THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

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November 2, 2006

9-9

U.S. Nuclear Regulatory Commission
Region I
Attn: Licensing Assistance Team
475 Allendale Road
King of Prussia, PA 19406

RECEIVED
REGION 1
2006 NOV -6 PM 12: 22

Re: License Amendment Request to Remove the Environmental Services Building Annex: 03000883
Rutgers University License Number 29-05218-28 and
UMDNJ/RWJMS License Number 29-15188-01 03008709

Mail Control No's: Rutgers University 139510
UMDNJ/RWJMS 139511

To Whom It May Concern:

This letter is to request an amendment to radioactive materials license numbers 29-05218-28 and 29-15188-01 authorizing unrestricted release of the Environmental Services Building Annex, commonly referred to as the Gamma Greenhouse. The facility is located within the Environmental Services Building Complex at 126 Davidson Road, Piscataway, NJ, 08854.

Licensed activities have ceased and the facility has undergone decommissioning conducted under the provisions of the Rutgers radioactive materials license and in accordance with a MARRSIM based decommissioning work plan. Chase Environmental Group was procured to perform the decommissioning activities. The enclosed Final Status Report demonstrates that the facility meets the criteria for unrestricted use specified in 10 CFR 20 Subpart E.

We respectfully request the Commission expedite the review of the enclosed Final Status Report. The University has a critical need to expand an existing electrical power sub-station and the Environmental Services Building Annex site has been identified as the most appropriate location for this expansion. Please be advised that construction work will not proceed until the Commission has acted upon our amendment request.

139693/139694
NMSS/RGN1 MATERIALS-002

As referenced in our notification letter to the Commission dated September 6, 2006, this facility is also listed on the UMDNJ/RWJMS license. The UMDNJ/RWJMS is aware of these activities and Dr. Judith Neubauer, Associate Dean for Research and the representative of management to the Commission for UMDNJ/RWJMS is copied on this correspondence.

Thank you for considering our amendment request and should you have questions or concerns, please contact Mr. Patrick McDermott, University Health Physicist at 732-445-2550 or mcdermot@rehs.rutgers.edu or our Radiation Safety Officer, Mr. Michael Quinlan, Associate Vice President for Business Services at 732-932-7866 or quinlan@oldqueens.rutgers.edu.

Sincerely,

Philip Furmanski

c: Dr. Judith Neubauer, Associate Dean for Research
UMDNJ/RWJMS
675 Hoes Lane
Piscataway, NJ 08854

M. Quinlan, RSO
P. McDermott, Univ. Health Physicist
M. Kelly, Mgr. Env. Services
M. McLane, Director, REHS

Rutgers Environmental Services Building Annex Facility Decommissioning Final Status Report

NRC License Numbers:
29-05218-28
29-052188-01

October 16, 2006

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

Rutgers, The State University of New Jersey
27 Road 1
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Prepared by:
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3501 Workman Rd., Suite H
Knoxville, TN 37921

Ceg

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ACRONYMS

ALARA	As Low As Reasonably Achievable
BNL	Brookhaven National Laboratory
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DAW	Dry Active Waste
$DCGL_{EMC}$	Derived Concentration Guideline Level – Elevated Measurement Comparison
$DCGL_W$	Derived Concentration Guideline Level – Wilcoxon Rank Sum
DIS	Decay in Storage
DP	Decommissioning Plan
DQO	Data Quality Objective
DOT	US Department of Transportation
DSV	Default Screening Value
ECD	Electron Capture Device
ESB	Environmental Services Building
GGH	Gamma Greenhouse
GSF	Gross Square Feet
HEPA	High Efficiency Particulate Air
HH	Head House
HSA	Historical Site Assessment
ISS	Interim Storage Shed
LabRATS	Laboratory Release And Termination System
LAW	Large Area Wipe
LSC	Liquid Scintillation Counting
LSV	Liquid Scintillation Vial
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDCR	Minimum Detectable Count Rate
MDC	Minimum Detectable Concentration
NaI	Sodium Iodide (Detector)
NARM	Naturally Occurring and Accelerator Produced Radioactive Materials
NIST	National Institute of Standards and Technology
NJDEP	New Jersey Department of Environmental Protection
NRC	U.S. Nuclear Regulatory Commission
PSPC	Position Sensitive Proportional Counter
RCRA	Resource Conservation Recovery Act
RSO	Radiation Safety Officer
REHS	Rutgers Environmental Health and Safety
RSB	Radioactive Storage Building
SRA	Shonka Research Associates, Inc.
TEDE	Total Effective Dose Equivalent
TSDF	Transfer, Storage and Disposal Facility

1.0 Introduction

Rutgers, The State University of New Jersey (Rutgers) has decided to permanently decommission their Environmental Services Building Annex, commonly referred to as the Gamma Greenhouse (GGH), located at 126 Davidson Road, Piscataway, NJ 08854. For the balance of this report, the facility is referred to as the GGH. The facility is specifically listed on US Nuclear Regulatory Commission (NRC) radioactive materials license numbers 29-05218-28 and 29-052188-01. Principal activities involving radioactive materials have ceased and activities formerly performed at the facility have been relocated to other licensed facilities. Rutgers plans to demolish existing site structures and construct an electrical power substation. To achieve unrestricted release, Rutgers must demonstrate that impacted areas of the facility meet US Nuclear Regulatory Commission (NRC) release criteria for building structural surfaces and soils as well as New Jersey Department of Environmental Protection (NJDEP) release criteria for soils.

The facility is located on a one-acre fenced property containing three buildings; a Greenhouse, a Head House and an Interim Storage Shed (a fourth building, a small metal garden-type shed was removed during the project). The buildings are located within a 10'-12' high earthen berm constructed as radiation shielding. Operations at the facility included gamma irradiation; hazardous waste storage; and volume reduction, packaging, and shipping of hazardous and low level radioactive wastes. Built in 1960, the facility was operated as a Co-60 irradiator facility from 1962 until the early 1970's. In the mid 1970's Rutgers began to use the facility for storage and packaging of radioactive and hazardous wastes. Following the passage of the Resource Conservation and Recovery Act (RCRA), the University was granted a Part B permit as a hazardous waste Treatment, Storage and Disposal Facility (TSDF). The TSDF permit was closed in the mid 1990's. From the 1970's through the early 1990's the site was Rutgers' primary radioactive waste packaging and staging area. The vast majority (>95%) all of radioactive wastes (by any measure: activity, volume or weight) passing through the facility were comprised of radioisotopes of carbon, hydrogen, iodine, phosphorous or sulfur (CHIPS). Additionally, a source shipping cask located in the Greenhouse was received with fixed Cs-137 contamination that was later spread due to corrosion of the cask.

Rutgers procured Chase Environmental Group, Inc. (Chase) to perform all decommissioning activities. Decommissioning was performed in accordance with a site-specific Decommissioning Plan, Rutgers's Radiation Protection Program, standard operating procedures, as applicable, and Rutgers' NRC Radioactive Materials License No. 29-05218-28. On-site decommissioning activities were performed during several mobilizations from July 24 to September 22, 2006.

The facility was decommissioned under a Decommissioning Plan (DP) developed using the guidance provided in NUREG 1757, "Consolidated NMSS Decommissioning Guidance"; NUREG 1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM) and NJDEP Field Sampling Procedures Manual, Chapter 12, "Radiological Assessment". The DP provided the approach, methods, and techniques used for the radiological decommissioning of impacted areas of the facility. Final status

surveys were designed to implement the protocols and guidance provided in MARSSIM to demonstrate compliance with the default screening values specified in NUREG 1757, Volume 1, Appendix B. These methods ensured technically defensible data were generated to aid in determining whether or not the facility meets the release criteria for unrestricted use specified in 10 CFR 20 Subpart E and NJAC 7:28 Subchapter 12, "Remediation Standards for Radioactive Materials." Additionally, Chase developed a project-specific Quality Assurance Project Plan (QAPP) in support of the DP. The QAPP was developed and organized with emphasis given to maximizing worker safety, minimizing/eliminating off-site releases and minimizing overall project costs.

Chase conducted a Historical Site Assessment (HSA) and scoping surveys from July 24 to August 2, 2006. The purpose of the HSA and scoping surveys was to determine the current status of the site including potential, likely, or known sources of radioactive contamination by gathering data from various sources. Characterization surveys were performed from August 6-8, 2006. Scoping and characterization surveys revealed areas of surface contamination on concrete floor surfaces in buildings as well as areas of elevated activity in soils adjacent to process areas. Remediation consisted of removal of concrete surfaces and excavation of surface soils. Indoor remediation activities based on scoping survey results were performed from August 23-25, 2006 followed by final status surveys from September 6-8, 2006. Outdoor remediation activities were performed from September 19-21, 2006 with final status surveys being performed on September 22, 2006.

This report provides conclusive evidence that building structural surfaces, associated systems, and soils of outside grounds included in the scope of this report meet the established release criteria and are suitable to release for unrestricted use:

Building Surfaces and Structures

Based on the results of the surface and structure final status surveys on the survey unit with the highest average activity, **the maximum TEDE to an average member of the critical group due to residual radioactivity from licensed activities is 3.7 millirem/year** calculated using the building occupancy scenario of NRC-approved DandD Version 2.1 software under default conditions. This is 15% of the criterion of the 25 millirem/year for license termination specified by the NRC in 10 CFR 20 Subpart E and 25% of the 15 millirem/year ALARA goal established by Rutgers.

Soils of Outside Grounds

Based on the results of final status soil samples taken in the outside grounds survey unit, **the maximum TEDE to an average member of the critical group due to residual radioactivity from licensed activities is 2.0 millirem/year** calculated using the residential scenario of NRC-approved DandD Version 2.1 software under default conditions. This is 8% of the criterion of 25 millirem/year for license termination specified by the NRC in 10 CFR 20 Subpart E and 13% of the 15 millirem/year ALARA goal established by Rutgers and specified by NJDEP in NJAC 7:28 Subchapter 12.

2.0 Historical Site Assessment

2.1 Ownership

The facility and surrounding properties are owned by Rutgers. Ownership of the facility will remain with Rutgers following decommissioning. Rutgers utilities will construct an electrical power substation on the property.

2.2 License History

Radioactive materials license files were reviewed to identify historical operations, nuclides used and quantities used affecting the GGH facility. Essentially, licensed operations for research and development did not change much over the history of the license. Amendments typically made minor administrative changes and minor changes in authorized materials and quantities. Much of the license history deals with changes to usage in various campus buildings that do not affect the GGH. Since the GGH was used as the radioactive waste storage area for all Rutgers waste being disposed from early 1970's to mid 1990's, radioactive waste disposal records offered the most insight regarding the potential nuclides of concern and quantities at the facility. The vast majority (>95%) all of radioactive wastes (by any measure: activity, volume or weight) passing through the GGH facility were comprised of radioisotopes of carbon, hydrogen, iodine, phosphorous or sulfur (CHIPS).

Current and previous employees having knowledge of facility historical operations were interviewed. The interviewees' presence at the facility spanned the continuous period of facility operations from 1971 to present. The accounts of all interviewees were remarkably congruent. Each interviewee had no knowledge of any release of radioactive materials outside facility buildings. Additionally, each interviewee identified the same locations as being the most probable for residual activity.

The facility was constructed in 1960 and became operational as an irradiator facility in 1962. The facility was operated under an Atomic Energy Commission license until the early 1970's. Records during this period are archived. It is known that the facility was only used as an irradiator facility for the period that records are not readily available (dispersible materials were not present).

The facility currently operates under two separate NRC licenses (one license is for operations at Rutgers campuses and one license is for operations at the University of Medicine and Dentistry of New Jersey). Wastes generated under both of these NRC licenses were received at the facility.

<u>License Number 29-05218-28</u>

License number 29-05218-28 for the Rutgers campuses is currently on Amendment 60 issued April 7, 2004 with an expiration date of February 28, 2007. A copy of the current license is provided in Appendix A. Amendment 60 possession limits and authorized uses are summarized in Table 2-1.

The following pages have been redacted from this document:

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There were two historical instances of leaking sealed sources - a Ni-63 source in 2001 and a Sm-151 source in 2005. Both of these leaking sources were disposed via the ESB and were never located at the GGH Facility.

All alpha emitters at the facility were stored in a small (~ 4' x 6') bermed area at the south end of the Greenhouse (see Figure 1) or in buckets near the south wall. Alpha emitters were segregated and stored for long periods of time because disposal was non-routine, difficult or costly. There has never been any indication of leakage or alpha contamination at the facility. Alpha emitters stored at the facility consisted of the following:

- Ra-226 sealed sources: check sources, needles, deck markers, and sight gauges that never had any indication of leakage
- Radium and uranium salts in sealed glass vials that were never opened.
- Uranium mill tailings in a coffee can sized tin less than 1/3 full. In the early 1990's it was noticed that the lid was corroded, so the lid was sealed with tape and then the tin was bagged and sent to the ESB. Surveys performed during this operation indicated that there was no leakage of material outside the tin.
- Uranyl/thorium nitrates and acetates in reagent and diluted forms. Reagents were stored in the original manufacturer's packaging. Diluted reagents were stored in sealed jugs.

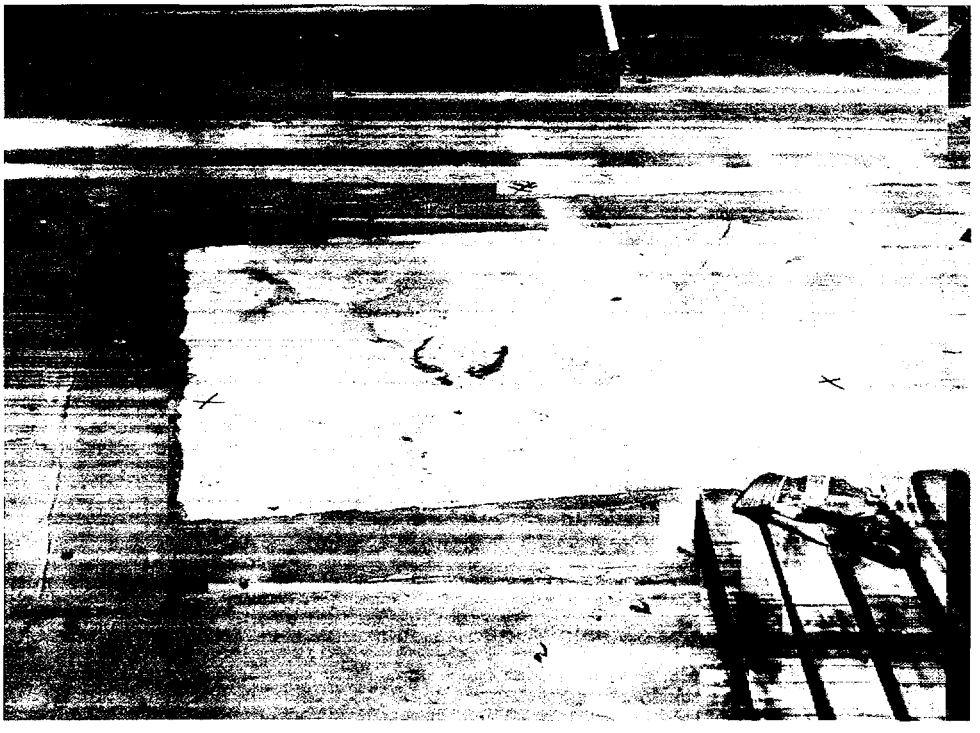

Figure 2-1 - Alpha Emitter Storage Area (berm has been removed, outline visible)

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amendment not withstanding, wastes generated under this license were received and processed at the facility prior to this amendment with the knowledge and concurrence of the NRC. On March 30, 2004, license 29-15188-02 (for an irradiator) was terminated and the irradiator added to license 29-15188-01.

State Licenses

Operations involving accelerator-produced materials are conducted under State licenses issued by New Jersey Department of Environmental Protection, Bureau of Environmental Radiation.

License # NJSL-80146/01/018 for the Robert Wood Johnson Medical School is currently on Amendment 18 with an expiration date of 1/31/09. The license authorizes the use of naturally occurring and accelerator produced radioactive materials (NARM) with atomic numbers 1-83 for instruction, research and development. The maximum possession quantity is 2 Ci in any form. Prior amendments were reviewed and it was discovered that the license previously authorized the use of up to 10 mCi Co-57 sources and up to 3 Ci (< 20 mCi any source) of accelerator products in any form.

License # NJSL-80091/01/019 for Rutgers University is currently on Amendment 19 with an expiration date of 7/31/2010. The license authorizes the use of NARM with atomic numbers 1-92 for instruction, research and development. The maximum possession quantity is 200 mCi in any form. The license also authorizes 10 mCi Cd-109 sealed sources, 25 mCi Ra-226 in a RaBe sealed neutron source. Prior amendments were reviewed and it was discovered that the license previously authorized the use of up to 1 Ci of accelerator products in any form for instruction, research and development as well as additional Ra-226 sealed sources up to 10 mCi. Much of the content of this license are artifacts from a cyclotron that was operated at the Bush Campus and then removed and shipped to Australia in the mid 1980's.

2.3 Facility Descriptions and Operations

The Rutgers Gamma Greenhouse (GGH) is located on the Rutgers campus at Building 3553, 126 Davidson Road, Piscataway, NJ 08854. The facility is located on a one-acre fenced property and contains three buildings; a Greenhouse, Head House and Interim Storage Shed. A metal "Sears Shed" was removed during the decommissioning project. The buildings are located within a 10'-12' high earthen berm that was constructed as radiation shielding. The area within the earthen berm is approximately one-quarter acre. The road entering the facility and a portion of the yard area north of the greenhouse were paved in the mid 1990's. Detailed descriptions of buildings and outside grounds are provided below. A satellite photo and a map of the facility are presented in Appendix B. Operations performed at the facility included gamma irradiation; hazardous waste storage; and volume reduction, packaging, and shipping of hazardous and low level radioactive wastes.

The facility was built in 1960 and became operational as a Co-60 irradiator facility on March 13, 1962. The original source was ~ 100 Ci and was replaced with a ~ 650 Ci source in the late 1960's. These sources were sealed and never showed any indication of leaking.

In the mid 1970's Rutgers began to use the facility for the storage and packaging of radioactive and hazardous wastes. Approximately 60% of the materials passing through the facility were chemical wastes with the remainder being low level radioactive wastes and mixed wastes. Following the passage of the Resource Conservation and Recovery Act (RCRA), the University applied for and was granted a Part B permit as a hazardous waste Treatment, Storage and Disposal Facility (TSDF). The TSDF permit was closed in the mid 1990's after all hazardous waste operations were transferred to the Environmental Storage Building (ESB). See Appendix C for evidence of the Acceptance of Closure Certification and a No Further Action Proposal (NFAP). The NFAP references the remedial work performed over the hazardous waste drum storage pad area. No licensed materials were utilized or stored in this area.

From the 1970's through the early 1990's the site was Rutgers' primary radioactive waste packaging and staging area. Dry active waste (DAW) was compacted into drums, the drums staged and ~ 4-6 times per year they were shipped off-site for disposal (for some periods, drums were shipped monthly).

With the completion of the ESB in 1994, all operations involving hazardous wastes ceased at the GGH. This time frame (1992-94) also corresponded to the beginning of Rutgers decay-in-storage (DIS) program for DAW and the drain disposal program for aqueous liquid radioactive wastes. Liquid radioactive wastes awaiting drain disposal off-site were stored in drums in what is now the Interim Storage Shed. Drain disposal never occurred at the facility. Short-lived radioactive wastes for DIS were staged in the Greenhouse. These DIS/DAW wastes were held until completion of the Radioactive Storage Building (RSB) in August 2005.

2.3.1 Greenhouse

The Greenhouse Building is a 1726 square foot building with concrete floors, concrete block and glass walls, and a metal-framed glass ceiling. The glass walls sit on a 2' high concrete block wall. Access to the building is via a door from the Head House on the north wall or from double doors located on the east wall. Four supply fans are located outside the building at ground level on the east side of the Greenhouse (one of these fans was removed during the decommissioning project). A single exhaust fan is located in the center of the south wall ~ 12 feet high. The Greenhouse floor drains were grouted prior to conversion to a waste storage facility.

The GGH was placed into operation on March 13, 1962. A 100 Ci Co-60 was located near the north end of the Greenhouse. The attached Head House was initially used for preparation of experimental specimens. The Head House and source operating area are shielded by a U-shaped concrete shield wall approximately 21' wide and 3' thick. The source was stored in a 6' aluminum pipe vertically buried through the concrete floor and into the ground. Just prior to receipt of the second Co-60 source, a second aluminum pipe was installed for storage of the original source.

From the 1970's through the early 1990's, the greenhouse was used to store sealed sources (such as soil moisture probes) behind the shield wall, the Co-60 sources (underground) and various other unwanted radioactive materials (such as the alpha emitters described above) in the concrete berm located at the south end. Other radioactive materials were stored in buckets on the south wall. Some of these materials were items such as uranium mill tailings, thorium nitrates and acetates, uranyl nitrates and acetates, and many other materials that were difficult or expensive to dispose of. The alpha emitters were sealed sources or in sealed containers and reagent bottles and were not opened or processed during their storage as waste – they were passed through the facility to commercial waste brokers for disposal. There are no records of alpha-emitter contamination events and no indication from surveys conducted in the past 10 years of any fixed or removable alpha contamination. For a period of time in the mid 1980's, a lead brick wall was constructed in the southwest corner of the building for storage of sealed sources.

From ~ 1994 to 2005 the greenhouse was mainly utilized to store DIS wastes prior to disposal as non-radioactive. Due to the short half-lives of the isotopes involved, no contamination is expected to remain as a result of these activities. (While decay calculations based on total quantities stored indicate that S-35 and I-125 could still be present, contamination events originating 1.5 to 2.0 years ago that would have resulted in lingering contamination today would have been noted by REHS staff during routine surveys.)

The Greenhouse until recently housed the two original Co-60 sources. These sources have been shipped off-site. Wipe records of the two sources indicated no leakage and these are not contributors to potential site contaminants.

The Greenhouse has also housed, since 1968, the BNL shipping cask the second of the two Co-60 sources was shipped in. This cask had elevated radioactivity since its arrival. While little removable activity was evident from 1968 through the end of 2005, it was clearly contaminated with a long-lived gamma emitter. In 1994, a contractor was hired to remove the contamination. These efforts were unsuccessful in removing fixed contamination, but the small amounts of removable contamination were eliminated during this operation. After the Co-60 sources were shipped

off-site in late 2005, the BNL cask started to "flake". The cask had gotten wet and it is believed that moisture in and on the cask contributed to corrosion and flaking. The flakes are contaminated with what was identified as Cs-137. When the flaking occurred, an initial sweep of the area captured > 95% of the activity. Residual removable activity is on the order of 100's to 1000's of dpm/100cm^2. The cask was removed from the facility on July 26, 2006.

Interviewees recalled several instances of spills of chemical wastes in the Greenhouse, but no instances involving radioactive materials.

Figure 2-2 – BNL Shipping Cask

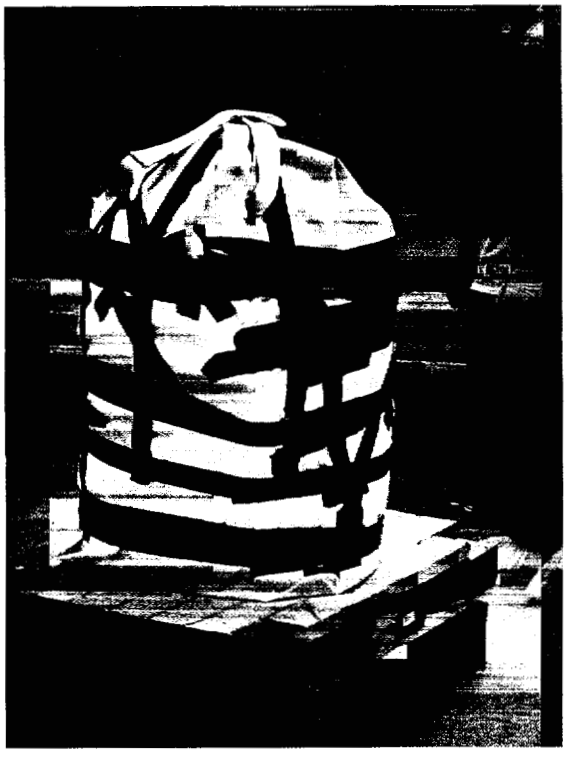

Figure 2-3 – BNL Shipping Cask (Packaged for Transport to RSB)

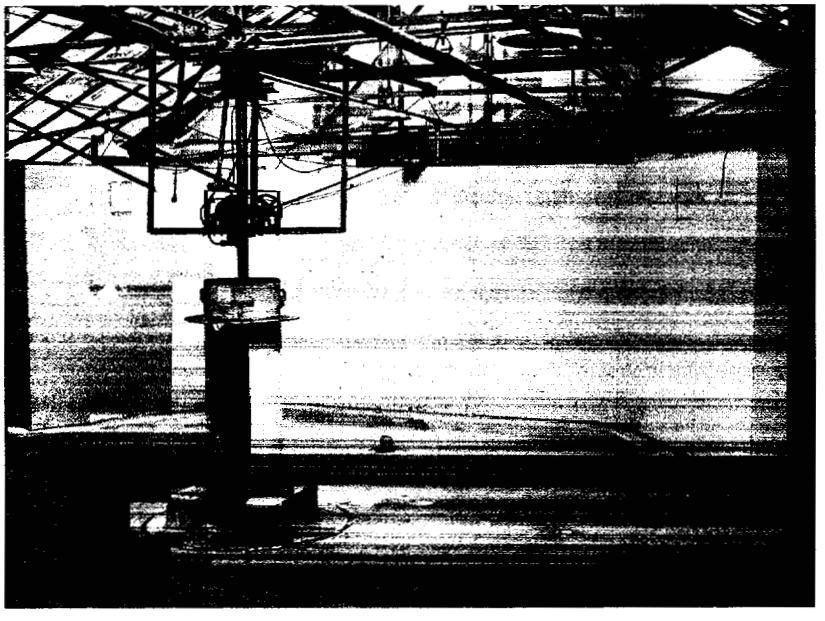

Figure 2-4 - Greenhouse Shield Wall Facing North

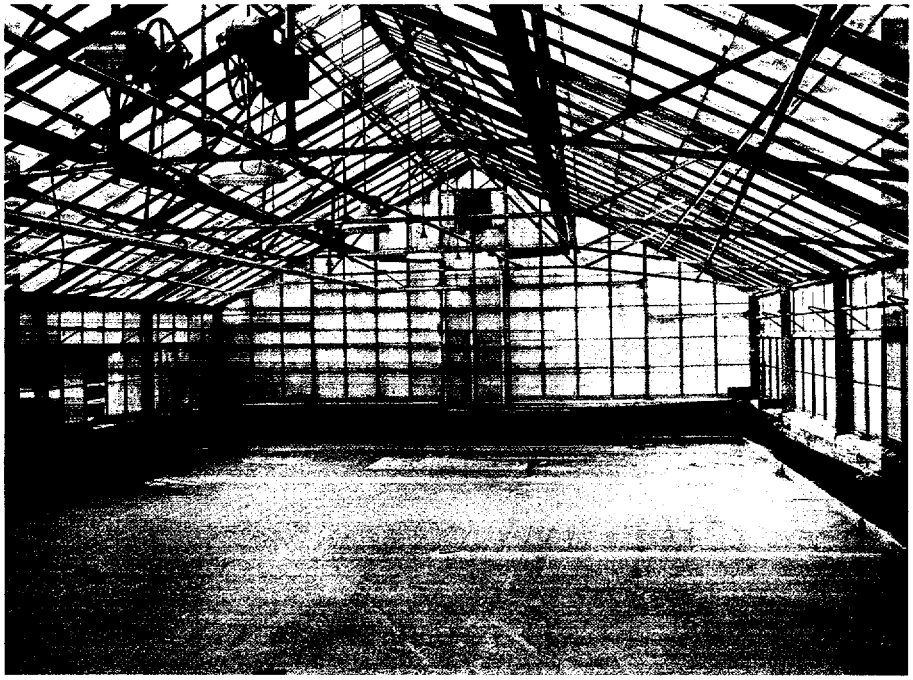

Figure 2-5 - Greenhouse Facing South

2.3.2 Head House

The Head House Building is a 354 square foot building with concrete floors and concrete block walls. A loft area (with outside access only) houses the ventilation exhaust ducts and fan. A boiler used for greenhouse heating is located on the east side of the room. There is a condensate floor drain near the boiler that was not used for waste processing operations. Waste processing operations were conducted on the west side of the room. In the northwest corner there was a "solid-pack" operation for packaging liquids and a drum compactor for packaging solids. Two flexible exhaust ducts were used to maintain a negative pressure near the operations. A letter dated May 13, 1981 outlines a cost estimate to install a shower, hot water heater, sink and outside water bibs at the Head House. A holding tank was installed in the 1980's so that drain water (sinks, shower, etc.) could be held prior to disposal. It is believed that the holding tank, shower, water supplies, hot water heater and sink were installed in the east half of the room at the same time. The shower was for personnel decontamination and was never used. The sink was used routinely for hand washing, but never for decontamination.

The Head House was the primary packaging area for the liquid, DAW and animal carcass wastes generated from the 1970's through the early 1990's. For much of this time, DAW wastes (long and short lived) were compacted into 55 gallon drums lined with poly bags prior to shipment off-site. Nearly all radioactive liquids (prior to 1993) generated were solid-packed under a floating hood in the head house. Solid packing consisted of pumping liquid waste from carboys into 30 gallon drums

overpacked into 55 gallon drums. On several occasions, tygon tubing from the peristaltic pump broke resulting in small spills. The spills were immediately cleaned and affected surfaces verified free of contamination. Animal carcasses were stored in a freezer in the head house prior to packaging for disposal off-site.

With the exception of liquid scintillation vials (LSV) that were processed by crushing, nearly all the waste materials that have been processed on-site from the 1970's through the early 1990's have passed through the head house. Monthly routine surveys records indicate that there was occasionally elevated removable radioactivity, but typically on the order of 100's of dpm/100cm^2.

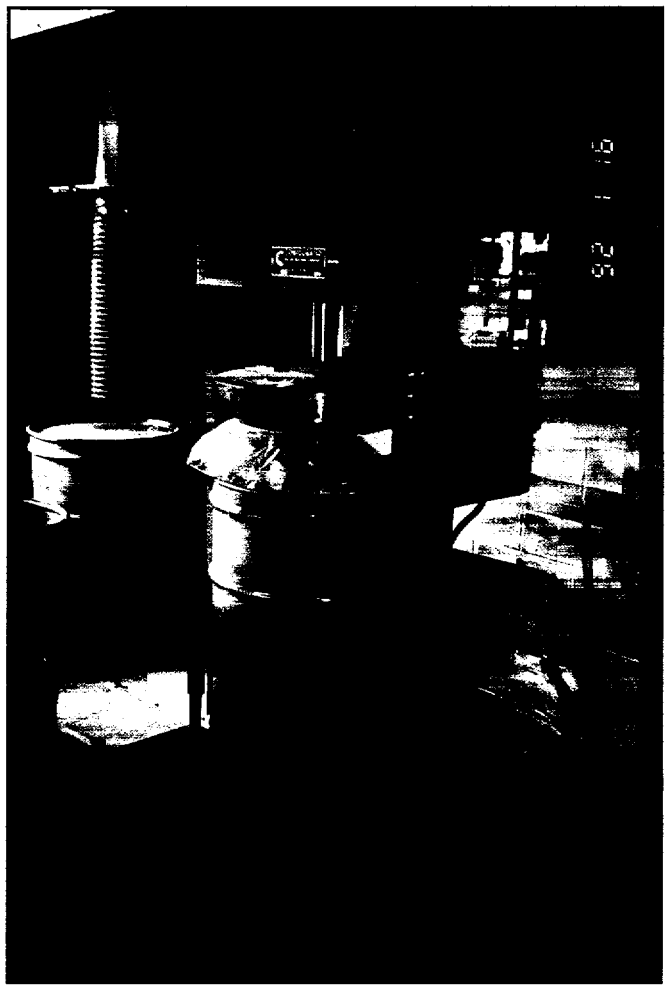

Figure 2-6 – Head House Facing Northwest Showing Compactor and Solid Pack

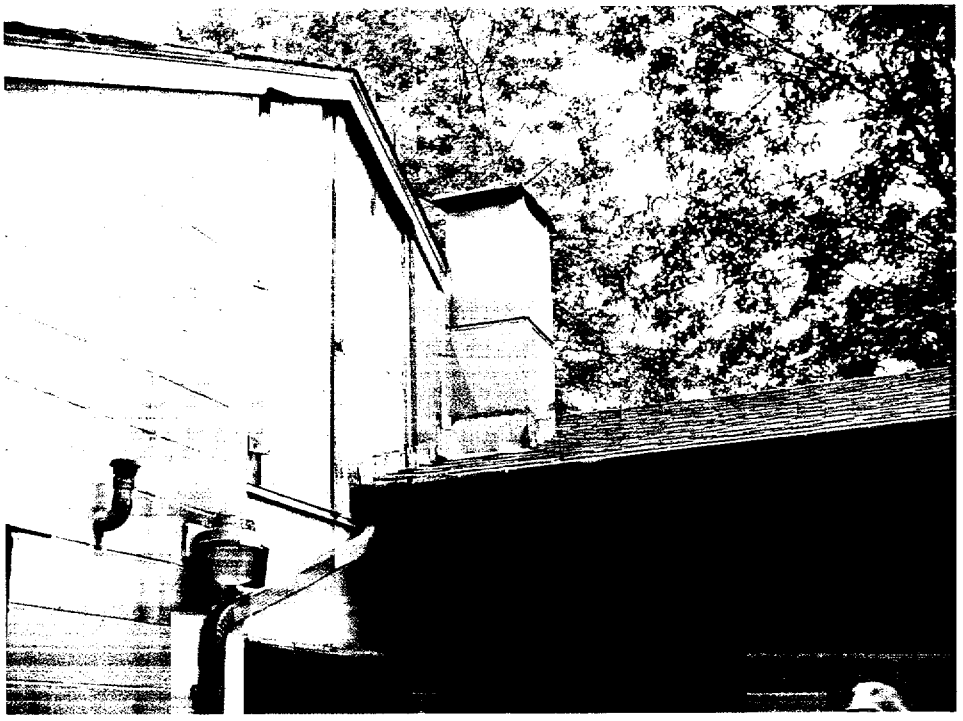

Figure 2-7 - Head House and Interim Storage Shed Showing Loft and Hood Exhaust Stack

2.3.3 Interim Storage Shed

The Interim Storage Shed is a 381 square foot building with concrete floors and wooden walls and ceiling. The shed was until ~ 1995 a concrete pad covered only with a canopy. The current pad and roof are believed to be original.

Until the early 1990's the Interim Storage Shed pad (at the time, it was simply a concrete pad with a canopy) held a vial crusher for collection of LSV wastes. The original installation date is unknown. The vial crushing operation was not considered a radiological operation. Only vials with trace quantities of radioactivity were crushed to collect and dispose of the toluene-containing cocktail solution as chemical waste. Vials that were considered radioactive were solid-packed in the Head House. Vials were received in 30 or 55 gal drums as well as cardboard trays and stored in the Greenhouse. Crushing operations involved shoveling vials into a hopper, where a conveyor moved the vials to a hammer mill that crushed the glass. Liquids drained through a sieve and the glass was collected in 55 gallon drums. When glass drums became full, operations were stopped and the cocktail sampled and counted by LSC. If results were less than 200 dpm/ml, the cocktail and glass were considered radiologically clean. The liquid was then sent off-site for disposal as hazardous waste. A sample of the crushed glass was collected and rinsed with a small amount of water, the water was then analyzed by LSC and the glass released if less than 200 dpm/ml. The containers of crushed glass were disposed as regular trash and placed in a dumpster outside the fence. Additionally, in the

northeastern corner of the pad was a drain. This drain was connected to a dry well located in the vial field. (See vial field description.) While this drain was plugged during the decommissioning of the vial crusher, it was active during the years the vial crusher was used. Rainwater or any other liquids on the pad would have washed into the drain and into the dry well.

The vial crusher was operational until the early 1990's and ultimately cleaned and disposed of in ~ 1994. Following the disposal of the vial crusher, the pad area was briefly utilized for the storage of 55 gallon drums of radioactive liquids (on spill pallets) prior to off-site drain disposal. The storage of these 55 gallon drums of radioactive waste on the pad was stopped after about one year when the ESB was able to receive wastes. At about this same time, construction of the walls and berms was begun in anticipation of long periods without access to a LLRW disposal facility, hence the name "Interim Storage Shed." The storage of long-lived wastes in the shed for any appreciable periods was never realized. When it became apparent that interim storage would not be needed, the shed was mainly utilized to store LSV wastes and DIS dry wastes. The DIS dry wastes were placed in the interim storage shed only after they were surveyed and repackaged as over-classified medical waste prior to off-site disposal as non-radioactive wastes. Additionally, this area took the place of the Sears Shed for the storage of lead and lead pigs prior to survey and recycling.

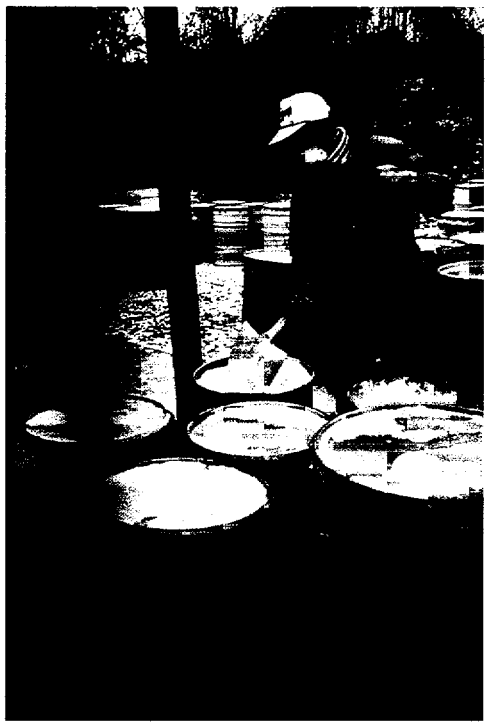

Figure 2-8 – Interim Storage Shed with Vial Field in Background

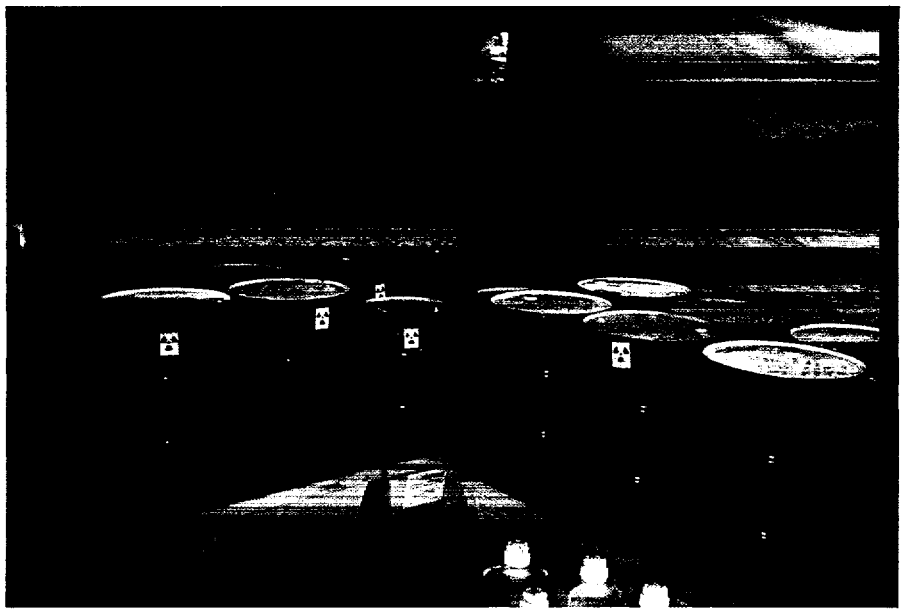

Figure 2-9 – Interim Storage Shed (Prior to Wall Installation)

Figure 2-10 - Interim Storage Shed Interior Facing Northeast (After Wall Installation)

2.3.4 Sears Shed

The Sears Shed was a 127 square foot area with concrete floors and metal walls and ceiling. The shed is a typical prefabricated garden shed. The date of installation is unknown. The Shed was removed during decommissioning to provide access for final status soil sampling. The shed was used for non-radioactive equipment and supply storage. During much of the 1990's, crates or buckets of lead pigs were stored in the shed after pickup from labs and prior to recycling. These pigs would be scanned (with a pancake GM probe and thin window NaI probe) prior to recycling. Occasionally, a contaminated pig was discovered, but this is not expected to be a reasonable pathway for contamination since potential gamma-emitting nuclides used in dispersible forms were short-lived. On occasion, radioactive animal carcasses and LSV wastes were stored in the shed for short periods in sealed 30 gallon containers.

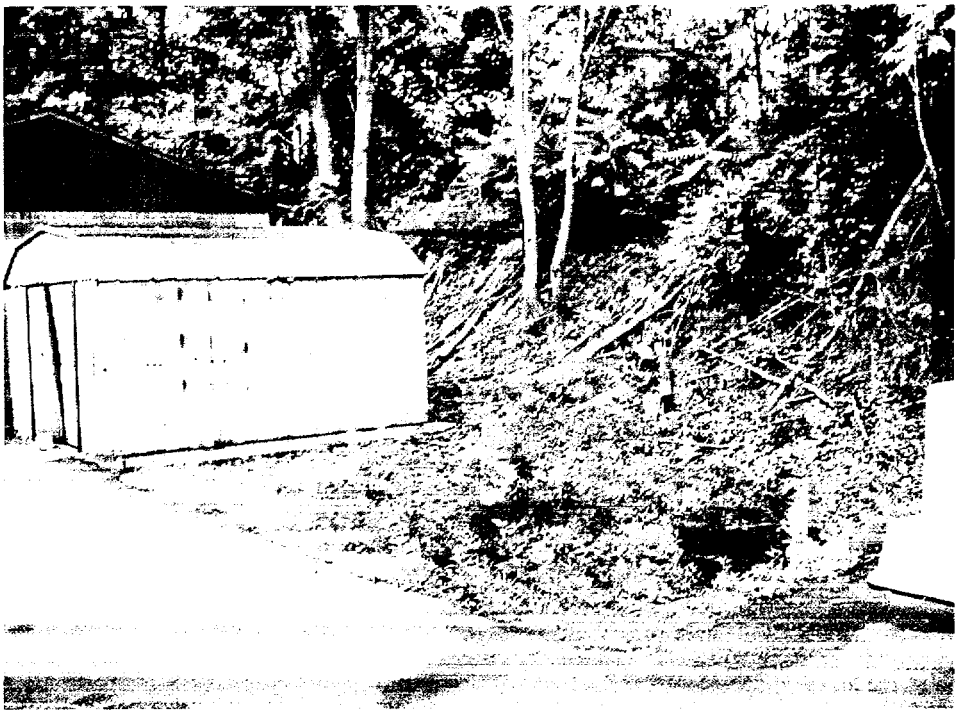

Figure 2-11 - Sears Shed and Yard Area Looking Southwest

2.3.5 Outside Areas

Selected portions of the quarter acre area bounded by the earthen berm (the yard and vial field) were used for storage of radioactive waste drums.

Yard

The yard was primarily utilized for the storage of DAW and animal carcass waste after they were packaged in 55 gallon drums meeting DOT packaging requirements prior to off-site disposal. These drums were wiped and verified free of removable radioactivity prior to off-site

shipment. Drums were stored on pallets and had drum covers attached to prevent accumulation of water to limit corrosion of the drums. No incidents of any contamination events related to the storage of these drums are known. Drums were surveyed using a G-M survey meter by Rutgers personnel. The contracted waste broker would then wipe test the drums to verify that no external removable activity was present prior to shipment.

When waste was received at the facility, trucks backed to the walkway beside the Interim Storage Shed and wastes were lowered using a lift gate. Waste containers were then moved to the appropriate location for storage – solids, liquids and carcasses were sent to Head House and usually packaged the same day. After packaging, drums were stored outside in the yard.

After the practice of staging the drums prior to disposal ceased (~1994) the majority of the yard and the entry drive were paved with a few inches of asphalt.

Figure 2-12 – Facility Entrance (Prior to Paving)

Figure 2-13 – Drums Stored in the Northwest Portion of the Yard

Figure 2-14 - Yard Area Looking Southwest (After Paving)

Figure 2-15 – Yard Area Looking Northwest (After Paving)

Vial Field

The flat area to the north of the Head House and east of the Interim Storage Shed is known as the Vial Field. It is so named because for many years, incoming drums of LSV wastes were stored there prior to processing in the vial crusher. At times, scores of drums would be stored in this area. In the mid 1990's, long after the vial field was cleared of drums, a concrete walkway was poured diagonally across the vial field to allow for easier equipment access to the Greenhouse via the door on the east side.

In the northwest section of the vial field is the concrete cover to a dry well. This well is ~ six to eight feet deep. The water table varies seasonally and with meteorological conditions, but is generally two to five feet below the surface. A drainpipe penetrates the top of the dry well on its western wall. This pipe originates from the drain located on the pad of the interim storage shed. Wile the drain is now plugged, it was operational during the life of the vial crusher. Liquids that were introduced to the pad (mostly rainwater or water from a hose) would have been washed down the drain to the dry well.

Figure 2-16 - Vial Field Looking Southeast with Drywell Cover

Figure 2-17 - Drywell in the Vial Field

Earthen Berm

The earthen berm was constructed to act as a shield during irradiation activities. The origin of the soils are unknown. No licensed activities were conducted in or on the berm. The berm is currently overgrown with small trees, grasses, weeds and bushes.

Figure 2-18 - Earthen Berm Entering the Yard Area Looking South

Figure 2-19 - Earthen Berm Looking West from Yard

Perimeter of Structures

These areas consist of the level ground between the berm and the outer walls of the greenhouse, interim storage shed and the metal shed. None of these areas were ever utilized for licensed activities. However, the area between the interim storage shed and the west earthen berm has a potential for migration of contaminants from adjacent areas. As mentioned previously, the vial crusher was operated for many years in the current location of the interim storage shed. During the operational period of the vial crusher, there was only a canopy covering the pad (no walls). The crusher would have been exposed to driving wind and rain, potentially allowing for contaminants to be blown out of the area. Additionally, surface waters flow from the yard and vial field to these areas.

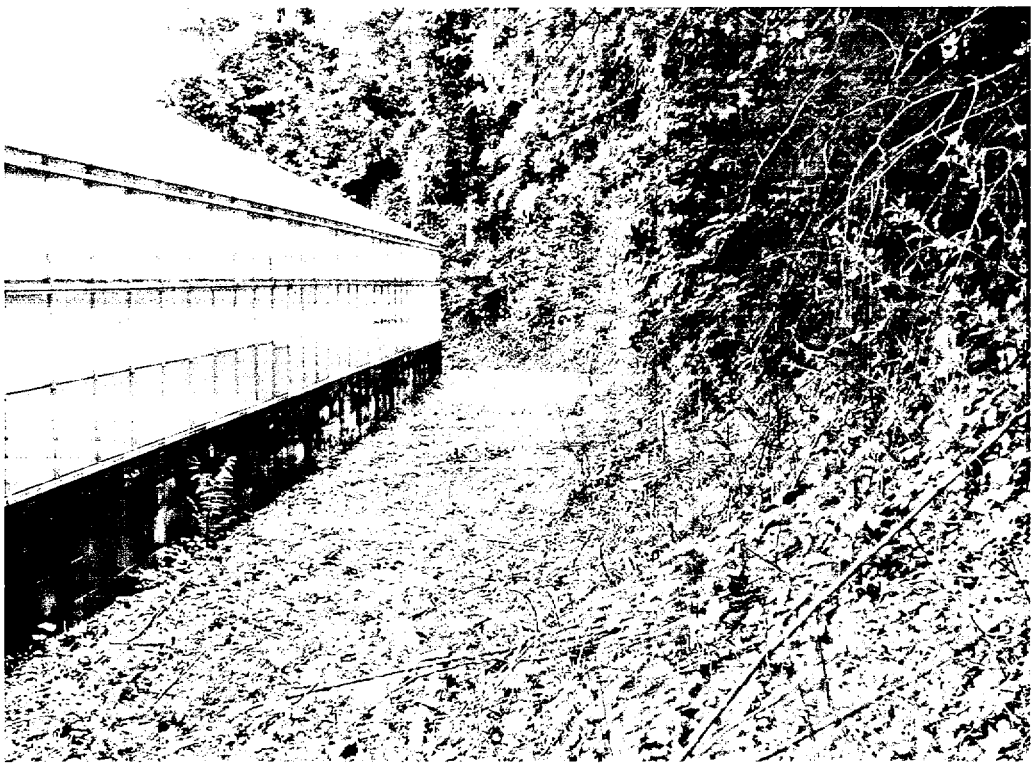

Figure 2-20 - West Side of Green House Looking South

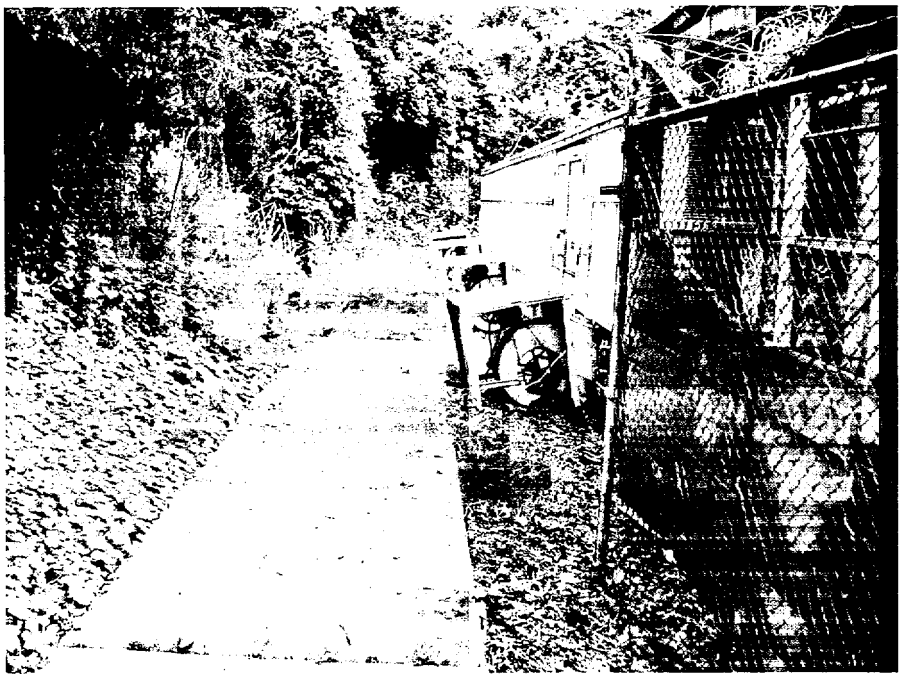

Figure 2-21 - East Side of Greenhouse Looking South

Dumpster Area

Crushed vials deemed radiologically clean from operations described above for the Interim Storage Shed were disposed in a dumpster located outside to the chain link fence.

