	43.73	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
21	0.7904	43.73	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
22	0	39.7607	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
23	0	35.001	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
24	0	30.2413	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
25	0	25.4817	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
26	0	20.722	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
27	0	15.9623	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
28	0	11.2026	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
29	0	6.4429	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth
30	0	1.6833	4.2711	Class 1 Systematic	Wall	2540-SU13	Monmouth



Legend

Class1 Sample Locations

- Floor Sample Locations
- Wall Sample Locations
- Class 1 SU 8
- Concrete Pad

Feet
0 1 2 4 6 8

BUILDING 2540
SU14 AND CONCRETE PAD
SYSTEMATIC SAMPLE LOCATIONS

FORT MONMOUTH
NEW JERSEY

Date: April, 2007

Project #: 05-3132.01

File Name : Figure 15

Prepared By: B.Pangelova

Figure 15

CABRERA SERVICES
RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

Sample ID	X(ft)	Y(ft)	Z(ft)	Type	Surface	Bldg.	Site
1	1.3568	1.4086	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
2	7.6758	1.4086	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
3	13.9948	1.4086	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
4	20.3138	1.4086	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
5	4.5163	6.881	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
6	10.8353	6.881	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
7	17.1543	6.881	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
8	20.3138	12.3534	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
9	4.0245	14.0089	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
10	10.3435	14.0089	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
11	0.865	19.4813	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
12	7.184	19.4813	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
13	13.503	19.4813	0	Class 1 Systematic	Floor	2540-SU14	Monmouth
14	0.2816	10.34	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
15	6.6006	10.34	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
16	12.9196	10.34	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
17	16.55	13.0286	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
18	16.55	19.3476	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
19	11.5634	20.68	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
20	5.2444	20.68	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
21	0	19.6054	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
22	0	13.2864	0.2168	Class 1 Systematic	Wall	2540-SU14	Monmouth
23	3.4411	10.34	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth
24	9.7601	10.34	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth
25	16.0791	10.34	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth
26	16.55	16.1881	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth
27	14.7229	20.68	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth
28	8.4039	20.68	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth
29	2.0849	20.68	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth
30	0	16.4459	5.6892	Class 1 Systematic	Wall	2540-SU14	Monmouth

APPENDIX A
RADIONUCLIDES MINIMUM DETECTABLE ACTIVITIES

APPENDIX A
RADIONUCLIDE MDAs

LUDLUM 43-37

Radionuclide[j]	Type	Screening Values for Building Surfaces: Transferable	Screening Values for Building Surfaces: Surface Total	Efficiency*	Buildings/Structures: Allowable Counts Transferable (cpm/100cm^2)	Buildings/Structures: Allowable Counts Total Surface (cpm)	Static Survey MDA[e,f,g] (dpm/100cm^2)	Scan Survey MDA[e,f,g] (dpm/100cm^2)
Radiological Constituents of Concern								
^{3}H	low energy beta	1.20E+07	1.20E+08	a,d	Instrument not used for transferable analyses	-		
^{14}C	low energy beta	3.60E+05	3.60E+06	0.12		2.51E+06		
^{36}Cl	beta	4.99E+04	4.99E+05	0.25		7.26E+05		
^{57}Co	beta/gamma	2.11E+04	2.11E+05	a		-		
^{60}Co	beta/gamma	7.10E+02	7.10E+03	0.25		1.03E+04	93[h]	420[h]
^{63}Ni	low energy beta	1.80E+05	1.80E+06	a		-		
^{90}Sr/Y	beta	8.70E+02	8.70E+03	0.25		1.27E+04		
^{99}Tc	beta	1.31E+05	1.31E+06	0.20		1.52E+06		
^{137}Cs	beta	2.80E+03	2.80E+04	0.25		4.07E+04		
^{154}Eu	beta/gamma	1.15E+03	1.15E+04	0.15		1.00E+04		
^{226}Ra	alpha	1.12E+02	1.12E+03	0.17		1.11E+03		
^{232}Th	alpha	6.03E-01	6.03E+00	0.17		5.97E+00	17[i]	17[i]
^{238}U	alpha	1.01E+01	1.01E+02	0.25		1.47E+02		
^{238}Pu	alpha	3.06E+00	3.06E+01	0.17		3.03E+01		
^{239}Pu	alpha	2.79E+00	2.79E+01	0.17		2.76E+01		
^{241}Am	alpha/gamma	2.70E+00	2.70E+01	0.17		2.67E+01		
^{252}Cf	alpha	8.68E+00	8.68E+01	0.17		8.59E+01		