Figure 2-22– Dumpster Area with Flags Showing Scoping Sample Locations

3.0 Potential Contaminants

Potential contaminants were determined from license files, NJ Waste Generator Surveys and Health Physics Assistant (HPA) database waste inventories. NJ Waste Generator Surveys were available from 1993 to 2000 with 1997 missing. HPA data were available from 1995 to present. The nuclides and quantities were fairly consistent from year to year and, according to personnel interviewed, are consistent with waste operations from previous years where data are not as well organized and readily available.

Table 3-1 lists the radionuclides used at the facility. This list was compiled through review of radioactive waste records (isotope and quantity) and interviews with facility personnel.

Table 3-1 - Radionuclides Used

Nuclide	Half Life (years)	Form	Half Life < 120 Days?
H-3	12.28	Dispersible	No
C-14	5730	Dispersible	No
Na-22	2.602	Dispersible	No
P-32	0.039	Dispersible	Yes
P-33	0.07	Dispersible	Yes
S-35	0.24	Dispersible	Yes
Cl-36	301,000	Dispersible	No
Ca-45	0.45	Dispersible	No
Sc-46	0.23	Dispersible	Yes
Cr-51	0.076	Dispersible	Yes
Mn-54	0.86	Sealed sources, uCi quantities dispersible occasionally used for research	No
Fe-55	2.7	Sealed Source	No
Fe-59	0.126	Dispersible	Yes
Co-60	5.271	Sealed Source	No
Ni-63	100.1	Sealed ECDs, some uCi quantities dispersible for research	No
Zn-65	0.67	unknown	No
As-73	0.22	uCi quantities dispperdible for research	Yes
Se-75	0.33	Research up to 1 mCi dispersible	Yes
Sr-85	0.18	Dispersible	Yes
Rb-86	0.05	Dispersible	Yes
Sr-90	28.6	Sealed Source	No
Nb-95	0.096	Non-dispersible Microsphere	Yes

Table 3-1 - Radionuclides Used

Nuclide	Half Life (years)	Form	Half Life < 120 Days?
Tc-99	213,000	Plate Source	No
Cd-109	1.27	Sealed Source and mCi quantities dispersible for research	No
I-125	0.16	Dispersible	Yes
Cs-134	2.06	From GE Soils – never passed through GGH	No
Cs-137	30.17	From GE Soils – never passed through GGH Sealed Sources Some residual from cask	No
Ce-141	0.089	Dispersible	Yes
Eu-152	13.6	Sealed Source	No
Hg-203	0.13	uci quantities dispersible for research	Yes
Pb-210	22.26	uCi quantities dispersible for research	No
Ra-226	1,600	Needles, deck markers, sight gauges, sealed sources	No
Ra-228	5.75	Unknown	No
Th-232	1.40E+10	Nitrate Reagent	No
U-235	7.00E+06	Fission plate, sealed source	No
U-238	4.50E+09	Acetate Reagent, mill tailings, salt vials	No

All short-lived nuclides ($t_{1/2}$ < 120 days) were eliminated from consideration as nuclides of concern since short-lived wastes have not been stored at the facility in about a year and routine surveys conducted over the past year would identify residual activity that would be initially high enough to be a contaminant of concern for decommissioning. All sealed sources were eliminated from consideration because no leaking sources were ever stored at the Greenhouse facility. Remaining nuclides were used in such small quantities compared to C-14 and H-3 that their dose contribution would be insignificant compared to C-14 and H-3 if contamination were present as a result of normal operations at the facility. Additionally, it is known that a source shipping cask was received with fixed Cs-137 contamination that became dispersible due to corrosion of the cask surface. There could be single events that would result in another nuclide being present at higher fractions, but it is extremely unlikely that such events large enough to require consideration of other nuclides for decommissioning purposes would not be known.

4.0 Scoping Surveys

4.1 Scoping Survey Protocols

Scoping surveys were performed immediately following the HSA. The information gained from the HSA was used to design scoping survey protocols intended to sample areas with the highest potential for residual radioactivity from historical operations and to confirm initial classifications, including non-impacted areas. The scoping survey protocol consisted of:

- One composite surface soil sample from the east side of the Greenhouse along the low side of the sidewalk at four locations with highest probability for residual activity. (Sample S1)
- One composite surface soil sample from the east side of the Interim Storage Shed at four locations with highest probability for residual activity. (Sample S2)
- One composite surface soil sample from the vial yard at four locations with highest probability for residual activity. (Sample S3)
- One composite surface soil sample from the west side of the Interim Storage Shed at the base of the earthen berm at four locations with highest probability for residual activity. (Sample S4)
- One composite surface soil sample from the yard where drums were stored at four locations with highest probability for residual activity. (Sample S5)
- One composite surface soil sample from the dumpster area at four locations with highest probability for residual activity. (Sample S6)
- One sludge sample from the drywell. (Sample S7)
- One water sample from the drywell. (Sample S8)
- One concrete surface sample in the Head House at a location of known contamination. (Sample S9)
- One paint/concrete[1] sample of the floor in the Greenhouse at a location of known contamination. (Sample S10)
- One paint/concrete[1] sample of the floor in the Greenhouse where the berm was located. (Sample S11)
- Large area Masslinn smears of interior surfaces (floors/walls/ceilings) and outdoor concrete/asphalt surfaces.[2]
- Removable contamination measurements (disc smears) on floor surfaces and outdoor concrete/asphalt surfaces at approximately a $1/m^2$ frequency counted for gross alpha and gross beta.[3]

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[1] It was intended to only sample paint to eliminate interference from NORM in the concrete, but the epoxy paint was so tightly adhered to the concrete floor that chips of concrete are included with the paint samples.
[2] The Sears Shed floors were inaccessible during scoping surveys due to being used for non-radioactive storage.
[3] The survey frequency was reduced to one per 4 m^2 for the northern 2/3 of the Greenhouse and outdoor concrete/asphalt areas due to extremely low probability of residual radioactivity based on the HSA.

- Removable contamination measurements on floor surfaces at approximately a 1/m^2 frequency counted by LSC (these smears were taken adjacent to gross alpha/beta smears described above).
- Smears/swabs of system internal surfaces – each drain, ventilation duct, fan and the air conditioner filter counted by LSC.
- 100% gamma scan of outside grounds within the earthen berm with a 2"x2" sodium iodide (NaI) detector at a 10 cm height.
- 100% gamma walkthrough survey of accessible building interiors with a 2"x2" NaI detector held at waist level.
- 100% scan of accessible interior floor surfaces for gross alpha and gross beta using a gas flow proportional counter.
- Judgmental beta-gamma scans of 10% of interior non-floor surfaces
- Judgmental beta-gamma static measurements and smears at areas of elevated activity identified during scans.
- Background soil samples and concrete samples were collected and archived but never analyzed.

Laboratory samples were analyzed by Teledyne Brown Engineering, a NJDEP-certified laboratory for each analytical method with the exception of C-14. After a good faith effort to identify a certified lab, it was determined that no laboratories are certified by NJDEP for the performance of C-14 analyses in soils. Soil, sludge and water samples were analyzed for H-3, C-14 and gamma spectroscopy. Solid samples taken on the greenhouse floor were analyzed for gamma spectroscopy, H-3 and C-14. Paint sample S11 was additionally analyzed by alpha spectroscopy for thorium and uranium isotopes. A map showing scoping survey sample locations is included in Appendix D.

4.2 Scoping Survey Results

Scans

Areas of elevated beta-gamma activity were identified during scans on Greenhouse and Head House floor surfaces. These areas received a static measurement and a smear at the location of highest activity. Cs-137 and Th-230 efficiencies were used to calculate activity concentrations. Areas of elevated activity identified during scan surveys are summarized below.

- An approximately 500 ft^2 area at the south end of the Greenhouse has distributed beta-gamma contamination throughout with activity concentrations up to 62,437 dpm/100cm^2. This area is controlled as a contaminated area due to known Cs-137 contamination from the shipping cask used to deliver a Co-60 source.
- An approximately 2 ft^2 area on the west side of the Greenhouse just north of the contamination area described above with activity concentrations up to 1,437 dpm/100cm^2.
- An approximately 10 ft^2 area on the west side of the Head House with activity concentrations up to 3,114 dpm/100cm^2.

- No areas of elevated alpha activity were identified during scans.

Removable Contamination Measurements
Liquid scintillation smears and cloth disc smears were taken on floor surfaces and outside paved surfaces.

- The highest disc smear beta-gamma result was 705 dpm/100cm^2.
- The highest disc smear alpha result was 3 dpm/100cm^2 (less than the MDC of 33 dpm/100cm^2).
- The highest LSC result was 80 gross cpm/100cm^2 in the wide open channel.
- The locations of the highest results above were on the floor at the south end of the Greenhouse.

Large Area Masslinn wipes were taken on all building surfaces. There was no indication of contamination on any Masslinn wipe of non-floor surfaces, so disc smears were not collected.

NaI Walkthrough Survey
A walkthrough survey was conducted on indoor areas. No elevated activity was identified in the Interim Storage Shed or Sears Shed. Since waste was stored in the Greenhouse and Head House, results of the walkthrough are inconclusive. No elevated readings were noted that could not be attributable to waste stored nearby.

NaI Walkover Survey
A walkover survey was conducted of outside grounds within the bermed area. No elevated activity was detected.[4]

Soil Samples
Composite surface soil samples were taken in the outside grounds and analyzed by gamma spectroscopy, C-14 and H-3. The samples exhibited expected levels of naturally-occurring nuclides. Results for Cs-137 were within the expected background range and were a small fraction of the Cs-137 Default Screening Value (DSV). The highest result for Cs-137 was less than 0.6 pCi/g. Samples around the Interim Storage Shed and in the Vial Field had elevated levels of H-3 and C-14. Therefore, surface soils surrounding the Interim Storage Shed and in the Vial Field were considered impacted for C-14 and H-3 only. Other portions of outside grounds were considered non-impacted. Soil sample results are shown in Table 4-1. Laboratory analytical reports are included in Appendix E.

[4] During characterization, outside grounds were re-scanned with a 3"x3" NaI detector. One area of elevated activity was detected at the southern-most ventilation supply fan as described later in this report.

Table 4-1 – Scoping Soil Sample Results

Sample Number	H-3 (pCi/g)	Fraction of DSV	Flag[5]	C-14 (pCi/g)	Fraction of DSV	Flag	Sum of Fractions
S1	-0.254	0.000	U	1.050	0.088	U	0.09
S2	10.100	0.092	+	3.290	0.274	+	0.37
S3	5.630	0.051	+	0.617	0.051	U	0.10
S4[6]	7.670	0.070	+	6.320	0.527	+	0.60
S5	-0.412	0.034	U	1.570	0.131	U	0.16
S6	0.440	0.004	U	1.260	0.105	U	0.11
S4-1	11.500	0.105	+	9.430	0.786	+	0.89
S4-2	11.400	0.104	+	0.000	0.000	U	0.10
S4-4	2.110	0.019	+	0.544	0.045	U	0.06

Solid Samples

Solid samples were taken of the drywell sludge to determine the potential for subsurface contamination, and in the Greenhouse and Head House to establish the nuclides of concern. As expected, the results indicate that contamination in the Head House is due to C-14 and contamination in the Greenhouse is due to Cs-137. Solid sample results are shown in Table 4-2. Laboratory analytical reports are included in Appendix E.

Table 4-2 – Solid Sample Results

Sample Number	Description	H-3 (pCi/g)	C-14 (pCi/g)	Cs-137 (pCi/g)
S7	Drywell Sludge	11.40	6.92	0.215
S9	HH Concrete Sample	472	1250	1.13
S10	GH Paint/Concrete Chips	U	U	1080
S11[7]	GH Berm Paint/Concrete Chips	U	U	509

The sludge sample exhibited elevated C-14 and H-3 activity. The results are less than the DSVs for surface soils (a unity calculation using DSVs is 0.68), but above the ALARA goal for surface soils. While it is obvious that the residual activity would not result in a significant dose contribution, there is no NRC guidance on screening for subsurface contaminants, so the activity was modeled using ResRad Version 6.3 using extremely conservative assumptions to calculate

[5] "U" means the sample result is <MDC, "+" means the sample result is ≥ MDC.

[6] Composite sample S-4 exhibited elevated activity equal to the ALARA goal, so the sample components were analyzed separately to more clearly understand the activity distribution. The components are S4-1, S4-2 and S4-4. There was not enough remaining sample to analyze S4-3.

[7] The paint sample from the berm was also analyzed for uranium and thorium isotopes by alpha spectroscopy to determine the potential for alpha emitter contamination. All alpha spectroscopy results are well less than 1 pCi/g, indicating that alpha emitters are not present in quantities significant to decommissioning and are likely due to naturally-occurring materials present in paint and concrete, not licensed materials.

an extreme upper bound of potential future exposures. The Resident Farmer Scenario (the most conservative) was used to model future doses from two different cases:

- **Case 1:** The drywell sludge has leached to surrounding soils resulting in a cylindrical contaminated zone with a 2 meter radius, thickness of 3 meters and is under 1 meter of cover. The contaminated zone is conservatively assumed to have an average activity concentration equal to the sludge sample results. This scenario results in a calculated maximum annual dose of 0.75 mrem/yr at time = 1.554 yrs.

- **Case 2:** The contaminated zone described in Case 1 is excavated and spread out on the ground surface to a uniform thickness of 15 cm resulting in a cylindrical contaminated zone with a 9 meter radius. This scenario results in a calculated maximum annual dose of 0.34 mrem/yr at time = 2.025 yrs.

Other than parameters related to the size and activity concentration of the contaminated zone and cover, ResRad 6.3 default parameter values were used. Since the purpose of this dose modeling is to confirm the common sense assumption that potential future doses under ridiculously conservative assumptions is negligible (i.e., the purpose is not to develop a site-specific DCGL), parameter values recommended in NRC Policy and Guidance Directive PG-8-08, "Scenarios for Assessing Potential Doses Associated with Residual Radioactivity" were not used.

It should be noted that a Resident Farmer Scenario is not credible in the foreseeable future. Rutgers plans to construct an electrical substation and maintain control of the property for many years. Considering that Rutgers is a State University, ownership is very stable and not subject to the same risks of loss of ownership associated with commercial properties. Regardless, the maximum annual dose is reached in two years or less and then rapidly drops to zero by the tenth year, well below the expected life of the substation.

The drywell sludge dose modeling reports are included as Appendix F.

Water Samples

Sample S8 was taken of the drywell water. All results are less than the detection limit for the nuclides analyzed. The laboratory analytical report is included in Appendix E.

5.0 Nuclides of Concern

After considering the results of the HSA, scoping surveys, quantities of radionuclides used, the locations of use and the impact of radioactive decay, the nuclides of concern[8] are:

- Structural Surfaces: H-3, C-14, Cs-137
- Soils[9]: H-3, C-14

Alpha-emitting nuclides were eliminated from survey design because:

- They were never processed at the facility, only stored while awaiting disposal.
- They were stored in sealed containers.
- There is no history of leakage.
- Historical surveys for gross alpha did not identify elevated activity.
- Scoping and characterization surveys (scans and smears) did not identify elevated alpha activity.
- The solid sample from the alpha emitter storage area did not indicate the presence of alpha emitting nuclides at levels significant to decommissioning.

6.0 Previous Decommissioning Activities

There have been no previous radiological decommissioning activities performed at the site.

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[8] Note that due to half-life and quantity considerations, NARM materials possessed under NJDEP licenses are not significant in regards to facility decommissioning.

[9] During characterization, Cs-137 was identified as nuclide of concern for a small area of surface soils surrounding the southernmost ventilation supply fan as described in Section 15.3.

7.0 Release Criteria

The radiological release criteria of NRC 10CFR20 Subpart E for unrestricted use were used for decommissioning this facility. Specifically, the facility was surveyed in accordance with the guidance contained in MARSSIM to demonstrate compliance with the criteria of 10CFR20.1402, Radiological Criteria for Unrestricted Use. The criteria is that residual radioactivity results in a TEDE to an average member of the critical group that does not exceed 25 mrem per year and that the residual radioactivity has been released to levels that are as low as reasonably achievable (ALARA).

Additionally, NJDEP specifies release criteria for real property of in NJAC 7:28 Subchapter 12. Specifically, "Sites shall be remediated so that the incremental radiation dose to any person from any residual radioactive contamination at the site above that due to natural background radionuclide concentration, under either an unrestricted use remedial action, limited restricted use remedial action, or a restricted use remedial action, shall be 15 millirem total annual effective dose equivalent (15 mrem/yr TEDE) for the sum of annual external gamma radiation dose (in effective dose equivalent) and intake dose (in committed effective dose equivalent) including the groundwater pathway."

Survey methods were designed to demonstrate compliance with the NRC criteria and described as such in this report for consistency with NRC regulations and guidance documents. However, the design also ensures that a sufficient number of samples are collected to statistically demonstrate that the site meets the NJDEP criteria. This will be demonstrated retrospectively in Section 18.0 Administratively, this demonstration is ensured by applying an ALARA goal to the survey design.

8.0 Derived Concentration Guideline Levels ($DCGL_W$)

Default screening values (DSVs) are used to determine DCGLs for structural surfaces and the soils of outside grounds. A DSV is a nuclide-specific activity concentration that equates to a dose of 25 mrem/yr to an average member of the critical group as modeled with DandD software using default parameters. Each of the nuclides of concern has a published DSV in NUREG 1757, Volume 1, Appendix B.

The site qualifies for screening analysis because site conditions (e.g., physical and source-term conditions) are compatible and consistent with the DandD model assumptions (NUREG/CR–5512, Volume 1). Specifically, the following site conditions exist:

- Contamination on building surfaces (e.g., walls, floors, ceilings) is surficial (e.g., < 1cm).
- Contamination on building surfaces is mostly fixed, with the fraction of loose surface contamination less than 10 percent of the total surface activity.
- Residual soil radioactivity is contained in the top layer of the surface soil (e.g., <15 cm)[10].
- There is no reason to suspect contamination of ground water.

8.1 Total and Removable Activity DCGLs for Surfaces and Structures

The NRC has published default screening values in NUREG 1757 for commonly used radionuclides. The isotopes of concern screening values for surfaces under default conditions (generic screening levels) are provided in Table 8-1.

Table 8-1 - Default Screening Values for Nuclides of Concern

Isotope	Half-life	Radiation Type	Default Screening Value ($dpm/100cm^2$)
H-3	12.3 years	Beta	1.2E8
C-14	5730 years	Beta	3.7E6
Cs-137	30.17 years	Beta-Gamma	2.8E4

The default screening values are the basis for developing the derived concentration guideline levels (DCGL's) for the project. The DCGL is the radionuclide specific surface area concentration that could result in a dose equal to the release criterion. $DCGL_W$ is the concentration limit if the residual activity is essentially evenly distributed over a large area. For this project, $DCGL_W$ is equal to the DSV. An important assumption of the dose model is that removable contamination is <10% of total contamination. To verify this assumption, a DCGL has been established for removable contamination.

[10] There is residual activity contained in sludge at the bottom of the drywell at concentrations less than surface soils DSVs. This was modeled separately using ResRad 6.3 and does not prohibit the use of screening methods for surface soils.

Based on the HSA and scoping surveys, C-14 is the main nuclide of concern for the Head House and Cs-137 is the main nuclide of concern for the Greenhouse. However, to simplify the survey process, a limiting nuclide methodology was used and gross measurements were made in all survey units and compared directly to the Cs-137 DSV to determine compliance with the release criteria. This method provides a simple and conservative way to determine an upper bound of the resultant doses.

The DCGLs for all surfaces and structures are:

Total Surface Activity $DCGL_W$ - 28,000 dpm/100cm^2 maximum gross beta-gamma total surface activity

Removable Activity $DCGL_W$ - 2,800 dpm/100cm^2 maximum gross beta-gamma removable surface activity

8.2 Elevated Measurement Criterion ($DCGL_{EMC}$) for Surfaces and Structures

No contingency for elevated removable contamination was established for structural surfaces.

8.3 DCGLs for Soils

The NRC has published default screening values in NUREG 1757 for commonly used radionuclides. The isotopes of concern screening values for soils under default conditions (generic screening levels) are provided in Table 8-2.

Table 8-2 - Soil DSV's for Nuclides of Concern

Isotope	Half-life	Radiation Type	Default Screening Value (pCi/g)
H-3	12.3 years	Beta	110
C-14	5730 years	Beta	12
Cs-137	30.17 years	Beta-Gamma	11

Since nuclide-specific measurements were taken in soils, the sum of fraction rule was used to determine compliance.

8.4 Elevated Measurement Criterion ($DCGL_{EMC}$) for Soil Areas

No contingency for elevated contamination was established for soils.

9.0 ALARA Goal

Rutgers has established an ALARA goal for each survey unit of < 15 mrem/yr TEDE to an average member of the critical group.

Additionally, an ALARA goal for removable contamination on structural surfaces was established at < 200 dpm/100cm^2. Operationally, this was demonstrated by ensuring the LSC open channel gross count rate was less than 100 cpm.

10.0 ALARA Analysis

Due to the extremely low doses associated with the facility, a quantitative ALARA analysis is not required. Default screening values are being used to establish DCGLs. Additionally, Chase made efforts to decontaminate all locations of identified activity detected during scoping and characterization surveys. These efforts included removal of contaminated surfaces and excavation of surface soils.

NUREG 1757, Volume 2, Appendix N states in part: "For ALARA during decommissioning, all licensees should use typical good-practice efforts such as floor and wall washing, removal of readily removable radioactivity in buildings or in soil areas, and other good housekeeping practices. In addition, licensees should provide a description in the FSSR of how these practices were employed to achieve the final activity levels. In light of the conservatism in the building surface and surface soil generic screening levels developed by NRC, NRC staff presumes, absent information to the contrary, that licensees who remediate building surfaces or soil to the generic screening levels do not need to provide analyses to demonstrate that these screening levels are ALARA. In addition, if residual radioactivity cannot be detected, it may be assumed that it has been reduced to levels that are ALARA. Therefore, the licensee may not need to conduct an explicit analysis to meet the ALARA requirement."

11.0 Area Classification and Determination of Survey Units

Based on the results of the historical site assessment and scoping surveys, facility areas were classified as impacted areas or non-impacted areas. Non-impacted areas are areas with no potential residual radioactivity from licensed activities. Non-impacted areas are not surveyed during final status surveys. Impacted areas are those areas that have some level of potential residual radioactivity from licensed activities. Impacted areas are subdivided into Class 1, 2 or 3 areas. Class 1 areas have the greatest potential for contamination and therefore receive the highest degree of survey effort for the final status survey, followed by Class 2, and then by Class 3. Impacted sub-classifications are defined as follows:

- **Class 1 Area**

  Areas with the highest potential for contamination, and meet the following criteria: (1) impacted; (2) potential for delivering a dose above the release criterion; (3) potential for small areas of elevated activity; and (4) insufficient evidence to support classification as Class 2 or Class 3.

- **Class 2 Area**

  Areas that meet the following criterion: (1) impacted; (2) low potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

- **Class 3 Area**

  Areas that meet the following criterion: (1) impacted; (2) little or no potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

11.1 Facility Classifications

Based on the Historical Site Assessment information, initial classifications were assigned for inclusion in the DP. These classifications were based on current knowledge of the facility and minor changes were made as additional information became available (e.g., characterization survey data, process knowledge, etc.). Changes to initial classifications are noted in the table below. Initial Classifications are presented in Table 11-1.

Table 11-1 – Initial Facility Classifications

Facility Area	Surfaces	Initial Classification	Comments
Building Interiors	Floors	Impacted Class 1	None
Building Interiors	Walls and Ceilings	Impacted Class 2	None
Sears Shed	All Interior Surfaces	Impacted Class 3	Surface contamination exceeding the DCGL was identified on the floor during characterization surveys. This would normally require upgrade to Class 1. However, after remediation, the shed and concrete support pad were removed to allow access to the underlying soils for Final Status Surveys of outside grounds, making the release of the Shed and Pad outside the scope of MARSSIM decommissioning surveys.
Outside Paved Areas	All Surfaces	Impacted Class 3	None
Outside Surface Soils	Area around Interim Storage Shed	Impacted Class 1	None
Outside Surface Soils	All except Around Interim Storage Shed	Non-Impacted	During characterization, it was discovered that a small area of soil surrounding a supply fan concrete support pad had elevated activity. Due to the limited extent, this area was not treated as a MARSSSIM survey unit and was surveyed using alternative methods.
Building Exterior Surfaces	All Surfaces	Non-Impacted	None
Earthen Berm	All Surfaces	Non-Impacted	None

12.0 Survey Units

12.1 Establishing Survey Units

A survey unit is an area of specified size and shape for which a separate decision is made whether or not that area meets the release criteria. Survey units are a portion of a building or site that is surveyed, evaluated, and released as a single unit. Areas of similar construction and composition were grouped together as survey units and tested individually against the DCGLs and null hypothesis to show compliance with the release criteria. Survey units are homogeneous in construction, contamination potential, and contamination distribution.

The number of discrete sampling locations needed to determine if a uniform level of residual radioactivity exists within a survey unit does not depend on the survey unit size. However, the sampling density should reflect the potential for small elevated areas of residual radioactivity. Survey units are sized according to the potential for small elevated areas of residual radioactivity. Table 12-1 lists the MARSSIM-recommended maximum survey unit sizes, based on floor area. The se size limits are recommended limits and not absolute limits.

The Greenhouse floor has an area of approximately 150 m^2, which exceeds the MARSSIM recommendation for a Class 1 area maximum survey unit size. Since the floor is contiguous and a single survey unit is more consistent with the dose model, the decision was made to treat the floor as a single survey unit and double the minimum number of measurements required to ensure a sufficient sample density. Survey unit designations are presented in Table 12-2.

Table 12-1 – Recommended Maximum Survey Unit Size Limits

Type of Survey Unit	Class 1	Class 2	Class 3
Structures	Up to 100 m^2	100 m^2 to 1,000 m^2	No limit
Land	Up to 2000 m^2	2,000 m^2 to 10,000 m^2	No limit

Table 12-2 - Survey Units

Survey Unit	Description	Class
GGH1	Greenhouse Floors	1
GGH2	Greenhouse Walls and Ceilings	2
GGH3	Head House Floors	1
GGH4	Head House Walls and Ceilings	2
GGH5	Interim Storage Shed Floors	1
GGH6	Interim Storage Shed Walls and Ceilings	2
GGH7	Outside Grounds Around Interim Storage Shed	1
GGH8	Outside Grounds – Asphalt Areas	3
GGH9	Outside Grounds – Concrete Areas	3

13.0 Survey Instrumentation

The instrumentation used for facility decommissioning surveys is summarized in the tables below. Table 13-1 lists the standard features of each instrument such as probe size and efficiency. Table 13-2 lists the operational parameters such as scan rate, count time, and the associated Minimum Detectable Concentrations (MDC).

Table 13-1 - Instrumentation Specifications

Detector Model	Detector Type	Detector Area	Meter Model	Window Thickness	Typical Total Efficiency
Ludlum 43-37 Floor Monitor	Gas Flow Proportional	540 cm^2	Ludlum 2360	0.8 mg/cm^2	18 % (Cs-137)
Ludlum 43-89	Plastic Scintillation	100 cm^2	Ludlum 2224	0.8 mg/cm^2	11 % (Tc-99)
SRA SCM IV	Gas Flow Proportional	25 cm^2	N/A	0.8 mg/cm^2	15 % (Cs-137)
Ludlum 44-10	2"x 2" NaI	NA	Ludlum 2241	NA	900 cpm per µR/hr
Ludlum 44-10-1	ZnS/ Plastic Scint.	N/A	Ludlum 2929	0.4 mg/cm^2	29% (α) 23% (β)
Beckman LS6500	Liquid Scintillation	N/A	N/A	N/A	50% (H-3) 80% (C-14) 100% (Open)[11]

Table 13-2 - Typical Instrument Operating Parameters and Sensitivities

Measurement Type	Detector Model	Scan Rate	Count Time	Background (cpm)	MDC ($dpm/100cm^2$)
Beta Surface Scans	SRA SCM IV	10 in./sec.	N/A	25	3672
Beta Surface Scans	Ludlum 43-37	5 in./sec.	N/A	1000	445
Beta Surface Scans	Ludlum 43-89	2 in./sec.	N/A	140	1038
Total Surface Activity	Ludlum 43-89	N/A	60 sec.	140	442
Gamma Soil Scans	Ludlum 44-10	0.25 meter/sec	N/A	10,000	4.6 pCi/g Cs-137
Removable Activity	Ludlum 44-10-1	N/A	60 sec.	4 (α) 70 (β)	33 (α) 134 (β)
Removable Activity	Beckman LS6500	N/A	60 sec.	25 (H-3) 15 (C-14) 50 (Open)	53 (H-3) 26 (C-14) 36 (Open)

[11] The stated LSC open channel efficiency is for beta energies greater than the C-14 beta energy (i.e., Cs-137). Operationally, open channel results in cpm were used to ensure the ALARA goal of 200 $dpm/100cm^2$ was met. Specifically, 100 cpm in the open channel was used as the action level because if all the activity detected in the open channel were due to H-3 (assuming a 50% H-3 efficiency) the maximum activity for the sample would be 200 $dpm/100cm^2$. This method is conservative and simplifies data management.

13.1 Shonka Surface Contamination Monitor

A Shonka Research Associates, Inc. Surface Contamination Monitor (SCM IV) was used to perform characterization surface scans of building structures and paved surfaces of outside grounds. The data collected was also used as final status data. The SCM is a state-of-the-art Position Sensitive Proportional Counter (PSPC) that achieves superior data quality (the system is described in detail in NUREG/CR-6450). PSPCs differ from traditional proportional counters in that they are able to precisely identify the location of ionizing events along the length of the detector. This enables a large detector to be divided (electronically) into an array of small, "virtual" detectors to gain the productivity advantages of large detectors while maintaining the data quality advantages of small detectors. Data are recorded in 25 cm^2 pixels over the entire surface surveyed, resulting in 400 statistically significant measurements per square meter. Because the instrument does not rely on human evaluation of an audible response, and probe distance and scan speed are accurately determined, human error is nearly eliminated from the scanning process. This allows data with quality equivalent to static measurements to be collected while scanning.

Two versions of the SCM were used – a self-propelled, motor-driven version that operates at a user-defined constant scan speed and a portable version that operates at a technician-controlled variable scan speed. The portable version, LabRATS (Laboratory Release And Termination System) was specifically designed for use in environments where structural obstructions prohibit the use of the self-propelled version (such as pharmaceutical research laboratories). LabRATS uses a wheel encoding system to record vs. control scan speed. The visual display provides real-time indication of scan speed and provides an audible alarm to alert the operator that the scan speed is approaching the maximum speed (MDC) allowed by the established Data Quality Objectives.

Survey data are spatially correlated allowing the discovery of relationships from the data collected. The combination of positioning along the detector length and recording of scan speed with wheel encoding devices allows accurate mapping of residual radioactivity on the surface surveyed. Logging spatial data allows the visualization of the distribution of contamination and anomalies in the data, such as cracks in the floor. Pixels are color-coded based on radioactivity levels so that areas of elevated activity appear as bright spots. Figure 13-3 provides a survey plot of the Sears Shed floor characterization survey showing an area of elevated activity.

When SCM data are analyzed, the software algorithm considers each 25 cm^2 measurement as ¼th of four separate 100 cm^2 areas. This technique ensures that the highest-activity 100-cm^2 area is identified. The fact that the SCM records 400 measurements for every square meter surveyed allows data to be evaluated via statistical methods in the Survey Information Management System (SIMS) that considers the distribution of activity on a surface in addition to its average concentration.

Figure 13-1 - SRA SCM IV Position Sensitive Proportional Counter

Figure 13-2 – LabRATS portable version of the SRA SCM IV

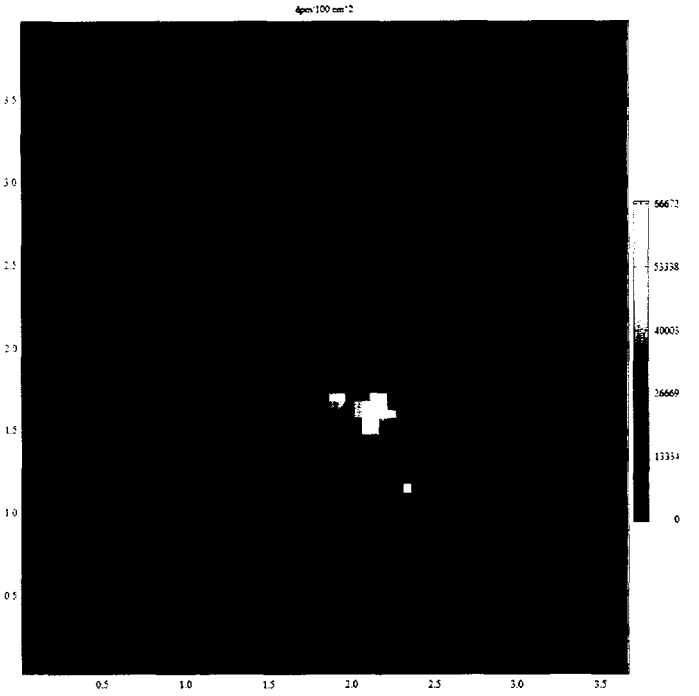

Figure 13-3 – Plot of Sears Shed Floor Characterization Survey

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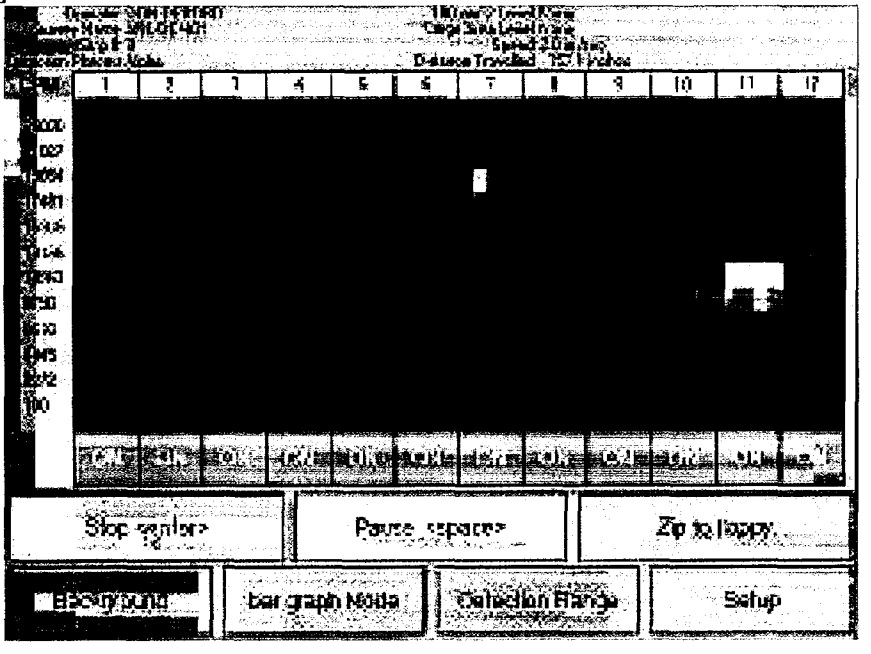


Figure 13-4 – SCM IV Display

13.2 Instrument Calibration

Laboratory instruments and portable field instruments were calibrated within the previous year with NIST traceable sources and to radiation emission types and energies that provide detection capabilities similar to the isotopes of concern. The Rutgers LSC located in the RSB was used for the project. The LSC was set-up and calibrated by a Beckman Coulter technician on March 3, 2006 under a manufacturer's service contract. Calibration records for portable instruments are provided in Appendix G.

13.3 Daily Functional Checks

Portable field instruments were response tested daily when in use. Background and source readings were taken as part of the daily instrument check and compared with the acceptance range for instrument and site conditions. REHS operationally checked the LSC with NIST traceable C-14 and H-3 standards prior to each use. The background, source check, and field measurement count times were specified by the Project Manager to ensure statistically valid measurements.

13.4 Determination of Counting Times and Minimum Detectable Concentrations

All minimum detectable concentrations (MDC) and associated count times were calculated in accordance with the Decommissioning Plan. For all final status measurements, MDC values were less than the ALARA goal. Where appropriate, MARSSIM equations have been modified to convert to units of dpm/100cm^2.

13.4.1 Static Counting

Static counting Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation, which is an expansion of NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", Table 3.1 (Strom & Stansbury, 1992).

$$MDC_{STATIC} = \frac{3 + 3.29\sqrt{B_R \cdot t_s \cdot \left(1 + \frac{t_s}{t_b}\right)}}{t_s \cdot E_{tot} \cdot \frac{A}{100}}$$

Where:

MDC_{STATIC} = Minimum detectable concentration level in dpm/100cm^2.
B_R = Background count rate in counts per minute
t_b = background count times in minutes
t_s = sample count times in minutes
E_{tot} = total detector efficiency for radionuclide emission of interest (includes combination of instrument efficiency and surface efficiency of 0. 5)
A = Active area of the detector in cm^2

A typical static MDC calculation for the Ludlum Model 43-89 gas flow proportional detector is shown below:

$$MDC_{STATIC} = \frac{3 + 3.29\sqrt{(140)(1)\left(1+\frac{1}{1}\right)}}{(1)(0.11)\frac{125}{100}} = 422\ \text{dpm/100cm}^2$$

13.4.2 Beta Ratemeter Scanning

Beta Scanning Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation which is a combination of MARSSIM equations 6-8, 6-9, and 6-10:

$$MDC_{SCAN} = \frac{d'\sqrt{b_i}\left(\frac{60}{i}\right)}{\sqrt{p}\cdot E_{TOT}\cdot\frac{A}{100cm^2}}$$

Where:

MDC_{Scan}	=	Minimum detectable concentration level in dpm/100cm^2.
d'	=	desired performance variable (1.38)
b_i	=	background counts during residence interval
i	=	residence interval in seconds
p	=	surveyor efficiency (0.5, 0.75 for SCM IV)
E_{TOT}	=	total detector efficiency for radionuclide emission of interest (includes combination of instrument efficiency and surface efficiency of 0. 5)
A	=	active area of the detector in cm^2

A typical beta MDC_{SCAN} calculation for the SRA SCM IV gas flow proportional detector is shown below:

$$MDC_{SCAN} = \frac{1.38\sqrt{0.083}\left(\frac{60}{0.20}\right)}{\left(\sqrt{0.75}\right)(0.15)\left(\frac{25}{100}\right)} = 3672\ \text{dpm/100cm}^2$$

$$\text{i} = 5\,\text{cm}\cdot\frac{\text{inch}}{2.54\,\text{cm}}\cdot\frac{\text{sec}}{10\,\text{inch}}\cdot = 0.20\,\text{sec}$$

$$b_i = .20\,\text{sec} \cdot \frac{25\,\text{counts}}{\text{minute}} \cdot \frac{\text{minute}}{60\,\text{sec}} = 0.083\,\text{counts}$$

A typical beta MDC_{SCAN} calculation for the Ludlum Model 43-37 gas flow proportional detector is shown below:

$$MDC_{SCAN} = \frac{1.38\sqrt{17.5}\left(\frac{60}{1.05}\right)}{\left(\sqrt{0.5}\right)(0.18)\left(\frac{582}{100}\right)} = 445\,\text{dpm}/100\text{cm}^2$$

$$i = 13.3\,\text{cm} \cdot \frac{\text{inch}}{2.54\,\text{cm}} \cdot \frac{\text{sec}}{5\,\text{inch}} \cdot = 1.05\,\text{sec}$$

$$b_i = 1.05\,\text{sec} \cdot \frac{1000\,\text{counts}}{\text{minute}} \cdot \frac{\text{minute}}{60\,\text{sec}} = 17.5\,\text{counts}$$

A typical beta MDC_{SCAN} calculation for the Ludlum Model 43-89 scintillation detector is shown below:

$$MDC_{SCAN} = \frac{1.38\sqrt{3.66}\left(\frac{60}{1.57}\right)}{\left(\sqrt{0.5}\right)(0.11)\left(\frac{125}{100}\right)} = 1038\,\text{dpm}/100\text{cm}^2$$

$$i = 8\,\text{cm} \cdot \frac{\text{inch}}{2.54\,\text{cm}} \cdot \frac{\text{sec}}{2\,\text{inch}} \cdot = 1.57\,\text{sec}$$

$$b_i = 1.57\,\text{sec} \cdot \frac{140\,\text{counts}}{\text{minute}} \cdot \frac{\text{minute}}{60\,\text{sec}} = 3.66\,\text{counts}$$

13.4.3 Smear Counting

Smear counting Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation, which is an expansion of NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", Table 3.1 (Strom & Stansbury, 1992):

$$MDC_{SMEAR} = \frac{3 + 3.29\sqrt{B_R \cdot t_s \cdot \left(1 + \frac{t_s}{t_b}\right)}}{t_s \cdot E}$$

Where:

MDC_{SMEAR}	=	Minimum detectable concentration level in dpm/smear.
B_R	=	background count rate in counts per minute
t_b	=	background count times in minutes
t_s	=	sample count times in minutes
E	=	Instrument efficiency for the radionuclide emission of interest

Typical MDC calculations for ^{3}H, ^{14}C and high energy beta emitters (>^{14}C beta energy) using a liquid scintillation counter are shown below.

$$^{3}\text{H MDC}_{SMEAR} = \frac{3 + 3.29\sqrt{(25)(1)\left(1 + \frac{1}{1}\right)}}{(1)(0.5)} = 53\,\text{dpm}$$

$$^{14}\text{C MDC}_{SMEAR} = \frac{3 + 3.29\sqrt{(15)(1)\left(1 + \frac{1}{1}\right)}}{(1)(0.8)} = 26\ \text{dpm}$$

$$>156\,\text{keV Beta MDC}_{SMEAR} = \frac{3 + 3.29\sqrt{(50)(1)\left(1 + \frac{1}{1}\right)}}{(1)(1)} = 36\ \text{dpm}$$

Typical MDC calculations for gross alpha and gross beta using a Ludlum 2929 are shown below.

$$\text{Alpha MDC}_{SMEAR} = \frac{3 + 3.29\sqrt{(4)(1)\left(1 + \frac{1}{60}\right)}}{(1)(0.29)} = 33\,\text{dpm}$$

$$\text{Beta MDC}_{SMEAR} = \frac{3 + 3.29\sqrt{(70)(1)\left(1 + \frac{1}{60}\right)}}{(1)(.23)} = 134\ \text{dpm}$$

13.5 Soil Scanning

The number of source counts required for a specific time interval is given by MARSSIM Equation 6-8:

$$s_i = d'\sqrt{b_i}$$

where:

d' is the performance factor based on required true and false positives rates (1.38), and

b_i is the number of background counts in the observation interval

Assuming that the source remains under the detector for 2 seconds (e.g. i=2) and the background count rate is 10,000 cpm. The value for b_i and s_i is then calculated:

$$b_i = \frac{10{,}000}{60} \times 2 = 333 \text{ counts/interval}$$

$$s_i = 1.38 \times \sqrt{333} = 25.2$$

The scan minimum detectable count rate is then calculated using the following MARSSIM equation 6-9:

$$MDCR = s_i \times (60/i)$$

where:

MDCR is the Minimum Detectable Count Rate

$$MDCR = 25.2 \times (60/2) = 756$$

The $MDCR_{surveyor}$ is calculated assuming a surveyor efficiency of 0.5 using MARSSIM equation 6-10:

$$MDCR_{surveyor} = \frac{MDCR}{\sqrt{0.5}} \text{ cpm}$$

$$MDCR_{surveyor} = \frac{756}{\sqrt{0.5}} = 1069$$

The instrument sensitivity of the Ludlum 44-10 – 2"x2" NaI detector is 900 cpm per μR/hr (from NUREG 1507, Table 6.3).

From above the $MDCR_{surveyor}$ is 1069 cpm. This is equivalent to 1.19 µR/hr using the instrument sensitivity of 900 cpm per µR/hr.

The following modeling analysis factors are input into the Microshield™ software (see MARSSIM section 6.7.2.1) using the nuclides of concern at the prescribed distribution:

- Areal dimension of cylinder area of elevated activity is 0.25 m^2 (28 cm radius)
- Depth of area of elevated activity is 15 cm
- The dose point is 10 cm above the surface, and
- The density of soil is 1.6 g/cc.

The dose rate calculated by Microshield™ is 0.26 µR/hour per 1.0 pCi/g. (calculated from the example in NUREG 1507, page 6-22 demonstrating that 5 pCi/g Cs-137 results in 1.307 µR/hr.)

Converting $MDCR_{surveyor}$ to *scan MDC*:

$$MDC_{SCAN} = \frac{(1.0\ pCi/g)(1.19\ \mu R/hr)}{0.26\,\mu R/hr} = 4.6\,pCi/g$$

Based on an observation interval of 2 seconds and an observation area of 0.25 m^2, the scan rate to achieve this scan MDC would be a maximum of 10 inches per second moving the detector in a serpentine motion.

13.6 Determination of Uncertainty

The uncertainty for each measurement is calculated using equation 6-15 from MARSSIM:

Equation 13-1

$$\sigma = 1.96\sqrt{\frac{C_{s+b}}{T_{s+b}^{\ 2}} + \frac{C_b}{T_b^{\ 2}}}$$

where:

σ	=	uncertainty
1.96	=	multiplier to achieve a 95% confidence level
C_{s+b}	=	gross sample counts
T_{s+b}	=	sample count time (min.)
C_b	=	gross background counts
T_b	=	Background count time (min.)

14.0 Data Quality Objectives

The Data Quality Objective Process as described in MARSSIM is used throughout the design and implementation of surveys. In addition to the DQOs specified in the Final Status Survey Plan, the following is a list of the major DQOs for the survey design:

- Static measurements will be taken to achieve an MDC_{static} of less than 25% of $DCGL_W$.
- Scanning will be conducted at a rate to achieve an MDC_{scan} of less than 50% of the $DCGL_W$.
- Soil samples will be analyzed to achieve an MDC of less than 30% of the $DCGL_W$.
- Individual measurements will be made to a 95% confidence interval.
- Decision error probability rates will initially be set at 0.05 for both α and β.
- The null hypothesis (H_0) and alternate null hypothesis (H_A) are that of NuReg 1505 scenario A:
  - H_0 is that the survey unit does not meet the release criteria
  - H_A is that the survey unit meets the release criteria
- A sufficient number of samples will be collected to demonstrate compliance with the ALARA goal of 15mrem/yr.
- Characterization and remedial action support surveys will be conducted under the same quality assurance criteria as final status surveys such that the data may be used as final status survey data to the maximum extent possible.

Instrument operating parameters and methodologies were established to meet the DQOs. Additionally, investigation levels were developed to verify the assumptions for classifying survey units. If these investigation levels were exceeded, an investigation was performed to verify the initial assumptions behind the classification and determine the appropriate resolution. This is further discussed in Section 18.0 of this report. The established investigation levels are summarized in Table 14-1.

Table 14-1 –Survey Investigation Levels

Survey Unit Classification	Flag Static Measurement or Sample Result When:	Flag Scanning Measurement Result When:	Flag Removable Activity Measurement Result When:
All	> 25% of $DCGL_W$	> 50% of $DCGL_W$	> 200dpm/100cm^2

15.0 Characterization Surveys

The purpose of the characterization survey is to confirm the initial area classification schemes of Impacted Class 1, 2 or 3; to identify any areas that are incorrectly classified and to identify areas requiring remediation. All surveys were of a type and quality such that the surveys were used as Final Status as appropriate.

15.1 Structural Surfaces

Characterization surveys performed on structural surfaces (indoor surfaces and outdoor paved surfaces) consisted primarily of scans required by the final status surveys. The percentage of area that was scan surveyed was dependent on classification.

The Shonka Research Associates Surface Contamination Monitor (SCM IV) was used to perform statistically significant beta surface contamination measurements during scans. Since fairly extensive scoping surveys served as the basis for indoor remediation activities conducted prior to characterization, it was expected that most, if not all, of the characterization scan surveys could be used as final status survey data.

Since the facility still contained small amounts of radioactive materials (waste) at the time of scoping surveys, the quality of the scoping indoor gamma walkthrough survey was poor in some areas of the facility. As such, the gamma walkthrough survey was re-performed in its entirety during characterization. A walkthrough was performed with a 2"x2" NaI detector held at waist level to identify any sources of radiation that might not be detected by using the final status survey protocols (i.e., beta surface contamination measurements), such as misplaced check sources. No unidentified source of elevated activity was detected

15.2 Soil Areas

A walkover survey was performed of outside grounds using a 3" x 3" NaI detector to confirm the initial classification of outside grounds as non-impacted for nuclides other than C-14 and H-3. The initial classification was determined based on a walkover survey performed with a 2"x2" NaI detector.

15.3 Characterization Results

Structural Surfaces

Characterization scans with the SRA SCM IV confirmed that structural surfaces in all survey units were less than $DGGL_w$. As such, characterization data were used as final status data in all survey units.