Footnotes

* Efficiency based on energy, yield, and instrument

* 0.8 mg/cm^2 window on 43-37 and 0.5 cm air gap limits beta detection to energies > 30 keV

[a] Low energy beta emitter not detectable by this instrument

[b] Low energy gamma emitter not detectable by this instrument

[c] Gamma emitter not detectable by this instrument

[d] Presence/absence of tritium is determined solely upon smear results

[e] MDA based on NUREG 1507 MDA equation 3-11 (Strom and Stansbury)

[f] Beta MDA assumes 800 cpm background, 1 minute background count and 1 minute sample count

[g] Alpha MDA assumes 14 cpm background, 30 minute background count and 3 minute sample count

[h] Count time for static is 1 minute background and 1 minute sample; Scan speed is 30 cm/sec, scan MDA is 420 dpm/100cm^2

[i] Count time for static is 5 minute background and 1 minute sample; Scan speed is 2 cm/sec, scan MDA is based on static

[j] Isotopes I-125, Kr-85, and Rn-222 are not listed since these isotopes are present only as short -lived isotopes not currently present, as noble gases not adhering to surfaces, or short-lived radon progeny determined by other means

APPENDIX A
RADIONUCLIDE MDAs

LUDLUM 43-68

Radionuclide[j]	Type	Screening Values for Building Surfaces (dpm/100cm^2) Transferable	Surface Total	Screening Values for Soil (pCi/g) Total	Efficiency*	Buildings/Structures Allowable Counts Transferable (cpm)	Allowable Counts Total Surface (cpm)	Static Survey MDA[e,f,g] (dpm/100cm^2)	Scan Survey MDA[e,f,g] (dpm/100cm^2)
Radiological Constituents of Concern									
^{3}H	low energy beta	1.20E+07	1.20E+08	110	a,d	Instrument not used for transferable analyses	-		
^{14}C	low energy beta	3.60E+05	3.60E+06	11.6	0.12		5.44E+05		
^{36}Cl	beta	4.99E+04	4.99E+05	0.36	0.24		1.51E+05		
^{57}Co	beta/gamma	2.11E+04	2.11E+05	150	a		-		
^{60}Co	beta/gamma	7.10E+02	7.10E+03	3.8	0.24		2.15E+03	213[h]	954[h]
^{63}Ni	low energy beta	1.80E+05	1.80E+06	2,100	a		-		
^{90}Sr/Y	beta	8.70E+02	8.70E+03	1.7	0.24		2.63E+03		
^{99}Tc	beta	1.31E+05	1.31E+06	19	0.24		3.96E+05		
^{137}Cs	beta	2.80E+03	2.80E+04	11	0.24		8.47E+03		
^{154}Eu	beta/gamma	1.15E+03	1.15E+04	8	0.16		2.32E+03		
^{226}Ra	alpha	1.12E+02	1.12E+03	0.7	0.16		2.26E+02		
^{232}Th	alpha	6.03E-01	6.03E+00	1.1	0.16		1.22E+00	2.5[i]	2.5[i]
^{238}U	alpha	1.01E+01	1.01E+02	14	0.16		2.04E+01		
^{238}Pu	alpha	3.06E+00	3.06E+01	2.5	0.16		6.17E+00		
^{239}Pu	alpha	2.79E+00	2.79E+01	2.3	0.16		5.62E+00		
^{241}Am	alpha/gamma	2.70E+00	2.70E+01	2.1	0.16		5.44E+00		
^{252}Cf	alpha	8.68E+00	8.68E+01	6.86	0.16		1.75E+01		

Footnotes

* Efficiency based on energy, yield, and instrument

* 0.8 mg/cm^2 window on 43-37 and 0.5 cm air gap limits beta detection to energies > 30 keV