Note: One area (~1m^2) of elevated activity up to 68,356 dpm/100cm^2 was identified on the concrete support pad for the Sears Shed[12]. The decision was

[12] This area of elevated activity was obstructed by stored equipment and inaccessible for survey during the scoping survey. This area can clearly be seen as a bright spot on the FSS overlay in Appendix L.

made to remove the Sears Shed and its concrete support pad to provide access to underlying soils for final status surveys in GGH7 (soils surrounding the Interim Storage Shed). The concrete pad was remediated to free release criteria for materials and equipment, then the Sears Shed and pad were surveyed and released as equipment and materials under the provisions of the Rutgers radioactive materials license. Even though it was no longer within the scope of the MARSSIM-based survey protocols, the Sears Shed was included in characterization surveys to evaluate its readiness for free release as equipment and materials.

Soils

One area of elevated activity was detected during the gamma scans of outside grounds. Approximately 40,000 net cpm was detected near the southernmost ventilation supply fan located on the east side of the Greenhouse. Upon further investigation, it was discovered that the drip pan associated with the fan casing drain contained elevated activity. A solid sample was obtained from the drip pan and analyzed on-site by gamma spectroscopy analysis for nuclide identification only.[13] As expected, the analysis identified Cs-137 as the contaminant. It appears that removable Cs-137 activity from the shipping cask formerly stored in the southeast corner of the Greenhouse had migrated through the ventilation supply duct into the fan casing and then washed into the drip pan from weather exposure. Debris (leaves and dirt) inside the duct and inside the fan casing had slightly elevated activity. After vacuuming the debris, no elevated activity was detected in the duct or in the fan casing. The drip pan had almost entirely corroded into fine rust particles. Structural steel members around the drip pan were still intact, limiting the further migration of solids from the drip pan. The supply fans have not been operated in many years. It is theorized that pressure changes within the Greenhouse due to temperature transients caused low levels of activity to migrate into the fan casing and then into the drip pan via the single 1/8" drain hole located at the bottom of the fan casing.

[13] The sample was not quantified due to lack of suitable calibration source geometries.

16.0 Remediation

Remediation was performed on building structural surfaces and in the surface soils of outside grounds. The locations of remediation are graphically presented in Appendix I.

16.1 Building Structures and Surfaces

Floor surfaces in the Greenhouse and Head House required removal of surface concrete in order to meet project criteria. The Greenhouse had distributed Cs-137 floor surface contamination in the southern 1/3 of the building due to the shipping cask previously described. The Head House had several locations of elevated C-14 activity that were remediated. Surface removal was accomplished using an electric scarifier fitted with a HEPA-filtered vacuum system. A shroud enclosed the tool working surface to contain dusts and rubble that were then vacuumed into the vacuum system. Approximately 1/8" of the floor surface on average was removed. Additionally, a handheld breaker (small electric jackhammer) fitted with a bushing tool was used to decontaminate surfaces that were inaccessible to the floor scarifier. Dusts were controlled locally with a HEPA-filtered vacuum cleaner.

Figure 16-1 – Floor Surface Remediation with Electric Scarifier

Figure 16-2 - Floor Surface Remediation in Southwest Corner of Greenhouse

Figure 16-3 – Floor Surface Remediation in Southeast Corner of Greenhouse

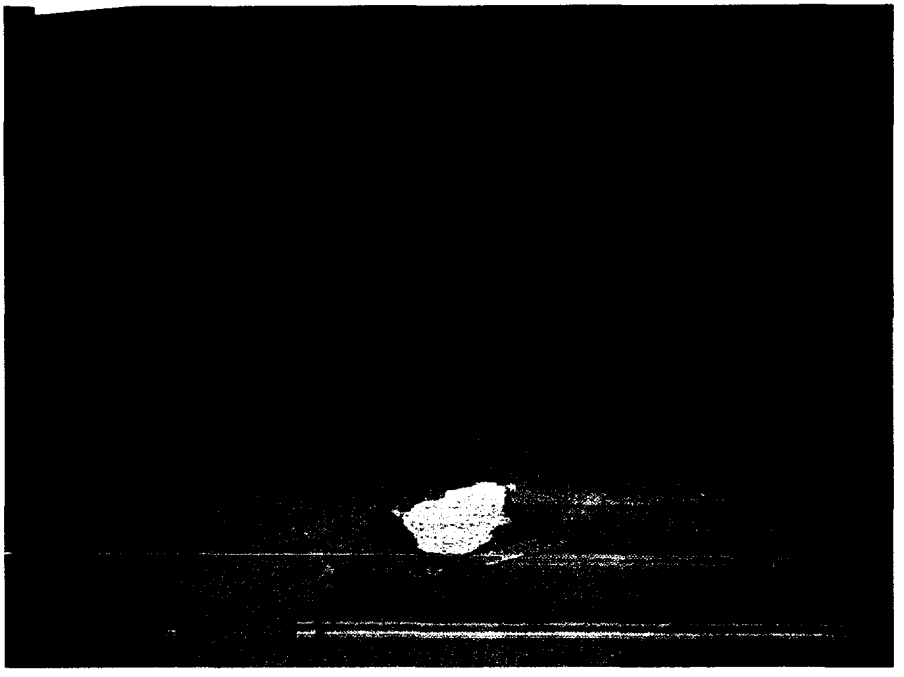


Figure 16-4 – Floor Surface Remediation in Northwest Corner of Head House

Additionally, a small area (~1m^2) of elevated activity on the Sears Shed floor was removed to about ½" depth with a 65-pound electric jackhammer. Dusts were controlled locally with a HEPA-filtered vacuum cleaner.

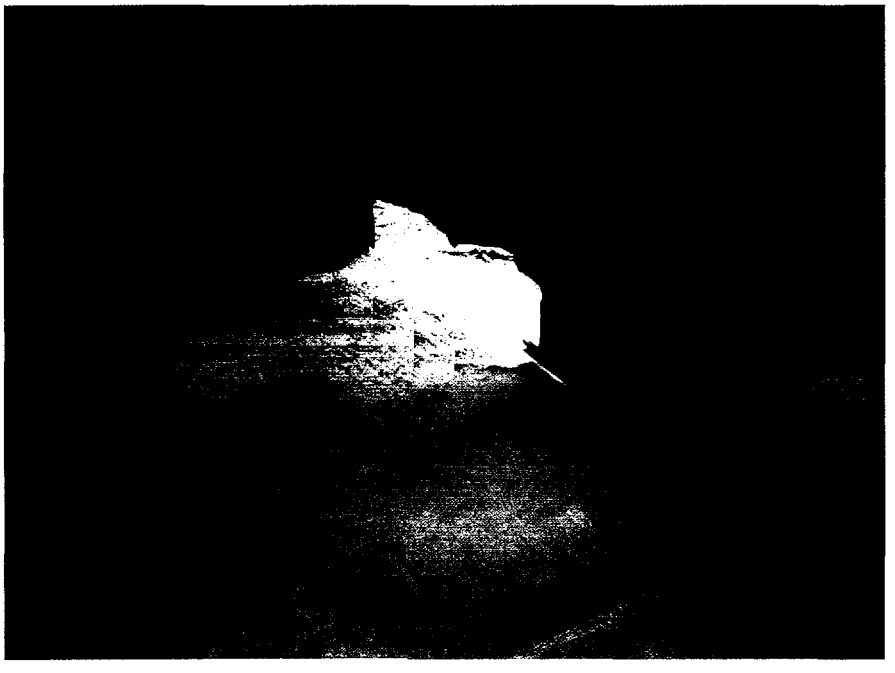


Figure 16-5 – Floor Surface Remediation in Sears Shed

All concrete surface remediation activities were conducted according to a project-specific procedure and dose assessment approved by the Chase Project Manager and Rutgers University Health Physicist (UHP). Work area breathing zone air samples were performed continuously during concrete remediation activities in the Greenhouse and Head House. All air samples were less than the MDC for the analytical method. The MDC for each air sample was well less than 1% of the Cs-137 DAC value.

The Sears Shed and concrete structures (walkways and pads) east and north of the Interim Storage Shed were surveyed and released as equipment and materials under the provisions of the Rutgers radioactive materials license. These structures were removed to provide access to underlying soils for final status surveys and not as a remedial action. Additionally, the southernmost supply ventilation fan and duct on the east side of the greenhouse were removed and free released to provide access for investigation the fan support pad. The surface of the fan pad was removed in order to meet free release criteria. Because these items were released as equipment and materials, they are not within the scope of the MARSSIM survey protocols.

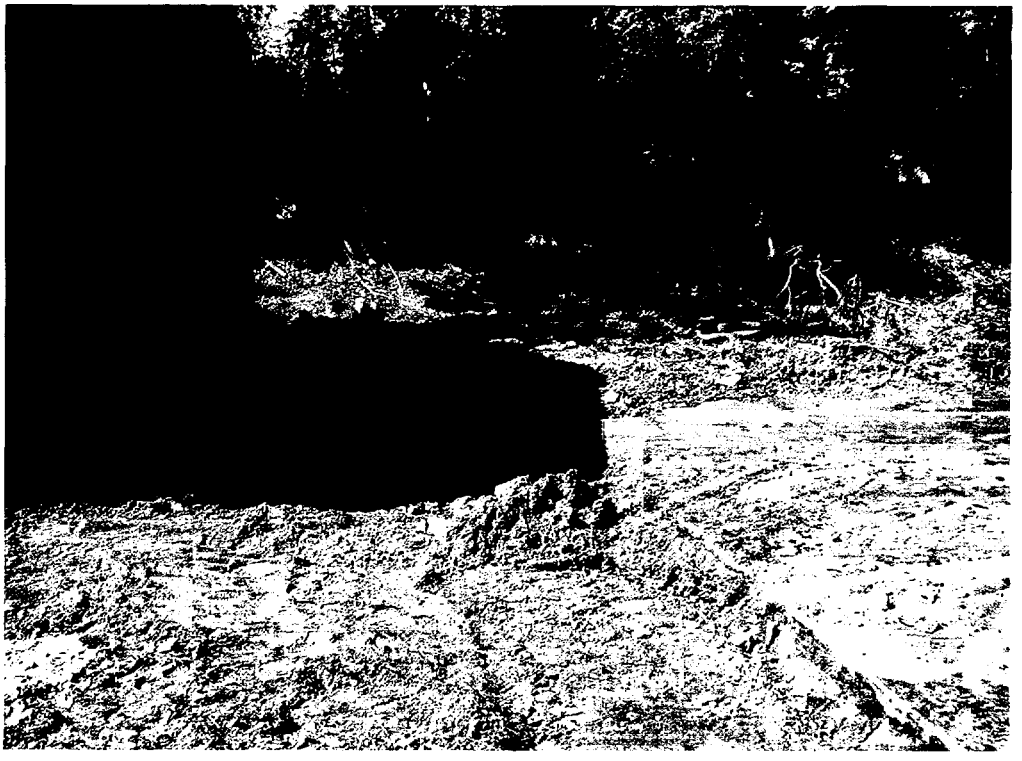


Figure 16-6 – North of Interim Storage Shed (Concerete Removed)

Figure 16-7 – Vial Field (Concrete Removed)

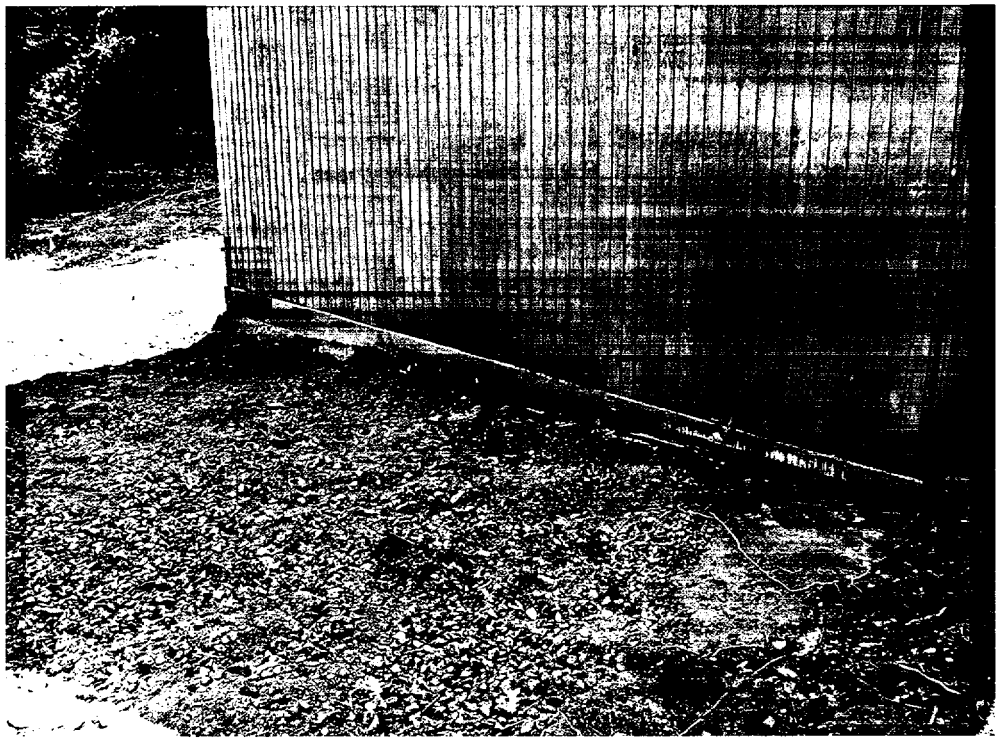


Figure 16-8 – Sears Shed Area (After Removal)

Table 16-1 summarizes all building structural surfaces that were remediated.

Table 16-1- Remediated Surfaces and Structures

Survey Unit	Location (Size)	Maximum Activity (dpm/100cm^2)		Remediation Method	Post-Remediation Activity (dpm/100cm^2)	
		Total[14]	Removable		Total	Removable
GGH1	Floor (500 ft^2)	62,437	705	Surface Removal	< 2000	< 200
GGH2	Floor (10 ft^2)	3,114	< 200	Surface Removal	< 2000	< 200
N/A[15]	Sears Shed Floor (10 ft^2)	68,356	<200	Surface Removal	< 5,000	<1,000
	Supply Fan Pad (10 ft^2)	63,709	11,000 dpm/LAW	Surface Removal		

16.2 Soils

Scoping survey samples identified elevated C-14 and H-3 activity in surface soils surrounding the Interim Storage Shed. One composite sample (S4) was equal to the ALARA goal. The components of this sample were split and analyzed separately as described in Section 4.2. This revealed that surface soils south of the Interim Stage Shed contained activity above the ALARA goal, but less than the DCGL. Subsequently, an area of about 50 ft^2 was excavated to a six inch depth for ALARA purposes.

Additionally, approximately 5 ft^2 of surface soils around the ventilation supply fan support pad were excavated to a six inch depth as described below.

Table 16-2 – Remediated Soils

Survey Unit	Location	Volume (ft^3)	Remediation Method
GGH7	South and West Corner of Interim Storage Shed	25	Hand Excavation
N/A[16]	Around Ventilation Supply Fan Support Pad	2.5	Hand Excavation

[14] Pre-remediation surveys performed with a Ludlum 43-37 gas flow proportional floor monitor.
[15] After remediation, these items were surveyed and free released as non-radioactive waste under the provisions of the Rutgers radioactive materials license.
[16] Due to its small area, this location was not surveyed under MARSSIM protocols.

The ventilation supply fan assembly, vent duct and concrete support pad identified during Characterization were removed. After removal of the fan and duct, the concrete pad was scraped and vacuumed, then surveyed. Elevated activity still remained on the pad surface so a layer of the surface was removed and the pad surveyed and verified to meet free release criteria for equipment and materials.

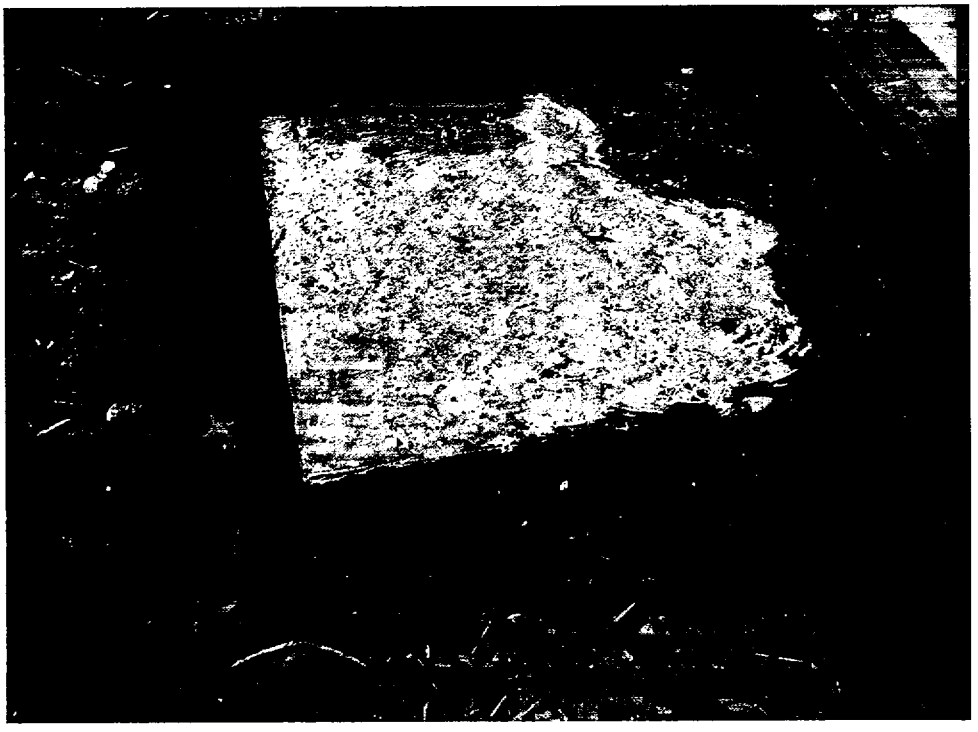


Figure 16-9 - Fan Pad After Surface Remediation

Scans of surrounding soils with a 2"x2" NaI detector indicated elevated activity. In order to further evaluate the impact to soils, the concrete pad was removed. Weighing the cost of sampling and analyzing the elevated soils (including costs associated with schedule delays) vs. the cost of disposal as radioactive material, Rutgers made a decision to excavate a six inch swath of the surface soils (up to a six inch depth) around the pad. After excavation of the surrounding soils and removal of the pad, NaI scans were performed. A soil sample was taken from the location on each side of the pad of highest activity identified during the scans. To verify that surrounding soils were not impacted, four additional surface soil samples were taken around the pad from unexcavated areas. Locations of soil samples are presented in Figure 16-11 – Fan Pad Post-Remediation Soil Sample Location Map.

Figure 16-10 – Performance of NaI Scans After Fan Pad Removal

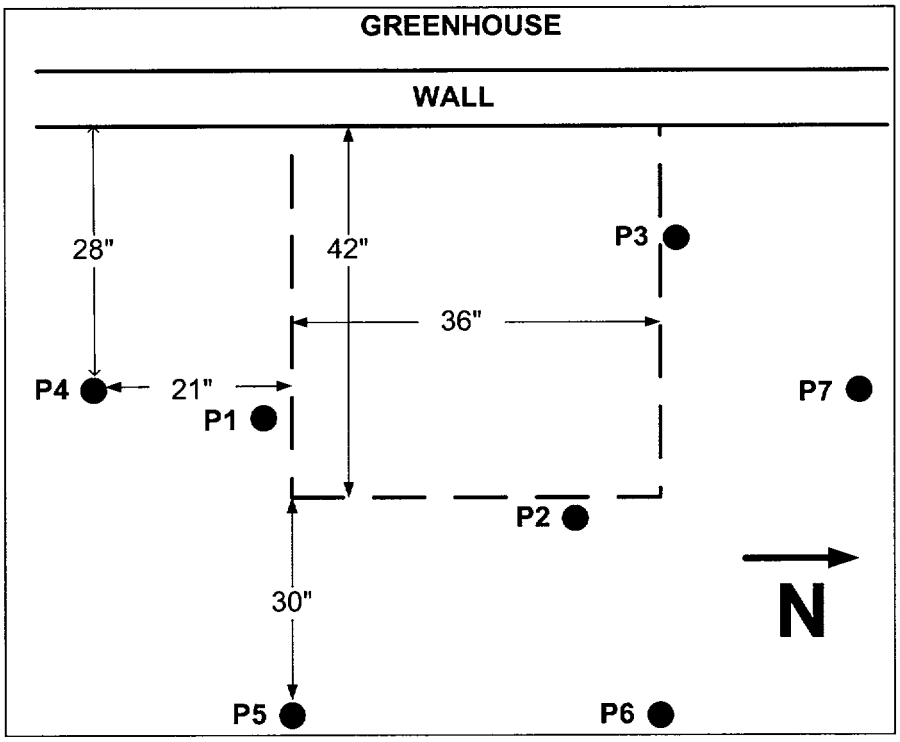


Figure 16-11 – Fan Pad Post-Remediation Soil Sample Location Map

Figure 16-12 – Fan Pad Post-Remediation Soil Samples

The laboratory analytical reports are included in Appendix H and summarized in Table 16-3.

Table 16-3 – Fan Pad Remediation Soil Sample Results

Sample Number	Cs-137 (pCi/g)	MDC (pCi/g)	Flag	Fract. DCGL
P1	1.75	0.0610	+	0.159
P2	1.39	0.0400	+	0.1.6
P3	2.46	0.0618	+	0.224
P4	2.25	0.0756	+	0.205
P5	0.962	0.0465	+	0.087
P6	2.77	0.0678	+	0.252
P7	0.965	0.0699	+	0.088
			St Dev	**0.07**
			Mean	**0.16**
			Dose (mrem/yr)	**4.07**

This area was excluded from the MARSSIM-based survey protocols because of its limited scope (small area).

- The pathway is isolated to a 1/8" drain hole.
- The source term and transport mechanisms are well understood.
- Cs-137 can be measured in the field at a fraction of its DCGL using a NaI detector, providing confidence that the extent of contamination is well understood.
- Sufficient samples were taken to define the contaminated zone and bound its areal extent.
- The impacted area is small, such that it isn't reasonable to survey as a MARSSIM survey unit.

16.3 Remedial Action Surveys

Remedial action surveys were conducted in support of remediation activities, to help determine when the area is ready for a final status survey, and to provide updated estimates for final status survey planning. Remedial action surveys served to monitor the effectiveness of decontamination efforts and ensure that surrounding areas are not cross-contaminated from remediation efforts. Remedial action surveys were designed to meet the final status surveys DQOs.

16.4 Waste Management

Radioactive wastes generated during decommissioning activities consisted of several streams as summarized in Table 16-4.

Table 16-4 – Radioactive Waste Streams

Description	Source
Dry Active Waste (DAW)	Protective clothing
Concrete Rubble and Dust	Rubblized concrete from floors, and concrete pads Contaminated dust from scabbling/scarifying
Contaminated Soils	Excavated soils

16.5 Waste Packaging

Dry active wastes were packaged in plastic bags. Concrete rubble/dusts from concrete surface removal were packaged in 55 gallon steel drums. Soils were packaged in 55 gallon and 30 gallon steel drums.

16.6 Waste Disposition

All project radioactive wastes were transported to the RSB for incorporation into the Rutgers waste management program. It is expected that in the near future, Rutgers will dispose of the materials at a licensed disposal facility along with waste generated from normal license activities via a waste brokerage contractor.

17.0 Design and Performance of Final Status Surveys

Final status surveys were performed using the Data Quality Objective (DQO) process to demonstrate that residual radioactivity in each survey unit satisfied the predetermined criteria for release for unrestricted use. Final status surveys were conducted by performing the appropriate combination of scan surveys, total activity measurements, removable activity measurements and soil samples as discussed further in this section. All final status surveys were performed according to survey package instructions. Survey data were documented on survey maps and/or associated data information sheets.

17.1 Background Determination

For the GGH facility, it was not expected that radionuclides of concern would be present in soil background or they would only be present at very small fractions of the DCGLs. Therefore, the guidance provided in MARSSIM Section 5.5.2.3 was used and survey design was based on the Sign Test.

For total surface activity measurements, ambient background levels were generally determined for each survey unit by performing a timed count in non-impacted areas. Ambient background was subtracted from each total activity gross measurement. Material background, the contribution from naturally-occurring radioactivity in building structural materials, was not accounted for (subtracted) since it was a small fraction of the DCGL.

For soil samples, background determinations were not made because nuclides of concern exist in background at levels that are a small fraction of the DCGLs. Soil sample results are presented as a gross measurements without subtraction of background.

For soil scans, baseline background values were determined using a 2"x 2" NaI detector. To establish background levels, a non-impacted area west of the site was chosen. Ten locations were selected and 1-minute timed counts were performed at a distance of ~10 cm above the ground (same geometry as scan surveys). The measurement values were averaged and a baseline background value of 8,500 cpm was established.

17.2 Surface Scans

Scanning is used to identify locations within the survey unit that exceed the investigation level. For building surfaces, scan surveys were conducted by holding the detector probe within $^{1}/_{8}$ to ¼ inch from the surface and moving the detector at the prescribed scan rate and listening for an increase in the audible response. For the SRA SCM IV, the technician scanned the surface at the prescribed rate and visually monitored surface activity on the LCD display. For soils, the detector was moved at a rate less than 10 inches per second over the surface at a distance of approximately 10 cm using a serpentine motion.

Class 1 survey units received a 100% scan of accessible surfaces. In Class 2 and 3 survey units, scanning was performed on a minimum percentage of accessible surfaces with the highest potential to contain residual activity at the discretion of the survey technician. Table 17-1 summarizes the minimum percentage of accessible building structural surfaces and soils scanned based on classification.

Table 17-1 – Scan Survey Coverage by Classification

Structure	Class 1	Class 2	Class 3
Floors	100 %	NA	NA
Lower Walls	100 %	80 %	NA
Upper Walls and Ceilings	100 %	10 %	NA
Soils and Paved Areas	100 %	NA	100%

17.3 Soil Samples and Total Surface Activity Measurements

Direct surveys (static measurements) were taken in impacted areas utilizing instrumentation capable of measuring nuclides of concern and of the best geometry based on the surface at the survey location. During characterization survey scans, the SCM IV data-logged statistically significant surface activity measurements. These measurements were used as final status data.

Total surface activity measurements were taken at each identified sample location. This was accomplished by including the MARSSIM-calculated locations in the surface scans with the SCM IV.

Soil samples were taken at each identified sample location in impacted open land areas to determine the amount of residual activity in the survey unit.

17.3.1 Determining the Number of Samples Needed

A minimum number of samples are needed to obtain sufficient statistical confidence that the conclusions drawn from the samples are correct. The number of samples will depend on the Relative Shift (the ratio of the concentration to be measured relative to the statistical variability of the contaminant concentration). The relative shift should be a value between 1 and 3 and can be adjusted with the Lower Bound of the Gray Region (LBGR) which is a site-specific parameter initially set to the expected concentration in the survey unit.

The minimum number of samples is obtained from MARSSIM tables or calculated using equations in Section 5 of MARSSIM.

Determination of the Relative Shift

The number of required samples depends on the ratio involving the activity level to be measured relative to the variability in the concentration. The ratio to be used is called the Relative Shift, Δ/σ_S and is defined in MARSSIM as:

$$\Delta / \sigma_S = \frac{DCGL_W - LBGR}{\sigma_S}$$

Where:

$DCGL_W$ = derived concentration guideline

$LBGR$ = concentration at the lower bound of the gray region. The LBGR is the average concentration to which the survey unit should be cleaned in order to have an acceptable probability of passing the test

σ_S = an estimate of the standard deviation of the residual radioactivity in the survey unit

The actual calculations are provided below (note that the number of samples is calculated using the ALARA goal as the DCGL to ensure that compliance with the ALARA goal can be statistically demonstrated):

Structural Surfaces

$$\Delta / \sigma_S = \frac{1.68E4 - 8.4E3}{2500} = 3.4$$

Since MARRSIM Table 5.5 does not include relative shifts above 3 and the number of samples required decreases with an increasing relative shift, the relative shift was conservatively set at 3.

Surface Soils

$$\Delta / \sigma_S = \frac{1 - 0.5}{0.2} = 2.5$$

Determination of Acceptable Decision Errors

A decision error is the probability of making an error in the decision on a survey unit by failing a unit that should pass (β decision error) or passing a unit that should fail (α decision error). MARSSIM uses the terminology α and β decision errors; this is the same as the more common terminology of Type I and Type II errors, respectively.

The applicable decision errors (Type I Type II errors) are selected at 0.05 in accordance with the established Data Quality Objectives.

Determination of Number of Data Points

The contaminants are not present in the background at significant levels relative to the DCGLs, therefore measurements are compared directly to the $DCGL_W$ value. Based on this, the Sign Test will be employed for the statistical evaluation of survey data.

The number of direct measurements for a particular survey unit, employing the Sign Test, is determined from MARSSIM Table 5.5, which is based on the following equation (MARSSIM equation 5-2):

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{4\left(SignP - 0.5\right)^2}$$

Where:

N = number of samples needed in the survey unit
$Z_{1-\alpha}$ = percentile represented by the decision error α
$Z_{1-\beta}$ = percentile represented by the decision error β
SignP = estimated probability that a random measurement will be less than the $DCGL_W$ when the survey unit median is actually at the LBGR

Note:Pecentiles $Z_{1-\alpha}$ and $Z_{1-\beta}$ are determined from MARSSIM Table 5.2. *SignP* is determined from MARSSIM Table 5.4

MARSSIM recommends increasing the calculated number of measurements by 20% to ensure sufficient power of the statistical tests and to allow for possible data losses. MARSSIM Table 5.5 values include an increase of 20% of the calculated value.

Rutgers' approach is to predetermine a number of samples to be applied to all survey units. This approach would provide sufficient power for the statistical test while streamlining the survey planning process. The following calculations were made to determine this number:

Structural Surfaces

$$N = \frac{\left(1.645 + 1.645\right)^2}{4\left(0.998650 - 0.5\right)^2} = 11$$

$Z_{1-\alpha}$ and $Z_{1-\beta}$ are equal to 1.645 using the error rate of 0.05 from MARSSIM Table 5.2. SignP is equal to 0.998650 from MARSSIM Table 5.4. Adding an additional 20% to account for data losses resulted in a value of 14.

Therefore, the determined number of structural surface samples for planning purposes was 14.

Surface Soils

$$N = \frac{(1.645 + 1.645)^2}{4(0.993790 - 0.5)^2} = 12$$

$Z_{1-\alpha}$ and $Z_{1-\beta}$ are equal to 1.645 using the error rate of 0.05 from MARSSIM Table 5.2. SignP is equal to 0.993790 from MARSSIM Table 5.4. Adding an additional 20% to account for data losses resulted in a value of 15.

Therefore, the determined number of surface soil samples for planning purposes was 15.

17.3.2 Determining Sample Locations

Determination of Class 1 survey unit sample locations is accomplished by the determination of sample spacing and systematically plotting these locations from a randomly generated start location. The random starting point of the grid provides an unbiased method for obtaining measurement locations to be used in the statistical tests. Class 1 survey units have the highest potential for small areas of elevated activity, so the areas between measurement locations may be adjusted to ensure that these areas can be detected by scanning techniques.

Similar systematic spacing methods are used for Class 2 survey units because there is an increased probability of small areas of elevated activity. The use of a systematic grid allows the decision-maker to draw conclusions about the size of the potential areas of elevated activity based on the area between measurement locations.

Simple random measurement patterns are used for Class 3 survey units to ensure that the measurements are independent and support the assumptions of the statistical tests.

Table 17-2 summarizes the survey protocols for all areas:

Table 17-2 – Survey Sample Placement Overview

Survey Unit Classification		Statistical Test	Elevated Measurement Comparison	Measurement Locations
Impacted	Class 1	Yes	Yes	Systematic Random
	Class 2	Yes	No	Systematic Random
	Class 3	Yes	No	Simple Random[17]
Non-Impacted		None	None	None

[17] MARSSIM specifies a simple random survey protocol for Class 3 areas. In lieu of a simple random protocol for Class 3 areas, the SCM IV was used to perform a 100% survey of outdoor paved areas.

Determining Class 1 and Class 2 Sample Locations

In Class 1 and Class 2 survey units, the sampling locations are established in a unique pattern beginning with the random start location and the determined sample spacing. After determining the number of samples needed in the survey unit, sample spacing is determined from MARSSIM equation 5-5 or 5-6:

$$L = \sqrt{\frac{A}{n_{EA}}} \quad \text{for a square grid in structural surface survey units}$$

$$L = \sqrt{\frac{A}{0.866\ n_{EA}}} \quad \text{for a triangular grid in surface soils survey units}$$

Where:

L	= sample spacing interval
A	= the total survey unit area
n_{EA}	= calculated number of samples needed in the survey unit or revised calculated number of samples when driven by areas of elevated activity

Maps were generated of the survey unit's surfaces (floors, walls, ceilings, etc.) folded out in a 2-dimensional view. A random starting point was determined using computer-generated random numbers coinciding with the x and y coordinates of the total survey unit. A grid was then plotted across the survey unit surfaces based on the random start point and the determined sample spacing. A measurement location was plotted at each intersection of the grid.

Determining Class 3 Sample Locations

For Class 3 areas, maps are generated of the survey unit's surfaces (floors, walls and ceilings) folded out in a 2-dimensional view. Sample locations are determined using computer generated random x and y coordinates for each sample location. Each location is plotted on the applicable survey map. For the outside paved areas, it was decided to perform a 100% survey using the SCM IV, so locations were not calculated.

Maps of sample locations are provided in Appendix J.

17.4 Removable Contamination Measurements

Removable contamination measurements were collected by wiping an area of approximately 100 cm^2 using smears or swabs on structural surfaces and cotton swabs inside building systems. For swabs or smears where less than 100 cm^2 of

area was wiped, area corrections were applied to correct to 100 cm^2. The smears/swabs were counted to achieve the detection sensitivities stated in the DQOs. The liquid scintillation counter was setup for dual label counting for ^3H and ^{14}C plus a wide open channel. The wide open channel was used to demonstrate compliance with the removable contamination DCGL.

Channel 1 (^3H):	0.0 – 18.6 keV
Channel 2 (^{14}C):	0.0 – 156 keV
Wide Open:	0.0 – 2000 keV

17.5 Building System Surveys

Activity measurements, including removable activity, scan surveys, and, where possible static measurements were completed on ventilation exhausts, and building drains in accordance with the Decommissioning Plan.

17.6 Survey Documentation

A survey package was developed and approved by the Project Manager for each survey unit containing the following:

- Survey instruction sheet
- General survey requirements
- Instrument requirements with associated MDCs, count times and scan rates
- Survey maps detailing survey locations and placement methodology
- Survey data sheets

17.7 Data Validation

Field data was reviewed by the Project Manager and validated to ensure:

- Completeness of forms
- Proper types of surveys were performed
- The MDCs for measurements met the established data quality objectives
- Independent calculations were performed on a representative sample of data sheets
- Satisfactory instrument calibrations and daily functionality checks were performed as required

18.0 Data Quality Assessment and Interpretation of Survey Results

The statistical guidance contained in Section 8 of MARSSIM was used to determine if areas are acceptable for unrestricted release and whether additional surveys or sample measurements were required.

18.1 Preliminary Data Review

A preliminary data review was performed for each survey unit to identify any patterns, relationships or anomalies. Additionally, measurement data were reviewed and compared with the applicable DCGL and Investigation Level to identify areas of elevated activity and confirm correct survey unit classification.

The following preliminary data reviews were performed for each survey unit:

- Calculations of the survey unit mean, median, maximum, minimum, and standard deviation for each type of reading.
- Comparison of the survey unit mean to the $DCGL_W$.
- Comparison of the survey unit mean to the median.
- Comparison of each individual measurement to applicable DCGLs.
- Comparison of each measurement to applicable Investigation Levels.
- A calculation of the minimum number of samples required to ensure the MARSSIM requirements were met.

Reports generated from the SCM IV software for structural surfaces and laboratory analytical reports for soils are included in Appendix K. Additionally, a survey overlay (Appendix L) was developed of all floors and paved surfaces to provide a graphical representation of the distribution of residual activity. Final Status Data are summarized in the following tables.

Table 18-1 – Surfaces and Structures Total Activity Summary

Survey Unit	# of Sample Locations	Max. MDC	Mean	Median	Standard Deviation	Maximum	Investigation Level	Any Result Exceeding Applicable Investigation Level?
		(dpm/100 cm^2)						
GGH1	14,706	5,709	2,412	2,696	1,922	16,177	14,000	Yes[1]
GGH2	8,800	9,233	1,313	1,163	1,219	8,264	14,000	No
GGH3	14,706	5,709	2,412	2,696	1,922	16,177	14,000	Yes[1]
GGH4	9,766	7,685	1,855	1,630	1,493	15,047	14,000	Yes[1]
GGH5	19,133	9,311	2,293	2,024	1,766	15,850	14,000	Yes[1]
GGH6	2,375	2,019	1,939	1,853	720	6,739	14,000	No
GGH8	88,418	8,878	4,189	3,652	3,018	25,386	14,000	Yes[1]
GGH9	9,086	7,797	2,551	1,774	2,097	13,864	14,000	No

Note 1: No measurement exceeded applicable DCGLs. See Section 18.2 for the detailed discussion of the investigation results.

Table 18-2 - GGH7 Final Status Survey Soil Sample Results

Sample Number	H-3 (pci/g)				C-14 (pci/g)				Sum of Fractions
	Result	MDC	Fract. DCGL	Flag	Result	MDC	Fract. DCGL[18]	Flag	
F1	0.280	0.967	0.003	U	-0.584	0.899	0.000	U	0.00
F2	0.204	0.882	0.002	U	-0.152	0.819	0.000	U	0.00
F3	1.000	1.160	0.009	U	-0.334	1.080	0.000	U	0.01
F4	0.758	0.837	0.007	U	-0.129	0.778	0.000	U	0.01
F5	0.232	0.915	0.002	U	-0.178	0.850	0.000	U	0.00
F6	0.308	0.759	0.003	U	0.479	0.706	0.040	U	0.04
F7	0.468	0.587	0.004	U	0.166	0.546	0.014	U	0.02
F8	0.844	0.810	0.008	+	1.710	0.774	0.143	+	0.15
F9	0.907	0.696	0.008	+	0.245	0.646	0.020	U	0.03
F10	0.549	0.723	0.005	U	-0.271	0.672	0.000	U	0.00
F11	0.757	0.665	0.007	+	0.572	0.618	0.048	U	0.05
F12	1.220	0.816	0.011	+	0.608	0.758	0.051	U	0.06
F13	1.150	0.636	0.010	+	0.351	0.591	0.029	U	0.04
F14	2.090	0.600	0.019	+	5.750	0.734	0.479	+	0.50
F15	13.600	0.900	0.124	+	1.870	0.758	0.156	+	0.28
								Mean	**0.08**
								Dose (mrem/yr)	**2.00**

[18] Where sample results are negative, zero was used to calculate the sum of fractions to demonstrate compliance with the DCGL and the actual value was used to calculate the sum of fractions used to determine the standard deviation of the population for number of sample calculations.

18.2 Determining Compliance for Building Surfaces and Structures

For all survey units, each total surface activity measurement was less than the applicable $DCGL_W$, the mean was less than the ALARA goal and each removable contamination measurement was less than the ALARA goal. Therefore, no further statistical tests are required and each survey unit meets the release criteria.

Additionally, each measurement was compared to the applicable Investigation Level. Where an Investigation Level was exceeded, an investigation was performed. Five of the eight structural surface survey units had individual measurements exceeding the Investigation Level. This is likely a result of anomalous measurements obtained using the SCM IV. With other types of instruments, anomalous measurements and spikes result in resurvey and replacement of suspect data. Because data are logged at each 25 cm^2 of surface area surveyed resulting in thousands of measurements per survey unit, it is difficult to remove anomalous data or to coordinate a separate re-survey of affected locations. Therefore, anomalous results are tolerated as long as they are isolated and less than the DCGL. Each measurement was below the DCGL, the mean for each survey unit is well below the Investigation Level and reviews of survey overlay plots (such as the plots presented in Appendix L) confirm that all elevated results are isolated.

The number of samples required was calculated based on the survey unit with the highest standard deviation and replacing the DCGL with the ALARA goal:

$$\Delta/\sigma_S = \frac{1.68E4 - 8.4E3}{3018} = 2.8$$

$$N = \frac{(1.645 + 1.645)^2}{4(0.993790 - 0.5)^2} = 12$$

18.3 Determining Compliance for Building Systems

All total surface activity measurements and removable activity measurements performed during scoping surveys were compared directly to the applicable DCGL and Investigation Levels. All total activity measurements and removable activity measurements were less than the applicable Investigation Level. Therefore, all systems survey units meet the release criteria and are suitable for release. Because remediation was performed after scoping and removal of a supply fan was required, it was decided to re-perform all systems final status surveys as part of the Quality Assurance surveys performed at the conclusion of the project. Therefore, systems final status survey data are presented in Section 19.0.

18.4 Determining Compliance for Surface Soils

Because nuclide-specific measurements were obtained for C-14 and H-3, the sum of fractions must be determined for each sample location and the unity rule applied using the equation below.

$$\frac{C_{H-3}}{DCGL_{H-3}} + \frac{C_{C-14}}{\mathrm{DCGL_{C\text{-}14}}} < 1$$

Where:

$C_{H\text{-}3}$ = Sample result for H-3 in pCi/g
$C_{C\text{-}14}$ = Sample result for C-14 in pCi/g
$DCGL_{H\text{-}3}$ = DCGL for H-3 (110 pCi/g)
$DCGL_{C\text{-}14}$ = DCGL for C-14 (12 pCi/g)

When unity is applied, the DCGL becomes 1. The result of a sum of fractions calculation is the fraction of the DCGL (i.e., a result of 0.75 means that the sample result is 75% of the DCGL).

The sum of fractions was calculated for each sample in survey unit GGH7 and compared to the DCGL. Each sample was below the DCGL and the ALARA goal, therefore no further statistical tests are required and the survey unit meets the release criteria.

The number of samples required was calculated based on the actual standard deviation and replacing the DCGL with the ALARA goal:

$$\Delta / \sigma_S = \frac{1-0.5}{0.24} = 2.08$$

$$N = \frac{(1.645+1.645)^2}{4(0.977250-0.5)^2} = 12$$

19.0 Quality Assurance Surveys

The Project Manager performed Quality Assurance Surveys consisting of static measurements and smears at each structural surface location calculated using MARSSIM protocols and at each system opening (i.e., drain, ventilation duct, source tube and vent fan). To ensure proper data management and organization, a unique location code system was used so that survey data could be properly entered and organized in a database. A breakdown of the location code and specific code components are provided in Table 19-1. Structural surface measurement locations are presented in Appendix J. The results of QA surveys are presented in Appendix M. Data analyses are provided in the tables below. The contract laboratory performed its own internal QA measurements for soil samples consisting of blanks, spikes and duplicates.

Table 19-1 - Location Code Description

A unique location code was assigned to each individual survey location to ensure proper data management of the survey results. The following format was used to ensure consistency throughout the final status survey process: **BBB-RRRR-SS-M-LLL** Where:		
BBB	=	Building/Facility Code. (3 characters)
RRRR	=	Survey Unit Number. (4 characters)
SS	=	Structural Surface Code. This field represents the structural surface such as floor, wall, ceiling, etc. (2 characters) C1 = Ceiling D1 = Drain F1 = Floor S1 = Structure T1 = Source Tube V1 = Ventilation Duct V2 = Ventilation Fan W1 = Wall
M	=	Structural Material Code. This field represents the type of structural material on which a particular measurement is taken. (1 Character) B = Concrete Block C = Poured Concrete G = Glass M = Metal P = Plastic W = Wood
LLL	=	Numerical Identifier. This field represents the survey location number. The field "001" means survey point location number 1. Numerical identifiers are unique within a survey unit. (3-characters)

Table 19-2 – QA Surfaces and Structures Total Activity Summary

Survey Unit	# of Sample Locations	MDC	Mean	Standard Deviation	Minimum	Maximum	Investigation Level	Any Result Exceeding Applicable Investigation Level?
		(dpm/100 cm^2)						
GGH1	24	404	580	624	-102	2,449	7,000	No
GGH2	15	404	257	264	-102	782	7,000	No
GGH3	17	404	215	237	-326	652	7,000	No
GGH4	16	404	117	189	-233	428	7,000	No
GGH5	15	404	246	167	-121	670	7,000	No
GGH6	16	404	36	128	-168	335	7,000	No

Table 19-3 – QA Surfaces and Structures Removable Activity Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Minimum	Maximum	Investigation Level	Any Result Exceeding Applicable Investigation Level?
		(dpm/100 cm^2)					
GGH1	24	60	9	41	83	200	No
GGH2	15	55	7	48	73	200	No
GGH3	17	58	8	45	75	200	No
GGH4	16	57	8	46	76	200	No
GGH5	15	59	10	43	77	200	No
GGH6	16	58	9	40	70	200	No

Table 19-4 – QA Building Systems Total Activity Summary

Survey Unit	# of Sample Locations	MDC	Mean	Standard Deviation	Minimum	Maximum	Investigation Level	Any Result Exceeding Applicable Investigation Level?
		(dpm/100 cm^2)						
SYS1	19	404	35	129	-168	335	7,000	No

Table 19-5 – QA Building Systems Removable Activity Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Minimum	Maximum	Investigation Level	Any Result Exceeding Applicable Investigation Level?
		(dpm/100 cm^2)					
SYS1	19	57	11	35	83	200	No

20.0 References

1. NRC Regulations 10 CFR 20 Subpart E
2. NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM) Revision 2, June 2001
3. Regulatory Guide 1.86, "Termination of Operating License for Nuclear Reactors", U.S. Nuclear Regulatory Commission, Washington, DC, June, 1974
4. NUREG-1505, "A Non-parametric Statistical Methodology for the Design and Analysis of Final Decommissioning Surveys", July 1997
5. NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", December 1997
6. NUREG 1757, Volume 1 "Consolidated NMSS Decommissioning Guidance," September, 2002
7. NUREG/CR-5512 Vol. 3 SAND99-2148, "Residual Radioactive Contamination From Decommissioning – Parameter Analysis", October 1999
8. Code of Federal Regulations, Titles 10, 29, 40 and 49 with specific emphasis given to 10 CFR 19, 10 CFR 20, 29 CFR 1910.96, 29 CFR 1910.120 and 29 CFR 1926.
9. US NRC Regulatory Guides including 8.2, 8.7, 8.10, 8.13, 8.15, 8.21, 8.25, 8.29, 8.34 and 8.36.
10. ISO-7503-1, "Evaluation of Surface Contamination -Part 1: Beta Emitters (Maximum Beta Energy Greater Than 0.15 Mev) and Alpha Emitters", First Edition 1988-08-01.
11. "MARSSIM Overview", Oak Ridge Institute for Science and Engineering, January 19, 2001
12. NRC Policy and Guidance Directive PG-8-08, "Scenarios for Assessing Potential Doses Associated with Residual Radioactivity"
13. N.J.A.C. 7:28-12, "Soil Remediation Standards for Radioactive Materials."
14. N.J.A.C. 7:26E, "NJDEP Technical Requirements for Site Remediation."
15. NJDEP Field Sampling Procedures Manual, Chapter 12, "Radiological Assessment."
16. Rutgers Radioactive Materials License
17. Rutgers Gamma Greenhouse Facility Project Quality Assurance Plan

21.0 Certification

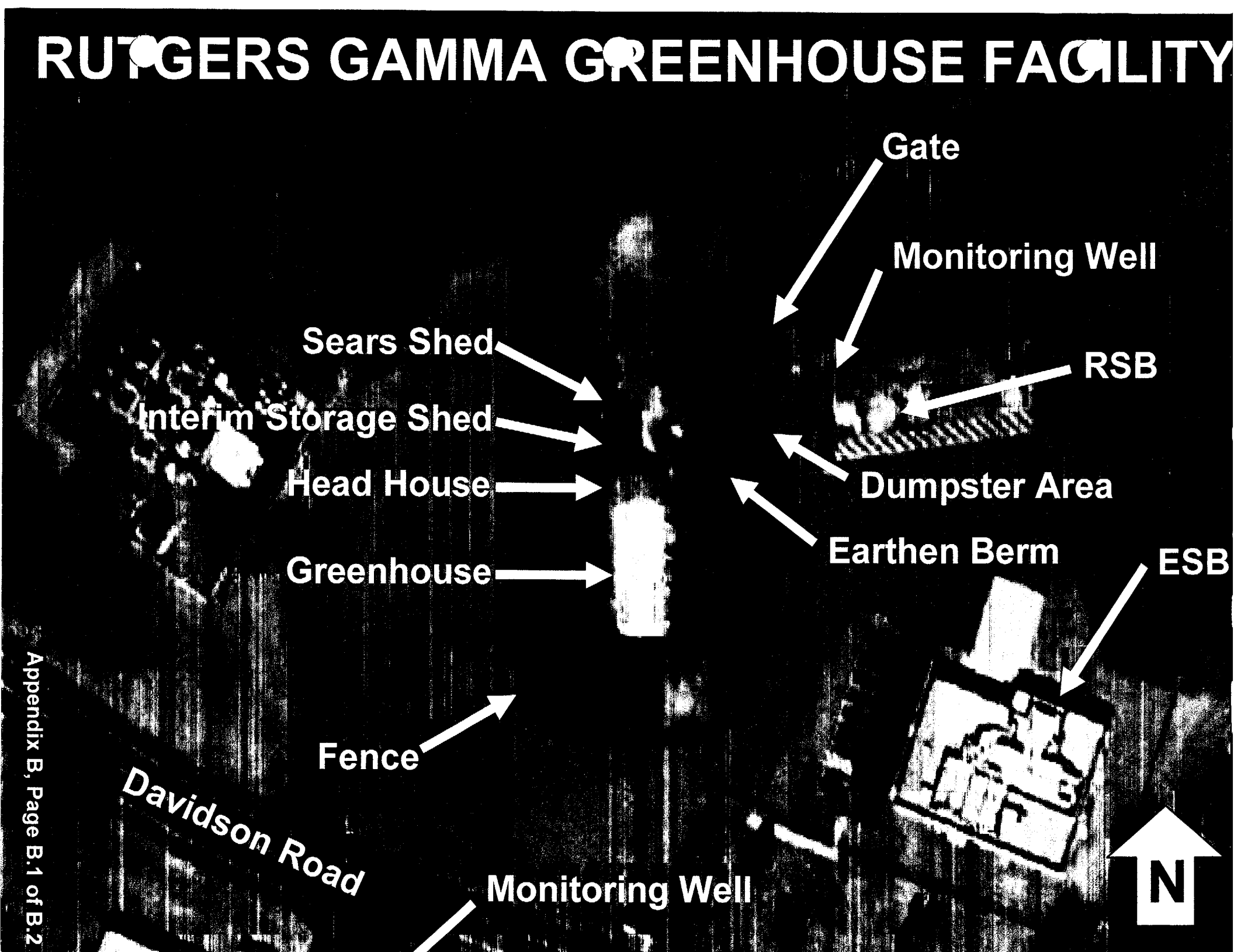
Prepared: _____ Dave Culp — Project Manager, Chase Environmental Group — Date: 10/16/06

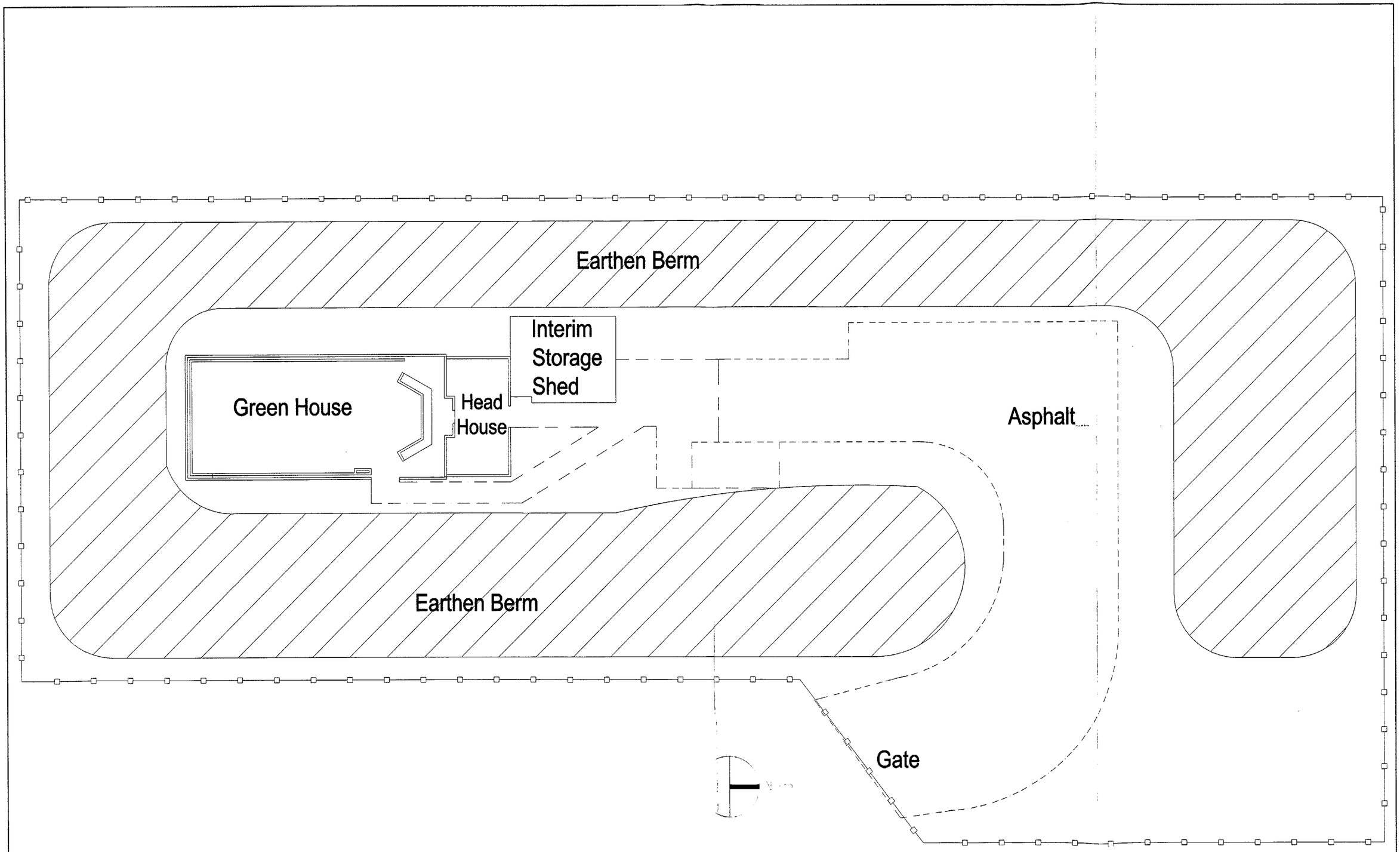
Approved: _____ Patrick J. McDermott — University Health Physicist, Rutgers — Date 10/20/06

The following pages have been redacted from this document:

Appendix A - Rutgers Radioactive Materials Licenses

RUTGERS GAMMA GREENHOUSE FACILITY





NOTE: NOT TO SCALE

Christine Todd Whitman
Governor

State of New Jersey
Department of Environmental Protection
Environmental Regulation
Hazardous Waste Regulation Program
CN 421
Trenton, NJ 08625-0421
Tel. #609-633-1418

Robert C. Shinn, Jr.
Commissioner

MCQ
chron
CC MC

Michael Quintan, Director
Rutgers Environmental Health & Safety
Building 4127
Livingston Campus
P.O. Box 5077
New Brunswick, NJ 08903

AUG 15 1995

RE: Acceptance of Closure Certification, Gamma Greenhouse Hazardous Waste Storage Facility, Rutgers University, Piscataway, Middlesex County, EPA ID No. 000 582 387

Dear Mr. Quintan:

The Bureau of Hazardous Waste Engineering (Bureau) is in receipt of your submittal dated July 25, 1995 concerning the above referenced facility.

The submittal included the closure summary, analytical data (rinsewater samples) and closure certification for the Gamma Greenhouse indoor container storage area signed and sealed by Richard W. Chapin, New Jersey registered professional engineer and senior vice president of Raritan Enviro Sciences, Inc.

The Hazardous Waste Facility (HWF) Permit issued on July 5, 1990 authorized Rutgers, the State University of New Jersey to store containerized Rutgers generated hazardous wastes in the Gamma Greenhouse (indoor), a prefabricated steel storage shed, and a proposed outdoor storage pad.

A pre-construction soil sampling indicated existence of soil contamination (petroleum hydrocarbons and volatile organics) at the site of the proposed container storage area. On November 4, 1991 the site was referred to the Central Bureau of Water and Hazardous Waste Enforcement (CBWHWE) to oversee appropriate remedial action(s). Thereafter, Rutgers unilaterally excavated and removed the contaminated soil and continued to store containerized waste on self-contained pallets at the site. To date, the soil contamination case has not been resolved between Rutgers and the CBWHWE.

The HWF Permit was renewed on July 10, 1995 authorizing Rutgers to replace the above described units with a new hazardous waste facility known as the Environmental Services Building (ESB). The permit authorized Rutgers to transfer the steel storage shed from

1995

the Gamma Greenhouse yard area to the ESB yard area and required closure of the Gamma Greenhouse.

Based on a review of your submittal and a closure inspection performed on July 28, 1995 the Bureau has determined that the closure of the Gamma Greenhouse storage area has been completed in accordance with the closure plan detailed in Condition 6, Section II of the HWF Permit. Therefore, the Bureau hereby accepts the closure certification.

Please be advised that the outdoor container storage area will be considered closed by the Bureau only upon notification by the CBWHWE of a satisfactory resolution of the soil contamination case.

If there are any questions, please contact N.C. Nader of my staff at (609) 292-9880.

Very truly yours,

Thomas Sherman, Chief
Bureau of Hazardous Waste Engineering

c: Wolf Skacel, RCRA Section Chief, CBWHWE
Michael Poetzsch, USEPA

(609) 642-9839

MCQ
Chion
CC: SSD
MC

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
Division of Responsible Party Site Remediation
Southern Field Office
CN 407
Trenton, New Jersey 08625-0407
(609) 584-4150 (Office)
(609) 584-4170 (Telefax)

Robert C. Shinn, Jr.
Commissioner

MARTY (ORIGINAL FOR FILE). GGH

December 10, 1996

DEC 17

Mr. Michael Quinlan
Rutgers, The State University
Livingston Campus - Building #4127
P.O. Box 5077
New Brunswick, New Jersey 08903-5077

Re: Gamma Greenhouse
Davidson Road
Piscataway, Middlesex County
Block: 844; Lot: 1C - Case #96-02-23-1243-49
No Further Action Proposal dated October 28, 1996

Dear Mr. Quinlan:

Pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (Department) and duly delegated to the Section Chief of the Bureau of Field Operations' Southern Field Office pursuant to N.J.S.A. 13:1B-4, the referenced No Further Action (NFA) proposal for the below referenced area of concern (AOC) is hereby approved.

This approval is based upon the Department's review of the Remedial Action Report dated October 28, 1996 and additional documents received on November 21, 1996, which were submitted to the Department in accordance with the Memorandum of Agreement dated May 10, 1966.

On July 2, 1992 sixteen cubic yards of contaminated soil was excavated from the RCRA Part B permitted hazardous waste drum storage pad area located at the referenced site. The contaminated soil was disposed of at Michigan Disposal, Inc. in Belleville, Michigan. Upon removal of the contaminated soil, eight post-excavation soil samples were obtained for laboratory analysis. The results of the analysis were below the soil cleanup criteria developed for the site. Ground water was not encountered during remedial activities. All work was certified by you on October 22, 1996.

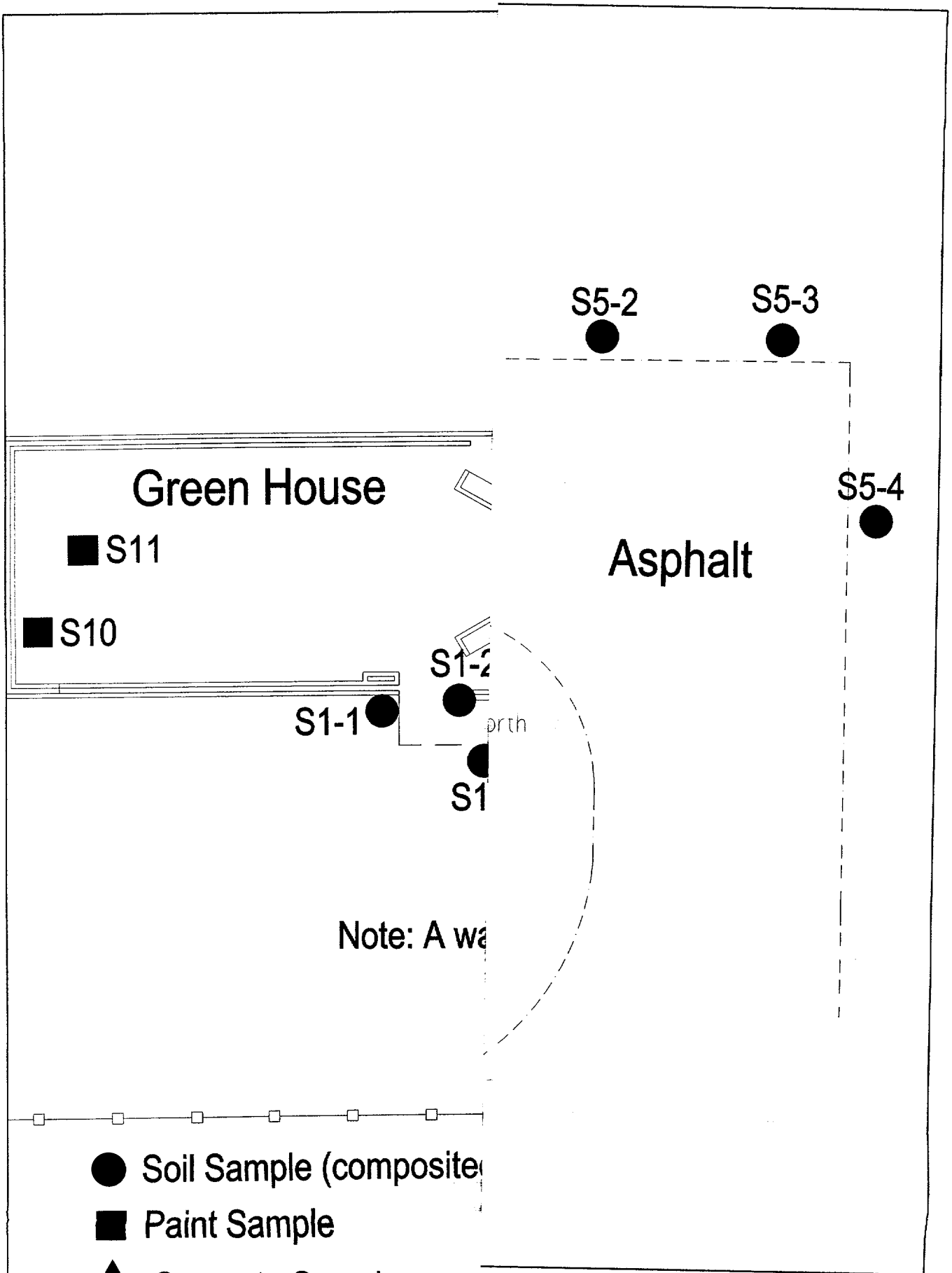
This approval shall be limited only to the above referenced AOC, and the condition of such area as of the date of this letter, and shall not be construed to address any other areas of the site.

This NFA Approval Letter shall not restrict or prohibit the Department or any other agency from taking regulatory action under any other statute, rule or regulation.

Sincerely,

Thomas W. Downey, Section Chief
Bureau of Field Operations

c: File #12-17-29 through Kirstin Pointin-Hahn
Piscataway Health Department
Wolf Skacel, BHWE
Tom Sherman, BTS&HWP
Mark Pedersen, Case Assignment Section


S5-2
S5-3
S5-4
Green House
S11
S10
Asphalt
S1-1
Note: A wa
Soil Sample (composite
Paint Sample
Concrete Sample

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

08/24/2006

LIMS #: L29545
Project ID#: CH085-3ERUTGERS-06
Received: 08/10/2006
Delivery Date: 08/24/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Martin K. Kelly for Keith Jeter

Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
RGGH-S1-1	L29545-1	
RGGH-S1-2	L29545-2	
RGGH-S1-3	L29545-3	
RGGH-S1-4	L29545-4	
RGGH-S1 (1-4) COMPOSITE	L29545-5	

Report of Analysis

08/24/06 14:23

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29545

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S1 (1-4) COMPOSITE** | Collect Start: 08/01/2006 13:20 | Matrix: Soil | (S)
Station: | Collect Stop: | Volume:
Description: | *Receive Date: 08/10/2006* | % Moisture: 10.54
LIMS Number: L29545-5

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	1.05E+00	1.57E+00	**2.50E+00**	pCi/g Dry		1.3737	g dry		08/23/06	10	M	U		
H-3	2003	-2.54E-01	2.11E+00	**3.51E+00**	pCi/g Dry		1.3737	g dry		08/23/06	10	M	U		
BE-7	2007	9.33E-02	3.03E-01	**5.10E-01**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
K-40	2007	**5.16E+00**	9.46E-01	2.85E-01	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	+		Yes
MN-54	2007	2.01E-02	2.90E-02	**5.31E-02**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
CO-58	2007	-1.14E-02	3.06E-02	**4.73E-02**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
FE-59	2007	-5.62E-02	7.91E-02	**1.10E-01**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
CO-60	2007	1.37E-02	3.44E-02	**6.71E-02**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
ZN-65	2007	-2.87E-02	7.45E-02	**9.10E-02**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
ZR-95	2007	2.44E-02	5.90E-02	**1.04E-01**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
RU-103	2007	1.54E-02	3.03E-02	**5.29E-02**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
RU-106	2007	-1.32E-01	2.77E-01	**4.08E-01**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
I-131	2007	-4.06E-02	9.49E-02	**1.49E-01**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
CS-134	2007	-5.51E-03	3.32E-02	**4.48E-02**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
CS-137	2007	**1.68E-01**	7.18E-02	4.70E-02	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	+		Yes
CE-141	2007	-9.68E-04	5.13E-02	**8.32E-02**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
CE-144	2007	4.54E-02	1.55E-01	**2.59E-01**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
RA-226	2007	6.34E-01	8.14E-01	**9.36E-01**	pCi/g Dry		308.19	g wet	*08/01/06 13:20*	*08/17/06*	*3600*	Sec	U		Yes
AC-228	2007	**3.65E-01**	1.59E-01	1.67E-01	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	+		Yes
TH-228	2007	**3.57E-01**	7.08E-02	6.88E-02	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	+		Yes
TH-230	2007	**3.19E-01**	7.64E-02	1.81E-01	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	+		Yes
TH-232	2007	**3.63E-01**	1.58E-01	1.66E-01	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	+		Yes
U-235	2007	1.23E-01	1.63E-01	**2.80E-01**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No
U-238	2007	2.69E+00	3.52E+00	**6.46E+00**	pCi/g Dry		308.19	g wet	08/01/06 13:20	08/17/06	3600	Sec	U		No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** *Results are reported on an as received basis* unless otherwise noted

MDC - Minimum Detectable Concentration

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

08/24/2006

LIMS #: L29546
Project ID#: CH085-3ERUTGERS-06
Received: 08/03/2006
Delivery Date: 08/21/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Martin Webb FOR KEITH JETER

Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
RGGH-S2-1	L29546-1	
RGGH-S2-2	L29546-2	
RGGH-S2-3	L29546-3	
RGGH-S2-4	L29546-4	
RGGH-S2 (1-4) COMPOSITE	L29546-5	

Report of Analysis

08/24/06 14:55

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29546

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S2 (1-4) COMPOSITE** Collect Start: 08/01/2006 13:35 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 08/03/2006 % Moisture: 9.18
LIMS Number: L29546-5

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	**3.29E+00**	1.69E+00	2.52E+00	pCi/g Dry		1.3621	g dry		08/23/06	10	M	+		
H-3	2003	**1.01E+01**	2.80E+00	3.54E+00	pCi/g Dry		1.3621	g dry		08/23/06	10	M	+		
BE-7	2007	1.59E-01	3.35E-01	**5.86E-01**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
K-40	2007	**8.55E+00**	1.13E+00	5.46E-01	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	+		Yes
MN-54	2007	-3.26E-03	3.38E-02	**5.41E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
CO-58	2007	-1.68E-02	3.76E-02	**5.73E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
FE-59	2007	1.04E-02	8.11E-02	**1.37E-01**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
CO-60	2007	2.91E-02	3.16E-02	**6.02E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
ZN-65	2007	-2.17E-02	7.08E-02	**9.32E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
ZR-95	2007	-1.53E-02	5.65E-02	**8.84E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
RU-103	2007	-2.78E-03	4.00E-02	**6.67E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
RU-106	2007	-8.02E-02	2.89E-01	**4.62E-01**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
I-131	2007	8.80E-02	1.16E-01	**2.02E-01**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
CS-134	2007	-9.95E-03	3.64E-02	**5.02E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
CS-137	2007	**5.49E-01**	8.49E-02	5.61E-02	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	+		Yes
CE-141	2007	-2.82E-02	5.51E-02	**9.04E-02**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
CE-144	2007	5.56E-02	2.10E-01	**3.39E-01**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
RA-226	2007	8.12E-01	8.70E-01	**1.05E+00**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		Yes
TH-228	2007	**2.90E-01**	1.09E-01	1.03E-01	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	+		Yes
TH-230	2007	**3.61E-01**	8.24E-02	2.01E-01	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	+		Yes
TH-232	2007	**4.52E-01**	2.48E-01	1.82E-01	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	+		Yes
U-235	2007	3.08E-02	1.96E-01	**3.16E-01**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No
U-238	2007	1.39E+00	3.17E+00	**5.71E+00**	pCi/g Dry		341.57	g wet	08/01/06 13:35	08/17/06	3600	Sec	U		No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

08/24/2006

LIMS #: L29547
Project ID#: CH085-3ERUTGERS-06
Received: 08/03/2006
Delivery Date: 08/21/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

for Keith Jeter
Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
RGGH-S3-1	L29547-1	
RGGH-S3-2	L29547-2	
RGGH-S3-3	L29547-3	
RGGH-S3-4	L29547-4	
RGGH-S3 (1-4) COMPOSITE	L29547-5	

Report of Analysis

08/24/06 14:56

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29547

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S3 (1-4) COMPOSITE** (S)
Station:
Description:
LIMS Number: L29547-5

Collect Start: 08/01/2006 13:45
Collect Stop:
Receive Date: 08/03/2006

Matrix: Soil
Volume:
% Moisture: 6.11

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	6.17E-01	1.53E+00	**2.48E+00**	pCi/g Dry		1.3857	g dry		08/23/06	10	M	U		
H-3	2003	**5.63E+00**	2.50E+00	3.48E+00	pCi/g Dry		1.3857	g dry		08/23/06	10	M	+		
BE-7	2007	1.85E-01	3.09E-01	**5.50E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
K-40	2007	**1.45E+01**	1.52E+00	4.46E-01	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	+		Yes
MN-54	2007	2.34E-02	3.81E-02	**6.69E-02**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
CO-58	2007	-1.26E-02	4.11E-02	**6.46E-02**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
FE-59	2007	-7.99E-02	1.03E-01	**1.46E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
CO-60	2007	-2.69E-03	3.82E-02	**6.27E-02**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
ZN-65	2007	3.02E-02	9.10E-02	**1.36E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
ZR-95	2007	-5.21E-02	7.05E-02	**1.04E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
RU-103	2007	9.83E-03	4.26E-02	**7.30E-02**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
RU-106	2007	-6.20E-02	3.35E-01	**5.45E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
I-131	2007	3.19E-02	1.29E-01	**2.12E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
CS-134	2007	-1.27E-02	3.47E-02	**4.71E-02**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
CS-137	2007	**1.96E-01**	8.01E-02	6.74E-02	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	+		Yes
CE-141	2007	2.94E-02	6.68E-02	**1.14E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
CE-144	2007	1.20E-02	2.18E-01	**3.66E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
RA-226	2007	1.31E+00	1.18E+00	**1.16E+00**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		Yes
AC-228	2007	**8.29E-01**	3.91E-01	2.07E-01	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	+		Yes
TH-228	2007	**5.70E-01**	1.48E-01	9.37E-02	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	+		Yes
TH-230	2007	**5.02E-01**	8.52E-02	2.29E-01	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	+		Yes
TH-232	2007	**7.08E-01**	2.00E-01	1.73E-01	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	+		Yes
U-235	2007	5.44E-02	2.24E-01	**3.79E-01**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No
U-238	2007	2.76E+00	4.33E+00	**7.61E+00**	pCi/g Dry		362.77	g wet	08/01/06 13:45	08/17/06	3600	Sec	U		No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

08/24/2006

LIMS #: L29549
Project ID#: CH085-3ERUTGERS-06
Received: 08/03/2006
Delivery Date: 08/21/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
RGGH-S4-1	L29549-1	
RGGH-S4-2	L29549-2	
RGGH-S4-3	L29549-3	
RGGH-S4-4	L29549-4	
RGGH-S4 (1-4) COMPOSITE	L29549-5	

Report of Analysis

08/24/06 15:35

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29549

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S4 (1-4) COMPOSITE** Collect Start: 08/01/2006 14:10 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 08/03/2006 % Moisture: 17.21
LIMS Number: L29549-5

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
C-14	032-80	**6.32E+00**	2.07E+00	2.92E+00	pCi/g Dry		1.1735	g dry		08/23/06	10	M	+	
H-3	2003	**7.67E+00**	3.01E+00	4.11E+00	pCi/g Dry		1.1735	g dry		08/23/06	10	M	+	
BE-7	2007	7.80E-01	8.47E-01	**7.11E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	Yes
K-40	2007	**1.92E+01**	2.40E+00	9.63E-01	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	+	Yes
MN-54	2007	-3.27E-03	6.02E-02	**9.65E-02**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
CO-58	2007	-3.77E-02	6.97E-02	**1.04E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
FE-59	2007	5.37E-02	1.29E-01	**2.29E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
CO-60	2007	2.42E-02	6.51E-02	**1.13E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
ZN-65	2007	1.07E-01	1.44E-01	**2.39E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
ZR-95	2007	-2.91E-02	1.25E-01	**1.97E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
RU-103	2007	2.18E-02	7.06E-02	**1.22E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
RU-106	2007	1.79E-01	5.38E-01	**9.24E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
I-131	2007	-1.34E-01	2.12E-01	**3.21E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
CS-134	2007	1.76E-03	6.78E-02	**9.78E-02**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
CS-137	2007	**4.96E-01**	1.38E-01	8.41E-02	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	+	Yes
CE-141	2007	-1.32E-01	1.07E-01	**1.55E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
CE-144	2007	-4.06E-01	3.59E-01	**5.25E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
RA-226	2007	1.01E+00	1.21E+00	**2.16E+00**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
AC-228	2007	**1.57E+00**	6.08E-01	2.80E-01	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	+	Yes
TH-228	2007	**1.04E+00**	1.42E-01	1.31E-01	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	+	Yes
TH-230	2007	**5.74E-01**	1.48E-01	3.16E-01	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	+	Yes
TH-232	2007	**1.17E+00**	4.09E-01	2.78E-01	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	+	Yes
U-235	2007	4.68E-01	3.29E-01	**5.77E-01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No
U-238	2007	4.42E+00	5.80E+00	**1.11E+01**	pCi/g Dry		299.32	g wet	08/01/06 14:10	08/17/06	3600	Sec	U	No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

08/24/2006

LIMS #: L29552
Project ID#: CH085-3ERUTGERS-06
Received: 08/03/2006
Delivery Date: 08/21/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Mark K Webb for Keith Jeter

Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
RGGH-S5-1	L29552-1	
RGGH-S5-2	L29552-2	
RGGH-S5-3	L29552-3	
RGGH-S5-4	L29552-4	
RGGH-S5 (1-4) COMPOSITE	L29552-5	

Report of Analysis

08/24/06 15:15

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29552

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S5 (1-4) COMPOSITE** Collect Start: 08/01/2006 14:10 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 08/03/2006 % Moisture: 28.18
LIMS Number: L29552-5

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	1.57E+00	1.54E+00	**2.40E+00**	pCi/g Dry		1.4264	g dry		08/23/06	10	M	U		
H-3	2003	-4.12E-01	2.02E+00	**3.38E+00**	pCi/g Dry		1.4264	g dry		08/23/06	10	M	U		
BE-7	2007	4.27E-01	4.59E-01	**8.80E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
K-40	2007	**1.45E+01**	1.63E+00	7.38E-01	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	+		Yes
MN-54	2007	-5.91E-03	4.84E-02	**8.54E-02**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
CO-58	2007	-3.63E-02	4.99E-02	**8.17E-02**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
FE-59	2007	3.21E-02	1.04E-01	**1.97E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
CO-60	2007	1.21E-02	4.28E-02	**8.54E-02**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
ZN-65	2007	-2.01E-01	1.38E-01	**2.00E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
ZR-95	2007	7.80E-04	8.62E-02	**1.56E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
RU-103	2007	3.33E-02	4.70E-02	**9.14E-02**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
RU-106	2007	-1.55E-01	4.40E-01	**7.62E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
I-131	2007	-7.23E-02	1.56E-01	**2.55E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
CS-134	2007	6.79E-03	4.90E-02	**7.76E-02**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
CS-137	2007	**1.83E-01**	1.05E-01	8.71E-02	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	+		Yes
CE-141	2007	-1.35E-02	8.08E-02	**1.38E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
CE-144	2007	4.42E-02	2.76E-01	**4.78E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
RA-226	2007	1.66E+00	9.99E-01	**1.91E+00**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
AC-228	2007	**9.84E-01**	4.36E-01	2.63E-01	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	+		Yes
TH-228	2007	**5.63E-01**	1.52E-01	1.46E-01	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	+		Yes
TH-230	2007	**5.45E-01**	1.08E-01	2.78E-01	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	+		Yes
TH-232	2007	**8.44E-01**	2.45E-01	2.62E-01	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	+		Yes
U-235	2007	-2.15E-01	2.75E-01	**4.56E-01**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No
U-238	2007	6.77E-01	4.58E+00	**8.75E+00**	pCi/g Dry		319.44	g wet	08/01/06 14:10	08/17/06	3600	Sec	U		No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
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BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

08/24/2006

LIMS #: L29553
Project ID#: CH085-3ERUTGERS-06
Received: 08/03/2006
Delivery Date: 08/21/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
RGGH-S6-1	L29553-1	
RGGH-S6-2	L29553-2	
RGGH-S6-3	L29553-3	
RGGH-S6-4	L29553-4	
RGGH-S6 (1-4) COMPOSITE	L29553-5	

Report of Analysis

08/24/06 15:17

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29553

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S6 (1-4) COMPOSITE** (S)
Station:
Description:
LIMS Number: L29553-5

Collect Start: 08/01/2006 14:26
Collect Stop:
Receive Date: 08/03/2006

Matrix: Soil
Volume:
% Moisture: 14.41

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	1.26E+00	1.26E+00	**1.98E+00**	pCi/g Dry		1.7323	g dry		08/23/06	10	M	U		
H-3	2003	4.40E-01	1.72E+00	**2.79E+00**	pCi/g Dry		1.7323	g dry		08/23/06	10	M	U		
BE-7	2007	2.71E-01	3.56E-01	**6.77E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
K-40	2007	**1.42E+01**	1.42E+00	5.47E-01	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	+		Yes
MN-54	2007	2.40E-02	4.05E-02	**7.65E-02**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
CO-58	2007	-4.14E-02	4.04E-02	**6.34E-02**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
FE-59	2007	4.19E-03	1.00E-01	**1.78E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
CO-60	2007	1.30E-03	3.27E-02	**6.34E-02**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
ZN-65	2007	-6.60E-03	1.06E-01	**1.60E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
ZR-95	2007	-2.78E-02	7.34E-02	**1.26E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
RU-103	2007	-1.22E-02	4.24E-02	**7.46E-02**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
RU-106	2007	-1.03E-03	3.50E-01	**6.28E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
I-131	2007	-4.84E-02	1.47E-01	**2.42E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
CS-134	2007	-1.67E-02	3.79E-02	**5.54E-02**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
CS-137	2007	**4.57E-01**	8.10E-02	6.49E-02	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	+		Yes
CE-141	2007	-3.10E-03	7.46E-02	**1.27E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
CE-144	2007	-3.65E-02	2.46E-01	**4.19E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
RA-226	2007	9.21E-01	1.19E+00	**1.37E+00**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		Yes
AC-228	2007	**1.09E+00**	5.04E-01	2.07E-01	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	+		Yes
TH-228	2007	**7.72E-01**	9.47E-02	1.07E-01	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	+		Yes
TH-230	2007	**6.93E-01**	9.69E-02	2.44E-01	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	+		Yes
TH-232	2007	**1.01E+00**	2.73E-01	2.05E-01	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	+		Yes
U-235	2007	5.80E-02	2.43E-01	**4.22E-01**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No
U-238	2007	-5.09E-01	4.53E+00	**8.12E+00**	pCi/g Dry		334.52	g wet	08/01/06 14:26	08/17/06	3600	Sec	U		No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

08/24/2006

LIMS #: L29554
Project ID#: CH085-3ERUTGERS-06
Received: 08/03/2006
Delivery Date: 08/21/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Mark Krebs for Keith Jeter

Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
RGGH-S7	L29554-1	
RGGH-S8	L29554-2	
RGGH-S9	L29554-3	
RGGH-S10	L29554-4	
RGGH-S11	L29554-5	

Report of Analysis

08/24/06 15:22

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29554

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S7** Collect Start: 08/02/2006 08:45 Matrix: Sludge (SL)
Station: Collect Stop: Volume:
Description: Receive Date: 08/03/2006 % Moisture: 14.23
LIMS Number: L29554-1

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	**6.92E+00**	1.51E+00	1.98E+00	pCi/g Dry		1.7363	g dry		08/23/06	10	M	+		
H-3	032-127	**1.14E+01**	2.39E+00	2.78E+00	pCi/g Dry		1.7363	g dry		08/23/06	10	M	+		
BE-7	2007	1.04E-01	2.22E-01	**3.79E-01**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
K-40	2007	**5.18E+00**	8.25E-01	4.04E-01	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	+		Yes
MN-54	2007	-1.08E-03	2.10E-02	**3.44E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
CO-58	2007	-2.27E-02	2.34E-02	**3.26E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
FE-59	2007	-1.09E-02	5.25E-02	**8.15E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
CO-60	2007	-2.10E-02	2.26E-02	**3.48E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
ZN-65	2007	-7.96E-02	5.88E-02	**7.24E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
ZR-95	2007	-1.39E-02	4.57E-02	**7.31E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
RU-103	2007	2.50E-03	2.42E-02	**3.99E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
RU-106	2007	1.27E-01	1.86E-01	**3.28E-01**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
I-131	2007	2.01E-02	7.25E-02	**1.23E-01**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
CS-134	2007	2.04E-02	2.54E-02	**4.02E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
CS-137	2007	**2.15E-01**	4.67E-02	3.30E-02	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	+		Yes
CE-141	2007	1.19E-02	4.00E-02	**6.64E-02**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
CE-144	2007	-8.09E-02	1.39E-01	**2.16E-01**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
RA-226	2007	**1.40E+00**	7.95E-01	7.37E-01	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	+		Yes
TH-228	2007	**3.36E-01**	5.87E-02	5.42E-02	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	+		Yes
TH-230	2007	**2.79E-01**	5.09E-02	1.49E-01	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	+		Yes
TH-232	2007	**2.49E-01**	1.30E-01	1.33E-01	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	+		Yes
U-235	2007	7.65E-02	1.34E-01	**2.27E-01**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No
U-238	2007	-4.12E-02	2.36E+00	**3.84E+00**	pCi/g Dry		531.7	g wet	08/02/06 08:45	08/17/06	3600	Sec	U		No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
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Bolded text indicates reportable value.

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MDC - Minimum Detectable Concentration

Report of Analysis

08/24/06 15:22

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29554

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S8** | Collect Start: 08/02/2006 08:50 | Matrix: Water (WO)
Station: | Collect Stop: | Volume:
Description: | Receive Date: 08/03/2006 | % Moisture:
LIMS Number: L29554-2

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-82	3.68E+01	1.03E+02	**1.69E+02**	pCi/L		.5	ml		08/18/06	60	M	U		
H-3	2010	1.33E+02	1.53E+02	**2.42E+02**	pCi/L		10	ml		08/18/06	60	M	U		
BE-7	2007	4.35E+01	8.25E+01	**1.47E+02**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
K-40	2007	2.31E+01	1.42E+02	**2.94E+02**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
MN-54	2007	5.75E+00	9.01E+00	**1.61E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
CO-58	2007	-1.63E+00	8.16E+00	**1.27E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
FE-59	2007	4.19E+00	2.01E+01	**3.48E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
CO-60	2007	-3.22E+00	9.43E+00	**1.43E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
ZN-65	2007	-3.00E+01	1.94E+01	**2.16E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
ZR-95	2007	-5.03E+00	1.76E+01	**2.74E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
RU-103	2007	1.18E+01	1.03E+01	**1.95E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
RU-106	2007	2.80E+01	7.57E+01	**1.32E+02**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
I-131	2007	-5.47E+00	2.95E+01	**4.66E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
CS-134	2007	-7.31E+00	8.42E+00	**9.56E+00**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
CS-137	2007	9.98E-02	9.12E+00	**1.51E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
CE-141	2007	-1.31E+00	1.49E+01	**2.51E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
CE-144	2007	1.11E+01	5.23E+01	**8.47E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
RA-226	2007	-1.63E+02	1.95E+02	**3.31E+02**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
TH-228	2007	1.47E+01	1.63E+01	**3.06E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
TH-232	2007	-3.33E+01	3.96E+01	**6.25E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
U-235	2007	-6.21E+01	5.42E+01	**7.69E+01**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No
U-238	2007	-5.28E+02	1.09E+03	**1.71E+03**	pCi/L		900.1	ml	08/02/06 08:50	08/17/06	3600	Sec	U		No

Flag Values
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Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
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MDC - Minimum Detectable Concentration

Report of Analysis

08/24/06 15:22

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29554

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S9** | Collect Start: 08/02/2006 10:30 | Matrix: Solids | (SD)
Station: | Collect Stop: | Volume:
Description: | Receive Date: 08/03/2006 | % Moisture:
LIMS Number: L29554-3

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	**1.25E+03**	5.03E+01	1.04E+01	pCi/g		1.0148	g wet		08/23/06	1.05	M	+		
H-3	2003	**4.72E+02**	1.93E+01	6.10E+00	pCi/g		1.1048	g wet		08/23/06	5.12	M	+		
BE-7	2007	*1.08E+00*	*1.49E+00*	**2.70E+00**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
K-40	2007	2.94E+00	3.05E+00	**2.78E+00**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		Yes
MN-54	2007	1.82E-01	1.54E-01	**3.02E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
CO-58	2007	-8.28E-02	1.74E-01	**2.60E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
FE-59	2007	-4.99E-02	4.22E-01	**6.61E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
CO-60	2007	1.15E-01	1.60E-01	**3.13E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
ZN-65	2007	-6.49E-01	4.61E-01	**5.16E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
ZR-95	2007	1.49E-01	2.96E-01	**5.29E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
RU-103	2007	4.91E-02	1.70E-01	**2.96E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
RU-106	2007	3.31E-01	1.29E+00	**2.22E+00**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
I-131	2007	5.50E-02	5.00E-01	**8.17E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
CS-134	2007	-5.37E-02	1.74E-01	**2.36E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
CS-137	2007	**1.13E+00**	2.98E-01	2.59E-01	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	+		Yes
CE-141	2007	-5.38E-02	2.02E-01	**3.31E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
CE-144	2007	6.67E-02	6.90E-01	**1.16E+00**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
RA-226	2007	2.02E+00	3.78E+00	**4.02E+00**	pCi/g		15.94	g wet	*08/02/06 10:30*	*08/17/06*	4178	Sec	U		Yes
TH-228	2007	5.71E-01	2.63E-01	**5.08E-01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U*		No
TH-232	2007	1.97E-02	5.90E-01	**1.05E+00**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
U-235	2007	-2.92E-02	6.84E-01	**1.14E+00**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No
U-238	2007	1.62E+01	1.53E+01	**3.06E+01**	pCi/g		15.94	g wet	08/02/06 10:30	08/17/06	4178	Sec	U		No

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**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

08/24/06 15:22

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29554

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S10**
Station:
Description:
LIMS Number: L29554-4

Collect Start: 08/02/2006 13:10
Collect Stop:
Receive Date: 08/03/2006

Matrix: Solids
Volume:
% Moisture:

(SD)

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	1.91E+01	4.01E+01	**6.45E+01**	pCi/g		.0532	g wet		08/23/06	10	M	U		
H-3	2003	2.46E+00	5.52E+01	**9.07E+01**	pCi/g		.0532	g wet		08/23/06	10	M	U		
BE-7	2007	-1.38E+01	3.31E+01	**5.49E+01**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
K-40	2007	1.07E+01	1.93E+01	**4.07E+01**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
MN-54	2007	-1.70E-01	1.19E+00	**1.89E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
CO-58	2007	-1.24E+00	1.20E+00	**1.57E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
FE-59	2007	-7.41E-01	2.01E+00	**3.03E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
CO-60	2007	2.99E-01	1.05E+00	**1.84E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
ZN-65	2007	-4.78E+00	2.93E+00	**3.39E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
ZR-95	2007	-7.38E-01	1.82E+00	**2.74E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
RU-103	2007	9.18E-01	3.51E+00	**5.95E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
RU-106	2007	9.40E+00	1.75E+01	**3.00E+01**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
I-131	2007	-4.12E+00	9.33E+00	**1.49E+01**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
CS-134	2007	-1.07E-01	1.88E+00	**3.11E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
CS-137	2007	**1.08E+03**	1.88E+01	3.06E+00	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	+		Yes
CE-141	2007	1.99E+00	2.59E+00	**4.25E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
CE-144	2007	3.16E+00	8.79E+00	**1.42E+01**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
RA-226	2007	1.14E+01	3.34E+01	**5.74E+01**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
TH-228	2007	-1.86E+00	3.02E+00	**4.95E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
TH-232	2007	-5.89E-01	4.10E+00	**6.69E+00**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
U-235	2007	-1.19E+01	9.06E+00	**1.36E+01**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No
U-238	2007	1.22E+02	1.25E+02	**2.48E+02**	pCi/g		3	g wet	08/02/06 13:10	08/17/06	4567	Sec	U		No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
*U** = *Compound/Analyte not* detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

08/24/06 15:22

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29554

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **RGGH-S11**
Station:
Description:
LIMS Number: L29554-5

Collect Start: 08/02/2006 13:45
Collect Stop:
Receive Date: 08/03/2006

Matrix: Solids
Volume:
% Moisture:

(SD)

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values		
C-14	032-80	-1.42E+01	2.85E+01	**4.81E+01**	pCi/g		.0713	g wet		08/23/06	10	M	U		
H-3	2003	-1.74E+01	3.98E+01	**6.77E+01**	pCi/g		.0713	g wet		08/23/06	10	M	U		
BE-7	2007	-9.33E+00	1.37E+01	**2.29E+01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
K-40	2007	-2.14E+00	4.90E+00	**1.09E+01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
MN-54	2007	-1.80E-01	2.65E-01	**4.60E-01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
CO-58	2007	-9.79E-02	3.61E-01	**6.95E-01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
FE-59	2007	-3.37E-04	6.97E-01	**1.48E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
CO-60	2007	7.05E-02	3.73E-01	**8.27E-01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
ZN-65	2007	-2.34E-01	7.30E-01	**1.38E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
ZR-95	2007	-7.92E-02	6.62E-01	**1.24E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
RU-103	2007	-1.25E+00	1.43E+00	**2.36E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
RU-106	2007	8.22E+00	7.07E+00	**1.36E+01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
I-131	2007	1.68E-01	3.62E+00	**6.38E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
CS-134	2007	-4.30E-01	7.21E-01	**1.20E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
CS-137	2007	**5.09E+02**	8.94E+00	1.24E+00	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	+		Yes
CE-141	2007	-3.96E-01	1.28E+00	**2.19E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
CE-144	2007	-5.16E+00	4.21E+00	**7.00E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
RA-226	2007	1.29E+01	1.75E+01	**3.09E+01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
TH-228	2007	-7.17E-02	1.40E+00	**2.41E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
TH-232	2007	-1.34E+00	1.39E+00	**2.66E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
U-235	2007	-1.29E-01	4.27E+00	**7.43E+00**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
U-238	2007	3.38E+01	3.75E+01	**9.09E+01**	pCi/g		6.04	g wet	08/02/06 13:45	08/17/06	3600	Sec	U		No
TH-228 (AS)	2001	**5.89E-01**	1.61E-01	1.63E-01	pCi/g		.3	g wet		08/21/06	60004	sec	+		
TH-230 (AS)	2001	**4.89E-01**	1.46E-01	6.39E-02	pCi/g		.3	g wet		08/21/06	60004	sec	+		
TH-232 (AS)	2001	**1.77E-01**	8.98E-02	4.95E-02	pCi/g		.3	g wet		08/21/06	60004	sec	+		
U-233/234 (AS)	2001	**1.17E-01**	4.88E-02	3.80E-02	pCi/g		.6937	g wet		08/18/06	60003	sec	+		
U-235 (AS)	2001	1.03E-02	1.46E-02	**7.60E-03**	pCi/g		.6937	g wet		08/18/06	60003	sec	U		
U-238 (AS)	2001	**1.29E-01**	4.92E-02	2.80E-02	pCi/g		.6937	g wet		08/18/06	60003	sec	+		

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MDC - Minimum Detectable Concentration

Report of Analysis

08/24/06 15:22

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29554

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID:	**RGGH-S11**	Collect Start:	08/02/2006 13:45	Matrix:	Solids (SD)
Station:		Collect Stop:		Volume:	
Description:		Receive Date:	08/03/2006	% Moisture:	
LIMS Number:	L29554-5				

Flag Values

U	=	Compound/Analyte not detected or less than 3 sigma
+	=	Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U*	=	Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High	=	Activity concentration exceeds customer reporting value
Spec	=	MDC exceeds customer technical specification
L	=	Low recovery
H	=	High recovery

Bolded text indicates reportable value.

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MDC - Minimum Detectable Concentration

Chain of Custody Record

No. RGGH-1

548
946
L29554
9

Chase Environmental Group, Inc.
3501 Workman Rd. Suite H., Knoxville, TN 379
865-584-0833

Project Name: RUTGERS GGH	Project Number: CO607010
Send Report To: DAVE CULP	Sampler (Print Name): DAVE CULP
Address:	Sampler (Print Name): N/A
DCULP@CHASEENV.COM	Shipment Method: HAND DELIVER
	Airbill Number: N/A
Phone: 865-207-3664	Laboratory Receiving: TBE
Fax: N/A	

Page 1 of 1

Purchase Order #: NONE

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested: GAMMA SPEC	H-3	C-14	ALPHA SPEC	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
RGGH-S1 - 1 THROUGH 4 548	8/1/06	1320	SOIL	4	X	X	X		COMPOSITE BY WEIGHT	
RGGH-S2 - 1 THROUGH 4 546	8/1/06	1335		4	X	X	X			
RGGH-S3 - 1 THROUGH 4 547	8/1/06	1345		4	X	X	X			
RGGH-S4 - 1 THROUGH 4 549	8/1/06	1355		4	X	X	X			
RGGH-S5 - 1 THROUGH 4 550	8/1/06	1410		4	X	X	X			
RGGH-S6 - 1 THROUGH 4 553	8/1/06	1425		4	X	X	X			
RGGH-S7	8/2/06	0845	SLUDGE	1	X	X	X			
RGGH-S8 554	8/2/06	0850	WATER	1	X	X	X			
RGGH-S9	8/2/06	1030	CONCRETE DUST	1	X	X	X		ELEVATED ACTIVITY	
RGGH-S10	8/2/06	1310	PAINT CHIPS	1	X	X	X			
RGGH-S11	8/2/06	1345	PAINT CHIPS	1	X	X	X	X		
ALL SAMPLES - 2 WEEK TAT										

Relinquished by: (Signature)	Received by: (Signature) Pat Marshall	Date: 8/3/06	Time: 16:35
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

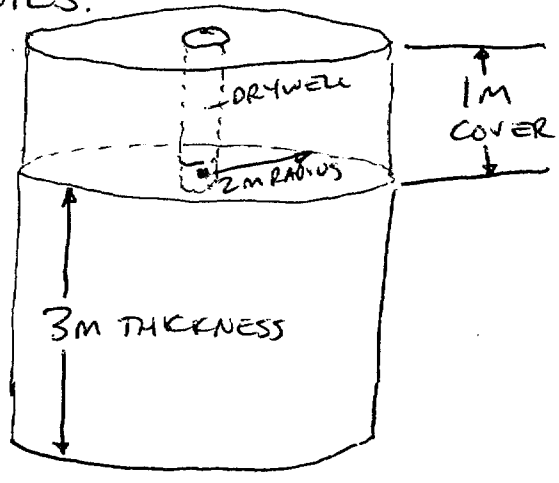
Sample Custodian Remarks (Completed By laboratory):

QA/QC level	Turnaround	Sample Receipt	
Level I ☐	Routine ☐	Total # Containers Received?	
Level II ☐	24 Hour ☐	COC Seals Present?	
Level III ☐	1 Week ☐	COC Seals Intact?	
Other ☐	Other _____	Received Containers Intact?	
		Temperature?	

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

- ASSUME CONTAMINATED ZONE IS A CYLINDER RESULTING FROM MIGRATION OF CONTAMINANT FROM DRYWELL TO SURROUNDING SOILS.



MODIFIED PARAMETERS:
- AREA = 12.56 m^2
- THICK(0) = 3M
- LCZPAQ = 4M
- COVER(0) = 1M

RESULTS: MAX DOSE = 0.75 mrem/yr @ t = 1,554 YRS

PERFORMED BY: [signature] 10-11-06

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 MORBIDITY

M	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	C-14	2.090E-06	2.090E-06	DCF2(1)
B-1	H-3	6.400E-08	6.400E-08	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	C-14	2.090E-06	2.090E-06	DCF3(1)
D-1	H-3	6.400E-08	6.400E-08	DCF3(2)
D-34	Food transfer factors:			
D-34	C-14 , plant/soil concentration ratio, dimensionless	5.500E+00	5.500E+00	RTF(1,1)
D-34	C-14 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.100E-02	3.100E-02	RTF(1,2)
D-34	C-14 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.200E-02	1.200E-02	RTF(1,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(2,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(2,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	C-14 , fish	5.000E+04	5.000E+04	BIOFAC(1,1)
D-5	C-14 , crustacea and mollusks	9.100E+03	9.100E+03	BIOFAC(1,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(2,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(2,2)

* Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2) *	1.256E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m) *	3.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m) *	4.000E+00	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): C-14	6.920E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): H-3	1.140E+01	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): C-14	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(2)
R013	Cover depth (m) *	1.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

* PARAMETERS MODIFIED FROM DEFAULT.