[a] Low energy beta emitter not detectable by this instrument

[b] Low energy gamma emitter not detectable by this instrument

[c] Gamma emitter not detectable by this instrument

[d] Presence/absence of tritium is determined solely upon smear results

[e] MDA based on NUREG 1507 MDA equation 3-11 (Strom and Stansbury)

[f] Beta MDA assumes 800 cpm background, 1 minute background count and 1 minute sample count

[g] Alpha MDA assumes 14 cpm background, 30 minute background count and 3 minute sample count

[h] Count time for static is 1 minute background and 1 minute sample; Scan speed is 22 cm/sec, scan MDA is 954 dpm/100cm ^{2}

[i] Count time for static is 3 minutes background and 30 minute sample; Scan speed is 0.25 cm/sec, scan MDA is based on static

[j] Isotopes I-125, Kr-85, and Rn-222 are not listed since these isotopes are present only as short -lived isotopes not currently present, as noble gases not adhering to surfaces, or short-lived radon progeny determined by other means

APPENDIX A
RADIONUCLIDE MDAs

LUDLUM 2929 with 43-10-1

Radionuclide[j]	Type	Screening Values for Building Surfaces		Efficiency*	Buildings/ Structures	Static Survey MDA[e,f,g] (dpm/100cm²)	Scan Survey MDA[e,f,g] (dpm/100cm²)
		Transferable	Surface Total		Allowable Counts Transferable (cpm/100cm²)		
Radiological Constituents of Concern							
^{3}H	low energy beta	1.20E+07	1.20E+08	a,d	-		
^{14}C	low energy beta	3.60E+05	3.60E+06	0.08	2.88E+04		
^{36}Cl	beta	4.99E+04	4.99E+05	0.28	1.40E+04		
^{57}Co	beta/gamma	2.11E+04	2.11E+05	a	-		
^{60}Co	beta/gamma	7.10E+02	7.10E+03	0.28	1.99E+02	116[h]	N/A
^{63}Ni	low energy beta	1.80E+05	1.80E+06	0.012	2.16E+03		
$^{90}Sr/Y$	beta	8.70E+02	8.70E+03	0.26	2.26E+02		
^{99}Tc	beta	1.31E+05	1.31E+06	0.27	3.54E+04		
^{137}Cs	beta	2.80E+03	2.80E+04	0.29	8.12E+02		
^{154}Eu	beta/gamma	1.15E+03	1.15E+04	0.27	3.11E+02		
^{226}Ra	alpha	1.12E+02	1.12E+03	0.37	4.14E+01		
^{232}Th	alpha	6.03E-01	6.03E+00	0.37	2.23E-01	2.5	N/A
^{238}U	alpha	1.01E+01	1.01E+02	0.39	3.94E+00		
^{238}Pu	alpha	3.06E+00	3.06E+01	0.37	1.13E+00		
^{239}Pu	alpha	2.79E+00	2.79E+01	0.37	1.03E+00		
^{241}Am	alpha/gamma	2.70E+00	2.70E+01	0.39	1.05E+00		
^{252}Cf	alpha	8.68E+00	8.68E+01	0.39	3.39E+00		

Footnotes

* Efficiency based on energy, yield, and instrument

* 0.8 mg/cm² window on 43-37 and 0.5 cm air gap limits beta detection to energies > 30 keV

[a] Low energy beta emitter not detectable by this instrument

[b] Low energy gamma emitter not detectable by this instrument

[c] Gamma emitter not detectable by this instrument

[d] Presence/absence of tritium is determined solely upon smear results

[e] MDA based on NUREG 1507 MDA equation 3-11 (Strom and Stansbury)

[f] Beta MDA assumes 800 cpm background, 1 minute background count and 1 minute sample count

[g] Alpha MDA assumes 14 cpm background, 30 minute background count and 3 minute sample count

[h] Count time for static is 1 minute background and 1 minute sample; Instrument not used for scanning

[i] Count time for static is 30 minutes background and 15 minute sample; Instrument not used for scan

[j] Isotopes I-125, Kr-85, and Rn-222 are not listed since these isotopes are present only as short -lived isotopes not currently present, as noble gases not adhering to surfaces, or short-lived radon progeny determined by other means