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for C-14				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.193E-01	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.193E-01	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.628E-02	FPLANT
R018	Contamination fraction of meat	-1	-1	0.628E-03	FMEAT
R018	Contamination fraction of milk	-1	-1	0.628E-03	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	2.000E-05	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	3.000E-02	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	2.000E-02	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	9.800E-01	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	3.000E-01	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	7.000E-07	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	1.000E-10	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	8.000E-01	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	2.000E-01	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	8.894E+01	0.000E+00	---	CO2F
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TIME	Number of graphical time points	32	---	---	NPTS
T	Maximum number of integration points for dose	17	---	---	LYMAX

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	suppressed

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	12.56 square meters	C-14	6.920E+00
Thickness:	3.00 meters	H-3	1.140E+01
Cover Depth:	1.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	2.009E-24	4.585E-01	3.638E-01	9.485E-03	2.878E-07	4.656E-23	0.000E+00	0.000E+00
M(t):	8.036E-26	1.834E-02	1.455E-02	3.794E-04	1.151E-08	1.863E-24	0.000E+00	0.000E+00

Maximum TDOSE(t): 7.491E-01 mrem/yr at t = 1.554 ± 0.003 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.554E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	9.597E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	9.597E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.554E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	6.337E-01	0.8460	8.652E-02	0.1155	0.000E+00	0.0000	1.627E-04	0.0002	2.739E-05	0.0000	9.674E-05	0.0001	7.205E-01	0.9618
H-3	2.855E-02	0.0381	8.825E-08	0.0000	0.000E+00	0.0000	3.426E-05	0.0000	8.509E-07	0.0000	2.427E-06	0.0000	2.858E-02	0.0382
Total	6.622E-01	0.8841	8.652E-02	0.1155	0.000E+00	0.0000	1.970E-04	0.0003	2.825E-05	0.0000	9.916E-05	0.0001	7.491E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	2.009E-24	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.009E-24	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.009E-24	1.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.009E-24	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.249E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.249E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	3.891E-01	0.8485	5.147E-02	0.1122	0.000E+00	0.0000	9.296E-05	0.0002	1.495E-05	0.0000	5.899E-05	0.0001	4.407E-01	0.9611
H-3	1.783E-02	0.0389	5.338E-08	0.0000	0.000E+00	0.0000	2.002E-05	0.0000	4.522E-07	0.0000	1.483E-06	0.0000	1.785E-02	0.0389
Total	4.069E-01	0.8873	5.147E-02	0.1122	0.000E+00	0.0000	1.130E-04	0.0002	1.540E-05	0.0000	6.047E-05	0.0001	4.585E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.732E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.732E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	8.134E-03	0.8575	1.119E-03	0.1179	0.000E+00	0.0000	2.125E-06	0.0002	3.640E-07	0.0000	1.244E-06	0.0001	9.256E-03	0.9759
H-3	2.285E-04	0.0241	7.117E-10	0.0000	0.000E+00	0.0000	2.788E-07	0.0000	7.210E-09	0.0000	1.959E-08	0.0000	2.288E-04	0.0241
Total	8.362E-03	0.8816	1.119E-03	0.1179	0.000E+00	0.0000	2.404E-06	0.0003	3.712E-07	0.0000	1.264E-06	0.0001	9.485E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	4.826E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.826E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	3.084E-01	0.8477	4.241E-02	0.1166	0.000E+00	0.0000	8.057E-05	0.0002	1.380E-05	0.0000	4.716E-05	0.0001	3.509E-01	0.9647
H-3	1.282E-02	0.0352	3.993E-08	0.0000	0.000E+00	0.0000	1.564E-05	0.0000	4.045E-07	0.0000	1.099E-06	0.0000	1.284E-02	0.0353
Total	3.212E-01	0.8830	4.241E-02	0.1166	0.000E+00	0.0000	9.621E-05	0.0003	1.420E-05	0.0000	4.826E-05	0.0001	3.638E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	2.509E-07	0.8717	3.451E-08	0.1199	0.000E+00	0.0000	6.556E-11	0.0002	1.123E-11	0.0000	3.838E-11	0.0001	2.855E-07	0.9920
H-3	2.300E-09	0.0080	7.163E-15	0.0000	0.000E+00	0.0000	2.806E-12	0.0000	7.256E-14	0.0000	1.971E-13	0.0000	2.303E-09	0.0080
Total	2.532E-07	0.8797	3.451E-08	0.1199	0.000E+00	0.0000	6.836E-11	0.0002	1.130E-11	0.0000	3.857E-11	0.0001	2.878E-07	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.335E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.335E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	4.091E-23	0.8786	5.627E-24	0.1208	0.000E+00	0.0000	1.069E-26	0.0002	1.831E-27	0.0000	6.257E-27	0.0001	4.656E-23	0.9998
H-3	7.437E-27	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.437E-27	0.0002
Total	4.092E-23	0.8788	5.627E-24	0.1208	0.000E+00	0.0000	1.069E-26	0.0002	1.831E-27	0.0000	6.257E-27	0.0001	4.656E-23	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	2.903E-25	6.368E-02	5.071E-02	1.338E-03	4.126E-08	6.728E-24	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	1.566E-03	1.126E-03	2.007E-05	2.020E-10	6.532E-28	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	*4.455E+12	3.926E+02	4.930E+02	1.869E+04	6.059E+08	*4.455E+12	*4.455E+12	*4.455E+12
H-3	*9.597E+15	1.597E+04	2.220E+04	1.246E+06	1.238E+11	*9.597E+15	*9.597E+15	*9.597E+15

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 1.554 ± 0.003 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
C-14	6.920E+00	1.553 ± 0.003	1.041E-01	2.401E+02	1.041E-01	2.401E+02
H-3	1.140E+01	1.498 ± 0.003	2.514E-03	9.943E+03	2.507E-03	9.971E+03

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	2.009E-24	4.407E-01	3.509E-01	9.256E-03	2.855E-07	4.656E-23	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	1.785E-02	1.284E-02	2.288E-04	2.303E-09	7.437E-27	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

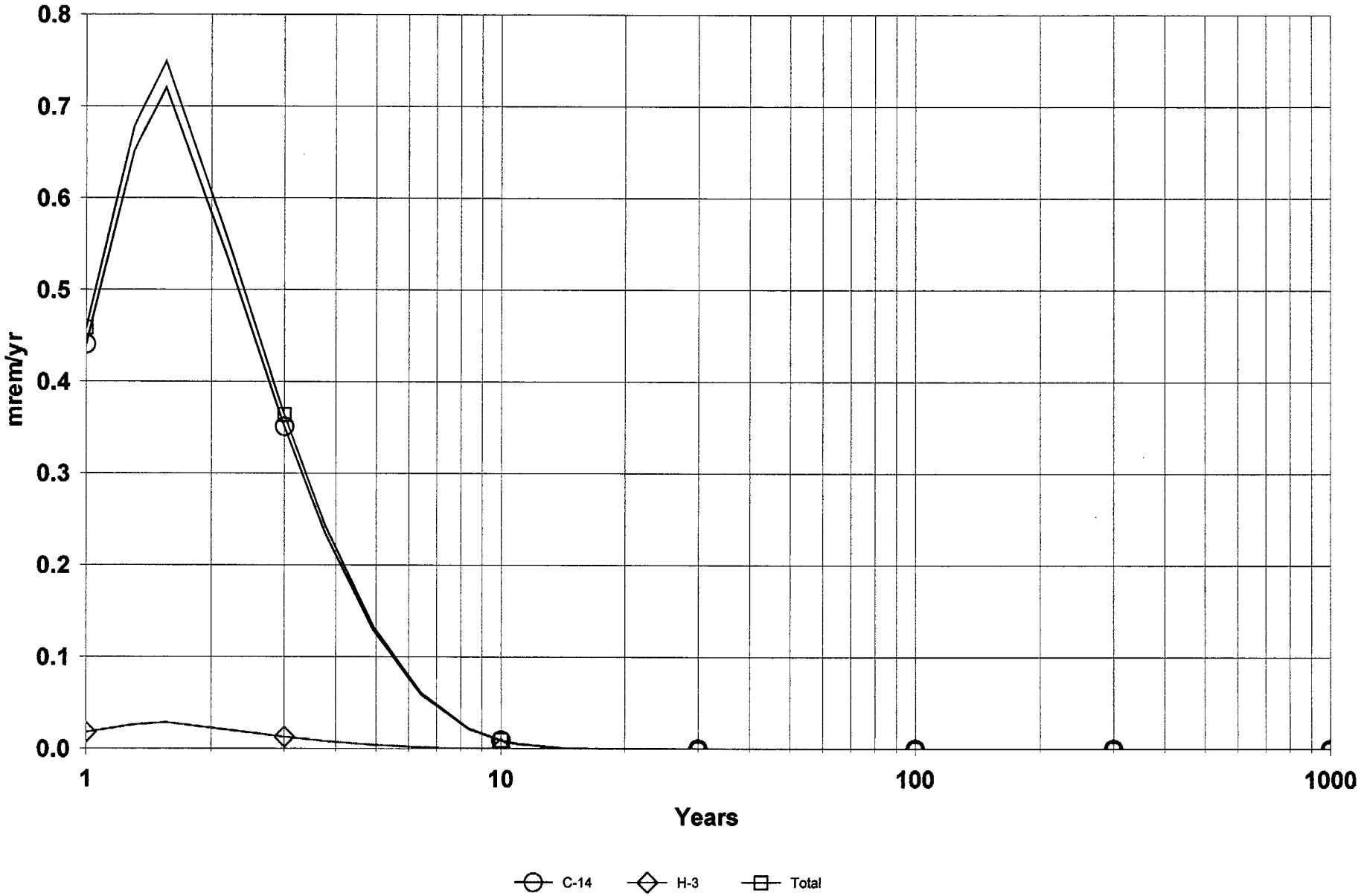
Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	6.920E+00	4.116E+00	1.456E+00	3.838E-02	1.181E-06	1.906E-22	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	1.140E+01	6.412E+00	2.028E+00	3.611E-02	3.625E-07	1.161E-24	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 1.04 seconds

DOSE: All Nuclides Summed, All Pathways Summed



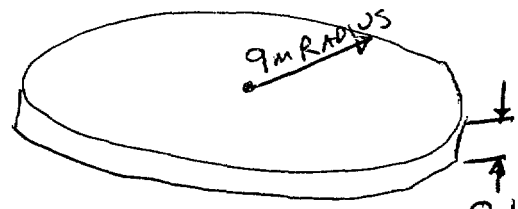
Drywell In Place.RAD 10/11/2006 15:42 GRAPHICS.ASC Includes All Pathways

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

- ASSUME CONTAMINATED ZONE EXCAVATED AND SPREAD ON THE SURFACE AT A 15 cm THICKNESS.

CONTAMINATED ZONE GEOMETRY:



NO COVER

MODIFIED PARAMETERS:

- AREA = 251 m^2
- THICK(0) = 0.15 m
- LCZPAQ = 18 m

RESULTS: MAX DOSE = 0.34 mrem/yr @ t = 2.025 yrs

PERFORMED BY: [signature] 10-11-06

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 MORBIDITY

M	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	C-14	2.090E-06	2.090E-06	DCF2(1)
B-1	H-3	6.400E-08	6.400E-08	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	C-14	2.090E-06	2.090E-06	DCF3(1)
D-1	H-3	6.400E-08	6.400E-08	DCF3(2)
D-34	Food transfer factors:			
D-34	C-14 , plant/soil concentration ratio, dimensionless	5.500E+00	5.500E+00	RTF(1,1)
D-34	C-14 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.100E-02	3.100E-02	RTF(1,2)
D-34	C-14 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.200E-02	1.200E-02	RTF(1,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(2,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(2,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	C-14 , fish	5.000E+04	5.000E+04	BIOFAC(1,1)
D-5	C-14 , crustacea and mollusks	9.100E+03	9.100E+03	BIOFAC(1,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(2,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(2,2)

* Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter		User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	*	2.510E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	*	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	*	1.800E+01	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)		2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)		0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)		1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)		3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)		1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)		3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)		1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)		3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)		1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)		not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)		not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): C-14		6.920E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): H-3		1.140E+01	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): C-14		not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): H-3		not used	0.000E+00	---	W1(2)
R013	Cover depth (m)		0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)		not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)		not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)		1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)		1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity		4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity		2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)		1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter		5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)		2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)		8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient		5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)		1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)		2.000E-01	2.000E-01	---	RI
R013	Irrigation mode		overhead	overhead	---	IDITCH
R013	Runoff coefficient		2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)		1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations		1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)		1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity		4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity		2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity		2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)		1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient		2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter		5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)		1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)		1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)		ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)		2.500E+02	2.500E+02	---	UW

* PARAMETER MODIFIED FROM DEFAULT

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for C-14				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.039E+01	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.039E+01	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.126E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.126E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.126E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	2.000E-05	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	3.000E-02	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	2.000E-02	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	9.800E-01	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	3.000E-01	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	7.000E-07	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	1.000E-10	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	8.000E-01	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	2.000E-01	2.000E-01	---	AVFG5
C14	DCF correction factor for gaseous forms of C14	8.894E+01	0.000E+00	---	CO2F
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TIME	Number of graphical time points	32	---	---	NPTS
T	Maximum number of integration points for dose	17	---	---	LYMAX

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	suppressed

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	251.00 square meters	C-14	6.920E+00
Thickness:	0.15 meters	H-3	1.140E+01
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	6.196E-03	2.290E-01	4.211E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
M(t):	2.479E-04	9.161E-03	1.684E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Maximum TDOSE(t): 3.357E-01 mrem/yr at t = 2.025 ± 0.004 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.025E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	5.537E-19	0.0000	0.000E+00	0.0000	1.989E-17	0.0000	2.492E-18	0.0000	9.728E-19	0.0000	5.488E-21	0.0000
Total	0.000E+00	0.0000	5.537E-19	0.0000	0.000E+00	0.0000	1.989E-17	0.0000	2.492E-18	0.0000	9.728E-19	0.0000	5.488E-21	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.025E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	2.671E-01	0.7957	4.060E-02	0.1210	0.000E+00	0.0000	2.272E-03	0.0068	2.514E-04	0.0007	8.235E-04	0.0025	3.111E-01	0.9267
H-3	2.428E-02	0.0723	8.365E-08	0.0000	0.000E+00	0.0000	2.780E-04	0.0008	1.345E-05	0.0000	4.027E-05	0.0001	2.462E-02	0.0733
Total	2.914E-01	0.8681	4.060E-02	0.1210	0.000E+00	0.0000	2.550E-03	0.0076	2.648E-04	0.0008	8.637E-04	0.0026	3.357E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.605E-06	0.0003	1.046E-05	0.0017	0.000E+00	0.0000	5.012E-03	0.8088	3.474E-04	0.0561	6.708E-05	0.0108	3.247E-06	0.0005
H-3	0.000E+00	0.0000	3.246E-05	0.0052	0.000E+00	0.0000	6.871E-04	0.1109	2.218E-05	0.0036	1.277E-05	0.0021	3.218E-07	0.0001
Total	1.605E-06	0.0003	4.292E-05	0.0069	0.000E+00	0.0000	5.699E-03	0.9197	3.695E-04	0.0596	7.985E-05	0.0129	3.569E-06	0.0006

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.442E-03	0.8782
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.549E-04	0.1218
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.196E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.224E-20	0.0000	7.927E-20	0.0000	0.000E+00	0.0000	2.800E-16	0.0000	2.857E-16	0.0000	2.158E-17	0.0000	2.460E-20	0.0000
H-3	0.000E+00	0.0000	5.174E-12	0.0000	0.000E+00	0.0000	1.858E-10	0.0000	2.328E-11	0.0000	9.089E-12	0.0000	5.128E-14	0.0000
Total	1.224E-20	0.0000	5.174E-12	0.0000	0.000E+00	0.0000	1.858E-10	0.0000	2.328E-11	0.0000	9.089E-12	0.0000	5.128E-14	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	1.831E-01	0.7992	2.704E-02	0.1181	0.000E+00	0.0000	1.459E-03	0.0064	1.526E-04	0.0007	5.598E-04	0.0024	2.123E-01	0.9268
H-3	1.656E-02	0.0723	5.548E-08	0.0000	0.000E+00	0.0000	1.787E-04	0.0008	8.015E-06	0.0000	2.703E-05	0.0001	1.677E-02	0.0732
Total	1.996E-01	0.8715	2.704E-02	0.1181	0.000E+00	0.0000	1.637E-03	0.0071	1.606E-04	0.0007	5.868E-04	0.0026	2.290E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	1.314E-25	0.0000	0.000E+00	0.0000	4.719E-24	0.0000	5.913E-25	0.0000	2.308E-25	0.0000	1.302E-27	0.0000
Total	0.000E+00	0.0000	1.314E-25	0.0000	0.000E+00	0.0000	4.719E-24	0.0000	5.913E-25	0.0000	2.308E-25	0.0000	1.302E-27	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	3.250E-02	0.7717	5.448E-03	0.1294	0.000E+00	0.0000	3.447E-04	0.0082	4.669E-05	0.0011	1.038E-04	0.0025	3.844E-02	0.9128
H-3	3.613E-03	0.0858	1.363E-08	0.0000	0.000E+00	0.0000	4.998E-05	0.0012	2.981E-06	0.0001	6.369E-06	0.0002	3.673E-03	0.0872
Total	3.611E-02	0.8575	5.448E-03	0.1294	0.000E+00	0.0000	3.946E-04	0.0094	4.967E-05	0.0012	1.101E-04	0.0026	4.211E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	7.863E-04	3.067E-02	5.555E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	6.622E-05	1.471E-03	3.222E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	3.179E+04	8.150E+02	4.501E+03	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12
H-3	3.775E+05	1.700E+04	7.760E+04	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.025 ± 0.004 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
C-14	6.920E+00	2.021 ± 0.004	4.495E-02	5.562E+02	4.495E-02	5.562E+02
H-3	1.140E+01	1.477 ± 0.003	2.212E-03	1.130E+04	2.159E-03	1.158E+04

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide	Parent	THF(i)	DOSE(j,t), mrem/yr							
(j)	(i)		t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	5.442E-03	2.123E-01	3.844E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	7.549E-04	1.677E-02	3.673E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

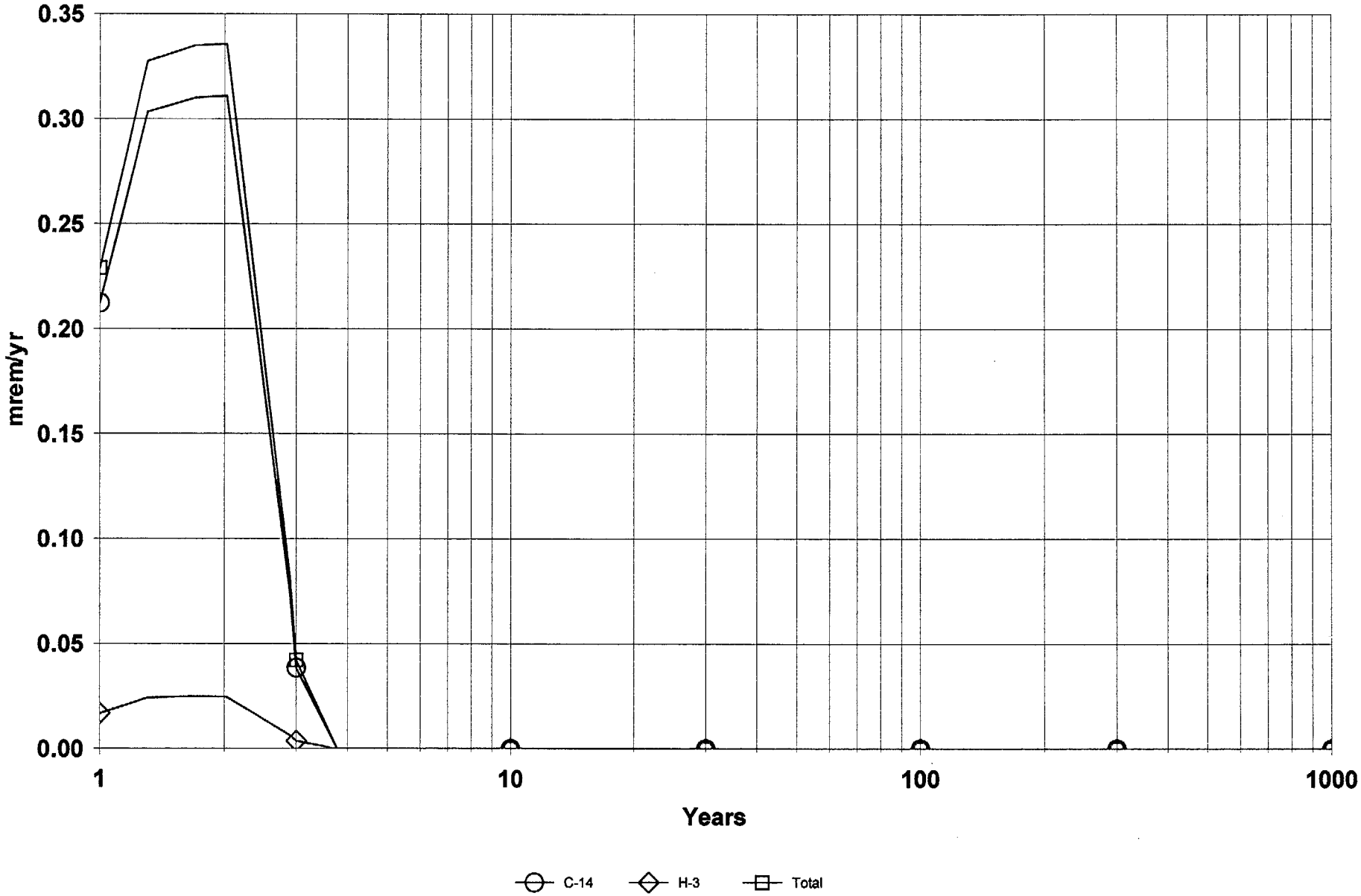
Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide	Parent	THF(i)	S(j,t), pCi/g							
(j)	(i)		t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	6.920E+00	5.279E-14	3.074E-42	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	1.140E+01	1.829E-06	4.709E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.88 seconds

DOSE: All Nuclides Summed, All Pathways Summed



Drywell Removed.RAD 10/11/2006 16:13 GRAPHICS.ASC Includes All Pathways

SRA SCM Calibration Form

SCM IV #2 Calibration Summary (Rutgers)

Type	P45	P100	T115[a]	T70
Beta	16.3%	17.8%	13.8%	not used
Alpha	not used	not used	not used	not used

[a]Lower efficiency resulted from a greater stand-distrance for calibration to exterior concrete surfaces.

Updated in SIMS by Post Processor

Post Processor Signature _____ Date _____

Calibration Source Information

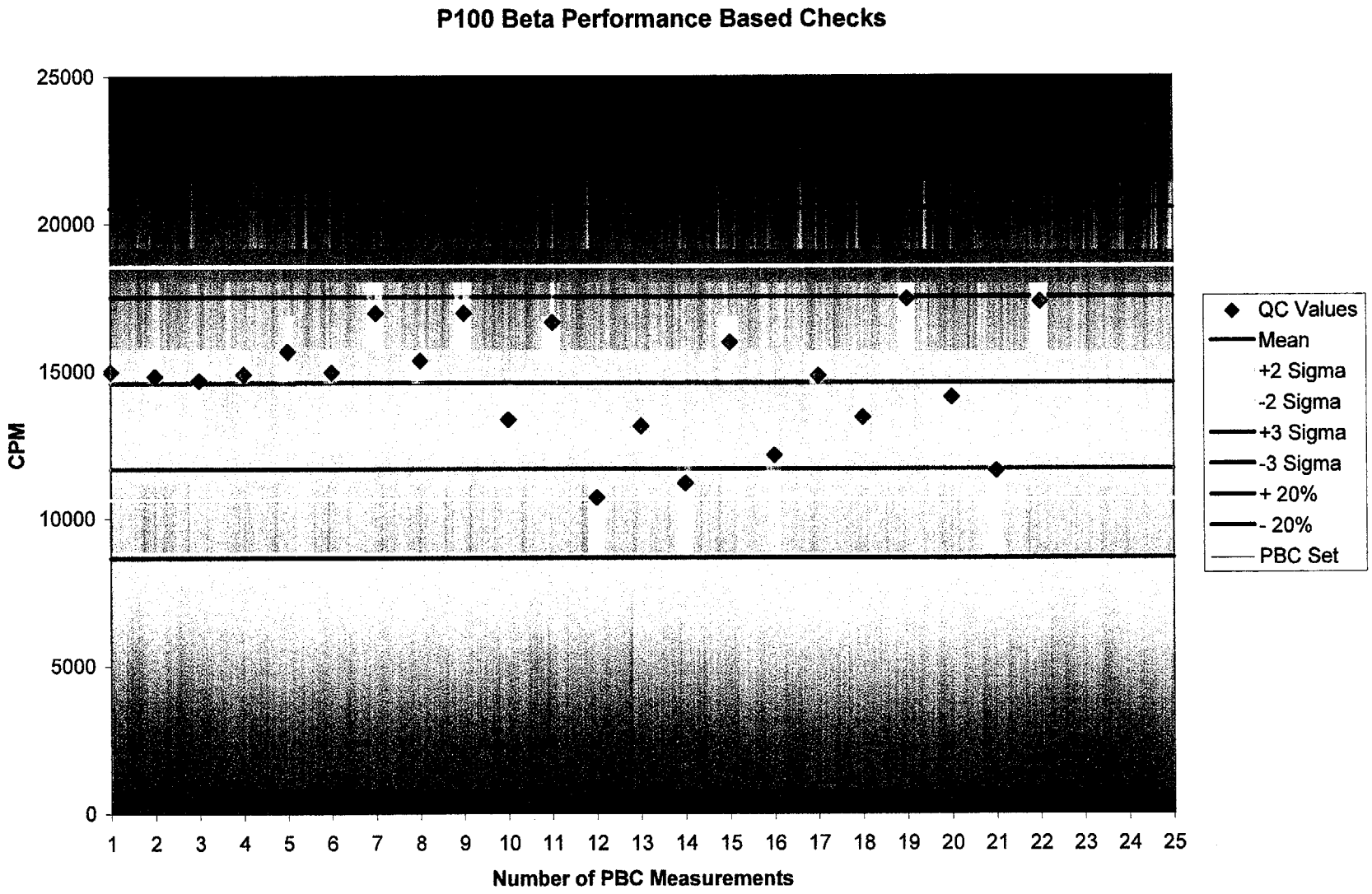
P45 Calibration Date	9/1/06
P100 & P115 Calibration Date	9/6/06

Calibraiton Source Data							Decay/Geometry Correction			Detector Type
Isotope	Emission Type	Surface Efficiency	Half Life (years)	Serial Number	$q_{2\pi}$ emission Rate (particals/min)	Assay Date	$q_{2\pi}$ emission Rate	Active Area of the Source (cm^2)	particles/min per 100 cm^2	
Cs-137	β	0.5	3.01E+01	FY 865	90,000	03/26/98	74086.47	100	74,086.47	P45
Cs-137	β	0.5	3.01E+01	FY 865	90,000	03/26/98	74063.08	100	74,063.08	P100

Calibration Data

	Beta					Alpha				
Detector	P45	P100	T115a	T70		P45	P100	T115a	T70	
Cal File Name	PCALP45	PCALP100	PCALP115							
n	30	30	30							
R_{S+B}	24172	26343	20376							
Units:	cpm	cpm	cpm	cpm	cpm	cpm	cpm	cpm	cpm	cpm
1	19946	24130	18221							
2	18559	35132	18801							
3	29201	25923	19682							
4	23100	23611	14116							
5	21325	25794	16108							
6	25435	24015	23387							
7	28149	27501	25204							
8	25965	26869	21785							
9	29172	22464	19094							
10	30357	23237	23518							
11	23205	27743	23117							
12	29882	29124	15203							
13	23791	28805	18893							
14	22803	26934	18564							
15	28773	20734	24667							
16	17183	32612	21034							
17	26951	27468	24643							
18	18254	29327	20672							
19	29339	22286	22640							
20	22173	30345	21688							
21	26216	28786	24954							
22	24256	26636	17269							
23	18683	19457	16049							
24	17186	27571	24730							
25	28452	24235	15879							
26	24063	24960	22165							
27	23413	25404	15693							
28	21271	25360	19408							
29	30698	26804	24945							
30	17357	27037	19144							

Project Manager or Designee _____ Date _____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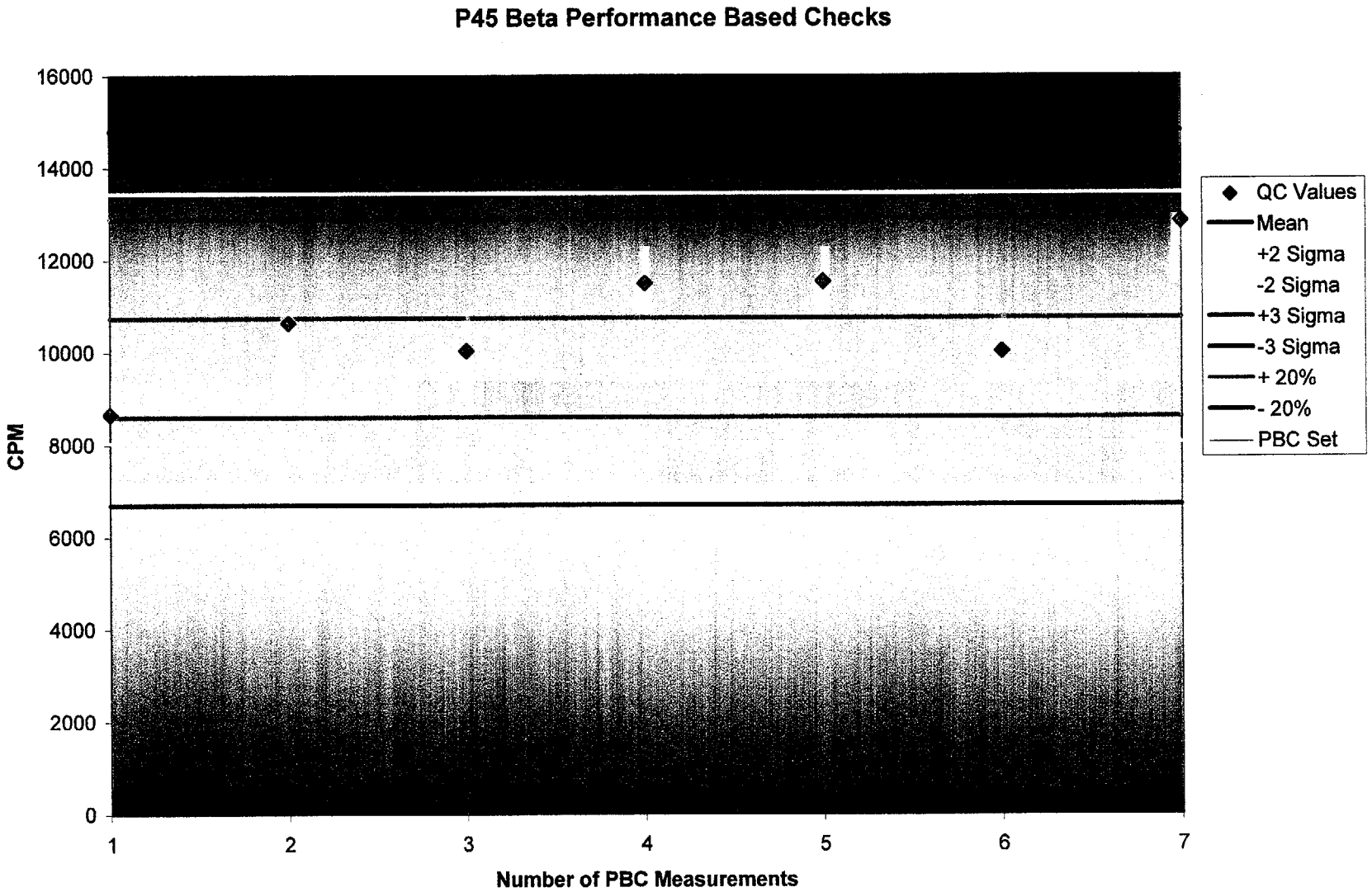
25000
20000
15000
10000
5000
0
CPM
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Number of PBC Measurements
QC Values
Mean
+2 Sigma
-2 Sigma
+3 Sigma
-3 Sigma
+ 20%
- 20%
PBC Set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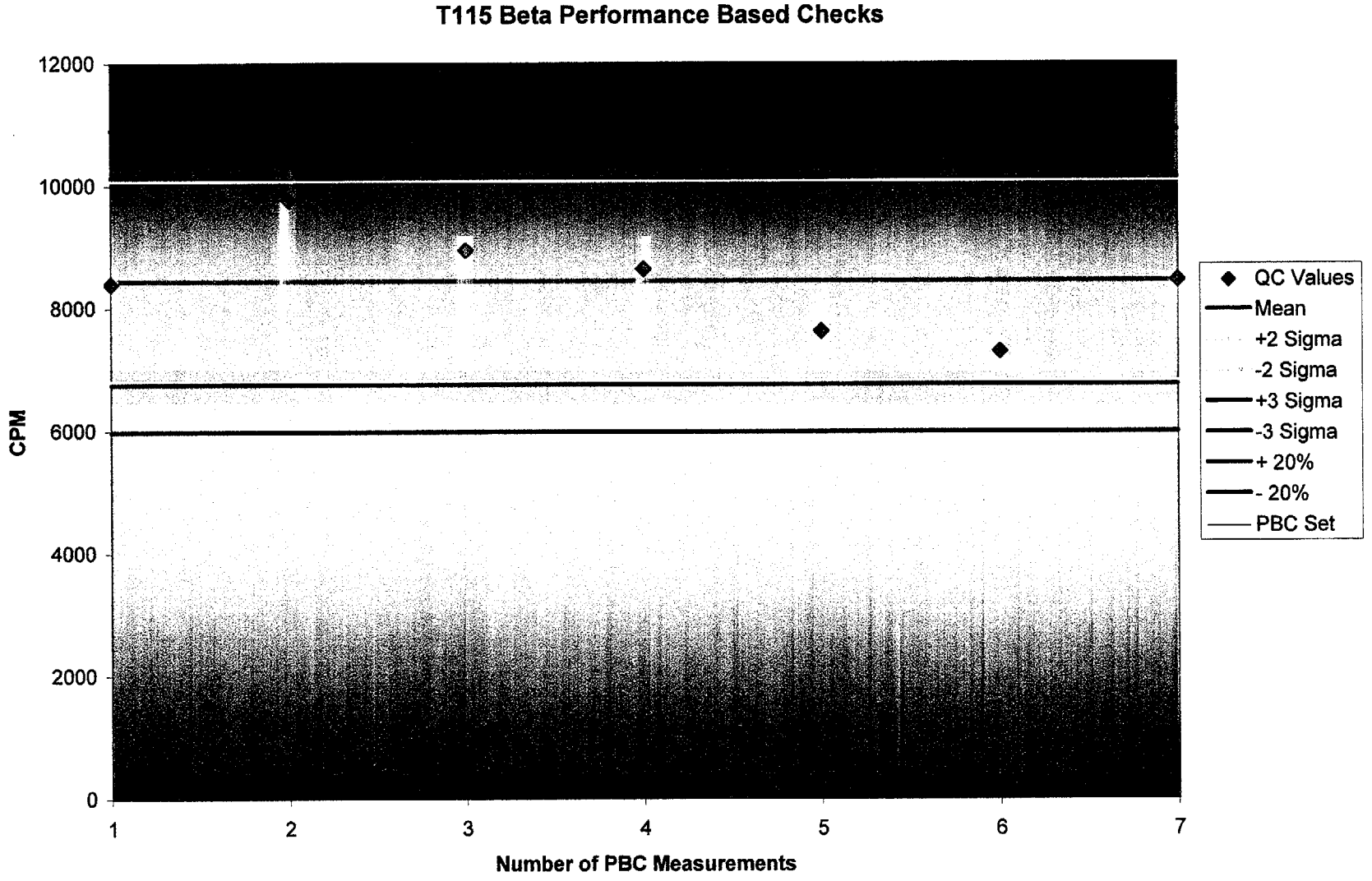
16000
14000
12000
10000
8000
6000
4000
2000
0
CPM
1
2
3
4
5
6
7
Number of PBC Measurements
QC Values
Mean
+2 Sigma
-2 Sigma
+3 Sigma
-3 Sigma
+ 20%
- 20%
PBC Set


T115 Beta Performance Based Checks
12000
10000
8000
6000
4000
2000
0
CPM
1
2
3
4
5
6
7
Number of PBC Measurements
QC Values
Mean
+2 Sigma
-2 Sigma
+3 Sigma
-3 Sigma
+ 20%
- 20%
PBC Set

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-89 PROBE # PR141226

Owner: CHASE ENV

DATE: 01/10/06 LOCATION: Griffin Inst
TECH: J. Glenn DATE LAST CAL EXPIRES: 07/30/04

REASON FOR CALIBRATION:

○ Due For Calibration ○ Repair (See Remarks) ○ Other (See Remarks) ◉ Due and Repair

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL:	2224	SERIAL #:	146719	CAL. DUE:	01/10/07
MODEL:		SERIAL #:		CAL. DUE:	

NIST TRACEABLE SOURCES USED

SOURCE #:	2695-00	SOURCE #:	2697-00
ISOTOPE:	Tc99	ISOTOPE:	Sr90
ACTIVITY(dpm):	18400	ACTIVITY:	12,200 dpm
ASSAY DATE:	03/01/00	ASSAY DATE:	03/01/00

Condition: ◉ Sat ○ Unsat Efficiency from last cal.: Pu: Tc Ni:
Th: Sr:

HV Vernier

Setpoints from last cal.:

Source	Alpha Response CPM	Beta Response CPM	
Background:			
Pu-239:			A-B XTLK:
Tc-99 Ni:			B-A XTLK:

As Found Efficiencies Pu, Tc:

Th-230 / Sr-90		/	/
Background:			
Pu-239:			A-B XTLK:
Tc-99 Ni:			B-A XTLK:

As Found Efficiencies Pu, Tc:

Th-230 / Sr-90		/	/

Is as found efficiency within 20% of the efficiency from the last cal? ○ Yes ◉ No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: **PR141226**
Date: 01/10/06

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
500	6	1099	5.5%	2546	264	13.9%	3	84	6.6%	<1%
525	10	2138	10.7%	3221	264	17.6%	5	161	3.1%	<1%
550				3337	269	18.0%	50	1150	-35.9%	<1%

Alpha / Beta Bkg (cpm) 5 161

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	Sr-90
525	**CPM:**	3221	2138	2837	5589	2520
	AL Efficiencies:	**17.57%**	**10.74%**	**7.17%**	**12.84%**	**19.34%**

Th-230 Source #99TH470-1815 8/3/99 43,500 dpm Pu-239 Source #2696-00 3/1/00 18,300dpm
Tc-99 on Stainless Steel Source #99TC470-1814 8/3/99 37,300 dpm

Remarks: Hole in mylar - replaced mylar window. Calibrated w/2224 #416719.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: **01/10/07**

Performed/Reviewed by: Joanne Glenn **Date:** 1/10/2006 **Entered by:** ____ **Initials**

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 2224 SERIAL# 146719

Owner: CHASE ENV

DATE: 01/10/06 LOCATION: Griffin Inst

TECH: J. Glenn DATE LAST CAL EXPIRES: 07/30/04

Reason For Calibration: (•) Due For Calibration ( ) Repair (See Remarks)

( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 114512 CAL. DUE: 11/14/06

MODEL: SERIAL #: CAL DUE:

[ ] Fast/Slow Switch working properly [x] Audio Response [x] Geotropism

CONDITION: Sat AF MECHANICAL ZERO: 0 AL MECHANICAL ZERO: 0

NEW BATTERIES: ( ) Yes (•) No BATTERY CHECK: Sat

HV	AS FOUND HV	AS LEFT HV	WINDOW SETTINGS:	A.F.	A.L.
500 V:	500	A.F.	BT (3.5 mV +/- 1 mV):	4	3.5
1000 V:	1000	A.F.	BW (30 mV +/-3 mV):	18	30
1500 V:	1500	A.F.	AT (120 mV +/-10 mV):	18	120

RATE METER

SCALER

SCALE	RATE CPM	AS FOUND		% ERROR	AS LEFT	% ERROR	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100		0.0%	A.F.					
	250	250		0.0%	A.F.		251	0.4%	A.F.	
	400	400		0.0%	A.F.					
x1 or x10	1000	1000		0.0%	A.F.					
	2500	2500		0.0%	A.F.					
	4000	4000		0.0%	A.F.					
x10 or x100	10K	10	K	0.0%	A.F.					
	25K	25	K	0.0%	A.F.					
	40K	40	K	0.0%	A.F.					
x100 or x1000	100K	100	K	0.0%	A.F.					
	250K	250	K	0.0%	A.F.					
	400K	400	K	0.0%	A.F.					

Is the As Found Data Within 20% of the Set Point?: ( ) Yes (•) No

Overload Light: (•) Adjusted ( ) Not Adj. Low Battery (2.2 V): (•) Sat ( ) Unsat

Remarks: Replaced bad cable. Calibrated as a unit w/43-89 #PR141226

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: 01/10/07

Performed/Reviewed by: Joanne Glenn Date: 1/10/2006 Entered by: Initials

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 2360 SERIAL# 185784

Owner: CHASE ENV

DATE: 01/07/06 LOCATION: Griffin Inst

TECH: J. Glenn DATE LAST CAL EXPIRES: 02/04/06

Reason For Calibration: (•) Due For Calibration ( ) Repair (See Remarks)

( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 114512 CAL. DUE: 11/14/06

MODEL: SERIAL #: CAL DUE:

[ ] Fast/Slow Switch working properly [✓] Audio Response [✓] Geotropism

CONDITION: Sat AF MECHANICAL ZERO: 0 AL MECHANICAL ZERO: 0

NEW BATTERIES: ( ) Yes (•) No BATTERY CHECK: Sat

HV	AS FOUND HV	AS LEFT HV	WINDOW SETTINGS:	A.F.	A.L.
500 V:	500	A.F.	BT (3.5 mV +/- 1 mV):	3.5	A.F.
1000 V:	1000	A.F.	BW (30 mV +/-3 mV):	30	A.F.
1500 V:	1500	A.F.	AT (120 mV +/-10 mV):	120	A.F.

RATE METER / SCALER

SCALE	RATE CPM	AS FOUND		% ERROR	AS LEFT	% ERROR	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100		0.0%	A.F.					
	250	250		0.0%	A.F.		250	0.0%	A.F.	
	400	400		0.0%	A.F.					
x1 or x10	1000	1000		0.0%	A.F.					
	2500	2500		0.0%	A.F.					
	4000	4000		0.0%	A.F.					
x10 or x100	10K	10	K	0.0%	A.F.					
	25K	25	K	0.0%	A.F.					
	40K	40	K	0.0%	A.F.					
x100 or x1000	100K	100	K	0.0%	A.F.					
	250K	250	K	0.0%	A.F.					
	400K	400	K	0.0%	A.F.					

Is the As Found Data Within 20% of the Set Point?: (•) Yes ( ) No

Overload Light: ( ) Adjusted (•) Not Adj. Low Battery (2.2 V): (•) Sat ( ) Unsat

Remarks: Calibrated w/43-37 #PR178300.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: 01/07/07

Performed/Reviewed by: Joanne Glenn Date: 1/7/2006 Entered by: _____ Initials

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-37 PROBE # PR178300

Owner: CHASE ENV

DATE: 01/07/06 LOCATION: Griffin Inst
TECH: J. Glenn DATE LAST CAL EXPIRES: 02/04/06

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL:	2360	SERIAL #:	185784	CAL. DUE:	01/07/07
MODEL:		SERIAL #:		CAL. DUE:	

NIST TRACEABLE SOURCES USED

SOURCE #:	2695-00	SOURCE #:	2697-00
ISOTOPE:	Tc99	ISOTOPE:	Sr90
ACTIVITY(dpm):	18400	ACTIVITY:	12,200 dpm
ASSAY DATE:	03/01/00	ASSAY DATE:	03/01/00

Condition: (●) Sat ( ) Unsat Efficiency from last cal.: Pu: 14.52% Tc Ni: 27.71% Th: 12.08% Sr: 21.33%

	HV	Vernier
Setpoints from last cal.:	1700	N/A

Source	Alpha Response CPM	Beta Response CPM		
Background:	2	767		
Pu-239:	3339	832	A-B XTLK:	1.9%
Tc-99 Ni:	3	5664	B-A XTLK:	<1%
As Found Efficiencies Pu, Tc:	18.23%	26.61%		
Th-230 / Sr-90	6018 /	3969	13.83% /	26.25%
Background:				
Pu-239:			A-B XTLK:	
Tc-99 Ni:			B-A XTLK:	
As Found Efficiencies Pu, Tc:				
Th-230 / Sr-90	/		/	

Is as found efficiency within 20% of the efficiency from the last cal? ( ) Yes (●) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: **PR178300**
Date: 01/07/06

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
1600	5	4154	21.3%	2643	463	14.4%	5	236	7.9%	<1%
1650	6	5124	25.4%	2820	616	15.4%	3	444	5.7%	<1%
1700	5	4963	22.9%	3116	829	17.0%	7	752	2.4%	<1%
1750	21	4010	17.2%	3402	1058	18.6%	7	841	6.0%	<1%
1800							30	782		<1%
										<1%

Alpha / Beta Bkg (cpm) 4 639

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	Sr-90
1700	**CPM:**	3330	5067	7724	5522	3638
	AL Efficiencies:	**18.17%**	**24.07%**	**18.99%**	**12.69%**	**24.58%**

Th-230 Source #99TH470-1815 8/3/99 43,500 dpm Pu-239 Source #2696-00 3/1/00 18,300dpm
Tc-99 on Stainless Steel Source #99TC470-1814 8/3/99 37,300 dpm

Remarks: Replateaued due to higher beta efficiency. Calibrated w/2360 #185784. C-14 7752 cpm - 639 bkg = 7113/67800 dpm = 10.49%. Source used DX295, 67,800 dpm, assay 5/3/94

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: **01/07/07**

Performed/Reviewed by: *Joanne Glenn* **Date:** 1/7/2006 **Entered by:**_____**Initials**

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 2241 SERIAL# 215437

Owner: CHASE ENV

DATE: 03/19/06 LOCATION: Griffin Inst

TECH: J. Glenn DATE LAST CAL EXPIRES: 03/26/06

Reason For Calibration: (•) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 114512 CAL. DUE: 11/14/06

MODEL: SERIAL #: CAL DUE:

[x] Fast/Slow Switch working properly [x] Audio Response [x] Geotropism CABLE LENGTH 39"

CONDITION: Sat

NEW BATTERIES: ( ) Yes (•) No BATTERY CHECK: Sat

HV TEST ( ) N/A (•) Sat ( ) Unsat

AF INPUT SENSITIVITY (mV) #1:	10	AL INPUT SENSITIVITY (mV) #1:	A.F.
AF INPUT SENSITIVITY (mV) #2:	N/A	AL INPUT SENSITIVITY (mV) #2 :	N/A
AF INPUT SENSITIVITY (mV) #3:	N/A	AL INPUT SENSITIVITY (mV) #3:	N/A

RATE CPM	AS FOUND		% ERROR	AS LEFT	% ERROR
250	250		0.0%	A.F.	
2500	2500		0.0%	A.F.	
25K	25	K	0.0%	A.F.	
250K	249.80	K	0.1%	A.F.	

Is the As Found Data Within 2% of the Set Point?: (•) Yes ( ) No

DETECTOR 1:		DETECTOR 2:		DETECTOR 3:	
AF 1-6	AL 1-6	AF 1-6	AL 1-6	AF 1-6	AL 1-6
0003 S-6	0000 S-6	N/A	N/A	N/A	N/A
0100 -2	A.F.	N/A	N/A	N/A	N/A
c/	A.F.	N/A	N/A	N/A	N/A
m	A.F.	N/A	N/A	N/A	N/A
1	A.F.	N/A	N/A	N/A	N/A
000 s	A.F.	N/A	N/A	N/A	N/A

Remarks: Calibrated w/44-10 #PR227353.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: **03/19/07**

Performed/Reviewed by: Joanne Glenn Date: 3/19/2006 Entered by: _____ Initials

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 44-10 PROBE # PR227353

Owner: CHASE ENV

DATE: 03/19/06 LOCATION: Griffin Inst
TECH: J. Glenn DATE LAST CAL EXPIRES: 03/26/06

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 22413 SERIAL #: 215437 CAL. DUE: 03/19/07
MODEL: SERIAL #: CAL. DUE:

SOURCE #: Other ISOTOPE: ACTIVITY: ASSAY DATE:
SOURCE #: 99-1816 ISOTOPE: Cs137 ACTIVITY: 1.23 uCi ASSAY DATE: 08/12/99

GEOMETRY: For G-5 Probe - Source placed in desk drawer, no planchet or jig, probe on top of desk. All Others: Jig upside down with source underneath, activity side up.

Physical Condition: (●) Sat ( ) Unsat

Efficiency From Last Calibration: Previous HV Set Point: 900 V

Counts (CPM) | Background (CPM) | Net CPM: Decay (yrs): 6.58

AF Efficiency:

Is the AF efficiency within 20% of the efficiency from the last calibration? ( ) Yes (●) No

Reproducibility: 125460 126480 126450 Average: 126130.00

Are the individual counts within 10% of the average? (●) Yes ( ) No

High Voltage:	Source Response (CPM):	Background (CPM):	Net CPM:
750	118060	7110	110950
800	123300	7370	115930
850	125940	7480	118460
900	123950	7710	116240
950	125580	7410	118170
1000	127790	7690	120100

HV	RESPONSE	BACKGROUND	NET CPM		
950 V	125460	7720	117740	Decay (yrs):	6.58
				Efficiency:	5.02%

Remarks: No previous cal data. Calibrated w/2241 #215437.

Does Instrument Meet Final Acceptance Criteria?: (●) Yes ( ) No

Calibration Sticker Attached?: (●) Yes ( ) No

Date Instrument is Due For Next Calibration: **03/19/07**

Performed/Reviewed by: Joanne Glenn Date: 3/19/2006 Entered by: Initials

Calibrations performed to ANSI N323A-1997 standards

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 2929 SERIAL# 132805

Owner: CHASE ENV

DATE: 01/06/06 **LOCATION:** Griffin Inst

TECH: J. Glenn **DATE LAST CAL EXPIRES:** 02/04/06

Reason For Calibration: (●) Due For Calibration ( ) Repair (See Remarks)

( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 **SERIAL #:** 114512 **CAL. DUE:** 11/14/06

MODEL: **SERIAL #:** **CAL DUE:**

Condition: (●) Sat ( ) Unsat

AF Mechanical Zero: 0

AL Mechanical Zero: 0

Scaler Function Check	As Found	As Left		
Beta Channel Window (4-50 mV):	4-50	A.F.		
Alpha Channel Window (175 mV):	175	A.F.		
Alpha Counts w/Pulser @ 10,000 CPM:	9,955	A.F.	% Error:	0.5%
Beta Counts w/Pulser @ 10,000 CPM:	9,968	A.F.	% Error:	0.3%
HIGH VOLTAGE POWER SUPLY CAL				
1 KV Reading (R-5 on HV Board):	1	A.F.		
Max HV (1500 V +):	(●) Sat	( ) Unsat		

Remarks: Calibrated w/43-10-1 #PR138386.

Does Instrument Meet Final Acceptance Criteria?: (●) Yes ( ) No

Calibration Sticker Attached?: (●) Yes ( ) No

Date Instrument is Due For Next Calibration: 01/06/07

Performed/Reviewed by: Joanne Glenn **Date:** 1/6/2006 **Entered by:** ____ **Initials**

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-10-1 PROBE # PR138386

Owner: CHASE ENV

DATE: 01/06/06 **LOCATION:** Griffin Inst
TECH: J. Glenn **DATE LAST CAL EXPIRES:** 02/04/06

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL:	2929	SERIAL #:	132805	CAL. DUE:	01/06/07
MODEL:		SERIAL #:		CAL. DUE:	

NIST TRACEABLE SOURCES USED

SOURCE #:	2695-00	SOURCE #:	2697-00
ISOTOPE:	Tc99	ISOTOPE:	Sr90
ACTIVITY(dpm):	18400	ACTIVITY:	12,200 dpm
ASSAY DATE:	03/01/00	ASSAY DATE:	03/01/00

Condition: (●) Sat ( ) Unsat **Efficiency from last cal.:** Pu: 36.76% Tc NI: 17.87% Th: 28.70% Sr: 33.61%

	HV	Vernier
Setpoints from last cal.:	775	2.30

Source	Alpha Response CPM	Beta Response CPM		
Background:	1	55		
Pu-239:	6622	250	A-B XTLK:	2.9%
Tc-99 NI:	0	3315	B-A XTLK:	<1%
As Found Efficiencies Pu, Tc:	36.18%	17.72%		
Th-230 / Sr-90	12239 /	4091	28.13% /	33.08%
Background:				
Pu-239:			A-B XTLK:	
Tc-99 NI:			B-A XTLK:	
As Found Efficiencies Pu, Tc:				
Th-230 / Sr-90	/		/	

Is as found efficiency within 20% of the efficiency from the last cal? (●) Yes ( ) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: PR138386
Date: 01/06/06

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
750 / 3.08	3	2839	15.2%	6499	223	35.5%	0	46	2.7%	<1%
800 / 3.32	1	3698	19.8%	6585	418	36.0%	0	52	5.3%	<1%
825 / 3.35	0	3847	20.5%	6495	500	35.5%	1	72	6.2%	<1%
850 / 3.50							3	186		

Alpha / Beta Bkg (cpm) 1 72

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	Sr-90
825 / 3.35	CPM:	6495	3847	5305	12096	3915
	AL Efficiencies:	**35.49%**	**20.52%**	**14.03%**	**27.80%**	**31.50%**

Th-230 Source #99TH470-1815 8/3/99 43,500 dpm Pu-239 Source #2696-00 3/1/00 18,300dpm
Tc-99 on Stainless Steel Source #99TC470-1814 8/3/99 37,300 dpm

Remarks: Re-plateaued for better beta efficiencies. Calibrated w/2929 #132805.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: **01/06/07**

Performed/Reviewed by: Joanne Glenn **Date:** 1/6/2006 **Entered by:** _____ **Initials**

Calibrations performed to ANSI N323A-1997 standards.

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

09/29/2006

LIMS #: L29988
Project ID#: CH085-3ERUTGERS-06
Received: 09/25/2006
Delivery Date: 10/09/2006
P.O. #: Q06-060
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Keith Jeter
Operations Manager

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
GGH-P1	L29988-1	
GGH-P2	L29988-2	
GGH-P3	L29988-3	
GGH-P4	L29988-4	
GGH-P5	L29988-5	
GGH-P6	L29988-6	
GGH-P7	L29988-7	

Report of Analysis

09/29/06 16:13

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29988

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-P1** | Collect Start: 09/22/2006 11:20 | Matrix: Soil | (S)
Station: | Collect Stop: | Volume:
Description: | Receive Date: 09/25/2006 | % Moisture: 14.96
LIMS Number: L29988-1

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
BE-7	2007	-5.56E-02	3.20E-01	**5.31E-01**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
K-40	2007	**2.08E+01**	1.40E+00	4.53E-01	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	+	Yes
MN-54	2007	7.99E-03	3.54E-02	**5.82E-02**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
CO-58	2007	-2.26E-02	3.53E-02	**5.34E-02**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
FE-59	2007	-3.35E-03	6.98E-02	**1.15E-01**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
CO-60	2007	1.33E-02	3.36E-02	**5.76E-02**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
ZN-65	2007	-2.80E-02	9.10E-02	**1.24E-01**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
ZR-95	2007	2.96E-02	5.74E-02	**9.78E-02**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
RU-103	2007	-1.53E-02	3.65E-02	**5.92E-02**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
RU-106	2007	9.99E-02	2.93E-01	**4.96E-01**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
I-131	2007	2.03E-02	6.14E-02	**1.01E-01**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
CS-134	2007	-1.80E-02	3.62E-02	**4.88E-02**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
CS-137	2007	**1.75E+00**	1.16E-01	6.10E-02	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	+	Yes
CE-141	2007	-1.54E-02	5.43E-02	**9.06E-02**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
CE-144	2007	-1.57E-02	1.97E-01	**3.32E-01**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
RA-226	2007	**2.24E+00**	1.14E+00	1.16E+00	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	+	Yes
AC-228	2007	**9.70E-01**	4.71E-01	1.81E-01	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	+	Yes
TH-228	2007	**1.01E+00**	1.21E-01	1.15E-01	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	+	Yes
TH-230	2007	**7.97E-01**	8.51E-02	1.83E-01	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	+	Yes
TH-232	2007	**1.01E+00**	2.27E-01	1.81E-01	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	+	Yes
TH-234	2007	-3.87E-01	2.00E+00	**3.24E+00**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
U-235	2007	1.12E-01	2.13E-01	**3.67E-01**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No
U-238	2007	-5.31E-01	3.27E+00	**5.37E+00**	pCi/g Dry		373.34	g dry	09/22/06 11:20	09/29/06	4200	Sec	U	No

Flag Values
U = *Compound/Analyte not detected or less than 3 sigma*
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

09/29/06 16:13

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29988

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-P2** | Collect Start: 09/22/2006 11:30 | Matrix: Soil | (S)
Station: | Collect Stop: | Volume:
Description: | Receive Date: 09/25/2006 | % Moisture: 12.70
LIMS Number: L29988-2

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
BE-7	2007	-1.30E-01	1.99E-01	**3.10E-01**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
K-40	2007	**1.94E+01**	1.31E+00	2.73E-01	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	+	Yes
MN-54	2007	1.11E-02	2.28E-02	**3.82E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
CO-58	2007	1.04E-02	1.91E-02	**3.28E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
FE-59	2007	-1.28E-02	4.37E-02	**6.47E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
CO-60	2007	3.56E-02	2.27E-02	**4.59E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
ZN-65	2007	-1.71E-02	4.89E-02	**7.19E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
ZR-95	2007	2.10E-02	3.76E-02	**6.42E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
RU-103	2007	-8.99E-03	2.24E-02	**3.54E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
RU-106	2007	1.06E-01	1.93E-01	**3.31E-01**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
I-131	2007	8.74E-03	3.57E-02	**6.05E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
CS-134	2007	-1.04E-02	2.12E-02	**2.98E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
CS-137	2007	**1.39E+00**	9.81E-02	4.00E-02	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	+	Yes
CE-141	2007	-6.99E-03	3.15E-02	**5.40E-02**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
CE-144	2007	7.63E-02	1.19E-01	**2.13E-01**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
RA-226	2007	**2.63E+00**	1.00E+00	7.11E-01	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	+	Yes
AC-228	2007	**1.11E+00**	3.21E-01	1.18E-01	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	+	Yes
TH-228	2007	**1.03E+00**	9.06E-02	5.52E-02	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	+	Yes
TH-230	2007	**5.57E-01**	7.50E-02	1.29E-01	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	+	Yes
TH-232	2007	**9.05E-01**	2.36E-01	1.17E-01	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	+	Yes
TH-234	2007	2.96E-01	1.62E+00	**2.45E+00**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
U-235	2007	7.23E-02	1.23E-01	**2.19E-01**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No
U-238	2007	5.23E-02	2.52E+00	**3.96E+00**	pCi/g Dry		357.52	g dry	09/22/06 11:30	09/29/06	6971	Sec	U	No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

09/29/06 16:13

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29988

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: GGH-P3
Station:
Description:
LIMS Number: L29988-3

Collect Start: 09/22/2006 11:40
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil
Volume:
% Moisture: 14.34

(S)

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
BE-7	2007	3.58E-01	3.56E-01	**6.23E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
K-40	2007	**1.69E+01**	1.33E+00	5.13E-01	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	+	Yes
MN-54	2007	2.37E-03	3.69E-02	**6.20E-02**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
CO-58	2007	1.39E-02	3.23E-02	**5.62E-02**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
FE-59	2007	-2.27E-02	7.82E-02	**1.24E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
CO-60	2007	2.16E-02	3.20E-02	**5.67E-02**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
ZN-65	2007	1.34E-03	1.07E-01	**1.50E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
ZR-95	2007	5.07E-02	6.54E-02	**1.13E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
RU-103	2007	2.08E-02	4.07E-02	**6.95E-02**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
RU-106	2007	1.49E-01	3.16E-01	**5.36E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
I-131	2007	-3.87E-02	6.59E-02	**1.02E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
CS-134	2007	-1.45E-02	4.04E-02	**5.53E-02**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
CS-137	2007	**2.46E+00**	1.36E-01	6.18E-02	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	+	Yes
CE-141	2007	4.82E-02	5.13E-02	**8.94E-02**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
CE-144	2007	5.04E-02	2.20E-01	**3.33E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
RA-226	2007	**2.02E+00**	1.14E+00	1.15E+00	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	+	Yes
AC-228	2007	**9.96E-01**	5.61E-01	2.18E-01	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	+	Yes
TH-228	2007	**9.06E-01**	8.96E-02	8.97E-02	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	+	Yes
TH-230	2007	**5.70E-01**	9.07E-02	2.28E-01	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	+	Yes
TH-232	2007	**9.62E-01**	2.94E-01	2.18E-01	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	+	Yes
TH-234	2007	7.39E-01	2.18E+00	**3.60E+00**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
U-235	2007	1.17E-01	2.08E-01	**3.58E-01**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No
U-238	2007	1.60E+00	4.84E+00	**7.16E+00**	pCi/g Dry		322.02	g dry	09/22/06 11:40	09/29/06	7343	Sec	U	No

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Yes = Peak identified in gamma spectrum
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MDC - Minimum Detectable Concentration

Report of Analysis

09/29/06 16:13

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29988

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-P4**
Station:
Description:
LIMS Number: L29988-4

Collect Start: 09/22/2006 11:50
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil (S)
Volume:
% Moisture: 16.79

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
BE-7	2007	1.12E-01	3.91E-01	**6.70E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
K-40	2007	**1.67E+01**	1.59E+00	6.85E-01	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	+	Yes
MN-54	2007	9.33E-05	3.86E-02	**6.31E-02**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
CO-58	2007	-3.06E-04	3.60E-02	**5.88E-02**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
FE-59	2007	-2.55E-02	8.65E-02	**1.33E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
CO-60	2007	1.11E-03	3.64E-02	**6.08E-02**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
ZN-65	2007	-5.39E-02	1.08E-01	**1.42E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
ZR-95	2007	3.04E-02	7.13E-02	**1.23E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
RU-103	2007	-9.11E-03	4.37E-02	**7.21E-02**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
RU-106	2007	3.67E-01	3.57E-01	**6.48E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
I-131	2007	2.70E-02	7.56E-02	**1.25E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
CS-134	2007	2.37E-02	4.36E-02	**6.72E-02**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
CS-137	2007	**2.25E+00**	1.56E-01	7.56E-02	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	+	Yes
CE-141	2007	2.01E-02	6.48E-02	**1.10E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
CE-144	2007	-1.92E-01	2.50E-01	**4.03E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
RA-226	2007	**2.84E+00**	1.60E+00	1.44E+00	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	+	Yes
AC-228	2007	**9.93E-01**	3.47E-01	1.54E-01	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	+	Yes
TH-228	2007	**6.71E-01**	1.55E-01	1.26E-01	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	+	Yes
TH-230	2007	**6.39E-01**	1.05E-01	2.78E-01	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	+	Yes
TH-232	2007	**1.14E+00**	2.62E-01	1.53E-01	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	+	Yes
TH-234	2007	2.87E-01	2.04E+00	**3.29E+00**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
U-235	2007	-5.27E-02	2.56E-01	**4.24E-01**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No
U-238	2007	1.86E+00	4.38E+00	**7.49E+00**	pCi/g Dry		319.87	g dry	09/22/06 11:50	09/29/06	3842	Sec	U	No

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MDC - Minimum Detectable Concentration

Report of Analysis

09/29/06 16:13

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29988

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-P5**
Station:
Description:
LIMS Number: L29988-5

Collect Start: 09/22/2006 12:00
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil (S)
Volume:
% Moisture: 14.41

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
BE-7	2007	1.35E-01	2.83E-01	**4.66E-01**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
K-40	2007	**1.38E+01**	1.13E+00	2.61E-01	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	+	Yes
MN-54	2007	-2.21E-02	2.90E-02	**4.42E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
CO-58	2007	7.79E-03	2.53E-02	**4.31E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
FE-59	2007	-1.09E-01	6.20E-02	**7.77E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
CO-60	2007	7.07E-03	2.46E-02	**4.30E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
ZN-65	2007	3.55E-02	6.71E-02	**1.02E-01**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
ZR-95	2007	-1.29E-04	5.18E-02	**8.57E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
RU-103	2007	1.20E-02	2.86E-02	**4.96E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
RU-106	2007	3.72E-03	2.23E-01	**3.72E-01**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
I-131	2007	-1.69E-02	4.56E-02	**7.16E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
CS-134	2007	-3.69E-02	3.06E-02	**3.84E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
CS-137	2007	**9.62E-01**	8.74E-02	4.65E-02	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	+	Yes
CE-141	2007	5.16E-02	4.30E-02	**7.50E-02**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
CE-144	2007	2.94E-02	1.60E-01	**2.70E-01**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
RA-226	2007	1.50E+00	9.06E-01	**1.18E+00**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U*	No
AC-228	2007	**9.22E-01**	2.89E-01	1.55E-01	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	+	Yes
TH-228	2007	**7.36E-01**	7.73E-02	7.31E-02	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	+	Yes
TH-230	2007	**5.01E-01**	7.22E-02	1.74E-01	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	+	Yes
TH-232	2007	**9.14E-01**	1.87E-01	1.55E-01	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	+	Yes
TH-234	2007	-2.12E-01	1.54E+00	**2.59E+00**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No
U-235	2007	9.75E-02	5.47E-02	**2.92E-01**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	Yes
U-238	2007	-1.41E-01	3.27E+00	**5.31E+00**	pCi/g Dry		353.69	g dry	09/22/06 12:00	09/29/06	6000	Sec	U	No

Flag Values
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MDC - Minimum Detectable Concentration

Report of Analysis

09/29/06 16:13

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29988

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-P6** | Collect Start: 09/22/2006 12:10 | Matrix: Soil | (S)
Station: | Collect Stop: | Volume:
Description: | Receive Date: 09/25/2006 | % Moisture: 16.87
LIMS Number: L29988-6

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
BE-7	2007	1.26E-01	3.58E-01	**6.13E-01**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
K-40	2007	**1.40E+01**	1.43E+00	4.42E-01	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	+	Yes
MN-54	2007	1.72E-03	3.68E-02	**5.97E-02**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
CO-58	2007	1.02E-02	3.14E-02	**5.29E-02**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
FE-59	2007	-1.01E-02	7.45E-02	**1.21E-01**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
CO-60	2007	3.69E-02	3.81E-02	**7.07E-02**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
ZN-65	2007	3.32E-02	8.43E-02	**1.29E-01**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
ZR-95	2007	-2.04E-02	6.24E-02	**9.74E-02**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
RU-103	2007	-4.20E-02	4.06E-02	**6.22E-02**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
RU-106	2007	-2.04E-01	3.35E-01	**5.19E-01**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
I-131	2007	-8.49E-02	7.03E-02	**1.03E-01**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
CS-134	2007	1.63E-02	3.68E-02	**5.58E-02**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
CS-137	2007	**2.77E+00**	1.61E-01	6.78E-02	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	+	Yes
CE-141	2007	-2.03E-02	5.83E-02	**9.66E-02**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
CE-144	2007	7.85E-02	2.55E-01	**3.88E-01**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
RA-226	2007	1.31E+00	8.64E-01	**1.58E+00**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
AC-228	2007	**9.61E-01**	3.58E-01	1.97E-01	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	+	Yes
TH-228	2007	**7.00E-01**	1.14E-01	1.05E-01	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	+	Yes
TH-230	2007	**6.06E-01**	8.93E-02	2.68E-01	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	+	Yes
TH-232	2007	**8.44E-01**	2.06E-01	1.96E-01	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	+	Yes
TH-234	2007	-1.38E+00	2.10E+00	**3.33E+00**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
U-235	2007	3.48E-02	2.34E-01	**3.98E-01**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No
U-238	2007	3.76E+00	3.56E+00	**6.72E+00**	pCi/g Dry		320.25	g dry	09/22/06 12:10	09/29/06	3721	Sec	U	No

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

09/29/06 16:13

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29988

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-P7** | Collect Start: 09/22/2006 12:20 | Matrix: Soil | (S)
Station: | Collect Stop: | Volume:
Description: | Receive Date: 09/25/2006 | % Moisture: 15.97
LIMS Number: L29988-7

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values	
BE-7	2007	-3.53E-02	3.15E-01	**5.24E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
K-40	2007	**2.13E+01**	1.68E+00	5.56E-01	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	+	Yes
MN-54	2007	-1.09E-02	3.68E-02	**5.81E-02**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
CO-58	2007	1.87E-02	3.58E-02	**6.21E-02**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
FE-59	2007	8.19E-02	8.91E-02	**1.59E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
CO-60	2007	4.76E-02	3.87E-02	**7.53E-02**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
ZN-65	2007	1.36E-02	9.87E-02	**1.46E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
ZR-95	2007	9.63E-03	6.53E-02	**1.09E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
RU-103	2007	2.77E-02	3.88E-02	**6.87E-02**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
RU-106	2007	6.31E-02	3.36E-01	**5.67E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
I-131	2007	-1.05E-02	6.34E-02	**1.01E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
CS-134	2007	3.52E-04	3.85E-02	**5.56E-02**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
CS-137	2007	**9.65E-01**	1.07E-01	6.99E-02	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	+	Yes
CE-141	2007	3.01E-02	5.84E-02	**9.97E-02**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
CE-144	2007	1.22E-03	2.29E-01	**3.83E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
RA-226	2007	**2.75E+00**	1.34E+00	1.32E+00	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	+	Yes
AC-228	2007	**1.07E+00**	5.67E-01	2.03E-01	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	+	Yes
TH-228	2007	**1.04E+00**	1.08E-01	1.02E-01	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	+	Yes
TH-230	2007	**6.08E-01**	9.85E-02	2.51E-01	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	+	Yes
TH-232	2007	**1.10E+00**	3.09E-01	2.03E-01	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	+	Yes
TH-234	2007	-3.35E-01	1.95E+00	**3.08E+00**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
U-235	2007	1.16E-01	2.36E-01	**4.03E-01**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No
U-238	2007	8.80E-02	4.17E+00	**6.75E+00**	pCi/g Dry		368.04	g dry	09/22/06 12:20	09/29/06	3721	Sec	U	No

Flag Values
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\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
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H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Chain of Custody Record

No. C0607010-01 L29988

Chase Environmental Group, Inc.
3501 Workman Rd. Suite H., Knoxville, TN 37921
865-584-0833

Project Name: Rutgers	Project Number: C0607010
Send Report To: Dave Culp	Sampler (Print Name): D Culp
Address:	Sampler (Print Name): NA
3501 Workman Rd., Suite H.	Shipment Method: NA
Knoxville, TN 37921	Airbill Number: NA
Phone: 865-584-0833	Laboratory Receiving: Teledyne
Fax: 865-584-1961	

Purchase Order #: C0607010

Analysis Requested: C-14, H-3, Cs-137

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	C-14	H-3	Cs-137	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
GGH-P1	9-22-06	1120	SOIL	1			X	14 day TAT	
GGH-P2		1130					X		
GGH-P3		1140					X		
GGH-P4		1150					X		
GGH-P5		1200					X		
GGH-P6		1210					X		
GGH-P7		1220					X		

Relinquished by: (Signature)	Received by: (Signature)	Date: 9/25/06	Time: 1630
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By laboratory):

QA/QC level	Turnaround
Level I	Routine
Level II	24 Hour
Level III	1 Week
Other	Other _____

Sample Receipt	
Total # Containers Received?	
COC Seals Present?	
COC Seals Intact?	
Received Containers Intact?	
Temperature?	

09/27/06 11:35

SR #: SR10603

Teledyne Brown Engineering
Sample Receipt Verification/Variance Report

Client: CHASE ENVIRONMENTAL GROUP INC Project #: CH085-3ERUTGERS-06 LIMS #: L29988

Initiated By: PMARSHALL
Init Date: 09/27/06 Receive Date: 09/27/06

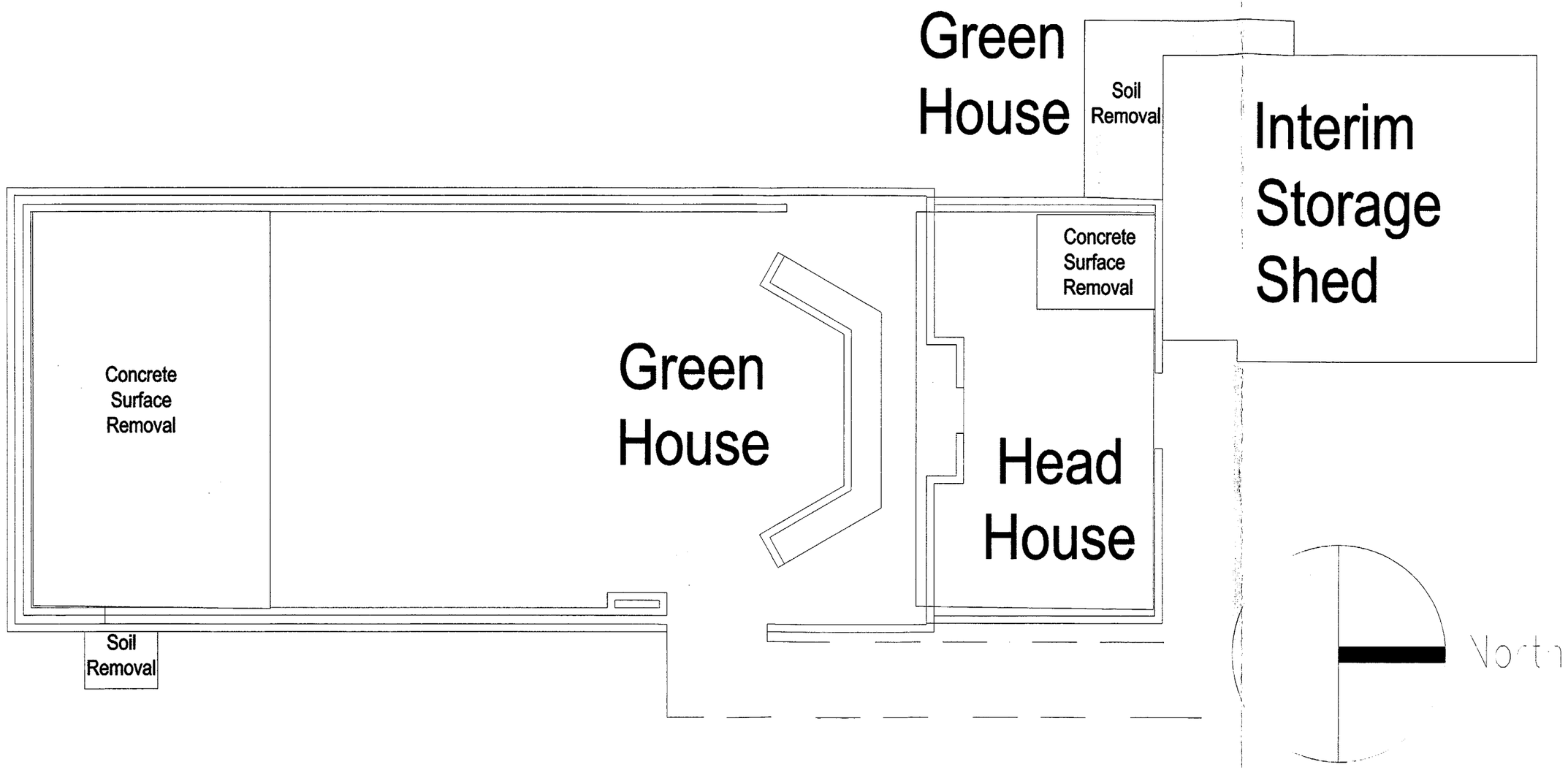
Notification of Variance

Person Notified: Contacted By:
Notify Date:
Notify Method:
Notify Comment:

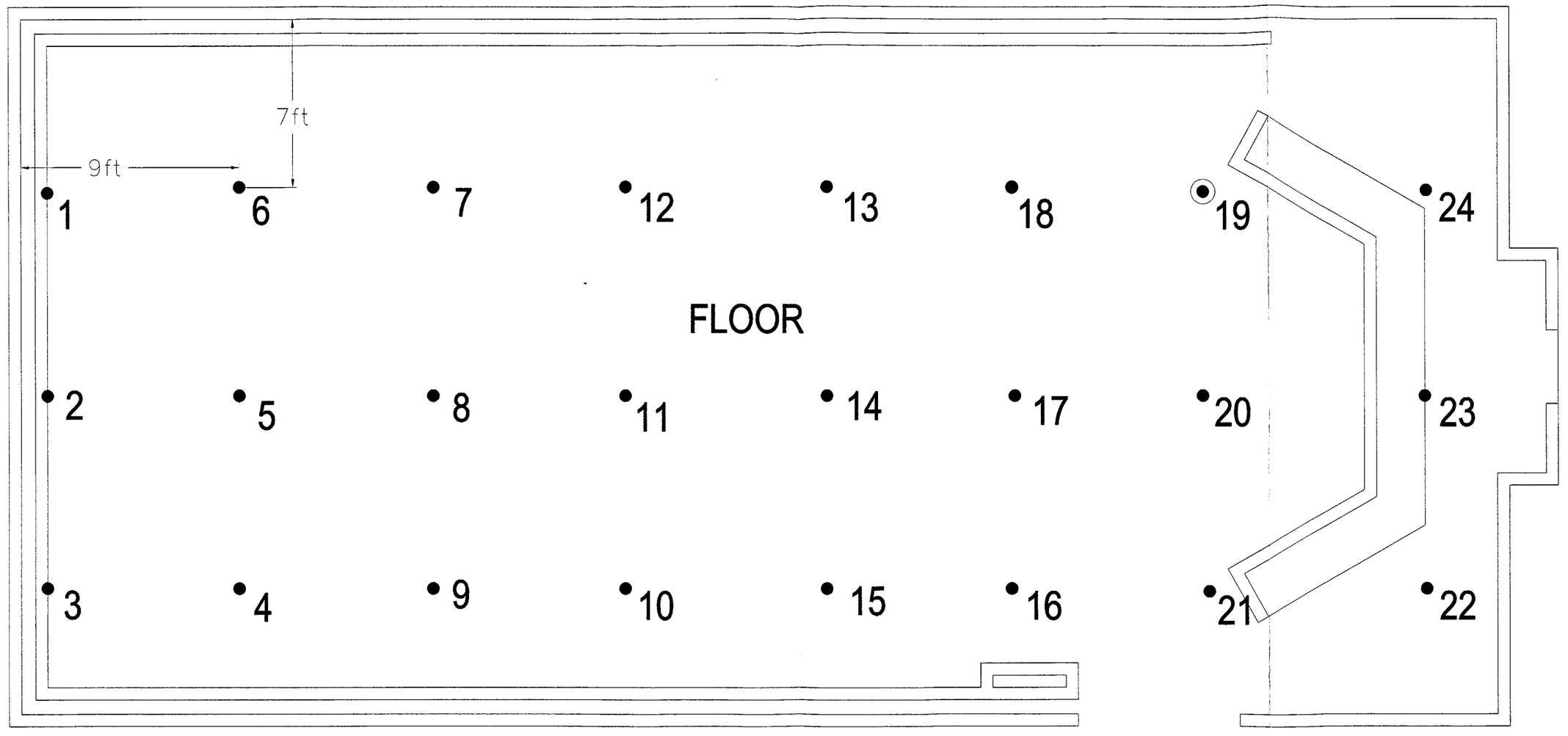
Client Response

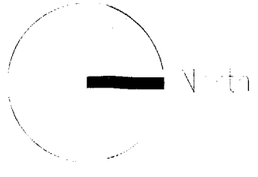
Person Responding:
Response Date:
Response Method:
Response Comment

	Criteria	Yes	No	NA	Comment
1	Shipping container custody seals present and intact.			NA	
2	Sample container custody seals present and intact.			NA	
3	Sample containers received in good condition	Y			
4	Chain of custody received with samples	Y			
5	All samples listed on chain of custody received	Y			
6	Sample container labels present and legible.	Y			
7	Information on container labels correspond with chain of custody	Y			
8	Sample(s) properly preserved and in appropriate container(s)			NA	
9	Other (Describe)			NA	



NOTE: NOT TO SCALE



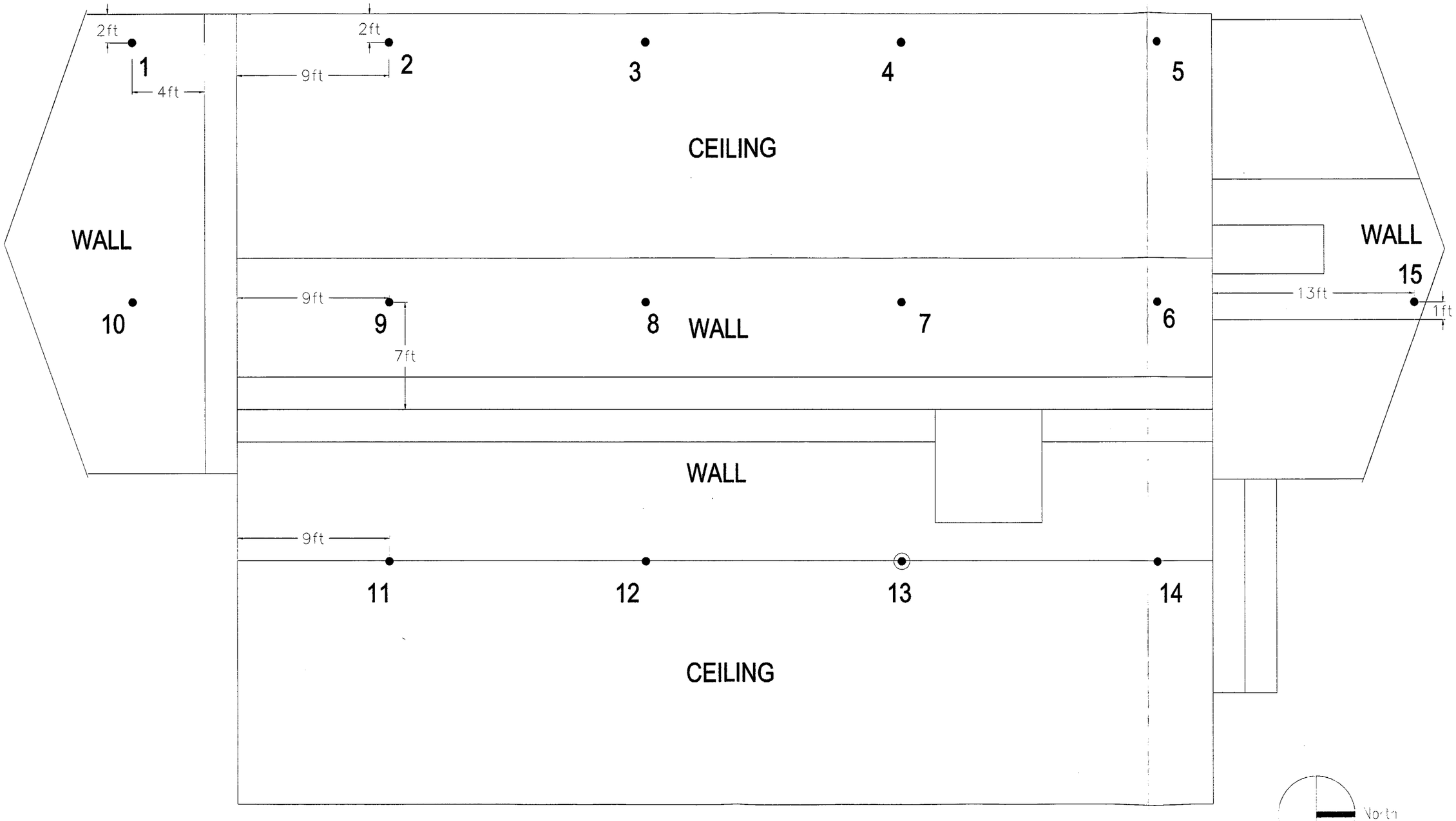


Random Start Location

Sample Location

Grid Spacing= 8 ft

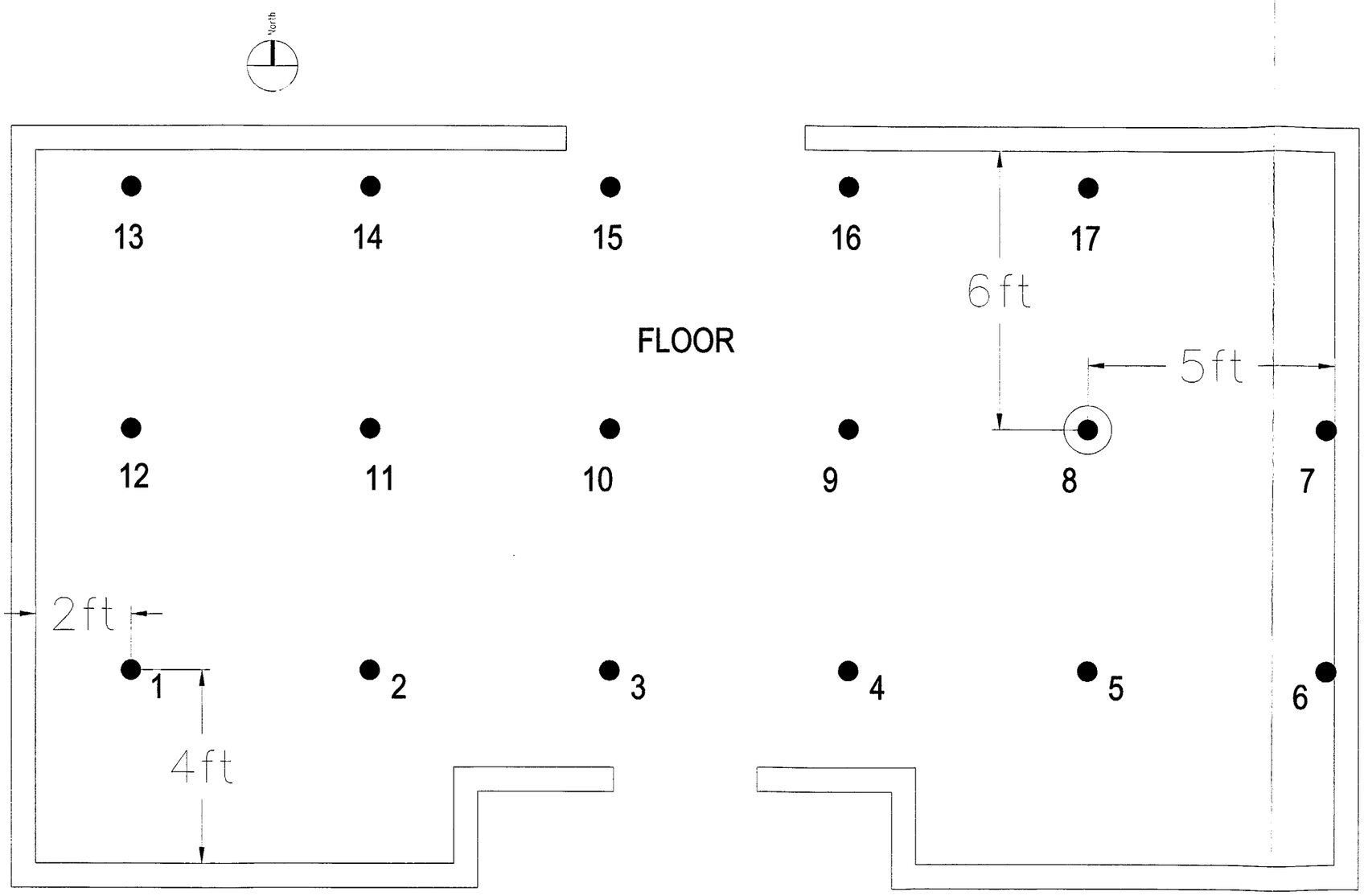
Rutgers Gamma Greenhouse
Facility Decommissioning
Final Status Report



◉ Random Start Location

● Sample Location

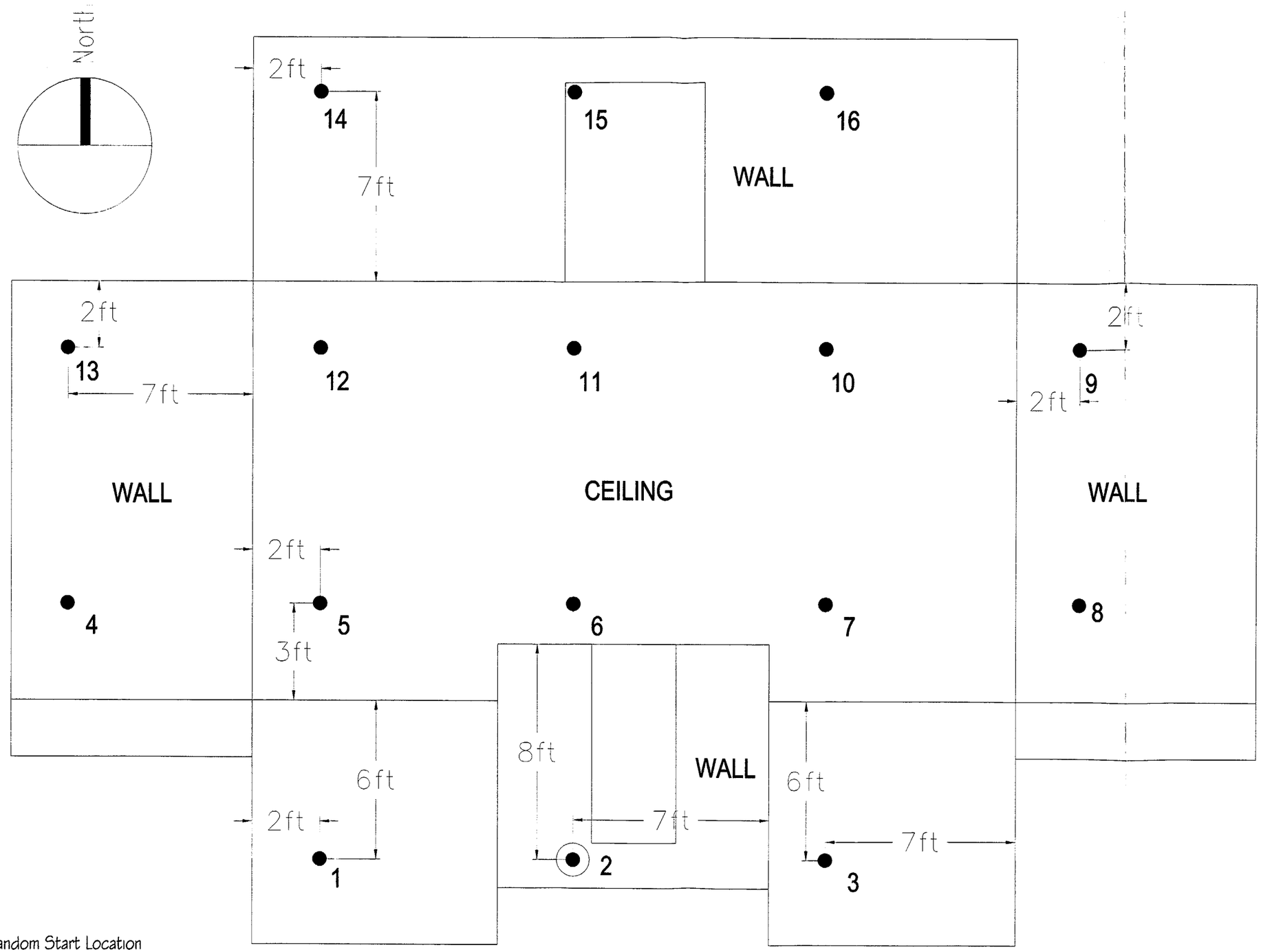
Grid Spacing= 17 ft

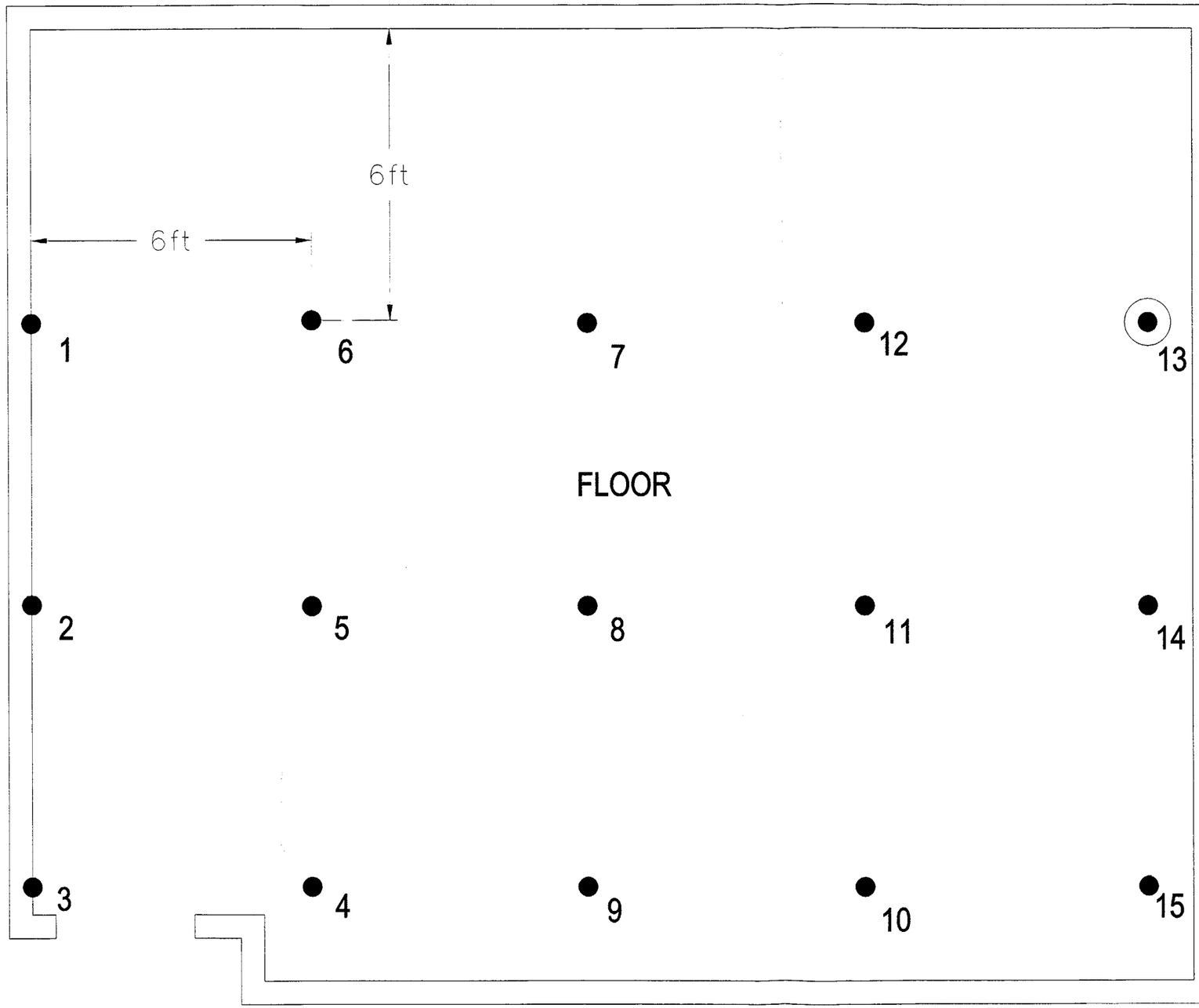


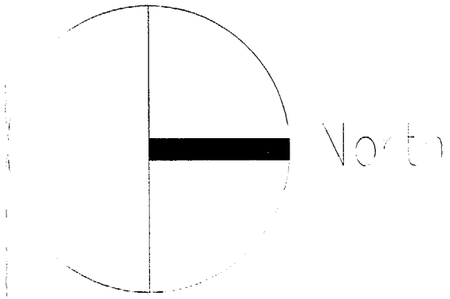
Random Start Location

Sample Location

Grid Spacing= 5 ft


North
2ft
14
15
16
7ft
WALL
2ft
13
7ft
12
11
10
2ft
9
2ft
WALL
CEILING
WALL
2ft
4
5
6
7
8
3ft
8ft
6ft
WALL
6ft
2ft
7ft
7ft
1
2
3
Random Start Location
Sample Location
Grid Spacing= 9 ft

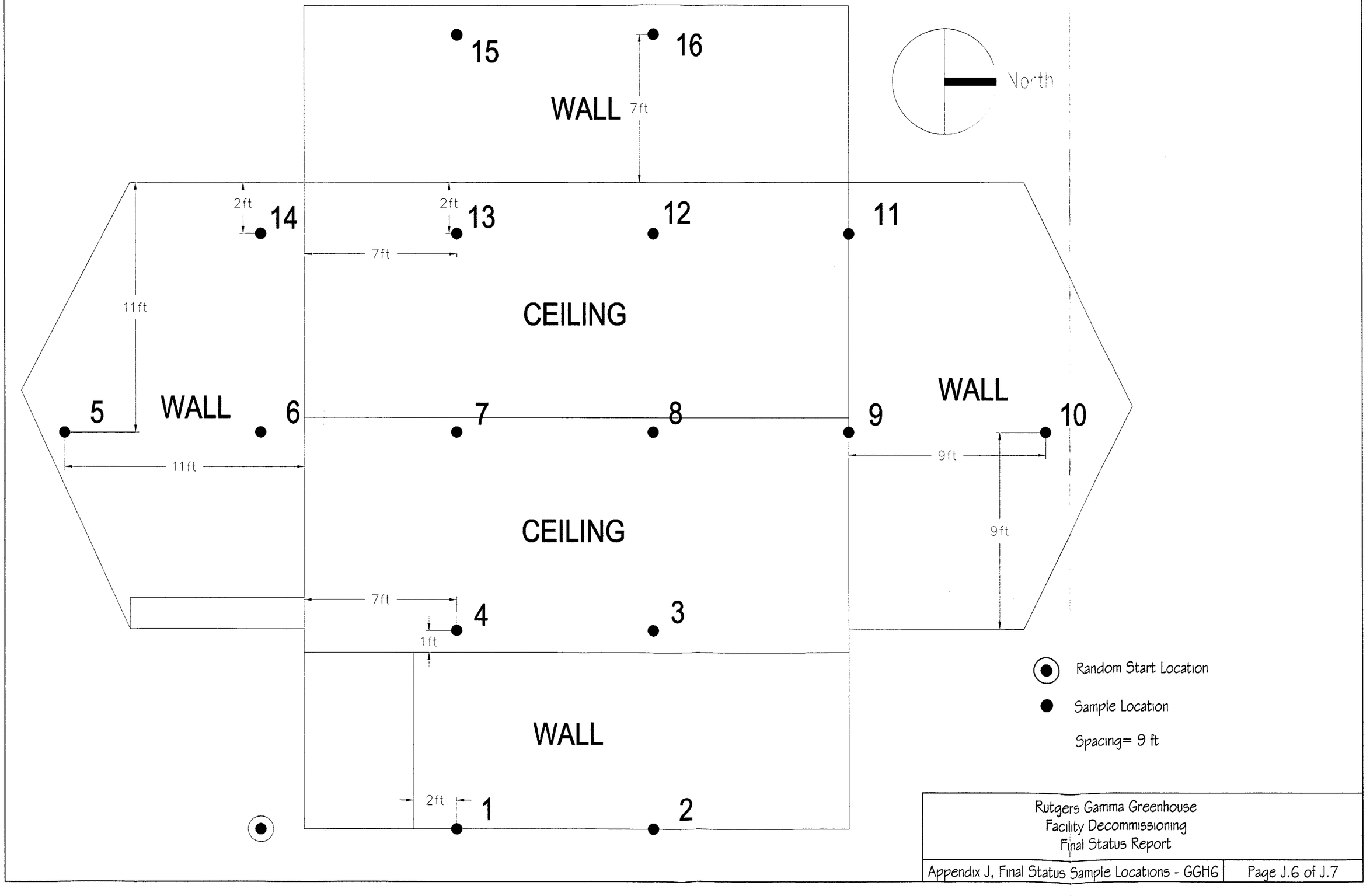


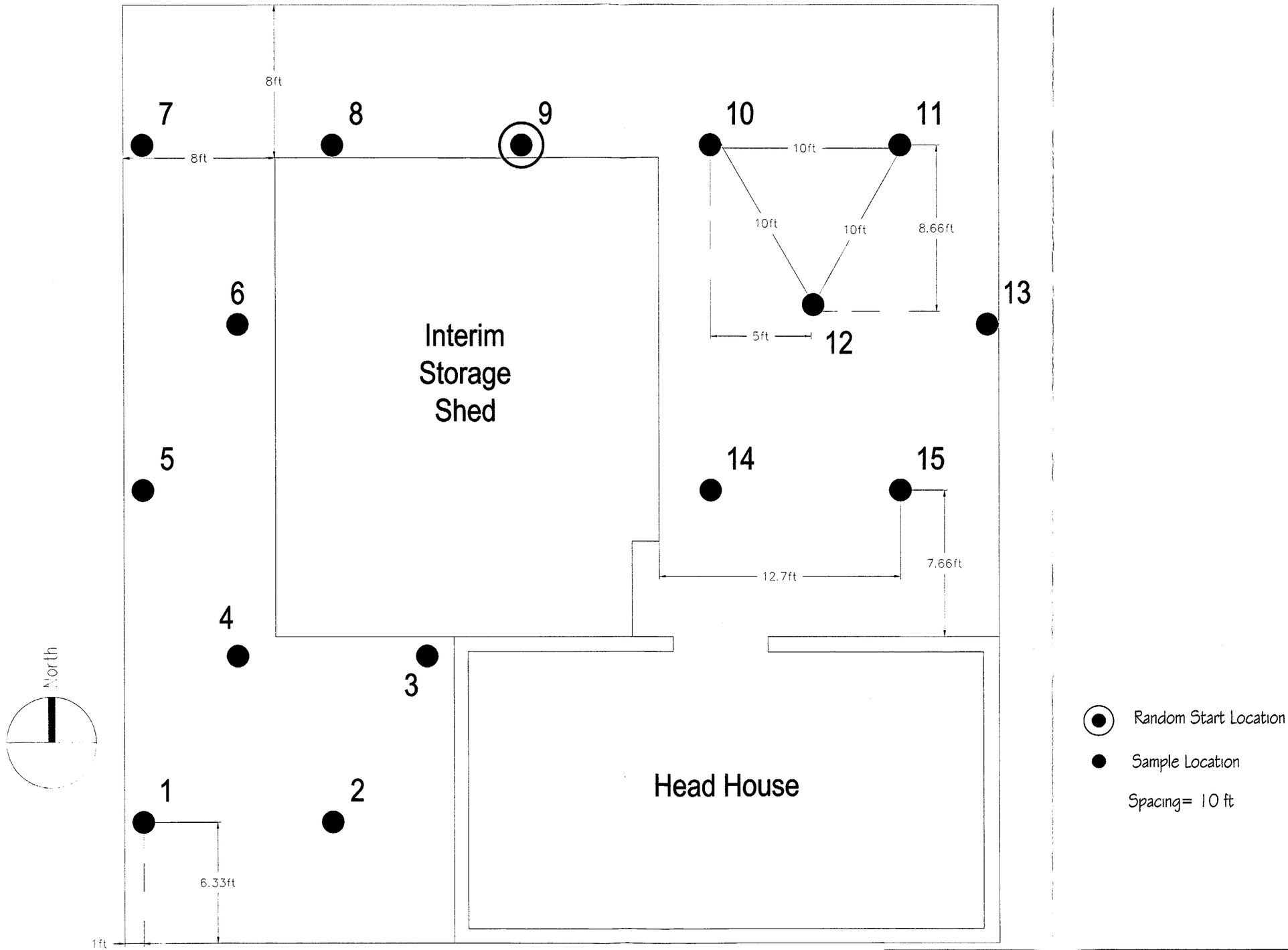


Random Start Location

Sample Location

Spacing= 6 ft


15
16
WALL
7ft
North
2ft
2ft
14
13
12
11
7ft
11ft
CEILING
5
WALL
6
7
8
9
WALL
10
9ft
11ft
9ft
CEILING
7ft
4
3
1ft
WALL
2ft
1
2
Random Start Location
Sample Location
Spacing= 9 ft


8ft
7
8
9
8ft
10
11
10ft
10ft
10ft
8.66ft
6
13
Interim
Storage
Shed
5ft
12
5
14
15
12.7ft
7.66ft
4
3
North
Head House
1
2
6.33ft
1ft
Random Start Location
Sample Location
Spacing= 10 ft

APPENDIX K
PART 1

Final Status Survey Reports for Surfaces and Structures

Final Status Survey Report

Survey Information	
Survey Unit:	GGH1
Room ID:	Rutgers Greenhouse Floor - Beta
Survey Date:	9/6/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency (100cm^2):	0.178
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	53,903
Mean (dpm/100 cm^2):	2,959
Median (dpm/100 cm^2):	2,618
StdDev (dpm/100 cm^2):	2,237

Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	23,502 dpm
Maximum Average (1 m^2):	11,136 dpm
Maximum Scan MDC (dpm/100 cm^2):	10,030
Average Scan Speed (cm/sec):	18.9

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

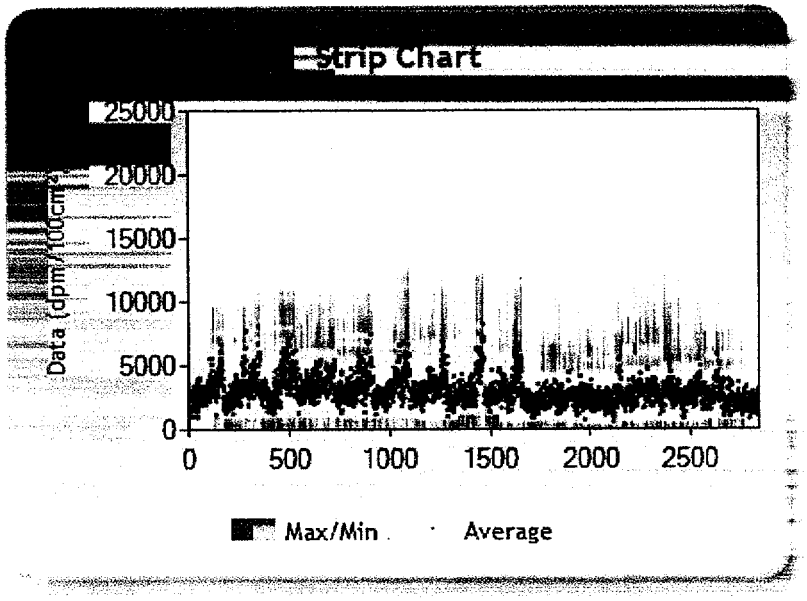


Figure 1: Maximum and Minimum Surface Activity per Acquisition

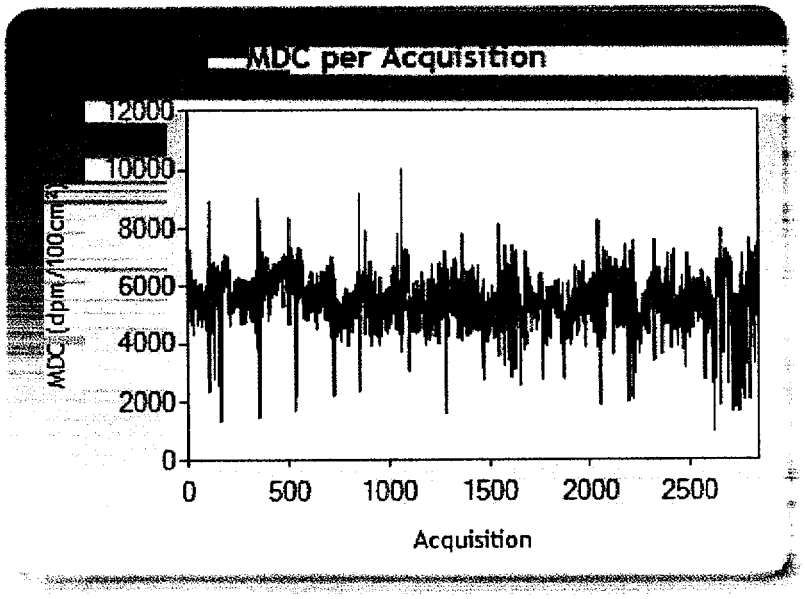


Figure 2: Scan MDC per Acquisition

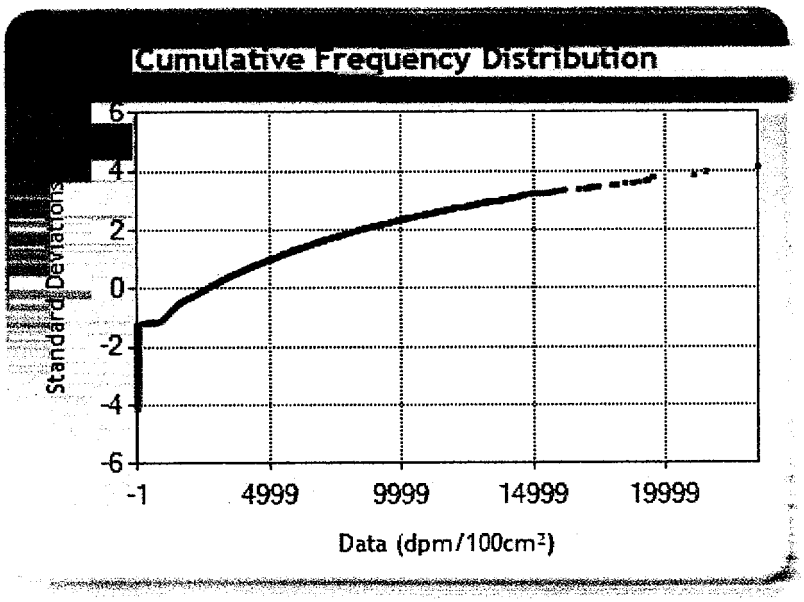


Figure 3: Cumulative Frequency Distribution of Surface Activity

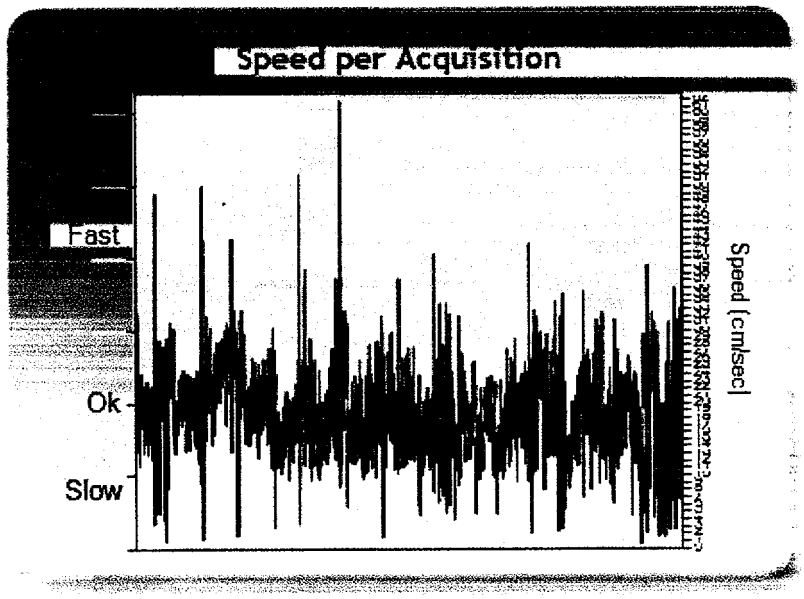


Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH2a
Room ID:	Rutgers Greenhouse Walls & Ceiling
Survey Date:	9/7/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency ($100cm^2$):	0.163
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	8,800
Mean (dpm/100 cm^2):	1,313
Median (dpm/100 cm^2):	1,163
StdDev (dpm/100 cm^2):	1,219

SCM IV Report Generator V1.1.6 10/15/2006
11:32:42 PM RG0912B

Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	8,264 dpm
Maximum Average (1 m^2):	4,646 dpm
Maximum Scan MDC (dpm/100 cm^2):	9,233
Average Scan Speed (cm/sec):	14.7

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

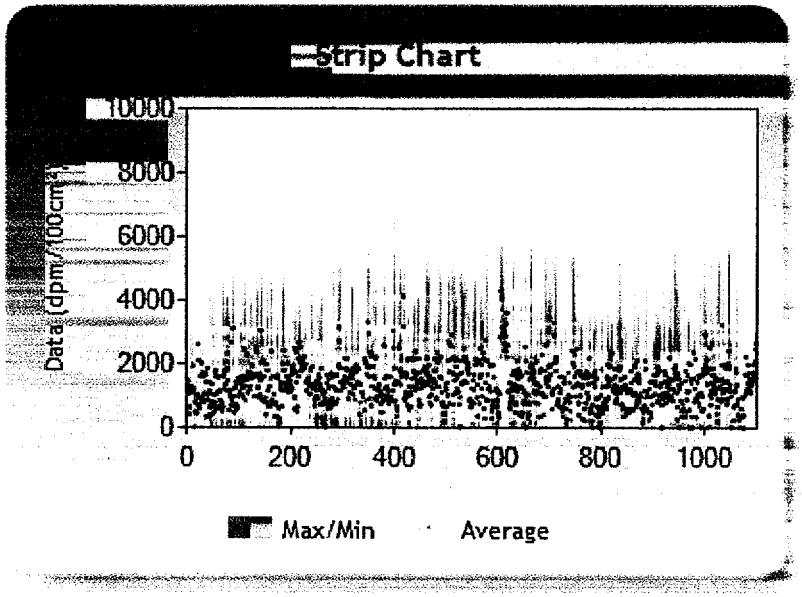


Figure 1: Maximum and Minimum Surface Activity per Acquisition

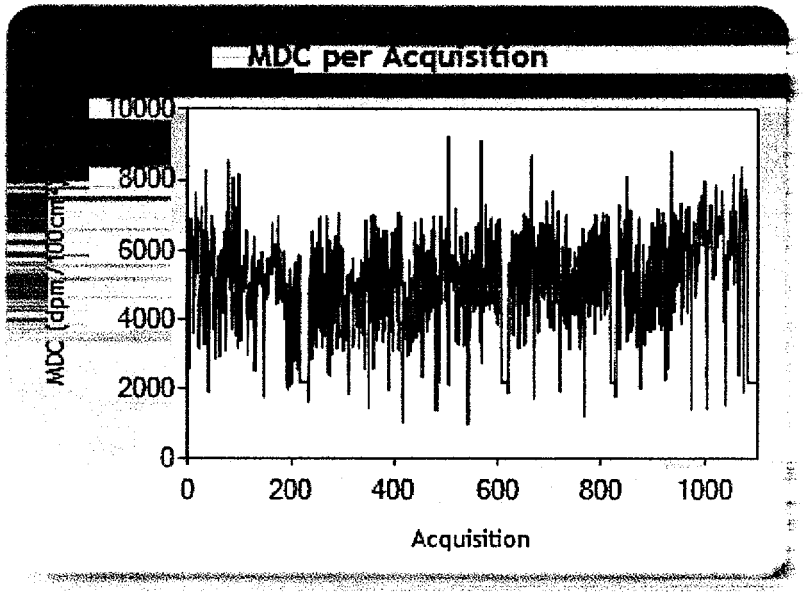


Figure 2: Scan MDC per Acquisition

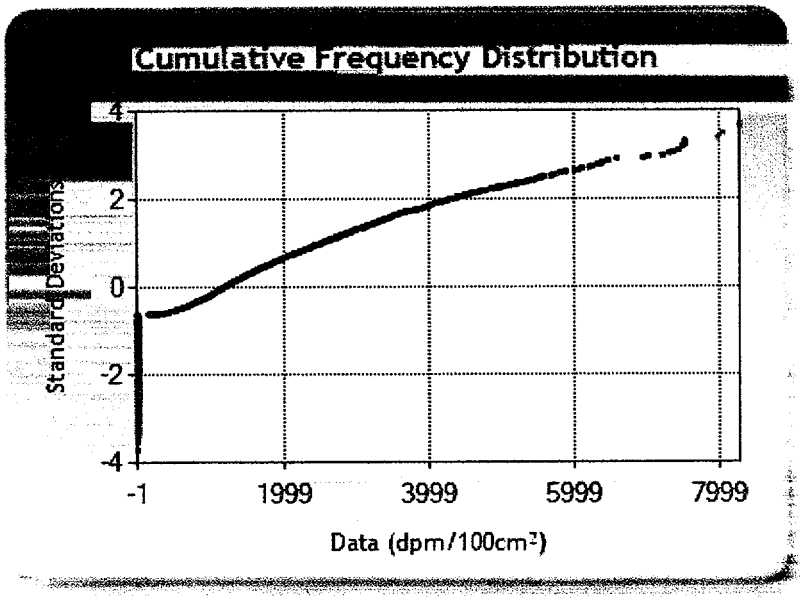


Figure 3: Cumulative Frequency Distribution of Surface Activity

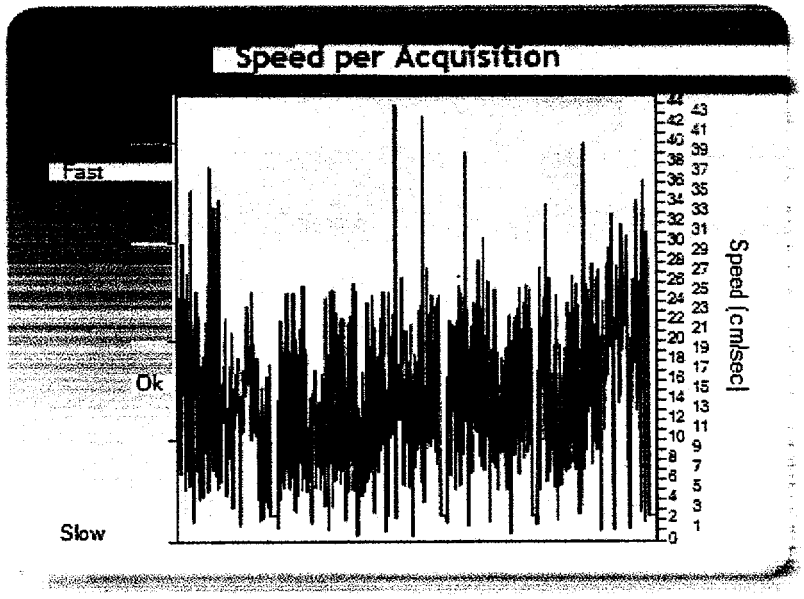


Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH2b
Room ID:	Rutgers Greenhouse Shield Wall
Survey Date:	9/7/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency ($100cm^2$):	0.178
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	9,101
Mean (dpm/100 cm^2):	1,490
Median (dpm/100 cm^2):	1,253
StdDev (dpm/100 cm^2):	1,445

SCM IV Report Generator V1.1.6 10/15/2006
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Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	19,067 dpm
Maximum Average (1 m^2):	9,175 dpm
Maximum Scan MDC (dpm/100 cm^2):	7,159
Average Scan Speed (cm/sec):	14.3

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

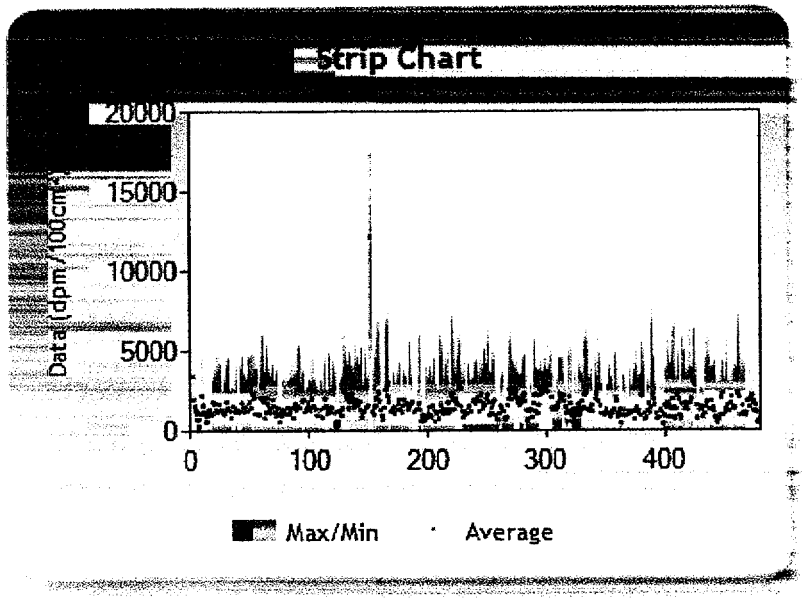

Figure 1: Maximum and Minimum Surface Activity per Acquisition

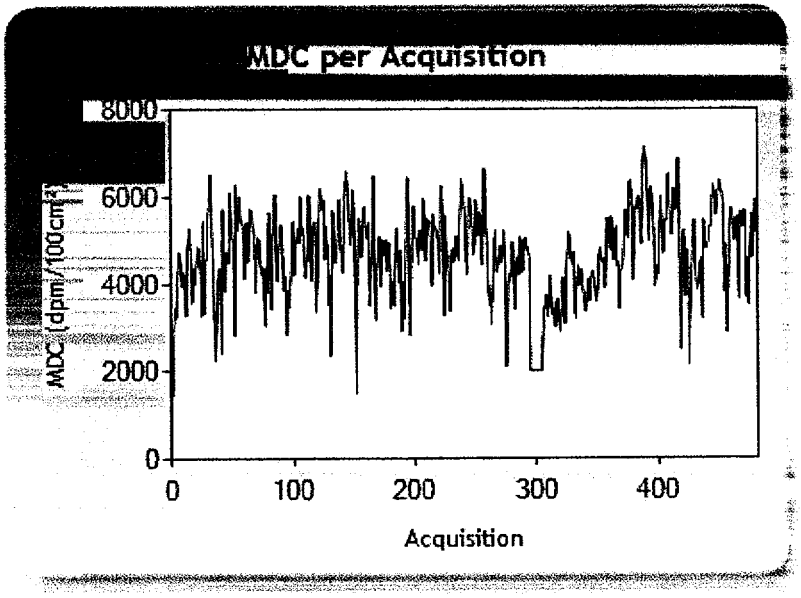

Figure 2: Scan MDC per Acquisition

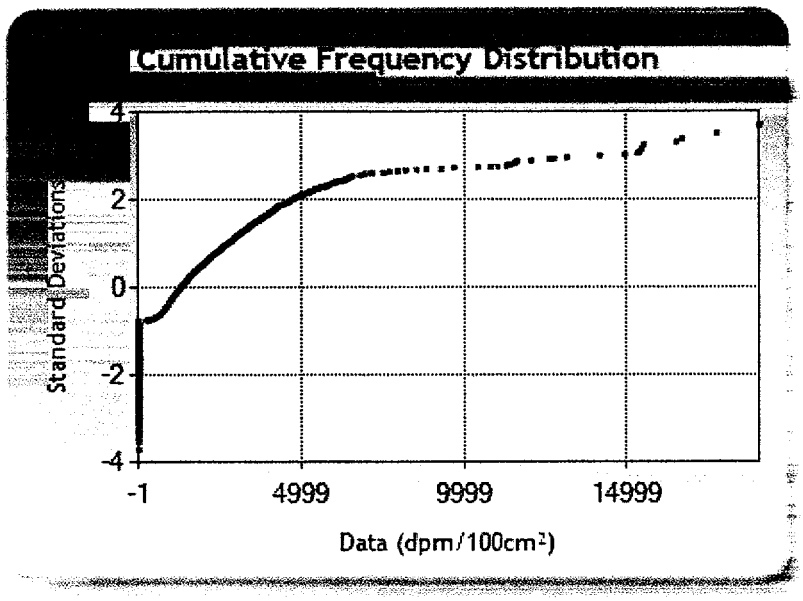

Figure 3: Cumulative Frequency Distribution of Surface Activity

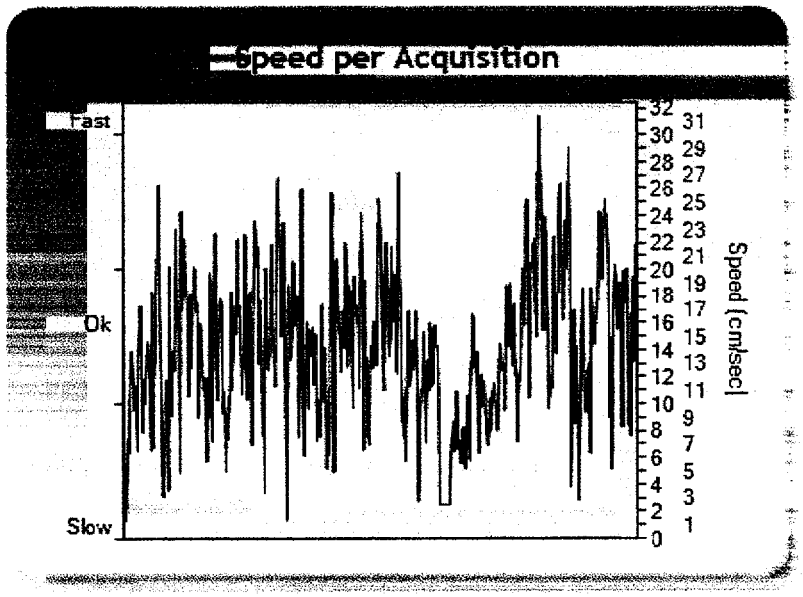

Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH3
Room ID:	Rutgers Head House Floor
Survey Date:	9/6/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency ($100cm^2$):	0.178
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	14,706
Mean (dpm/100 cm^2):	2,412
Median (dpm/100 cm^2):	2,696
StdDev (dpm/100 cm^2):	1,922

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Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	16,177 dpm
Maximum Average (1 m^2):	9,773 dpm
Maximum Scan MDC (dpm/100 cm^2):	5,709
Average Scan Speed (cm/sec):	20.0

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

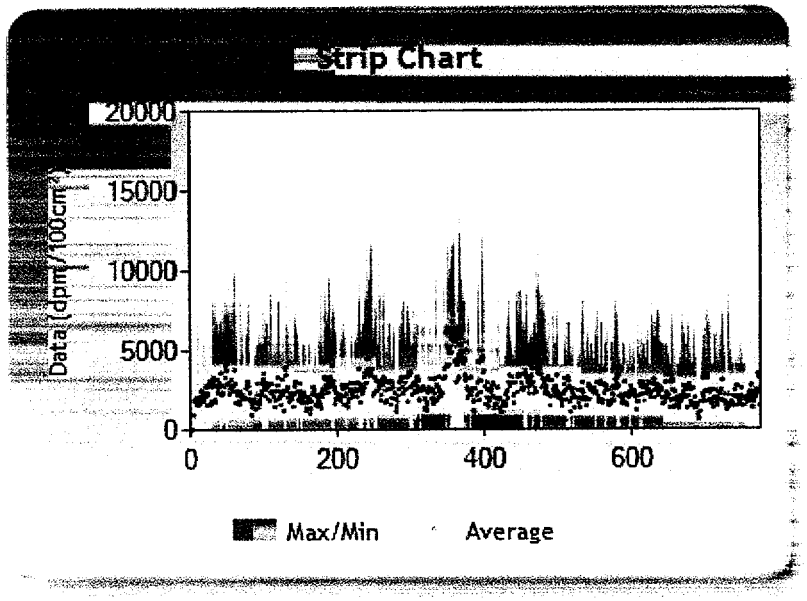

Figure 1: Maximum and Minimum Surface Activity per Acquisition

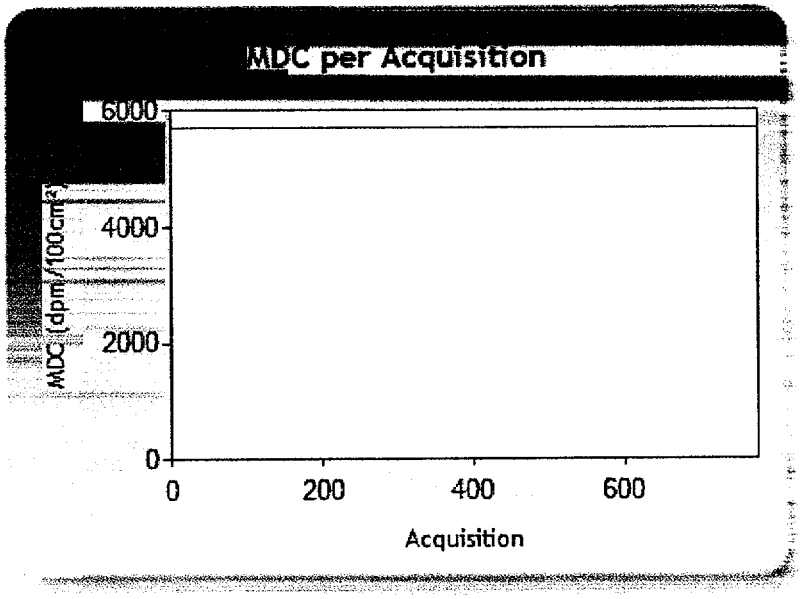

Figure 2: Scan MDC per Acquisition

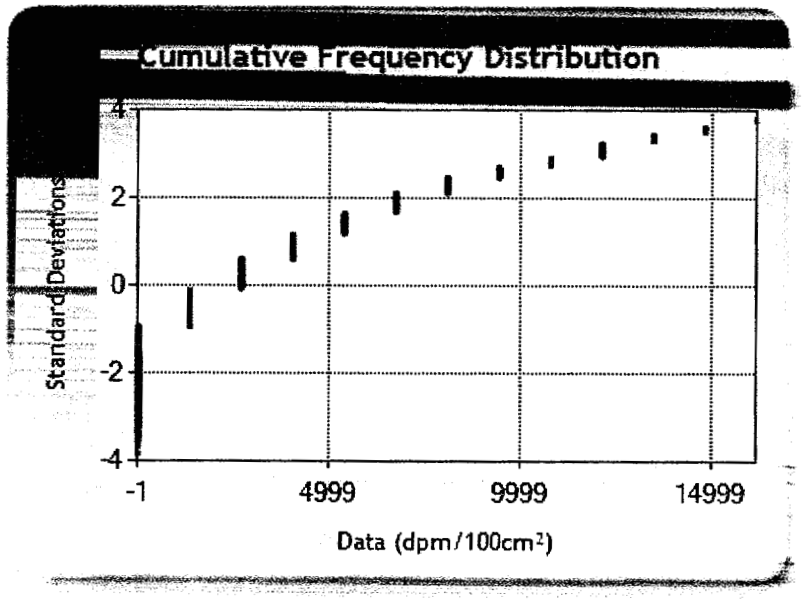

Figure 3: Cumulative Frequency Distribution of Surface Activity

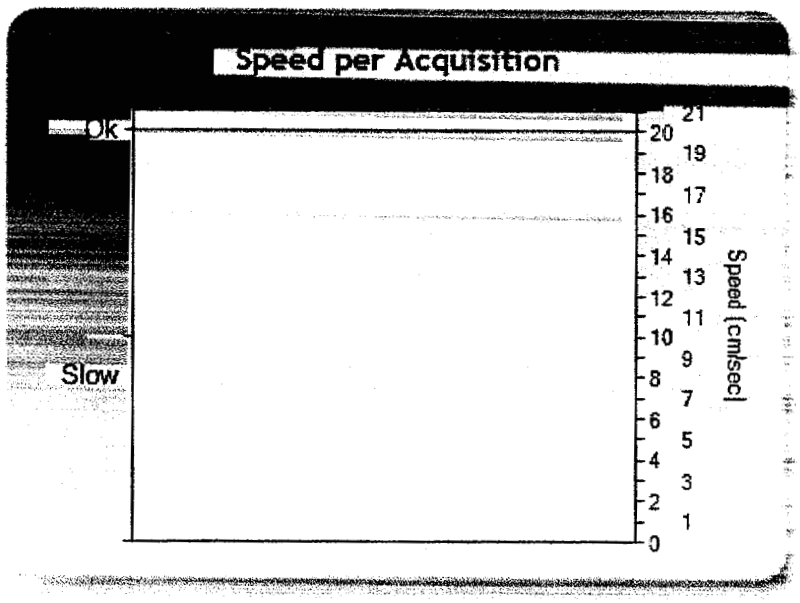

Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH4
Room ID:	Rutgers Head House Walls & Ceilings
Survey Date:	9/7/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency ($100cm^2$):	0.178
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	9,766
Mean (dpm/100 cm^2):	1,855
Median (dpm/100 cm^2):	1,630
StdDev (dpm/100 cm^2):	1,493

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Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	15,047 dpm
Maximum Average (1 m^2):	7,322 dpm
Maximum Scan MDC (dpm/100 cm^2):	7,685
Average Scan Speed (cm/sec):	13.4

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

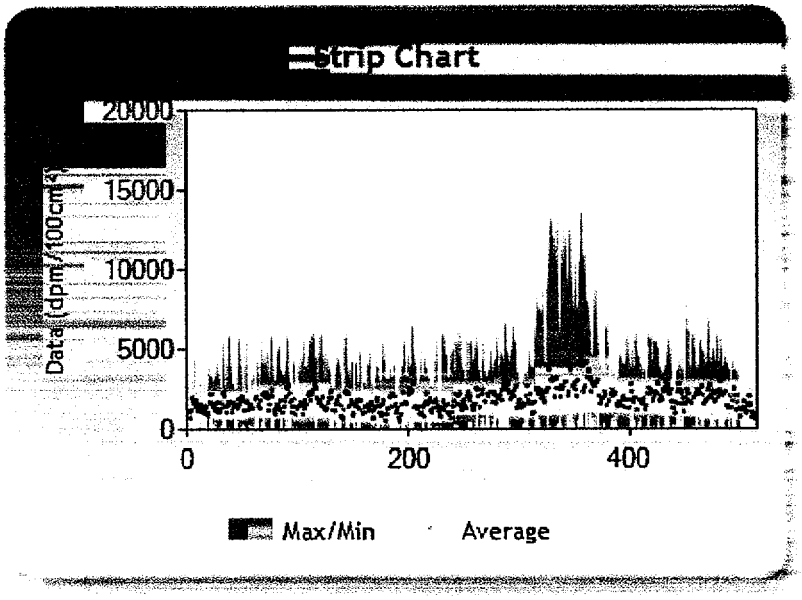

Figure 1: Maximum and Minimum Surface Activity per Acquisition

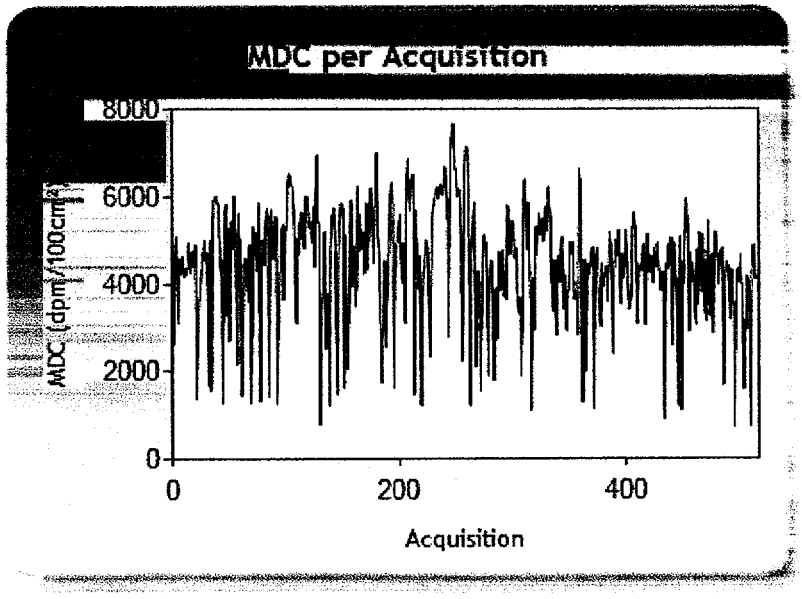

Figure 2: Scan MDC per Acquisition

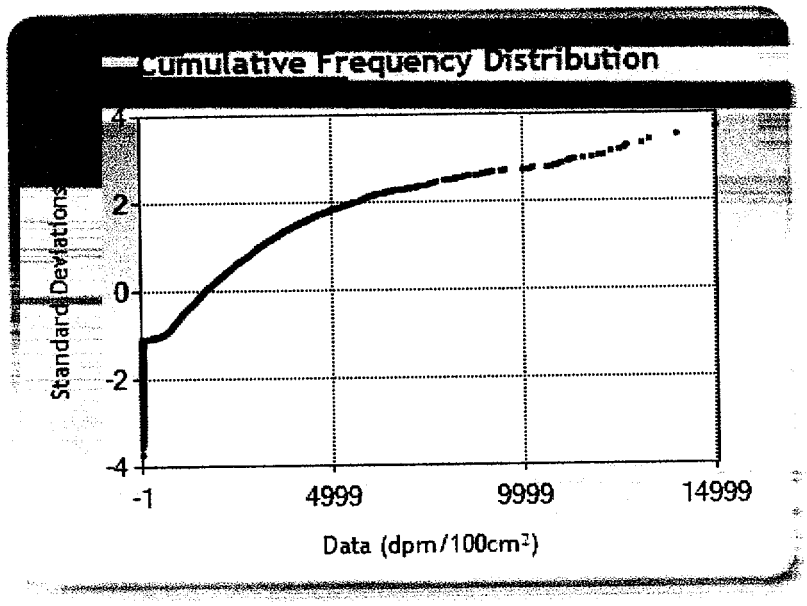

Figure 3: Cumulative Frequency Distribution of Surface Activity

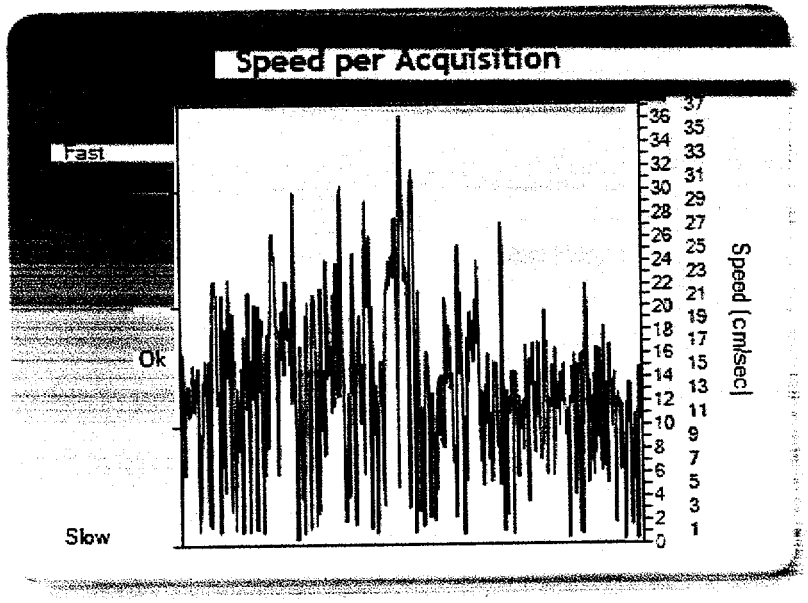

Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH5
Room ID:	Rutgers Interim Storage Shed Floor
Survey Date:	9/6/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency ($100cm^2$):	0.178
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	19,133
Mean (dpm/100 cm^2):	2,293
Median (dpm/100 cm^2):	2,024
StdDev (dpm/100 cm^2):	1,766

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Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	15,850 dpm
Maximum Average (1 m^2):	6,764 dpm
Maximum Scan MDC (dpm/100 cm^2):	9,311
Average Scan Speed (cm/sec):	18.8

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

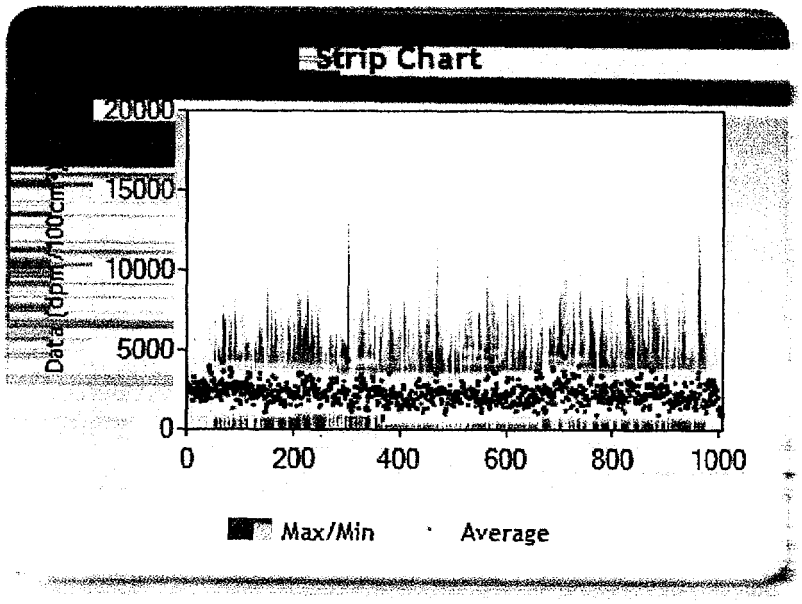

Figure 1: Maximum and Minimum Surface Activity per Acquisition

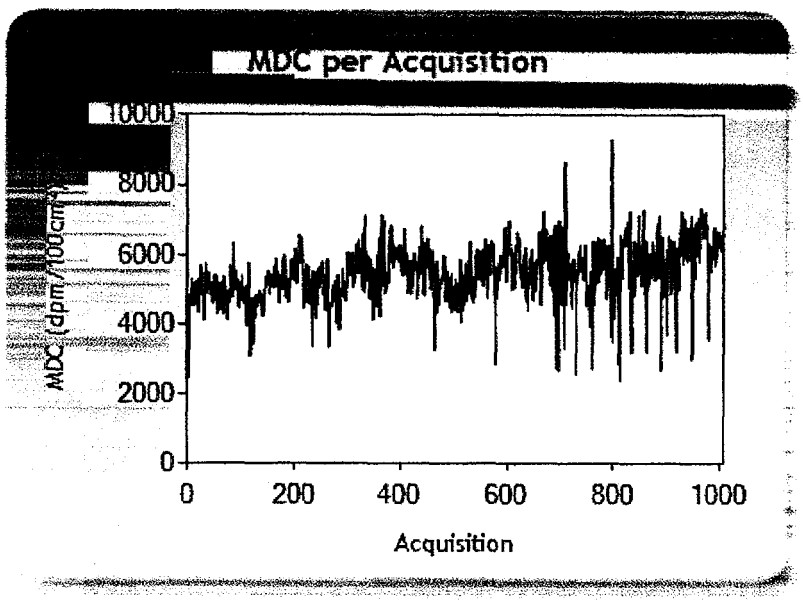

Figure 2: Scan MDC per Acquisition

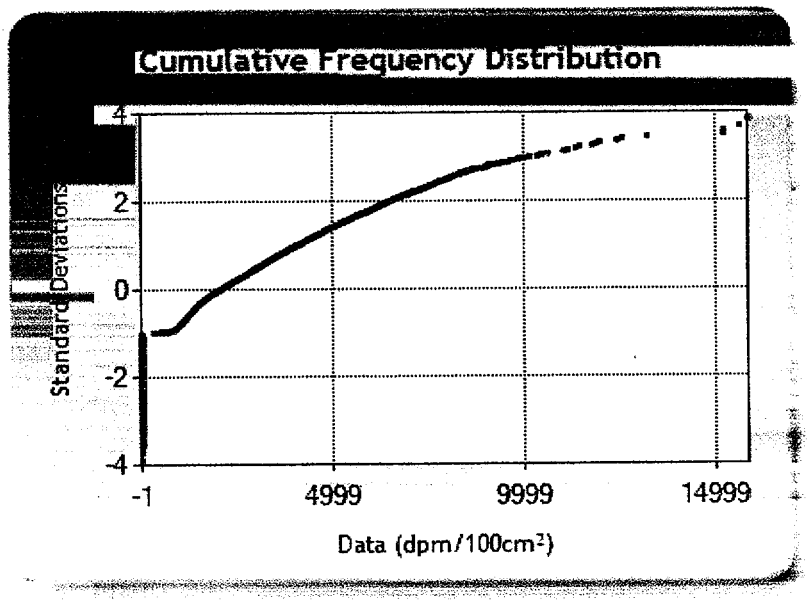

Figure 3: Cumulative Frequency Distribution of Surface Activity

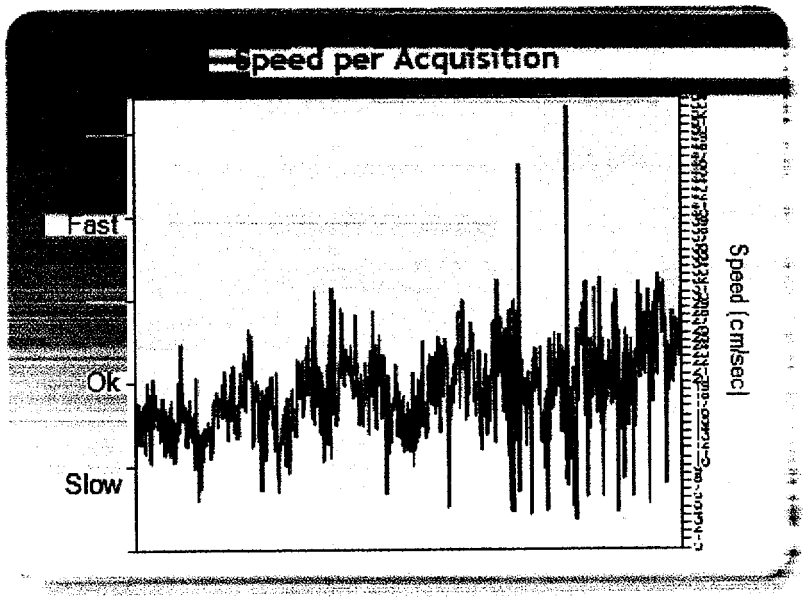

Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH6
Room ID:	Rutgers Interim Storage Shed Walls & Ceilings
Survey Date:	9/7/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency ($100cm^2$):	0.178
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	2,375
Mean (dpm/100 cm^2):	1,939
Median (dpm/100 cm^2):	1,853
StdDev (dpm/100 cm^2):	720

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Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	6,739 dpm
Maximum Average (1 m^2):	3,442 dpm
Maximum Scan MDC (dpm/100 cm^2):	2,019
Average Scan Speed (cm/sec):	2.5

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

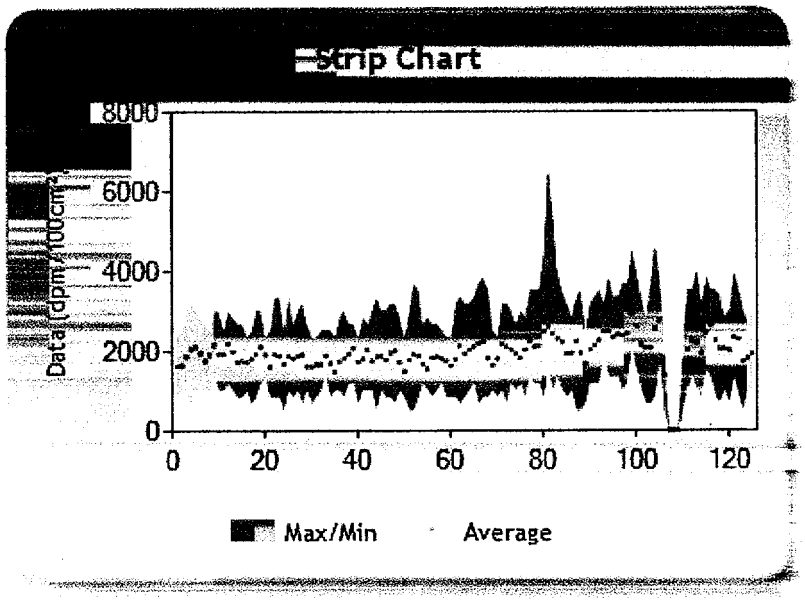


Figure 1: Maximum and Minimum Surface Activity per Acquisition

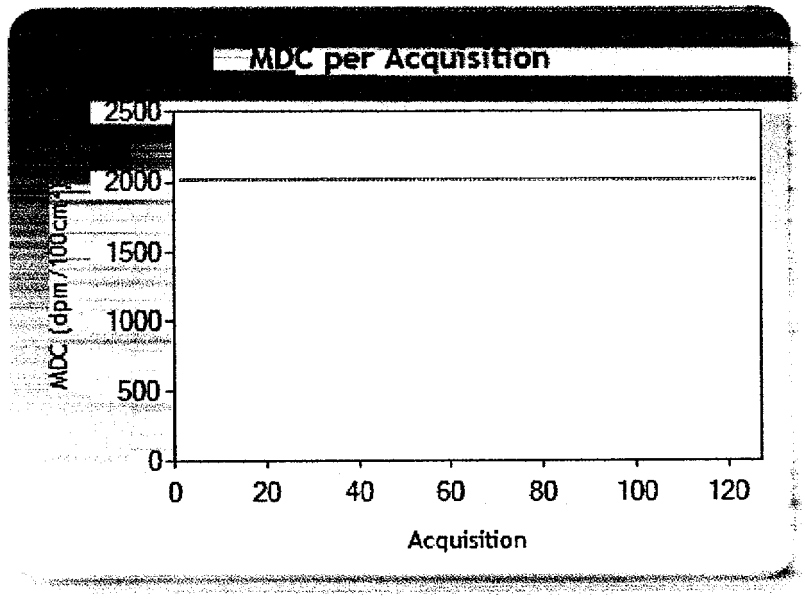


Figure 2: Scan MDC per Acquisition

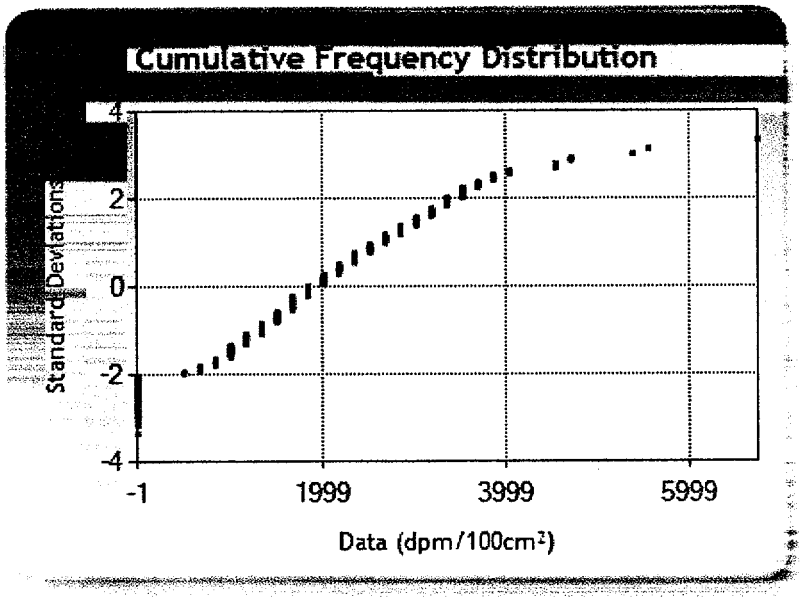


Figure 3: Cumulative Frequency Distribution of Surface Activity

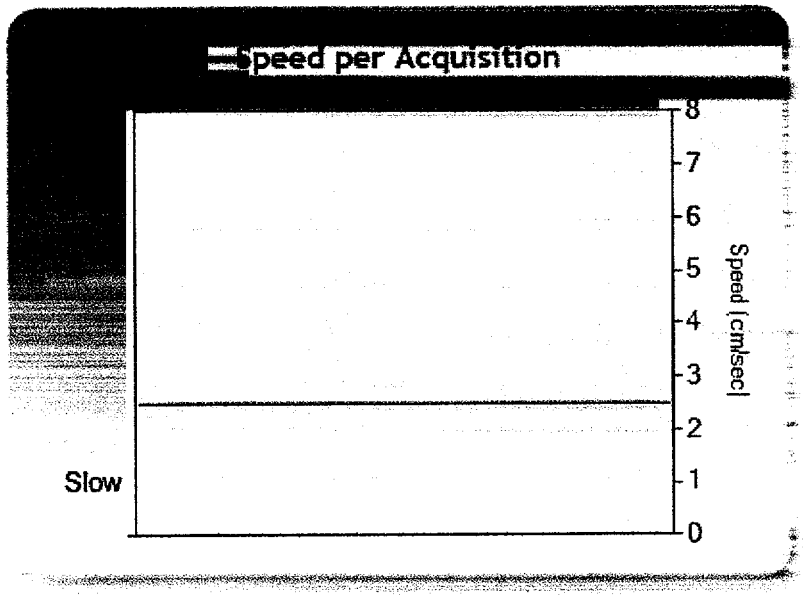


Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH8
Room ID:	Rutgers Exterior Asphalt
Survey Date:	9/7/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency ($100cm^2$):	0.138
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	88,418
Mean (dpm/100 cm^2):	4,189
Median (dpm/100 cm^2):	3,652
StdDev (dpm/100 cm^2):	3,018
Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28

Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	25,386 dpm
Maximum Average (1 m^2):	15,471 dpm
Maximum Scan MDC (dpm/100 cm^2):	8,878
Average Scan Speed (cm/sec):	19.0

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

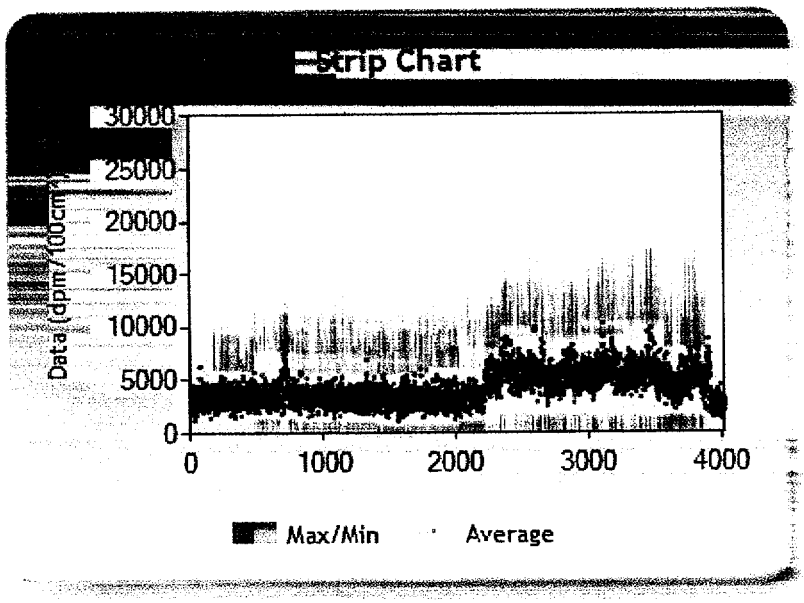


Figure 1: Maximum and Minimum Surface Activity per Acquisition

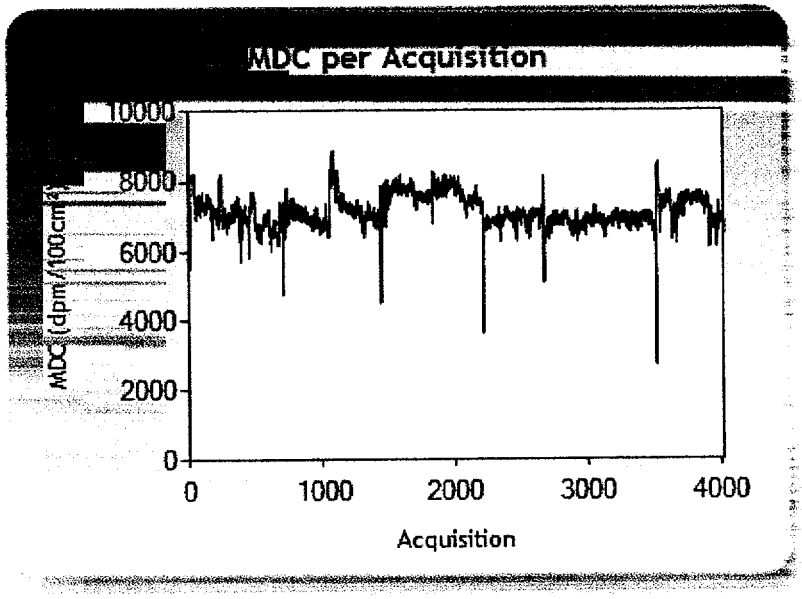


Figure 2: Scan MDC per Acquisition

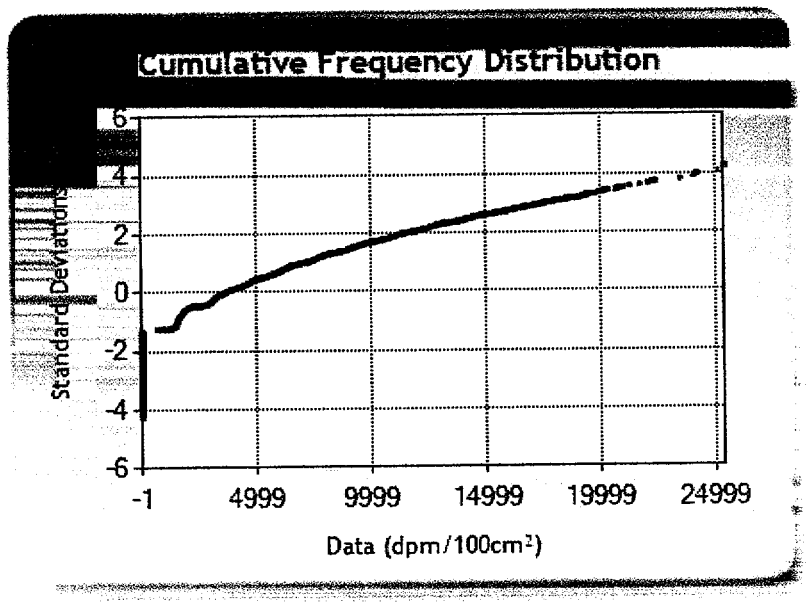


Figure 3: Cumulative Frequency Distribution of Surface Activity

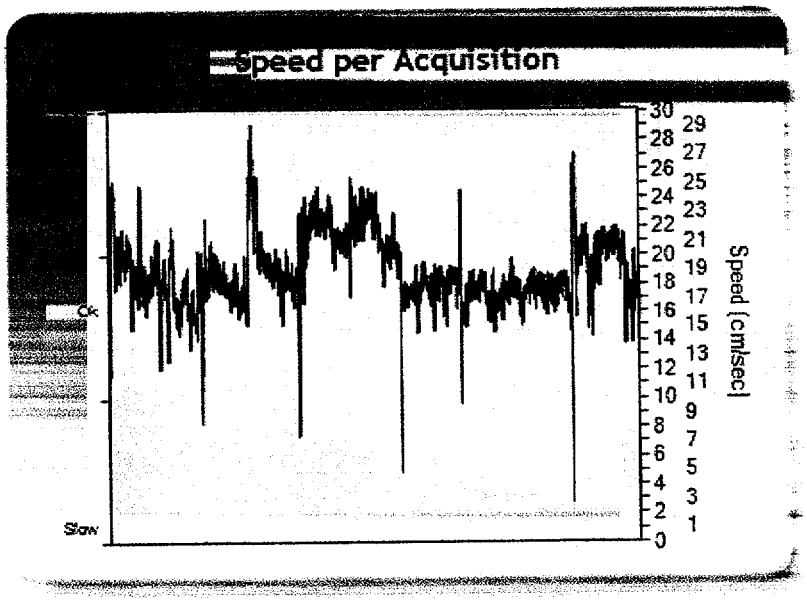


Figure 4: Survey Scan Speed

Final Status Survey Report

Survey Information	
Survey Unit:	GGH9
Room ID:	Rutgers Exterior Concrete
Survey Date:	9/7/2006
PSE4 Serial Number:	PSPC4 #2 03/08/06 B#267
PSPC Efficiency (100cm^2):	0.138
Background (cpm):	300
Surveyor(s):	Duane R. Quayle
Software Suite Version:	1.1.2.0
Criteria	
Hotspot Alarm (100 cm^2):	28,000 dpm
Descriptive Statistics	
Number of Measurements:	9,086
Mean (dpm/100 cm^2):	2,551
Median (dpm/100 cm^2):	1,774
StdDev (dpm/100 cm^2):	2,097
Scan MDC Parameters[1]	
Index of Sensitivity, d':	3.28
Background (cpm):	300
Surveyor Efficiency, P:	0.75
Detector Area (cm^2):	100
Survey Results	
Maximum Hotspot (100 cm^2):	13,864 dpm
Maximum Average (1 m^2):	7,033 dpm
Maximum Scan MDC (dpm/100 cm^2):	7,797
Average Scan Speed (cm/sec):	19.3

[1]The Scan Minimum Detectable Concentration (MDC) is calculated using equation 6.10 from MARSSIM.

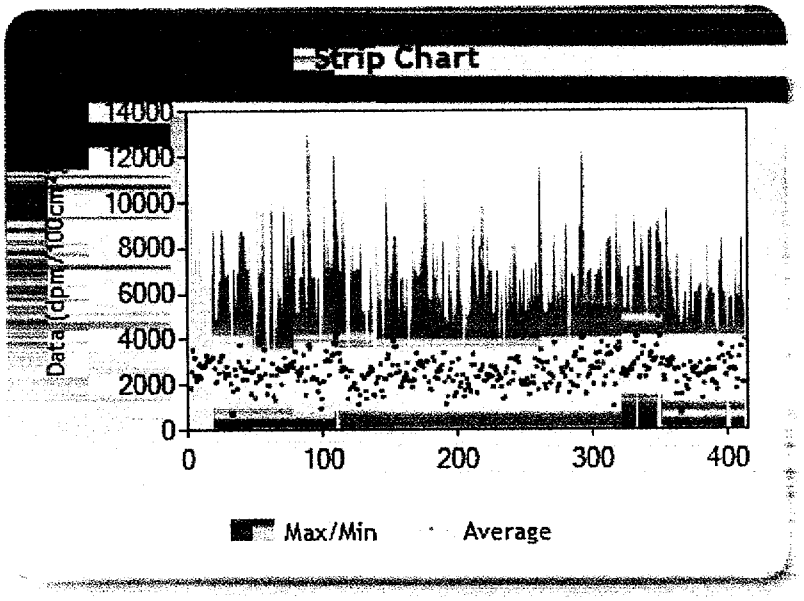


Figure 1: Maximum and Minimum Surface Activity per Acquisition

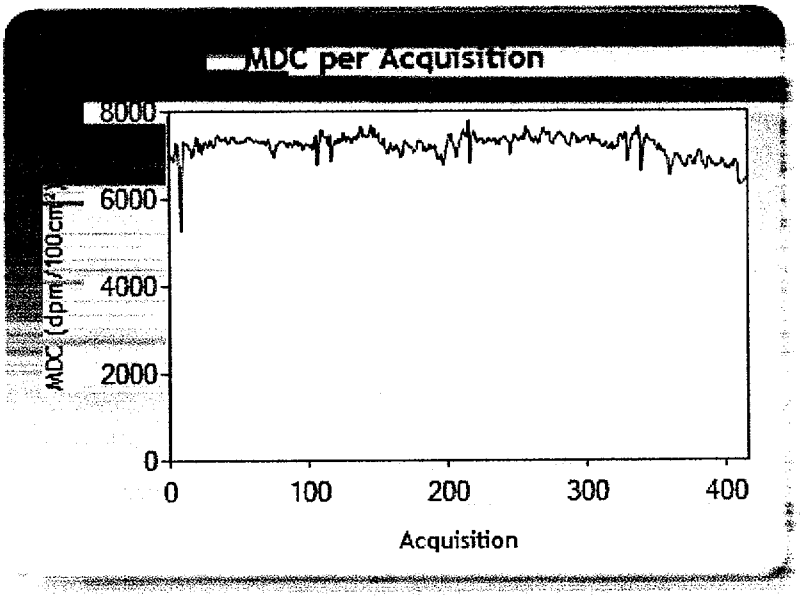


Figure 2: Scan MDC per Acquisition

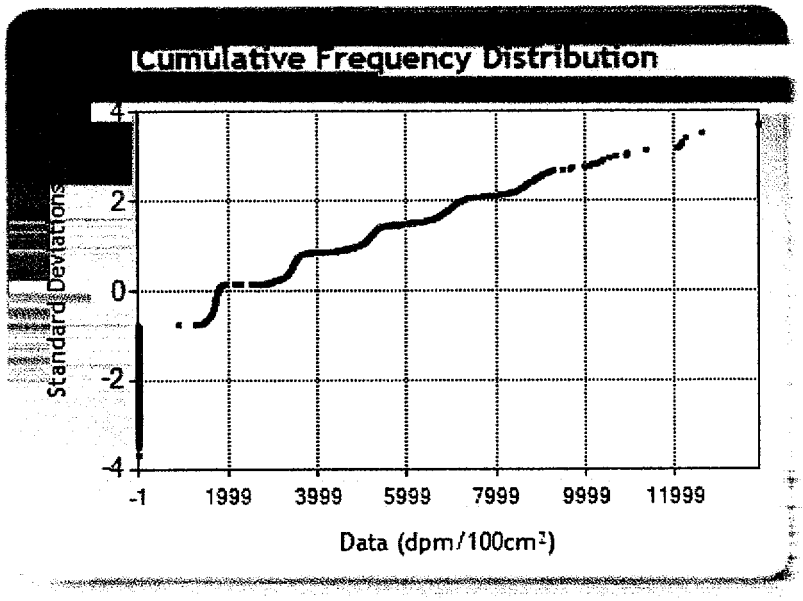


Figure 3: Cumulative Frequency Distribution of Surface Activity

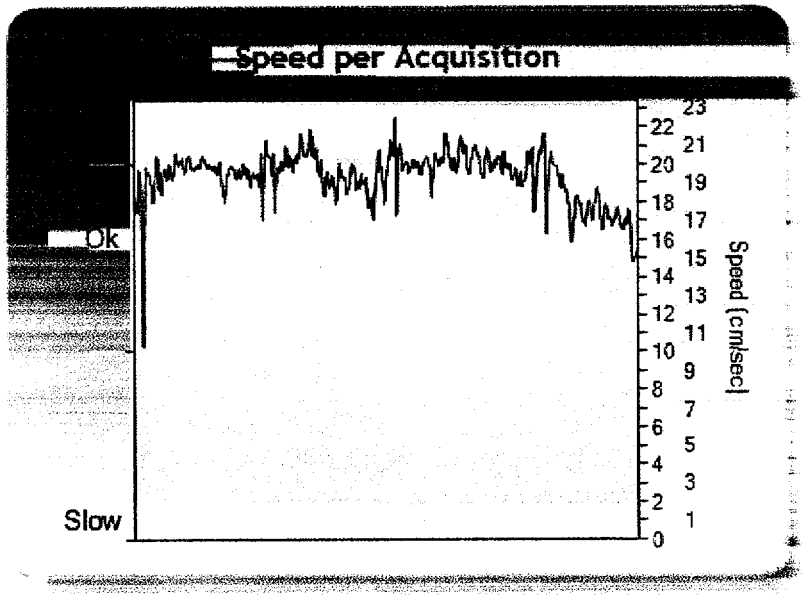


Figure 4: Survey Scan Speed

APPENDIX K
PART 2

Final Status Survey
Analytical Reports
for
Soil Samples

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

Report of Analysis/Certificate of Conformance

10/11/2006

LIMS #: L29989
Project ID#: CH085-3ERUTGERS-06
Received: 09/25/2006
Delivery Date: 10/09/2006
P.O. #: *Q06-060*
Release #:
SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

Keith Jeter
Operations Manager

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133

Dave Culp
Chase Environmental Group, Inc.
3501 Workman Road
Suite H
Knoxville TN 37921

LIMS #: L29989
Project ID#: CH085-3ERUTGERS-06
Received: 09/25/2006
Delivery Date: 10/09/2006
P.O. #: Q06-060
Release #:
SDG #:

Cross Reference Table

Client ID	Laboratory ID	Station ID(if applicable)
GGH-F1	L29989-1	
GGH-F2	L29989-2	
GGH-F3	L29989-3	
GGH-F4	L29989-4	
GGH-F5	L29989-5	
GGH-F6	L29989-6	
GGH-F7	L29989-7	
GGH-F8	L29989-8	
GGH-F9	L29989-9	
GGH-F10	L29989-10	
GGH-F11	L29989-11	
GGH-F12	L29989-12	
GGH-F13	L29989-13	
GGH-F14	L29989-14	
GGH-F15	L29989-15	

Report of Analysis

10/11/06 09:16

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29989

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-F1** (S)
Station:
Description:
LIMS Number: L29989-1

Collect Start: 09/22/2006 07:50
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil
Volume:
% Moisture: 14.60

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	-5.84E-01	5.36E-01	**8.99E-01**	pCi/g Dry		1.4877	g dry		10/06/06	100	M	U
H-3	2003	2.80E-01	5.94E-01	**9.67E-01**	pCi/g Dry		1.4877	g dry		10/05/06	100	M	U

Sample ID: **GGH-F2** (S)
Station:
Description:
LIMS Number: L29989-2

Collect Start: 09/22/2006 08:00
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil
Volume:
% Moisture: 13.35

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	-1.52E-01	4.95E-01	**8.19E-01**	pCi/g Dry		1.6316	g dry		10/06/06	100	M	U
H-3	2003	2.04E-01	5.40E-01	**8.82E-01**	pCi/g Dry		1.6316	g dry		10/05/06	100	M	U

Sample ID: **GGH-F3** (S)
Station:
Description:
LIMS Number: L29989-3

Collect Start: 09/22/2006 08:10
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil
Volume:
% Moisture: 20.05

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	-3.34E-01	6.52E-01	**1.08E+00**	pCi/g Dry		1.2351	g dry		10/06/06	100	M	U
H-3	2003	1.00E+00	7.31E-01	**1.16E+00**	pCi/g Dry		1.2351	g dry		10/05/06	100	M	U

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

10/11/06 09:16

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29989

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-F4** (S)
Station:
Description:
LIMS Number: L29989-4

Collect Start: 09/22/2006 08:20
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil
Volume:
% Moisture: 15.40

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	-1.29E-01	4.70E-01	**7.78E-01**	pCi/g Dry		1.719	g dry		10/06/06	100	M	U
H-3	2003	7.58E-01	5.26E-01	**8.37E-01**	pCi/g Dry		1.719	g dry		10/05/06	100	M	U

Sample ID: **GGH-F5** (S)
Station:
Description:
LIMS Number: L29989-5

Collect Start: 09/22/2006 08:30
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil
Volume:
% Moisture: 14.02

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	-1.78E-01	5.13E-01	**8.50E-01**	pCi/g Dry		1.5723	g dry		10/06/06	100	M	U
H-3	2003	2.32E-01	5.61E-01	**9.15E-01**	pCi/g Dry		1.5723	g dry		10/05/06	100	M	U

Sample ID: **GGH-F6** (S)
Station:
Description:
LIMS Number: L29989-6

Collect Start: 09/22/2006 08:40
Collect Stop:
Receive Date: 09/25/2006

Matrix: Soil
Volume:
% Moisture: 12.03

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	4.79E-01	4.36E-01	**7.06E-01**	pCi/g Dry		1.8947	g dry		10/06/06	100	M	U
H-3	2003	3.08E-01	4.68E-01	**7.59E-01**	pCi/g Dry		1.8947	g dry		10/05/06	100	M	U

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

10/11/06 09:16

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29989

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-F7** Collect Start: 09/22/2006 08:50 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 13.38
LIMS Number: L29989-7

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	1.66E-01	3.34E-01	**5.46E-01**	pCi/g Dry		2.45	g dry		10/06/06	100	M	U
H-3	2003	4.68E-01	3.67E-01	**5.87E-01**	pCi/g Dry		2.45	g dry		10/05/06	100	M	U

Sample ID: **GGH-F8** Collect Start: 09/22/2006 09:00 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 16.19
LIMS Number: L29989-8

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	**1.71E+00**	4.91E-01	7.74E-01	pCi/g Dry		1.7769	g dry		10/07/06	94.39	M	+
H-3	2003	**8.44E-01**	5.11E-01	8.10E-01	pCi/g Dry		1.7769	g dry		10/05/06	100	M	+

Sample ID: **GGH-F9** Collect Start: 09/22/2006 09:10 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 12.51
LIMS Number: L29989-9

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	2.45E-01	3.96E-01	**6.46E-01**	pCi/g Dry		2.0683	g dry		10/07/06	100	M	U
H-3	2003	**9.07E-01**	4.43E-01	6.96E-01	pCi/g Dry		2.0683	g dry		10/05/06	100	M	+

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

10/11/06 09:16

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29989

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-F10** Collect Start: 09/22/2006 09:20 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 11.75
LIMS Number: L29989-10

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	-2.71E-01	4.03E-01	**6.72E-01**	pCi/g Dry		1.9909	g dry		10/07/06	100	M	U
H-3	2003	5.49E-01	4.52E-01	**7.23E-01**	pCi/g Dry		1.9909	g dry		10/05/06	100	M	U

Sample ID: **GGH-F11** Collect Start: 09/22/2006 09:30 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 8.62
LIMS Number: L29989-11

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	5.72E-01	3.84E-01	**6.18E-01**	pCi/g Dry		2.1623	g dry		10/07/06	100	M	U
H-3	2003	**7.57E-01**	4.22E-01	6.65E-01	pCi/g Dry		2.1623	g dry		10/05/06	100	M	+

Sample ID: **GGH-F12** Collect Start: 09/22/2006 09:40 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 9.81
LIMS Number: L29989-12

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	6.08E-01	4.70E-01	**7.58E-01**	pCi/g Dry		1.7633	g dry		10/07/06	100	M	U
H-3	2003	**1.22E+00**	5.23E-01	8.16E-01	pCi/g Dry		1.7633	g dry		10/05/06	100	M	+

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

Report of Analysis

10/11/06 09:16

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

L29989

Chase Environmental Group, Inc.

Dave Culp

CH085-3ERUTGERS-06

Sample ID: **GGH-F13** Collect Start: 09/22/2006 09:50 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 7.86
LIMS Number: L29989-13

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	3.51E-01	3.64E-01	**5.91E-01**	pCi/g Dry		2.2619	g dry		10/07/06	100	M	U
H-3	2003	**1.15E+00**	4.13E-01	6.36E-01	pCi/g Dry		2.2619	g dry		10/05/06	100	M	+

Sample ID: **GGH-F14** Collect Start: 09/22/2006 10:00 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 8.89
LIMS Number: L29989-14

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	**5.75E+00**	5.12E-01	7.34E-01	pCi/g Dry		2.3972	g dry		10/07/06	57.76	M	+
H-3	2003	**2.09E+00**	4.11E-01	6.00E-01	pCi/g Dry		2.3972	g dry		10/05/06	100	M	+

Sample ID: **GGH-F15** Collect Start: 09/22/2006 10:10 Matrix: Soil (S)
Station: Collect Stop: Volume:
Description: Receive Date: 09/25/2006 % Moisture: 8.17
LIMS Number: L29989-15

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
C-14	2003	**1.87E+00**	4.81E-01	7.58E-01	pCi/g Dry		1.8329	g dry		10/07/06	92.61	M	+
H-3	2003	**1.36E+01**	8.19E-01	9.00E-01	pCi/g Dry		1.8329	g dry		10/06/06	76	M	+

Flag Values
U = Compound/Analyte not detected or less than 3 sigma
\+ = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
U* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
High = Activity concentration exceeds customer reporting value
Spec = MDC exceeds customer technical specification
L = Low recovery
H = High recovery

Bolded text indicates reportable value.

No = Peak not identified in gamma spectrum
Yes = Peak identified in gamma spectrum
**** Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

QC Summary Report for L29989

10/11/2006 9:22:00AM

TELEDYNE BROWN ENGINEERING
A Teledyne Technologies Company

C-14

Method Blank Summary

TBE Sample ID	Radionuclide	Matrix	Count Date/Time	Blank Result	Units	Qualifier	P/F
WG4493-3	C-14	WO	10/07/2006 12:52	< 1.340E+00	pCi/Total	U	P

LCS Sample Summary

TBE Sample ID	Radionuclide	Matrix	Count Date/Time	Spike Value	LCS Result	Units	Spike Recovery	Range	Qualifier	P/F
WG4493-4	C-14	WO	10/07/2006 12:57	5.87E+002	7.010E+02	pCi/Total	119.4	70-130	+	P

Spike ID: 14C-110295
Spike conc: 5.87E+003
Spike Vol: 1.00E-001

L29989 *C-14*

Associated Samples for **WG4493**

SAMPLENUM	CLIENTID
L29989-1	GGH-F1
L29989-2	GGH-F2
L29989-3	GGH-F3
L29989-4	GGH-F4
L29989-5	GGH-F5
L29989-6	GGH-F6
L29989-7	GGH-F7
L29989-8	GGH-F8
L29989-9	GGH-F9
L29989-10	GGH-F10
L29989-11	GGH-F11
L29989-12	GGH-F12
L29989-13	GGH-F13
L29989-14	GGH-F14
L29989-15	GGH-F15

+	Positive Result
U	Compound/analyte was analyzed, peak not identified and/or not detected above MDC
*	< 5 times the MDC are not evaluated
**	Nuclide not detected
***	Spiking level < 5 times activity
P	Pass
F	Fail
NE	Not evaluated

QC Summary Report for L29989

10/11/2006 9:22:00AM

TELEDYNE BROWN ENGINEERING
A Teledyne Technologies Company

H-3

Method Blank Summary

TBE Sample ID	Radionuclide	Matrix	Count Date/Time	Blank Result	Units	Qualifier	P/F
WG4492-1	H-3	WO	10/06/2006 2:21	< 1.440E+00	pCi/Total	U	P

LCS Sample Summary

TBE Sample ID	Radionuclide	Matrix	Count Date/Time	Spike Value	LCS Result	Units	Spike Recovery	Range	Qualifier	P/F
WG4492-2	H-3	WO	10/06/2006 2:34	2.52E+002	2.530E+02	pCi/Total	100.2	70-130	+	P

Spike ID: 3H-041706-1
Spike conc: 5.05E+002
Spike Vol: 5.00E-001

L29989 H-3

Associated Samples for WG4492

SAMPLENUM	CLIENTID
L29989-1	GGH-F1
L29989-2	GGH-F2
L29989-3	GGH-F3
L29989-4	GGH-F4
L29989-5	GGH-F5
L29989-6	GGH-F6
L29989-7	GGH-F7
L29989-8	GGH-F8
L29989-9	GGH-F9
L29989-10	GGH-F10
L29989-11	GGH-F11
L29989-12	GGH-F12
L29989-13	GGH-F13
L29989-14	GGH-F14
L29989-15	GGH-F15

+	Positive Result
U	Compound/analyte was analyzed, peak not identified and/or not detected above MDC
*	< 5 times the MDC are not evaluated
**	Nuclide not detected
***	Spiking level < 5 times activity
P	Pass
F	Fail
NE	Not evaluated

Chain of Custody Record No. C0607010-01

Chase Environmental Group, Inc.
3501 Workman Rd. Suite H., Knoxville, TN 37921
865-584-0833

L29989

Page 1 of 2

Project Name: Rutgers	Project Number: C0607010
Send Report To: Dave Culp DCULP@CHASEENV.COM 865-207-3664	Sampler (Print Name): D Culp
Address:	Sampler (Print Name): NA
3501 Workman Rd., Suite H.	Shipment Method: NA
Knoxville, TN 37921	Airbill Number: NA
Phone: 865-584-0833	Laboratory Receiving: Teledyne
Fax: 865-584-1961	

Purchase Order #: C0607010

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested: C-14	H-3	Cs-137	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
GGH-F1	9-22-06	0750	Soil	1	X	X		14 day TAT	
GGH-F2		0800			X	X		ALL ANALYSES MUST BE APPROVED UNDER NJ DEP LAB CERT PROGRAM.	
GGH-F3		0810			X	X			
GGH-F4		0820			X	X			
GGH-F5		0830			X	X			
GGH-F6		0840			X	X			
GGH-F7		0850			X	X			
GGH-F8		0900			X	X			
GGH-F9		0910			X	X			
GGH-F10		0920			X	X			
GGH-F11		0930			X	X			
GGH-F12		0940			X	X			
GGH-F13		0950			X	X			
GGH-F14		1000			X	X			
GGH-F15		1010			X	X			

Relinquished by: (Signature)	Received by: (Signature) Pat Marshall	Date: 9/25/06	Time: 1630
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By laboratory):

QA/QC level	Turnaround
Level I	Routine
Level II	24 Hour
Level III	1 Week
Other	Other _____

Sample Receipt	
Total # Containers Received?	
COC Seals Present?	
COC Seals Intact?	
Received Containers Intact?	
Temperature?	

09/27/06 11:36

SR #: SR10604

Teledyne Brown Engineering
Sample Receipt Verification/Variance Report

Client: CHASE ENVIRONMENTAL GROUP INC Project #: CH085-3ERUTGERS-06 LIMS #: L29989

Initiated By: PMARSHALL
Init Date: 09/27/06 Receive Date: 09/27/06

Notification of Variance

Person Notified: Contacted By:
Notify Date:
Notify Method:
Notify Comment:

Client Response

Person Responding:
Response Date:
Response Method:
Response Comment

	Criteria	Yes	No	NA	Comment
1	Shipping container custody seals present and intact.			NA	
2	Sample container custody seals present and intact.			NA	
3	Sample containers received in good condition	Y			
4	Chain of custody received with samples	Y			
5	All samples listed on chain of custody received	Y			
6	Sample container labels present and legible.	Y			
7	Information on container labels correspond with chain of custody	Y			
8	Sample(s) properly preserved and in appropriate container(s)			NA	
9	Other (Describe)			NA	

09/27/06 11:36

SR #: SR10604

Teledyne Brown Engineering
Sample Receipt Verification/Variance Report

Client: CHASE ENVIRONMENTAL GROUP INC Project #: CH085-3ERUTGERS-06 LIMS #: L29989

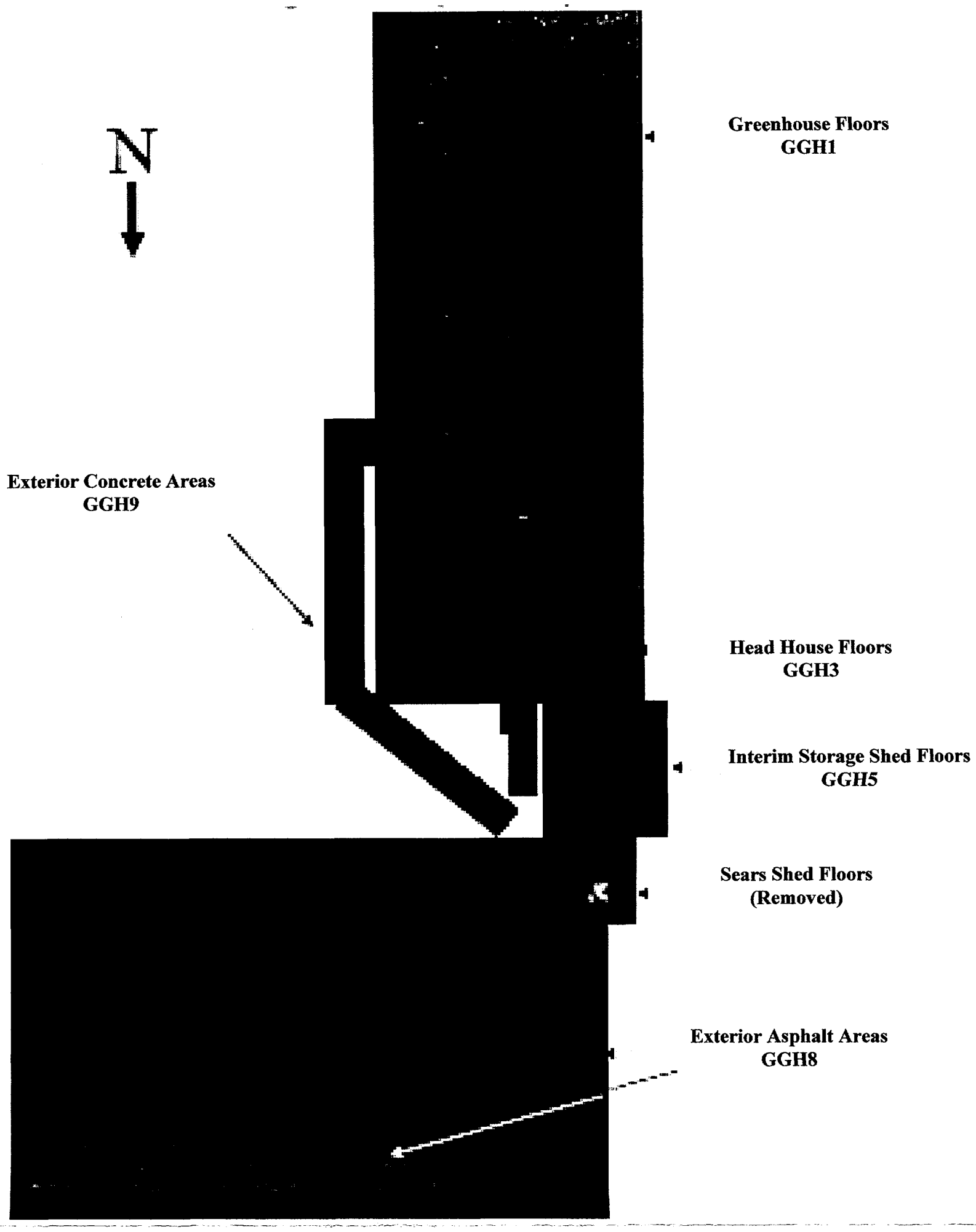
Project: CH085-3ERUTGERS-06

Receipt Instructions:

No receipt instructions

Login QC: None

Rutgers GGH Survey Overlay – Horizontal Surfaces



NOTE: The Sears Shed, the Sears Shed concrete pad, and portions of the concrete walkways were removed to provide access to underlying soils for GGH7 Final Status Surveys. These structures were free released under the provisions of the Rutgers Radioactive materials license. The Sears Shed concrete pad was remediated by removing approximately ½" of the surface at an elevated area of approximately 1 m^2 (shown as a bright spot on the overlay) to achieve free release criteria.

Final Status Quality Assurance Survey Results

Building ALL — Survey Unit SYS1 — Class N/A

Location Code	Total Beta Activity Measurements (dpm/100cm2)		Removable Activity Measurements (cpm/100cm2)	
	Activty	MDC	Open Channel	MDCR
ALL-SYS1-T1-M-001	335 ± 241	404	35 ± 16	36
ALL-SYS1-T1-M-002	270 ± 236	404	55 ± 17	36
ALL-SYS1-D1-M-003	-140 ± 203	404	58 ± 17	36
ALL-SYS1-D1-M-004	-19 ± 213	404	57 ± 17	36
ALL-SYS1-D1-M-005	56 ± 219	404	50 ± 16	36
ALL-SYS1-D1-M-006	130 ± 225	404	68 ± 17	36
ALL-SYS1-D1-M-007	65 ± 220	404	46 ± 16	36
ALL-SYS1-D1-M-008	-37 ± 212	404	53 ± 17	36
ALL-SYS1-V1-M-009	28 ± 217	404	57 ± 17	36
ALL-SYS1-V1-M-010	-19 ± 213	404	49 ± 16	36
ALL-SYS1-V2-M-011	-130 ± 204	404	63 ± 17	36
ALL-SYS1-V1-M-012	102 ± 223	404	58 ± 17	36
ALL-SYS1-V2-M-013	56 ± 219	404	61 ± 17	36
ALL-SYS1-V2-M-014	-168 ± 200	404	70 ± 17	36
ALL-SYS1-V2-M-015	121 ± 225	404	67 ± 17	36
ALL-SYS1-V2-M-016	112 ± 224	404	46 ± 16	36
ALL-SYS1-V2-M-017	-65 ± 209	404	57 ± 17	36
ALL-SYS1-V2-M-018	-37 ± 212	404	83 ± 18	36
ALL-SYS1-V2-M-019	0 ± 215	404	47 ± 16	36
Summary for Survey Unit # SYS1 (19 detail records)				
Average	35		57	
Minimum	-168		35	
Maximum	335		83	
Standard Deviation	129		11	

Summary for Building # ALL (19 detail records)		
Avg	35	57
Min	-168	35
Max	335	83

Final Status Quality Assurance Survey Results

Building DQA Survey Unit GGH1 Class 1

Location Code	Total Beta Activity Measurements (dpm/100cm2)		Removable Activity Measurements (cpm/100cm2)	
	Activty	MDC	Open Channel	MDCR
DQA-GGH1-F1-C-001	1741 ± 329	404	62 ± 17	36
DQA-GGH1-F1-C-002	2449 ± 366	404	62 ± 17	36
DQA-GGH1-F1-C-003	1685 ± 326	404	69 ± 17	36
DQA-GGH1-F1-C-004	1462 ± 314	404	52 ± 16	36
DQA-GGH1-F1-C-005	317 ± 240	404	51 ± 16	36
DQA-GGH1-F1-C-006	652 ± 263	404	67 ± 17	36
DQA-GGH1-F1-C-007	466 ± 250	404	83 ± 18	36
DQA-GGH1-F1-C-008	410 ± 246	404	49 ± 16	36
DQA-GGH1-F1-C-009	456 ± 250	404	64 ± 17	36
DQA-GGH1-F1-C-010	717 ± 268	404	52 ± 16	36
DQA-GGH1-F1-C-011	531 ± 255	404	57 ± 17	36
DQA-GGH1-F1-C-012	456 ± 250	404	62 ± 17	36
DQA-GGH1-F1-C-013	428 ± 248	404	63 ± 17	36
DQA-GGH1-F1-C-014	354 ± 242	404	43 ± 16	36
DQA-GGH1-F1-C-015	391 ± 245	404	68 ± 17	36
DQA-GGH1-F1-C-016	456 ± 250	404	61 ± 17	36
DQA-GGH1-F1-C-017	233 ± 233	404	64 ± 17	36
DQA-GGH1-F1-C-018	168 ± 228	404	56 ± 17	36
DQA-GGH1-F1-C-019	19 ± 216	404	56 ± 17	36
DQA-GGH1-F1-C-020	158 ± 227	404	72 ± 17	36
DQA-GGH1-F1-C-021	-102 ± 206	404	41 ± 16	36
DQA-GGH1-F1-C-022	205 ± 231	404	70 ± 17	36
DQA-GGH1-F1-C-023	9 ± 215	404	66 ± 17	36
DQA-GGH1-F1-C-024	251 ± 235	404	59 ± 17	36
Summary for Survey Unit # GGH1 (24 detail records)				
Average	580		60	
Minimum	-102		41	
Maximum	2449		83	
Standard Deviation	624		9	

Final Status Quality Assurance Survey Results

Building DQA Survey Unit GGH2 Class 2

Location Code	Total Beta Activity Measurements (dpm/100cm2)		Removable Activity Measurements (cpm/100cm2)	
	Activty	MDC	Open Channel	MDCR
DQA-GGH2-W1-G-001	782 ± 272	404	48 ± 16	36
DQA-GGH2-C1-G-002	177 ± 229	404	48 ± 16	36
DQA-GGH2-C1-G-003	475 ± 251	404	57 ± 17	36
DQA-GGH2-C1-G-004	37 ± 218	404	61 ± 17	36
DQA-GGH2-C1-G-005	521 ± 254	404	53 ± 17	36
DQA-GGH2-W1-G-006	93 ± 222	404	57 ± 17	36
DQA-GGH2-W1-G-007	9 ± 215	404	54 ± 17	36
DQA-GGH2-W1-G-008	121 ± 225	404	51 ± 16	36
DQA-GGH2-W1-G-009	670 ± 265	404	51 ± 16	36
DQA-GGH2-W1-G-010	177 ± 229	404	55 ± 17	36
DQA-GGH2-C1-G-011	270 ± 236	404	57 ± 17	36
DQA-GGH2-C1-G-012	317 ± 240	404	73 ± 17	36
DQA-GGH2-C1-G-013	-102 ± 206	404	64 ± 17	36
DQA-GGH2-C1-G-014	56 ± 219	404	52 ± 16	36
DQA-GGH2-W1-C-015	±		51 ± 16	36
Summary for Survey Unit # GGH2 (15 detail records)				
Average	257		55	
Minimum	-102		48	
Maximum	782		73	
Standard Deviation	264		7	

Final Status Quality Assurance Survey Results

Building DQA Survey Unit GGH3 Class 1

Location Code	Total Beta Activity Measurements (dpm/100cm2)		Removable Activity Measurements (cpm/100cm2)	
	Activty	MDC	Open Channel	MDCR
DQA-GGH3-F1-C-001	149 ± 227	404	51 ± 16	36
DQA-GGH3-F1-C-002	186 ± 230	404	55 ± 17	36
DQA-GGH3-F1-C-003	140 ± 226	404	75 ± 18	36
DQA-GGH3-F1-C-004	121 ± 225	404	68 ± 17	36
DQA-GGH3-F1-C-005	56 ± 219	404	53 ± 17	36
DQA-GGH3-F1-C-006	261 ± 235	404	50 ± 16	36
DQA-GGH3-S1-P-007	-326 ± 186	404	65 ± 17	36
DQA-GGH3-F1-C-008	251 ± 235	404	59 ± 17	36
DQA-GGH3-F1-C-009	400 ± 246	404	45 ± 16	36
DQA-GGH3-F1-C-010	149 ± 227	404	54 ± 17	36
DQA-GGH3-F1-C-011	652 ± 263	404	61 ± 17	36
DQA-GGH3-F1-C-012	596 ± 260	404	71 ± 17	36
DQA-GGH3-F1-C-013	84 ± 222	404	61 ± 17	36
DQA-GGH3-F1-C-014	428 ± 248	404	56 ± 17	36
DQA-GGH3-F1-B-015	±		55 ± 17	36
DQA-GGH3-F1-C-016	317 ± 240	404	58 ± 17	36
DQA-GGH3-F1-C-017	-19 ± 213	404	50 ± 16	36
Summary for Survey Unit # GGH3 (17 detail records)				
Average	215		58	
Minimum	-326		45	
Maximum	652		75	
Standard Deviation	237		8	

Final Status Quality Assurance Survey Results

Building DQA Survey Unit GGH4 Class 2

Location Code	Total Beta Activity Measurements (dpm/100cm2)		Removable Activity Measurements (cpm/100cm2)	
	Activty	MDC	Open Channel	MDCR
DQA-GGH4-W1-B-001	242 ± 234	404	49 ± 16	36
DQA-GGH4-W1-B-002	-74 ± 208	404	54 ± 17	36
DQA-GGH4-W1-B-003	177 ± 229	404	76 ± 18	36
DQA-GGH4-W1-B-004	410 ± 246	404	70 ± 17	36
DQA-GGH4-C1-W-005	-233 ± 194	404	50 ± 16	36
DQA-GGH4-C1-W-006	0 ± 215	404	51 ± 16	36
DQA-GGH4-C1-W-007	-102 ± 206	404	60 ± 17	36
DQA-GGH4-W1-B-008	270 ± 236	404	65 ± 17	36
DQA-GGH4-W1-B-009	205 ± 231	404	56 ± 17	36
DQA-GGH4-C1-W-010	112 ± 224	404	58 ± 17	36
DQA-GGH4-C1-W-011	121 ± 225	404	57 ± 17	36
DQA-GGH4-C1-W-012	-121 ± 204	404	46 ± 16	36
DQA-GGH4-W1-B-013	233 ± 233	404	50 ± 16	36
DQA-GGH4-W1-B-014	428 ± 248	404	54 ± 17	36
DQA-GGH4-S1-M-015	19 ± 216	404	51 ± 16	36
DQA-GGH4-W1-B-016	186 ± 230	404	66 ± 17	36
Summary for Survey Unit # GGH4 (16 detail records)				
Average	117		57	
Minimum	-233		46	
Maximum	428		76	
Standard Deviation	189		8	

Final Status Quality Assurance Survey Results

Building DQA Survey Unit GGH5 Class 1

Location Code	Total Beta Activity Measurements (dpm/100cm2)		Removable Activity Measurements (cpm/100cm2)	
	Activty	MDC	Open Channel	MDCR
DQA-GGH5-S1-W-001	-121 ± 204	404	62 ± 17	36
DQA-GGH5-F1-C-002	196 ± 230	404	51 ± 16	36
DQA-GGH5-F1-C-003	102 ± 223	404	50 ± 16	36
DQA-GGH5-F1-C-004	196 ± 230	404	76 ± 18	36
DQA-GGH5-F1-C-005	223 ± 233	404	51 ± 16	36
DQA-GGH5-F1-C-006	307 ± 239	404	55 ± 17	36
DQA-GGH5-F1-C-007	214 ± 232	404	64 ± 17	36
DQA-GGH5-F1-C-008	233 ± 233	404	55 ± 17	36
DQA-GGH5-F1-C-009	186 ± 230	404	66 ± 17	36
DQA-GGH5-F1-C-010	317 ± 240	404	52 ± 16	36
DQA-GGH5-F1-C-011	261 ± 235	404	54 ± 17	36
DQA-GGH5-F1-C-012	391 ± 245	404	43 ± 16	36
DQA-GGH5-F1-C-013	177 ± 229	404	77 ± 18	36
DQA-GGH5-F1-C-014	670 ± 265	404	65 ± 17	36
DQA-GGH5-F1-C-015	345 ± 242	404	59 ± 17	36
Summary for Survey Unit # GGH5 (15 detail records)				
Average	246		59	
Minimum	-121		43	
Maximum	670		77	
Standard Deviation	167		10	

Final Status Quality Assurance Survey Results

Building DQA Survey Unit GGH6 Class 2

Location Code	Total Beta Activity Measurements (dpm/100cm2)		Removable Activity Measurements (cpm/100cm2)	
	Activty	MDC	Open Channel	MDCR
DQA-GGH6-W1-W-001	112 ± 224	404	56 ± 17	36
DQA-GGH6-W1-W-002	-102 ± 206	404	52 ± 16	36
DQA-GGH6-C1-W-003	0 ± 215	404	60 ± 17	36
DQA-GGH6-C1-W-004	130 ± 225	404	62 ± 17	36
DQA-GGH6-W1-W-005	-47 ± 211	404	40 ± 16	36
DQA-GGH6-W1-W-006	-168 ± 200	404	50 ± 16	36
DQA-GGH6-C1-W-007	-37 ± 212	404	56 ± 17	36
DQA-GGH6-C1-W-008	102 ± 223	404	52 ± 16	36
DQA-GGH6-C1-W-009	130 ± 225	404	65 ± 17	36
DQA-GGH6-W1-W-010	-140 ± 203	404	54 ± 17	36
DQA-GGH6-C1-W-011	65 ± 220	404	64 ± 17	36
DQA-GGH6-C1-W-012	28 ± 217	404	70 ± 17	36
DQA-GGH6-C1-W-013	9 ± 215	404	48 ± 16	36
DQA-GGH6-W1-W-014	335 ± 241	404	70 ± 17	36
DQA-GGH6-W1-W-015	-19 ± 213	404	68 ± 17	36
DQA-GGH6-W1-W-016	177 ± 229	404	66 ± 17	36
Summary for Survey Unit # GGH6 (16 detail records)				
Average	36		58	
Minimum	-168		40	
Maximum	335		70	
Standard Deviation	128		9	

Summary for Building # DQA (103 detail records)		
Avg	268	58
Min	-326	40
Max	2449	83

This is to acknowledge the receipt of your letter/application dated

11/2/2006, and to inform you that the initial processing which includes an administrative review has been performed.

Amendments 29-05218-28 / 29-15188-01

☒ There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

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A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 139693 / 139694
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader